

2025 Louisiana Plant Disease Management Guide

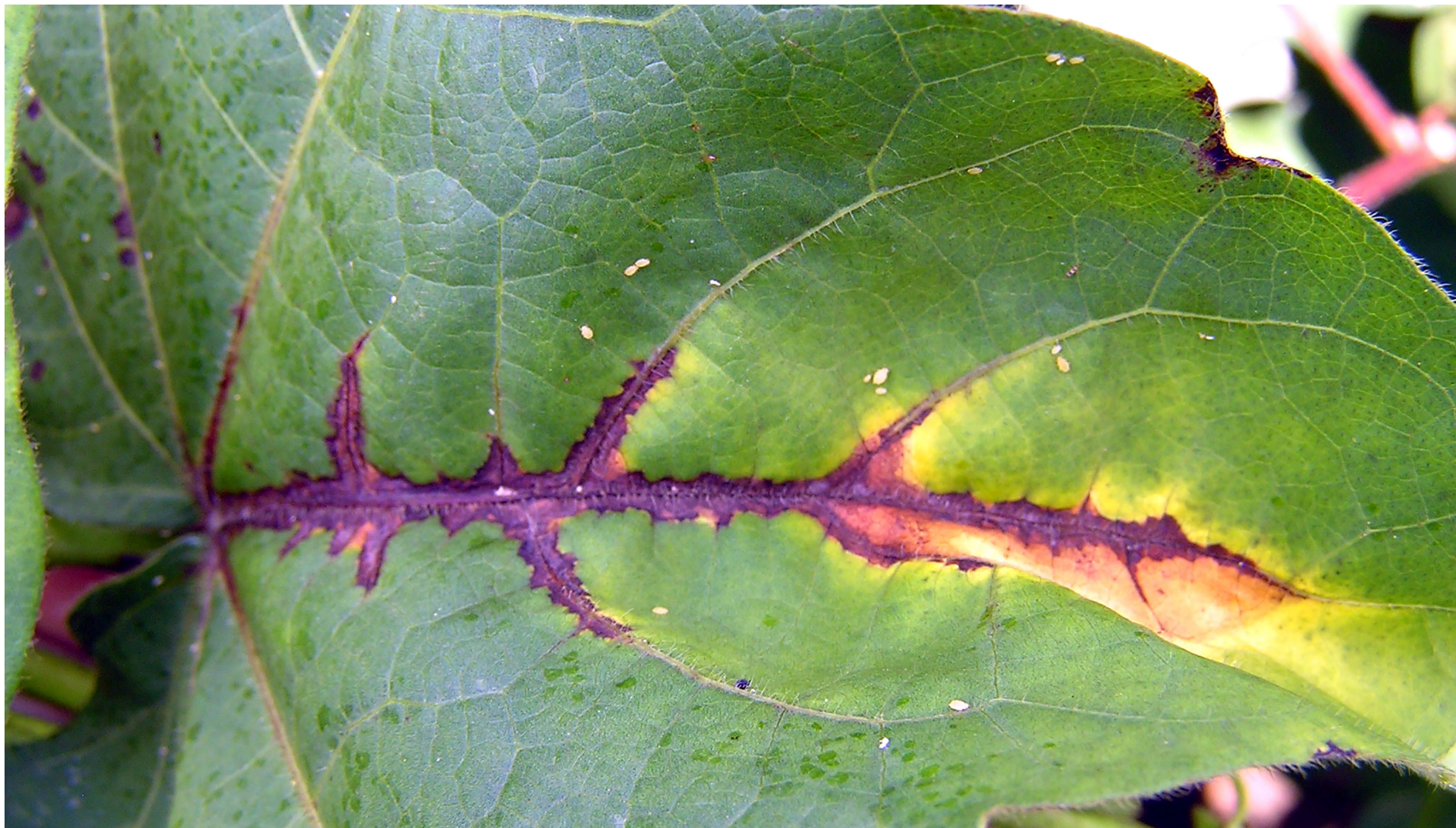


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Introduction

The LSU AgCenter Plant Disease Management Guide is a resource for crop producers in Louisiana and neighboring states. The guide provides integrated management tactics for the most important or more prevalent diseases that affect agricultural and horticultural crops grown in Louisiana.

Disease management recommendations are based on research results of experiments conducted by the LSU AgCenter, other land-grant universities in the United States and the U.S. Department of Agriculture Agricultural Research Service. Disease management recommendations within the guide are updated at least annually and, if necessary, more frequently. The name of the primary contributor for each section and the date the information was last revised are located at the end of each section. Questions pertaining to specific recommendations should be directed to the section contributors.

Successful management of plant diseases requires a management program that integrates the use of available resistant and hybrids, good cultural practices, weed and insect management, and biocontrol and chemical management. Newly revised chapters include integrated disease management tactics. While many pesticides are labeled for disease management, not all are included in this guide. References to commercial or trade names are made with the understanding that no discrimination is intended, and endorsement of a particular product by the LSU AgCenter or LSU is not implied. More information on available pesticides can be obtained at www.cdms.net.

Pesticide Safety

Pesticides are an important management tool in an integrated pest management program (IPM). Pesticides should be used in a manner that limits worker and domestic animal and wildlife exposure, runoff, drift, and the buildup of pesticide-resistant pathogens. Adequate training should be provided to all employees on how to use pesticides safely. For more pesticide safety information or a list of pesticide certification or recertification conferences offered throughout the state, go to:

[LSU AgCenter Pesticide Safety Education Program](http://www.lsuagcenter.com/pesticide)
www.lsuagcenter.com/pesticide or contact:

Bryan Gueltig

Pesticide Safety Education Program Coordinator
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Before applying a pesticide to a crop:

- Confirm that the problem is due to a pathogen, insect or weed.
- Have the disease identified by an authority on plant pathogens and diseases.
- Select a pesticide that is recommended for the disease.
- Confirm that the pesticide is registered with the Environmental Protection Agency and labeled in Louisiana for the crop on which you intend to use it.
- Read the product label in its entirety. Pay particular attention to any application restrictions that may exist for the product.
- Check that your application equipment is functioning properly by testing it using only water. Make all repairs prior to using a pesticide.
- Make sure your application equipment is properly calibrated before applying a pesticide.
- Check that gloves and protective clothing fit properly and are clean and free of holes. Always have extra clean clothes available in case of an emergency.

Application of pesticides:

- Always wear the label-required protective clothing or personal protective equipment (PPE) while applying the pesticide.
- Spray during weather conditions that mitigate pesticide drift.

Preparation, storage and disposal of pesticides:

- Always wear protective clothing when handling pesticides.
- Mix pesticides in a well-ventilated area with access to clean water, soap and single use towels (decontamination supplies).
- Product labels and safety data sheets, as well as emergency contact information, should be available for quick reference.
- Only compatible pesticides should be tank-mixed. Read the label carefully to confirm pesticide compatibility. If you are not sure, a jar test is recommended.
- Do not mix or store pesticides near food or feed.
- Only mix the amount of pesticide required to treat the crop.
- Store pesticides in a locked room at the recommended temperature.

For proper (and legal) disposal of unused pesticides, contact your local solid waste management authority, environmental agency or health department.

To identify a local authority, go to:

<https://www.epa.gov/hwgenerators/links-hazardous-waste-programs-and-us-state-environmental-agencies>
or call **1-800-CLEANUP** or **LDAF at 225-922-1234** (ask for the pesticide division).

Do not pour leftover pesticides down the sink, into the toilet or down a sewer or street drain!

After applying a pesticide to a crop:

- Promptly post signs indicating that the crop has been treated with a pesticide if required by the pesticide label or the Worker Protection Standard requirements for agricultural use products.
- Clean and decontaminate equipment according to the product label.
- Keep required pesticide application records: Document the day, time, crop and type (including EPA number) and the amount of pesticide applied. **Careful record keeping is extremely important.** A complete record-keeping manual can be found on the LSU AgCenter online store.

In case of an emergency:

- In the case of direct human exposure that results in personal injury or ingestion of a pesticide, immediately dial 911 and/or contact your local physician. Be sure to have copies of the pesticide label and the safety data sheet for treating medical personnel.
- In the case of a pesticide spill, contact the Louisiana Department of Agriculture (LDAF) on the LDAF Emergency Hotline: 855-452-5323.

Worker Protection Standard (WPS)

The Environmental Protection Agency (EPA) Agricultural Worker Protection Standard (WPS) is aimed at reducing the risk of pesticide poisoning and injury among agricultural workers and pesticide handlers. Pesticide applicators must comply with this Occupational Safety and Health Administration (OSHA) regulation when using agricultural use pesticide products that reference the Worker Protection Standard, 40 CFR Part 170. In 2015, the EPA made major revisions to the Worker Protection Standard.

The LSU AgCenter has since worked to provide an updated WPS Train-the-Trainer program that is approved by the EPA. In Louisiana, those employers who wish to train their own workers and handlers (or other workers and handlers on nearby agricultural establishments) must be certified pesticide applicators and have been trained with the new WPS Train-the-Trainer program provided through the LSU AgCenter. Note: all agricultural workers and handlers (who work with or around applied pesticides and who work for one of these four establishments: farm, forest, plant nursery or green house operation) must be trained on a yearly basis with these approved training materials.

If a pesticide applicator who has had “WPS Trainer” status has attended a WPS Train-the-Trainer program prior to November 2016, then he or she must attend an updated WPS Train-the-Trainer program. Once this training has been completed, the “WPS Trainer” category will be added to the back of their pesticide certification card. This WPS Trainer certification will be renewed when they attend their normal pesticide applicator recertification meeting - on their three-year recertification cycle. Training dates and locations can be found at www.lsuagcenter.com/pesticide by selecting the WPS tab.

If you would like to receive WPS Train-the-Trainer training so that you will be certified to administer WPS worker/handler training to workers who perform work around or with agricultural pesticide products, please email LSUAGPSEP@agcenter.lsu.edu and someone at the LSU AgCenter's Pesticide Safety Education Program will assist you.

As part of the revised rule there are a few things that need to be pointed out:

- Workers and handlers must be trained **every 12 months**. Records of their training must be kept.
- WPS trainers must participate in the new EPA-approved Train-the-Trainer program (See information above).
- Workers and handlers **must be trained by trainers using the updated, EPA-approved training materials**.
- The card system for records of training is no longer used. You must maintain the following worker/handler annual training information:
 - Trained worker's printed name and signature
 - Date of the training
 - Information identifying which EPA-approved training materials were used
 - The trainer's name (and certification number) and qualification to train
 - The worker or handler employer's name

- The LSU AgCenter has created a record keeping form that you are welcome to use. If you would like to download a training verification form for WPS, please do so by going to the LSU AgCenter's PSEP website (within the WPS tab).
- Records of the training of workers and handlers must be kept for at least three years
- Maintain the following information at a central location:
 - New safety poster <https://npsecstore.com/collections/posters>
 - Application records
 - Emergency medical contact information
 - Safety Data Sheet (SDS/safety information)
- When using a pesticide that requires a respirator, employers must:
 - Have an employee medically evaluated by a physician or other licensed health care professional
 - Have employee go through an annual fit test for each type of respirator required by the pesticide product label
 - Have the employee participate in annual training on how to properly use the respirator(s)
 - Maintain records for three years of the completion of the above, respirator requirements

To get more information about the WPS revised rule, you will need to refer to the final rule at <https://www.epa.gov/pesticide-worker-safety/agricultural-worker-protection-standard-wps>.

Where to get updated information:

- <http://www.lsuagcenter.com/pesticide>.
- *The How to Comply Manual* is a great reference guide and can be ordered at <https://npsecstore.com>.
- Get the newest pesticide safety poster and other important WPS materials at <https://npsecstore.com>.
- Get EPA approved worker/handler training materials at <https://www.pesticideresources.org>.

This section was revised September 2024 by Bryan Gueltig, LSU AgCenter PSEP.

Fungicide Resistance

Fungicides are important tools for managing many diseases in agricultural and horticultural crops. Fungicides are most effective when applied before fungal infections are established. Because protection by fungicides is temporary, they may need to be reapplied to protect new growth.

Although many factors can contribute to the failure of a fungicide to protect a crop, the development of resistance by the fungal pathogen is the most difficult to overcome. Resistance is a heritable genetic trait that results in reduced sensitivity to a fungicide by a fungal pathogen. Fungicides that disrupt multiple cellular functions (multisite inhibiting fungicides) in the pathogen are less likely to result in resistant pathogen populations compared to those that target a single cellular function (single site-specific fungicides). Most new fungicides are single site-specific.

Fungal pathogens that are resistant to one fungicide often are resistant to other fungicides that share the same mode of action. This is classified as cross-resistance. For this reason, the Fungicide Resistance Action Committee (FRAC) developed fungicide group codes, referred to as FRAC codes, to facilitate resistance management. Fungicides with the same FRAC code have a similar mode of action and could exhibit cross-resistance. A full list of the codes for all fungicide common names (active ingredients), their modes of action and the risk level (low, medium or high) for fungicide resistance development can be found at <http://www.phi-base.org/images/fracCodeList.pdf>. **The FRAC codes also are listed on the front of a product label or in the resistance management section.**

Fungicide resistance in a pathogen population becomes important when fungicide-resistant isolates outnumber fungicide-sensitive isolates. **The buildup of resistant isolates is caused by repeated or incorrect use of a fungicide.** Fungicide resistance within a population occurs at different rates and is affected by the mode of action of the fungicide, the genetics of the pathogen and cropping practices.

Strategies for managing fungicide resistance are aimed at slowing the development of resistance. Therefore, resistance management plans must be implemented when at-risk fungicides become available for a particular use before resistance becomes a problem. The objective of a resistance management program is to minimize the use of at-risk fungicides without compromising disease control. Although specific strategies vary depending on the fungicide FRAC code, the target pathogen and the crop, the general approach is similar. A resistance management program should integrate resistant varieties, good cultural practices and thoughtful and judicious use of fungicides.

Resistant Varieties

Whenever feasible, resistant varieties should be selected. The use of resistant varieties reduces the potential for disease incidence and severity and thereby minimizes or eliminates the need for fungicides.

Good Cultural Practices

Proper sanitation and crop rotations can reduce initial pathogen populations, while proper soil fertility and the use of high-quality water can reduce disease incidence. To decrease the potential for fungicide resistance, avoid sites with a history of disease.

Fungicide Use

Fungicides should only be used when alternatives are not available to avoid unnecessary selection of fungicide resistant populations. The following practices should be used when fungicides are necessary:

- Start fungicide applications early in disease development.
- Use low-risk fungicides when possible.
- Use optimal application methods to maximize spray coverage.
- Do not apply fungicides at rates below or above the range specified in the label.
- Do not apply a fungicide more than two times sequentially. Alternate (apply a fungicide at most twice and then switch) fungicides from different FRAC codes.
- Alternatively, tank-mix at-risk fungicides with a multi-site mode of action fungicide. Refer to product labels to ensure fungicides are compatible or to confirm that the fungicide is not already a pre-mix.
- Refer to product labels for specific resistance management guidelines.
- Do not exceed the number of fungicide applications (or maximum use amount) recommended by the manufacturer.

The fungicide resistance management section was revised September 2023 by Boyd Padgett.

Abbreviations

Throughout this guide, units of measurement and time are abbreviated. The table below lists the units of measure or time and the corresponding abbreviations.

Abbreviation	Term
min	Minute
hr	Hour
d	Day
yr	Year
in	Inch
ft	Feet
ft ²	Square Feet
fl oz	Fluid Ounce
pt	Pint
qt	Quart
oz	Ounce
lb	Pound
a.i.	Active Ingredient
OMRI	Organic Materials Review Institute
OG	OMRI Listed

The Plant Diagnostic Center

Instructions for Collecting, Packaging and Shipping Plant Samples

Accurate and rapid diagnoses depend on the quality and quantity of the sample submitted. No one method of preparation for shipping plant materials will guarantee their satisfactory arrival in the laboratory, but following the suggestions given below generally will ensure specimens will be received in good condition.

Specimens completely desiccated or in advanced states of decay, and those that arrive without supporting information and diagnostic fees will have to be discarded. This represents time and labor wasted for the sender and personnel at the LSU AgCenter.

Note: Findings reported are based on examination of the material submitted. Some diagnoses require intensive studies. Because the time devoted to individual specimens must be limited, reports, while reflecting considered opinion and best judgment, may not always be statements of complete facts.

To get the best possible results, follow these instructions:

General Guidelines for Submitting Plant Samples for Routine Diagnosis

- Please consult the following guidelines before collecting, packing and submitting the samples.
- Plan to collect and submit samples early in the week.
- Pack samples properly (see “Sample Packaging and Mailing” below).
- Collect specimens representing a range of symptoms.
- Collect all parts of the plant that show symptoms.
- Collect specimens before applying any chemicals.
- Submit a generous amount of plant material.
- Samples must be accompanied with a completed “Sample Submission Form.” Samples without this form will not be diagnosed. Place Sample Submission Form in a plastic bag when sample contains roots, soil or perishable tissue.
- Samples must be accompanied by the diagnostic fee. (Samples without diagnostic fee may not be diagnosed).
- Write the correct mailing address on the package.
- Specimens from different plant species should be packed separately.
- Out-of-state samples must be accompanied by the PPQ 526 permit for interstate movement of the plant/plant material. (Contact Raj Singh at rsingh@agcenter.lsu.edu or Tim Burks at tburks@agcenter.lsu.edu or 225-578-4562 for the permit.)

For Plant Disease Diagnostics

Plants showing wilting, yellowing or general decline

1. Send whole plants including roots, if practical. Be sure to send plants showing early stages of disease.
2. Dig up carefully (Don't pull up!).
3. Send sample of soil and feeder roots in plastic bag. Seal to avoid loss of moisture. Don't add any excess water to the sample.

Cankers

1. Select specimens from recent infestations. Send the entire cankered portion, if possible, with some of the healthy wood above and below the canker.
2. Branches and twigs that have been dead for several months are useless for identification.

Leaf spots/blights/scorch

1. Collect several (15-20) leaves showing early and late stages of infestation.
2. For scorch symptoms, send in the affected twig/branch with leaves attached. Cut several foot-long twigs showing leaf scorch symptoms, wrap these in dry paper towel(s) and pack in plastic bag.
3. For spots or blight, wrap leaves in dry paper towel(s) and pack those in plastic bags.
4. It usually is not possible to diagnose marginal burning or other injury symptoms on leaves.

Fleshy organs

1. Rots of fleshy fruits and vegetables need special attention. Do not send those in advanced stages of decay.
2. Select fresh specimens showing early symptoms.
3. Place specimens in a plastic bag with dry paper towel(s). Do not add extra moisture. Fleshy vegetables and fruit specimens should be wrapped separately. Keep cool until shipped.

Homeowner turfgrass samples

1. Collect turf samples with early and advanced stages of disease development. Completely dead turfgrass seldom generates an accurate diagnosis.
2. Collect turf sample from transition zone between healthy and diseased turfgrass so it contains both healthy and affected turf.
3. Collect a 6-inch-by-6-inch section of affected turf with soil intact.
4. Wrap the sample in newspaper or aluminum foil.
5. Place sample in a sturdy cardboard box and pack securely.
6. Do not add water to the sample.
7. Place the completed Sample Submission Form and diagnostic fee in a plastic bag and send it with the sample.
8. Ship turf samples to the Plant Diagnostic Center immediately after collection.

For Nematode Diagnosis/Identification

1. Late summer and fall are the best times to take nematode samples.
2. Nematode samples require at least one pint of soil from approximately 20 random soil probes. Mix soil together and mail in plastic bag.
3. A Nematode Assay Form with required information must accompany samples.
4. Protect sample from heat and light.

For Insect Pests or Mite Diagnosis/Identification

1. Collect damaged plant parts, such as leaves or twigs, wrap these in dry paper towel(s) and place the wrapped tissue in plastic bags.
2. If root samples are submitted, pack the damaged roots, with soil intact, in plastic bags.
3. Submit insect specimens in glass vials containing ethanol. Label the vials with the collection information, including the site, host, date and collector's name.
4. Complete the Sample Submission Form for each sample/vial submitted for diagnosis.

For Weed Identification

1. Send the entire plant for identification. Leaves alone may not be sufficient for an accurate identification.
2. Dig up carefully. (Don't pull up!)
3. Wrap roots in plastic bag and rest of the plant in dry paper towel(s) and pack the entire plant in a plastic bag.
4. High-quality images of the plant where it was growing may aid in identification.

Sample Packaging and Mailing

1. Do not add water to samples.
2. Wrap plant tissue such as leaves or twigs in dry paper towel(s) and place in plastic bags.
3. Pack foliage and roots collected from the same plant in separate plastic bags.
4. Wrap fruit samples in dry paper towel(s).
5. Pack samples in a sturdy cardboard box. Wrap package in heavy paper. Attach envelope containing Sample Submission Form to outside of package.
6. Identify package with both outside and inside labels and protect inside the label from moisture.
7. Address package to: Plant Diagnostic Center, 302 Life Sciences Building, Baton Rouge, LA 70803.
8. Mail packages to arrive on weekdays (Monday through Thursday) rather than on the weekend.

Remember, the better the specimen, the more accurate the diagnosis!

Rapid Turfgrass Diagnostics

The rapid turfgrass diagnostics service is intended for commercial golf courses, athletic fields and landscapes. It is always preferred to check with the diagnostician before collecting and submitting turfgrass samples for rapid turfgrass diagnosis.

Turfgrass Sample Collection

1. Collect turf samples with early and advanced stages of disease development.
2. Collect turf samples from transition zone between healthy and diseased turfgrass so samples contain both healthy and affected turf.
3. Collect two samples from each problem area. Samples can be either “cup cutter” samples or a sample at least 6 inches by 6 inches.
4. Completely dead turfgrass seldom generates an accurate diagnosis.

Turfgrass Sample Packaging

1. Wrap samples in newspaper or aluminum foil.
2. Place samples in a sturdy cardboard box and pack securely.
3. Do not add water to samples.
4. Ship samples to the Plant Diagnostic Center immediately after collection.
5. Do not forget to include the completed Rapid Turfgrass Sample Submission Form with the samples.
6. Samples without the appropriate Sample Submission Form(s) and diagnostic fee(s) will not be processed.
7. The rapid turfgrass diagnostic service is provided for a charge of \$75 for in-state and \$100 for out-of-state samples.
8. Make check payable to **LSU AgCenter PDC**.

Turfgrass Sample Submission

1. Ship samples to correct mailing address.
2. Ship samples early in the week.
3. Samples should be delivered overnight (preferably via courier services).
4. Samples will not be received on Saturdays, Sundays and other LSU AgCenter holidays.

Diagnostic Fee Schedule

Diagnostic Service	Diagnostic Fee for In-state samples	Diagnostic Fee for Out-of-state samples
Routine diagnostics	\$20	\$40
Serological and biochemical tests	\$30	\$60
Molecular diagnostics	\$75	\$100
Rapid turfgrass diagnostics	\$75	\$100

Sample Submission Address

Plant Diagnostic Center

302 Life Sciences Building
Baton Rouge, LA 70803

Contact Information

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Email: rsingh@agcenter.lsu.edu

Phone: 225-578-4562

Fax: 225-578-1415

www.LSUAgCenter.com/PlantDiagnostics

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Commercial Crop Production: Field Crops

Corn

Disease

Symptoms, source of inoculum and management of corn diseases.

Disease	Symptoms	Source of Inoculum	Management
Charcoal Rot (<i>Macrophomina phaseolina</i>)	Injury from this disease usually does not become evident until plants approach maturity. Diseased plants exhibit poorly developed ears, premature ripening, lodging and drying of the stalk. Stalks are soft and discolored at the base, and the pith becomes shredded.	This fungus survives in old plant debris or in the soil.	Rotate crops. Bury stubble. Maintain balanced potassium/nitrogen rates.
Common Rust (<i>Puccinia sorghi</i>)	Common rust can be recognized by small oval- to elongated-pustules, which are at first cinnamon-brown and then become brownish-black as the corn matures. The pustules may appear on any aboveground part of the plant but are most abundant on the leaves – scattered over both surfaces.	Spores usually are windblown from the south. An alternate host is the wood sorrel (<i>Oxalis</i> sp.).	Most hybrids are tolerant to this disease. Always use the recommended hybrids for your area.
Fusarium Stalk Rot (<i>Fusarium</i> spp.)	Leaves of infected plants become grayish-green as plants approach maturity. Softening and discoloration of the exterior of lower internodes occur. When stalks are affected with stalk rot, they split and generally will show a reddish discoloration of the diseased area.	This fungus lives in old stubble or in the soil.	Practice crop rotation. Plow crop residue under. Make sure adequate potassium is applied with high nitrogen rates.
Gray Leaf Spot (<i>Cercospora zeae-maydis</i>)	The early lesions produced on the corn leaves by <i>Cercospora zeae-maydis</i> are yellow to tan and look similar to those produced by other diseases, except they have a faint watery halo that can be seen when held up to the light. After about two weeks, the lesions appear tan to brown and rectangular shaped, bordered by the veins of the leaf. When fully expanded, individual lesions may be 3 to 4 inches long and 1/16- to 1/8-inch-wide, depending on the distance between veins. If several infections occur near each other on the same leaf, however, a broader lesion will result.	The fungus causing gray leaf spot overwinters in and on corn debris left above and on the soil surface.	Hybrids are available with moderate resistance. Crop rotation and clean plowing are effective in reducing the level of surviving fungus in fields.
Northern Corn Leaf Blight (<i>Exserohilum tursicum</i>)	Leaves of infected plants have a few to numerous elongated (up to 1 inch by 6 inches) leaf spots that are tan but reveal black spore growth at maturity.	Carried on the seed and in old plant refuse, spores also are readily windborne	Disease resistance is available. The hybrids should also be ones recommended for your area.

Disease	Symptoms	Source of Inoculum	Management
Smut (<i>Ustilago maydis</i>)	All aboveground parts of the plant are susceptible, particularly the young, actively growing embryonic corn tissue. Symptoms are easily recognized. Galls are first covered with a glistening greenish-white to silvery-white membrane. Except for galls on leaves, the interiors of the galls soon darken, with the membrane rupturing to expose millions of greasy to powdery, sooty spores known as chlamydospores or teliospores. Galls on leaves seldom develop beyond pea-size, becoming hard and dry without rupturing. Early infection may kill young plants, but not often.	The teliospores of this fungus overwinter on the soil surface.	Use hybrids recommended for your area. Most have adequate resistance.
Southern Leaf Blight (<i>Bipolaris maydis</i> = <i>Helminthosporium maydis</i>)	Leaves of infected plants have numerous elongated spots between the veins. The spots are buff to reddish-brown.	Carried on the seed and in old plant refuse, spores also are readily windborne.	Use only seed produced by normal tasseling (N). The hybrids also should be ones recommended for your area.
Southern Rust (<i>Puccinia polysora</i>)	Southern rust is recognized by small circular to oval pustules, which are light cinnamon-brown. The pustules may appear on leaves and sheaths but are most abundant on the leaves.	Spores are windblown from the south. No alternate host is known.	Use hybrids tolerant to this disease. Fungicides might be necessary if southern rust symptoms are expressed prior to soft dough growth stage.

Management of Corn Diseases Using Fungicides

Based on fungicide experimentation over the past five years, it has been determined that fungicides should only be used if corn foliar diseases are present and threaten the ear leaf with diseased areas covering 5% or more.

Fungicide Efficacy for Management of Corn Diseases — January 2024

The Corn Disease Working Group (CDWG), which includes LSU AgCenter pathologists, develops ratings for how well fungicides control major corn diseases in the United States. The ratings are determined by field testing the materials over multiple years and locations. Ratings are based on the product's level of disease control and do not necessarily reflect yield increases obtained from product application. A product's efficacy depends upon proper application timing, rate and application method as determined by the product label and overall disease level in the field at the time of application. Differences in efficacy among each fungicide product were determined by directly comparing products in field tests using a single application of the labeled rate. **The table includes marketed products available that have been tested over multiple years and locations and is not intended to be a list of all labeled products.**

Efficacy categories: **NR**=Not Recommended; **P**=Poor; **F**=Fair; **G**=Good; **VG**=Very Good; **E**=Excellent; **NL**= Not Labeled for use against this disease; **U**= Unknown efficacy or insufficient data to rank product.

Link to publication: <https://cropprotectionnetwork.org/publications/fungicide-efficacy-for-control-of-corn-diseases>

Recommended fungicides, rates and application timing for corn diseases.

Leaf Blights (primarily *Helminthosporium* and *Excerohilum* spp.)

Product Choices ¹	Product Mode of Action Group ²	Rate ³	Time of Application	PHI ⁴
Adastrio	3, 7, 11	7-9 fl oz	See label	30
AmTide Propiconazole 41.8% EC	3	2-4 oz	At first appearance	30
Avaris	3, 11	7-14 oz	At first appearance	30
Affiance	3, 11	10-17 fl oz	See label	7
Aproach Prima	3, 7	3.4-6.8	See label	30
Bumper	3	2-4 fl oz	At first appearance	30
Delaro	3, 11	8-12 fl oz	At first appearance	14
Fitness	3	2-4 fl oz	At first appearance	30
Headline AMP	3, 11	10-14.4 fl oz	Prior to disease development	20
Headline SC	11	6-12 fl oz	Prior to disease development	7
Lucento	3, 7	3-5.5 fl oz	At first appearance	10
Orius 3.6F	3	4-6 fl fl oz	Prior to disease development	36
Miravis Neo	3, 7, 11	13.7 fl oz	See label	30
Priaxor SC	7, 11	4-8 fl oz	Prior to disease development	21
PropiMax	3	2-4 fl oz	At first appearance	30
Quadris	11	6.2-9 fl oz	Prior to disease development	7
Quadris S	11	9.2-15.4 fl oz	Prior to disease development	7
Quilt	3, 11	7-14 fl oz	At first appearance	30
Quilt Xcel	3, 11	7-14 fl oz	At first appearance	30

Product Choices ¹	Product Mode of Action Group ²	Rate ³	Time of Application	PHI ⁴
Revytec	3, 7, 11	8-15 fl oz	See label	21
Stratego	3, 11	10-12 fl oz	At first appearance	30
Stratego YLD	3, 11	4-5 fl oz	At first appearance	14
Tebuzol 3.6F	3	4-6 fl oz	Prior to disease development	36
Tilt	3	2-4 fl oz	At first appearance	30
TopGuard	3	7-14 fl oz	No later than R4	7
TopGuard EQ	3, 11	5-7 fl oz	At first appearance	7
Veltyma	3, 11	7-10 fl oz	See label	21
Xyway	3	See label	In-furrow at planting	-

¹ Reference to commercial or trade names is made with the understanding that no discrimination is intended nor endorsement of a particular product by LSU or the LSU AgCenter is implied.

² Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

³ Rates are the amount of formulation (product) per acre unless otherwise indicated.

⁴ Preharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

Rust (Common only)

Product Choices ¹	Product Mode of Action Group ²	Rate ³	Time of Application	PHI ⁴
Adastrio	3, 7, 11	7-9 fl oz	See label	30
Quadris	11	6.2-9 fl oz	Prior to disease development	7
Quadris S	11	6.2-9 fl oz	Prior to disease development	7

Rusts (Common and southern)

Product Choices ¹	Product Mode of Action Group ²	Rate ³	Time of Application	PHI ⁴
Adastrio	3, 7, 11	7-9 fl oz	See label	7
AmTide Propiconazole 41.8% EC	3	2-4 fl oz	At first appearance	30
Avaris	3, 11	10.5-14 fl oz	At first appearance	30
Affiance	3, 11	10-17 fl oz	See label	7
Aproach Prima	3, 11	3.7-6.8	See label	30
Bumper	3	4 fl fl oz	At first appearance	30
Delaro	3, 11	8-12 fl oz	At first appearance	14
Fitness	3	4 fl oz	At first appearance	30
Headline AMP	3,11	10-14.4 fl oz	Prior to disease development	20
Headline SC	11	6-12 fl oz	Prior to disease development	7
Lucento	3, 7	3-5.5 fl oz	At first appearance	10
Miravis Neo	3, 7, 11	13.7 fl oz	See label	30
Orius 3.6F	3	4-6 fl oz	Prior to disease development	36
Priaxor SC	7, 11	4-8 fl oz	At first appearance	21

Product Choices ¹	Product Mode of Action Group ²	Rate ³	Time of Application	PHI ⁴
PropiMax	3	2-4 fl oz	At first appearance	30
Quilt	11, 3	10.5-14 fl oz	At first appearance	30
Quilt Xcel	11, 3	10.5-14 fl oz	At first appearance	30
Revytek	3, 7, 11	8-15 fl oz	See label	21
Stratego	11,3	10-12 fl oz	At first appearance	30
Stratego YLD	11, 3	4-5 fl oz	At first appearance	14
Tebuzol 3.6F	3	4-6 fl oz	Prior to disease development	36
Tilt	3	4 fl oz	At first appearance	30
TopGuard	3	7-14 fl oz	No later than R4	7
TopGuard EQ	3, 11	5-7 fl oz	At first appearance	7
Veltyma	3, 11	7-10 fl oz	See label	21

¹ Reference to commercial or trade names is made with the understanding that no discrimination is intended nor endorsement of a particular product by LSU or the LSU AgCenter is implied.

² Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

³ Rates are the amount of formulation (product) per acre unless otherwise indicated.

⁴ Preharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

The corn section was revised October 2024 by Boyd Padgett.

Cotton

Disease

Symptoms, source of inoculum and management of cotton diseases.

Disease	Symptoms	Source of Inoculum	Management
Bacterial Blight (<i>Xanthomonas citri</i> pv. <i>malvacearum</i>)	On seedlings lesions appear as small, water-soaked irregular spots eventually turning brown; hypocotyls will appear black with elongated lesions girdling the stem and causing death. Foliar symptoms on older plants consist of angular lesions that initially appear water-soaked and later turn brown to blackish purple, occasionally following main leaf veins and rarely with yellow halos. Petioles and stems may appear blackened, and significant defoliation may occur. The bacterium may cause boll blight, which begins with round, water-soaked lesions eventually turning brown to black and allowing entry of secondary organisms that cause rot.	The primary source of inoculum is seed, and the secondary source is cotton debris.	Use acid-delinted seed. Destroy cotton debris, rotate to another crop, and/or use resistant varieties. The pathogen may be moved from field-to-field by equipment or insects. Overhead irrigation or excessive rainfall along with windy conditions may exacerbate disease. Infected bolls will have infected seed, which serves as primary inoculum.
Boll Rots (many fungi and bacteria)	There are a wide range of symptoms since there are many organisms involved and many stages of boll development when damage may occur. Discolored, sunken areas may develop on the boll surface. Seed and fiber may be damaged without surface lesions on the boll. Fiber may be stained.	Organisms causing boll rots may be carried over in the soil, on crop debris, or on the seed coat.	Avoid rank growth and control insects during boll development. Plant-growth regulators may be helpful in reducing rank growth and, in turn, boll rot incidence.
Fusarium Wilt (<i>Fusarium</i> spp.)	Plants usually are stunted and may fruit early. Leaves may turn yellow, wilt, and drop. Brown to dark-brown discoloration occurs on woody tissue just beneath the bark. Disease is more severe on sandy soils during hot weather when root-knot or reniform nematodes are present. (See root-knot nematode section.)	The pathogen lives indefinitely in soil along with nematodes.	Use tolerant varieties. Most recommended varieties exhibit tolerance to Fusarium wilt. Under more severe conditions, use recommended nematicides.
Leaf Spot Complex (<i>Alternaria</i> spp., <i>Cercospora gossypina</i> , <i>Stemphylium</i> spp., <i>Ascochyta</i> spp., and other fungi)	Brown to red to tan circular lesions on leaves that may occur at any stage. Lesions may be up to ¾ inch, and margins usually appear reddish to purple. As the diseases progress, centers of lesions may appear sooty due to sporulation of the pathogens and eventually fall away resulting in a “shothole” appearance of foliage. In cases of heavy infestation, lesions may overlap and cause premature defoliation resulting in decreased lint yields.	Fungi overwinter in previous crop/weed debris.	Plow under infected plant debris. Plant high-quality, acid-delinted, fungicide-treated seed. Avoid nutrient stresses (particularly Potassium), drought stress, other pest damage, and/or herbicide injury. Foliar fungicides may reduce incidence and severity, but economic benefit is very unlikely.
Reniform Nematodes (<i>Rotylenchulus reniformis</i>)	These nematodes cause severe stunting, reduced boll set, and tight, locked bolls. Root systems are restricted but not knotted. May be found in mixed to heavy soil.	Reniform nematodes live from year to year in the soil.	Apply nematicides. Refer to Nematode Management Field Crops section. There are very few resistant varieties. Rotate to a non-host crop.

Disease	Symptoms	Source of Inoculum	Management
Root Knot Nematodes (<i>Meloidogyne incognita</i>)	Root systems are knotted or galled. Plants are stunted, slow growing, and low yielding. Usually associated with a high incidence of Fusarium wilt. Damage from RKN is most severe on sandy soils. (See Fusarium wilt above.)	Root-knot nematodes live from year to year in the soil as eggs, juveniles, or adults.	Use resistant varieties. Apply nematicides. Refer to table on nematode control in field crops. Rotate to a resistant or non-host crop.
Seedling Diseases (<i>Rhizoctonia</i> spp., <i>Pythium</i> spp., <i>Fusarium</i> spp., and many other fungi)	Loss before emergence is characterized by rotting of the seed or seedling. After emergence, affected seedlings have dark lesions on the stem, often girdling and extending downward into the root system. Older plants have reddish-brown, sunken lesions near the soil line.	Some of the organisms causing seed rot and seedling diseases may be carried on the seed coat, while others persist in the soil.	Use only high-quality seed. Plant seed only when soil temperatures at a 4-inch depth reach 68° F for three to four days. Plant fungicide-treated seed to a weed-free seedbed at proper depth for soil type and weather conditions along with adequate drainage.
Target Spot (<i>Corynespora cassiicola</i>)	Brown to tan circular lesions on leaves usually beginning low after canopy closure. Lesions usually will not have reddish to purple margins when found low in the canopy and will have a “bullseye” appearance. Target spot lesions are usually larger than other leaf spot lesions. The disease progresses from low in the canopy upward, and severe defoliation may occur in a relatively short period of time, particularly during warm, rainy periods. During severe epidemics, target spot lesions in the upper canopy are smaller, do not have a target-like pattern, and may be confused with the cotton leaf spot complex.	The pathogen overwinters in crop debris.	Destroy debris. Some varieties may tolerate target spot better than others. Avoid excessive nitrogen and rank plant growth (apply PGRs as necessary). Scout closely prior to and after canopy closure. Scout nearby soybeans for target spot. Foliar fungicides may lower disease incidence and in severe cases preserve yield. Fungicide coverage is key, and applications should be made by ground with a minimum total volume of 15 gal/A with high pressure using hollow cone or flat fan nozzles. Refer to Table 1.
Verticillium Wilt (<i>Verticillium</i> spp.)	Leaf margins and between veins have pale yellow markings. Severely affected plants shed the young bolls. Light brown discoloration occurs in the interior woody tissue of the stem with little to no discoloration just beneath the bark. Disease occurs in cool weather with or without nematodes.	The pathogen lives indefinitely in the soil.	Rotate with soybeans, sorghum, or small grains.

Foliar fungicides labeled for use in Louisiana cotton.

Fungicide ¹	Mode of Action Group ²	Use Rate (fl oz/A)	Target Disease(s)/Pathogen(s) ³
Amistar Top (Syngenta)	11+3	8-11.6	Alternaria leaf spot (<i>Alternaria</i> spp.), Anthracnose (<i>Glomerella gossypii</i>), Areolate mildew (<i>Ramularia gossypii</i>), Ascochyta blight (<i>A. gossypii</i>), boll rots (<i>Ascochyta gossypii</i> , <i>Alternaria</i> spp., <i>Diplodia</i> spp., <i>Phoma</i> spp.), cotton rust (<i>Puccinia schedonnardi</i>), Diplodia boll rot (<i>Diplodia</i> spp.), hard lock (<i>Fusarium verticillioides</i>), leafspots and blights (<i>Alternaria</i> spp., <i>Ascochyta gossypii</i> , <i>Cercospora</i> spp., <i>Stemphylium</i> spp.), Southwestern cotton rust (<i>Puccinia cacabata</i> , <i>Puccinia</i> spp.) Stemphylium leaf spot (<i>Stemphylium</i> spp.), target spot (<i>Corynespora cassiicola</i>)
Aproach	11	6-12	Stemphylium leaf spot (<i>Stemphylium</i> spp.)
Delaro (Bayer)	11+3	8-12	Target spot (<i>Corynespora cassiicola</i>), rust (<i>Puccinia</i> spp.)
Elatus (Syngenta)	11+7	5-7.3	Ascochyta blight (<i>A. gossypii</i>), Target spot (<i>Corynespora cassiicola</i>)
Headline (BASF)	11	6-12	Alternaria leaf spot/boll rot (<i>Alternaria</i> spp.), Anthracnose/boll rot (<i>Glomerella</i> spp.), Ascochyta blight/boll rot (<i>Ascochyta</i> spp.), Cercospora blight and leaf spot (<i>Cercospora</i> spp.), Diplodia boll rot (<i>Diplodia</i> spp.), Hard lock/boll rot (<i>Fusarium</i> spp.), Phoma blight, boll rot (<i>Phoma</i> spp.), Stemphylium leaf spot (<i>Stemphylium</i> spp.)
Miravis Top (Syngenta)	7+3	13.7	Alternaria leaf spot (<i>Alternaria</i> spp.), Areolate mildew (<i>Ramularia gossypii</i>), Ascochyta blight (<i>A. gossypii</i>), boll rots (<i>Ascochyta gossypii</i> , <i>Alternaria</i> spp., <i>Diplodia</i> spp., <i>Phoma</i> spp.), hard lock (<i>Fusarium verticillioides</i>), leafspots and blights (<i>Alternaria</i> spp., <i>Ascochyta gossypii</i> , <i>Cercospora</i> spp., <i>Stemphylium</i> spp.), target spot (<i>Corynespora cassiicola</i>)
Priaxor (BASF)	7+11	4-8	Same as above plus Target spot/ <i>Corynespora</i> leaf spot (<i>Corynespora cassiicola</i>)
Proline (Bayer)	3	5-5.7	Target spot (<i>Corynespora cassiicola</i>)
Quadris (Syngenta) ⁴	11	6-9	Same as Amistar Top.
Revytek (BASF)	3+7+11	8-15	Same as Priaxor plus Rust (<i>Phakopsora</i> and <i>Puccinia</i> spp.)
Topguard (FMC)	3	7-14	Alternaria leaf spot/boll rot (<i>Alternaria</i> spp.), anthracnose/boll rot (<i>Glomerella</i> spp.), Areolate mildew (<i>Ramularia gossypii</i>), Ascochyta blight/boll rot (<i>Ascochyta gossypii</i>), Cercospora blight and leaf spot (<i>Cercospora</i> spp.), Diplodia boll rot (<i>Diplodia</i> spp.), Fusarium boll rot (<i>Fusarium</i> spp.), hard lock (<i>Fusarium verticillioides</i>), Phoma blight/boll rot (<i>Phoma</i> spp.), Stemphylium leaf spot (<i>Stemphylium</i> spp.), target spot (<i>Corynespora cassiicola</i>)
Topguard EQ (FMC)	11+3	5-7	Same as Topguard.
Twinline (BASF)	3+11	7-8.5 (10-12 for Target spot)	Same as Priaxor.
Vertisan (Corteva)	7	16-24	Boll rot (<i>Diplodia</i> spp., <i>Fusarium</i> spp.), Foliar disease complex, Alternaria leaf and stem spots (<i>Alternaria</i> spp.), Cercospora leaf spot (<i>Cercospora</i> spp.), Stemphylium leaf spot (<i>Stemphylium</i> spp.), Hard lock (<i>Fusarium</i> spp.), Soil-borne diseases, Seedling and root rot (<i>Rhizoctonia solani</i>)

¹Reference to commercial or trade names is made with the understanding that no discrimination or endorsement of a particular product is implied by LSU or the LSU AgCenter. Multiple biofungicides, generic tebuconazoles, and other triazoles exist on the market and are not included because these products have not been tested in Louisiana cotton. This list is not all-inclusive; generic pre-mixes that are labeled for use in cotton may be available locally.

²Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

³Consult product label for disease pressure or additional target pathogens.

⁴Multiple generics are available with the same active ingredient.

The cotton section was revised September 2024 by Trey Price.

Grain Sorghum

Disease

Symptoms, source of inoculum and management of grain sorghum diseases.

Disease	Symptoms	Management
Anthracnose (<i>Colletotrichum graminicola</i>)	Infection first appears on the leaves as small tan to reddish-purple circular spots, which later enlarge and may unite to involve large areas of the leaf. Later, the centers of the leaf spots fade to grayish-tan. Infection on the leaf midrib is strikingly discolored. The leaf anthracnose organism also causes a stalk rot. The stalk rot phase of this disease usually follows the anthracnose stage on the leaves. The fungus enters the stalk directly through the rind or a wound in the rind and spreads to the interior of the plant. The lesions that form on the outside of diseased stalks usually have reddish to purplish margins and whitish centers. When infected stalks are split, the pith is red or purplish-red. Diseased stalks frequently break over at the base or at a node low to the ground. Poor head and seed development results from severe infections.	Plant fungicide-treated seed. Practice at least a three-year rotation with other crops such as wheat, oats, barley, cotton and soybeans. Turn under old crop stubble after harvest. Fungicides are available (see following table).
Charcoal Rot (<i>Macrophomina phaseolina</i>)	Injury from this disease usually does not become evident until the plant approaches maturity. Affected plants show poorly developed heads, light kernels, premature ripening, drying of the stalk and lodging. Diseased stalks are soft and discolored at the base, and the pith becomes shredded.	Irrigate where possible.
Downy Mildew (<i>Sclerospora</i> sp.)	Systemically diseased seedlings are yellowed, stunted and frequently have a white downy growth on the underside of the yellowed leaves. Later, the plants have green-and-white-striped or mottled leaves. These plants may fail to head, produce sterile heads or form partially affected heads. Diseased plants usually are found in poorly drained areas.	Follow cultural practices outlined for anthracnose.
Head Blight (<i>Fusarium moniliforme</i> , <i>Curvularia</i> sp., <i>Cladosporium</i> sp.)	Head blight is caused by several fungal organisms that infect plants from flowering to maturity, depending on high moisture conditions. (<i>Fusarium</i> head blight, the most destructive of sorghum head blights, occurs most commonly along the Gulf Coast production areas). The fungus is capable of infecting sorghum heads at and soon after blooming. Panicles and rachis branches are infected first, followed by infection of stalk tissue at and immediately below the head. Weak neck and stalk lodging may follow.	
Gray Leaf Spot (<i>Cercospora sorghi</i>)	Small circular-to-elliptical dark purple or red spots appear on leaf surface. Later, leaf center becomes tan or brown, and spots elongate with gray spore masses covering the spots. Other hosts include corn, johnsongrass and cultivated grasses.	Most varieties have adequate tolerance to this disease.
Zonate Leaf Spot (<i>Gloeocercospora sorghi</i>)	On the leaves, circular, reddish-purple bands alternate with tan or straw-colored areas that give a concentric or zonate pattern with irregular borders. Spots may occur along the margins of leaves or on other plant parts.	Recommended varieties have some tolerance to the disease. Crop rotation and clean cultivation help.

Recommended fungicides, rates and application timing for Anthracnose (*Colletotrichum graminicola*) disease of grain sorghum.

Product Choices ¹	Product Mode of Action Group ²	Rate ³	Time of Application	PHI ⁴
Adastrio	3,7,11	7-9 fl oz	See label	30
Aframe	11	6-15.5 fl oz	Prior to disease development	14
Approach	11	12 fl oz	Prior to flowering	— ⁵
Evito 480 SC	11	2-4 fl oz	Prior to disease development	21
Headline	11	6-12 fl oz	Apply no later than 25% flowering	— ⁶
Headline SC	11	6-12 fl oz	Apply no later than 25% flowering	— ⁶
Nexicor	3,7,11	7-13 fl oz	Prior to disease development	21
Priaxor	7,11	4-8 fl oz	Prior to disease development	21
Quadris	11	6-15.5 fl oz	Prior to disease development	14
Quilt	11,3	14 fl oz	Prior to disease development	21
Quilt Xcel	11,3	10.5-14 fl oz	At first appearance of disease	21
Topguard	3	7-14 fl oz	Prior to disease development	7
Topguard EQ	3,11	5-7 fl oz	Prior to disease development	30

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² Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

³ Rates are the amount of formulation (product) per acre unless otherwise indicated.

⁴ Preharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

⁵ Must be applied prior to flowering.

⁶ Must be applied prior to 25% flowering.

The grain sorghum section was revised October 2024 by Boyd Padgett.

Oats

Disease

Symptoms, source of inoculum and management of oat diseases.

Disease	Symptoms	Source of Inoculum	Management
Crown Rust (<i>Puccinia coronata</i>)	Small, scattered, oval or oblong, orange-yellow pustules develop principally on the leaves. Similar pustules may occur on the leaf sheaths, stems (culms) and panicles. The pustules soon break open to release a dusty mass of golden spores.	The source of spores that cause the primary infection during the fall in Louisiana is not known. Disease spreads by windborne spores.	Plant recommended varieties that have resistance to the prevalent races of the rust unguis.
Stem Rust (<i>Puccinia graminis avenae</i>)	Elongated, reddish-brown pustules occur on the stem, leaf sheaths, leaf blades and glumes. Pustules rupture the epidermis to expose a powdery, reddish-brown mass of spores. Fragments of epidermis adhere to sides and ends of pustules to give them a ragged appearance.	The source of spores that cause the primary infection is not known. Stem rust has an alternate host, European or common barberry (<i>Berberis vulgaris</i>).	Plant recommended varieties that have resistance to the prevalent races of the rust fungus.
Yellow Dwarf (Barley Yellow Dwarf virus)	The most typical symptom is leaf discoloration. Affected oat plants may have leaves that are dull yellow to brilliant red. The red leaf color is not always present, however. Plants infected late in the season may be stunted and have reduced yields.	The virus may live in perennial grasses. Aphids spread the virus.	No practical control measure is available.
Leaf Blotch (<i>Drechslera avenacea</i> = <i>Helminthosporium avenaceum</i>)	This fungus can cause seedling disease. On older plants the disease appears as reddish-brown, round to oval spots, primarily on leaves and leaf sheaths but sometimes on stems and floret parts. Spots have irregular margins and frequently have sunken centers. Long linear blotches result from merging of spots. Severely infected leaves turn yellow and die.	The fungus can live on seed and plant debris.	Rotate oat crops on different fields.

The oats section was revised October 2024 by Boyd Padgett.

Peanuts

Integrated Peanut Disease Management

An effective disease management program incorporates a number of strategies including genetic resistance, seedbed preparation, field drainage, weed/insect management and judicious use of fungicides.

Variety Selection: Successful disease management begins by selecting agronomically acceptable varieties containing effective genetic resistance to plant pathogens. The LSU AgCenter does not have a variety testing program for peanuts, but information on variety performance and management from the University of Georgia can be found at:

<https://extension.uga.edu/publications/detail.html?number=B1146>

Seedbed Preparation and Planting: Prior to planting, burying plant debris from the previous crop or cover crops can reduce initial inoculum of some soilborne pathogens (*Rhizoctonia solani*, *Pythium* spp. and *Phytophthora* spp.). After seedbed preparation is completed, plant when environmental conditions favor rapid seed germination and seedling establishment. The 4-inch soil temperature should be at least 68 F to 70 F for three consecutive days.

Field Drainage: Avoid planting in poorly drained fields. Waterlogging can result in reduced plant vigor and increased risk to some soilborne pathogens. Ensure fields do not support standing water by strategically cutting water furrows in the field immediately after planting.

Plant Health/Pest Management: After the crop has emerged, maintain plant health to minimize the risk to plant pathogens. This is accomplished in part through effective weed and insect pest management and proper nutrient management.

Table 1: Recommended pesticides, rates and pesticide use restrictions for Late Leaf Spot (*Nothopassalora personata*) and Early Leaf Spot (*Passalora arachidicola*) in peanuts.

Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Bravo Weather Stik ⁵	M5	1-1.5 lb	14	12 pt
Bravo Ultrex ⁵	M5	0.9-1.4	14	10.9 lb
Chloronil 720 ⁵	M5	1-1.5 lb	14	12 pt
Chlorothalonil 720SC ⁵	M5	1-1.5 lb	14	12 pt
Echo 720 (Late leaf spot) ⁵	M5	1.5 pt	14	9 lb a.i.
Echo 720 (Early leaf spot) ⁵	M5	1-1.5 pt	14	9 lb a.i.
Echo 90DF (Late leaf spot) ⁵	M5	1.25 lb	14	9 lb a.i.
Echo 90DF (Early leaf spot) ⁵	M5	0.875-1.25 lb	14	9 lb a.i.
Equus 720 SST ⁵	M5	1-1.5 pt	14	12 pt
Equus DF ⁵	M5	0.9-1.36	14	10.9 lb
Artisan	3, 7	Refer to label	40	84 fl oz
Absolute 500SC ⁵	3, 11	3.5 fl oz	14	4 app
Approach Prima	3, 11	5-6.8 fl oz	30	13.6 fl oz
Elatus	7, 11	7.3-9.5 oz	30	21.9 oz
Evito T ^{5,6}	3, 11	6-9 fl oz	14	44.8 fl oz
Headline ⁵	11	6-15 fl oz	14	45 fl oz
T-Methyl 70WSB	1	0.5 lb	14	1.4 lb
Topguard	3	Refer to label	7	56 fl oz
Topguard EQ	3, 11	Refer to label	45	32 fl oz
Topsin M 70 WP	1	0.5 lb	14	2 lb
Topsin M 4.5FL	1	10 fl oz	14	40 fl oz
Lucento ⁵	3, 7	3-5.5 fl oz	14	11 fl oz
Fontelis	7	16-24 fl oz	14	72 fl oz
Priaxor ⁵	7, 11	4-8 fl oz	14	24 fl oz
Quash ⁵	3	2.5 oz	14	4 app
Revytek ⁵	3, 7, 11	8-15 fl oz	14	45 fl oz

Table 2: Recommended pesticides, rates and pesticide use restrictions for Stem Rot (*Sclerotium* sp.) and Limb Rot (*Rhizoctonia* sp.) in peanuts.

Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Absolute 500SC ⁵	3, 11	Refer to label	14	14.0 fl oz
Elatus	7, 11	7.3-9.5 oz	30	21.9 oz
Lucento ⁵	3, 7	3-5.5 fl oz	14	11 fl oz
Folicur 3.6F ^{5, 7}	3	7.2 fl oz	14	28.8 fl oz
Monsoon ^{5, 7}	3	7.2 fl oz	14	28.8 fl oz
Orius 3.6F ^{5, 7}	3	7.2 fl oz	14	28.8 fl oz
Tebustar 3.6F ^{5, 7}	3	7.2 fl oz	14	28.8 fl oz
Muscle 3.6F ^{5, 7}	3	7.2 fl oz	14	28.8 fl oz
Tebuzol 3.6F ^{5, 7}	3	7.2 fl oz	14	28.8 fl oz
Convoy ⁸	7	Refer to label	40	64 fl oz
Headline ⁵	11	6-15 fl oz	14	45 fl oz
Quash ⁵	3	2.5-4 oz	14	4 app
Abound	11	12-24.5 oz	14	49 fl oz
Fontelis	7	13-21 fl oz	14	72 fl oz
Artisan	3, 7	Refer to label	40	84 fl oz
Priaxor ⁵	7, 11	8 fl oz	14	24 fl oz
Revytek ⁵	3, 7, 11	15 fl oz	14	45 fl oz
Topguard	3	Refer to label	7	56 fl oz
Topguard EQ	3, 11	Refer to label	45	32 fl oz

¹ Reference to commercial or trade names is made with the understanding that no discrimination is intended nor is endorsement of a particular product by LSU or the LSU AgCenter implied.

² Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

³ Rates are the amount of formulation per acre unless otherwise indicated. Check label for recommended application volume of spray solution per acre.

⁴ Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

⁵ Do not allow livestock to graze treated areas. Do not feed hay or threshings from treated fields to livestock.

⁶ Supplemental label.

⁷ Use a four-application spray program (four consecutive applications at 14-day intervals). Consult label for timing of applications.

⁸ Application timings differ for stem rot and limb rot. Consult label for timing of applications.

The peanut section was revised October 2024 by Boyd Padgett.

Rice

Rice Diseases

Best results in disease management are achieved when an integrated pest management (IPM) strategy is used. The combination of host resistance, cultural practices and reasonable use of fungicides offers better disease control than these methods applied isolated. Overall, varieties with some levels of disease resistance are available for most of the relevant rice diseases, and their use is encouraged. Unbalanced mineral fertilization and late planting are frequently associated with severe disease epidemics for most diseases. Because the list of labeled fungicides may change, check with your cooperative extension agent for current recommendations. Fungicide timing is critical for disease control (Table 1 and Figure 1).

- **Bacterial Panicle Blight (BPB):**

Bacterial panicle blight, caused by the bacterias *Burkholderia glumae* and *B. gladioli*, is one of the most important rice diseases in the South. The disease is associated with warm temperatures (day and night) and moisture. Losses include reduced yields and poor milling. The bacteria are seed-borne, survive in the soil and live on the surface of the leaves and leaf sheaths following the canopy up.

The bacteria infect the grain at flowering and cause grain abortion and rotting during grain filling. The disease is first detected as a light- to medium-brown discoloration of the hulls' lower third to half shortly after emergence. The stem below the infected grain remains green. Pollination occurs, but the grain aborts sometime after grain filling begins. Rain splash can disperse the bacteria on the plant surface to other plants, developing a circular pattern in the field with the most severely affected panicles in the center remaining upright because of grains not filling.

No chemical control measures are recommended. Fungicide application will not control or prevent BPB. Some varieties have more resistance than others. Rice planted later in the season and fertilized with high nitrogen rates tends to have more disease.

- **Blast:**

Blast is caused by the fungus *Pyricularia grisea*. The leaf blast phase occurs between the seedling and late tillering stages. Leaf spots begin as small white-, gray- or blue-tinged spots and then enlarge quickly under moist conditions to either oval diamond-shaped spots or linear lesions with pointed ends with gray or white centers and narrow brown borders. Leaves and whole plants are often killed under severe conditions. Rotten-neck symptoms appear at the base of the panicle, starting at the node soon after heading. The tissue turns brown to chocolate-brown and shrivels, causing the stem to snap and lodge. Panicle branches and stems of florets also have gray-brown lesions.

Varieties with good resistance are available, although new races can develop

fast and overcome genetic resistance. Scouting for blast should begin early in the season, and the flood must be maintained. Areas of heavy nitrogen fertilization and edges of the fields are also potential sites. If leaf blast is in the field or has been reported in the same general area and if the variety is susceptible, fungicide applications are advisable to reduce rotten-neck blast. The absence of leaf blast does not mean rotten-neck blast will not occur. Fungicide timing is critical (Table 1 and Figure 1). If a single fungicide application is used to control blast, it should be applied when 50% to 70% of the heads have begun to emerge. Application before or after this growth stage will not control this disease well. This growth stage is very difficult to detect, so it is important to scout for the crop growth stage at the same time as scouting for disease. Allow time to obtain a fungicide, schedule the application, and consider the chances of poor weather conditions. Under heavy blast pressure and conducive weather conditions, two applications, one at boot and one at 50% to 70% heading, may be needed to suppress blast effectively.

- **Cercospora:**

This disease is caused by the fungus *Cercospora janseana*, and symptoms can develop on the leaf, sheath, panicle and grains. Similarly to blast, different names are used for this disease depending on the infected site. When symptoms occur in the leaf, the disease is referred to as **narrow brown leaf spot (NBLS)**, with linear and reddish-brown lesions along the leaf blade as the classic symptoms of NBLS. Some variation of the disease symptoms can be observed depending on the cultivar's resistance, with more susceptible varieties having wider, more numerous, and lighter brown with gray necrotic centers. Spots usually appear near or after heading growth stage, but both young and old leaves are susceptible. When symptoms develop on the sheath, the disease is called **Cercospora net-blotch (CNB)** due to the brown cell walls and the tan-to-yellow intracellular areas forming a netlike pattern. When infection occurs in the panicle, it can be referred to as **Cercospora panicle blight (CPB)**, where branches of the seed heads can become infected, causing premature ripening and unfilled grains. Symptoms of CPB can be confused with blast rotten-neck and panicle blast lesions, but CPB symptoms usually are darker brown and develop in the internodal area of the neck. Glumes can also be infected, causing significant discoloration and necrosis, and grain infected appears as a diffused brown discoloration. The distinction between NBLS, CNB, and CPB is important because some varieties can have some genetic resistance to NBLS, such as those with CRPS2.1 gene, but not CNB and CPB.

The disease's intensity is intermittent between years but is often severe on late planting fields and in the second crop. Warm, rain, and conditions that prolong leaf moisture favor the disease infection and development. However, it can

take up to 30 days from the infection to the development of visible symptoms. The best fungicide timing for NBLs is between early boot to heading growth stages (Table 1 and Figure 1). However, the later the rice is planted, the earlier the fungicide must be applied. Triazoles fungicides, such as propiconazole and difeconazole, provide the best efficacy.

- **False Smut:**

The false smut fungus, *Ustilaginoidea virens*, infects rice at flowering. The disease is characterized by large orange to olive-green spore masses that replace one or more grains on the panicle. In the middle of the spore masses are sclerotia that act as the survival structure. These sclerotia can be spread with the seed and infect the next crop. Removal of the sclerotia in seed cleaning reduces spread. A fungicide seed treatment also reduces inoculum potential. False smut spores cause discoloration of milled rice, but no significant yield loss is associated with the disease. The presence of the smut sclerotia in grain for export has caused problems. Some foliar fungicides applied at boot can reduce disease incidence. Research results indicate the 2- to 4-inch panicle in the boot applications of demethylation inhibitors (propiconazole and difenoconazole) reduce damage significantly. Applications after boot split have little, if any, activity.

- **Grain and Head Disorders:**

Many fungi and bacteria infect developing grain and cause spots and discoloration on the hulls or kernels. Damage by the rice stink bug also causes discoloration of the kernel. Kernels discolored by fungal infections or insect damage are commonly called pecky rice. This complex disorder in rice involves many fungi, the white-tip nematode, and insect damage. High winds at the early heading stage may cause similar symptoms. Proper insect control and disease management will reduce this problem.

- **Kernel Smut:**

Kernel smut symptoms appear just before maturity. A black mass of smut spores replaces all or some of the seed's endosperm. Often, the spores ooze out of the grain, leaving a black mass along the seam of the hulls. The fungus, *Tilletia barclayana*, overwinters as spores in the soil of affected fields and seeds. Significant yield reductions are possible, but usually, the damage is limited to grain quality. High nitrogen rates favor disease development. Research results indicate that boot applications of demethylation inhibitors (propiconazole and difenoconazole) reduce damage significantly. Applications after boot split have little, if any, activity.

- **Sheath Blight:**

Sheath blight is one of the most important diseases in rice in Louisiana. It is characterized by large oval spots on the leaf sheaths and irregular spots on the leaf blades. Infections usually begin during the late tillering/joint-elongation stages of growth. The fungus, *Rhizoctonia solani* AG-1, survives between crops as structures called sclerotia or as hyphae in plant debris.

Sclerotia on plant debris floating on the surface of irrigation water serve as sources of inoculum that attack and infect lower sheaths of rice plants at the waterline. Fungal mycelium grows up the leaf sheath, forms infection structures, infects and causes new lesions. The infection can spread to leaf blades. After the panicle emerges from the boot, the disease progresses rapidly to the flag leaf on susceptible varieties. With very susceptible varieties, the fungus will spread into the culm from early sheath infections, weakening them and causing tillers to lodge.

As lesions coalesce on the sheath, the blades turn yellow-orange and eventually die. Damage is usually most common where wind-blown, floating debris accumulates. Disease severity can be reduced by integrating several management practices. Dense stands and excessive use of nitrogen fertilizer both tend to increase sheath blight damage. The same pathogen also causes aerial blight on soybeans. Therefore, rotation with soybeans or continuous rice increases the amount of inoculum in soils and should be avoided when possible. Fungicides are available for managing sheath blight. Avoid late application beyond 50% to 70% heading (Table 1 and Figure 1). In some areas of south Louisiana, the fungus has developed resistance to the strobilurin fungicides (e.g., azoxystrobin), and the use of other modes of action, such as carboxamides (e.g., flutolanil), is recommended where fungicide resistance was detected.

- **Sheath Rot:**

Sheath rot is caused by the fungus *Sarocladium oryzae*. Symptoms are most severe on the uppermost leaf sheaths that enclose the young panicle during the boot stage. Lesions are oblong or irregular oval spots with gray or light brown centers and a dark reddish-brown diffuse margin. Early or severe infections may affect the panicle so that it only partially emerges. The non-emerged portion of the panicle rots with florets turning reddish-brown to dark brown. A powdery white growth consisting of spores and hyphae of the pathogen is usually observed on the inside of affected leaves. Insect or mite damage to the boot or leaf sheaths increases the damage from this disease. Emerged panicles may be damaged with florets discolored reddish-brown to dark brown and unfilled. Some varietal resistance is available. The disease is usually minor, affecting scattered tillers in a field and plants along levees. Occasionally, large areas may have significant damage. No control measures are currently recommended.

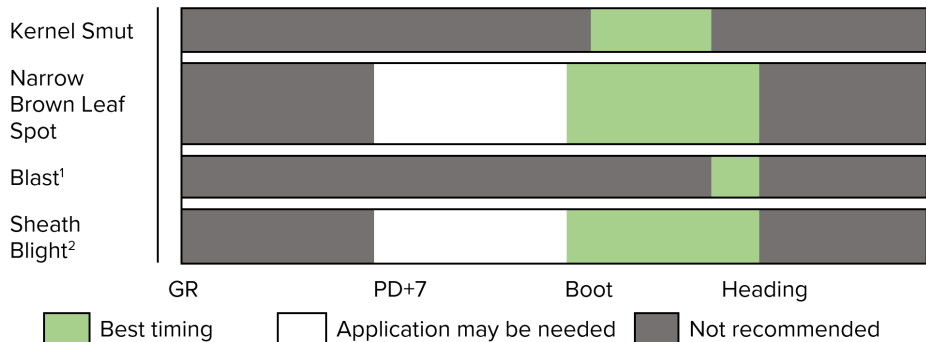
- **Stem Rot:**

The fungus *Sclerotium oryzae* causes stem rot. Losses are not usually detected until late in the season when control practices are ineffective. Damage appears as severe lodging, which makes harvesting difficult. Seed sterility also has been reported. No high level of resistance to stem rot is available. High nitrogen and low potassium levels favor the disease. Stem rot is more serious in fields that have been in continuous rice for several years. The pathogen overwinters as sclerotia in the top 2 to 4 inches of soil and in plant debris. During early floods, sclerotia float to the surface, contact plants, germinate and infect the tissues near the water surface.

The first symptom is a black angular lesion on leaf sheaths near the waterline at tillering or later growth stages. As lesions develop, the outer sheath may die as the fungus penetrates the inner sheaths and the culm. These become discolored and have black or dark brown lesions. At maturity, the softened culm breaks, plants lodge, and numerous small, round, black sclerotia develop in the dead tissues. The fungus can continue to develop in the stubble after harvest, and numerous sclerotia are produced. Control measures include burning or cultivating stubble after harvest to destroy sclerotia, using crop rotation when possible, applying potassium fertilizer, and avoiding excessive nitrogen rates. Fungicide applications used against other fungal diseases may reduce stem rot damage.

- Straighthead:**
This physiological disorder is associated with sandy soils, fields with arsenic residues, or fields having anaerobic decomposition of large amounts of organic matter incorporated into the soil before flooding. Panicles are unfilled and upright at maturity or do not emerge from the flag leaf sheath. Hulls may be distorted and discolored, with portions missing or reduced in size. Distorted florets with a hook on the end are called “parrot beak” and are typical of straighthead. Plants are darker green or blue-green and often produce new shoots and adventitious roots from the lower nodes. These symptoms can be confused with herbicide damage. Management is accomplished by using resistant varieties and draining the field approximately ten days before internode elongation (green ring), allowing the soil to dry until it cracks. This growth stage can be determined by slicing the crown of the plant lengthwise and counting the nodes. When three nodes are distinctly visible, internode elongation is approximately ten days away. It is important that the flood be established again by internode elongation.

Figure 1: Rice Fungicide Timing



Rice Disease Management

The yield potential of any rice variety can be severely reduced under high disease levels. Management strategies with integrated pest management have a higher chance of successfully maintaining the disease below economic damage levels. It is important to have a comprehensive understanding of the field’s history and variety’s disease resistance package to plan the disease management strategy. Avoid scenarios that can increase the risk for multiple diseases. For example, late planting with a susceptible variety for sheath blight and blast in a field with historical problems for sheath blight may require multiple fungicide applications with uncertain control efficacy or investment return. For overall disease management, consider the following:

- Field disease’s historic from pathogens that can survive in the soil (e.g., kernel smut). Also, consider crop rotation that can host rice pathogens, such as soybean aerial blight and rice sheath blight.
- Choose varieties with some level of genetic resistance.
- Avoid late planting as rice is more likely to encounter foliar disease problems.
- Maintain proper fertility levels.
- Maintain adequate irrigation flood, especially for varieties susceptible to blast.
- Use fungicides at the correct growth stage when necessary.
- Consider the yield potential, cost application, and overall disease intensity and risk for fungicide application.
- Rice cultivated for seed production purposes should have the minimum disease risk tolerance.
- If a ratoon crop is planned, disease not suppressed in the first crop may cause significant damage in the second crop.
- Plan to scout the fields frequently to assess the disease intensity, especially if the weather is conducive to disease development.

Rice disease control using a single fungicide application can be difficult because of fungicide resistance and multiple diseases requiring different timings for effective control. Rice producers are encouraged to use full labeled rates, rotate modes of action when possible, and use multiple fungicide applications when justified to effectively and economically manage rice diseases.

Fungicide timing is critical for disease control (Table 1 and Figure 1). Some growth stages are difficult to detect, and plant development may be uneven in the field, so scouting for disease and growth stages should be done frequently and throughout the entire field. Also, consider the logistics for fungicide application. Allow time to obtain a fungicide, schedule the application, and the chances for poor weather conditions that can prevent the application at the correct time.

¹ Susceptible varieties under high disease pressure may require an application at the boot stage followed by 50-70% heading.
² An early application may be necessary if a sheath blight appears before the boot stage.

Table 1: Rice variety reactions to common diseases in Louisiana.**Table Legend**

Rating	Abbreviation
Very Susceptible	VS
Susceptible	S
Moderately Susceptible	MS
Moderately Resistant	MR
Resistant	R
Unknown	-

Varieties labeled “S” or “VS” for a given disease may be severely damaged under conditions favoring disease or disorder development.

Variety	Blast	Sheath Blight	Narrow Brown Leaf Spot	Bacterial Panicle Blight	Straighthead
Addi Jo	R ¹	S	MR	MR	MR
Aroma22	S	MS	MR	MS	MS
Avant	S	S	MR	S	MR
Cheniere	MS	S	S	MS	MS
CL111	R ¹	VS	S	VS	MS
CL151	VS	S	S	VS	VS
CL153	R ¹	S	MS	MS	MS
CLJ01	MS	MS	MS	S	MS
CLL16	R ¹	S	MR	S	MR
CLL18	MS	MS	MR	-	MR
CLL19	R ¹	S	MS	S	S
CLM04	MS	MS	MR	MR	S
Della-2	MS	S	MS	MS	R
DG-263L	MR	S	R	MS	MR
Frontiere	-	S	S	-	S
Jazzman	MR	MS	S	S	MS
Jupiter	S	MS	S	MR	S
Mermentau	S	S	S	S	S
PVL03	R ¹	S	MS	MR	MR
PVL04	— ¹	S	MR	-	S
RT7301 ²	MR	MS	MR	MS	R
RT7302 ²	-	MR	MR	-	MR
RT7331MA ²	-	MR	MR	-	MR
RT7421FP ²	-	MR	MR	-	MR
RT7431MA ²	-	MR	MR	-	MR
RT7521 FP ²	MR	MS	MR	MR	R
RT7812	-	MR	MR	-	MR
Taurus	S	MS	MS	S	MS
Titan	S	S	MS	MS	S

¹ Varieties with Pita-2 gene, known to confer resistance to most common blast races.

² Marker data not available for RiceTec products.

Table 2: Efficacy of fungicides in managing rice diseases.**Table Legend**

Rating	Abbreviation
Poor	P
Fair	F
Good	G
Very Good	VG
Not Labeled for use against this disease.	NL

Varieties labeled "S" or "VS" for a given disease may be severely damaged under conditions favoring disease or disorder development.

Class and Mode of Action Group ¹	Active Ingredient	Product(s) ²	Rate (fl oz) ³	Blast	Sheath Blight	Sheath Blight QoI Resistant	Cercospora	Kernel Smut
QoI Strobilurins Group 11	Azoxystrobin	Quadris 2.08 SC	9-15.5	G	VG	P	P	P
QoI Strobilurins Group 11	Generic	Others						
QoI Strobilurins Group 11	Trifloxystrobin	Flint Extra	3.1-4.7	VG	G	P	NL	NL
Carboxamides Group 7	Flutolanil	Elegia 3.8 F	12-32	NL	G	G	NL	NL
Demethylation Inhibitors (DMI)	Propiconazole	Tilt 3.6 EC	6-10	NL	F	F	G	G
Group 3	Generic	Others						
Mixed ⁴	Azoxystrobin	Quilt Xcel 2.2 SE	14-27	G	VG	P	G	G
Mixed ⁴	Propiconazole	Others						
Mixed ⁴	Azoxystrobin	Amistar Top	10-15	G	VG	G	G	G
Mixed ⁴	Difenoconazole	Other						

¹ Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

² Reference to commercial or trade names is made with the understanding that no discrimination is intended nor endorsement of a particular product by LSU or the LSU AgCenter is implied. Many products have specific use restrictions about the amount of active ingredient that can be applied within a period of time or the amount of sequential applications that can occur. Please read and follow all specific use restrictions prior to fungicide use. This information is provided only as a guide. It is the responsibility of the pesticide applicator by law to read and follow all current label directions. Members or participants in the CDWG assume no liability resulting from the use of these products.

³ Rates are the amount of formulation (product) per acre unless otherwise indicated.

⁴ Refer to product label for the fungicide class and mode of action group.

Soybeans

Disease

Symptoms, source of inoculum and management of soybean diseases.

Disease	Symptoms	Source of Inoculum	Management
Aerial Blight (<i>Rhizoctonia solani</i>)	The initial infected area typically involves the lower third of one or more of the three leaflets. Necrotic areas may vary in shape from circular to irregular with reddish-brown margins. Leaf blight, leaf spots, and defoliation are symptoms of the disease. Lesions may vary from reddish-brown to brown or tan. Several leaflets may appear to be matted together with a cottony growth (mycelia). Sclerotia may be visible (round survival structures, white to brown, mustard seed to pencil eraser-sized). Petioles, stems, and pods also may be infected.	Weed hosts, field debris, and soil. Rice, grain sorghum, corn and cotton serve as alternative hosts. Risk of disease is increased in rice/soybean rotations.	Fall cultivation of stubble. Use good seedbed preparation and weed control. Research and field observations indicate that some varieties may be tolerant aerial blight. Resistance to strobilurin fungicides has occurred in some areas. SDHI fungicides will be more effective in these situations (Table 1).
Anthrachnose (<i>Colletotrichum</i> spp.)	Symptoms appear as irregular brown areas most frequently on stems and pods. In advanced stages, affected tissues are covered with black fruiting bodies. The disease may cause serious losses, especially during rainy periods. Seed may fail to form or be wrinkled and moldy.	The pathogens are seed- and debris-borne.	Plant disease-free seed. Some benefit may be derived from seed treatment. Plow under crop residue. Fungicides may be effective (Table 1).
Brown Spot (<i>Septoria glycines</i>)	Angular brown to reddish-brown spots appear first on lower leaves, causing yellowing and later defoliation. Symptoms usually are seen first on young plants during cool weather. Sizes of spots vary from a pinpoint to ¼-inch diameter.	The fungus overwinters in crop residue and on infected seed.	Plant disease-free seed. Rotate. Bury crop residue if possible. Resistant varieties may be available. Fungicides are effective and may be economically beneficial in severe cases (Table 1).
Cercospora Leaf Blight (<i>Cercospora</i> spp.)	Longitudinal, purplish lesions on petioles appearing at R5 or later. Purpling to bronzing of leaves and/or blighting (brown, necrotic areas on leaflets) beginning in the upper canopy during pod fill. The pathogen may sporulate on leaflets resulting in a grayish hue. Premature defoliation may occur.	The same fungi cause purple seed stain. Pathogens overwinter in crop debris. Some weeds and cotton are alternative hosts. Spores may be airborne. Latent infection occurs with these pathogens; therefore, plants may be infected long before symptoms appear.	Use tolerant varieties based on ratings nearest your location. Fungicides may be effective but are notoriously inconsistent (Table 1).

Disease	Symptoms	Source of Inoculum	Management
Charcoal Rot (<i>Macrophomina phaseolina</i>)	Seedling infections result in a discoloration at the soil line. Seedlings may die if hot, dry conditions exist, or they may survive in wet weather with disease symptoms reappearing during hot, dry spells. In older plants, a light brown discoloration of internal tissue occurs. Plants turn yellow and “mature very early.” Below the epidermis, at the soil line, small black bodies appear, giving the tissue a grayish-black “charcoal” appearance. Lower stems may be disintegrated.	Overwinters in soil, on seed and in soybean residue.	Avoid excessive seeding rates. Maintaining good fertility will reduce the incidence of this disease. Avoid drought stress, if possible.
Downy Mildew (<i>Peronospora manshurica</i>)	Indefinite yellowish-green areas on upper leaf surface, later becoming reddish-brown with age. Grayish tufts of mold growth on lower leaf surface beneath chlorotic spots.	Overwinters in soil, on seed and in soybean residue.	Crop rotation. Use disease-free seed. Seed treatment reduces seedling infection. This disease does not affect yield, and fungicides are ineffective.
Frogeye Leaf Spot (<i>Cercospora sojae</i>)	An eyespot type of lesion with a gray or light tan center and a narrow reddish-brown border forms on the leaves. Usually occurs in the upper half of the canopy. May cause premature defoliation. May occur as purplish lesions on petioles, stems, and pods.	Seed and airborne.	Use resistant varieties. Apply foliar fungicides, if necessary, to susceptible varieties (see Table 1).
Minor Nematodes (Spiral, Lance, Ring, Lesion, Stubby-root)	Stunting, stand loss, and reduced yields are associated with high populations of single or mixed populations of these nematodes. Symptoms will vary depending on nematode type and population levels.	Soil.	Rotate with other crops. If populations are high at planting, a nematicide may be used. Use sanitation with equipment that may spread nematode infested soil.
Phytophthora Root Rot (<i>Phytophthora</i> spp.)	Destroys roots and tender stems of infected seedlings, resulting in rapid death. Older plants turn yellow and leaves wilt. A brown discoloration develops in the stem. Damage is most severe on heavy clay soils or on poorly drained soils.	The pathogen is soilborne.	Avoid planting susceptible varieties on poorly drained soils. Rotate. Improve drainage.
Pod and Stem Blight (<i>Diaporthe phaseolorum</i> var. <i>sojae</i> = <i>Phomopsis sojae</i>)	Numerous small black fruiting bodies appear on the pods and stems of mature plants. Blight usually occurs in linear rows on the stem. Under favorable environmental conditions for the disease, white mycelial growth may be observed on seed.	Fungus is seedborne and overwinters on diseased plant tissue in the field.	Plant disease-free seed. Some benefit may be derived from the seed treatment. Foliar fungicides may be effective; however, efficacy data is limited (Table 1).
Purple Seed Stain (<i>Cercospora</i> spp.)	Pink or light purple to dark purple discoloration of seed. Cracks may occur in discolored areas.	The same fungi cause <i>Cercospora</i> leaf blight. Pathogens overwinter in crop residue and on infected seed. Some weeds and cotton are alternative hosts. Spores may be airborne. Latent infection occurs with these pathogens; therefore, plants may be infected long before symptoms appear.	Plant disease-free seed. Fungicide efficacy is unknown. Varieties vary in susceptibility.

Disease	Symptoms	Source of Inoculum	Management
Red Crown Rot (<i>Calonectria ilicicola</i>)	First symptoms appear as an interveinal chlorosis in leaves during R5 to R6 followed by browning and defoliation. On the stems, reddish-orange fruiting structures appear at the soil surface and up to 3 inches above. Stem tissue may appear reddish.	The pathogen is soilborne.	Research and field observations indicate differences in varieties, but ratings are not available. Delayed planting may reduce disease incidence and severity.
Reniform Nematode (<i>Rotylenchulus reniformis</i>)	Severely infected plants are stunted and may be chlorotic. Severe yield reductions may occur when nematode populations are relatively high.	The nematode overwinters in the soil.	Planting resistant varieties and rotation with nonhost crops may reduce populations. Nematicides are effective and may be economical if precision application methods are used. Use sanitation with equipment that may spread nematode infested soil.
Root Knot Nematode (<i>Meloidogyne incognita</i>)	Aboveground symptoms are poor pod set with wilting and stunting in more-or-less circular patches on lighter soil types. Interveinal chlorosis on foliage is commonly observed. Below ground symptoms appear as knots or galls on the roots. These swellings are a part of the root and are not removeable like bacterial nodules. Southern blight is commonly observed along with root knot nematodes.	The nematode overwinters in the soil as eggs or larvae.	Resistant varieties may be available, and rotation to peanut may reduce populations. Precision-applied nematicides may be economically beneficial. Use sanitation with equipment that may spread nematode infested soil.
Seedling Disease (<i>Rhizoctonia solani</i> , <i>Phytophthora</i> spp., <i>Pythium</i> spp., etc.)	Seed decay and postemergence “damping off.” Roots and basal portion of stem may deteriorate. Brownish-red lesions are often observed on seedling stems at the soil line.	Most of these organisms are soilborne and persist in crop residue.	Fungicide seed treatment or in-furrow spray.
Southern Blight (<i>Athelia rolfsii</i>)	Seedlings and vegetative stage plants may be affected in a row. Scattered plants wilt suddenly and die. White mold appears at the base of the plant and girdles the stem. Tan-to-brown sclerotia (resting bodies) about the size of mustard seeds appear in the mold. Southern blight is often seen with southern RKN.	The fungus is soilborne and occurs widely in many soils. It is capable of persisting on almost any type of organic matter.	Resistant varieties may be available. Rotation to less-susceptible crops may reduce incidence and severity. Do not follow soybean with peanut.
Southern Stem Canker (<i>Diaporthe phaseolorum</i> var. <i>meridionalis</i>)	Small reddish-brown lesions may occur on one or both cotyledons. Later in the season, interveinal chlorosis may be evident on leaflets (similar to foliar symptoms of red crown rot) and plants may die leaving dried attached leaves. Infection usually starts as a small lesion at the base of a main-stem node enlarging rapidly to form a slightly sunken, reddish-brown canker. Plants may be brittle and break at the canker.	The fungus is seedborne and overwinters on infested soybean debris in the field. There may be alternative hosts.	Use resistant varieties. Delayed planting, avoiding stress, and maintaining good fertility may reduce disease incidence and severity.

Disease	Symptoms	Source of Inoculum	Management
Soybean Cyst Nematode (<i>Heterodera glycines</i>)	Stunting and various stages of yellowing occur in roughly circular spots. Symptoms vary depending on nematode population, soil type, fertility, and environmental conditions. Symptoms are most pronounced on sandy soils. May occur in conjunction with sudden death syndrome.	Nematodes overwinter in soil, primarily inside resistant cysts. They may be spread to new locations by any means that spread soil.	Practice two-to-four-year rotation with cotton, corn, or sorghum. Use sanitation with equipment that may spread nematode infested soil.
Soybean Rust (<i>Phakopsora pachyrhizi</i>)	Rust pustules can be found on the underside of lower leaves. Pustules are tiny, raised, and resemble sand grains requiring at least a 15X hand lens.	This pathogen overwinters on kudzu or volunteer soybean.	Fungicides are very effective on soybean rust (Table 1).
Sudden Death Syndrome (<i>Fusarium virguliforme</i>)	Interveinal chlorosis and necrosis similar to red crown rot and stem canker. Will cause premature defoliation. Plants are easily pulled from the ground. White/blue spore masses may be found on roots. Vascular discoloration of stems with pith remaining white. May be exacerbated by soybean cyst nematode.	The fungus is soilborne; however, the disease is rare in Louisiana.	Rotate to a non-host. In-furrow fungicides or seed treatments may be effective. Use sanitation with equipment that may spread infested soil.
Taproot Decline (<i>Xylaria necrophora</i>)	Taproot decline may cause plant death at any point during the growing season. On seedlings, cotyledons are characterized by an interveinal mottling. Infection is indicated by a mild interveinal chlorosis on vegetative and early reproductive stage plants. During pod fill, foliar symptoms appear more severe and interveinal necrosis may occur. When affected plants are pulled, they will usually break at the soil line. When excavated, affected tap and lateral roots will have a blackened appearance, and when stems are split at the crown, a white, cottony growth is apparent in the pith. Blackened soybean debris from previous seasons is usually found near affected roots.	The fungus survives within debris from previous seasons.	Rotation to a nonhost and/or tillage may reduce disease incidence and severity. Resistant varieties may be available.

Table 1: Management of Soybean Diseases Using Fungicides

Plant pathologists throughout the United States have developed the following information on foliar fungicide efficacy for control of major foliar soybean diseases. Ratings in this table have been modified by LSU AgCenter Pathologists to reflect observations more accurately in Louisiana. Efficacy ratings for each fungicide listed in the table were determined by field-testing the materials over multiple years and locations. Efficacy ratings are based upon level of disease control achieved by product and are not necessarily reflective of yield preservation. Efficacy depends upon proper application timing, rate, and application method to achieve optimum effectiveness of the fungicide as determined by labeled instructions and overall level of disease in the field at the time of application. **Differences in efficacy among fungicide products were determined by direct comparisons among products in field tests and are based on a single application of the labeled rate as listed in the table, unless otherwise noted.**

The table is not intended to be a list of all labeled products.

Table Legend

Efficacy Rating	Abbreviation	Active ingredient	Product/Trade name	Rate (fl oz/A)	AB ¹	AN	BS ²	CB ³	FE ⁴	PS	SR	TS	Harvest Restriction
Poor	P	thiophanate-methyl tetraconazole	Acropolis 2.37 SC	20.0-23.0	NL	U	U	U	VG	U	VG-E	U	R5
Fair	F	azoxystrobin tetraconazole	Affiance 1.5 SC	10.0-14.0	U	VG	VG	P-G ⁶	VG	U	U	U	R5, 14 days
Good	G	cyproconazole	Alto 100SL	2.75-5.5	U	U	VG	F	F	U	VG	U	30 days
Very Good	VG	picoxystrobin	Aproach 2.08 SC	6.0-2.0	VG	G	P-G	P	P	U	G	U	14 days
Excellent	E	picoxystrobin cyproconazole	Aproach Prima 2.34 SC	5.0-6.8	VG	U	G	P-G ⁶	F-G	U	VG-E	F-G	14 days
Not Labeled	NL	prothioconazole trifloxystrobin	Delaro 325 SC	8.0-11.0	VG	U	VG	U	G-VG	U	U	NL	21 days
Unkown Efficacy	U	prothioconazole trifloxystrobin fluopyram	Delaro Complete 3.83 SC	8.0-11.0	U	U	VG	U	U	U	U	NL	21 days
		tetraconazole	Domark 230 ME	4.0-5.0	NL	VG	VG	P-G ⁶	VG	U	VG-E	P	R5
		fluoxastrobin	Evito 480 SC Aftershock 480 SC	2.0-5.7	VG	G	P-G	P	P	U	U	U	R5, 30 days
		boscalid	Endura 0.7 DF	3.5-11.0	U	NL	VG	U	P	NL	NL	U	21 days
		inpyrfluxam	Excalia 2.84 SC	2	E	NL	NL	NL	NL	NL	U	NL	R5
		pyraclostrobin	Headline 2.09 EC/SC	6.0-12.0	VG	VG	P-G	P	P	U	VG	P-F	21 days
		flutriafol bixafen	Lucento 4.17 SC	3.0-5.5	VG	U	VG	G	VG	U	VG-E	F-G	21 days
		pydiflumetofen difenoconazole	Miravis Top 1.67 SC	13.7	G-VG	U	VG	G	VG	G	NL	F-G	14 days

Active ingredient	Product/Trade name	Rate (fl oz/A)	AB ¹	AN	BS ²	CB ³	FE ⁴	PS	SR	TS	Harvest Restriction
flutriafol fluoxastrobin	Preemptor SC Fortix SC	4.0-6.0	U	U	G-VG	P-G ⁶	G-VG	U	VG	P	R5
pyraclostrobin fluxapyroxad	Priaxor 4.17 SC	4.0-8.0	E	VG	G-VG	P-G ⁶	P-F	G	VG	F-G	21 days
prothioconazole	Proline 480 SC	2.5-5.0	NL	NL	NL	NL	G-VG	NL	VG	U	21 days
fluopyram prothioconazole	Propulse 3.34 SC	6.0-10.2	NL	NL	U	NL	U	U	U	NL	21 days
azoxystrobin	Quadris 2.08 SC Multiple Generics ⁵	6.0-15.5	VG	VG	P-G	P	P	U	G-VG	P-F	14 days
azoxystrobin difenoconazole	Quadris Top 2.72 SC Quadris Top SBX 3.76 SC	8.0-14.0 7.0-7.5	VG	U	G-VG	P-G ⁶	VG	F-G	VG	F-G	14 days
azoxystrobin propiconazole	Quilt 1.66 SC Multiple Generics ⁵ Quilt Xcel 2.2 SE	14.0-20.5	VG-E	VG	G	P	F	U	VG	P	21 days R6
mefentrifluconazole pyraclostrobin fluxapyroxad	Revytek	8.0-15.0	VG	U	VG	G	VG	U	VG-E	F-VG	21 days
trifloxystrobin prothioconazole	Stratego YLD 4.18 SC	4.0-4.65	VG	VG	G	P-F	F-G	U	VG	P	21 days
propiconazole	Tilt 3.6 EC Multiple Generics ⁵	4.0-6.0	P	VG	G	NL	F	NL	VG	U	R5
flutriafol	Topguard 1.04 SC	7.0-14.0	U	VG	VG	P-G ⁶	G-VG	U	VG-E	P	21 days
azoxystrobin flutriafol	Topguard EQ	5.0-7.0	VG	U	VG	P-G ⁶	G-VG	U	E	P	21 days
thiophanate-methyl	Topsin-M Multiple Generics ⁵	10.0-20.0	U	U	U	P	VG	U	G	U	21 days
benzovindiflupyr azoxystrobin propiconazole	Trivapro	13.7-20.7	E	U	G-VG	P-G ⁶	F-G	G	VG-E	U	14 days R6
mefentrifluconazole pyraclostrobin	Veltyma	7.0-10.0	U	U	U	U	U	U	U	U	21 days
tetraconazole fluoxastrobin	Zolera FX 3.34 SC	4.4-6.8	U	U	U	U	F-G	U	U	U	R5 30 days

¹ In areas where strobilurin resistance has been found, efficacy of products containing strobilurins may be reduced.

² Strobilurin resistance has been discovered in nearby states in this pathogen population and may exist in Louisiana. Reduced efficacy of strobilurins may be observed.

³ Fungicides with a solo or mixed Qol or MBC mode of action may not be effective in areas where Qol or MBC resistance exists in the fungal population that causes Cercospora leaf blight.

⁴ Fungicides with a solo or mixed Qol mode of action may not be effective in areas where Qol-resistance exists in the fungal population that causes frogeye leaf spot.

⁵ Generics containing the same active ingredient may be available.

⁶ Efficacy of this product on CLB has been inconsistent across locations and years.

The soybean section was revised September 2024 by Trey Price.

Sugarcane

Integrated Disease Management of Sugarcane

Sugarcane productivity and profitability depend on effective disease management, particularly in Louisiana, where varietal resistance and a healthy seed cane program are key strategies. Since sugarcane is vegetatively propagated, obtaining and planting healthy seed cane is essential to manage systemic diseases such as ratoon stunt, leaf scald, smut, mosaic and yellow leaf. These diseases can spread through infected stalks, so using disease-free seed cane is critical.

Historically, the sugarcane industry has faced significant disease challenges, such as the mosaic epidemic of the 1920s, which nearly devastated the industry due to the susceptibility of the most popular cultivar at the time. In response, breeding programs have focused on developing resistant varieties to prevent such catastrophic impacts. Varietal resistance remains the top management strategy, but the adoption of propagative material with undetectable levels of pathogens, verified through testing, is also essential, particularly for systemic diseases.

In Louisiana, tissue-cultured sugarcane material is routinely tested for key pathogens, benefiting the industry through the breeding program and the clean seed program. However, continued monitoring and a deeper understanding of the impact of diseases on current cultivars are necessary. While varietal resistance and clean seed cane are the primary management approaches, other methods, such as heat treatment and chemical control, are also employed. Heat treatment can eliminate pathogenic bacteria like *Leifsonia xyli* subsp. *xyli* and reduce fungal spores' viability, while chemical control is commonly used to manage brown rust, particularly in susceptible varieties during the spring. This overview highlights the common diseases found in Louisiana and the management tactics used to mitigate their effects.

Disease

Symptoms, source of inoculum and management of sugarcane diseases.

Disease	Symptoms	Source of Inoculum	Management
Leaf Scald (<i>Xanthomonas albilineans</i>)	Leaves of young plants may show bleaching or yellowing and dead tissue. The characteristic symptom of leaf scald is the presence of one or more narrow, white “pencil lines” running longitudinally along a vein from the leaf margin down the blade into the sheath. Bands of dead tissue then develop along pencil lines starting at the leaf margin and may expand until the entire leaf is dead. Young shoots may be killed. Mature stalks may show leaf symptoms and develop side shoots with symptoms. Under severe disease conditions, entire plants may die. Drought stress, water logging and low temperatures can increase symptom expression and severity. This may occur in different ways – the chronic phase of leaf scald is characterized by a progressive increment in disease severity; the acute phase is defined by sudden disease outbreaks that can rapidly lead to the death of mature sugarcane plants.	The bacteria that cause leaf scald live from year to year in infected plants. Many times, although the bacterium is present in the plant, symptoms won't manifest due to the lengthy latent period of the disease. It is spread by harvesters and farm equipment, and possibly by other cultivation practices that cause plant wounding. The disease can be spread aerially in windblown rain.	Varietal resistance is the best means of control. The current varieties have adequate levels of resistance, particularly when produced with progeny from a tissue-culture based seed cane program. Avoid planting seed cane from fields with obvious disease. Regular planting of healthy seed cane produced through tissue-culture has kept the incidence of leaf scald low. Sanitize equipment, especially after working in fields where leaf scald was observed. Sanitation can be performed with suitable sanitizer products, such as disinfectant sprays, alcohol and bleach solutions. The heat treatment previously used to control ratoon stunting disease is not effective against leaf scald.

Disease	Symptoms	Source of Inoculum	Management
Mosaic (Species <i>Potyvirus sacchari</i> and <i>Potyvirus sorghitessellati</i> , former virus names Sugarcane mosaic virus and Sorghum mosaic virus, respectively)	The mosaic pattern of irregular, interspersed, pale green, yellowish and green areas on leaves varies with cane variety, stage of growth, temperature and the strain of the virus involved. The mosaic symptom is most evident in the youngest emerging leaves and is most easily seen in young plants, therefore, scouting in Louisiana is recommended during the spring, when plants are recovering from the winter freezes.	The virus persists from year to year in infected plants. Mosaic in Louisiana is transmitted by various aphid species such as, <i>Rhopalosiphum maidis</i> (Fitch), <i>Hysteroneura setariae</i> (Thomas) and <i>Schizaphis graminum</i> (Rondani). Infected seed cane also spreads the disease.	Mosaic is controlled primarily with host plant resistance. Historically, mosaic was a major disease adversely affecting sugarcane production in Louisiana. However, basic breeding and development of sources of resistance have greatly reduced the impact of this disease. Currently grown varieties have adequate levels of resistance to mosaic with the exception of three recently released varieties, HoCP 09-804, L 11-183 and HoL 15-508. Planting seed cane produced through tissue-culture can help keep disease incidence low in susceptible varieties.
Ratoon Stunt (<i>Leifsonia xyli</i> subsp. <i>xyli</i>)	Ratoon stunting disease has no obvious external symptoms, but can cause important yield losses if spread is not under control. It is among the most important sugarcane diseases worldwide, but it is currently under control in Louisiana due to the adoption of resistant cultivars and clean seed. Infected plants may be shorter but with little or no decrease in diameter of the stalk. Stunting severity is associated with adverse environmental conditions, particularly drought stress, and it is more severe in ratoon crops. Affected plants, when split, may or may not show a pinkish color in the growing point of young shoots and orange to brownish discoloration of vascular bundles at the nodes in the lower portion of mature stalks.	The bacteria live from year to year in infected plants. It is spread mechanically by the cane harvester and by planting infected seed cane.	A healthy seed cane program is the primary method for RSD control. Seed cane produced from tissue-culture free of RSD is commercially available. Heat treatment of seed cane in hot water at 50 C (122 F) for two hours can provide control of most RSD bacteria. A regular annual heat treatment program can provide good RSD control. Sanitation of farm machinery and tools is a form of prevention. Cleaning machinery and farm equipment with bleach, water and other sanitizers able to kill bacterial cells is recommended, especially if they are shared among different farmers or used in areas affected by the disease. Monitoring of RSD infection levels and the success of a healthy seed cane program can be provided by collecting stalk samples and having them tested at the LSU Ag Center's Sugarcane Disease Detection Lab (https://lsu.edu/agriculture/ppcp/outreach/sugarcane-disease-detection-lab.php). The level of RSD resistance varies among varieties. High levels of resistance are uncommon, so a healthy seed cane program is essential for successful RSD control.
Red Rot (<i>Colletotrichum falcatum</i>)	Red rot adversely affects stand establishment by rotting planted seed cane. Splitting stalks dug up from portions of row without living plants reveals red discoloration of the internode tissue and rotted nodes. Within the red areas, white spots usually elongated at right angles to the long axis of the stalk, are diagnostic of red rot infection. Red rot is more severe when planted stalks are exposed to drought stress or waterlogging, especially on plant cane. The disease is highly associated to sugarcane borer infestations.	The fungal pathogen survives from season to season in infected cane tissues. Fungal inoculum is present on most planted stalks and in the soil.	Avoid using stalks with sugarcane borer damage as propagative material, as those are usually affected by red rot. Sharper blades in harvesters are recommended, as dull blades lead to greater physical damage to billets, increasing susceptibility. Avoid planting under drought, wet or cooler soil conditions that may hamper bud germination. This is especially the case when planting billets (stalk sections). The use of seed treatment chemicals to improve stand establishment and yield obtained from billet planting is under investigation. Labels have been obtained for application of three fungicide combination products to billets at planting: azoxystrobin + propiconazole (Quilt Xcel), fluxapyroxad + pyraclostrobin (Priaxor), and pyraclostrobin + mefentrifluconazole + fluxapyroxad (Revvytek).

Disease	Symptoms	Source of Inoculum	Management
Brown Rust (<i>Puccinia melanocephala</i>)	Small chlorotic areas appear on the leaves at first as flecks. Later, the flecks elongate and become reddish-brown. The spots continue to enlarge with a slight yellow halo surrounding the lesion on some varieties. The lesion takes on a pustular appearance on the lower surface of the leaf. The pustules erupt, releasing a reddish-brown mass of spores. On susceptible varieties, heavily infected leaves dry out and die prematurely.	Rust survives the winter in living green leaf tissue usually in southern areas of the industry. Spores are then produced and aerially dispersed to spread the disease over short and long distances.	Host plant resistance is the primary control method. However, the rust pathogen has the capability to adapt and overcome varietal resistance. Once a variety becomes susceptible, rust can be controlled with the application of fungicide. Avoiding excess fertilization is another way to prevent the disease – excessive levels of nutrients may lead to brown rust development. Detailed information on varietal resistance ratings, fungicide labels and use recommendations, and other brown rust management strategies can be found through the LSU Ag Center website in “Best Management Practices for Minimizing the Impact of Brown Rust in Sugarcane” at https://www.lsuagcenter.com/profiles/lblack/articles/page1553195579511
Smut (<i>Sporisorium scitamineum</i>)	Smut is characterized by the production of a black, whip-like structure at the apex of stalks with smaller than normal diameter that can grow more rapidly and extend above the crop canopy. The whip often elongates to a length of 2-3 feet and curls downward. The whip is covered by a layer of dark brown fungal spores. Prior to the emergence of whips, smut-infected plants can have a grassy appearance with many small-diameter shoots.	Tremendous numbers of smut spores are released over time from whips and dispersed in air currents to spread the disease over short and long distances.	To control smut, grow resistant varieties and plant healthy seed cane. Current varieties have adequate resistance to smut with the exception on L 01-299 that is moderately susceptible under field conditions. Cultivar HoCP96-540 is resistant to smut. High rates of disease increase do not occur under Louisiana climatic conditions, so it is possible to grow varieties with moderate smut susceptibility, if a rigorous healthy seed cane program is followed. Tissue-culture produced seed cane will have little or no smut infection. On-farm roguing of smut-infected plants with glyphosate is only feasible in seed cane sources with low levels of infection. Avoid planting seed cane sources of smut susceptible varieties next to smut infected cane. Do not plant seed cane with more than 2% smut infection.
Mosaic (species <i>Potyvirus sacchari</i> and <i>Potyvirus sorghitessellati</i> , former virus names sugarcane mosaic virus and sorghum mosaic virus, respectively)	The underside of the mid-vein on young leaves at the apex of mature plants turns bright yellow in SCYLV-infected plants. The yellowing can spread into the leaf blade, and mid-veins can turn pink in severely infected plants. Due to the short growing season in Louisiana, symptoms are not seen most years because of ripener applications and/or frosts. Despite the lack of visible symptoms, infected plants may exhibit reduced growth and juice quality.	The sugarcane aphid acquires the virus during feeding on an infected plant. The aphid retains the virus for life and can transmit SCYLV during feeding to healthy plants within the same field or in other fields. Infected propagative material can also introduce the disease to new fields.	Certified seed cane produced through tissue-culture is tested for SCYLV. Continuous planting of seed cane with little or no virus infection will keep the incidence of yellow leaf low. Information is lacking on the disease resistance levels of commercial varieties. Epidemiological information is lacking on whether vector management is effective to prevent yield losses related to yellow leaf disease.

Disease	Symptoms	Source of Inoculum	Management
Red Stripe and Top Rot (<i>Acidovorax avenae</i> subsp. <i>avenae</i>)	Narrow, dark red stripes of variable length run longitudinally along veins. Symptoms are often seen in 4- to 6-month-old cane. The leaf spindle at the shoot apex can become infected in susceptible varieties, particularly under warm, wet conditions. The infection can then spread into the shoot apex and cause a top rot. Reddish brown discoloration and cavities may form in stalk internodes. An unpleasant odor is associated with the rotting spindle that may be detected outside the field.	Bacterial exudates form that are readily spread from plant to plant by wind-blown rain. The bacteria infect through wounds and stomates.	Red stripe is usually a minor disease. Most commercial varieties are resistant and never exhibit top rot. HoCP 00-950 is a current variety that may develop top rot during wet growing seasons.
Brown Stripe (<i>Bipolaris stenospila</i>)	In leaves, elongate, reddish-brown lesions with an obvious yellow “halo” develop parallel to veins. During severe infection, lesions may coalesce, and entire leaves may be killed. Disease is more severe when plants are under nutritional stress or injured by herbicides. Brown stripe may be severe in fields cut the previous season for seed cane.	Spores produced by the fungus are spread by the wind to cause new infections.	Brown stripe is usually a minor disease. Severe disease symptoms have been observed in L 01-299, L 03-371, HoCP 04-838 and HoCP 09-804 during early spring following mild winters and frequent rainfall events. Disease development is minimal when conditions are favorable for growth. Symptoms usually diminish after fertilization.
Pokkah Boeng (<i>Gibberella fujikuroi</i>)	Malformed or twisted leaves occur near the shoot apex. Young leaves may exhibit pronounced wrinkling, twisting and shortening. Chlorosis (yellowing) is often evident at the leaf base, and necrosis may develop. Spindle infection can spread into the stalk. In severe cases, dark red streaks and ladder-like lesions form inside the stalk and the rind. A “knife-cut” lesion may form in the rind.	Spores of the fungus are spread by wind and rain.	Grow resistant varieties. All the current varieties have adequate resistance. Pokkah boeng may become evident during warm, wet periods when rapid plant growth is occurring. However, plants recover, and the effect on yield is minimal.
Orange Rust (<i>Puccinia kuehnii</i>)	Leaf lesions are very similar to brown rust except that young lesions and the spores produced in pustular lesions on the underside of the leaf are orange, lighter than brown rust spores. It is easier to distinguish orange rust lesions from brown rust on younger leaves in the upper section of sugarcane plants. Symptoms will persist into the summer months, whereas few brown rust symptoms are evident in young leaves during summer.	Same as for brown rust. The fungus overwinters in green leaf tissue, and spores produced during late spring spread the disease over short and long distances.	Orange rust was first observed in 2012. Varietal resistance has provided good control. One variety, Ho 05-961, has shown moderate susceptibility to orange rust. Avoiding excessive fertilizer applications may avoid orange rust outbreaks.
White Stripe (Physiological disorder)	Characterized by variable amounts of longitudinal, white striping on leaves of some plants, usually occurring during spring. The white stripes extend the full length of the leaf. Striping is not considered infectious but rather a growth response to environmental conditions.		None. Plants will recover after fertilizer uptake in the presence of adequate rainfall.

The sugarcane section was revised October 2024 by Andre Gama.

Wheat

Disease

Symptoms, source of inoculum and management of wheat diseases.

Disease	Symptoms	Source of Inoculum	Management
Leaf Rust (<i>Puccinia triticina</i>)	Leaf rust is widespread and probably is a destructive disease on wheat in Louisiana. The leaf rust fungus produces small, yellowish-orange pustules on the leaves. These masses of spores turn dark as wheat matures. Infection usually begins on lower leaves and spreads upward. Infected leaves turn yellow and die.		Resistant varieties are the most practical approach. Some seed treatments provide early season suppression, but foliar-applied fungicides are most effective (Tables 1 and 2b).
Stem Rust (<i>Puccinia graminis tritici</i>)	Elongated, reddish-brown pustules occur on the stem, leaf sheaths, leaf blades and glumes. Pustules rupture the epidermis to expose a powdery, reddish-brown mass of spores. Fragments of epidermis adhere to sides and ends of pustules to give them a ragged appearance.	Has alternate host species of Berberis and Mahonia where new races may occur but spread in this area primarily is from wheat to wheat.	Stem rust can be a serious problem in some years in localized regions of Louisiana. Resistant varieties are the most practical approach for control of this disease, although fungicides may be used (Table 2b).
Stripe Rust (<i>Puccinia striiformis</i>)	The first sign of disease is individual yellow pustules, usually at the tip of the leaf. Later, pustules develop in rows, giving the characteristic of striped appearance. Leaves, sheaths, stems and glumes may be attacked.		Resistant varieties are the most practical approach for control of this disease, although fungicides may be used (Table 2b).
Powdery Mildew (<i>Erysiphe graminis tritici</i>)	Powdery mildew usually is found on leaves but may attack all aboveground parts of the plant. It first appears as small irregular or circular light gray spots on the upper leaf surface. Later, the plant is covered with a "floury" appearance. Leaves eventually become misshapen and die.		The application of fungicide for the control of powdery mildew has rarely been economical.
Bacterial Streak/Black Chaff (<i>Xanthomonas campestris</i> pv. <i>translucens</i>)	Symptoms on leaves begin as dark green, water-soaked spots that eventually become necrotic and develop into streaks. On the heads, black chaff appears as stripes on the glumes, but blackening may be total.		Use crop rotation, clean tillage and pathogen-free seed.
Fusarium Head Blight/Scab (<i>Fusarium</i> spp.)	The symptoms after flowering appear as a bleaching of the glumes, spikelets, areas of the head or even the entire head. Salmon-red or pink-red spore masses frequently form on infected heads.		Well-timed, foliar-applied fungicides only suppress disease incidence (Table 2c).

Disease	Symptoms	Source of Inoculum	Management
Leaf and Glume Blotch (<i>Stagonospora</i> sp.)	The disease appears on the chaff and may be seen as small, irregular, grayish or brownish spots or blotches, which enlarge and become chocolate brown. As the spots age, their centers turn grayish-white and may include tiny, round, raised black spore-bearing bodies. Ordinarily, only a few glumes in a head become infected, but in severe cases the entire head is attacked and turns dark brown. Spots on the sheaths are dark brown and often include most of each sheath. Spots on leaves are light colored and usually surrounded by a brown border.		Varieties differ in tolerance to leaf and glume blotch. Consult variety recommendations. For fungicide recommendations, please refer to (Table 2a).
Take-all (<i>Gaeumannomyces graminis</i>)	Affected plants have shortened, bleached heads that stand erect, and the affected plants are distributed irregularly throughout the field. The stem base is blackish-brown, and the roots show dark discoloration and are extensively rotted.		Maintain balanced soil fertility and some labeled seed treatment fungicides for suppression only.
Tan Spot (<i>Pyrenophora tritici-repentis</i>)	Tan spot first appears on the lower leaves as small yellowish-brown spots that develop into oval spots. Lesion centers become tan and usually are surrounded by a yellow border or halo. As the leaf declines, the spots expand and merge into irregular tan to brown lesions.		Deep plow crop residues. Fungicides may be used.
Yellow Dwarf (barley yellow dwarf virus or BYDV)	Leaf discoloration in shades of yellow, red or purple, especially from tip to base and from margin to midrib. Stunting and excessive tillering are noted. White sterile heads may develop. The virus is spread by some species of aphids.		No adequate controls are available at this time.

Table 1. Fungicides available to manage seed and seedling diseases in wheat.

Product ¹	Rate ²	Disease
Apron XL LS	0.0425-0.085 fl oz	Pythium damping-off
Charter F2	5.4 fl oz	Common bunt, flag smut, Fusarium seed rot, Fusarium seedling blight, loose smut, Pythium damping-off
Charter	3.1 fl oz	Common bunt, flag smut, Fusarium seed rot, Fusarium seedling blight, loose smut
Dividend XL RTA	5-10 fl oz	Common bunt, dwarf bunt, loose smut, flag smut, seed-borne Septoria, general seed rots, Fusarium Seed scab, Pythium damping-off
Dividend Extreme	2-4 fl oz	Common bunt, dwarf bunt, loose smut, flag smut, seed-borne Septoria, general seed rots, Fusarium Seed scab, Pythium damping-off
ManKocide	4 oz	Bacterial diseases, common bunt
Manex	3.5-5.2 fl oz	Damping-off, seed rot, seedling blight
Maxim 4FS	0.08-0.16 fl oz	Damping-off
Maxim XL	0.167-0.334 fl oz	Damping-off
Raxil 2.6F	0.1 fl oz	Stinking smut, flag smut, loose smut, early season Septoria disease complex, early season Rhizoctonia root rot, early season common root rot, early season Fusarium foot rot, early season suppression of powdery mildew, early season suppression of wheat leaf rust
Stamina	0.4-0.8 fl oz ³	Dry seed decay, Rhizoctonia seed and seedling disease
Stamina F3	4.6 fl oz	Common bunt, common root rot, dry seed decay, flag smut, Fusarium seed rot, Fusarium seedling blight, loose smut, Pythium damping off, Rhizoctonia root rot
Vibrance Extreme	2.8-5.6 fl oz ³	General seed rots, seedling blight, root rot and damping-off caused by seed- and soilborne Fusarium spp. or Rhizoctonia spp. seedling blight, root rot and damping-off caused by soil-borne Pythium spp. seed-borne Septoria, Septoria leaf blotch. common bunt, dwarf bunt, karnal bunt, flag smut, Fusarium seed scab, loose smut, Pythium damping-off

¹ Reference to commercial or trade names is made with the understanding that no discrimination or endorsement of a particular product is implied by LSU or the LSU AgCenter.

Labels are subject to change and users should always read the label before applying a pesticide.

² Rates are the amount of formulation (product) per-hundredweight unless otherwise noted.

³ Consult label for specific rates.

Table 2a. Recommended fungicides, rates and application timing for leaf and glume blotch (*Phaeosphaeria nodorum*⁵).

Product Choices ¹	Product Mode of Action Group ²	Rate ³	Time of Application	PHI ⁴
Adastrio	3, 7, 11	5-9 fl oz	Consult label	30
Aproach	11	6-12 fl oz	Consult label	45
Aproach Prima	3, 11	3.4-6.8 fl oz	Consult label	45
Bumper 41.8EC	3	4 fl oz	Consult label	-
PropiMax	3	4 fl oz	Flag leaf emergence	-
Tilt	3	4 fl oz	No applications past Feeke's 10.54	-
Caramba	3	10-14 fl oz	Protect as flag leaf emerges	30
Delaro	3, 11	8 fl oz	Consult label	35
Headline	11	6-9 fl oz	No later than Feeke's 10.5	-
Lucento	3, 7	3-5.5 fl oz	Consult label	30
Miravis Ace	3, 7	13.7 fl oz	Do not apply after Feeke's 10.5.4	-
Priaxor	7, 11	4-8 fl oz	No later than Feeke's 10.5	30
Proline 480 SC	3	4.3-5 fl oz	First appearance of disease but not past Feeke's 10.5	30
Prosaro 421 SC	3	6.5-8.2 fl oz	Consult label	30
Prosaro Pro 400 SC	3, 7	10.3-13.6 fl oz	Consult label	30
Quilt Xcel	3, 11	10.5-14 fl oz	No applications past Feeke's 10.5	7
Sphaerex	3	4.0-7.3 fl oz	Consult label	30
Stratego YLD	3, 11	4 fl oz	Consult label	35
Twinline	3, 11	7-9 fl oz	No applications past Feeke's 10.5	-

¹ Reference to commercial or trade names is made with the understanding that no discrimination or endorsement of a particular product is implied by LSU or the LSU AgCenter. **Labels are subject to change and users should always read the label before applying a pesticide. Consult label for restrictions.**

² Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

³ Rates are the amount of formulation (product) per acre unless otherwise indicated.

⁴ Preharvest interval (PHI) is the minimum number of days allowed between the last application and harvest. If not listed consult label.

⁵ Formerly *Stagonospora nodorum* and *Septoria nodorum*.

Table 2b. Recommended fungicides, rates and application timing for rusts.

Product Choices ¹	Product Mode of Action Group ²	Rate ³	Time of Application	PHI ⁴
Adastrio	3, 7, 11	5-9 fl oz	Consult label	30
Approach	11	6-12 fl oz	Consult label	45
Approach Prima	3, 11	3.4-6.8 fl oz	Consult label	45
Priaxor	3, 7	4-8 fl oz	No later than Feeke's 10.5	-
Bumper 41.8EC	3	4 fl oz	Consult label	-
PropiMax	3	4 fl oz	Flag leaf emergence	-
Tilt	3	4 fl oz	No applications past Feeke's 10.54	-
Caramba	3	10-14 fl oz	Protect as flag leaf emerges	30
Delaro	3, 11	8 fl oz	Consult label	35
Headline	11	6-9 fl oz	No later than Feeke's 10.5	-
Lucento	3, 7	3-5.5 fl oz	Consult label	30
Miravis Ace	3, 7	13.7 fl oz	Do not apply after Feeke's 10.5.4	-
Proline 480 SC	3	4.3-5 fl oz	First appearance of disease but not past Feeke's 10.5	30
Prosaro 421 SC	3	6.5 to 8.2 fl oz	Consult label	30
Prosaro Pro 400 SC	3, 7	10.3-13.6 fl oz	Consult label	30
Quilt Xcel	3, 11	10.5-14 fl oz	No applications past Feeke's 10.5	7
Stratego YLD	3, 11	4 fl oz	Consult label	35
Folicur 3.6F	3	4 fl oz	Consult label	30
Orius 3.6F	3	4 fl oz	Consult label	30
Tebustar 3.6F	3	4 fl oz	Consult label	30
Monsoon	3	4 fl oz	Consult label	30
Muscle 3.6F	3	4 fl oz	Consult label	30
Tebuzol 3.6F	3	4 fl oz	Consult label	30
Sphaerex	3	4.0-7.3 fl oz	Consult label	30
Twinline	3, 11	7-9 fl oz	No applications past Feeke's 10.5	-

¹ Reference to commercial or trade names is made with the understanding that no discrimination or endorsement of a particular product is implied by LSU or the LSU AgCenter. **Labels are subject to change and users should always read the label before applying a pesticide. Consult label for restrictions.**

² Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

³ Rates are the amount of formulation (product) per acre unless otherwise indicated.

⁴ Preharvest interval (PHI) is the minimum number of days allowed between the last application and harvest. If not listed consult label.

Table 2c. Recommended fungicides, rates and application timing for scab (*Fusarium graminearum*).

Product Choices ¹	Product Mode of Action Group ²	Rate ³	Time of Application	PHI ⁴
Caramba ⁵	3	10-14 fl oz	Consult label	30
Proline 480 SC ⁵	3	4.3-5 fl oz	Consult label	30
Prosaro 421 4C	3	6.5 to 8.2 fl oz	Consult label	30
Prosaro Pro 400 SC	3, 7	7.3 fl oz	Consult label	30
Folicur 3.6F ⁵	3	4 fl oz	Consult label	30
Orius 3.6F ⁵	3	4 fl oz	Consult label	30
Tebustar3.6F ⁵	3	4 fl oz	Consult label	30
Monsoon ⁵	3	4 fl oz	Consult label	30
Muscle 3.6F ⁵	3	4 fl oz	Consult label	30
Tebuzol 3.6F ⁵	3	4 fl oz	Consult label	30
Miravis Ace	3, 11	13.7 fl oz	Do not apply after Feeke's 10.5.4	-
Sphaerex	3	7.3 fl oz	Consult label	30

¹ Reference to commercial or trade names is made with the understanding that no discrimination or endorsement of a particular product is implied by LSU or the LSU AgCenter. **Labels are subject to change and users should always read the label before applying a pesticide. Consult label for restrictions.**

² Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

³ Rates are the amount of formulation (product) per acre unless otherwise indicated.

⁴ Preharvest interval (PHI) is the minimum number of days allowed between the last application and harvest. If not listed consult label.

⁵ Suppression only.

The wheat section was revised October 2024 by Boyd Padgett.

Commercial Crop Production: Fruit and Nut Crops

Apple

Integrated Apple Disease Management

Many diseases commonly occur on apples and can reduce flowering and the quality of the fruit in Louisiana. Disease management depends largely on the care and attention that trees are given throughout their lifetime. Achieving “store quality” apples in Louisiana is very difficult due to year-round hot and humid conditions, and they usually require an intensive fungicide and insecticide spray program. Planting resistant varieties is one of the best ways to reduce many of these disease problems. For many apple diseases, good sanitation practices are also essential for disease management.

Plant resistant cultivars: Apple scab is the most widespread and destructive disease of apples in North America. Selecting cultivars that are resistant or tolerant to apple scab is recommended, especially in southern Louisiana where warm and humid conditions favor disease development. Fire blight is also a major apple disease, and thus planting varieties with resistance is strongly recommended.

Use good sanitation practices: Certain foliage diseases and fruit rots overwinter on leaves, twigs, and fruits. Raking leaves that have fallen on the ground and burning them will help reduce the severity of apple scab the following year. Prune dead and diseased limbs from trees infected with fire blight to prevent the spread of the bacterium in the early spring. Removing dead or rotting fruit from the trees and ground will slow bitter rot development the following season.

Ensure good spray coverage: Uniform spray coverage is essential for good disease management and, to a lesser extent, for insect control. A large air blast sprayer (speed sprayer) has proven very satisfactory for treating large acreages of apple trees.

Use registered chemicals: The potential for developing isolates of pathogens resistant to fungicides is high in apple production. To slow the development of resistant pathogen populations: 1) develop a spray program that uses fungicides with different modes of action; 2) avoid consecutive sprays with fungicides with the same or similar modes of action; and 3) only use the labeled rates of recommended fungicides. More information about fungicide-resistance management can be found in the front of this guide.

Disease

Symptoms, source of inoculum and management of apple diseases.

Disease	Symptoms	Source of Inoculum	Management
Apple scab (<i>Venturia inaequalis</i>)	Scab may occur on leaves, fruit, leaf and fruit stems and green twigs. Infections of the leaves and fruit are most common and obvious. Leaf spots are diffuse, brown-to-olive green in color and often have a velvety texture. Fruit lesions are dark brown and corky-like.	Infected leaves that have fallen to the ground. Spores are wind dispersed.	The use of resistant varieties is the most effective means for avoiding apple scab disease. Pruning to establish an open canopy will allow air to move through the tree and dry leaves quickly. Rake and burn fallen leaves. Follow the apple spray schedule.
Armillaria root rot (<i>Armillaria</i> spp.)	Trees appear weak with small, yellowish leaves over the entire tree or confined to one or two branches. The entire tree or single branches may die by the end of the summer or the next year. White mycelial growth can be found beneath the bark of roots or base of affected trees at or about the time of death.	These fungi live in soil and survive for many years in old, diseased roots.	Dig up and burn old roots before planting new trees. Remove dead trees and as many roots as possible. Fumigate before replanting.
Bitter rot (<i>Glomerella cingulata</i> = <i>Colletotrichum gloeosporioides</i>)	Although infection can occur at any stage of fruit development, most infections occur after mid-season as the fruit approaches maturity. The disease is characterized by sunken (more or less), soft and watery, pinkish to brown rotten spots on the fruit. The rotten tissue has a bitter taste.	The fungus survives from season to season in mummified fruit and in dead wood and cankers. Fungal spores are dispersed primarily in splashing water, and disease develops best under warm, moist conditions.	Remove mummified fruit and prune dead wood. Follow the apple spray schedule; late cover sprays are important.
Cedar apple rust (<i>Gymnosporangium juniperi-virginianae</i>)	Galls or “cedar apples” are produced on eastern red cedar and yellow-orange spots are produced on the leaves and fruit of apples and crabapples.	The fungus survives from season to season on the familiar “cedar apples” on eastern red cedar. Windborne spores are produced during periods of rain in the spring.	Rust can be avoided by eradicating cedar trees within two miles of apples. Follow the apple spray schedule.
Fire blight (<i>Erwinia amylovora</i>)	Affects blossoms, leaves, twigs, and young fruit. Infected blossoms wilt suddenly and turn dark brown, followed by blighting of leaves and terminals. Infected twigs and leaves turn dark brown to black, and leaves cling to the stem, often remaining attached most of the season.	The bacteria overwinter at the base of blighted twigs or in cankers on larger limbs. Bacteria are spread by bees and splashing rain.	Spray during bloom with copper fungicides or streptomycin according to manufacturer's directions. Prune out and burn infected twigs. Cut 12-15 inches below affected tissue. Dip pruning tools in 10% chlorine bleach solution between cuts.

Disease	Symptoms	Source of Inoculum	Management
Powdery mildew (<i>Podosphaera leucotricha</i>)	Affects young green tissues and young blossoms. Yellowing of the upper side of young leaves. Infected leaves may crinkle, curl, or roll upwards. Premature dropping of severely infected leaves. White fungal growth on leaves, petioles and shoots is a sign of the powdery mildew pathogen.	Developing buds become infected and overwinter as fungal strands. Disease is apparent on leaves and flower buds as they emerge in the spring.	The use of resistant varieties is the most effective means for avoiding powdery mildew disease. A strict fungicide spray program is required when susceptible varieties are planted.
Phytophthora crown, collar and root rot (<i>Phytophthora</i> spp.)	Foliar symptoms include thinning of the canopy, poor shoot growth and gradual decline. Removal of the outer bark reveals a reddish-brown to brown decay of the phloem and cambium with distinct margins between diseased and healthy tissue.	These pathogens are soil-borne organisms.	Use a combination of practices, including proper site selection, improving drainage and managing soil water, using resistant rootstocks and preventative applications of selected fungicides.

Table 1: Recommended pesticides, rates and pesticide use restrictions for apple scab (*Venturia inaequalis*).

Product Choices	Product Mode of Action Group	Rate	PHI	Maximum Use
copper hydroxide (various products)	M	See labels	1-2	See labels
MasterCop ¹	M	See label	See label	See label
Double Nickel 55OG	N/A	0.25-3 lb	0	N/A
Fontelis	29	16-20 fl oz	28	61 fl oz
Indar2F	3	6-8 fl oz	14	32 fl oz
Inspire Super	9, 3	12 fl oz	14	60 fl oz
Luna Sensation	7, 11	4-5.8 fl oz	14	21 fl oz
Omega 500F	7	10-13.8 fl oz	28	8.625 pt
PH-D (suppression only)	19	6.2 oz	0	6 app
Pristine	7, 11	14.5-18.5 oz	0	74 oz
Procure 480SC	3	8-16 fl oz	14	64 fl oz
Rally 40WSP	3	5-8 oz	14	5 lb
Rally 40WSP (post-infection)	3	8 oz	14	5 lb
Scala (applied alone)	9	7-10 fl oz	72	40 fl oz
Scala (tank mixed)	9	5 fl oz	72	40 fl oz
Sovran	11	3.2-6.4 oz	30	25.6 oz
Serenade ^{OG}	44	2-6 qt	0	N/A
Serenade MAX ^{OG}	44	1-3 lb	0	N/A
Sulfur (various products)	M	See labels	1	See labels
Thiophanate-methyl 85WDG	1	0.6-0.8 lb	3	3.3 lb
Topsin 4.5FL	1	15-20 fl oz	1	80 fl oz
Topsin M WSB	1	0.75-1 lb	1	4 lb
T-Methyl 4.5F	1	15-20 oz	1	4 lb
T-Methyl 70WSB	1	1 lb	1	4 lb
Incognito 4.5F	1	15-20 fl oz	1	80 fl oz
Cercobin	1	16-21.8 fl oz	1	87.2 fl oz
Topguard Specialty Crops	3	13 fl oz	14	52 fl oz
Vacciplant ³	N/A	14 fl oz	See label	See label
Ziram 76DF	M	6-8 lb	14	56 lb

^{OG} Indicates a pesticide that has been listed by the Organic Materials Review Institute (OMRI) as approved for use in organic production.

¹ Rates vary depending on the time of application (i.e., fall, late dormant, growing season, etc.).

² Registered for nonbearing fruits and nuts only.

³ Apply with another registered bactericide or fungicide.

Table 2: Recommended pesticides, rates and pesticide use restrictions for bitter rot (*Colletotrichum gloeosporioides*).

Product Choices	Product Mode of Action Group	Rate	PHI	Maximum Use
Adament 50WG	3, 11	4-6 oz	75	22 oz
captan (various products)	M	See labels	0	See labels
copper hydroxide (various products)	M	See labels	2-Jan	See labels
Double Nickel 55 ^{OG}		0.25-3 lb	0	
Flint 50WP	11	2-2.5 oz	14	11 oz
Luna Sensation	7, 11	4-5.8 fl oz	14	21 fl oz
Merivon	7, 11	4-5.5 fl oz	0	22 fl oz
Omega 500F	29	13.8 fl oz	28	8.625 pt
Pristine	7, 11	14.5-18.5 oz	0	74 oz
Scholar SC (post-harvest drench)	12	10-16 fl oz/100 gal	0	1 app
Serenade ^{OG}	44	2-6 qt	0	
Serenade MAX ^{OG}	44	1-3 lb	0	
Thiophanate-methyl 85WDG	1	0.6-0.8 lb	3	3.3 lb
Ziram 76DF	M	6-8 lb	14	56 lb

^{OG} Indicates a pesticide that has been listed by the Organic Materials Review Institute (OMRI) as approved for use in organic production.

¹ Rates vary depending on the time of application (i.e., fall, late dormant, growing season, etc.).

² Registered for nonbearing fruits and nuts only.

³ Apply with another registered bactericide or fungicide.

Table 3: Recommended pesticides, rates and pesticide use restrictions for cedar apple rust (*Gymnosporangium juniperi-virginianae*).

Product Choices	Product Mode of Action Group	Rate	PHI	Maximum Use
Adament 50WG	3, 11	4-6 oz	75	22 oz
Double Nickel 55 ^{OG}		0.25-3 lb	0	
Flint	11	2-2.5 oz	14	11 oz
Fontelis	7	16-20 fl oz	28	61 fl oz
Indar 2F	3	6-8 fl oz	14	32 fl oz
Inspire Super	9, 3	12 fl oz	14	60 fl oz
Luna Sensation	7, 11	4-5.8 fl oz	14	21 fl oz
mancozeb (various products)	M	See labels	See labels	See labels
Merivon	7, 11	4-5.5 fl oz	0	22 fl oz
Omega 500F	29	13.8 fl oz	28	8.625 pt
Pristine	7, 11	14.5-18.5 oz	0	74 oz
Procure 480SC	3	8-16 fl oz	14	64 fl oz
Inspire Super MP	3	4 fl oz	72	20 fl oz
Propicon 3.6EC ²	3	4 fl oz	See label	20 fl oz
Topaz ²	3	4 fl oz	See label	20 fl oz
Rally 40WSP	3	5-8 oz	14	5 lb
Serenade ^{OG}	44	2-6 qt	0	
Serenade MAX ^{OG}	44	1-3 lb	0	
Sovran	11	3.2-6.4 oz	30	25.6 oz
Topguard Specialty Crops	3	8-12 fl oz	14	56 fl oz
Ziram 76DF	M	6-8 lb	14	56 lb

^{OG} Indicates a pesticide that has been listed by the Organic Materials Review Institute (OMRI) as approved for use in organic production.

¹ Rates vary depending on the time of application (i.e., fall, late dormant, growing season, etc.).

² Registered for nonbearing fruits and nuts only.

³ Apply with another registered bactericide or fungicide.

Table 4: Recommended pesticides, rates and pesticide use restrictions for fire blight (*Erwinia amylovora*).

Product Choices	Product Mode of Action Group	Rate	PHI	Maximum Use
Agri-mycin 17	25	24-48 oz	50	See label
Aliette WDG	33	2-5 lb	14	20 lb
copper hydroxide (various products)	M	See labels	2-Jan	See labels
Copper sulfate crystals	M	5 lb	See label	See label
Cuprofix Ultra 40	M	5-7.5 lb	See label	40 lb
MasterCop ¹	M	See label	See label	See label
Double Nickel 55 ^{OG}		0.25-3 lb	0	
mancozeb (various products)	M	See labels	See labels	See labels
Mankocide	M	8-16 lb	77	See label
Nordox	M	1-16 lb	1	See label
Alude	33	1-2 qt	0	
Confine Extra	33	1-3 qt/100 gal		
K-Phite 7LP	33	2-8 qt/20 gal		
Phostrol	33	2.5-5 pt		
Fosphite	33	1-3 qt	0	
Fungi-phite	33	2-4 pt	0	
Rampart	33	1-3 qt/100 gal		
Serenade ^{OG}	44	2-6 qt	0	
Serenade MAX ^{OG}	44	2-3 lb	0	
Vacciplant ³		14 fl oz	See label	See label

^{OG} Indicates a pesticide that has been listed by the Organic Materials Review Institute (OMRI) as approved for use in organic production.

¹ Rates vary depending on the time of application (i.e., fall, late dormant, growing season, etc.).

² Registered for nonbearing fruits and nuts only.

³ Apply with another registered bactericide or fungicide.

Table 5: Recommended pesticides, rates and pesticide use restrictions for Phytophthora crown, collar and root rot (*Phytophthora* spp.).

Product Choices	Product Mode of Action Group	Rate	PHI	Maximum Use
Aliette WDG (root dip)	33	3 lb/100 gal	0	1 app
Aliette WDG (foliar)	33	2.5-5.0 lb	14	20 lb
MasterCop ¹	M	1.5 pt	0	1 app
Ridomil Gold	4	2 qt		2 app
Metastar 2E	4	2 gal		2 app
Metalaxyl 2E AG	4	2 gal		2 app
Ultra Flourish	4	8 pt		1 app
Alude	33	0.67 fl oz/gal	See label	
Confine Extra (root dip)	33	0.67 fl oz/gal	See label	1 app
K-Phite 7LP (root dip)	33	2.5-5 pt	See label	1 app
Phostrol	33	2 qt/100 gal	See label	
Rampart (root dip)	33	1-3 qt/100 gal	See label	
Rampart (foliar)	33	1-3 qt/100 gal	See label	

⁰⁶ Indicates a pesticide that has been listed by the Organic Materials Review Institute (OMRI) as approved for use in organic production.

¹ Rates vary depending on the time of application (i.e., fall, late dormant, growing season, etc.).

² Registered for nonbearing fruits and nuts only.

³ Apply with another registered bactericide or fungicide.

Table 6: Recommended pesticides, rates and pesticide use restrictions for powdery mildew (*Podosphaera leucotricha*).

Product Choices	Product Mode of Action Group	Rate	PHI	Maximum Use
Double Nickel 55 ^{OG}		0.25-3 lb	0	
Fontelis	7	16-20 fl oz	28	61 fl oz
Indar 2F	3	6-8 fl oz	14	32 fl oz
Inspire Super	9, 3	12 fl oz	14	60 fl oz
Luna Sensation	7, 11	5-5.8 fl oz	14	21 fl oz
PH-D	19	6.2 oz	0	6 app
Procure 480SC	3	8-16 fl oz	14	64 fl oz
Rally 40WSP	3	5-10 oz	14	5 lb
SerenadeOG	44	2-6 qt	0	
Serenade MAX ^{OG}	44	1-3 lb	0	
sulfur (various products)	M	See labels	1	See labels
Thiophanate-methyl 85WDG	1	0.6-0.8 lb	3	3.3 lb
Topsin 4.5FL	1	15-20 fl oz	1	80 fl oz
Topsin M WSB	1	0.75-1 lb	1	4 lb
T-Methyl 4.5Ag	1	15-20 oz	1	4 lb
T-Methyl 70WSB	1	1 lb	1	4 lb
Incognito 4.5F	1	15-20 fl oz	1	80 fl oz
Cercobin	1	16-21.8 fl oz	1	87.2 fl oz
Topguard Specialty Crops	3	8-12 fl oz	14	56 fl oz
Inspire Super MP	3	4 fl oz	72	20 fl oz
Propicon 3.6EC ²	3	4 fl oz	See label	20 fl oz
Topaz ²	3	4 fl oz	See label	20 fl oz

^{OG} Indicates a pesticide that has been listed by the Organic Materials Review Institute (OMRI) as approved for use in organic production.

¹ Rates vary depending on the time of application (i.e., fall, late dormant, growing season, etc.).

² Registered for nonbearing fruits and nuts only.

³ Apply with another registered bactericide or fungicide.

The apple section was revised September 2023 by R. Singh.

Citrus

Integrated Citrus Disease Management

Profitable and sustainable citrus production relies on effective management of diseases and insects that transmit diseases. This is particularly important as exotic diseases such as citrus canker and citrus greening threaten the productivity of the citrus industry in Louisiana. To manage and prevent the spread of citrus diseases an integrated disease management program that incorporates early and accurate disease identification, cultural practices, fungicides and postharvest sanitation should be developed. An overview of citrus diseases commonly found on citrus in Louisiana and management tactics is provided in the disease table. A general seasonal fungicide spray schedule (Table 1) and a list of registered fungicides for disease management (Tables 2-13) are also provided in this section.

Citrus Quarantines

Plant quarantines are established to prevent the introduction of economically important plant pathogens or insect pests into a region where it does not occur. The quarantine restricts movement of **citrus trees, citrus nursery stock and citrus plant parts, including fruit**, from parishes where plant diseases called citrus greening and citrus canker and the insect called Asian citrus psyllid have been confirmed.

Quarantined areas in Louisiana are:

- **Citrus greening:** Jefferson, Orleans, Plaquemines, St. Bernard, St. Charles and Washington parishes.
- **Asian citrus psyllid (transmits citrus greening pathogen):** Jefferson, Orleans, Lafourche, Plaquemines, St. Bernard, St. Charles, St. James, St. Tammany, Tangipahoa and Terrebonne parishes.
- **Citrus canker:** Jefferson, Lafourche, Orleans, Plaquemines, St. Bernard, St. Charles, St. James, St. John and a portion of St. Martin parishes.

For more information on the diseases, the insect or the restrictions, contact the Louisiana Department of Agriculture and Forestry's Horticulture and Quarantine Programs office at 225-952-8100 or go to www.ldaf.la.gov. More information about citrus canker and citrus greening diseases can be obtained by calling the LSU AgCenter Plant Diagnostic Center at 225-578-4562.

**For complete information on citrus diseases, consult the
Louisiana Home Citrus Production Guide,
LSU AgCenter Publication 1234.**

Disease

Symptoms, source of inoculum and management of citrus diseases.

Disease	Symptoms	Source of Inoculum	Management
Anthracnose (<i>Colletotrichum</i> spp.)	The disease can cause symptoms on both leaves and fruit. It produces light tan spots with dark purple margins on the leaves. Dry, firm decay of fruits occurs and the entire fruit rots during wet weather.	The lesions on the fruit and leaves produce spores that may disperse with water splashed from rain or irrigation.	Removal of infected fruits both from the ground and on the tree is crucial to reduce the fungal spores. Follow a fungicide spray program to manage anthracnose.
Brown rot (<i>Phytophthora</i> spp.)	Light brown, leathery-appearing spots develop on the fruit, particularly those low in the canopy or touching the ground. A whitish growth may develop under humid conditions.	The pathogen survives in the soil and is splashed onto low-hanging fruit. It can then be spread by rain splash or wind-driven rain.	Prune to remove low-hanging branches and fruit. Follow a fungicide spray program to manage brown rot.
Citrus canker (<i>Xanthomonas citri</i> subsp. <i>citri</i> = <i>Xanthomonas axonopodis</i> pv. <i>citri</i>)	Leaf lesions are raised on the upper and lower leaf surface. Lesions become corky and crater-like with raised margins, sunken centers, which are surrounded by a yellow halo. Fruit lesions vary in size (2-10 mm). Twigs and stem lesions resemble those on fruit. All citrus cultivars are susceptible to citrus canker.	The pathogen reproduces in lesions on leaves, stems and fruit. Bacteria ooze out of the lesions and are spread by wind-driven rain, overhead irrigation, flooding and human activities. Human movement of infected plant material is the primary means of spread over long distances.	The first line of defense against citrus canker is to prevent the movement of infected tissue from regions with known infections of citrus canker to disease free regions. Good sanitation practices and elimination of inoculum by removal and destruction of infected and exposed trees are recommended. Copper-based fungicides can be used to suppress citrus canker.
Citrus greening or Huanglongbing or Yellow shoot disease (<i>Candidatus Liberibacter asiaticus</i> , <i>C. L. americanus</i>)	Symptoms differ according to citrus variety. The most common symptom is blotchy mottling (irregular pattern of indistinct light and dark areas) on both sides of the leaf. Leaf veins become raised and corky. Fruit are small and lopsided with internal discoloration (orange-brown staining). The disease causes uneven ripening of fruits and abortion of seeds in the fruit. Overall symptoms in the canopy are unevenly distributed.	The pathogen is transmitted by the Asian citrus psyllid. The disease is spread by moving infected plants and plant materials such as bud wood and even leaves.	Use clean bud wood, plant certified disease-free healthy trees, and only purchase trees from a certified nursery. Use good sanitation practices.
Citrus scab (<i>Elsinöe fawcettii</i>)	Citrus scab causes disease on a variety of citrus including grapefruit, lemon, satsuma and tangerine and on rootstocks of sour and trifoliate oranges. Sweet orange is not affected. Citrus scab affects the fruit, leaves and young shoots of plants causing irregular, raised, corky, scabby, wart-like outgrowths. Severely scabbed leaves and fruit become misshapen and distorted. The rind of scabbed fruit is thick and puffy.	The fungus causing scab survives in old pustules on leaves and fruit. Spores are spread primarily by rain splash.	Follow a fungicide spray program to manage citrus scab.

Disease	Symptoms	Source of Inoculum	Management
Greasy spot (<i>Mycosphaerella citri</i>)	Yellow mottled lesions on upper leaf surface with a matching, slightly raised, pale orange to yellow-brown blister on the lower leaf surface. Affected areas later become dark brown to black with a greasy appearance. Black necrotic specks form on fruit.	Spores produced in previously infected decomposing fallen leaves during warm, wet periods of late spring and early summer.	Good sanitation practices and the use of a fungicide spray program.
Melanose (<i>Diaporthe citri</i>)	Melanose is caused by a fungal pathogen that attacks leaves, shoots and fruit, causing numerous dark brown dots or spots. These spots are sunken at first but later become raised, so area has a rough, sandpaper feel. The spots may be irregularly scattered on the surface of the fruit or they can run in streaks (tear stains). Melanose infection occurs only on the young, tender growth, and fruit become resistant as they age. The fungus also infects ripe fruit after harvest, causing stem-end rot.	The fungus colonizes and survives in dead twigs. Fungal spores are spread primarily by rain splashing and wind-driven rain, although windborne spores also may be produced.	Prune out and burn dead wood, which eliminates much of the inoculum. Follow a fungicide spray program. Control of melanose will help to reduce fruit loss from stem-end rot.
Penicillium decays (Green, blue and Whisker molds) (<i>Penicillium</i> spp.)	The pathogen enters the fruit through wounds in the rind. Decay appears as a softened, water-soaked area that is easily punctured by pressure. Later, white mycelium appears on the surface of the fruit, and a mass of powdery olive-green (green mold) or blue spores (blue mold) are produced.	These fungi are common saprophytes in citrus groves. They also survive on contaminated packing equipment resulting in postharvest decay.	Prevent fruit injury at harvest. Sanitize postharvest equipment and storage areas. Follow a fungicide spray program to manage Penicillium decays.
Phytophthora root rot, Foot rot and Gummosis (<i>Phytophthora</i> spp.)	The cortex of infected roots is soft, discolored and sloughs off easily. Growth of and fruit production by infected trees are greatly reduced. Cracked lesions on the bark exude a gummy sap. The spread of lesions around the tree trunk can cause girdling and tree death. Phytophthora root rot symptoms progress more rapidly in the presence of the citrus root weevil.	The pathogen survives in the soil and moves in running or splashing water.	Use resistant rootstock, improve drainage and manage irrigation. Follow a fungicide spray program to manage Phytophthora root rot.
Postbloom fruit drop (PFD) (<i>Colletotrichum acutatum</i>)	The fungus produces necrotic reddish-brown spots on the petals. The entire flower cluster becomes dark brown to orange and the petals dry. Infected young fruits exhibit yellow discoloration and abscise (drop off). The calyx and the floral disc stay intact and are called buttons.	The fungus survives on the surface of leaves, twigs and buttons. Fungal spores are splash-dispersed from infected by rains to healthy flowers by rains.	Avoid overhead irrigation during blooming period to reduce leaf wetness period. Follow a fungicide spray program to manage postbloom fruit drop.

Disease	Symptoms	Source of Inoculum	Management
Sooty mold (<i>Capnodium</i> spp.)	The fungi that cause sooty mold are not plant pathogens. They do not penetrate plant tissue and only grow superficially on the honeydew excretions of aphids, mealy bugs, scale insects and white flies. Sooty mold causes an overall decline in plant health because it prevents sunlight from reaching the leaves and hence photosynthesis is reduced. Fruit covered with sooty mold are smaller, do not color well and have an unattractive (dirty) appearance.		Control honeydew-producing insects. Wash off with soapy water or loosen and protect using dormant oils.
Sour rot (<i>Geotrichum candidum</i>)	Lesions appear as soft, water-soaked spots on fruit at points where an injury has occurred and may increase to involve the entire fruit. White fungal growth develops on the surface of the infected fruit. A strong sour odor is present.	This fungus is a common saprophyte in citrus soils. The pathogen is windborne or splash-borne on soil particles and penetrates the fruit through wounds caused by insects or mechanical means. The pathogen can survive on contaminated packing equipment resulting in postharvest decay.	Prevent fruit injury during harvesting. Prevent fruit from coming in contact with the soil. Sanitize postharvest equipment daily. Do not reuse packing boxes.
Sweet orange scab (<i>Elsinöe australis</i>)	Sweet orange scab causes disease on cultivars of sweet orange, satsuma, tangerine, grapefruit and lemon as well as sour orange and trifoliate orange rootstocks. Sweet orange scab affects fruit, leaves and young shoots causing irregular, slightly raised, corky, scabby growths.	The fungus causing sweet orange scab survives in old pustules on leaves and fruit. Spores are spread primarily by rain splash.	Follow a fungicide spray program to manage sweet orange scab.

Table 1: Seasonal fungicide spray schedule for citrus.

Season	Fungicide Application Timing	Disease
Prebloom	Grapefruit	Citrus scab
Prebloom	Oranges	Sweet orange scab
Prebloom	Satsuma	Melanose
Early bloom	Grapefruit	Postbloom fruit drop
Early bloom	Oranges	Postbloom fruit drop
Late bloom (petal fall)	All citrus	Citrus scab
Late bloom (petal fall)	All citrus	Melanose
Late bloom (petal fall)	All citrus	Postbloom fruit drop
Late bloom (petal fall)	All citrus	Sweet orange scab
Postbloom	All citrus	Anthrachnose
Postbloom	All citrus	Citrus scab
Postbloom	All citrus	Melanose
Postbloom	All citrus	Sweet orange scab
June 15 to July 15	All citrus	Anthrachnose
June 15 to July 15	All citrus	Citrus scab
June 15 to July 15	All citrus	Greasy spot
June 15 to July 15	All citrus	Melanose
June 15 to July 15	All citrus	Sweet orange scab
Oct. 15 to Nov. 15	All citrus	Anthrachnose
Oct. 15 to Nov. 15	All citrus	Brown rot
Soil treatment	All citrus	Phytophthora root rot

Table 2. Recommended pesticides, rates and pesticide-use restrictions for anthracnose (*Elsinoe ampelina*) in citrus produced in the field.¹

Product Choices ²	Product Mode of Action Group (FRAC) ³	Rate ⁴	PHI ⁵	Maximum Use
Abound	11	12-15.5 fl oz	0	90 fl oz
Champ WG	M	4-6.3 lb	0	25.2 lb
Kocide 3000	M	1.8-3.5 lb	0	42 lb
Kocide 2000	M	3-6 lb	0	36 lb
Badge SC	M	3-7 pt	0	44.4 pt
Badge X2 ^{OG}	M	1.8-3.5 lb	0	12.6 lb Cu
Cuprofix-Ultra Disperss	M	1.8-6 lb	0	31.5 lb
Cuproxat	M	5-13 pt	0	62 pt
Nordox	M	4-20 lb	0	See label
Priaxor Xenium	7, 11	5-11 fl oz	0	44 fl oz
Quadris Top	11, 3	15.4 fl oz	0	61.5 fl oz
Top Cop with Sulfur	M	4 qt/100 gal	0	See label

^{OG} Indicates a pesticide that has been listed by the Organic Materials Review Institute (OMRI) as approved for use in organic production.

¹ Fungicides and application rates apply to open field citrus production unless otherwise noted. Refer to product labels for registered cultivars, rates and restrictions for citrus grown in greenhouses or shade houses.

² Reference to commercial or trade names is made with the understanding that no discrimination is intended nor endorsement of a particular product by LSU or the LSU AgCenter is implied.

³ Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

⁴ Rates are the amount of formation per acre unless otherwise indicated. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

⁵ Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

Table 3. Recommended pesticides, rates and pesticide-use restrictions for brown rot (*Phytophthora* spp.) in citrus produced in the field.¹

Product Choices ²	Product Mode of Action Group (FRAC) ³	Rate ⁴	PHI ⁵	Maximum Use
Aliette WDG	33	5 lb	30	20 lb
Champ WG	M	4-6.3 lb	0	25.2 lb
Kocide 3000	M	1.8-3.5 lb	0	42 lb
Kocide 2000	M	3-6 lb	0	36 lb
Badge SC	M	3-7 pt	0	44.4 pt
Badge X2 ^{OG}	M	1.8-3.5 lb	0	12.6 lb Cu
Cuprofix-Ultra Disperss	M	1.8-6 lb	0	31.5 lb
Cuproxat	M	5-13 pt	0	62 pt
Nordox	M	4-20 lb	0	See label
Ridomil Gold SL	4	1-2 qt ⁶	0	3 app
Ultra Flourish	4	4-8 pt ⁶	0	24 pt
Helena ProPhyt	33	4 pt	0	See label
Phostrol	33	4.5 pt	0	See label
Top Cop with Sulfur	M	4 qt/100 gal	0	See label

^{OG} Indicates a pesticide that has been listed by the Organic Materials Review Institute (OMRI) as approved for use in organic production.

¹ Fungicides and application rates apply to open field citrus production unless otherwise noted. Refer to product labels for registered cultivars, rates and restrictions for citrus grown in greenhouses or shade houses.

² Reference to commercial or trade names is made with the understanding that no discrimination is intended nor endorsement of a particular product by LSU or the LSU AgCenter is implied.

³ Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

⁴ Rates are the amount of formation per acre unless otherwise indicated. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

⁵ Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

Table 4. Recommended pesticides, rates and pesticide-use restrictions for citrus canker (*Xanthomonas axonopodis*) in citrus produced in the field.¹

Product Choices ²	Product Mode of Action Group (FRAC) ³	Rate ⁴	PHI ⁵	Maximum Use
Champ WG	M	6.3 lb	0	25.2 lb
Kocide 3000	M	1-2.5 lb	0	42 lb
Kocide 2000	M	2-4 lb	0	36 lb
Badge SC	M	2-11 pt	0	44.4 pt
Badge X2 ^{OG}	M	2-5 lb	0	12.6 lb Cu
Cuprofix-Ultra Disperss	M	1.3-8 lb	0	31.5 lb
Cuproxat	M	3-15.5 pt	0	62.1 pt
Nordox	M	12 lb	0	-

^{OG} Indicates a pesticide that has been listed by the Organic Materials Review Institute (OMRI) as approved for use in organic production.

¹ Fungicides and application rates apply to open field citrus production unless otherwise noted. Refer to product labels for registered cultivars, rates and restrictions for citrus grown in greenhouses or shade houses.

² Reference to commercial or trade names is made with the understanding that no discrimination is intended nor endorsement of a particular product by LSU or the LSU AgCenter is implied.

³ Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

⁴ Rates are the amount of formation per acre unless otherwise indicated. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

⁵ Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

Table 5. Recommended pesticides, rates and pesticide-use restrictions for citrus scab (*Elsinöe fawcettii*) in citrus produced in the field.¹

Product Choices ²	Product Mode of Action Group (FRAC) ³	Rate ⁴	PHI ⁵	Maximum Use
Abound	11	12-15.5 fl oz	0	90 fl oz
Champ WG	M	4-6.3 lb	0	25.2 lb
Kocide 3000	M	1.8-5 lb	0	42 lb
Kocide 2000	M	3-9 lb	0	36 lb
Badge SC	M	3-11 pt	0	44.4 pt
Badge X2 ^{OG}	M	1.8-5 lb	0	12.6 lb Cu
Cuprofix-Ultra Disperss	M	1.8-8 lb	0	31.5 lb
Cuproxat	M	5-15.5 pt	0	62.1 pt
Enable 2F	3	8 fl oz	0	24 fl oz
Gem 500SC	11	1.9-3.8 fl oz	0	15.2 fl oz
Headline and Headline SC	11	12-15 fl oz	0	54 fl oz
Luna Sensation	7, 11	5-6 fl oz	7	27.1 fl oz
Priaxor Xenium	7, 11	5-11 fl oz	0	44 fl oz
Pristine	7, 11	16-18.5 oz	0	74 fl oz
Quadris Top	11, 3	15.4 fl oz	0	61.5 fl oz
Trilogy ^{OG}	-	1%	0	-

^{OG} Indicates a pesticide that has been listed by the Organic Materials Review Institute (OMRI) as approved for use in organic production.

¹ Fungicides and application rates apply to open field citrus production unless otherwise noted. Refer to product labels for registered cultivars, rates and restrictions for citrus grown in greenhouses or shade houses.

² Reference to commercial or trade names is made with the understanding that no discrimination is intended nor endorsement of a particular product by LSU or the LSU AgCenter is implied.

³ Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

⁴ Rates are the amount of formation per acre unless otherwise indicated. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

⁵ Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

Table 6. Recommended pesticides, rates and pesticide-use restrictions for *(Mycosphaerella citri)* in citrus produced in the field.¹

Product Choices ²	Product Mode of Action Group (FRAC) ³	Rate ⁴	PHI ⁵	Maximum Use
Abound	11	12-15.5 fl oz	0	92.3 fl oz
Actinovate ^{OG}	-	3-12 oz	-	-
Champ WG	M	4-6.3 lb	0	25.2 lb
Kocide 3000	M	0.8-2.5 lb	0	42 lb
Kocide 2000	M	1.5-4.5 lb	0	36 lb
Badge SC	M	1-5 pt	0	44.4 pt
Badge X2 ^{OG}	M	0.8-2.5 lb	0	12.6 lb Cu
Cuprofix-Ultra Disperss	M	0.8-5 lb	0	31.5 lb
Cuproxat	M	2-10 pt	0	62.1 pt
Dormant Oil 435	-	5-10 gal	-	159 lb a.i.
Suffoil	-	1-2 gal/100 gal	-	159 lb a.i.
Tritek ^{OG}	-	1-2 gal/100 gal	-	159 lb a.i.
Enable 2F	3	8 fl oz	0	24 fl oz
Gem 500SC	11	1.9-3.8 fl oz	0	15.2 fl oz
Headline and Headline SC	11	12-15 fl oz	0	54 fl oz
Luna Sensation	7, 11	4 fl oz	7	27.1 fl oz
Priaxor Xenium	7, 11	5-11 fl oz	0	44 fl oz
Pristine	7, 11	16-18.5 oz	0	74 fl oz
Amtide Propiconazole 41.8% EC ⁶	3	6-8 fl oz	1 yr	24 fl oz
Banner MAX and MAX II ⁶	3	2-4 fl oz/100 gal	1 yr	5.4 gal
Bumper ES and 41.8EC ⁶	3	6-8 fl oz	1 yr	24 fl oz
Fitness ⁶	3	6-8 fl oz	1 yr	24 fl oz
Quadris Top	11, 3	10-15.4 fl oz	0	61.5 fl oz
Quilt ⁶	11, 3	20.5-27.5	1 yr	83.5 fl oz
Trilogy ^{OG}	-	1%	-	-

^{OG} Indicates a pesticide that has been listed by the Organic Materials Review Institute (OMRI) as approved for use in organic production.

¹ Fungicides and application rates apply to open field citrus production unless otherwise noted. Refer to product labels for registered cultivars, rates and restrictions for citrus grown in greenhouses or shade houses.

² Reference to commercial or trade names is made with the understanding that no discrimination is intended nor endorsement of a particular product by LSU or the LSU AgCenter is implied.

³ Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

⁴ Rates are the amount of formation per acre unless otherwise indicated. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

⁵ Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

⁶ **Do not apply to fruit-bearing trees.** Refer to label for additional restrictions and maximum amount of product allowed per acre per year.

Table 7. Recommended pesticides, rates and pesticide-use restrictions for melanose (*Diaporthe citri*) in citrus produced in the field.¹

Product Choices ²	Product Mode of Action Group (FRAC) ³	Rate ⁴	PHI ⁵	Maximum Use
Abound	11	12-15.5 fl oz	0	92.3 fl oz
Champ WG	M	4-6.3 lb	0	25.2 lb
Kocide 3000	M	1.8-5 lb	0	42 lb
Kocide 2000	M	3-9 lb	0	36 lb
Badge SC	M	3-11 pt	0	44.4 pt
Badge X2 ^{OG}	M	1.8-5 lb	0	12.6 lb Cu
Cuprofix-Ultra Disperss	M	1.8-8 lb	0	31.5 lb
Cuproxat	M	5-15.5 pt	0	62.1 pt
Gem 500SC	11	1.9-3.8 fl oz	0	15.2 fl oz
Headline and Headline SC	11	12-15 fl oz	0	54 fl oz
Luna Sensation	7, 11	5-6 fl oz	0	27.1 fl oz
Priaxor Xenium	7, 11	5-11 fl oz	0	44 fl oz
Pristine	7, 11	16-18.5 oz	0	74 fl oz
Quadris Top	11, 3	15.4 fl oz	0	61.5 fl oz

^{OG} Indicates a pesticide that has been listed by the Organic Materials Review Institute (OMRI) as approved for use in organic production.

¹ Fungicides and application rates apply to open field citrus production unless otherwise noted. Refer to product labels for registered cultivars, rates and restrictions for citrus grown in greenhouses or shade houses.

² Reference to commercial or trade names is made with the understanding that no discrimination is intended nor endorsement of a particular product by LSU or the LSU AgCenter is implied.

³ Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

⁴ Rates are the amount of formation per acre unless otherwise indicated. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

⁵ Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

Table 8. Recommended pesticides, rates and pesticide-use restrictions for *Penicillium* decays (Green, blue and whisker molds) (*Penicillium* spp.) in citrus produced in the field. ¹

Product Choices ²	Product Mode of Action Group (FRAC) ³	Rate ⁴	PHI ⁵	Maximum Use
Abound	11	12-15.5 fl oz	0	92.3 fl oz
Fungi-Phite	33	2 qt/100 gal	-	See label
Graduate A+ ⁶	11, 12	32-64 fl oz/100 gal	-	1 app
Magnate 500EC ⁶	3	12.5-18.7 fl oz/100 gal	-	1 app

⁰⁶ Indicates a pesticide that has been listed by the Organic Materials Review Institute (OMRI) as approved for use in organic production.

¹ Fungicides and application rates apply to open field citrus production unless otherwise noted. Refer to product labels for registered cultivars, rates and restrictions for citrus grown in greenhouses or shade houses.

² Reference to commercial or trade names is made with the understanding that no discrimination is intended nor endorsement of a particular product by LSU or the LSU AgCenter is implied.

³ Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

⁴ Rates are the amount of formation per acre unless otherwise indicated. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

⁵ Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

⁶ Postharvest drench. Dip for a minimum of 30 seconds and allow fruit to drain.

Table 9. Recommended pesticides, rates and pesticide-use restrictions for Phytophthora root rot, foot rot and gummosis (*Phytophthora* spp.) in citrus produced in the field.¹

Product Choices ²	Product Mode of Action Group (FRAC) ³	Rate ⁴	PHI ⁵	Maximum Use
Aliette WDG	33	5 lb	30	20 lb
Champ WG ⁶	M	1 lb/gal	0	25.2 lb
Kocide 3000 ⁶	M	0.5 lb/qt	0	42 lb
Kocide 2000 ⁶	M	0.8 lb/qt	0	36 lb
Badge SC ⁶	M	1 pt/qt	0	44.4 pt
Badge X2 ^{OG,6}	M	0.5 lb/qt	0	12.6 lb Cu
Cuprofix-Ultra Disperss ⁶	M	0.5-1 lb/gal	0	31.5 lb
Cuproxat ⁶	M	1.2-2 pt/gal	0	62.1 pt
Ridomil Gold GR ⁷	4	40-80 lb	-	3 app
Ridomil Gold SL ⁷	4	1-2 qt	-	3 app
Ultra Flourish ⁷	4	4-8 pt	-	24 pt
MetaStar 2E ⁷	4	1-2 gal	-	3 app
Helena Prophyt	33	4 pt	-	-
Phostrol	33	4.5 pt	-	-
Fungi-Phite	33	2 qt/100 gal	-	-

^{OG} Indicates a pesticide that has been listed by the Organic Materials Review Institute (OMRI) as approved for use in organic production.

¹ Fungicides and application rates apply to open field citrus production unless otherwise noted. Refer to product labels for registered cultivars, rates and restrictions for citrus grown in greenhouses or shade houses.

² Reference to commercial or trade names is made with the understanding that no discrimination is intended nor endorsement of a particular product by LSU or the LSU AgCenter is implied.

³ Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

⁴ Rates are the amount of formation per acre unless otherwise indicated. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

⁵ Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

⁶ Apply by painting the trunk of the tree from the soil surface to the lowest scaffold limbs.

⁷ Apply to soil beneath tree or through irrigation water. Refer to label for other application methods.

Table 10. Recommended pesticides, rates and pesticide-use restrictions for post-bloom fruit drop (*Colletotrichum acutatum*) in citrus produced in the field.¹

Product Choices ²	Product Mode of Action Group (FRAC) ³	Rate ⁴	PHI ⁵	Maximum Use
Abound	11	12-15.5 fl oz	0	92.3 fl oz
Gem 500SC	11	1.9-3.8 fl oz	0	15.2 fl oz
Headline and Headline SC	11	12-15 fl oz	0	54 fl oz
Luna Sensation	7, 11	7.6 fl oz	7	27.1 fl oz
Priaxor Xenium	7, 11	9-11 fl oz	0	44 fl oz
Quadris Top	11, 3	15.4 fl oz	0	61.5 fl oz
Trilogy ^{OG}	-	1%	-	-

^{OG} Indicates a pesticide that has been listed by the Organic Materials Review Institute (OMRI) as approved for use in organic production.

¹ Fungicides and application rates apply to open field citrus production unless otherwise noted. Refer to product labels for registered cultivars, rates and restrictions for citrus grown in greenhouses or shade houses.

² Reference to commercial or trade names is made with the understanding that no discrimination is intended nor endorsement of a particular product by LSU or the LSU AgCenter is implied.

³ Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

⁴ Rates are the amount of formation per acre unless otherwise indicated. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

⁵ Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

Table 11. Recommended pesticides, rates and pesticide-use restrictions for sour rot (*Geotrichum candidum*) in citrus produced in the field.¹

Product Choices	Product Mode of Action Group (FRAC)	Rate	PHI	Maximum Use
No fungicides are available to manage sour rot decay. Fruit injury prevention and good postharvest sanitation practices are recommended.				

Table 12. Recommended pesticides, rates and pesticide-use restrictions for sooty mold (*Capnodium* spp.) in citrus produced in the field.¹

Product Choices ²	Product Mode of Action Group (FRAC) ³	Rate ⁴	PHI ⁵	Maximum Use
Dormant Oil 435	-	5-10 gal	-	159 lb a.i.
Suffoil	-	1-2 gal/100 gal	-	159 lb a.i.
Tritek ^{OG}	-	1-2 gal/100 gal	-	159 lb a.i.
Enable 2F	-	8 fl oz	0	24 fl oz

^{OG} Indicates a pesticide that has been listed by the Organic Materials Review Institute (OMRI) as approved for use in organic production.

¹ Fungicides and application rates apply to open field citrus production unless otherwise noted. Refer to product labels for registered cultivars, rates and restrictions for citrus grown in greenhouses or shade houses.

² Reference to commercial or trade names is made with the understanding that no discrimination is intended nor endorsement of a particular product by LSU or the LSU AgCenter is implied.

³ Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

⁴ Rates are the amount of formation per acre unless otherwise indicated. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

⁵ Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

Table 13. Recommended pesticides, rates and pesticide-use restrictions for sweet orange scab (*Elsinöe australis*) in citrus produced in the field.¹

Product Choices ²	Product Mode of Action Group (FRAC) ³	Rate ⁴	PHI ⁵	Maximum Use
Abound	11	12-15.5 fl oz	0	90 fl oz

¹ Fungicides and application rates apply to open field citrus production unless otherwise noted. Refer to product labels for registered cultivars, rates and restrictions for citrus grown in greenhouses or shade houses.

² Reference to commercial or trade names is made with the understanding that no discrimination is intended nor endorsement of a particular product by LSU or the LSU AgCenter is implied.

³ Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

⁴ Rates are the amount of formation per acre unless otherwise indicated. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

The citrus section was revised September 2023 by R. Singh.

Fig

Integrated Fig Disease Management

Many homeowners in Louisiana, especially in the southern regions, where the threat of freeze damage is minimal, grow fig trees. Figs are well-adapted to the climate in Louisiana and produce an abundance of fruit. Several important diseases affect fig production in Louisiana. These diseases can only be managed using cultural practices and variety selection since no fungicides are currently labeled for use on figs in Louisiana. A list of varieties suitable for production in Louisiana is available in LSU AgCenter Publication 1529, “Figs for Commercial and Home Production in Louisiana.”

Disease

Symptoms, source of inoculum and management of fig diseases.

Disease	Symptoms	Source of Inoculum	Management
Fig rust (<i>Cerotelium fici</i>)	Small, yellowish spots on the leaves that turn reddish-brown as the spots enlarge. Spots are relatively smooth on the upper surface of leaves while on the lower surface the spots appear as small blisters. Heavily infected leaves turn yellow or brown and drop prematurely. Fruit is not affected by fig rust.	Fungal spores survive on fallen, infected and diseased leaves. Spores are dispersed by wind and splashing rain.	Collect and destroy leaf debris. Do not compost diseased leaves. Selective pruning of the trees will increase airflow and decrease leaf moisture. No fungicides are registered for fig rust management in Louisiana.
Thread blight (<i>Pellicularia koleroga</i> , formerly <i>Corticium stevensii</i>)	Symptoms appear as semicircular brown spots at the base of the leaf. Most infected leaves shrivel and dry up but do not fall off the tree. Leaves may also be covered with irregular holes. Sometimes white threads or mycelia can be seen on the underside of the leaves. Dead leaves often hang on the tree by threadlike strands like spider webs. Figs turn hard and dry if the disease occurs before the fruit ripens.	The pathogen survives as sclerotia (overwintering structures) on the plant, in plant debris or in the soil.	Collect and destroy leaf debris. Selective pruning will increase airflow in the plant canopy. Pruning should be done in the dormant season to avoid freeze damage. Do not overhead irrigate as leaf wetness promotes infection. No fungicides are registered for thread blight management in Louisiana.
Leaf spot (<i>Cercospora fici</i>)	The disease starts as irregular reddish-brown angular spots on the leaves. As the spots enlarge, they develop a yellow halo. Severe infection leads to leaf drop. Symptoms also appear on the fruit. Spots on the fruit are brown, slightly sunken with a dark margin.	The fungus survives on infested seed and crop debris. Spores are disseminated by wind and splashing rain and irrigation water.	Collect and destroy leaf debris. Selective pruning of the trees will increase airflow in the plant canopy and around planting. No fungicides are registered for leaf spot management in Louisiana.

Disease	Symptoms	Source of Inoculum	Management
Web blight (<i>Rhizoctonia solani</i>)	Typical infection starts at the base of the leaves and spreads outward in a fanlike manner. Symptoms appear as yellowish, water-soaked lesions on the leaves that enlarge rapidly, and the upper leaf surface looks silvery in appearance. The white- to light-brown fungal mycelium is readily visible on the underside of the infected leaf, which may shrivel up and die. Some infected leaves shrivel, die and cling to the twig.	The pathogen survives as sclerotia on the plant, in plant debris or in the soil.	Collect and destroy leaf debris. Selective pruning of the trees will increase airflow in the plant canopy and around planting. Do not get leaves wet during irrigation. No fungicides are registered for web blight management in Louisiana.
Root-knot nematodes (<i>Meloidogyne</i> spp.)	Damage from root-knot nematode is progressive and results in poor growth and low vigor of plants, yellowing of foliage, low yield and poor fruit quality. Infected roots are characterized by small galls or swellings on the roots.	Root-knot nematode survives from season to season as eggs in the soil. After the eggs hatch, the second-stage juveniles infest the roots.	Nematodes are difficult to control but can be prevented. Choose a planting site where root knot susceptible plants such as tomatoes, okra or tobacco have not been recently grown. High organic matter in the soil can reduce root-knot nematodes. Plant only nematode and disease-free plants. Keep the plants in good health with regular fertilizer application and maintain adequate moisture around the plants.
Botrytis limb blight or Botrytis dieback (<i>Botrytis cinerea</i>)	The fungus enters the fruit after frost damage in the early winter and moves to the shoot causing cankers resulting in sudden wilting of new shoots in the spring. In late winter and early spring, buff-colored spores develop on infected shoots and fruits. Foliage on infected shoots wilts and turns light green or brown in color. Sclerotia form on heavily infected limbs.	Heavy frosts initiate disease, and wet and cool springs favor disease development. Spores are wind-dispersed.	Remove diseased shoots by pruning below the cankered area. Sanitize pruners with an EPA registered disinfectant between cuts.
Surface mold or Alternaria rot (<i>Alternaria alternata</i> , <i>Cladosporium herbarum</i>)	Occurs on both green and ripe fruit. Lesions first appear as small sunken specks on the fruit. Specks caused by <i>Cladosporium</i> are olive-green to yellow. Specks caused by <i>Alternaria</i> are light brown to black. Both pathogens can be present at the same time on the fruit although <i>Alternaria</i> is primarily observed on ripe fruit. Lesions are distributed over the entire surface of the fruit.	The fungi overwinter on dead dried plant material or on the surface of the soil. Spores are dispersed by wind or on dust particles.	Pick fruit before it is overripe. To limit disease spread, reduce dust in the orchard. To prevent disease development during storage, use clean picking boxes and storage containers. No fungicides are registered for surface mold or Alternaria rot management in Louisiana.
Aspergillus rot (<i>Aspergillus</i> spp.)	The internal tissues of figs turn bright yellow to olive depending upon the species. Decaying fruit produced masses of powdery spores. Although rare, figs infected by <i>A. flavus</i> or <i>A. parasiticus</i> are contaminated with aflatoxins and should not be consumed or used for animal feed.	The fungus overwinters on plant debris and is dispersed by wind or on dust particles.	Varieties with small ostioles (eye of the fig) are less susceptible to Aspergillus rot. Avoid water stressing the trees and reduce dust in the orchards to reduce spore dispersal.

Disease	Symptoms	Source of Inoculum	Management
Fig endosepsis (<i>Fusarium</i> spp.)	Initially, a part of the infected fruit shows pink or brown internal discoloration, as well as discolored flowers. As the disease progresses, the pulp becomes soft and purple-brown water-soaked areas appear on the skin.	The fungus overwinters in the summer caprifig crop or as conidia on mummified fruit of the summer caprifig crop. Spores produced in the spring are carried from flower to flower by the wasp <i>Blastophaga psenes</i> during pollination.	Sample fruits when wasps start emerging and discard fruits with any internal discoloration.
Fig mosaic (Fig mosaic virus)	Distinct yellow spots appear on foliage with diffuse margins. These spots blend gradually into the green healthy leaf. The mosaic spots are uniformly distributed across the leaf surface or as irregular patches on the leaf surface. Mature spots develop a rust-colored band along the margins. Mosaic spots on fruits are similar to those on leaves. Premature fruit drop may occur.	The virus is vectored by fig mites (<i>Aceria fici</i>) or can be transmitted by grafting.	Choose disease-free trees for propagation material. Examine propagated plants before planting in the field. Controlling fig mites may help to reduce incidence of the disease.
Fig smut (<i>Aspergillus niger</i> and <i>Aspergillus</i> spp.)	Internal tissues of the fruit or the entire fruit discolor and turn into black powdery masses of spores.	The fungus is present in the soil and decaying plant material. Nitidulid beetles, vinegar flies, predaceous mites and thrips disperse fungal spores. The fungus may directly attack fruit through wounds.	Remove all old fruit and debris from the field.
Sour rot or Souring (various yeasts and bacteria)	Symptoms can be observed when the fruit begins to open. The inner flesh of figs becomes pink, and water soaked. A pink bubbly syrupy liquid exudes from the figs, which then gives off a fermentation odor. As the disease progresses, the pulp disintegrates into a white, watery pulp. Figs eventually sag on the twig and dry up. Diseased fruit may remain on the tree or drop to the ground.	Nitidulid beetles and vinegar flies feed on the exudates of rotting fruit and can disperse the yeast and bacteria from fruit to fruit or tree to tree.	Controlling beetles and flies may reduce disease incidence. Plants with closed “eyes” (Celeste, Alma and Texas Everbearing) are resistant to sour rot. Plants with open “eyes” are susceptible to souring.

The fig section was revised September 2023 by R. Singh.

Mayhaw

Integrated Mayhaw Disease Management

The mayhaw tree is the official state fruit tree in Louisiana. The tree is a Hawthorne native to the southeastern United States and is normally found in low and wet areas. Mayhaws flower in February and March, and the fruit is commonly used to make jellies. For more information on mayhaw trees visit the Louisiana Mayhaw Association website (<http://www.mayhaw.org>). Mayhaws are susceptible to two diseases in Louisiana: fire blight and cedar-quince rust (or quince rust). These diseases are best managed by using an integrated approach including fire blight-resistant varieties, good cultural and sanitation practices and judicious use of fungicides.

Site selection: Although mayhaws are found in lowlands and wetlands in nature, they produce best when planted in well-drained upland soils and full sun.

Resistant varieties: Several mayhaw varieties are resistant or tolerant to fire blight. A list of varieties commonly grown in Louisiana and the level of disease resistance to fire blight is provided in Table 1. No varieties have known resistance to cedar-quince rust.

Disease

Symptoms, source of inoculum and management of mayhaw diseases.

Disease	Symptoms	Source of Inoculum	Management
Fire blight (<i>Erwinia amylovora</i>)	Infected blossoms turn black and die. Tender shoots become infected, resulting in a shoot blight that is characterized by dead leaves that remain attached to the shoot, which often develops into a shepherd's crook.	The bacterium survives in old cankers and is dispersed by splashing rain, wind-driven rain, bees and other insects.	Plant-resistant varieties (Table 1). Prune out diseased branches. Sanitize pruning equipment. Aliette (2.5-5 lbs/100 gal) can be applied to non-bearing trees only. Fosphite (aluminum tris, 1-3 qt/100 gal) can be applied to fruit-bearing and nonfruit-bearing trees. Alude (2.5-5 pt/A) can be applied to manage fire blight.
Cedar-quince rust (<i>Gymnosporangium clavipes</i>)	Infected berries develop pimply projections and ripen unevenly. Infected twigs become thickened and deformed.	The fungus overwinters in cankers on eastern red cedar and some junipers. Spores are wind dispersed.	Adament (4-5 oz/A), Inspire Super (12 fl oz/A), Luna Sensation (4-5.8 f oz/A), Pristine (14.5-18.5 oz/A), Sovran (3.2-6.4 oz/A) and TopGuard (8-12 fl oz/A) can be applied to suppress quince rust.

Table 1: Mayhaw varieties, variety characteristics and resistance to fire blight.**Table Legend**

Resistance Category	Abbreviation
Very Susceptible	VS
Susceptible	S
Tolerant	T
Resistant	R

Variety	Variety Characteristics	Resistance
Big Red	Requires a cross pollinator (i.e., Marlene or Maxine), blooms late, red fruit with pink flesh, yields high on first shaking	R
Cajun	Small- to medium-size tree, blooms very late, yields high on first shaking	R
Crimson	Blooms late, mostly red fruit (some pink), moderate to high fruit drop	R
Double G	Well-formed tree, blooms early, dark red fruit, yields high on first shaking	S
Elite	Blooms early, deep red fruit, yields high on first shaking	R
Hope 13	Blooms early, large dark red fruit, very low fruit drop, yields high on first shaking	R
Marlene	Blooms very early, medium-size red fruit, high level of fruit drop (use suspended netting to collect dropping fruit)	R
Maxine	Inverted umbrella shaped canopy, large red fruit, blooms late, low fruit drop	R
Red Majesty	Blooms late, red fruit, low level of fruit drop	VS
Red Splendor	Cross between Texas Star and Cajun, blooms early, dark red fruit, holds fruit well, yields high on first shaking	T
Royalty	Blooms early, medium- to large-size red fruit, moderate level of fruit drop, does not hold fruit well in high winds	T
Royal Star (G5)	Thornless tree, dark red to purple fruit, low fruit drop, yields high on first shaking	S
Spectacular	Requires a cross pollinator (i.e., Texas Star or Royal Star), blooms early, large fruit, yields high on first shaking	R
Super Spur	Bloom early, deep red fruit, resistant to high winds, very high yielding	R
Texas Star	Well-formed tree, blooms early, red fruit, yields high on first shaking	S

The mayhaw section was revised September 2023 by R. Singh.

Pear

Disease

Symptoms, source of inoculum and management of pear diseases.

Disease	Symptoms	Source of Inoculum	Management
Armillaria root rot (<i>Armillaria</i> spp.)	Trees appear weak with small, yellowish leaves over the entire tree or confined to one or two branches. The entire tree or single branches may die by the end of the summer or the next year. White mycelial growth can be found beneath the bark of roots or base of affected trees at or about the time of death.	These fungi live in soil and survive for many years in old, diseased roots.	Dig up and burn old roots before planting peach trees. Remove dead trees and as many roots as possible. Fumigate before replanting.
Black rot (<i>Botryosphaeria obtusae</i>)	Symptoms are observed on leaves, limbs and fruit. Leaf lesions begin as small purple flecks that enlarge and develop a tan to brown center. Heavily infected leaves become chlorotic (yellow), die and drop off of the tree. Red flecks that develop into purple raised spots are observed on immature fruit. As fruit matures the lesions enlarge with concentric rings and fruit may rot around the core. Slightly sunken red colored cankers can form on the limbs and may cause the limb to crack and die.	The fungus survives between seasons on infected wood and fruit. Spores are released from fungal fruiting structures during rain events.	Remove and burn infected twigs, limbs and mummified fruit. Dip pruning tools in 10% chlorine bleach solution or another registered disinfectant between cuts. Apply fungicides according to the pear spray schedule.
Blossom blast (<i>Pseudomonas syringae</i>)	Buds are the most sensitive to infection and fail to open when infected. Eventually buds dry out and die. Infections that occur after bloom result in slightly depressed shiny black spots on the fruit and leaves.	<i>Pseudomonas</i> is ubiquitous on plants. Cold weather and wet weather favor population and disease development. High populations of pseudomonads induce freeze damage in fruit and foliage tissue at temperatures 3 degrees to 6 degrees F higher than would occur in their absence.	Protect trees against frost. Maintain a firm, wet soil surface with a low cover crop to keep orchards warm. Apply copper-based bactericides during dormancy.
Early leaf spot or Fabraea leaf (<i>Fabraea</i> spp.)	The disease begins on the lower leaves in early spring. Spots on the leaves, mostly circular in outline, are dark brown to nearly black, with purplish margins. Spotted leaves turn yellow and shed.	The fungus survives mainly in infected leaves on the ground. May also form minute cankers on the bark of twigs and shoots.	Rake and burn fallen leaves. Begin sprays in April after leaves have unfolded. Orient has moderate resistance, and Maxine is very resistant. Follow a pear spray schedule.

Disease	Symptoms	Source of Inoculum	Management
Fire blight (<i>Erwinia amylovora</i>)	Affects blossoms, leaves, twigs and young fruit. Infected blossoms wilt suddenly and turn dark brown, followed by blighting of leaves and terminals. Infected twigs and leaves turn dark brown to black, and leaves cling to the stem, often remaining attached most of the season.	The bacteria overwinter at the base of blighted twigs or in cankers on larger limbs. Bacteria are spread by bees and splashing rain.	Spray during bloom with copper fungicides or streptomycin according to manufacturer's directions. Prune out and burn symptomatic twigs. Cut 12-15 inches below affected tissue. Dip pruning tools in 10% chlorine bleach solution between cuts. Use resistant varieties such as Orient, Moon Glow and Biscamp.
Flyspeck (<i>Schizothyrium pomi</i> , formerly <i>Microthyriella rubi</i>)	Shiny black raised specks on the fruit. These specks are the fruiting structures of the fungus. Spores are produced within the specks during warm and moist weather.	The fruiting structures survive between seasons on infected twigs. Spores are dispersed by wind.	Well-pruned trees will develop less disease during dry to moderately wet weather. Thin fruit to promote air flow and improve fungicide coverage. Follow a pear spray schedule.
Crown gall (<i>Agrobacterium tumefaciens</i>)	Affects roots and crown of host plant, causing galling of tissue and reduction in the movement of water and nutrients through the plant. Galls may be spongy or hard.	This bacterium lives in the soil.	Check planting stock for galls or swelling and rogue-infected plants. Avoid planting new plants in the same site for several years. Treat before planting with Galltrol.
Leaf spots (various fungi)	Leaf spots vary in size depending on the pathogen. Severely infected leaves turn yellow and drop from the tree.	Fungus may overwinter on diseased leaves or twig cankers. Spores are released in the spring and dispersed by rain or irrigation water. Secondary infections can occur during warm and wet periods during the summer.	Rake and bury or burn diseased leaves. Dispersion can be reduced by increasing space between trees. Use labeled fungicides.
Powdery mildew (<i>Podosphaera leucotricha</i>)	Symptoms first appear on the underside of leaves as grayish-white patches. Chlorotic (yellowing) spots appear in the upper surface of the leaves. As the disease progresses, grayish-white patches form on the upper leaf surface. Severely infected leaves curl and drop from the tree. Flower buds may also become infected and infected buds open 5-8 days later than non-infected buds. Symptoms also appear on fruit.	The fungus overwinters in dormant buds infected the previous season. Spores are released in the air during the day and germinate during dry weather.	Dormant season pruning will reduce the number of potentially infected buds. During the season, prune and destroy severely diseased shoots. Fungicides applied during the season will reduce the release of spores and spread within the tree.

Disease	Symptoms	Source of Inoculum	Management
Pear scab (<i>Venturia pirina</i>)	Dark brown to black spots form on infected fruit, which often are misshapen. Brown lesions form on leaves, but these may appear to be velvety and olive green when the fungus is actively sporulating.	The fungus overwinters mainly in infected leaves on the ground, but it may also survive in infected twigs.	Rake and burn fallen leaves. Begin sprays in April after leaves have unfolded. Follow a pear spray schedule.
Quince rust (<i>Gymnosporangium clavipes</i>)	Dark green spots form on the calyx end of fruit and extend internally to the core. Fruit are distorted and drop prematurely.	Affects fruit of apple, crabapple, pear, hawthorne and quince. This fungus must have eastern red cedar or dwarf or prostrate junipers as alternate hosts to complete its life cycle. Galls are formed on the alternate host in which the fungus survives and infects apples and other host crops.	Remove alternate host plants in vicinity of desired trees; or remove all galls from cedar trees during the winter; or follow a regular spray program beginning at blossom and continuing until fruit are formed. A combination of the above measures may be necessary.
Sooty blotch (<i>Gloeodes pomigena</i> and other fungi)	Olive green, soot-like smudges on mature fruit. Fungal fruiting bodies are produced in the thallus.	The fungus survives between seasons on infected twigs of apple and woody plants common to hedgerows and woodlots. Spores are spread during the spring and early summer by rain. Disease develops throughout the growing season.	Well-pruned trees will develop less disease during dry to moderately wet weather. Thin fruit to promote air flow and improve fungicide coverage. Follow a pear spray schedule.

Table 1: Seasonal fungicide spray schedule for pears.

Developmental Stage	Diseases
Dormant	Fire blight
Dormant	Blossom blast
Tight (or green) cluster	Pear scab
Tight (or green) cluster	Early leaf spot
Tight (or green) cluster	Powdery mildew
Pink	Pear scab
Pink	Early leaf spot
Pink	Powdery mildew
Bloom	Early leaf spot
Bloom	Fire blight
Bloom	Pear scab
Bloom	Powdery mildew
Petal fall	Fire blight
Petal fall	Pear scab
Petal fall	Leaf spots
Petal fall	Powdery mildew
Cover sprays	Pear scab
Cover sprays	Leaf spots
Cover sprays	Powdery mildew
Cover sprays	Sooty blotch
Cover sprays	Fly speck

Table 2: Pear scab

Product Name ¹	Chemical Name	Product Mode of Action Group (FRAC) ²	Rate ³	PHI ⁴	Maximum Use
Pristine	boscalid + pyraclostrobin	7, 11	14.5-18.5 oz	0	74 oz
Rubigan EC	fenarimol	3	8-12 fl oz	30	84 fl oz
Vintage SC	fenarimol	3	4-12 fl oz	30	48 fl oz
Merivon	fluxapyroxad + pyraclostrobin	7, 11	4-5.5 fl oz	0	22 fl oz
Luna Sensation	fluopyram + trifloxystrobin	7, 11	4-5.8 fl oz	14	21 fl oz
Sovran	kresoxim-methyl	11	3.2-6.4 oz	30	25.6 oz
Dithane F45 Rainshield ⁵	mancozeb	M3	4.8 qt	See label	19.2 qt
Dithane M45 ⁵	mancozeb	M3	6 lb	See label	24 lb
Manzate Flowable ⁵	mancozeb	M3	3-6 lb	See label	21-24 lb
Manzate Max ⁵	mancozeb	M3	2.4-4.8 qt	See label	16.8-19.2 qt
Manzate Pro-stick ⁵	mancozeb	M3	3-6 lb	See label	21-24 lb
Penncozeb 75DF ⁵	mancozeb	M3	3.2-6.4 lb	See label	22.4-25.6 lb
Penncozeb 80WP ⁵	mancozeb	M3	3-6 lb	See label	21-24 lb
Roper Rainshield ⁵	mancozeb	M3	3-6 lb	See label	21-24 lb
Fontelis	penthiopyrad	7	16-20 fl oz	28	61 fl oz
Scala SC	pyrimethanil	9	7-10 fl oz (alone), 5 fl oz (tank mix)	72	40
Liquid Sulfur Six ⁵	sulfur	M2	0.75-3.5 pt/100 gal	NA	See label
Microfine Sulfur ⁵	sulfur	M2	10-60 lb	NA	See label
Microthiol Disperss ⁵	sulfur	M2	10-20 lb	NA	See label
Yellow Jacket Wettable Sulfur ⁵	sulfur	M2	10-60 lb	NA	See label
Tebuconazole 45DF	tebuconazole	3	4-8 oz	75	3 lb
Adament 50WG	tebuconazole + trifloxystrobin	3, 11	4-5 oz	75	22 oz
T-Methyl 70WSB	thiophanate-methyl	1	1 lb	1	4 lb
Thiophanate-methyl 85WDG	thiophanate-methyl	1	0.8 lb	1	3.2 lb
Topsin M 70WP	thiophanate-methyl	1	1 lb	1	4 lb
Topsin M WSB	thiophanate-methyl	1	1 lb	1	4 lb

Product Name ¹	Chemical Name	Product Mode of Action Group (FRAC) ²	Rate ³	PHI ⁴	Maximum Use
Procure 480SC	triflumizole	3	8-16 fl oz	14	64 fl oz
Flint	trifloxystrobin	11	2-2.5 oz	14	11 oz
Strike Plus 50WDG ⁶	trifloxystrobin+ triadimefon	11, 3	3-9 oz/100 gal	1 year	207 oz
Ziram 76DF	ziram		6 lb	14	42.4 lb

¹ Reference to commercial or trade names is made with the understanding that no discrimination is intended nor endorsement of a particular product by LSU or the LSU AgCenter is implied.

² Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

³ Rates are the amount of formulation per acre unless otherwise indicated. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

⁴ Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

⁵ See labels for variety restrictions and the potential to damage (i.e., russetting) fruit.

⁶ Non-bearing only, garden center and nursery stock only.

Table 3: Flyspeck

Product Name ¹	Chemical Name	Product Mode of Action Group (FRAC) ²	Rate ³	PHI ⁴	Maximum Use
Pristine	boscalid + pyraclostrobin	7, 11	14.5-18.5 oz	0	74 oz
Inspire Super	difenoconazole+ cyprodinil	3, 9	12 fl oz	14	60 fl oz
Merivon	fluxapyroxad + pyraclostrobin	7, 11	4-5.5 fl oz	0	22 fl oz
Luna Sensation	fluopyram + trifloxystrobin	7, 11	4-5.8 fl oz	14	21 fl oz
Adament 50WG	tebuconazole + trifloxystrobin	3, 11	4-5 oz	75	22 oz
T-Methyl 70WSB	thiophanate-methyl	1	1 lb	1	4 lb
Thiophanate-methyl 85WDG	thiophanate-methyl	1	0.8 lb	1	3.2 lb
Topsin M 70WP	thiophanate-methyl	1	1 lb	1	4 lb
Topsin M WSB	thiophanate-methyl	1	1 lb	1	4 lb
Flint	trifloxystrobin	11	2-2.5 oz	14	11 oz
Ziram 76DF	ziram	M3	6 lb	14	42.4 lb

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² Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

³ Rates are the amount of formulation per acre unless otherwise indicated. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

⁴ Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

Table 4: Powdery mildew

Product Name ¹	Chemical Name	Product Mode of Action Group (FRAC) ²	Rate ³	PHI ⁴	Maximum Use
Pristine	boscalid + pyraclostrobin	7, 11	14.5-18.5 oz	0	74 oz
Inspire Super	difenoconazole+ cyprodinil	3, 9	12 fl oz	14	60 fl oz
Rubigan EC	fenarimol	3	8-12 fl oz	30	84 fl oz
Vintage SC	fenarimol	3	4-12 fl oz	30	48 fl oz
Merivon	fluxapyroxad + pyraclostrobin	7, 11	4-5.5 fl oz	0	22 fl oz
Luna Sensation	fluopyram + trifloxystrobin	7, 11	5-5.8 fl oz	14	21 fl oz
Sovran	kresoxim-methyl	11	3.2-6.4 oz	30	25.6 oz
Fontelis	penthiopyrad	7	16-20 fl oz	28	61 fl oz
Alude	phosphite (phosphorous acid salts)	33	1.25-2.5 qt	See label	See label
Confine Extra	phosphite (phosphorous acid salts)	33	1-3 qt	See label	See label
Fosphite	phosphite (phosphorous acid salts)	33	1-3 qt	See label	See label
Fungi-phite	phosphite (phosphorous acid salts)	33	1-2 qt	See label	See label
Rampart	phosphite (phosphorous acid salts)	33	1-3 qt	See label	See label
Liquid Sulfur Six ⁵	sulfur	M2	0.75-3.5 pt/100 gal	NA	See label
Microfine Sulfur ⁵	sulfur	M2	10-60 lb	NA	See label
Microthiol Disperss ⁵	sulfur	M2	10-20 lb	NA	See label
Yellow Jacket Wettable Sulfur ⁵	sulfur	M2	10-60 lb	NA	See label
Tebuzaol 45DF	tebuconazole	3	4-8 oz	75	3 lb
Adament 50WG	tebuconazole + trifloxystrobin	3, 11	4-5 oz	75	22 oz
T-Methyl 70WSB	thiophanate-methyl	1	1 lb	1	4 lb
Thiophanate-methyl 85WDG	thiophanate-methyl	1	0.8 lb	1	3.2 lb
Topsin M 70WP	thiophanate-methyl	1	1 lb	1	4 lb
Topsin M WSB	thiophanate-methyl	1	1 lb	1	4 lb
Flint	trifloxystrobin	11	2-2.5 oz	14	11 oz
Strike Plus 50WDG ⁶	trifloxystrobin+ triadimefon	11, 3	3-9 oz/100 gal	1 year	207 oz

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²Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

³Rates are the amount of formulation per acre unless otherwise indicated. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

⁴Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

⁵See labels for variety restrictions and the potential to damage (i.e., russetting) fruit.

⁶Non-bearing only, garden center and nursery stock only.

Table 5: Quince rust

Product Name ¹	Chemical Name	Product Mode of Action Group (FRAC) ²	Rate ³	PHI ⁴	Maximum Use
Pristine ⁵	boscalid + pyraclostrobin	7, 11	14.5-18.5 oz	0	74 oz
Inspire Super	difenoconazole+ cyprodinil	3, 9	12 fl oz	14	60 fl oz
Merivon ⁵	fluxapyroxad + pyraclostrobin	7, 11	4-5.5 fl oz	0	22 fl oz
Luna Sensation	fluopyram + trifloxystrobin	7, 11	4-5.8 fl oz	14	21 fl oz
Sovran ⁵	kresoxim-methyl	11	3.2-6.4 oz	30	25.6 oz

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² Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

³ Rates are the amount of formulation per acre unless otherwise indicated. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

⁴ Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

⁵ Suppression only.

Table 6: Sooty blotch

Product Name ¹	Chemical Name	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Pristine	boscalid + pyraclostrobin	7, 11	14.5-18.5 oz	0	74 oz
Inspire Super	difenoconazole+ cyprodinil	3, 9	12 fl oz	14	60 fl oz
Merivon	fluxapyroxad + pyraclostrobin	7, 11	4-5.5 fl oz	0	22 fl oz
Luna Sensation	fluopyram + trifloxystrobin	7, 11	4-5.8 fl oz	14	21 fl oz
Adament 50WG	tebuconazole + trifloxystrobin	3, 11	4-5 oz	75	22 oz
T-Methyl 70WSB	thiophanate-methyl	1	1 lb	1	4 lb
Thiophanate-methyl 85WDG	thiophanate-methyl	1	0.8 lb	1	3.2 lb
Topsin M 70WP	thiophanate-methyl	1	1 lb	1	4 lb
Topsin M WSB	thiophanate-methyl	1	1 lb	1	4 lb
Flint	trifloxystrobin	11	2-2.5 oz	14	11 oz
Ziram 76DF	ziram	M3	6 lb	14	42.4 lb

¹ Reference to commercial or trade names is made with the understanding that no discrimination is intended nor endorsement of a particular product by LSU or the LSU AgCenter is implied.

² Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

³ Rates are the amount of formulation per acre unless otherwise indicated. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

⁴ Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

Table 7: Postharvest rots

Product Name ¹	Chemical Name	Product Mode of Action Group (FRAC) ²	Rate ³	PHI ⁴	Maximum Use
Captan 50WP ⁵	captan	M4	2.5 lb/100 gal	1 app	NA
Captan 80WDG	captan	M4	1.6 lb/100 gal	1 app	NA
Mertect 340F ⁶	thiabendazole	1	16 fl oz/100 gal	1 app	NA

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² Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

³ Rates are the amount of formulation per acre unless otherwise indicated. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

⁴ Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

⁵ Can only be used for mechanical fruit dips.

⁶ Harvested fruit only.

Table 8: Fire blight

Product Name ¹	Chemical Name	Product Mode of Action Group (FRAC) ²	Rate ³	PHI ⁴	Maximum Use
Badge SC ^{6,7}	copper hydroxide	MI	0.9 pt	See Label	56.3 pt
Badge X2 ^{OG, 6,7}	copper hydroxide	MI	0.5 lb	See Label	16 lb
Champ WG ^{6,7}	copper hydroxide	MI	1 lb	See Label	32 lb
Champ Formula 2 ^{6,7}	copper hydroxide	MI	0.66 pt	See Label	44 pt
Kentan DF ^{6,7}	copper hydroxide	MI	1 lb	See Label	16 lb ai
Kocide 3000 ^{6,7}	copper hydroxide	MI	0.5 lb	See Label	53.3 lb
Kocide 2000 ^{6,7}	copper hydroxide	MI	0.75 lb	See Label	45.7 lb
ManKocide ^{5,6,7}	copper hydroxide+ mancozeb	M1, M3	1.5 lb	See Label	53.3 lb
Cuprofix Ultra 40 Disperss ^{6,7}	copper sulfate	MI	0.75 lb	See Label	40 lb
Cuproxat ^{6,7}	copper sulfate	MI	0.75 pt	See Label	78.8 pt
Mastercop ^{6,7}	copper sulfate	MI	0.5 lb	See Label	12 lb
Top Cop with Sulfur ^{6,7}	copper sulfate	MI	2 qt	See Label	See Label
C-O-C-S WDG ^{6,7}	copper sulfate + copper oxychloride	MI	12-15.6 lb (dormant) 0.5-1 lb (bloom)	See Label	1 app 31 lb
Aliette WDG	fosetyl-al	33	2.5-5 lb/100 gal	1 year	20 lb
Dithane F45 Rainshield ⁷	mancozeb	M3	See label	See label	See label

Product Name ¹	Chemical Name	Product Mode of Action Group (FRAC) ²	Rate ³	PHI ⁴	Maximum Use
Dithane M45 ⁷	mancozeb	M3	See label	See label	See label
Manzate Flowable ⁷	mancozeb	M3	See label	See label	See label
Manzate Max ⁷	mancozeb	M3	See label	See label	See label
Manzate Pro-stick ⁷	mancozeb	M3	See label	See label	See label
Penncozeb 75DF ⁷	mancozeb	M3	See label	See label	See label
Penncozeb 80WP ⁷	mancozeb	M3	See label	See label	See label
Roper Rainshield ⁷	mancozeb	M3	See label	See label	See label
Mycoshield	oxytetracycline	41	1 lb/100 gal	60	10 app
Alude	phosphite (phosphorous acid salts)	33	1.25-2.5 qt	See label	See label
Confine Extra	phosphite (phosphorous acid salts)	33	1-3 qt	See label	See label
Fosphite	phosphite (phosphorous acid salts)	33	1-3 qt	See label	See label
Fungi-phite	phosphite (phosphorous acid salts)	33	1-2 qt	See label	See label
Rampart	phosphite (phosphorous acid salts)	33	1-3 qt	See label	See label
Agri-Mycin 17	streptomycin	25	24-48 oz	See label	30

¹ Reference to commercial or trade names is made with the understanding that no discrimination is intended nor endorsement of a particular product by LSU or the LSU AgCenter is implied.

² Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

³ Rates are the amount of formulation per acre unless otherwise indicated. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

⁴ Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

⁵ Do no apply after bloom.

⁶ See labels for correct application timings and rates to manage blossom blight.

⁷ See labels for variety restrictions and the potential to damage (i.e., russetting) fruit.

Table 9: Blossom blast

Product Name ¹	Chemical Name	Product Mode of Action Group (FRAC) ²	Rate ³	PHI ⁴	Maximum Use
Badge SC ^{5,6}	copper hydroxide	MI	0.9 pt	See Label	56.3 pt
Badge X2 ^{OG, 5,6}	copper hydroxide	MI	0.5 lb	See Label	16 lb
Champ WG ^{5,6}	copper hydroxide	MI	1 lb	See Label	32 lb
Champ Formula 2 ^{5,6}	copper hydroxide	MI	0.66 pt	See Label	44 pt
Kentan DF ^{5,6}	copper hydroxide	MI	1 lb	See Label	16 lb ai
Kocide 3000 ^{5,6}	copper hydroxide	MI	0.5 lb	See Label	53.3 lb
Kocide 2000 ^{5,6}	copper hydroxide	MI	0.75 lb	See Label	45.7 lb
ManKocide ^{5,6}	copper hydroxide+ mancozeb	M1, M3	1.5 lb	See Label	53.3 lb
Cuprofix Ultra 40 Disperss ^{5,6}	copper sulfate	M1	7.5-10 lb	See Label	1 app
Cuproxat ^{5,6}	copper sulfate	M1	15-20 pt	See Label	2 app
Mastercop ^{5,6}	copper sulfate	M1	4-6 lb	See Label	1 app
C-O-C-S WDG	copper sulfate + copper oxychloride ^{5,6}	MI	12-15.6 lb (dormant) 0.5-1 lb (bloom)	See Label	1 app 31 lb

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² Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

³ Rates are the amount of formulation per acre unless otherwise indicated. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

⁴ Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

⁵ See labels for correct application timings and rates to manage blossom blight.

⁶ See labels for variety restrictions and the potential to damage (i.e., russetting) fruit.

Table 10: Early leaf spot

Product Name ¹	Chemical Name	Product Mode of Action Group (FRAC) ²	Rate ³	PHI ⁴	Maximum Use
Dithane F45 Rainshield ⁵	mancozeb	M3	4.8 qt	See label	19.2 qt
Dithane M45 ⁵	mancozeb	M3	6 lb	See label	24 lb
Manzate Flowable ⁵	mancozeb	M3	3-6 lb	See label	21-24 lb
Manzate Max ⁵	mancozeb	M3	2.4-4.8 qt	See label	16.8-19.2 qt
Manzate Pro-stick ⁵	mancozeb	M3	3-6 lb	See label	21-24 lb
Penncozeb 75DF ⁵	mancozeb	M3	3.2-6.4 lb	See label	22.4-25.6 lb
Penncozeb 80WP ⁵	mancozeb	M3	3-6 lb	See label	21-24 lb
Roper Rainshield ⁵	mancozeb	M3	3-6 lb	See label	21-24 lb
T-Methyl 70WSB	thiophanate-methyl	1	1 lb	1	4 lb
Thiophanate-methyl 85WDG	thiophanate-methyl	1	0.8 lb	1	3.2 lb
Topsin M 70WP	thiophanate-methyl	1	1 lb	1	4 lb
Topsin M WSB	thiophanate-methyl	1	1 lb	1	4 lb
Flint	trifloxystrobin	11	2-2.5 oz	14	11 oz
Strike Plus 50WDG ⁶	trifloxystrobin+ triadimefon	11, 3	3-9 oz/100 gal	1 year	207 oz
Ziram 76DF	ziram	M3	6 lb	14	42.4 lb

¹ Reference to commercial or trade names is made with the understanding that no discrimination is intended nor endorsement of a particular product by LSU or the LSU AgCenter is implied.

² Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

³ Rates are the amount of formulation per acre unless otherwise indicated. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

⁴ Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

⁵ See labels for variety restrictions and the potential to damage (i.e., russetting) fruit.

⁶ Non-bearing only, garden center and nursery stock only

Table 11: Rusts

Product Name ¹	Chemical Name	Product Mode of Action Group (FRAC) ²	Rate ³	PHI ⁴	Maximum Use
Rubigan EC	fenarimol	3	8-12 fl oz	30	84 fl oz
Dithane F45 Rainshield ⁵	mancozeb	M3	4.8 qt	See label	19.2 qt
Dithane M45 ⁵	mancozeb	M3	6 lb	See label	24 lb
Manzate Flowable ⁵	mancozeb	M3	3-6 lb	See label	21-24 lb
Manzate Max ⁵	mancozeb	M3	2.4-4.8 qt	See label	16.8-19.2 qt
Manzate Pro-stick ⁵	mancozeb	M3	3-6 lb	See label	21-24 lb
Penncozeb 75DF ⁵	mancozeb	M3	3.2-6.4 lb	See label	22.4-25.6 lb
Penncozeb 80WP ⁵	mancozeb	M3	3-6 lb	See label	21-24 lb
Roper Rainshield ⁵	mancozeb	M3	3-6 lb	See label	21-24 lb
Fontelis	penthiopyrad	7	16-20 fl oz	28	61 fl oz

¹ Reference to commercial or trade names is made with the understanding that no discrimination is intended nor endorsement of a particular product by LSU or the LSU AgCenter is implied.

² Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

³ Rates are the amount of formulation per acre unless otherwise indicated. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

⁴ Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

⁵ See labels for variety restrictions and the potential to damage (i.e., russetting) fruit.

The pear section was revised October 2023 by R. Singh.

Pecan

Integrated Pecan Disease Management

Management of diseases and insects is essential for profitable pecan production in Louisiana. Commercial pecan producers must spray at the proper time with recommended fungicides and insecticides. Learning to identify the major insect pests and diseases of pecans is highly desirable and strongly recommended. To obtain adequate disease control and receive maximum benefit from applied fungicides, spray applications must be made on a preventive program. In addition to spraying, cultural practices and sanitation can reduce the severity of certain insects and disease problems. Commercial growers as well as homeowners should follow these practices. More information on pecan IPM can be found on the Pecan IPM-PIPE website (<http://pecan.ipmpipe.org>).

Plant resistant cultivars: Pecan scab is the most widespread and destructive disease of pecans. Selecting cultivars that are resistant or tolerant to pecan scab is recommended (Table 1), especially in southern Louisiana where warm and humid conditions favor disease development. It is important to note that a particular variety may be resistant to scab in one location but susceptible to scab in another location. Contact your parish agent to identify cultivars suitable for your area. For a full description of pecan cultivars go to <http://cgrr.usda.gov/CARYA/PECANS>.

Use good sanitation practices: Certain leaf diseases such as scab and insects such as the hickory shuckworm overwinter on shucks and leaves. If these are raked and burned, it will help reduce the severity of these problems to some extent the following year. Prune dead and broken limbs from trees to remove potential habitats for certain insects and diseases.

Use optimal levels of fertilizer: Proper fertilization will increase production and boost pest control. Well-maintained pecan trees are less susceptible to attack by certain diseases and insects. Consult the LSU AgCenter's Louisiana Cooperative Extensive Service for information on leaf and soil sampling techniques, fertilization and cultural practices.

Ensure good spray coverage: Good spray coverage is essential for good disease control and, to a lesser extent, for insect control. A large air blast sprayer (speed sprayer) has proven very satisfactory for treating large acreages of pecan trees for control of insects and diseases.

Use registered chemicals: The potential for developing isolates of pathogens resistant to fungicides is high in pecan production. To slow the development of resistant pathogen populations:

1. Develop a spray program that uses fungicides with different modes of action.
2. Avoid consecutive sprays with fungicides with the same or similar modes of action.
3. Only use the labeled rates of recommended fungicides.

More information on fungicide resistance management can be found in the front of this guide.

Disease

Symptoms, source of inoculum and management of pecan diseases.

Disease	Symptoms	Source of Inoculum	Management
Anthracnose (<i>Colletotrichum</i> spp., <i>Glomerella cingulata</i>)	Brown-black sunken lesions on the leaves and shucks. In the spring and early summer cream- to salmon-colored spores form on shuck spots.	Spores are dispersed in the spring and early summer by rainfall.	Plant resistant varieties. Remove and destroy diseased plant material. No fungicides are available for homeowners. Commercial fungicides are listed in Table 3.
Bacterial leaf scorch (<i>Xylella fastidiosa</i>)	Symptoms of bacterial leaf scorch include chlorotic mottling of the leaves that starts from the tips and margins and progresses toward the midribs. As disease develops, leaf tips and margins become necrotic. Once a tree is infected, there is no cure.	The bacterium resides in the xylem vessels (water-conducting channels) of the tree, where it multiplies and blocks these channels and eventually obstructs the flow of water and nutrients within the plant. The bacterium is transmitted and spread by xylem-feeding insects, such as sharp shooters, leaf hoppers or spittle bugs.	There are no chemicals available to manage bacterial leaf scorch. Cultural practices that improve plant vigor, such as proper watering and fertilization, may help the infected plants to live longer. Pruning symptomatic branches will not save the plant. Detection and removal of infected plants at early stages may help reduce subsequent spread of the pathogen. Management of insects that transmit bacterial leaf scorch is critical to prevent disease spread.
Brown leaf spot (<i>Cercospora</i> spp.)	Early leaf spots are circular, reddish-brown and often develop grayish concentric zones. Spots become irregular later. Nuts are not susceptible to this disease. Usually, a problem when trees lack vigor or where rainfall is unusually high. Premature defoliation often occurs when disease is severe.	Fungus lives from year to year in infected spots on the old leaves. Spores are windborne.	Water and fertilize trees to improve vigor. Fungicides that control scab also control brown leaf spot although not all scab fungicides are labeled for brown leaf spot (see Table 3). Follow the pecan spray schedule.
Downy spot (<i>Mycosphaerella</i> spp.)	Appear in late spring or early summer as downy spots on the undersides of the leaflets. Later, greenish-white spots about 1/8 inch in diameter are visible on both sides of the leaves. As the season advances, the color of the spots changes to brown.	Fungus lives from year to year in infected leaves.	Plant resistant or tolerant varieties (i.e., Schley, Success, Mahan and Western). Remove and discard fallen leaves. Follow the pecan spray schedule.
Powdery mildew (<i>Microsphaera alni</i>)	This disease affects both foliage and nuts, forming a white superficial fungal growth early in the growing season. Nuts are affected more adversely than foliage. Nuts infected early in the season may abort or be undersized.	Infected leaf and shuck debris.	Plant cultivars that are less susceptible to disease. Include sulfur in the June, July and August sprays at the rate of 6 lb per 100 gallons or follow the pecan spray schedule. A regular scab spray program will manage powdery mildew.

Disease	Symptoms	Source of Inoculum	Management
Scab (<i>Cladosporium carpophilum</i> , <i>C. caryigenum</i>)	Early leaf infections produce pinpoint olive-brown lesions often on veins of undersides of leaves. Spots enlarge and coalesce until large areas of leaves may become almost black. Lesions on nuts are small, black and circular, slightly raised at first but later sunken. The entire surface of nuts of highly susceptible varieties may appear black from extensive infections.	Fungus may overwinter in infested shucks, leaf stems or leaves. The fungus is spread by windborne spores and is boosted by high humidity.	Knock off old shucks and stems before spring. Prune out low limbs to improve air circulation in orchard. Fungicides that control brown leaf spot also control brown leaf spot. Follow the pecan spray schedule.
Shuck dieback and stem end blight (<i>Phomopsis</i> spp. and other fungal pathogens)	Disease is more severe in overcrowded orchards or trees that are water or nutrient stressed. The shuck turns black and begins to die near the tip of the nut. The blackened area can spread over the entire shuck, and the shuck may flare open. Stem end blight begins as a brownish black spot on the shuck near the base of the nut. The black area enlarges to cover the entire nut and the nut is easily dislodged from its stem.	Fungi overwinter is dislodged nuts.	Reduce tree stress by irrigating sufficiently to support the crop load. Thin trees to avoid overcrowding. No fungicides are effective at controlling shuck dieback and stem end blight.
Vein spot (<i>Gnomonia nerviseda</i>)	Spots (lesions) may originate on vein of leaflets or on leaf stem and are dark brown to black in final stages. On lateral veins, lesions are circular or oval and seldom attain a diameter of more than 1/4 inch. On midribs of leaflets and on leaf stems, spots are long and narrow. When the disease is severe, premature defoliation usually occurs.	Fungus lives through the winter on fallen leaves.	The pre-pollination spray and first cover sprays are essential for control.
Zonate leaf spot (<i>Cristulariella moricola</i>)	Grayish-brown spots on the upper surface of leaves. Leaf spots are light brown with dark margins on the underside of the leaf. Spots have a concentric ring formation that is more distinct on the leaf underside. Severely infected leaves dry and curl and drop from the tree. Severe defoliation of pecan trees occurs during rainy summers.	The fungus overwinters in resting bodies, called sclerotia, on plant debris. Leaf wetness in the spring initiates new infections.	No known cultivars are resistant to this disease. Remove wild hosts (i.e., hackberry, sassafras, Virginia creeper and poison oak) of the fungus from around the orchard. Prune lower branches to promote airflow and leaf drying. Follow the pecan spray schedule.

Table 1: Pecan varieties and disease resistance profiles.**Table Legend**

Resistance Category	Abbreviation
Very Susceptible	VS
Susceptible	S
Tolerant	T
Resistant	R
Unknown	-

Cultivar	Pecan Scab	Downy Spot	Powdery mildew	Shuck dieback	Vein spot	Zonate leaf spot
Caddo	T-S	-	S	-	-	-
Candy	R-T	-	-	-	-	S
Cape Fear	T-S	-	-	-	-	S
Creek	T	-	-	-	-	S
Desirable	S	-	-	-	-	S
Elliott	R	-	-	-	-	S
Excel	R	-	-	-	-	S
Gloria Grande	S	-	-	-	-	S
Jackson	T-S	-	-	-	-	S
Kanza	R	-	-	-	S	-
Kiowa	T-S	-	-	-	-	-
Mahan	VS	R	-	-	-	S
Melrose	T-S	-	-	T	-	-
Moreland	T	-	-	-	-	S
Schley	VS	R	-	S	-	S
Success	VS	R	-	S	-	S
Sumner	R-T	-	-	-	-	S
Western	VS	S	-	S	-	S

Table 2: Spray Schedule

Season	Fungicide Application Timing	Disease
First pre-pollination	When leaves are at least 1 inch long	Anthracnose
First pre-pollination	When leaves are at least 1 inch long	Downy spot
First pre-pollination	When leaves are at least 1 inch long	Scab
First pre-pollination	When leaves are at least 1 inch long	Vein spot
First pre-pollination	When leaves are at least 1 inch long	Zonate leaf spot
Second pre-pollination	When leaves have grown (or 10-14 days after first spray)	Anthracnose
Second pre-pollination	When leaves have grown (or 10-14 days after first spray)	Downy spot
Second pre-pollination	When leaves have grown (or 10-14 days after first spray)	Scab
Second pre-pollination	When leaves have grown (or 10-14 days after first spray)	Vein spot
Second pre-pollination	When leaves have grown (or 10-14 days after first spray)	Zonate leaf spot
First cover spray	2-3 weeks after previous spray	Downy spot
First cover spray	2-3 weeks after previous spray	Scab
First cover spray	2-3 weeks after previous spray	Vein spot
Second cover spray	2-3 weeks after previous spray	Scab
Third cover spray	2-4 weeks after previous spray	Scab
Fourth cover spray	2-3 weeks after previous spray	Scab
Fifth cover spray ¹	3-4 weeks after previous spray	Scab
Sixth cover spray	Do not apply fungicides after shuck split.	Scab

¹ Sprays may be omitted during dry weather.

Table 3: Anthracnose (*Colletotrichum* spp., *Glomerella cingulata*)

Product Choices ¹	Product Mode of Action Group (FRAC) ²	Rate ³	PHI ⁴	Maximum Use
Abound	11	12 fl oz	45	73.8 fl oz
Aframe	11	12 fl oz	45	73.8 fl oz
Azaka ⁵	11	6-12 fl oz	45	73.8 fl oz
AzoxyStar	11	6-12 fl oz	45	73.8 fl oz
Satori	11	6-12 fl oz	45	73.8 fl oz
Willowood Azoxy 2SC	11	6-18.5 fl oz	14	49 fl oz
Custodia ⁶	3, 11	8.6-17.2 fl oz	45	69 fl oz
Luna Sensation	7, 11	4-7.6 fl oz	14	27.1 fl oz
Orius ⁵	3	4-6 fl oz	see footnote	32 fl oz
Pristine	7, 11	10.5-14.5 oz	14	32 fl oz
Quilt	11, 3	14-27.5 fl oz	45	58 oz
Quilt Excel	11, 3	14-21 fl oz	45	122 fl oz
Regalia	P5	0.5-1 qt	0	122 fl oz
Stratego ⁵	3, 11	10 fl oz	30	-
Absolute 500SC	3, 11	5-7.7 fl oz	30	30 fl oz
Adament 50WG	3, 11	4-8 oz	60	46 oz
Topguard	3, 11	7-14 fl oz	14	32 oz
Viathon ⁵	3, 33	2 pt (early season only)	see footnote	56 fl oz
Willow AzoxyProp ⁵	3, 11	14-21 fl oz	45	115 fl oz
Ziram 76DF	M	6-8 lb	55	48.2 lb

¹ Reference to commercial or trade names is made with the understanding that no discrimination or endorsement of a particular product is implied by LSU or the LSU AgCenter.

² Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

³ Rates are the amount of fungicide per acre unless otherwise indicated. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

⁴ Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

⁵ Do not apply to trees that will bear fruit within 12 months.

⁶ Do not apply after shuck split

Table 4: Brown leaf spot (*Cercospora* spp.)

Product Choices ¹	Product Mode of Action Group (FRAC) ²	Rate ³	PHI ⁴	Maximum Use
Elast ^{5,6}	M	3 pt	See footnote	18 pt
Eminent VP ⁶	3	6-16 fl oz	30	64 fl oz
Banner MAXX ^{5,6}	3	12 fl oz	See footnote	24 fl oz
Bumper ES ^{5,6}	3	4-8 fl oz	See footnote	32 fl oz
Procon-Z ^{5,6}	3	12 fl oz	See footnote	32 fl oz
Topaz ^{5,6}	3	4-8 fl oz	See footnote	32 fl oz
Orbit ^{5,6}	3	4-8 fl oz	See footnote	32 fl oz
Protocol ⁶	1, 3	1.3-2.5 pt	See footnote	7.5 pt
Monsoon ^{6,8}	3	4-8 fl oz	See footnote	32 fl oz
Onset 3.6L ^{6,8}	3	4-8 fl oz	See footnote	32 fl oz
Orius 3.6F ^{6,8}	3	4-8 fl oz	See footnote	32 fl oz
Thiophanate-methyl 85WDG	1	0.4-0.8 lb	1	2.5 lb
Topsin M 70WP ⁶	1	1 lb	See footnote	3 lb
Topsin XTRA 2 ^{6,9}	1, 3	25 fl oz	See footnote	See footnote
Agri Tin	30	5-7.5 oz	30	45 fl oz
Super Tin 80WP	30	5-7.5 oz	30	45 fl oz
Viathon ^{6,7}	3, 33	2-2.5 pt	See footnote	16.5 pt

^{OG} Indicates a pesticide that has been listed by the Organic Materials Review Institute (OMRI) as approved for use in organic production.

¹ Reference to commercial or trade names is made with the understanding that no discrimination or endorsement of a particular product is implied by LSU or the LSU AgCenter.

² Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

³ Rates are the amount of formation per acre unless otherwise indicated. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

⁴ Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

⁵ Do not apply to trees that will bear fruit within 12 months.

⁶ Do not apply after shuck split.

⁷ Use 2 pt per acre early in the season and 2-2.5 pt per acre post pollination.

⁸ Also registered are: Tebu-Crop 3.6F, Tebuzol and Topaz.

⁹ Do not exceed a total application of 2.1 lb a.i. thiophanate-methyl and 0.9 lb a.i. tebuconazole per year.

Table 5: Downy spot (*Mycosphaerella* spp.)

Product Choices ¹	Product Mode of Action Group (FRAC) ²	Rate ³	PHI ⁴	Maximum Use
Custodia	3, 11	8.6-17.2 fl oz	45	69 fl oz
Elast ^{5,6}	M	3 pt	See footnote	18 pt
Enable 2F ⁶	3	8 fl oz	28	1.5 qt
Eminent VP ⁶	3	6-16 fl oz	30	64 fl oz
Bumper ES ⁶	3	4-8 fl oz	See footnote	32 fl oz
Procon-Z ⁶	3	12 fl oz	See footnote	32 fl oz
Topaz ^{6,6}	3	4-8 fl oz	See footnote	32 fl oz
Orbit ⁶	3	4-8 fl oz	See footnote	32 fl oz
Protocol ⁶	1, 3	1.3-2.5 pt	See footnote	7.5 pt
Quadris Top	11, 3	8-14 fl oz	45	56 fl oz
Quilt ⁶	11, 3	14-27.5 fl oz	45	122 fl oz
Quilt Excel ⁶	11, 3	14-21 fl oz	45	122 fl oz
Monsoon ⁶	3	4-8 fl oz	See footnote	32 fl oz
Onset 3.6 ⁶	3	4-8 fl oz	See footnote	32 fl oz
Orius 3.6F ⁶	3	4-8 fl oz	See footnote	32 fl oz
Thiophanate-Methyl 85WDG	1	0.4-0.8 lb	1	2.5 lb
Topsin M 70WP ⁶	1	1 lb	See footnote	3 lb
Topsin XTRA 2 ^{6,8}	1, 3	25 fl oz	See footnote	See footnote
Topguard	3	7-14 fl oz	14	56 fl oz
Agri Tin	30	5-7.5 oz	30	45 oz
Super Tin 80WP	30	5-7.5 oz	30	45 oz
Viathon ^{6,7}	33, 3	2-2.5 pt	See footnote	16.5 pt
Willow AzoxyProp ⁶	3, 11	14-21 fl oz	30	115 fl oz

¹ Reference to commercial or trade names is made with the understanding that no discrimination or endorsement of a particular product is implied by LSU or the LSU AgCenter.

² Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

³ Rates are the amount of formation per acre unless otherwise indicated. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

⁴ Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

⁵ Do not apply to trees that will bear fruit within 12 months.

⁶ Do not apply after shuck split.

⁷ Use 2 pt per acre early in the season and 2-2.5 pt per acre post pollination.

⁸ Do not exceed a total application of 2.1 lb a.i. thiophanate-methyl and 0.9 lb a.i. tebuconazole per year.

Table 6: Powdery mildew (*Microsphaera alni*)

Product Choices ¹	Product Mode of Action Group (FRAC) ²	Rate ³	PHI ⁴	Maximum Use
Actinovate ^{OG}		3-12 oz		
Adament 50WG ⁶	3, 11	4-8 oz	60	32 oz
Enable 2F ⁶	3	8 fl oz	28	1.5 qt
Eminent VP ⁶	3	6-16 fl oz	28	64 fl oz
Luna sensation	7, 11	4-7.6 fl oz	14	27.1 fl oz
Fosphite	33	1-3 qt		
K-Phite 7LP AG	33	1-3 qt		
Rampart	33	1-3 qt		
Procon-Z ^{5,6,8}	3	12 fl oz	See footnote	32 fl oz
Topaz ^{5,6,8}	3	4-8 fl oz	See footnote	32 fl oz
Orbit ^{5,6,8}	3	1.3-2.5 pt	See footnote	7.5 pt
Protocol ⁶	1, 3	4-8 fl oz	See footnote	32 fl oz
Quadris Top	11, 3	8-14 fl oz	45	56 fl oz
Quilt ⁶	11, 3	14-27.5 fl oz	45	122 fl oz
Quilt Excel ⁶	11, 3	14-21 fl oz	45	122 fl oz
Microthiol Disperss	M	5-10 lb		
Monsoon ⁶	3	4-8 fl oz	See footnote	32 fl oz
Onset 3.6L ⁶	3	4-8 fl oz	See footnote	32 fl oz
85WDG	1	0.4-0.8 lb	1	2.5 lb
Topsin M 70WP ⁶	1	1 lb	See footnote	3 lb
Topsin XTRA 2 ^{6,7}	1, 3	25 fl oz	See footnote	See footnote
Trilogy ^{OG}		0.01		
Agri Tin	30	5-7.5 oz	30	45 oz
Super Tin 80WP	30	5-7.5 oz	30	45 oz
Willow Azoxypop	3, 11	14-21 fl oz	306	115 fl oz

^{OG} Indicates a pesticide that has been listed by the Organic Materials Review Institute (OMRI) as approved for use in organic production.

¹ Reference to commercial or trade names is made with the understanding that no discrimination or endorsement of a particular product is implied by LSU or the LSU AgCenter.

² Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

³ Rates are the amount of formation per acre unless otherwise indicated. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

⁴ Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

⁵ Do not apply to trees that will bear fruit within 12 months.

⁶ Do not apply after shuck split.

⁷ Do not exceed a total application of 2.1 lb a.i. thiophanate-methyl and 0.9 lb a.i. tebuconazole per year.

⁸ Also registered are: Propensity 1.3ME, Propicure 3.6F, Strider and Willowood Propican 3.6EC.

Table 7: Scab (*Cladosporium carpophilum*, *C. caryigenum*)

Product Choices ¹	Product Mode of Action Group (FRAC) ²	Rate ³	PHI ⁴	Maximum Use
Abound	11	6-12 fl oz	45	73.8 fl oz
Aframe	11	6-12 fl oz	45	73.8 fl oz
Azaka	11	6-12 fl oz	45	73.8 fl oz
AzoxyStar	11	6-12 fl oz	45	73.8 fl oz
Satori	11	6-12 fl oz	45	73.8 fl oz
Willowood Azoxy 2SC	11	6-18.5 fl oz	14	49 fl oz
Custodia	3, 11	8.6-17.2 fl oz	45	69 fl oz
Double Nickel 55 ^{OG}		see label	0	see label
Elast ^{5, 6}	M	3 pt	See footnote	18 pt
Eminent VP ⁶	3	6-16 fl oz	30	64 fl oz
Enable 2F ⁶	3	8 fl oz	28	1.5 qt
Helena ProPhyt	33	2-3 pt		
Luna Sensation	7, 11	4-7.6 fl oz	14	27.1 fl oz
Pristine	7, 11	10.5-14.5 oz	14	58 oz
Bumper ES ^{5,6,10}	3	4-8 fl oz	See footnote	32 fl oz
Procon-Z ^{5,6,10}	3	12 fl oz	See footnote	32 fl oz
Topaz ^{5,6,10}	3	4-8 fl oz	See footnote	32 fl oz
Orbit ^{5,6,10}	3	4-8 fl oz	See footnote	32 fl oz
Protocol	1, 3	1.3-2.5 pt	See footnote	7.5 pt
Quash	3	2.5-3.5 oz	25	14 oz
Quadris Top	11, 3	8-14 fl oz	45	56 fl oz
Quilt ⁶	11, 3	14-27.5 fl oz	45	122 fl oz
Quilt Excel ⁶	11, 3	14-21 fl oz	45	122 fl oz
Regalia	P5	0.5-1 qt	0	-
Sovran		2.4-4.8 oz ⁸	45	14.4 oz
Stratego ⁶	3, 11	10 fl oz	30	30 fl oz
Monsoon ^{6,11}	3	4-8 fl oz	See footnote	32 fl oz
Onset 3.6L ^{6,11}	3	4-8 fl oz	See footnote	32 fl oz

Product Choices ¹	Product Mode of Action Group (FRAC) ²	Rate ³	PHI ⁴	Maximum Use
Orius 3.6F ^{6,11}	3	4-8 fl oz	See footnote	32 fl oz
Absolute 500SC	3, 11	5-7.7 fl oz	30	46 fl oz
Adament 50WG	3, 11	4-8 oz	60	32 fl oz
85WDG	1	0.4-0.8 lb	1	2.5 lb
Topsin M 70WP ⁶	1	1 lb	See footnote	3 lb
Topsin XTRA 2 ^{6,9}	1, 3	25 fl oz	See footnote	See footnote
Topguard	3	7-14 fl oz	14	56 fl oz
Trilogy ^{OG}		0.01		
Agri Tin	30	5-7.5 oz	30	45 fl oz
Super Tin 80WP	30	5-7.5 oz	30	45 fl oz
Viathon ^{6, 7}	3, 33	2-2.5 pt	See footnote	16.5 pt
Willow AzoxyProp ⁶	3, 11	14-21 fl oz	30	115 fl oz
Ziram 76DF	M	6-8 lb	55	48.2 lb

^{OG} Indicates a pesticide that has been listed by the Organic Materials Review Institute (OMRI) as approved for use in organic production.

¹ Reference to commercial or trade names is made with the understanding that no discrimination or endorsement of a particular product is implied by LSU or the LSU AgCenter.

² Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

³ Rates are the amount of formation per acre unless otherwise indicated. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

⁴ Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

⁵ Do not apply to trees that will bear fruit within 12 months.

⁶ Do not apply after shuck split.

⁷ Use 2 pt per acre early in the season and 2-2.5 pt per acre post pollination.

⁸ Use 2.4-3.2 oz per acre pre-pollination and 3.2-4.8 oz post-pollination.

⁹ Do not exceed a total application of 2.1 lb a.i. thiophanate-methyl and 0.9 lb a.i. tebuconazole per year.

¹⁰ Also registered are: Propensity 1.3ME, Propicure 3.6F, Strider and Willowood Propican 3.6EC.

¹¹ Also registered are: Tebu-Crop 3.6F, Tebuzol and Topaz.

Table 8: Vein spot (*Gnomonia nerviseda*)

Product Choices ¹	Product Mode of Action Group (FRAC) ²	Rate ³	PHI ⁴	Maximum Use
Custodia	3, 11	8.6-17.2 fl oz	45	69 fl oz
Eminent VP ⁶	3	6-16 fl oz	30	64 fl oz
Enable 2F ⁶	3	8 fl oz	28	1.5 qt
Bumper ES ^{5,6,10}	3	4-8 fl oz	See footnote	32 fl oz
Procon-Z ^{5,6,10}	3	12 fl oz	See footnote	32 fl oz
Topaz ^{5,6,10}	3	4-8 fl oz	See footnote	32 fl oz
Orbit ^{5,6,10}	3	4-8 fl oz	See footnote	32 fl oz
Pristine	7, 11	10.5-14.5 oz	14	58 oz
Protocol ⁶	1, 3	1.3-2.5 pt	See footnote	7.5 pt
Quadris Top	11, 3	8-14 fl oz	45	56 fl oz
Quilt ⁶	11, 3	14-27.5 fl oz	45	122 fl oz
Quilt Xcel ⁶	11, 3	14-21 fl oz	45	122 fl oz
Monsoon ^{6,11}	3	4-8 fl oz	See footnote	32 fl oz
Onset 3.6L ^{6,11}	3	4-8 fl oz	See footnote	32 fl oz
Orius 3.6F ^{6,11}	3	4-8 fl oz	See footnote	32 fl oz
Topsin XTRA 2 ^{6,9}	1, 3	25 fl oz	See footnote	See footnote
Viathan ⁷	3, 33	2-2.5 pt	See footnote	16.5 pt
Willow AzoxyProp ⁶	3, 11	14-21 fl oz	30	115 fl oz

⁰⁶ Indicates a pesticide that has been listed by the Organic Materials Review Institute (OMRI) as approved for use in organic production.

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² Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

³ Rates are the amount of formation per acre unless otherwise indicated. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

⁴ Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

⁵ Do not apply to trees that will bear fruit within 12 months.

⁶ Do not apply after shuck split.

⁷ Use 2 pt per acre early in the season and 2-2.5 pt per acre post pollination.

⁸ Use 2.4-3.2 oz per acre pre-pollination and 3.2-4.8 oz post-pollination.

⁹ Do not exceed a total application of 2.1 lb a.i. thiophanate-methyl and 0.9 lb a.i. tebuconazole per year.

¹⁰ Also registered are: Propensity 1.3ME, Propicure 3.6F, Strider and Willowood Propican 3.6EC.

¹¹ Also registered are: Tebu-Crop 3.6F, Tebuzol and Topaz.

Table 9: Zonate leaf spot (*Cristulariella moricola*)

Product Choices ¹	Product Mode of Action Group (FRAC) ²	Rate ³	PHI ⁴	Maximum Use
Badge X2 ^{OG,6}	M	0.75-1.75 lb	See footnote	1.6 lb
Champ Formula 2FL ⁶	M	1.33-2.66 pt	See footnote	23.2 pt
Kocide 3000 ⁶	M	0.75-1.75 lb	See footnote	28 lb
Cuprofix Ultra 40 ⁶	M	1.25-2.5 lb	See footnote	21 lb
Custodia ⁶	11, 3	8.6-17.2 fl oz	45	69 fl oz
Eminent VP ⁶	3	6-16 fl oz	30	64 fl oz
Amtide 41.8EC ⁶	3	4-8 fl oz	See footnote	32 fl oz
Banner MAXX ⁶	3	12 fl oz	See footnote	24 fl oz
Bumper 41.8EC ⁶	3	4 fl oz	See footnote	32 fl oz
Bumper ES ⁶	3	4 fl oz	See footnote	32 fl oz
Topaz ⁶	3	4-8 fl oz	See footnote	32 fl oz
Protocol ⁶	3, 1	1.3-2.5 pt	See footnote	7.5 pt
Quadris Top	11, 3	8-14 fl oz	45	56 fl oz
Quilt XCEL ⁶	11, 3	14-27.5 fl oz	45	122 fl oz
Quilt ⁶	11, 3	14-21 fl oz	45	122 fl oz
Monsoon ^{6,11}	3	4-8 fl oz	See footnote	32 fl oz
Onset 3.6L ^{6,11}	3	4-8 fl oz	See footnote	32 fl oz
Orius 3.6F ^{6,11}	3	4-8 fl oz	See footnote	32 fl oz
85WDG	1	0.4-0.8 lb	1	2.5 lb
Topsin M 70WP ⁶	1	1 lb	See footnote	3 lb
Topguard	3	7-14 fl oz	14	56 fl oz
Topsin XTRA 2 ⁶	1, 3	25 fl oz	See footnote	See label
Viathan ⁶	3, 33	2-2.5 pt ⁷	See footnote	16.5 pt
Willow AzoxyProp ⁶	3, 11	14-21 fl oz	30	115 fl oz

^{OG} Indicates a pesticide that has been listed by the Organic Materials Review Institute (OMRI) as approved for use in organic production.

¹ Reference to commercial or trade names is made with the understanding that no discrimination or endorsement of a particular product is implied by LSU or the LSU AgCenter.

² Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

³ Rates are the amount of formation per acre unless otherwise indicated. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

⁴ Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

⁵ Do not apply to trees that will bear fruit within 12 months.

⁶ Do not apply after shuck split.

⁷ Use 2 pt per acre early in the season and 2-2.5 pt per acre post pollination.

⁸ Use 2.4-3.2 oz per acre pre-pollination and 3.2-4.8 oz post-pollination.

⁹ Do not exceed a total application of 2.1 lb a.i. thiophanate-methyl and 0.9 lb a.i. tebuconazole per year.

¹⁰ Also registered are: Propensity 1.3ME, Propicure 3.6F, Strider and Willowood Propican 3.6EC.

¹¹ Also registered are: Tebu-Crop 3.6F, Tebuzol and Topaz.

The pecan section was revised October 2023 by R. Singh.

Stone fruits (Peach, Plum, etc.)

Disease

Symptoms, source of inoculum and management of stone fruit diseases.

Disease	Symptoms	Source of Inoculum	Management
Armillaria root rot (<i>Armillaria</i> spp.)	Trees appear weak with small, yellowish leaves over the entire tree or confined to one or two branches. The entire tree or single branches may die by the end of the summer or the next year. White mycelial growth can be found beneath the bark of roots or base of affected trees at or about the time of death.	These fungi live in soil and survive for many years in old, diseased roots.	Dig up and burn old roots before planting peach trees. Remove dead trees and as many roots as possible. Fumigate before replanting.
Brown rot blossom blight and/or fruit rot (<i>Monilinia</i> spp.)	Occurs on all stone fruits. The brown rot fungus causes blossom and twig blight, fruit rot and canker. Affected blossoms turn gray or light brown and are covered with spores if wet weather prevails. The fungus may invade twigs from infected blossoms, causing twig blight or canker. Fruit infection normally occurs as the fruit near maturity. Small circular light brown spots develop on fruit, often at insect wounds or spots where scab or other diseases occur. These spots enlarge rapidly if the fruit is mature, often rotting the whole fruit. Eventually, the spots become covered with a brownish-gray spore mass.	The fungus overwinters in peach “mummies” on the tree or ground and in twig cankers.	Remove affected peaches from the orchard at harvest. Remove and bury any peach “mummies” remaining on the trees before spring. Do not just knock fruit to the ground. Destroy wild plum thickets, abandoned stone fruit orchards and fence row seedlings as far away as possible from producing trees. Follow the stone fruit fungicide spray program.
Bacterial spot (<i>Xanthomonas arbuticola</i> pv. <i>pruni</i>)	The disease occurs on leaves, twigs and fruit of almost all stone fruits. Leaf spots progress from grayish and water-soaked to deep purple, brown or black and are angular in shape. Spots fall out to give “shot-hole” appearance. Fruit are roughened with cracked, sunken spots. Small, thick-edged depressed spots occur on twigs and larger spots or cankers occur on branches or the trunk.	The bacterium survives from one year to the next in twig cankers and is primarily rain-splashed.	Obtain healthy, vigorous nursery stock free from bacterial spot cankers. Maintain vigorous growing conditions by proper cultivation and fertilization. Resistant varieties: La. Gold (immune), Bicentennial, La. Premiere (highly resistant), La. Felician, Sure Crop, Majestic, Ruston Red and Ouachita Gold.
Black knot (<i>Apiosporina</i> [= <i>Dibotryon</i>] <i>morbosum</i>)	This disease occurs on plum and cherry. Large, rough, coal black, hard swellings or knots occur along the branches, frequently several inches long.	The fungus survives in infected tissue of knots or swellings.	Prune and burn diseased branches during the fall or winter, making the cut at least 4 inches below the visible infection. Destroy badly infected trees. Remove wild plums in the vicinity of desirable trees.
Crown gall (<i>Agrobacterium tumefaciens</i>)	Occurs on many fruits including apple, pear, peach and plum. Affects roots and crown of host plant, causing galling of tissue and reduction in the movement of water and nutrients through the plant.	This bacterium lives in the soil.	Check planting stock for galls or swelling and rogue-infected plants. Treat before planting with Galltrol.

Disease	Symptoms	Source of Inoculum	Management
Peach leaf curl (<i>Taphrina deformans</i>)	This disease occurs only on peach trees. It has not been a problem in Louisiana, except on first-year trees. It apparently does not live over the summer here. In spring, when leaves first appear, they are thickened, and as they develop, the blades become puffed and folded with the edges curling inward so that the undersurface of the leaf is a series of concave chambers. Affected leaves become reddish or purplish, later becoming reddish-yellow and shedding.	The fungus lives from one year to the next on limbs or on the ground.	Monitor trees for symptoms. Apply fungicides if disease is confirmed.
Phony peach (<i>Xylella fastidiosa</i>)	Trees are dwarfed, foliage is abnormally green, and fruit remain small. Phony trees have short terminals and profuse lateral branching. Growth starts in the spring earlier than on normal trees.	This bacterium lives in infected trees of many species and is spread by xylem-feeding insects and root grafting.	Rogue out and burn all infected trees. Also, destroy wild plum and peach seedlings in the neighborhood of producing trees.
Rhizopus rot (<i>Rhizopus</i> spp.)	Normally an important postharvest disease of fruit only. Fruit breaks down quickly into a soft, watery rot after harvest and is covered with “whiskers” or raised white fungal growth with little black spores.	Spores are present in soil on organic matter and airborne.	Avoid wounding the fruit. Practice sanitation within and around the packing shed. Spray with Botran before harvest.
Rust (<i>Tranzschelia discolor</i>)	The disease occurs on leaves, twigs and fruit of almost all stone fruits. Brown pustules occur on the lower leaf surface, marked by a yellowish spot on the upper surface. It may cause leaves to drop prematurely, lowering tree vigor.	The fungus overwinters as mycelium in twigs or as spores on twigs or leaves clinging to the tree.	Follow the stone fruit fungicide spray program.
Scab (<i>Cladosporium carpophilum</i>)	The disease occurs on leaves, twigs and fruit of almost all stone fruits. Spots on fruit are small, circular, dark olive-greenish and usually about 1/16 to 1/8 inch in diameter. Spots may be distinctly separate or merge, giving a velvety blotch appearance to half or more of the fruit (usually on the attachment end). Spots are superficial but cracking or distortion of fruit may follow early or severe infection.	The fungus lives from year to year in infected twigs.	Prune to allow increased air circulation. Avoid low-lying planting sites. Follow the stone fruit fungicide spray schedule.

Table 1. Seasonal fungicide spray schedule for peach, nectarine, plum and other stone fruit.

This table was developed based on recommendations from the 2024 Southeastern Peach, Nectarine and Plum Pest Management and Culture Guide (<https://extension.uga.edu/publications/detail.html?number=B1171&title=southeastern-peach-nectarine-and-plum-pest-management-and-culture-guide>).

Developmental Stage	Pesticide Application Timing	Diseases
Dormant	After leaf fall and before bud swell	• Bacterial spot • Leaf curl
Delayed dormant	1-5% bud swell	• Bacterial spot • Leaf curl
Early bloom	Less than 5% bloom	• Bacterial spot • Leaf curl
Bloom	Full bloom	• Bacterial spot • Leaf curl
Postbloom	Petal fall to 1% shuck split	• Bacterial spot • Black knot • Scab
Postbloom	Shuck split to 10% shuck off	• Bacterial spot • Scab
Postbloom	7-10 days after shuck split spray	• Bacterial spot • Scab
Summer cover sprays	7-21 days interval, usually 14 days	• Bacterial spot • Scab
Preharvest	21 days before harvest	• Brown rot (only if disease pressure is high)
Preharvest	14 and 7 days (or less) before harvest	• Botrytis rot • Brown rot • Rhizopus rot
Postharvest fruit handling		• Botrytis rot • Brown rot • Gilbertella rot • Rhizopus rot

Table 2. Efficacy of selected fungicides against peach, nectarine and plum diseases.

This table was reproduced from the 2024 Southeastern Peach, Nectarine and Plum Pest Management and Culture Guide

(<https://extension.uga.edu/publications/detail.html?number=B1171&title=southeastern-peach-nectarine-and-plum-pest-management-and-culture-guide>).

Table Legend

Efficacy Rating	Abbreviation
Superior	6
Excellent	5
Good Activity	4
Fair	3
Poor	2
Supression	1
No Benefit	-

The efficacy rating could be affected by resistance development. If resistance has occurred, use of fungicides in the same class would likewise show resistance, and a substitute fungicide should be considered for pathogen management.

No data is provided for products not labeled for the specific disease or if the efficacy is unknown. These ratings are benchmarks; actual performance will vary.

Chemical name	Product Names	Leaf curl	Bacterial spot	Blossom blight	Scab	Anthracnose	Red spot	Sooty peach	Brown rot	Rhizopus rot
oxytetracycline	Mycoshield, Fireline	-	3 ^R	-	-	-	-	-	-	-
azoxystrobin	Abound	-	-	-	4 ^R	4	-	-	4 ^R	-
trifloxystrobin	Gem	-	-	-	4 ^R	4	-	-	4 ^R	-
captan	Captan, Captec, etc.	-	-	2	4	3	-	2	3	1
chlorothalonil	chlorothalonil	4	-	3	4	-	-	-	-	-
coppers	various products	3	3 ^R	-	-	-	-	-	-	-
2, 6-dichloro-4-nitroaniline	Botran	-	-	1	-	-	-	-	1	2
	Ferbam	5	-	-	-	-	3	-	-	-
iprodione	Rovral	-	-	4	-	-	2	2	-	-
boscalid+pyraclostrobin	Pristine	-	-	5	4	4	-	-	5	3
penthiopyrad	Fontelis	-	-	4	2	1	-	-	4 ^R	1
pyraclostrobin+fluxapyroxad	Merivon	-	-	6	4	4	-	-	6	3
cyprodinil+difenoconazole	Inspire Super	-	-	5	3	?	-	-	5	?
fludioxonil	Scholar	-	-	-	-	-	-	-	5	4
tebuconazole+trifloxystrobin	Adament	-	-	3	4	3	-	-	3	2
azoxystrobin+difenoconazole	Quadris Top	-	-	4	4	3	-	-	4	2
sulfur	various	-	-	1	3	-	-	-	1	-
tebuconazole	Elite, Orius, Tebuzol	-	-	5	-	-	-	-	5 ^R	-
thiram	Thiram	3	-	-	-	-	3	-	-	-
flutriafol	Topguard	-	-	4	-	-	-	-	4 ^R	-
thiophanate-methyl	Topsin M, Thiophanate-methyl	-	-	4 ^R	4 ^R	-	-	-	3 ^R	-
pyrimethanil	Vanguard, Scala	-	-	4	-	-	-	-	-	-
fludioxonil	Scholar	-	-	-	-	-	-	-	5	4

Chemical name	Product Names	Leaf curl	Bacterial spot	Blossom blight	Scab	Anthracnose	Red spot	Sooty peach	Brown rot	Rhizopus rot
propiconazole	Orbit, PropiMax, Bumper	-	-	4	-	-	-	-	4 ^R	-
myclobutanil	Rally	-	-	3	-	-	-	-	1 ^R	-
fenbuconazole	Indar	-	-	5	2	-	-	-	5 ^R	-
metconazole	Quash	-	-	5	-	-	-	-	5 ^R	-
ziram	Ziram	3	1	-	1	-	3	3	-	-

^R Resistance (or occasional failure of control) has been observed in some southeastern states; thus, if control failure occurs, it could indicate resistance has developed.

Table 3. Recommended pesticides, rates and pesticide use restrictions for pear, nectarine, plum and other stone fruit.

Chemical Name	Product Choices ¹	Product Mode of Action Group (FRAC) ²	Rate ³	Maximum Use	PHI ⁴	Comments
aluminum tris	Aliette	33	5 lb/100 gal	20 lb	NA	Controls collar and root rot caused by <i>Phytophthora</i> spp. Apply only to trees that will not produce fruit for 12 months.
azoxystrobin	Abound	11	12-15.5 fl oz	92.3 fl oz	0	See labels for application timings specific to each disease.
azoxystrobin	Willowood Azoxy 2SC	11	12-15.5 fl oz	92.3 fl oz	0	See labels for application timings specific to each disease.
azoxystrobin + difenoconazole	Quadris Top	11, 3	12-14 fl oz	56 fl oz	0	See label for application timings specific to each disease.
azoxystrobin + propiconazole	Quilt Xcel	11, 3	12-14 fl oz	56 fl oz	0	See label for application timings specific to each disease.
boscalid + pyraclostrobin	Pristine	7, 11	10.5-14.5 oz	72.5 oz	0	NA
captan	Captan 50WP	M4	4-8 lb	24-32 lb ai	0	See label for rates specific to each commodity and disease.
captan	Captan 80WDG	M4	2.5-5 lb	30-40 lb	0	See label for rates specific to each commodity and disease.
captan	Captec 4L	M4	0.75-1 qt/100 gal	24-32 qt	0	See label for rates specific to each commodity and disease.
chlorothalonil	Bravo Ultrex ⁵	M5	2.8-3.8 lb	18.8 lb	See label	Do not apply Bravo Ultrex or Echo 90DF after shuck split or before harvest.
chlorothalonil	Chloronil 720 ⁶	M5	3.1-4.1 pt	20.5 pt	0	NA
chlorothalonil	Echo 90DF	M5	2.25-3 lb	15.5 lb ai	See label	Do not apply Bravo Ultrex or Echo 90DF after shuck split or before harvest.
chlorothalonil	Equus DF	M5	2.8-3.8	16.9 lb	0	NA
copper hydroxide	Badge SC	M1	5-14 pt	63.4 pt	21	See label for application rates specific to each disease.
copper hydroxide	Badge X2	M1	3.5-7 lb	18 lb	21	See label for application rates specific to each disease.
copper hydroxide	Champ WG	M1	8-16 lb	36 lb	21	See label for application rates specific to each disease.
copper hydroxide	Champ Formula 2	M1	5.33-10.66 pt	49.6 pt	21	See label for application rates specific to each disease.

¹ Reference to commercial or trade names is made with the understanding that no discrimination or endorsement of a particular product is implied by LSU or the LSU AgCenter.

² Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

³ Rates are the amount of formulation per acre unless otherwise indicated. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

⁴ Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

⁵ Other generic products include Daconil Ultrex and Ensign 82.5.

⁶ Other generic products include Bravo Weather Stik, Chlorothalolil 720SC, Docket WS, Echo 720 or Ensign 720 (do not apply after shuck split), Initiate 720, Equus 720SST and Daconil Weather Stik.

Chemical Name	Product Choices ¹	Product Mode of Action Group (FRAC) ²	Rate ³	Maximum Use	PHI ⁴	Comments
copper hydroxide	Kentan DF	M1	6-16 lb	18 lb	21	See label for application rates specific to each disease.
copper hydroxide	Kocide 3000	M1	3.5-7 lb	60 lb	6 app	See label for application rates specific to each disease.
copper hydroxide	Kocide 2000	M1	6-12 lb	51.4 lb	21	See label for application rates specific to each disease.
copper sulfate	Cuprofix Ultra 40 Disperss	M1	5-7.5 lb	45 lb	See label	Do not apply Cuprofix Ultra 40 Disperss after shuck split.
copper sulfate	Cuproxat	M1	10-20 pt	88.7 pt	21	See label for application rates specific to each disease.
copper sulfate	Top Cop with Sulfur	M1	0.75-1.26 qt/100 gal	See label	See label	See label for application rates specific to each disease.
copper sulfate + copper oxychloride	C-O-C-S WDG	M1	12-15.6 lb (dormant) 1-2.9 lb (bloom)	35 lb	See label	NA
cyprodinil	Vanguard WG	9	5 oz	30 oz	2	No more than 2 applications by air.
difenoconazole + cyprodinil	Inspire Super	3, 9	16-20 fl oz	80 fl oz	2	No more than 2 applications by air.
dicloran	Botran 75W	14	2 lb	5.3 lb	10	NA
fenbuconazole	Indar 2F	3	6 fl oz	48 fl oz	0	Do not graze livestock in treated areas or feed livestock cover crops grown in treated areas.
fludioxonil	Scholar	12	8-16 oz/100 gal	1 app	16 oz	Use as a postharvest dip to control brown rot, gray mold, Rhizopus rot and Gilberella rot. Dip for 30 sec and allow fruit to drain.
fenhexamid	Elevate 50WG	17	1.5 lb (alone) 1-1.5 lb (tank mix)	6 lb	0	NA
fluxapyroxad + pyraclostrobin	Merivon	7, 11	4-6.7 fl oz	20.1 fl oz	0	NA
iprodione	Iprodione 4L AG	2	1-2 pt	2 app	See label	NA
iprodione	Meteor	2	1-2 pt	2 app	See label	NA
iprodione	Nevado 4F	2	1-2 pt	2 app	See label	NA
iprodione	Rovral Flowable	2	1-2 pt	2 app	See label	NA

Chemical Name	Product Choices ¹	Product Mode of Action Group (FRAC) ²	Rate ³	Maximum Use	PHI ⁴	Comments
mefenoxam	Ridomil Gold SL	4	2 qt	3 app	See label	Soil application only. Apply to the soil to cover the entire root zone. Do not apply to trees under stress. Do not graze livestock in treated areas or feed livestock cover crops grown in treated areas.
metconazole	Quash	3	2.5-4 oz	12 oz	14	See label for application rates specific to each disease. Do not make more than two applications AFTER petal fall.
myclobutanil	Eagle 20EW	3	2-3 fl oz/100 gal	84-100 fl oz	0	See label for maximum application rates specific to each commodity.
myclobutanil	Rally 40WSP	3	2.5-6 oz	2.75-3.25 lb	0	See label for maximum application rates specific to each commodity.
oxytetracycline	Mycoshield	41	12 oz/100 gal	12 lb	21	Bacterial spot management only.
phosphite	Confine Extra	33	1-3 qt (foliar)	NA	0	See label for root dip and trunk injection rates.
phosphite	Fosphite	33	1-3 qt	NA	0	See label for root dip and trunk injection rates.
phosphite	Fungi-phite	33	1-2 qt	NA	0	See label for root dip and trunk injection rates.
phosphite	Helena Prophyt	33	2 pt	4 apps	0	See label for root dip and trunk injection rates.
phosphite	Rampart	33	1-3 qt	NA	0	See label for root dip and trunk injection rates.
propiconazole	Propiconazole	3	4 fl oz	20 fl oz	0	NA
propiconazole	Banner MAXX	3	2-4 fl oz/100 gal	see label	See label	Do not apply to trees that will bear harvestable fruit within 12 months.
propiconazole	Bumper 41.8EC	3	4 fl oz	20 fl oz	0	NA
propiconazole	Bumper ES	3	4 fl oz	20 fl oz	0	NA
propiconazole	Fitness	3	4 fl oz	20 fl oz	0	NA
propiconazole	Procon-Z	3	2-4 fl oz/100 gal	see label	See label	Do not apply to trees that will bear harvestable fruit within 12 months.
propiconazole	Strider	3	2-4 fl oz/100 gal	see label	See label	Do not apply to trees that will bear harvestable fruit within 12 months.
propiconazole	Tilt	3	4 fl oz	20 fl oz	0	NA

Chemical Name	Product Choices ¹	Product Mode of Action Group (FRAC) ²	Rate ³	Maximum Use	PHI ⁴	Comments
propiconazole	Topaz	3	4 fl oz	20 fl oz	0	NA
propiconazole	Willowood Propicon 3.6EC	3	4 fl oz	20 fl oz	0	NA
propiconazole + thiophanate-methyl	Protocol	3, 1	1.3-3.75	6.6 pt	1	See label for application rates specific to each disease.
pyrimethanil	Scala SC	9	9-18 fl oz	54 fl oz	2	Do not use on cherries.
sulfur	Liquid Sulfur Six	9	0.66-2.75/100 gal	See label	See label	NA
sulfur	Microfine Sulfur	9	40-50 lb	See label	See label	NA
sulfur	Microthiol Disperss	9	10-20 lb	See label	See label	NA
sulfur	Yellow Jacket Wettable Sulfur	9	40-50 lb	See label	See label	NA
tebuconazole	Elite 45WP	3	4-8 oz	3 lb	0	NA
tebuconazole	Orius 20AQ	3	8.6-17.2 oz	103 oz	0	The amount of Orius 20AQ depends on tree size and the amount of foliage present.
tebuconazole	Tebuzol 45DF	3	4-8 oz	3 lb	0	NA
tebuconazole + trifloxystrobin	Adament 50WG	3, 11	4-8 oz	32 oz	1	NA
thiophanate-methyl	Cercobin	1	21.8-32.7 fl oz	82.7 fl oz	1	NA
thiophanate-methyl	Incognito 4.5F	1	20-30 fl oz	80 fl oz	1	NA
thiophanate-methyl	T-Methyl 4.5F	1	20-30 fl oz	80 fl oz	1	Can only be applied to peaches and cherries during nonbearing years of new plantings and nursery stock
thiophanate-methyl	T-Methyl 70WSB	1	1-1.5 lb	4 lb	1	NA
thiophanate-methyl	Thiophanate methyl 85WDG	1	0.8-1.2 lb	3.3 lb	1	NA
thiophanate-methyl	Topsin 4.5FL	1	20-30 fl oz	80 fl oz	1	NA
thiophanate-methyl	Topsin M 70WP	1	1-1.5 lb	4 lb	1	NA
thiophanate-methyl	Topsin M WSB	1	1-1.5 lb	4 lb	1	NA
trifloxystrobin	Gem	11	1.9-3.8 fl oz	15.2 fl oz	1	NA
ziram	Ziram	M3	3.75-10 lb	40-72 lb	14	See label for rates specific to each commodity and disease.

The stone fruit section was revised October 2023 by R. Singh.

Commercial Crop Production: Ornamentals

Table 1. Diseases of ornamental plants.

Ornamental Plant (<i>Latin name</i>)	Diseases	Pathogen (<i>Genus and/or species</i>)
Abelia	Leaf spot	<i>Cercospora</i>
Abelia	Powdery mildew	<i>Oidium</i>
Abelia	Root rot	<i>Pythium, Rhizoctonia</i>
African violet (<i>Saintpaulia</i>)	Gray mold	<i>Botrytis</i>
African violet (<i>Saintpaulia</i>)	Leaf spot	<i>Alternaria, Corynespora</i>
African violet (<i>Saintpaulia</i>)	Leaf and stem rot	<i>Rhizoctonia</i>
African violet (<i>Saintpaulia</i>)	Necrotic spot	<i>Impatiens necrotic spot virus</i>
African violet (<i>Saintpaulia</i>)	Powdery mildew	<i>Oidium</i>
African violet (<i>Saintpaulia</i>)	Root rot	<i>Fusarium, Rhizoctonia</i>
African violet (<i>Saintpaulia</i>)	Root and crown rot	<i>Phytophthora, Pythium</i>
Agapanthus	Bacterial leaf blight	<i>Xanthomonas</i>
Agapanthus	Bulb and root rot	<i>Fusarium, Rhizoctonia</i>
Agapanthus	Gray mold	<i>Botrytis</i>
Agapanthus	Leaf spot	<i>Colletotrichum, Myrothecium</i>
Agapanthus	Root rot	<i>Phytophthora, Pythium</i>
Ageratum	Leaf spot	<i>Cercospora</i>
Ageratum	Powdery mildew	<i>Erysiphe</i>
Ageratum	Root rot	<i>Pythium</i>
Ageratum	Root and stem rot	<i>Rhizoctonia</i>
Ageratum	Rust	<i>Puccinia</i>
Ageratum	Southern blight	<i>Agroathelia rolfsii</i>
Aglaonema	Anthraxnose	<i>Colletotrichum, Glomerella</i>

Ornamental Plant (<i>Latin name</i>)	Diseases	Pathogen (<i>Genus and/or species</i>)
Aglaonema	Bacterial leaf spot	<i>Pseudomonas, Xanthomonas</i>
Aglaonema	Bacterial soft rot	<i>Erwinia</i>
Aglaonema	Leaf spot	<i>Cercospora, Corynespora, Myrothecium</i>
Aglaonema	Root rot	<i>Pythium, Rhizoctonia</i>
Aglaonema	Root and stem rot	<i>Cylindrocladiella, Fusarium, Phytophthora</i>
Aglaonema	Stem rot	<i>Cylindrocladium</i>
Aglaonema	Southern blight	<i>Agroathelia rolfsii</i>
Ajuga	Leaf spot	<i>Alternaria, Cercospora, Colletotrichum, Corynespora, Myrothecium, Stemphylium</i>
Ajuga	Root rot	<i>Pythium, Rhizoctonia</i>
Ajuga	Root and crown rot	<i>Fusarium</i>
Ajuga	Southern blight	<i>Agroathelia rolfsii</i>
Almond, flowering (<i>Prunus triloba</i>)	Blossom and twig blight	<i>Monilinia</i>
Almond, flowering (<i>Prunus triloba</i>)	Gray mold	<i>Botrytis</i>
Almond, flowering (<i>Prunus triloba</i>)	Rust	<i>Tranzschelia</i>
Adenium (Desert rose)	Leaf spot	<i>Aristastoma</i>
Adenium (Desert rose)	Root and stem rot	<i>Rosellinia</i>
Alyssum	Basal stem rot	<i>Pythium</i>
Alyssum	Damping-off	<i>Rhizoctonia</i>
American hornbeam (<i>Carpinus</i>)	Leaf blister	<i>Taphrina</i>
American hornbeam (<i>Carpinus</i>)	Leaf spot	<i>Septoria</i>

Ornamental Plant (<i>Latin name</i>)	Diseases	Pathogen (<i>Genus and/or species</i>)
American hornbeam (<i>Carpinus</i>)	Powdery mildew	<i>Microsphaera, Phyllactinia</i>
Amaryllis	Anthracnose	<i>Colletotrichum</i>
Amaryllis	Red blotch	<i>Stagnospora</i>
Anemone, Jerusalem	Damping-off	<i>Rhizoctonia</i>
Anthurium	Anthracnose	<i>Gloeosporium</i>
Anthurium	Bacterial leaf spot	<i>Pseudomonas, Xanthomonas</i>
Anthurium	Bacterial soft rot	<i>Erwinia</i>
Anthurium	Leaf rot	<i>Botrytis</i>
Anthurium	Leaf spot	<i>Alternaria, Cercospora, Phomopsis, Phyllosticta, Septoria</i>
Anthurium	Root rot	<i>Fusarium, Pythium</i>
Anthurium	Root and stem rot	<i>Fusarium, Phytophthora, Rhizoctonia</i>
Anthurium	Southern blight	<i>Agroathelia rolfii</i>
Aphelandra	Anthracnose	<i>Colletotrichum</i>
Aphelandra	Bacterial leaf spot	<i>Pseudomonas, Xanthomonas</i>
Aphelandra	Bacterial soft rot	<i>Erwinia</i>
Aphelandra	Leaf spot	<i>Alternaria, Cercospora, Corynespora, Myrothecium</i>
Aphelandra	Root rot	<i>Pythium, Rhizoctonia</i>
Aphelandra	Root, crown and stem rot	<i>Phytophthora</i>
Aphelandra	Southern blight	<i>Agroathelia rolfii</i>
Arborvitae (<i>Thuja</i>)	Tip and twig blights or dieback	<i>Alternaria, Cercospora, Coryneum, Pestalotiopsis, Phomopsis</i>
Arborvitae (<i>Thuja</i>)	Root rot	<i>Fusarium, Phytophthora, Pythium</i>
Arborvitae (<i>Thuja</i>)	Root and stem rot	<i>Rhizoctonia</i>
Aronia	Root rot	<i>Phytophthora</i>

Ornamental Plant (<i>Latin name</i>)	Diseases	Pathogen (<i>Genus and/or species</i>)
Ardisia	Leaf spot	<i>Cercospora, Mycosphaerella, Phyllosticta</i>
Ardisia	Root rot	<i>Phytophthora</i>
Ardisia	Stem rot	<i>Fusarium, Rhizoctonia, Sclerotinia</i>
Areca palm	Root rot	<i>Phytophthora, Pythium</i>
Artemisia	Root rot	<i>Phytophthora, Pythium</i>
Ash	Anthracnose	<i>Gloeosporium</i>
Ash	Heart rot	<i>Ganoderma</i>
Ash	Leaf spot	<i>Cercospora, Cercosporidium, Cylindrosporium</i>
Ash	Powdery mildew	<i>Oidium</i>
Ash	Rust	<i>Puccinia</i>
Asian jasmine	Aerial blight	<i>Rhizoctonia</i>
Asian jasmine	Root rot	<i>Armillaria, Fusarium</i>
Asparagus fern	Anthracnose	<i>Colletotrichum</i>
Asparagus fern	Blight	<i>Ascochyta, Cercospora</i>
Asparagus fern	Stem rot	<i>Fusarium, Rhizoctonia</i>
Aspidistra	Anthracnose	<i>Colletotrichum</i>
Aspidistra	Leaf spot	<i>Ascochyta, Cercospora</i>
Aster	Powdery mildew	<i>Erysiphe</i>
Aster	Root rot	<i>Fusarium, Phytophthora, Pythium, Rhizoctonia, Thielaviopsis</i>
Aster	Rust	<i>Puccinia</i>
Aster	Stem rot	<i>Rhizoctonia</i>
Astilbe	Leaf spot	<i>Cercospora</i>
Astilbe	Powdery mildew	<i>Erysiphe</i>
Aucuba	Anthracnose	<i>Gloeosporium</i>
Aucuba	Leaf spot	<i>Pestalotia, Phyllosticta</i>

Ornamental Plant (Latin name)	Diseases	Pathogen (Genus and/or species)
Aucuba	Root rot	<i>Fusarium, Phytophthora, Pythium, Rhizoctonia, Thielaviopsis</i>
Azalea	Damping-off	<i>Rhizoctonia</i>
Azalea	Dieback	<i>Phytophthora</i>
Azalea	Flower blight	<i>Ovulinia</i>
Azalea	Foliage blight	<i>Phytophthora</i>
Azalea	Leaf gall	<i>Exobasidium</i>
Azalea	Leaf spot	<i>Cercospora, Colletotrichum, Pestalotia, Phyllosticta</i>
Azalea	Powdery mildew	<i>Microsphaera</i>
Azalea	Root rot	<i>Phytophthora, Pythium, Rhizoctonia</i>
Azalea	Web blight	<i>Rhizoctonia</i>
Baby's breath (<i>Gypsophila</i>)	Gray mold	<i>Botrytis</i>
Baby's breath (<i>Gypsophila</i>)	Leaf spot	<i>Phyllosticta</i>
Baby's breath (<i>Gypsophila</i>)	Root rot	<i>Phytophthora, Pythium</i>
Baby's breath (<i>Gypsophila</i>)	Stem Rot	<i>Fusarium, Rhizoctonia</i>
Balsam (<i>Impatiens balsamina</i>)	Leaf spot	<i>Cercospora, Septoria</i>
Balsam (<i>Impatiens balsamina</i>)	Root rot	<i>Fusarium, Phytophthora, Pythium, Rhizoctonia, Thielaviopsis</i>
Balsam (<i>Impatiens balsamina</i>)	Stem rot	<i>Fusarium, Rhizoctonia</i>
Banana shrub	Algal leaf spot	<i>Cephaleuros</i>
Banana shrub	Root rot	<i>Phytophthora, Rhizoctonia</i>
Barberry	Bacterial leaf spot	<i>Pseudomonas</i>
Barberry	Leaf spot	<i>Gloeosporium</i>
Barberry	Powdery mildew	<i>Erysiphe, Phyllactinia</i>

Ornamental Plant (Latin name)	Diseases	Pathogen (Genus and/or species)
Barberry	Rust	<i>Cumminsia, Puccinia</i>
Bay, red	Leaf spot	<i>Cercospora</i>
Bee balm	Leaf spot	<i>Cercospora</i>
Beech, American	Leaf spot	<i>Cercospora</i>
Beech, American	Powdery mildew	<i>Phyllactinia</i>
Begonia	Anthrachnose	<i>Colletotrichum</i>
Begonia	Bacterial leaf spot	<i>Xanthomonas</i>
Begonia	Gray mold	<i>Botrytis</i>
Begonia	Leaf spot	<i>Cercospora, Phyllosticta, Phomopsis</i>
Begonia	Powdery mildew	<i>Erysiphe</i>
Begonia	Root rot	<i>Fusarium, Phytophthora, Pythium, Rhizoctonia, Thielaviopsis</i>
Begonia	Stem rot	<i>Fusarium, Rhizoctonia</i>
Birch	Anthrachnose	<i>Gloeosporium</i>
Birch	Leaf spot	<i>Septoria</i>
Birch	Powdery mildew	<i>Phyllactinia</i>
Black cherry	Anthrachnose	<i>Colletotrichum</i>
Black cherry	Leaf blister	<i>Taphrina</i>
Black cherry	Leaf spot	<i>Cercospora</i>
Black cherry	Powdery mildew	<i>Podosphaera</i>
Black cherry	Rust	<i>Tranzschelia</i>
Bleeding heart	Leaf spot	<i>Cercospora, Colletotrichum</i>
Boston fern	Rust	<i>Desmella</i>
Boston fern	Web blight	<i>Rhizoctonia</i>
Bottlebrush	Gall	<i>Nectriella</i>
Bougainvillea	Leaf spot	<i>Cercospora</i>
Bougainvillea	Root rot	<i>Phytophthora, Pythium</i>
Box elder	Anthrachnose	<i>Gloeosporium</i>

Ornamental Plant (Latin name)	Diseases	Pathogen (Genus and/or species)
Box elder	Leaf spot	<i>Ascochyta, Cercospora, Septoria</i>
Box elder	Powdery mildew	<i>Microsphaera, Uncinula</i>
Boxwood	Canker	<i>Nectria</i>
Boxwood	Dieback	<i>Colletotrichum theobromicola</i>
Boxwood	Leaf spot	<i>Macrophoma, Phyllosticta</i>
Boxwood	Root and crown rot	<i>Fusarium, Phytophthora, Pythium, Rhizoctonia</i>
Boxwood	Stem blight	<i>Volutella</i>
Browallia	Root rot	<i>Phytophthora, Pythium</i>
Buckeye	Anthraxnose	<i>Glomerella</i>
Buckeye	Leaf blotch	<i>Phyllosticta</i>
Buckeye	Leaf spot	<i>Cercospora</i>
Buckeye	Powdery mildew	<i>Uncinula</i>
Buckthorn	Leaf spot	<i>Cercospora, Septoria</i>
Buckthorn	Rust	<i>Puccinia</i>
Buffaloberry	Leaf spot	<i>Cylindrosporium</i>
Cactus	Leaf spot	<i>Phoma</i>
Cactus	Root rot	<i>Fusarium, Phytophthora, Pythium, Rhizoctonia, Thielaviopsis</i>
Caladium	Root rot	<i>Fusarium, Phytophthora, Pythium, Rhizoctonia, Thielaviopsis</i>
Calathea	Root rot	<i>Phytophthora, Pythium</i>
Calceolaria	Root rot	<i>Pythium</i>
Calendula	Leaf spot	<i>Cercospora</i>
Calendula	Powdery mildew	<i>Erysiphe</i>
Calendula	Root rot	<i>Phytophthora, Pythium</i>
Calendula	Rust	<i>Puccinia</i>
Calendula	Stem rot	<i>Rhizoctonia, Sclerotinia</i>
Camellia	Algal leaf spot	<i>Cephaleuros</i>

Ornamental Plant (Latin name)	Diseases	Pathogen (Genus and/or species)
Camellia	Flower blight	<i>Ciborinia</i>
Camellia	Gray leaf blight	<i>Pestalotiopsis</i>
Camellia	Leaf gall	<i>Exobasidium</i>
Camellia	Leaf spot	<i>Guignardia, Pestalotia, Macrophoma</i>
Camellia	Petal blight	<i>Botrytis</i>
Camellia	Root rot	<i>Fusarium, Phytophthora, Pythium, Rhizoctonia, Thielaviopsis</i>
Camphor-tree	Anthraxnose	<i>Glomerella</i>
Camphor-tree	Leaf spot	<i>Gloeosporium</i>
Camphor-tree	Powdery mildew	<i>Microsphaera</i>
Candytuft	Gray mold	<i>Botrytis</i>
Candytuft	Stem rot	<i>Fusarium, Rhizoctonia</i>
Canna	Rust	<i>Puccinia</i>
Carissa	Root rot	<i>Phytophthora, Pythium</i>
Carnation	Anthraxnose	<i>Colletotrichum</i>
Carnation	Branch rot	<i>Botrytis</i>
Carnation	Damping-off	<i>Pythium</i>
Carnation	Leaf spot	<i>Alternaria, Septoria</i>
Carnation	Powdery mildew	<i>Oidium</i>
Carnation	Root rot	<i>Phytophthora, Pythium, Rhizoctonia</i>
Carnation	Rust	<i>Uromyces</i>
Catalpa	Anthraxnose	<i>Gloeosporium</i>
Catalpa	Leaf spot	<i>Cercospora, Phyllosticta</i>
Catalpa	Powdery mildew	<i>Microsphaera, Phyllactinia</i>
<i>Cattleya skinneri</i>	Root rot	<i>Phytophthora, Pythium</i>
Cedar	Cedar-apple rust	<i>Gymnosporangium</i>
Cedar	Leaf spot	<i>Alternaria</i>
Cedar	Needle blight	<i>Cercospora, Phomopsis</i>

Ornamental Plant (<i>Latin name</i>)	Diseases	Pathogen (<i>Genus and/or species</i>)
Cedar	Root rot	<i>Fusarium, Phytophthora, Pythium, Rhizoctonia, Thielaviopsis</i>
Celosia	Leaf spot	<i>Alternaria</i>
Celosia	Root rot	<i>Fusarium, Phytophthora, Pythium, Rhizoctonia, Thielaviopsis</i>
Ceanothus	Root rot	<i>Phytophthora, Pythium</i>
Chamaedorea	Root rot	<i>Phytophthora, Pythium</i>
Cherry-hawthorn	Leaf spot	<i>Fabraea</i>
Cherry-hawthorn	Rust	<i>Gymnosporangium</i>
Cherry-laurel	Leaf spot	<i>Cercospora, Septoria</i>
Cherry-laurel	Powdery mildew	<i>Podosphaera</i>
Cherry-laurel	Root rot	<i>Phytophthora</i>
Chestnut	Powdery mildew	<i>Microsphaera, Phyllactinia</i>
Chinaberry	Leaf spot	<i>Cercospora</i>
Chinaberry	Powdery mildew	<i>Phyllactinia</i>
Chinese elm	Anthrachnose	<i>Colletotrichum</i>
Chinese elm	Leaf spot	<i>Actinopelte, Phyllosticta</i>
Chinese elm	Powdery mildew	<i>Phyllactinia</i>
Chinese elm	Root rot	<i>Armillaria</i>
Chinese evergreen	Powdery mildew	<i>Phyllactinia</i>
Chinese evergreen	Root rot	<i>Phytophthora, Pythium</i>
Chinese forget-me-not	Gray mold	<i>Botrytis</i>
Chinese forget-me-not	Leaf spot	<i>Cercospora</i>
Chinese forget-me-not	Stem rot	<i>Rhizoctonia</i>
Chinese lantern (<i>Abutilon</i>)	Leaf spot	<i>Cercospora, Phyllosticta</i>
Chinese parasol tree	Web blight	<i>Rhizoctonia</i>
Chinese pistachio	Leaf spot	<i>Septoria</i>
Chinese pistachio	Thread blight	<i>Rhizoctonia</i>
Chocolate plant	Leaf spot	<i>Phyllosticta</i>

Ornamental Plant (<i>Latin name</i>)	Diseases	Pathogen (<i>Genus and/or species</i>)
Christmas rose	Flower spot	<i>Botrytis</i>
Chrysanthemum	Anthrachnose	<i>Colletotrichum</i>
Chrysanthemum	Bacterial blight	<i>Pectobacterium</i>
Chrysanthemum	Damping-off	<i>Pythium</i>
Chrysanthemum	Gray mold	<i>Botrytis</i>
Chrysanthemum	Leaf spot	<i>Alternaria, Septoria</i>
Chrysanthemum	Powdery mildew	<i>Erysiphe</i>
Chrysanthemum	Ray blight	<i>Ascochyta, Mycosphaerella</i>
Chrysanthemum	Root rot	<i>Phytophthora, Pythium, Rhizoctonia</i>
Chrysanthemum	Rust	<i>Puccinia</i>
Chrysanthemum	Wilt	<i>Fusarium</i>
Cineraria	Powdery mildew	<i>Erysiphe</i>
Cineraria	Root rot	<i>Phytophthora, Pythium, Rhizoctonia</i>
Cissus	Leaf spot	<i>Cercospora</i>
Cissus	Root rot	<i>Phytophthora, Pythium</i>
Clarkia	Gray mold	<i>Botrytis</i>
Clarkia	Root rot	<i>Rhizoctonia</i>
Clematis	Leaf spot	<i>Ascochyta, Cercospora</i>
Cleome	White mold	<i>Sclerotinia sclerotiorum</i>
Cleyera	Leaf spot	<i>Cercospora</i>
Cockscomb	Leaf spot	<i>Cercospora</i>
Cockscomb	Stem rot	<i>Fusarium, Rhizoctonia</i>
Coleus	Downy mildew	<i>Peronospora</i>
Coleus	Leaf blight	<i>Botrytis</i>
Coleus	Root rot	<i>Phytophthora, Pythium, Rhizoctonia</i>
Columbine	Leaf spot	<i>Ascochyta, Septoria</i>
Columbine	Powdery mildew	<i>Erysiphe</i>

Ornamental Plant (Latin name)	Diseases	Pathogen (Genus and/or species)
Columbine	Root rot	<i>Phytophthora, Pythium, Rhizoctonia</i>
Columbine	Rust	<i>Puccinia</i>
Coneflower	Leaf spot	<i>Cercospora</i>
Coneflower	Witch's broom	<i>Phytoplasma (Aster yellows)</i>
Confederate jasmine	Anthracnose	<i>Colletotrichum</i>
Confederate jasmine	Leaf spot	<i>Cercospora, Corynespora</i>
Confederate jasmine	Root rot	<i>Armillaria</i>
Confederate jasmine	Stem rot	<i>Fusarium, Rhizoctonia</i>
Cordyline	Leaf spot	<i>Cercospora</i>
Coreopsis	Gray mold	<i>Botrytis</i>
Coreopsis	Leaf spot	<i>Cercospora, Phyllosticta, Septoria</i>
Coreopsis	Rust	<i>Coleosporium</i>
Coreopsis	Stem rot	<i>Rhizoctonia</i>
Cornflower	Leaf spot	<i>Cercospora, Septoria</i>
Cornflower	Rust	<i>Puccinia</i>
Cornflower	Root rot	<i>Phytophthora</i>
Cornflower	Stem rot	<i>Rhizoctonia</i>
Cornflower	White mold	<i>Sclerotinia sclerotiorum</i>
Cosmos	Leaf spot	<i>Cercospora</i>
Cosmos	Powdery mildew	<i>Erysiphe</i>
Cosmos	Stem rot	<i>Rhizoctonia</i>
Cotoneaster	Leaf spot	<i>Cercospora, Phyllosticta</i>
Cotoneaster	Root rot	<i>Phytophthora, Pythium</i>
Cottonwood	Leaf blister	<i>Taphrina</i>
Cottonwood	Leaf spot	<i>Cercospora, Septoria</i>
Cottonwood	Powdery mildew	<i>Uncinula</i>
Cottonwood	Rust	<i>Melampsora</i>
Crabapple	Leaf spot	<i>Sphaeropsis</i>
Crabapple	Powdery mildew	<i>Podosphaera</i>

Ornamental Plant (Latin name)	Diseases	Pathogen (Genus and/or species)
Crabapple	Rust	<i>Gymnosporangium</i>
Crabapple	Scab	<i>Venturia</i>
Crape myrtle	Bacterial leaf spot	<i>Xanthomonas</i>
Crape myrtle	Leaf spot	<i>Cercospora, Pestalotia, Phyllosticta</i>
Crape myrtle	Powdery mildew	<i>Erysiphe, Phyllactinia</i>
Crape myrtle	Root rot	<i>Armillaria, Phytophthora, Pythium, Rhizoctonia</i>
Crassula	Leaf spot	<i>Cercospora, Phomopsis</i>
Crassula	Powdery mildew	<i>Spaerotheca</i>
Crassula	Root rot	<i>Phytophthora, Pythium</i>
Croton	Root rot	<i>Fusarium, Phytophthora, Rhizoctonia, Thielaviopsis</i>
Crown vetch	Anthracnose	<i>Colletotrichum</i>
Crown vetch	Leaf spot	<i>Cercospora</i>
Cycas or cycad	Root rot	<i>Phytophthora</i>
Cypress	Canker	<i>Seiridium</i>
Cypress	Needle blight	<i>Cercospora</i>
Cypress	Root and crown rot	<i>Armillaria</i>
Cypress	Root rot	<i>Phytophthora</i>
Cypress	Twig blight	<i>Phomopsis</i>
Daffodil	Bulb rot	<i>Fusarium, Penicillium</i>
Daffodil	Leaf scorch	<i>Stagnospora</i>
Daffodil	Root rot	<i>Phytophthora, Rhizoctonia</i>
Dahlia	Blight	<i>Botrytis</i>
Dahlia	Leaf spot	<i>Cercospora</i>
Dahlia	Powdery mildew	<i>Erysiphe</i>
Dahlia	Root rot	<i>Phytophthora, Pythium, Rhizoctonia</i>
Daisy	Gray mold	<i>Botrytis</i>
Daisy	Leaf spot	<i>Cercospora, Phyllosticta, Septoria</i>

Ornamental Plant (Latin name)	Diseases	Pathogen (Genus and/or species)
Daisy	Powdery mildew	<i>Erysiphe</i>
Daisy	Ray blight	<i>Mycosphaerella</i>
Daisy	Rust	<i>Puccinia</i>
Daisy	Stem Rot	<i>Fusarium, Rhizoctonia, Sclerotinia</i>
Daphne	Leaf spot	<i>Gloeosporium</i>
Daphne	Root rot	<i>Phytophthora, Pythium</i>
Daphne	Stem rot	<i>Sclerotinia</i>
Daylily	Anthrachnose	<i>Colletotrichum</i>
Daylily	Blight	<i>Botrytis</i>
Daylily	Leaf spot	<i>Cercospora, Phomopsis</i>
Daylily	Root and stem rot	<i>Fusarium, Phytophthora, Rhizoctonia</i>
Daylily	Rust	<i>Puccinia</i>
Delphinium	Gray mold	<i>Botrytis</i>
Delphinium	Leaf spot	<i>Ascochyta, Cercospora, Phyllosticta</i>
Delphinium	Powdery mildew	<i>Erysiphe</i>
Delphinium	Root rot	<i>Phytophthora, Pythium, Rhizoctonia</i>
Delphinium	Rust	<i>Puccinia</i>
Delphinium	Stem rot	<i>Rhizoctonia, Sclerotinia</i>
Deutzia	Leaf spot	<i>Cercospora</i>
Deutzia	Root rot	<i>Rhizoctonia</i>
Dianthus	Root rot	<i>Fusarium, Phytophthora, Pythium, Rhizoctonia</i>
Dianthus	Rust	<i>Uromyces</i>
Dieffenbachia	Bacterial stem rot	<i>Erwinia</i>
Dieffenbachia	Leaf spot	<i>Leptosphaeria</i>
Dieffenbachia	Root rot	<i>Phytophthora, Pythium, Rhizoctonia</i>
Dogwood	Blight	<i>Cercospora</i>

Ornamental Plant (Latin name)	Diseases	Pathogen (Genus and/or species)
Dogwood	Leaf spot	<i>Septoria</i>
Dogwood	Powdery mildew	<i>Microsphaera, Phyllactinia</i>
Dogwood	Root rot	<i>Phytophthora, Pythium, Rhizoctonia</i>
Dracaena	Leaf spot	<i>Fusarium</i>
Dracaena	Root rot	<i>Phytophthora, Pythium, Rhizoctonia</i>
Duranta skyflower	Leaf spot	<i>Cercospora</i>
Dusty miller	Root rot	<i>Fusarium, Phytophthora, Pythium, Rhizoctonia, Thielaviopsis</i>
Dutch iris	Bulb rot	<i>Athelia</i>
Dwarf bamboo	Leaf spot	<i>Corynespora</i>
Dwarf bamboo	Rust	<i>Puccinia</i>
Easter lily	Bulb rot	<i>Fusarium, Penicillium</i>
Easter lily	Root rot	<i>Phytophthora, Pythium, Rhizoctonia</i>
Echeveria	Root rot	<i>Phytophthora, Pythium</i>
Elaeagnus	Leaf spot	<i>Cercospora</i>
Elaeagnus	Root rot	<i>Phytophthora</i>
Elaeagnus	Stem canker	<i>Phytophthora</i>
Elaeagnus	Twig dieback	<i>Fusarium</i>
Elaeagnus	Tip blight	<i>Gloeosporium</i>
Elm	Anthrachnose	<i>Gloeosporium</i>
Elm	Bacterial leaf scorch	<i>Xylella fastidiosa</i>
Elm	Leaf spot	<i>Cercospora, Gnomonia</i>
Elm	Powdery mildew	<i>Microsphaera, Phyllactinia, Uncinula</i>
Elm	Root rot	<i>Armillaria, Phytophthora</i>
Euonymus	Anthrachnose	<i>Colletotrichum</i>
Euonymus	Leaf spot	<i>Cercospora, Phyllosticta, Ramularia, Septoria</i>

Ornamental Plant (<i>Latin name</i>)	Diseases	Pathogen (<i>Genus and/or species</i>)
Euonymus	Powdery mildew	<i>Microsphaera</i>
Euonymus	Root rot	<i>Phytophthora, Pythium, Rhizoctonia</i>
Farkleberry	Leaf spot	<i>Septoria</i>
Fatsia	Anthracnose	<i>Colletotrichum</i>
Fatsia	Leaf spot	<i>Alternaria</i>
Fatsia	Root rot	<i>Fusarium, Phytophthora, Pythium, Rhizoctonia, Thielaviopsis</i>
Ferns	Blight	<i>Rhizoctonia</i>
Ferns	Gray mold	<i>Botrytis</i>
Ferns	Leaf spot	<i>Cercospora</i>
Ferns	Root rot	<i>Fusarium, Phytophthora, Pythium, Rhizoctonia, Thielaviopsis</i>
Fern (Japanese holly fern)	Mosaic	Japanese holly fern mosaic virus
Festuca	Leaf spot	<i>Ascochyta, Septoria</i>
Festuca	Root rot	<i>Rhizoctonia</i>
Festuca	Rust	<i>Puccinia</i>
Ficus	Leaf spot	<i>Cercospora</i>
Ficus	Root rot	<i>Phytophthora, Pythium, Rhizoctonia</i>
Firethorn	Scab	<i>Fusicladium</i>
Fittonia	Root rot	<i>Phytophthora, Pythium, Rhizoctonia</i>
Forget-me-not	Gray mold	<i>Botrytis</i>
Forget-me-not	Powdery mildew	<i>Erysiphe</i>
Forget-me-not	Rust	<i>Puccinia</i>
Forsythia	Anthracnose	<i>Gloeosporium</i>
Forsythia	Leaf spot	<i>Alternaria</i>
Forsythia	Root rot	<i>Rhizoctonia</i>

Ornamental Plant (<i>Latin name</i>)	Diseases	Pathogen (<i>Genus and/or species</i>)
Four o'clock	Leaf spot	<i>Cercospora</i>
Four o'clock	Rust	<i>Puccinia</i>
Four o'clock	Stem Rot	<i>Rhizoctonia</i>
Foxglove	Leaf spot	<i>Colletotrichum, Phyllosticta</i>
Foxglove	Root rot	<i>Phytophthora, Pythium</i>
Foxglove	Stem Rot	<i>Rhizoctonia</i>
Fringe-tree	Leaf spot	<i>Cercospora, Septoria</i>
Fringe-tree	Powdery mildew	<i>Phyllactinia</i>
Fuchsia	Blight	<i>Botrytis</i>
Fuchsia	Dieback	<i>Phomopsis</i>
Fuchsia	Leaf spot	<i>Septoria</i>
Fuchsia	Rust	<i>Pucciniastrum</i>
Gaillardia	Leaf spot	<i>Septoria</i>
Gaillardia	Powdery mildew	<i>Erysiphe</i>
Gaillardia	Root rot	<i>Phytophthora, Pythium, Rhizoctonia</i>
Gardenia	Anthracnose	<i>Colletotrichum</i>
Gardenia	Canker	<i>Phomopsis</i>
Gardenia	Leaf spot	<i>Cercospora</i>
Gardenia	Petal blight	<i>Botrytis</i>
Gardenia	Powdery mildew	<i>Erysiphe</i>
Gardenia	Root rot	<i>Phytophthora, Pythium, Rhizoctonia</i>
Geranium	Blight	<i>Botrytis</i>
Geranium	Powdery mildew	<i>Erysiphe</i>
Geranium	Root rot	<i>Phytophthora, Pythium, Rhizoctonia</i>
Geranium	Rust	<i>Puccinia</i>
Gerbera	Powdery mildew	<i>Erysiphe</i>
Gerbera	Root rot	<i>Fusarium, Phytophthora, Pythium, Rhizoctonia, Thielaviopsis</i>

Ornamental Plant (Latin name)	Diseases	Pathogen (Genus and/or species)
Ginkgo	Anthracnose	<i>Colletotrichum</i>
Gladiolus	Corm rot	<i>Fusarium, Penicillium</i>
Gladiolus	Damping-off	<i>Fusarium, Rhizoctonia</i>
Gladiolus	Flower spot	<i>Botrytis</i>
Gladiolus	Leaf spot	<i>Curvularia, Stemphylium</i>
Gladiolus	Neck dry rot	<i>Athelia</i>
Gloxinia	Root rot	<i>Phytophthora, Pythium, Rhizoctonia</i>
Golden dewdrop (<i>Duranta erecta</i>)	Leaf blight	<i>Xanthomonas</i>
Golden rain	Leaf spot	<i>Cercospora</i>
Grapeleaf ivy	Anthracnose	<i>Colletotrichum</i>
Grapeleaf ivy	Leaf spot	<i>Cercospora</i>
Grapeleaf ivy	Powdery mildew	<i>Oidium</i>
Gynura	Root rot	<i>Phytophthora, Pythium, Rhizoctonia</i>
Gypsophila	Root rot	<i>Phytophthora, Pythium</i>
Hackberry	Leaf spot	<i>Phyllosticta</i>
Hackberry	Powdery mildew	<i>Uncinula</i>
Halesia	Leaf spot	<i>Cercospora</i>
Hawthorne	Fire blight	<i>Erwinia amylovora</i>
Hawthorne	Leaf spot	<i>Fabraea</i>
Hawthorne	Powdery mildew	<i>Phyllactinia, Podosphaera</i>
Hawthorne	Root rot	<i>Rhizoctonia</i>
Hawthorne	Rust	<i>Gymnosporangium</i>
Hawthorne	Scab	<i>Venturia</i>
Hawthorne	Stem canker	<i>Fusarium</i>
Heather	Root rot	<i>Phytophthora, Pythium</i>
Hen and chickens	Leaf spot	<i>Cercospora</i>
Hen and chickens	Root rot	<i>Fusarium, Rhizoctonia</i>
Hibiscus	Anthracnose	<i>Colletotrichum</i>

Ornamental Plant (Latin name)	Diseases	Pathogen (Genus and/or species)
Hibiscus	Gray mold	<i>Botrytis</i>
Hibiscus	Leaf spot	<i>Cercospora, Phyllosticta</i>
Hibiscus	Powdery mildew	<i>Erysiphe, Microsphaera</i>
Hibiscus	Root rot	<i>Phytophthora, Pythium</i>
Hibiscus	Rust	<i>Kuehneola</i>
Hibiscus	Stem rot	<i>Fusarium, Rhizoctonia, Sclerotinia</i>
Hickory	Anthracnose	<i>Gnomonia</i>
Hickory	Leaf spot	<i>Cercospora, Septoria</i>
Hickory	Powdery mildew	<i>Microsphaera</i>
Holly	Leaf spot	<i>Gloeosporium, Phyllosticta</i>
Holly	Powdery mildew	<i>Microsphaera</i>
Holly	Purple spot	<i>Cercospora</i>
Holly	Root rot	<i>Phytophthora, Rhizoctonia</i>
Holly	Stem canker	<i>Botryodiplodia</i>
Holly	Twig dieback	<i>Phoma</i>
Holly	Web blight	<i>Rhizoctonia</i>
Hollyhock	Anthracnose	<i>Colletotrichum</i>
Hollyhock	Leaf spot	<i>Asochyta, Cercospora</i>
Hollyhock	Petal blight	<i>Botrytis</i>
Hollyhock	Powdery mildew	<i>Erysiphe</i>
Hollyhock	Rust	<i>Puccinia</i>
Honey locust	Leaf spot	<i>Cercospora</i>
Honey locust	Powdery mildew	<i>Microsphaera</i>
Honeysuckle	Blight	<i>Herpobasidium</i>
Honeysuckle	Leaf spot	<i>Corynespora, Phyllosticta</i>
Honeysuckle	Powdery mildew	<i>Microsphaera</i>
Honeysuckle	Root rot	<i>Phytophthora, Pythium</i>
Hornbeam	Leaf Blister	<i>Taphrina</i>
Hornbeam	Powdery mildew	<i>Microsphaera, Phyllactinia</i>

Ornamental Plant (<i>Latin name</i>)	Diseases	Pathogen (<i>Genus and/or species</i>)
Hosta	Crown rot	<i>Botrytis</i>
Hosta	Leaf spot	<i>Colletotrichum</i> , <i>Phyllosticta</i>
Hosta	Stem rot	<i>Rhizoctonia</i>
Hoya	Root rot	<i>Phytophthora</i> , <i>Pythium</i> , <i>Rhizoctonia</i>
Huckleberry	Leaf spot	<i>Phyllosticta</i>
Hyacinth	Black rot	<i>Sclerotinia</i>
Hydrangea	Blight	<i>Botrytis</i>
Hydrangea	Leaf spot	<i>Ascochyta</i> , <i>Cercospora</i> , <i>Colletotrichum</i> , <i>Phyllosticta</i> , <i>Septoria</i>
Hydrangea	Powdery mildew	<i>Erysiphe</i>
Hydrangea	Root rot	<i>Fusarium</i> , <i>Phytophthora</i> , <i>Pythium</i> , <i>Rhizoctonia</i> , <i>Thielaviopsis</i>
Hydrangea	Rust	<i>Pucciniastrum</i>
Ilex	Root rot	<i>Fusarium</i> , <i>Phytophthora</i> , <i>Pythium</i> , <i>Rhizoctonia</i> , <i>Thielaviopsis</i>
Impatiens	Downy mildew	<i>Plasmopara obducens</i>
Impatiens	Leaf spot	<i>Cercospora</i> , <i>Septoria</i>
Impatiens	Root rot	<i>Fusarium</i> , <i>Phytophthora</i> , <i>Pythium</i> , <i>Rhizoctonia</i> , <i>Thielaviopsis</i>
Iris	Anthracnose	<i>Colletotrichum</i>
Iris	Blossom blight	<i>Botrytis</i>
Iris	Bulb rot	<i>Fusarium</i> , <i>Penicillium</i>
Iris	Crown rot	<i>Pellicularia</i>
Iris	Leaf spot	<i>Didymellina</i>
Iris	Root rot	<i>Rhizoctonia</i>
Iris	Rust	<i>Puccinia</i>
Iris, African	Root rot	<i>Phytophthora</i>
Ivy	Bacterial leaf spot	<i>Xanthomonas</i>

Ornamental Plant (<i>Latin name</i>)	Diseases	Pathogen (<i>Genus and/or species</i>)
Ivy	Blight	<i>Colletotrichum</i>
Ivy	Root rot	<i>Fusarium</i> , <i>Phytophthora</i> , <i>Pythium</i> , <i>Rhizoctonia</i> , <i>Thielaviopsis</i>
Ivy, Algerian	Root rot	<i>Phytophthora</i> , <i>Pythium</i>
Ivy, English	Gray mold	<i>Botrytis</i>
Ivy, English	Leaf spot	<i>Cercospora</i> , <i>Colletotrichum</i>
Ivy, English	Powdery mildew	<i>Erysiphe</i>
Ivy, English	Root rot	<i>Phytophthora</i> , <i>Pythium</i> , <i>Rhizoctonia</i>
Ivy, English	Stem rot	<i>Fusarium</i> , <i>Rhizoctonia</i>
Japanese blueberry	Root rot	<i>Phytophthora</i>
Japanese plum (<i>Prunus</i> sp.)	Anthracnose	<i>Colletotrichum</i>
Japanese plum (<i>Prunus</i> sp.)	Bacterial leaf scorch	<i>Xylella fastidiosa</i>
Japanese plum (<i>Prunus</i> sp.)	Leaf spot	<i>Septoria</i>
Japanese plum (<i>Prunus</i> sp.)	Scab	<i>Fusicladium</i>
Japanese yew	Leaf spot	<i>Cercospora</i> , <i>Phomopsis</i>
Japanese yew	Root rot	<i>Armillaria</i> , <i>Phytophthora</i>
Jasmine	Leaf spot	<i>Colletotrichum</i>
Jasmine	Root rot	<i>Phytophthora</i>
Jasmine	Stem canker	<i>Phoma</i>
Java	Leaf spot	<i>Cercospora</i> , <i>Septoria</i>
Jerusalem cherry	Anthracnose	<i>Colletotrichum</i>
Jerusalem cherry	Leaf spot	<i>Phyllosticta</i>
Jerusalem cherry	Stem rot	<i>Rhizoctonia</i>
Jerusalem thorn	Dieback	<i>Phomopsis</i>
Jerusalem thorn	Leaf spot	<i>Phyllosticta</i>
Jerusalem thorn	Powdery mildew	<i>Erysiphe</i>

Ornamental Plant (Latin name)	Diseases	Pathogen (Genus and/or species)
Jujube	Leaf spot	<i>Cercospora</i>
Jujube	Rust	<i>Phakopsora</i>
Juniper	Blight	<i>Phomopsis</i>
Juniper	Leaf spot	<i>Cercospora</i>
Juniper	Root rot	<i>Armillaria, Phytophthora, Pythium, Rhizoctonia</i>
Juniper	Rust	<i>Gymnosporangium</i>
Justica	Anthrachnose	<i>Colletotrichum</i>
Justica	Leaf spot	<i>Cercospora, Corynespora</i>
Kalanchoe	Leaf spot	<i>Cercospora</i>
Kalanchoe	Powdery mildew	<i>Sphaerotheca</i>
Kalanchoe	Root rot	<i>Phytophthora, Pythium, Rhizoctonia</i>
Lantana	Leaf spot	<i>Colletotrichum</i>
Lantana	Root rot	<i>Rhizoctonia</i>
Lantana	Rust	<i>Puccinia</i>
Larkspur	Root rot	<i>Phytophthora, Pythium</i>
Larkspur	Stem rot	<i>Rhizoctonia</i>
Lavender	Root rot	<i>Phytophthora</i>
Leatherleaf fern	Blight	<i>Ascochyta, Rhizoctonia</i>
Leatherleaf fern	Leaf spot	<i>Cercospora, Cylindrocladium</i>
Leopard plant	Root rot	<i>Rhizoctonia</i>
Leucothoe	Leaf spot	<i>Cercospora</i>
Leucothoe	Root rot	<i>Fusarium, Phytophthora, Pythium, Rhizoctonia, Thielaviopsis</i>
Liatris	Leaf spot	<i>Phyllosticta, Septoria</i>
Liatris	Rust	<i>Coleosporium, Puccinia</i>
Ligularia	Root rot	<i>Rhizoctonia</i>
Ligularia	Stem rot	<i>Rhizoctonia</i>
Ligustrum	Leaf spot	<i>Cercospora</i>

Ornamental Plant (Latin name)	Diseases	Pathogen (Genus and/or species)
Ligustrum	Powdery mildew	<i>Microsphaera</i>
Ligustrum	Root rot	<i>Fusarium, Phytophthora, Pythium, Rhizoctonia, Thielaviopsis</i>
Ligustrum	Twig canker	<i>Botryodiplodia</i>
Ligustrum	Web blight	<i>Rhizoctonia</i>
Lily	Blight	<i>Phytophthora</i>
Lily	Gray mold	<i>Botrytis</i>
Lily	Root rot	<i>Rhizoctonia</i>
Linden	Anthrachnose	<i>Gloeosporium</i>
Linden	Leaf spot	<i>Cercospora</i>
Lipstick	Leaf spot	<i>Cercospora</i>
Liriope	Anthrachnose	<i>Colletotrichum</i>
Liriope	Crown rot	<i>Fusarium</i>
Liriope	Leaf and crown rot	<i>Phytophthora</i>
Liriope	Leaf spot	<i>Cercospora</i>
Liriope	Root rot	<i>Fusarium, Rhizoctonia</i>
Lobelia	Leaf spot	<i>Cercospora, Septoria</i>
Lobelia	Root rot	<i>Fusarium, Phytophthora, Pythium, Rhizoctonia, Thielaviopsis</i>
Locust, black	Anthrachnose	<i>Colletotrichum</i>
Locust, black	Leaf spot	<i>Cercospora</i>
Locust, black	Powdery mildew	<i>Microsphaera</i>
Loquat	Bacterial leaf scorch	<i>Xylella fastidiosa</i>
Loquat	Fire blight	<i>Erwinia amylovora</i>
Loquat	Root rot	<i>Armillaria</i>
Loquat	Twig dieback	<i>Botryodiplodia</i>
Loropetalum	Bacterial stem gall	<i>Pseudomonas</i>
Loropetalum	Root rot	<i>Armillaria, Phytophthora, Pythium, Rhizoctonia</i>
Lupine	Gray mold	<i>Botrytis</i>

Ornamental Plant (Latin name)	Diseases	Pathogen (Genus and/or species)
Lupine	Leaf spot	<i>Cercospora, Ramularia</i>
Lupine	Powdery mildew	<i>Erysiphe</i>
Lupine	Rust	<i>Uromyces</i>
Lupine	Stem rot	<i>Fusarium, Rhizoctonia</i>
Magnolia	Algal leaf spot	<i>Cephaleuros</i>
Magnolia	Leaf spot	<i>Cercospora, Colletotrichum, Gloesporium, Septoria</i>
Magnolia	Spot anthracnose	<i>Elsinoe</i>
Magnolia	Root rot	<i>Armillaria, Phytophthora, Pythium</i>
Magnolia	Tip dieback	<i>Phoma</i>
Mahonia	Leaf spot	<i>Cercospora, Phyllosticta</i>
Maiden Grass	Sheath blight	<i>Sclerotinia</i>
Maple	Anthracnose	<i>Gloeosporium</i>
Maple	Leaf spot	<i>Alternaria, Phyllosticta</i>
Maple	Powdery mildew	<i>Uncinula</i>
Maple	Root rot	<i>Phytophthora, Pythium</i>
Maranta	Root rot	<i>Phytophthora, Pythium</i>
Marigold	Head blight	<i>Botrytis</i>
Marigold	Leaf spot	<i>Ascochyta, Cercospora, Septoria</i>
Marigold	Root rot	<i>Phytophthora, Pythium, Rhizoctonia</i>
Marigold	Rust	<i>Puccinia</i>
Marigold	Stem rot	<i>Fusarium, Rhizoctonia</i>
Mimosa	Leaf spot	<i>Cercospora</i>
Mock orange	Blight	<i>Botrytis</i>
Mock orange	Leaf spot	<i>Cercospora</i>
Mock orange	Powdery mildew	<i>Phyllactinia</i>
Mock orange	Rust	<i>Gymnosporangium</i>
Mondo grass (<i>Ophiopogon</i> sp.)	Anthracnose	<i>Colletotrichum</i>

Ornamental Plant (Latin name)	Diseases	Pathogen (Genus and/or species)
Mondo grass (<i>Ophiopogon</i> sp.)	Leaf and crown rot	<i>Fusarium, Phytophthora</i>
Mondo grass (<i>Ophiopogon</i> sp.)	Root rot	<i>Rhizoctonia</i>
Morning glory	Leaf spot	<i>Cercospora</i>
Morning glory	Rust	<i>Coleosporium, Puccinia</i>
Mulberry	Bacterial leaf scorch	<i>Xylella fastidiosa</i>
Mulberry	Leaf spot	<i>Cercospora</i>
Mulberry	Powdery mildew	<i>Uncinula</i>
Mulberry	Rust	<i>Cerotelium</i>
Mulberry, French	Leaf spot	<i>Cercospora</i>
Nandina	Anthracnose	<i>Glomerella</i>
Nandina	Bacterial leaf scorch	<i>Xylella fastidiosa</i>
Nandina	Leaf spot	<i>Cercospora</i>
Narcissus	Blight	<i>Botrytis</i>
Narcissus	Root rot	<i>Rhizoctonia</i>
Nasturium	Gray mold	<i>Botrytis</i>
Nasturium	Leaf spot	<i>Cercospora</i>
Nasturium	Root rot	<i>Fusarium, Phytophthora, Pythium, Rhizoctonia, Thielaviopsis</i>
Natal plum	Anthracnose	<i>Colletotrichum</i>
Natal plum	Blight	<i>Rhizoctonia</i>
Natal plum	Leaf spot	<i>Phyllosticta</i>
Natal plum	Powdery mildew	<i>Oidium</i>
Nematanthus	Root rot	<i>Phytophthora</i>
Nemesia	Necrotic spot	<i>Impatiens necrotic spot virus</i>
Nephrolepis	Root rot	<i>Phytophthora, Pythium</i>
Nephthytis	Leaf spot	<i>Cephalosporium</i>
Nephthytis	Root rot	<i>Phytophthora, Pythium</i>
Norfolk Island pine	Root rot	<i>Phytophthora, Pythium</i>

Ornamental Plant (Latin name)	Diseases	Pathogen (Genus and/or species)
Oak	Anthracnose	<i>Gloeosporium</i>
Oak	Bacterial flux	<i>Bacteria</i>
Oak	Bacterial leaf scorch	<i>Xylella fastidiosa</i>
Oak	Heart rot	<i>Ganoderma, Polyporus</i>
Oak	Leaf blister	<i>Taphrina</i>
Oak	Leaf spot	<i>Actinopelte, Cercospora, Septoria</i>
Oak	Powdery mildew	<i>Erysiphe, Microsphaera, Phyllactinia, Sphaerotheca</i>
Oak	Root rot	<i>Armillaria, Phytophthora</i>
Oak	Rust	<i>Cronartium</i>
Oleander	Anthracnose	<i>Gloeosporium</i>
Oleander	Bacterial leaf scorch	<i>Xylella fastidiosa</i>
Oleander	Leaf spot	<i>Cercospora, Septoria</i>
Oleander	Spot anthracnose	<i>Sphaceloma</i>
Orchid	Black rot	<i>Phytophthora</i>
Orchid	Blossom blight	<i>Botrytis</i>
Orchid	Root rot	<i>Fusarium, Phytophthora, Pythium</i>
Orchid (<i>Phalaenopsis</i> sp.)	Mosaic	<i>Cymbidium mosaic virus</i>
Oregon grape	Leaf spot	<i>Cercospora</i>
Oregon grape	Rust	<i>Puccinia</i>
Osage orange	Gray mold	<i>Botrytis</i>
Osage orange	Leaf spot	<i>Cercospora, Ovularia</i>
Osage orange	Rust	<i>Cerotelium</i>
Osmanthus	Bacterial leaf scorch	<i>Xylella fastidiosa</i>
Osmanthus	Leaf spot	<i>Phyllosticta, Septoria</i>
Oyster plant	Leaf spot	<i>Cercospora, Colletotrichum, Curvularia</i>
Oxalis	Rust	<i>Puccinia</i>
Pachysandra	Blight	<i>Volutella</i>

Ornamental Plant (Latin name)	Diseases	Pathogen (Genus and/or species)
Pachysandra	Leaf spot	<i>Phyllosticta</i>
Pachysandra	Stem rot	<i>Rhizoctonia</i>
Palm, Canary Island Date	Rachis blight	<i>Botryodiplodia, Serenomyces</i>
Palm, Canary Island Date	Fusarium wilt	<i>Fusarium oxysporum</i> f. sp. <i>canariensis</i>
Palm, Canary Island Date	Lethal bronzing	<i>Candidatus Phytoplasma palmae</i> 16SrV-D
Palm, Canary Island Date	Lethal yellowing	<i>Candidatus Phytoplasma palmae</i> 16SrV-A
Palm, Date	Heart rot	<i>Ganoderma</i>
Palm, Date	Lethal bronzing	<i>Candidatus Phytoplasma palmae</i> 16SrV-D
Palm, Fan	Bud rot	<i>Phytophthora</i>
Palm, Fan	Lethal bronzing (Mexican fan palm)	<i>Candidatus Phytoplasma palmae</i> 16SrV-D
Palm, Parlor	Leaf spot	<i>Helminthosporium</i>
Palm, Sabal	Heart rot	<i>Ganoderma</i>
Palm, Sabal	Leaf spot	<i>Ascochyta, Phyllosticta</i>
Palm, Sabal	Lethal bronzing	<i>Candidatus Phytoplasma palmae</i> 16SrV-D
Palm, Sabal	Root rot	<i>Rhizoctonia</i>
Palm, Sylvester	Leaf spot	<i>Graphiola</i>
Palm, Sylvester	Lethal yellowing	<i>Candidatus Phytoplasma palmae</i> 16SrV-A
Palm, Washingtonia	Leaf spot	<i>Cercospora, Colletotrichum</i>
Palm, Windmill	Bud or heart rot	<i>Phytophthora</i>
Palm, Chinese Windmill	Lethal bronzing	<i>Candidatus Phytoplasma palmae</i> 16SrV-D
Palm, Chinese Windmill	Lethal yellowing	<i>Candidatus Phytoplasma palmae</i> 16SrV-A
Pansy	Anthracnose	<i>Colletotrichum</i>
Pansy	Blight	<i>Botrytis</i>
Pansy	Downy mildew	<i>Peronospora</i>

Ornamental Plant (Latin name)	Diseases	Pathogen (Genus and/or species)
Pansy	Leaf spot	<i>Alternaria, Cercospora, Phyllosticta, Septoria</i>
Pansy	Powdery mildew	<i>Sphaerotheca</i>
Pansy	Root rot	<i>Fusarium, Phytophthora, Pythium, Rhizoctonia, Thielaviopsis</i>
Pansy	Rust	<i>Puccinia</i>
Pansy	Stem rot	<i>Rhizoctonia</i>
Partridge berry	Stem rot	<i>Rhizoctonia</i>
Paulownia	Leaf spot	<i>Phyllosticta</i>
Paulownia	Powdery mildew	<i>Phyllactinia, Uncinula</i>
Pawpaw	Leaf spot	<i>Phyllosticta, Septoria</i>
Pearl bush	Fire blight	<i>Erwinia amylovora</i>
Pear, flowering	Bacterial leaf scorch	<i>Xylella fastidiosa</i>
Pear, flowering	Fire blight	<i>Erwinia amylovora</i>
Pear, flowering	Leaf spot	<i>Entomopsporium</i>
Pear, flowering	Powdery mildew	<i>Podosphaera</i>
Pentas	Leaf spot	<i>Cercospora, Corynespora, Phyllosticta</i>
Pentas	Powdery mildew	<i>Oidium</i>
Pentas	Stem rot	<i>Fusarium, Rhizoctonia</i>
Peony	Aerial blight	<i>Phytophthora</i>
Peony	Blossom blight	<i>Botrytis</i>
Peony	Leaf spot	<i>Alternaria</i>
Peperomia	Leaf spot	<i>Cercospora</i>
Peperomia	Root rot	<i>Phytophthora, Pythium, Rhizoctonia</i>
Periwinkle	Gray mold	<i>Botrytis</i>
Periwinkle	Leaf spot	<i>Colletotrichum, Phyllosticta</i>
Periwinkle	Root rot	<i>Phytophthora, Rhizoctonia</i>
Periwinkle	Web blight	<i>Rhizoctonia</i>
Persimmon	Anthracnose	<i>Gloeosporium</i>

Ornamental Plant (Latin name)	Diseases	Pathogen (Genus and/or species)
Persimmon	Powdery mildew	<i>Podosphaera</i>
Petunia	Aerial blight	<i>Phytophthora</i>
Petunia	Gray mold	<i>Botrytis</i>
Petunia	Leaf spot	<i>Ascochyta, Cercospora</i>
Petunia	Powdery mildew	<i>Oidium</i>
Petunia	Root rot	<i>Phytophthora, Pythium, Rhizoctonia</i>
Philodendron	Aerial blight	<i>Phytophthora</i>
Philodendron	Bacterial Leaf spot	<i>Erwinia</i>
Philodendron	Leaf spot	<i>Dactylaria</i>
Philodendron	Root rot	<i>Phytophthora, Pythium, Rhizoctonia</i>
Phlox	Anthracnose	<i>Colletotrichum</i>
Phlox	Powdery mildew	<i>Erysiphe</i>
Phlox	Root rot	<i>Phytophthora, Pythium</i>
Phlox	Rust	<i>Puccinia</i>
Phlox	Southern blight	<i>Agroathelia rolfii</i>
Phlox	Stem Rot	<i>Rhizoctonia</i>
Phlox, perennial	Gray mold	<i>Botrytis</i>
Phlox, perennial	Leaf spot	<i>Cercospora, Septoria</i>
Phlox, perennial	Powdery mildew	<i>Erysiphe</i>
Phlox, perennial	Rust	<i>Puccinia, Uromyces</i>
Phlox, perennial	Stem rot	<i>Rhizoctonia, Sclerotinia</i>
Photinia	Leaf spot	<i>Cercospora, Entomosporium</i>
Photinia	Powdery mildew	<i>Oidium</i>
Photinia	Root rot	<i>Fusarium, Phytophthora, Pythium, Rhizoctonia, Thielaviopsis</i>
Photinia	Rust	<i>Gymnosporangium</i>
Photinia	Twig dieback	<i>Botryodiplodia</i>
Pieris	Dieback	<i>Phytophthora</i>

Ornamental Plant (Latin name)	Diseases	Pathogen (Genus and/or species)
Pieris	Leaf spot	<i>Phyllosticta</i>
Pieris	Root rot	<i>Phytophthora, Pythium</i>
Pilea	Root rot	<i>Phytophthora, Pythium</i>
Pink	Gray mold	<i>Botrytis</i>
Pink	Leaf spot	<i>Septoria</i>
Pink	Root rot	<i>Phytophthora, Pythium</i>
Pink	Stem rot	<i>Rhizoctonia</i>
Pine	Blight	<i>Lophodermella</i>
Pine	Brown spot	<i>Scirrhia</i>
Pine	Canker	<i>Scleroderis</i>
Pine	Needle cast	<i>Lophodermium</i>
Pine	Root rot	<i>Phytophthora, Pythium, Rhizoctonia</i>
Pine	Rust	<i>Cronartium</i>
Pine	Tip blight	<i>Sirococcus</i>
Pine	Wilt	<i>Pine wilt nematode</i>
Pineapple guava	Leaf spot	<i>Cercospora</i>
Pittosporum	Leaf spot	<i>Cercospora, Phyllosticta</i>
Pittosporum	Root rot	<i>Phytophthora, Pythium, Rhizoctonia</i>
Plane-tree	Powdery mildew	<i>Microsphaera</i>
Plumbago	Leaf spot	<i>Cercospora</i>
Plumbago	Powdery mildew	<i>Oidium</i>
Podocarpus	Root rot	<i>Phytophthora, Pythium</i>
Poinsettia	Blight	<i>Amphobotrys, Botrytis</i>
Poinsettia	Mosaic virus	Poinsettia mosaic virus
Poinsettia	Root rot	<i>Phytophthora, Pythium, Rhizoctonia</i>
Poinsettia	Scab	<i>Sphaceloma</i>
Pomegranate	Anthracnose	<i>Colletotrichum</i>
Pomegranate	Spot anthracnose	<i>Sphaceloma</i>

Ornamental Plant (Latin name)	Diseases	Pathogen (Genus and/or species)
Poplar	Leaf spot	<i>Marssonina</i>
Poplar	Powdery mildew	<i>Uncinula</i>
Poplar	Rust	<i>Melampsora</i>
Poppy	Gray mold	<i>Botrytis</i>
Poppy	Leaf spot	<i>Cercospora</i>
Poppy	Stem rot	<i>Rhizoctonia</i>
Portulaca	Root rot	<i>Phytophthora, Pythium</i>
Portulaca	Stem rot	<i>Rhizoctonia</i>
Potentilla	Rust	<i>Phragmidium</i>
Pothos	Leaf spot	<i>Alternaria, Fusarium, Helminthosporium</i>
Pothos	Root rot	<i>Phytophthora, Pythium, Rhizoctonia</i>
Prayer plant	Leaf spot	<i>Helminthosporium</i>
Primrose	Blight	<i>Botrytis</i>
Primrose	Root rot	<i>Phytophthora, Pythium</i>
Privet	Leaf spot	<i>Cercospora</i>
Privet	Powdery mildew	<i>Microsphaera</i>
Pyracantha	Fire blight	<i>Erwinia amylovora</i>
Pyracantha	Leaf spot	<i>Fabraea</i>
Pyracantha	Powdery mildew	<i>Podosphaera</i>
Pyracantha	Scab	<i>Venturia</i>
Quince	Leaf spot	<i>Fabraea</i>
Quince	Rust	<i>Gymnosporangium</i>
Redbud	Leaf spot	<i>Cercospora</i>
Rose	Black spot	<i>Diplocarpon</i>
Rose	Blossom blight	<i>Botrytis</i>
Rose	Crown gall	<i>Agrobacterium tumefaciens</i>
Rose	Crown rot	<i>Phytophthora</i>
Rose	Downy mildew	<i>Peronospora sparsa</i>
Rose	Leaf spot	<i>Alternaria, Cercospora</i>

Ornamental Plant (Latin name)	Diseases	Pathogen (Genus and/or species)
Rose	Powdery mildew	<i>Sphaerotheca</i>
Rose	Root rot	<i>Armillaria, Phytophthora, Pythium, Rhizoctonia</i>
Rose	Rust	<i>Phragmidium</i>
Rose	Rose rosette disease	<i>Rose rosette virus</i>
Rose	Spot anthracnose	<i>Elsinoe</i>
Rose	Stem canker	<i>Botryodiplodia</i>
Rose	Storage rot	<i>Botrytis</i>
Rose of Sharon	Leaf spot	<i>Cercospora, Cristulariella, Phyllosticta</i>
Rudbeckia	Leaf spot	<i>Cercospora, Septoria</i>
Rudbeckia	Powdery mildew	<i>Erysiphe</i>
Rudbeckia	Rust	<i>Uromyces</i>
Russian olive	Leaf spot	<i>Cercospora</i>
Russian olive	Rust	<i>Puccinia</i>
	Stem canker	<i>Phytophthora</i>
Sage, Texas	Powdery mildew	<i>Oidium</i>
St. John's-wort	Rust	<i>Uromyces</i>
Salvia	Blight	<i>Botrytis</i>
Salvia	Downy mildew	<i>Peronospora</i>
Salvia	Leaf spot	<i>Cercospora</i>
Salvia	Mosaic	<i>Clerodendron golden mosaic China virus Phytophthora, Pythium</i>
Salvia	Root rot	<i>Rhizoctonia</i>
Salvia	Root and stem rot	<i>Puccinia</i>
Salvia	Rust	
Sansevieria	Anthrachnose	<i>Colletotrichum</i>
Sansevieria	Root rot	<i>Phytophthora, Pythium</i>
Santolina	Blight	<i>Rhizoctonia</i>
Sassafras	Leaf spot	<i>Phyllosticta, Septoria</i>

Ornamental Plant (Latin name)	Diseases	Pathogen (Genus and/or species)
Sassafras	Laurel wilt	<i>Raffaelea lauricola</i>
Sassafras	Powdery mildew	<i>Phyllactinia</i>
Scabiosa	Leaf spot	<i>Cercospora, Ramularia, Septoria</i>
Scabiosa	Powdery mildew	<i>Erysiphe</i>
Scabiosa	Rust	<i>Puccinia</i>
Schefflera	Anthrachnose	<i>Colletotrichum</i>
Schefflera	Blight	<i>Alternaria</i>
Schefflera	Leaf spot	<i>Cercospora</i>
Schefflera	Root rot	<i>Phytophthora, Pythium, Rhizoctonia</i>
Schefflera	Twig blight	<i>Pestalotia, Phomopsis</i>
Sedum	Anthrachnose	<i>Colletotrichum</i>
Sedum	Leaf spot	<i>Cercospora, Corynespora, Phyllosticta, Septoria</i>
Sedum	Powdery mildew	<i>Erysiphe</i>
Sedum	Root rot	<i>Phytophthora, Pythium</i>
Sedum	Stem rot	<i>Fusarium, Rhizoctonia</i>
Seedlings, general	Damping-off	<i>Pythium, Rhizoctonia</i>
Sempervivum	Root rot	<i>Phytophthora, Pythium</i>
Shasta daisy	Root rot	<i>Phytophthora, Pythium</i>
Sinningia	Root rot	<i>Phytophthora, Pythium</i>
Snapdragon	Blight	<i>Botrytis</i>
Snapdragon	Downy mildew	<i>Peronospora</i>
Snapdragon	Leaf spot	<i>Cercospora, Colletotrichum, Phyllosticta</i>
Snapdragon	Powdery mildew	<i>Erysiphe</i>
Snapdragon	Root rot	<i>Fusarium, Phytophthora, Pythium, Rhizoctonia, Thielaviopsis</i>
Snapdragon	Rust	<i>Puccinia</i>
Snapdragon	Stem rot	<i>Rhizoctonia</i>

Ornamental Plant (<i>Latin name</i>)	Diseases	Pathogen (<i>Genus and/or species</i>)
Snapdragon	White mold	<i>Sclerotinia sclerotiorum</i>
Sourwood	Leaf spot	<i>Cercospora, Phyllosticta</i>
Spathiphyllum	Leaf spot	<i>Alternaria, Colletotrichum</i>
Spathiphyllum	Root rot	<i>Phytophthora, Pythium, Rhizoctonia</i>
Spathiphyllum	Stem blight	<i>Rhizoctonia</i>
Spider plant	Downy mildew	<i>Peronospora</i>
Spider plant	Leaf spot	<i>Cercospora</i>
Spiraea	Leaf spot	<i>Cercospora</i>
Spiraea	Powdery mildew	<i>Podosphaera</i>
Star magnolia	Leaf spot	<i>Cercospora, Colletotrichum, Phyllosticta</i>
Statice	Anthracnose	<i>Colletotrichum</i>
Statice	Leaf blight	<i>Alternaria, Botrytis, Cercospora</i>
Statice	Leaf spot	<i>Alternaria, Botrytis, Fusarium, Helminthosporium</i>
Statice	Root rot	<i>Fusarium, Phytophthora, Pythium, Rhizoctonia, Thielaviopsis</i>
Stock	Gray mold	<i>Botrytis</i>
Stock	Leaf spot	<i>Alternaria</i>
Stock	White rust	<i>Albugo</i>
Stokesia	Head blight	<i>Botrytis</i>
Stokesia	Leaf spot	<i>Ascochyta, Cercospora, Phyllosticta</i>
Strawberry geranium	Leaf spot	<i>Cercospora</i>
Strawflower	Downy mildew	<i>Bremia</i>
Stromanthe	Root rot	<i>Phytophthora, Pythium</i>
Sumac	Leaf blister	<i>Taphrina</i>
Sumac	Leaf spot	<i>Cercospora, Septoria</i>
Sumac	Rust	<i>Pileolaria</i>
Sunflower	Downy mildew	<i>Plasmopara</i>

Ornamental Plant (<i>Latin name</i>)	Diseases	Pathogen (<i>Genus and/or species</i>)
Sunflower	Leaf and stem blight	<i>Alternariaster helianthi</i>
Sunflower	Leaf spot	<i>Cercospora, Septoria</i>
Sunflower	Powdery mildew	<i>Erysiphe</i>
Sunflower	Rust	<i>Puccinia</i>
Swamp red maple	Root rot	<i>Phytophthora</i>
Sweet gum	Anthracnose	<i>Gloeosporium</i>
Sweet gum	Leaf spot	<i>Cercospora, Septoria</i>
Sweet olive	Anthracnose	<i>Colletotrichum</i>
Sweet olive	Bacterial leaf scorch	<i>Xylella fastidiosa</i>
Sweet olive	Root rot	<i>Armillaria, Phytophthora</i>
Sweet pea	Downy mildew	<i>Peronospora</i>
Sweet pea	Gray mold	<i>Botrytis</i>
Sweet pea	Leaf spot	<i>Ascochyta, Colletotrichum, Phyllosticta</i>
Sweet pea	Powdery mildew	<i>Erysiphe, Microsphaera</i>
Sweet pea	Rust	<i>Uromyces</i>
Sweet pea	Stem rot	<i>Rhizoctonia</i>
Sweet william	Leaf spot	<i>Heterosporium</i>
Sycamore	Anthracnose	<i>Gloeosporium</i>
Sycamore	Leaf spot	<i>Cercospora, Septoria, Tubakia</i>
Sycamore	Root rot	<i>Phytophthora</i>
Syngonium	Leaf spot	<i>Cephalosporium</i>
Syngonium	Root rot	<i>Fusarium, Phytophthora, Pythium, Rhizoctonia, Thielaviopsis</i>
Tallow	Leaf spot	<i>Phomopsis, Phyllosticta</i>
Tecoma	Root rot	<i>Phytophthora</i>
Titi	Leaf spot	<i>Phyllosticta</i>
Titi	Root rot	<i>Phytophthora, Pythium, Rhizoctonia</i>
Tritoma	Anthracnose	<i>Colletotrichum</i>

Ornamental Plant (Latin name)	Diseases	Pathogen (Genus and/or species)
Tuberous begonia	Leaf spot	<i>Cercospora, Phomopsis, Phyllosticta</i>
Tuberous begonia	Powdery mildew	<i>Erysiphe</i>
Tuberous begonia	Rot	<i>Pythium, Rhizoctonia</i>
Tulips	Anthracnose	<i>Gloeosporium</i>
Tulips	Blight	<i>Botrytis</i>
Tulips	Bulb rot	<i>Fusarium, Penicillium</i>
Tulips	Root rot	<i>Rhizoctonia</i>
Tulip poplar	Anthracnose	<i>Colletotrichum</i>
Tulip poplar	Leaf spot	<i>Phyllosticta, Septoria</i>
Tulip poplar	Powdery mildew	<i>Oidium</i>
Tung oil	Anthracnose	<i>Glomerella</i>
Tung oil	Leaf spot	<i>Cercospora, Phyllosticta</i>
Tupelo	Leaf spot	<i>Cercospora, Phyllosticta</i>
Tupelo	Rust	<i>Aplopsora</i>
Turkey ivy	Leaf spot	<i>Ramularia, Septoria</i>
Verbena	Flower blight	<i>Botrytis</i>
Verbena	Leaf spot	<i>Cercospora, Septoria</i>
Verbena	Powdery mildew	<i>Erysiphe</i>
Verbena	Root rot	<i>Phytophthora, Pythium, Rhizoctonia</i>
Verbena	Rust	<i>Puccinia</i>
Viburnum	Anthracnose	<i>Colletotrichum</i>
Viburnum	Leaf spot	<i>Cercospora</i>
Viburnum	Powdery mildew	<i>Microsphaera</i>
Viburnum	Root rot	<i>Armillaria</i>
Viburnum	Rust	<i>Puccinia</i>
Viburnum	Stem canker	<i>Botryosphaeria</i>
Vinca	Flower blight	<i>Botrytis</i>
Vinca	Root rot	<i>Phytophthora, Pythium, Rhizoctonia</i>

Ornamental Plant (Latin name)	Diseases	Pathogen (Genus and/or species)
Vinca	Slime mold	<i>Stemonitis</i>
Vinca	Web blight	<i>Rhizoctonia</i>
Viola	Root rot	<i>Phytophthora</i>
Violet	Downy mildew	<i>Bremiella</i>
Violet	Gray mold	<i>Botrytis</i>
Violet	Leaf spot	<i>Cercospora, Colletotrichum, Phyllosticta</i>
Violet	Powdery mildew	<i>Sphaerotheca</i>
Violet	Root rot	<i>Phytophthora, Pythium, Rhizoctonia</i>
Violet	Rust	<i>Puccinia</i>
Violet	Spot anthracnose	<i>Sphaceloma</i>
Violet	Stem rot	<i>Fusarium, Rhizoctonia</i>
Vitex	Leaf spot	<i>Cercospora</i>
Walnut	Leaf spot	<i>Gnomonia</i>
Walnut	Powdery mildew	<i>Microsphaera</i>
Wandering yew	Gray mold	<i>Botrytis</i>
Wandering yew	Leaf spot	<i>Cercospora, Colletotrichum</i>
Wandering yew	Root rot	<i>Fusarium, Phytophthora, Rhizoctonia</i>
Wax myrtle	Leaf spot	<i>Cercospora, Phyllosticta, Septoria</i>
Wax myrtle	Rust	<i>Gymnosporangium</i>
Weeping Willow	Powdery mildew	<i>Uncinula</i>
Weeping Willow	Rust	<i>Melampsora</i>
Weeping Willow	Twig blight	<i>Diplodia</i>
Weeping Willow	Root rot	<i>Armillaria</i>
Weigela	Leaf spot	<i>Cercospora</i>
Witch hazel	Leaf spot	<i>Phyllosticta</i>
Witch hazel	Powdery mildew	<i>Podosphaera</i>
Yarrow	Anthracnose	<i>Colletotrichum</i>

Ornamental Plant (<i>Latin name</i>)	Diseases	Pathogen (<i>Genus and/or species</i>)
Yarrow	Powdery mildew	<i>Erysiphe</i>
Yarrow	Root rot	<i>Rhizoctonia</i>
Yarrow	Rust	<i>Puccinia</i>
Yaupon	Anthraxnose	<i>Colletotrichum</i>
Yaupon	Leaf spot	<i>Diplodia, Macrophoma, Phyllosticta</i>
Yew	Root rot	<i>Armillaria, Phytophthora, Pythium</i>
Yew	Twig blight	<i>Physalospora</i>
Yucca	Anthraxnose	<i>Colletotrichum</i>
Zinnia	Bacterial leaf spot	<i>Xanthomonas</i>
Zinnia	Blight	<i>Botrytis</i>
Zinnia	Leaf blight	<i>Alternaria</i>
Zinnia	Leaf spot	<i>Cercospora</i>
Zinnia	Powdery mildew	<i>Erysiphe</i>
Zinnia	Root rot	<i>Phytophthora, Pythium, Rhizoctonia</i>
Zinnia	Stem rot	<i>Fusarium, Rhizoctonia, Sclerotinia</i>
Zygocactus	Root rot	<i>Fusarium, Phytophthora, Pythium, Rhizoctonia, Thielaviopsis</i>

Table 2. Diseases of ornamentals and fungicides and bactericides for disease management.

Disease	Fungicides and Bactericides	Disease	Fungicides and Bactericides
Aerial blight (<i>Phytophthora</i>)	ametoctradin + dimethomorph	Anthracnose	maneb
Aerial blight (<i>Phytophthora</i>)	aluminum tris	Anthracnose	metconazole
Aerial blight (<i>Phytophthora</i>)	azoxystrobin	Anthracnose	myclobutanil
Aerial blight (<i>Phytophthora</i>)	boscalid + pyraclostrobin	Anthracnose	propiconazole
Aerial blight (<i>Phytophthora</i>)	chlorothalonil	Anthracnose	thiophanate-methyl
Aerial blight (<i>Phytophthora</i>)	copper hydroxide	Anthracnose	trifloxystrobin
Aerial blight (<i>Phytophthora</i>)	cyazofamid	Anthracnose	triticonazole
Aerial blight (<i>Phytophthora</i>)	dimethomorph	Bacterial blight	aluminum tris (suppression only)
Aerial blight (<i>Phytophthora</i>)	maneb	Bacterial blight	copper hydroxide
Aerial blight (<i>Phytophthora</i>)	mancozeb	Bacterial blight	copper sulfate
Aerial blight (<i>Phytophthora</i>)	phosphite	Bacterial blight	phosphite (suppression only)
Aerial blight (<i>Phytophthora</i>)	trifloxystrobin	Bacterial leaf rot	streptomycin sulfate
Aerial blight (<i>Rhizoctonia</i>)	chlorothalonil	Bacterial leaf spot	copper hydroxide
Aerial blight (<i>Rhizoctonia</i>)	fludioxonil	Bacterial leaf spot	copper sulfate
Aerial blight (<i>Rhizoctonia</i>)	flutolanil	Bacterial stem rot	streptomycin sulfate
Aerial blight (<i>Rhizoctonia</i>)	iprodione	Bacterial wilt	streptomycin sulfate
Aerial blight (<i>Rhizoctonia</i>)	mancozeb	Black root rot	fludioxonil
Aerial blight (<i>Rhizoctonia</i>)	mclobutanil	Black root rot	thiophanate-methyl
Aerial blight (<i>Rhizoctonia</i>)	propiconazole	Black root rot	trifloxystrobin
Aerial blight (<i>Rhizoctonia</i>)	triflumizole	Black root rot	triflumizole
Algal leaf spot (<i>Cephaleurus</i>)	copper hydroxide	Black rot (<i>Sclerotinia</i>)	PCNB
Algal leaf spot (<i>Cephaleurus</i>)	copper sulfate	Black spot	captan
Anthracnose	azoxystrobin	Black spot	chlorothalonil
Anthracnose	boscalid + pyraclostrobin	Black spot	copper hydroxide
Anthracnose	chlorothalonil	Black spot	kresoxim-methyl
Anthracnose	copper hydroxide	Black spot	mancozeb
Anthracnose	copper sulfate	Black spot	maneb
Anthracnose	kresoxim-methyl	Black spot	propiconazole
Anthracnose	mancozeb	Black spot	thiophanate-methyl

Disease	Fungicides and Bactericides
Black spot	trifloxystrobin
Blossom blight	see flower blight
Botrytis blight	azoxystrobin
Botrytis blight	boscalid + pyraclostrobin
Botrytis blight	captan
Botrytis blight	chlorothalonil
Botrytis blight	copper hydroxide
Botrytis blight	copper sulfate
Botrytis blight	fenhexamid
Botrytis blight	fludioxonil
Botrytis blight	iprodione
Botrytis blight	mancozeb
Botrytis blight	maneb
Botrytis blight	metconazole
Botrytis blight	thiophanate-methyl
Botrytis blight	trifloxystrobin
Botrytis blight	triflumizole
Brown spot	mancozeb
Brown spot	propiconazole
Bulb rot	boscalid + pyraclostrobin
Bulb rot	captan
Bulb rot	iprodione
Bulb rot	PCNB
Bulb rot	thiophanate-methyl
Canker	chlorothalonil
Canker	mancozeb
Canker	thiophanate-methyl
Conifer blights	azoxystrobin
Conifer blights	copper sulfate
Conifer blights	mancozeb
Conifer blights	thiophanate-methyl

Disease	Fungicides and Bactericides
Corm rot	see bulb rot
Crown gall	No effective bactericides are available for crown gall management
Crown rot or canker (<i>Cylindrocladium</i> and other fungi)	boscalid + pyraclostrobin
Crown rot or canker (<i>Cylindrocladium</i> and other fungi)	fludioxonil
Crown rot or canker (<i>Cylindrocladium</i> and other fungi)	mancozeb
Crown rot or canker (<i>Cylindrocladium</i> and other fungi)	thiophanate-methyl
Crown rot or canker (<i>Cylindrocladium</i> and other fungi)	trifloxystrobin
Crown rot or canker (<i>Cylindrocladium</i> and other fungi)	triflumizole
Crown rot (<i>Phytophthora</i>)	aluminum tris
Crown rot (<i>Phytophthora</i>)	boscalid + pyraclostrobin
Crown rot (<i>Phytophthora</i>)	cyazofamid
Crown rot (<i>Phytophthora</i>)	dimethomorph
Crown rot (<i>Phytophthora</i>)	etridiazole
Crown rot (<i>Phytophthora</i>)	phosphite
Damping-off (<i>Pythium</i>)	boscalid + pyraclostrobin
Damping-off (<i>Pythium</i>)	captan
Damping-off (<i>Pythium</i>)	cyazofamid
Damping-off (<i>Pythium</i>)	etridiazole
Damping-off (<i>Pythium</i>)	mefenoxam
Damping-off (<i>Pythium</i>)	propamocarb hydrochloride
Damping-off (<i>Rhizoctonia</i>)	boscalid + pyraclostrobin
Damping-off (<i>Rhizoctonia</i>)	captan
Damping-off (<i>Rhizoctonia</i>)	flutolanil
Damping-off (<i>Rhizoctonia</i>)	PCNB
Damping-off (<i>Rhizoctonia</i>)	metconazole
Dieback	copper hydroxide

Disease	Fungicides and Bactericides
Dieback	copper sulfate
Dieback	thiophanate-methyl
Downy mildew	ametoctradin + dimethomorph
Downy mildew	aluminum tris
Downy mildew	azoxystrobin
Downy mildew	boscalid + pyraclostrobin
Downy mildew	copper hydroxide
Downy mildew	copper sulfate
Downy mildew	cyazofamid
Downy mildew	dimethomorph
Downy mildew	fluopicolide
Downy mildew	kresoxim-methyl
Downy mildew	mancozeb
Downy mildew	mandipropamid
Downy mildew	phosphite
Downy mildew	trifloxystrobin
Fire blight	aluminum tris (suppression only)
Fire blight	copper hydroxide
Fire blight	copper sulfate
Fire blight	phosphite (suppression only)
Flower blight	captan
Flower blight	chlorothalonil
Flower blight	iprodione
Flower blight	mancozeb
Flower blight	myclobutanil
Flower blight	PCNB
Flower blight	propiconazole
Flower blight	thiophanate-methyl
Flower blight	triadimefon
Flower spot	chlorothalonil
Fusarium wilt	triflumizole

Disease	Fungicides and Bactericides
Gray mold	see Botrytis blight
Head blight	propiconazole
Leaf blight	chlorothalonil
Leaf blight	copper hydroxide
Leaf blight	fludioxonil
Leaf blight	iprodione
Leaf blight	mancozeb
Leaf blight	maneb
Leaf blight	metconazole
Leaf blight	propiconazole
Leaf blight	thiophanate-methyl
Leaf blight	triadimefon
Leaf blister	chlorothalonil
Leaf blister	copper sulfate
Leaf blister	mancozeb
Leaf curl	see leaf blister
Leaf gall	boscalid + pyraclostrobin
Leaf gall	triadimefon
Leaf spot	azoxystrobin
Leaf spot	boscalid + pyraclostrobin
Leaf spot	captan
Leaf spot	chlorothalonil
Leaf spot	copper hydroxide
Leaf spot	copper sulfate
Leaf spot	fludioxonil
Leaf spot	iprodione
Leaf spot	kresoxim-methyl
Leaf spot	mancozeb
Leaf spot	maneb
Leaf spot	metconazole
Leaf spot	myclobutanil

Disease	Fungicides and Bactericides
Leaf spot	propiconazole
Leaf spot	thiophanate-methyl
Leaf spot	triadimefon
Leaf spot	trifloxystrobin
Leaf spot	triflumizole
Needle blight	copper sulfate
Needle cast	copper sulfate
Needle cast	mancozeb
Needle rust	azoxystrobin
Needle rust	myclobutanil
Petal blight	see flower blight
Petiole rot (<i>Myrothecium</i>)	fludioxonil
Petiole rot (<i>Myrothecium</i>)	trifloxystrobin
Petiole rot (<i>Myrothecium</i>)	triflumizole
Powdery mildew	azoxystrobin
Powdery mildew	boscalid + pyraclostrobin
Powdery mildew	calcium polysulfide
Powdery mildew	chlorothalonil
Powdery mildew	copper hydroxide
Powdery mildew	copper oleate
Powdery mildew	copper sulfate
Powdery mildew	fenarimol
Powdery mildew	kresoxim-methyl
Powdery mildew	metconazole
Powdery mildew	myclobutanil
Powdery mildew	piperalin
Powdery mildew	propiconazole
Powdery mildew	sulfur
Powdery mildew	thiophanate-methyl
Powdery mildew	triadimefon
Powdery mildew	trifloxystrobin

Disease	Fungicides and Bactericides
Powdery mildew	triflumizole
Powdery mildew	triforine
Powdery mildew	triticonazole
Purple spot	mancozeb
Ray blight (<i>Ascochyta</i> blight)	chlorothalonil
Ray blight (<i>Ascochyta</i> blight)	iprodione
Ray blight (<i>Ascochyta</i> blight)	mancozeb
Ray blight (<i>Ascochyta</i> blight)	maneb
Ray blight (<i>Ascochyta</i> blight)	myclobutanil
Ray blight (<i>Ascochyta</i> blight)	propiconazole
Ray blight (<i>Ascochyta</i> blight)	thiophanate-methyl
Rhizome rot	see bulb rot
Root rot (<i>Phytophthora</i> , <i>Pythium</i>)	ametoctradin + dimethomorph (for <i>Phytophthora</i> only)
Root rot (<i>Phytophthora</i> , <i>Pythium</i>)	aluminum tris
Root rot (<i>Phytophthora</i> , <i>Pythium</i>)	boscalid + pyraclostrobin
Root rot (<i>Phytophthora</i> , <i>Pythium</i>)	cyazofamid
Root rot (<i>Phytophthora</i> , <i>Pythium</i>)	dimethomorph
Root rot (<i>Phytophthora</i> , <i>Pythium</i>)	etridiazole
Root rot (<i>Phytophthora</i> , <i>Pythium</i>)	fluopicolide
Root rot (<i>Phytophthora</i> , <i>Pythium</i>)	mefenoxam
Root rot (<i>Phytophthora</i> , <i>Pythium</i>)	phosphite
Root rot (<i>Phytophthora</i> , <i>Pythium</i>)	propamocarb hydrochloride
Root rot (<i>Phytophthora</i> , <i>Pythium</i>)	trifloxystrobin
Root rot (<i>Cylindrocladium</i> , <i>Fusarium</i> , <i>Rhizoctonia</i> , <i>Thielaviopsis</i> , etc.)	azoxystrobin
Root rot (<i>Cylindrocladium</i> , <i>Fusarium</i> , <i>Rhizoctonia</i> , <i>Thielaviopsis</i> , etc.)	fludioxonil
Root rot (<i>Cylindrocladium</i> , <i>Fusarium</i> , <i>Rhizoctonia</i> , <i>Thielaviopsis</i> , etc.)	flutolanil
Root rot (<i>Cylindrocladium</i> , <i>Fusarium</i> , <i>Rhizoctonia</i> , <i>Thielaviopsis</i> , etc.)	iprodione

Disease	Fungicides and Bactericides
Root rot (<i>Cylindrocladium</i> , <i>Fusarium</i> , <i>Rhizoctonia</i> , <i>Thielaviopsis</i> , etc.)	PCNB
Root rot (<i>Cylindrocladium</i> , <i>Fusarium</i> , <i>Rhizoctonia</i> , <i>Thielaviopsis</i> , etc.)	thiophanate-methyl
Root rot (<i>Cylindrocladium</i> , <i>Fusarium</i> , <i>Rhizoctonia</i> , <i>Thielaviopsis</i> , etc.)	trifloxystrobin
Root rot (<i>Cylindrocladium</i> , <i>Fusarium</i> , <i>Rhizoctonia</i> , <i>Thielaviopsis</i> , etc.)	triflumizole
Rust	azoxystrobin
Rust	boscalid + pyraclostrobin
Rust	calcium polysulfide
Rust	captan
Rust	chlorothalonil
Rust	copper sulfate
Rust	fenarimol
Rust	flutolanil
Rust	kresoxim-methyl
Rust	mancozeb
Rust	maneb
Rust	metconazole
Rust	myclobutanil
Rust	propiconazole
Rust	sulfur
Rust	triadimefon
Rust	trifloxystrobin
Rust	triflumizole
Rust	triforine
Scab	azoxystrobin
Scab	boscalid + pyraclostrobin
Scab	chlorothalonil
Scab	copper hydroxide
Scab	copper sulfate

Disease	Fungicides and Bactericides
Scab	fenarimol
Scab	kresoxim-methyl
Scab	mancozeb
Scab	metconazole
Scab	myclobutanil
Scab	propiconazole
Scab	thiophanate-methyl
Scab	trifloxystrobin
Scab	triflumizole
Scab	triticonazole
Shoot blight (<i>Phytophthora</i>)	see aerial blight caused by <i>Phytophthora</i> spp.
Southern blight	azoxystrobin
Southern blight	fludioxonil
Southern blight	flutolanil
Stem rot (<i>Phytophthora</i>)	aluminum-tris
Stem rot (<i>Phytophthora</i>)	dimethomorph
Stem rot (<i>Phytophthora</i>)	etridiazole
Stem rot (<i>Phytophthora</i>)	mefenoxam
Stem rot (<i>Phytophthora</i>)	phosphite
Stem rot (fungal)	fludioxonil
Stem rot (fungal)	iprodione
Stem rot (fungal)	maneb
Stem rot (fungal)	PCNB
Stem rot (fungal)	thiophanate-methyl
Stem rot (fungal)	trifloxystrobin
Stem rot (fungal)	triticonazole
Storage rot	lprodione
Thread blight	see aerial blight caused by <i>Rhizoctonia</i> spp.
Tip blight	myclobutanil
Tip blight	propiconazole

Disease	Fungicides and Bactericides
Tip blight	thiophanate-methyl
Tip blight	triadimefon
Tuber rot	see bulb rot
Twig blight	chlorothalonil
Twig blight	copper hydroxide
Twig blight	copper sulfate
Twig blight	myclobutanil
Twig blight	thiophanate-methyl
Twig dieback	copper sulfate
Twig dieback	thiophanate-methyl
Web blight	see aerial blight caused by <i>Rhizoctonia</i> spp.
White rust	myclobutanil
Wilt (<i>Cylindrocladium</i>)	iprodione
Wilt (<i>Cylindrocladium</i>)	triflumizole

Table 3. Recommended pesticides, rates and pesticide use restrictions for ornamentals.

Common Name	FRAC Code ¹	Trade Names ²	REI (hr) ³	Comments
aluminum tris (or fosetyl-al)	33	Aliette WDG	12	Not compatible with copper-containing fungicides (do not apply within 7 days of each other).
aluminum tris (or fosetyl-al)	33	Fosal Select	12	Not compatible with copper-containing fungicides (do not apply within 7 days of each other).
azoxystrobin	11	Heritage	4	Make no more than 3 sequential applications: no more than 8 applications or 10 pounds per crop acre per year.
azoxystrobin	11	Heritage G	4	Make no more than 3 sequential applications: no more than 8 applications or 10 pounds per crop acre per year.
azoxystrobin	11	Heritage TL	4	Make no more than 3 sequential applications: no more than 8 applications or 10 pounds per crop acre per year.
captan	M4	Captan 50WP	96	NA
captan	M4	Captan 80WDG	96	NA
captan	M4	Captec 4L	96	NA
chlorothalonil	M5	AllPro Exotherm Termil	12	NA
chlorothalonil	M5	Chlorostar DF	12	NA
chlorothalonil	M5	Chlorostar VI	12	NA
chlorothalonil	M5	Chlorothalonil 720F	12	NA
chlorothalonil	M5	Countdown LandG	12	NA
chlorothalonil	M5	Daconil Ultrex	12	NA
chlorothalonil	M5	Daconil Weather Stik	12	NA
chlorothalonil	M5	Daconil Zn	12	NA
chlorothalonil	M5	Echo 720 Turf and Ornamental	12	NA
chlorothalonil	M5	Echo Ultimate Turf and Ornamental	12	NA
chlorothalonil	M5	Ensign 720	12	NA
chlorothalonil	M5	Ensign 82.5% Turf and Ornamental	12	NA
chlorothalonil	M5	Initiate 720	12	NA
chlorothalonil	M5	Mainsail 6.0F	12	NA
chlorothalonil	M5	Mainsail WDG	12	NA
chlorothalonil	M5	Manicure 6 Flowable Turf and Ornamental	12	NA

Common Name	FRAC Code ¹	Trade Names ²	REI (hr) ³	Comments
chlorothalonil	M5	Manicure Ultrex Turf and Ornamental	12	NA
chlorothalonil	M5	Quali-Pro Chlorothalonil 500ZN	12	NA
chlorothalonil	M5	Quali-Pro Chlorothalonil DF	12	NA
chlorothalonil	M5	Quali-Pro Chlorothalonil 700 SFT	12	NA
copper hydroxide	M1	Badge SC	24	Should not be applied in a spray solution with a pH of less than 6.5.
copper hydroxide	M1	Champ DP	24	Should not be applied in a spray solution with a pH of less than 6.5.
copper hydroxide	M1	Kocide 3000	24	Should not be applied in a spray solution with a pH of less than 6.5.
cyazofamid	21	Segway	12	For control of <i>Phytophthora</i> , <i>Pythium</i> and downy mildews (see label); no more than 2 soil applications or 4 foliar applications per crop cycle.
dimethomorph	40	Stature SC	12	For control of downy mildews, aerial <i>Phytophthora</i> and <i>Phytophthora</i> root, crown and stem rots; no more than 2 sequential applications; no more than 8 applications per crop (greenhouse) or 30.6 fluid ounces per acre per year (outdoors); not for landscape use.
etridiazole	14	Terrazole 35WP	12	For control of <i>Pythium</i> and <i>Phytophthora</i> only.
etridiazole	14	Terrazole L	12	For control of <i>Pythium</i> and <i>Phytophthora</i> only.
etridiazole	14	Truban 25EC	12	For control of <i>Pythium</i> and <i>Phytophthora</i> only.
fenarimol	3	Rubigan A.S.	12	For control of powdery mildew.
fenhexamid	17	Decree 50WDG	12	For <i>Botrytis</i> only; no more than 2 sequential applications; use no more than 6 pounds per acre per season (outdoors) or 2.2 ounces per crop cycle (greenhouse).
fludioxonil	12	Medallion	12	Use no more than 80 pounds per year or crop (indoor), 4 pounds per acre per year (outdoor, field-grown) or 8 pounds per acre per year (outdoor, container-grown); Mozart for use in greenhouses only.
fludioxonil	12	Mozart TR	12	Use no more than 80 pounds per year or crop (indoor), 4 pounds per acre per year (outdoor, field-grown) or 8 pounds per acre per year (outdoor, container-grown); Mozart for use in greenhouses only.
fluopicolide	43	Adorn	12	For downy mildew, <i>Phytophthora</i> and <i>Pythium</i> diseases; no more than 2 sequential applications per year. See label for additional restrictions.

Common Name	FRAC Code ¹	Trade Names ²	REI (hr) ³	Comments
flutolanil	7	Contrast 70WSP	12	For diseases caused by Basidiomycetes; not for use in the landscape; no more than 4 applications per year.
flutolanil	7	ProStar 70WDG	12	For diseases caused by Basidiomycetes; not for use in the landscape; no more than 4 applications per year.
flutolanil	7	ProStar 70WP	12	For diseases caused by Basidiomycetes; not for use in the landscape; no more than 4 applications per year.
imazalil	3	Fungaflor TR	24	For use in greenhouses only.
iprodione	2	26GT	12	Not for residential use.
iprodione	2	Chipco 26019	12	Not for residential use.
iprodione	2	Chipco 26019 Flo	12	Not for residential use.
iprodione	2	Chipco 26019 N/G	12	Not for residential use.
iprodione	2	Iprodione Pro 2SE	12	Not for residential use.
iprodione	2	Iprodione SPC	12	Not for residential use.
iprodione	2	OHP 26 GT-O	12	Not for residential use.
kresoxim-methyl	11	Cygnus	12	Not for use in residential landscapes; no more than 2 sequential applications; no more than 6 applications per season (outdoors) or 8 applications or 25.6 ounces per acre per year (greenhouse).
mancozeb	M3	Dithane 75DF Rainshield	24	NA
mancozeb	M3	Fore 80WP Rainshield	24	NA
mancozeb	M3	Penncozeb (4F, 70DF, 80WP)	24	NA
mancozeb	M3	Protect DF	24	NA
mandipropamid	40	Micora	4	For both greenhouse and outdoor grown ornamentals; for control of downy mildew and <i>Phytophthora</i> diseases; no more than 2 sequential applications per year.
maneb	M3	Maneb 75DF	24	No longer being manufactured, but supplies may be available.
maneb	M3	Maneb 80WP	24	No longer being manufactured, but supplies may be available.
mefenoxam	4	Fenox ME	0	For control of <i>Pythium</i> and <i>Phytophthora</i> by soil application only; not for landscape use.

Common Name	FRAC Code ¹	Trade Names ²	REI (hr) ³	Comments
mefenoxam	4	Mefenoxam 2AQ	0	For control of <i>Pythium</i> and <i>Phytophthora</i> by soil application only; not for landscape use.
mefenoxam	4	Subdue GR	0	For control of <i>Pythium</i> and <i>Phytophthora</i> by soil application only; not for landscape use.
mefenoxam	4	Subdue Maxx	0	For control of <i>Pythium</i> and <i>Phytophthora</i> by soil application only; Subdue Maxx can be used in commercial and residential landscapes.
mefenoxam	4	Subdue WSP	0	For control of <i>Pythium</i> and <i>Phytophthora</i> by soil application only; not for landscape use.
metconazole	3	Tourney	0	Use no more than 4 lb per acre per year; not for greenhouse use.
myclobutanil	3	Eagle 20EW	24	NA
myclobutanil	3	Eagle 40WP	24	NA
myclobutanil	3	Eagle WSP	24	NA
myclobutanil	3	Hoist	24	NA
myclobutanil	3	Myclobutanil 20EW Turf and Ornamental	24	NA
pentachloronitro-benzene (PCNB)	14	Glacier (10G and 4F)	12	For soil application.
pentachloronitro-benzene (PCNB)	14	Parflo 4F	12	For soil application.
pentachloronitro-benzene (PCNB)	14	Turfcide 10% Granular	12	For soil application.
phosphites, various salts	33	Agri-fos	4	NA
phosphites, various salts	33	Alude	4	NA
phosphites, various salts	33	Fosphite	4	NA
phosphites, various salts	33	Fungi-Phite Turf and Ornamental	4	NA
phosphites, various salts	33	Primera Magellan	4	NA
phosphites, various salts	33	Rampart Turf and Ornamental	4	NA
phosphites, various salts	33	Vital	4	NA
piperalin	5	Pipron	12	For control of powdery mildew only; for use only in commercial greenhouses or other structures with impermeable roofs.
propamocarb hydrochloride	28	Banol	24	For control of <i>Pythium</i> and <i>Phytophthora</i> ; not for use in landscapes.
propamocarb hydrochloride	28	Proplant	24	For control of <i>Pythium</i> and <i>Phytophthora</i> ; not for use in landscapes.

Common Name	FRAC Code ¹	Trade Names ²	REI (hr) ³	Comments
propiconazole	3	Banner 1.1EC	24	Not for use in greenhouses; no more than 5.4 gallons per acre per crop per year (outdoors).
propiconazole	3	Banner MAXX	24	NA
propiconazole	3	Banner Pro	24	NA
propiconazole	3	Dorado	24	NA
propiconazole	3	Fathom 14.3MEC	24	NA
propiconazole	3	Fitness	24	NA
propiconazole	3	Honor Guard PPZ	24	NA
propiconazole	3	ProPensity 1.3ME	24	NA
propiconazole	3	Propiconazole E-Pro 14.3 MEC	24	NA
propiconazole	3	Propiconazole G-Pro	24	NA
propiconazole	3	Propiconazole EC	24	NA
propiconazole	3	Propiconazole 14.3	24	NA
propiconazole	3	Propimax EC	24	NA
propiconazole	3	Propi-Star EC	24	NA
propiconazole	3	Savvi	24	NA
propiconazole	3	Strider	24	NA
thiophanate-methyl	1	3336 (DG, F, GC and WP)	12	NA
thiophanate-methyl	1	Allban (50WSB and Flo)	12	NA
thiophanate-methyl	1	Cavalier (50WSB and F)	12	NA
thiophanate-methyl	1	Fungo (50WSB and Flo)	12	NA
thiophanate-methyl	1	OHP 6672 (4.5L and 50W)	12	NA
thiophanate-methyl	1	Quali-Pro TM (4.5 and 85WDG)	12	NA
thiophanate-methyl	1	SysTec 1998	12	NA
thiophanate-methyl	1	Tee-Off 4.5F	12	NA
thiophanate-methyl	1	T-Methyl E-Pro (4.5F, 50 WSB, GC and Granular)	12	NA
thiophanate-methyl	1	Transom (4.5F and 50WSB)	12	NA
thiophanate-methyl	1	T-Storm	12	NA
triadimefon	3	Bayleton 50 Turf and Ornamental Fungicide	12	NA

Common Name	FRAC Code ¹	Trade Names ²	REI (hr) ³	Comments
triadimefon	4	Bayleton Flo	12	NA
triadimefon	5	Strike 50WDG	12	NA
trifloxystrobin	11	Compass	12	No more than two sequential applications (one for powdery mildew); no more than 34.5 ounces per acre per year (outdoors) or 120 ounces per acre per year (indoors).
trifloxystrobin	12	Compass O 50WDG	12	No more than two sequential applications (one for powdery mildew); no more than 34.5 ounces per acre per year (outdoors) or 120 ounces per acre per year (indoors).
triflumizole	3	Terraguard SC	12	SC formulation is for nursery use only. SC/LS formulation is for landscape use only.
triflumizole	3	Terraguard SC/LS	12	SC formulation is for nursery use only. SC/LS formulation is for landscape use only.
triticonazole	3	Trinity TR	12	No more than two sequential applications; no more than 216 fl oz per acre.
ziram	M3	Ziram 76DF	48	NA
ametoctradin + dimethomorph	45, 40	Orvego	12	No more than 56 fl oz per acre per crop per year for outdoor use; no more than 4 applications per crop per growing season.
boscalid + pyraclostrobin	7, 11	Pageant	12	No more than 7.3 pounds per acre per year.
chlorothalonil + propiconazole	M5, 3	Concert	12	NA
chlorothalonil + thiophanate-methyl	M5, 1	ConSyst	12	NA
chlorothalonil + thiophanate-methyl	M5, 2	Prominence	12	NA
chlorothalonil + thiophanate-methyl	M5, 3	Spectro 90	12	NA
copper hydroxide + mancozeb	M1, M3	Junction	24	NA
cyprodinil + fludioxonil	9, 12	Palladium	12	Not for use on residential plantings.
etridiazole + thiophanate-methyl	14, 1	Banrot 8G	12	NA
etridiazole + thiophanate-methyl	14, 2	Banrot 40WP	12	NA
fludioxonil + mefenoxam	12, 4	Hurricane WDG	48	Not for use in landscapes or field plantings.
flutolanil + thiophanate-methyl	7, 1	SysStar WDG	12	Not for use in landscapes.
iprodione + thiophanate-methyl	2, 1	26/36	12	Not for residential use.
mancozeb + myclobutanil	M3, 3	Clevis	24	NA
mancozeb + thiophanate-methyl	M3, 1	Zyban	24	NA

Common Name	FRAC Code ¹	Trade Names ²	REI (hr) ³	Comments
propamocarb hydrochloride + fluopicolide	28, 43	Stellar	12	For control of downy mildews, <i>Phytophthora</i> and <i>Pythium</i> .
triadimefon + trifloxystrobin	3, 11	Armada 50WDG	12	For interior and landscape use only.
triadimefon + trifloxystrobin	3, 12	Armada 50WP	13	For interior and landscape use only.

¹ Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

² Reference to commercial or trade names is made with the understanding that no discrimination or endorsement of a particular product is implied by LSU or the LSU AgCenter.

³ Re-entry interval.

The ornamentals section was revised October 2023 by Boyd Padgett.

Commercial Crop Production: Small Fruits

Blackberry

Blackberries are the most commonly grown brambles in Louisiana. Blackberries are native to Louisiana and most commercial cultivars are well-adapted to growing conditions in the state. Thorny type varieties such as CVs. Brazos, Brison, Womack are very productive and early bearing in Louisiana but are susceptible to the fungal disease rosette (double blossom). These cultivars require careful attention to disease management tactics such as pruning on time and preventative fungicide spray programs. Alternatives to the thorny varieties are CVs. Navaho and Arapaho, which are thornless types. These two varieties are not as susceptible to double blossom and don't require as high a level of management as the thorny types

Disease

Symptoms, source of inoculum and management of soybean diseases.

Disease	Symptoms	Source of Inoculum	Management
Anthrachnose (<i>Elsinoe veneta</i>)	Symptoms appear on canes and leaves. Both current and second-year canes can be affected. Circular, light gray spots form on canes; as the disease progresses the spots become sunken with a dark purple margin. Leaf spots start off yellow, turn grey with a purple border and eventually dry up and drop out, resulting in shot holes. Fruit may ripen abnormally and have an "off" flavor. Anthracnose can cause loss of winter hardiness.	The fungus overwinters on bark and cane lesions. In the spring spores are produced, released and spread to new canes by splashing rain and wind.	Remove and destroy infected canes. Do not compost canes. Remove and destroy wild brambles. Immediately after harvest remove floricanes to reduce overwintering fungus. Follow a fungicide spray program. Do not use lime sulfur.
Botrytis fruit rot and cane blight (<i>Botrytis cinerea</i>)	White lesions (bleaching effect) form on new canes and floricanes. Cane blight is more severe on blackberries than raspberries. Botrytis causes flowers to shrivel and turn brown. As the fruit develops and ripens, the fruit becomes soft and covered with grey tufts of fungal spores.	The fungus survives as sclerotia (overwintering structure) on infected canes and dead leaves and as spores on mummified fruit. During wet and cool conditions, sclerotia germinate and the fungus begins to sporulate. Spores are dispersed by wind, rain and overhead irrigation.	Promote good air circulation in the planting by pruning and trellising plants. Minimize the use of nitrogen fertilizer. Partial resistance is available for red raspberry varieties. Minimize fruit damage during harvest. Follow a fungicide spray schedule.
Cane blight (<i>Leptosphaeria coniothyrium</i>)	Dark red to purple lesions form on the canes around wounds. Lesions may be on one side of the cane or may girdle it and kill the shoots.	The fungus survives in infected tissues and dead canes. Spores are rain-splashed.	Prune out infected canes and remove floricanes immediately after harvest. Avoid wounding the plants.
Cane and leaf rust (<i>Kuehneola uredinis</i>)	First seen on floricanes in late spring when large yellow pustules split the bark. Small yellow pustules develop on the lower surface of leaves on the floricane and may lead to premature defoliation.	The fungus overwinters on infected canes. Spores are wind dispersed.	Prune out old diseased canes after harvest. Follow the fungicide spray schedule.

Disease	Symptoms	Source of Inoculum	Management
Orange rust (<i>Gymnoconia nitens</i>)	Disease is evident on new growth in spring as many weak, spindly shoots are formed rather than one strong shoot. Bright orange pustules form on the undersides of infected leaves, and no blooms are produced on the floricanes.	The fungus overwinters within systemically infected canes. Spores are wind dispersed.	Use only disease-free planting materials. Remove infected plants as soon as they are observed. Follow a fungicide spray schedule.
Phytophthora root rot (<i>Phytophthora</i> spp.)	Infected primocanes may rapidly wilt and die in the spring, or they (and the floricanes) may slowly become chlorotic, wilt and die in the summer. Infected roots exhibit a reddish-brown discoloration of the cortex.	The pathogen can be introduced on infected planting material, but it also survives in soil. Spreads primarily in water.	Use disease-free transplants, improve drainage and avoid low spots. Rogue out infected plants and treat surrounding plants with fungicide.
Powdery mildew (<i>Podosphaera aphanis</i>)	A whitish gray coat covers both sides of the leaves, flowers, fruit and shoots. Diseased new growth is stunted and distorted.	The fungus overwinters as mycelium or chasmothecia in dormant buds of stunted cane tips. Spores are spread by wind.	Blackberries are not susceptible to powdery mildew. Plant resistant red raspberry varieties such as Chief, Marcy and Malling Orion. Follow a fungicide spray schedule.
Rosette (double blossom) (<i>Cercospora rubi</i>)	Infected buds give rise to a proliferation of small shoots or witches' broom. Infected flower buds give rise to distorted blossoms from which fruit do not develop.	The fungus survives in wild blackberries and dewberries. Spores are wind dispersed.	Eradicate wild blackberries and dewberries in the vicinity. Remove infected blossom clusters before they open. Remove the floricanes immediately after harvest. Follow a fungicide spray schedule.
Septoria leaf spot (<i>Septoria rubi</i>)	Frogeye lesions with whitish centers and brown to purple margins are produced on leaves. Similar lesions are found on canes and petioles.	The fungus overwinters in dead leaves and stems. Spores are wind dispersed.	Follow a fungicide spray schedule for leaf spots.
Spur blight (<i>Didymella applanata</i>)	Symptoms appear in primocanes in late spring. Brownish purple lesions appear just below on the lower portion of the stem just below the leaf or bud. In late fall, the bark of infected canes splits longitudinally. Leaflets may have V-shaped brown lesions with chlorosis.	The fungus survives the winter in lesions on diseased canes. Spores are carried to new growth in the spring by splashing rain and wind.	Promote good air circulation in the planting by pruning and trellising plants. Avoid excessive nitrogen applications, which promote rapid and excessive growth of new tissue. Remove and destroy wild brambles. Follow a fungicide spray schedule.

Table 1. List of disease-resistant thorny blackberry cultivars recommended for production in Louisiana.

Type, cultivars	Anthraco	Rosette (double blossom)	Orange Rust	Sunburn (abiotic)
Brazos	R	S	-	-
Brison	-	S	-	-
Cheyenne	-	S	R	-
Womack	-	S	-	-
Apache	-	S	-	-
Rosborough	-	S	-	-
Shawnee	R	S	R	-
Choctaw	-	S	R	-
Kiowa	-	S	R	-
Chickasaw	R	S	R	-

Table 1, 2 and 3 Legend

Resistance Category	Abbreviation
Susceptible	S
Moderately Susceptible	MS
Moderately Resistant	MR
Resistant	R
No data for the variety or disease	-

Table 2. List of disease-resistant thornless blackberry cultivars recommended for production in Louisiana.

Type, cultivars	Anthraco	Rosette (double blossom)	Orange Rust	Sunburn (abiotic)
Arapaho	-	R	R	-
Navaho	R	MR	S	-
Apache	R	R	-	S
Ouachita	R	R	R	S

Table 3. List of disease-resistant trailing blackberry cultivars recommended for production in Louisiana.

Type, cultivars	Anthraco	Rosette (double blossom)	Orange Rust	Sunburn (abiotic)
Youngberry	-	S	-	-

Table 4. Seasonal fungicide spray schedule for blackberry, raspberry and other bramble diseases.

Developmental Stage	Diseases	Developmental Stage	Diseases
Delayed dormant (Bud swell to green tip)	Anthrachnose Cane blight Spur blight	Preharvest (14 days before anticipated harvest date)	Anthrachnose Botrytis gray mold Cane blight Leaf spots Rosette Rusts
Shoots 6 inches long until prebloom	Anthrachnose Cane blight Leaf spots Phytophthora root rot Powdery mildew Rusts Spur blight	Harvest	Anthrachnose Botrytis gray mold Cane blight Leaf spots Rosette Rusts
Early bloom (5-10%)	Anthrachnose Botrytis gray mold Cane blight Leaf spots Rosette Rusts	Postharvest	Cane blight Leaf spots Orange cane blotch Phytophthora root rot Powdery mildew Rusts
Full bloom (Bramble bloom periods are protracted. Bloom and cover spray stages can be difficult to define clearly. Make sure that the pathogens indicated are addressed with a thorough fungicide program as defined by the variety but do not exceed labeled rates or spray intervals.)	Anthrachnose Botrytis gray mold Cane blight Leaf spots Rosette Rusts		
Petal fall	Anthrachnose Botrytis gray mold Cane blight Leaf spots Rosette Rusts		
Cover sprays	Anthrachnose Botrytis gray mold Cane blight Leaf spots Rosette Rusts		

Table 5. Efficacy of selected fungicides against blackberry, raspberry and other bramble diseases.**Table Legend**

Efficacy	Rating
Excellent	5
Very Good	4
Good	3
Fair	2
Poor	1
Ineffective	-

Table was reproduced from the 2023 Southeast Regional Caneberries Integrated Management Guide (https://secure.caes.uga.edu/extension/publications/files/pdf/AP%20121-3_1.PDF).

The efficacy rating could be affected by resistance development. If resistance has occurred, use of fungicides in the same class would likewise show resistance, and a substitute fungicide should be considered for pathogen management.

No data is provided for products not labeled for the specific disease or if the efficacy is unknown. These ratings are benchmarks; actual performance will vary.

Chemical name	Product Name	Anthracnose	Cane blight	Spur blight	Leaf spots	Botrytis gray mold	Rusts	Powdery mildew	Rosette	Phytophthora root rot
azoxystrobin	Abound FL	5	5	5	4	-	5	5	5	-
azoxystrobin + propiconazole	Quilt Xcel	5	5	5	4	-	5	5	5	-
captan	Captan 80WDG, Captec 4L, Captan 50W	3	2	2	-	2	-	-	-	-
copper	various products	1	1	1	-	-	-	-	-	-
myclobutanil	Rally 40WSP	-	3 After pruning	-	-	-	5	5	-	-
mono and di-potassium salts of phosphorus acid or potassium phosphite	K-phite or ProPhyt	-	-	-	-	-	-	-	-	4
pyraclostrobin	Cabrio EG	5	5	5	5	-	5	5	-	-
pyraclostrobin + boscalid	Pristine WG	5	5	5	4	4 ^R	5	-	5	-
cyprodinil + fludioxonil	Switch 62.5WG	-	-	-	-	5	-	-	5	-
fenhexamid	Elevate 50WDG	-	-	-	-	5	-	-	-	-
iprodione	Rovral 4F, Nevado 4F	-	-	-	-	3	-	-	-	-
mefenoxam	Ridomil Gold SL	-	-	-	-	-	-	-	-	4
fosetyl-AL	Aliette WDG	-	-	-	-	-	-	-	-	4
sulfur	various products	-	-	-	-	-	-	3	-	-
propiconazole	Tilt 3.6EC	-	-	-	4	-	5	-	-	-
oxathiapiprolin	Orondis Gold 200	-	-	-	-	-	-	-	-	4

^R Isolates of this pathogen with resistance to this fungicide have been identified in southeastern United States.

Table 6. Recommended pesticides, rates and pesticide use restrictions for blackberry, raspberry and other bramble diseases.

Chemical Name	Product Name ¹	Product Mode of Action Group ²	Rate ³	Maximum Use	PHI ⁴	Diseases
azoxystrobin	Abound FL	11	6.0-15.5 fl oz	92.3 fl oz	0	Anthrachnose, Cane blight, Leaf spots, Rosette, Rusts, Spur blight
azoxystrobin + propiconazole	Quilt Xcel	11, 3	14-21 fl oz	105 fl oz	30	Anthrachnose, Cane blight, Leaf spots, Powdery mildew, Rosette, Spur blight
captan	Captan 50WP	M4	2-4 lb	10 lb ai	3	Anthrachnose, Cane blight, Leaf spots, Spur blight
captan	Captec 4L	M4	0.75-1.0 qt/100 gal	10 lb ai	3	Anthrachnose, Cane blight, Leaf spots, Spur blight
copper	ChampWG	M1	2-3 lb	See labels	1-2	Anthrachnose, Cane blight, Leaf spots, Orange cane blotch, Spur blight
copper	Kocide 3000	M1	0.8-1.3 lb	See labels	1-2	Anthrachnose, Cane blight, Leaf spots, Orange cane blotch, Spur blight
copper	Kocide 2000	M1	1.5-2.3 lb	See labels	1-2	Anthrachnose, Cane blight, Leaf spots, Orange cane blotch, Spur blight
copper	Cuprofix Disperss	M1	2.5-5 lb	See labels	0.5	Anthrachnose, Cane blight, Leaf spots, Orange cane blotch, Spur blight
copper	Cuprofix Ultra 40 Disperss	M1	1.25-2.5 lb	See labels	0.5	Anthrachnose, Cane blight, Leaf spots, Orange cane blotch, Spur blight
fosetyl-AL	Aliette WDG	33	5 lb	20 lb	60	Phytophthora root rot
myclobutanil	Rally 40WSP	3	1.25-3 oz	10 oz	0	Powdery mildew, Rusts
phosphorous acids	Confine Extra	33	1-3 qt	See labels	0	Leaf spots, Phytophthora root rot
phosphorous acids	Fosphite	33	1-3 qt	See labels	0	Leaf spots, Phytophthora root rot
phosphorous acids	Fungi-phite	33	1-2 qt	6 app	0	Leaf spots, Phytophthora root rot
phosphorous acids	Helena Prophyt	33	4 pt	4 app	0	Leaf spots, Phytophthora root rot
phosphorous acids	Rampart	33	1-3 qt	See labels	0	Leaf spots, Phytophthora root rot
propiconazole	Bumper 41.8EC	3	6 fl oz	30 fl oz	30	Leaf spots (post-harvest only), Rusts, Powdery mildew
propiconazole	Propi-Star EC	3	6 fl oz	30 fl oz	30	Leaf spots (post-harvest only), Rusts, Powdery mildew
propiconazole	Tilt	3	6 fl oz	30 fl oz	30	Leaf spots (post-harvest only), Rusts, Powdery mildew
propiconazole	Topaz	3	6 fl oz	30 fl oz	30	Leaf spots (post-harvest only), Rusts, Powdery mildew
pyraclostrobin	Cabrio EG	11	14 oz	56 oz	0	Anthrachnose, Cane blight, Leaf spots, Powdery mildew, Rusts

Chemical Name	Product Name ¹	Product Mode of Action Group ²	Rate ³	Maximum Use	PHI ⁴	Diseases
pyraclostrobin + boscalid	Pristine WG	11, 7	18.5-23 oz	92 oz	0.5	Anthracnose, Botrytis gray mold, Cane blight, Leaf spots, Powdery mildew, Rosette, Rusts, Spur blight
cyprodinil + fludioxonil	Switch 62.5WG	9, 12	11-14 oz	56 oz	0	Botrytis gray mold
fenhexamid	Elevate 50WDG	17	1.5 lb	6 lb	0	Botrytis gray mold (resistance isolates have been detected in other regions of the south)
iprodione	Iprodione 4L AG	2	1-2 pt	4 app	0	Botrytis fruit rot
iprodione	Nevado 4F	2	1-2 pt	4 app	0	Botrytis fruit rot
iprodione	Rovral 4F	2	1-2 pt	4 app	0	Botrytis fruit rot
mefenoxam	Ridomil Gold SL	4	0.25 pt/1,000 linear feet, 3 ft band	1 app	See label	Phytophthora root rot (raspberries only)
sulfur	Microfine Sulfur	M	10-30 lb	See labels	1	Anthracnose, Cane blight, Powdery mildew, Spur blight
sulfur	Microthiol Disperss	M	6-15 lb	See labels	1	Anthracnose, Cane blight, Powdery mildew, Spur blight
sulfur	Yellow Jacket Dusting Sulfur	M	3-50 lb	See labels	1	Anthracnose, Cane blight, Powdery mildew, Spur blight

¹ Reference to commercial or trade names is made with the understanding that no discrimination is intended nor endorsement of a particular product by LSU or the LSU AgCenter is implied.

² Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

³ Rates are the amount of formulation (product) per acre unless otherwise indicated.

⁴ Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

The blackberry (brambles) section was revised October 2023 by R. Singh.

Blueberry

Integrated Blueberry Disease Management

Successful management of blueberry diseases requires an integrated approach. Choosing appropriate varieties, a well-suited planting site and good soil preparation are all important for preventing blueberry disease problems. Well-drained soil is especially important for preventing Phytophthora root rot, one of the most significant blueberry diseases. For protection from both frost and disease problems, it also may be beneficial to choose a site from which air can easily drain (not low sites).

Select varieties appropriate for your region. For variety recommendations as well as information on how to choose a suitable site and prepare the soil before planting, see LSU AgCenter publications 2363, “Commercial Blueberry Production,” or the Mississippi State University Extension Service publication 1758, “Establishment and Maintenance of Blueberries.”

Start with clean plants. Use plants that have been propagated from clean (disease-free) planting material and check plants for disease symptoms before planting.

Use good cultural practices. Pruning is recommended to remove dead, damaged or diseased limbs so that sunlight and pesticides can penetrate the plant canopy. Pruning recommendations are provided in the LSU AgCenter publication 2363, “Commercial Blueberry Production.” Applying one inch of mulch under plants each year may help minimize the effects of mummy berry disease. Avoid using equipment that has been in orchards infected with mummy berry.

Use crop protectants. Prior to using chemicals, have the disease confirmed by a crop specialist. Once the disease has been confirmed, select a labeled product that has been shown to be effective in reducing disease, and apply the product at the correct stage of plant development (Table 1). Chemicals with proven efficacy against a pathogen will not reduce disease if applied at the wrong time. Always rotate between products with different modes of action (in different FRAC groups; see Table 2) to prevent the development of fungicide resistance in the pathogen (disease-causing agent). If a pathogen becomes resistant to a product, the product will no longer be effective. Although some details about chemical application are given in Table 2, always see the label for complete instructions and to determine if changes have been made to the label.

Disease

Symptoms, source of inoculum and management of blueberry diseases.

Disease	Symptoms	Source of Inoculum	Management
Bacterial Leaf Scorch (<i>Xylella fastidiosa</i>)	In susceptible Southern highbush varieties, the edges of leaves turn brown (marginal necrosis) and eventually drop off the plant, and young twigs and stems may turn yellow before plants die. Rabbiteye cultivars may show early fall color, and fruit production may decline over time.	Infected plants serve as reservoirs for this bacterium. Bacteria are transmitted through propagation or by sharpshooter insects.	No chemicals are available for disease management. Plant disease-free plants and choose resistant varieties if planting Southern highbush blueberries. See the Southeast Regional Blueberry Integrated Management Guide for insecticide recommendations for leafhoppers.
Botrytis (Gray Mold) (<i>Botrytis cinerea</i>)	The fungus attacks tender young twigs, leaves, flowers and fruit, causing them to become brown to black. Infected fruit do not rot until after harvest.	The fungus survives as dormant mycelia or sclerotia. Spores are wind dispersed.	Follow a fungicide spray schedule if needed. (See Tables 1 and 2).
Exobasidium Fruit and Leaf Spot (<i>Exobasidium maculosum</i>)	Whitish spots occur on undersides of leaves, with light green spots on the upper sides. Spots turn brown over time. Fruit also has spots, which remain unripe as the rest of the fruit ripens.	The life cycle of this pathogen is still being studied, but it is thought that the fungus overwinters on the surface of the plant and/or in bud scales or bark and infects the plant in the spring.	Plant in areas with good air movement. Prune appropriately to allow air movement and spray penetration. An application of lime sulfur has been found to be very effective when made at bud swell, 1 to 2 weeks before leaf or flower buds break. Other products can be applied from green tip through the cover spray period. (See Tables 1 and 2).
Fruit Rots (<i>Alternaria</i> , <i>Colletotrichum</i>) (including Anthracnose Fruit Rot or Ripe Rot)	A variety of rots develop on the fruit as they mature.	The fungi causing fruit rots survive from year to year on or in infected twigs and for <i>Alternaria</i> , fallen debris.	Harvest ripe fruit regularly and cool it soon after harvest to minimize postharvest disease development. Follow a fungicide spray schedule, at the interval(s) directed on label(s), if needed. (See Tables 1 and 2).

Disease	Symptoms	Source of Inoculum	Management
Leaf Spots (<i>Septoria</i> , rust, anthracnose)	<i>Septoria</i> : Small, circular, light-colored lesions with a purple border are produced on leaves, and sunken lesions may be formed on stems. Rust: spots develop on upper sides of leaves and change from yellow to red to brown. Orange spores are produced on the undersides of leaves.	<i>Septoria</i> : The fungus survives from year to year in infected leaf debris and stems. Spores are windborne. Rust: The fungus is believed to survive on evergreen plants in the blueberry genus (<i>Vaccinium</i>).	If needed, follow a fungicide spray schedule at the interval(s) directed on label(s). (See Tables 1 and 2).
Mummy Berry (<i>Monilinia vaccinii-corymbosi</i>)	This fungus attacks and kills leaves, twigs, flowers and fruit. Infected fruit turn cream to pink as they begin to mature and then shrivel and harden into “mummies.”	The fungus survives in the mummified fruit. Spores are wind-dispersed.	Remove or bury (1-inch depth) mummified fruit. If mummy berry is an ongoing problem, then a fungicide spray schedule should be followed. See Tables 1 and 2. For mummy berry, the first recommended sprays of the season are very important.
Phytophthora Root Rot (<i>Phytophthora cinnamomi</i>)	Initially, leaves become yellow and plant growth ceases. Rootlets are killed, and infected roots and crowns are discolored. Bushes may defoliate and die.	The pathogen survives as chlamydospores in the soil. Disease development is favored by wet soil conditions and temperatures between 68 F and 90 F.	Plant disease-free plants in well-drained soil or raised beds. Mefenoxam or oxathiapiprolin can be applied to soil while plants are dormant. Aluminum tris or “phosphite” (mono- and di-potassium salts of phosphorus acid or potassium phosphite) products can be applied to foliage during the growing season. (See Table 2.) If plants are severely infected, chemicals are not likely to result in a return to healthy plant growth.
Stem Cankers and Blights (<i>Phomopsis</i> , <i>Botryosphaeria</i>)	<i>Phomopsis</i> twig blight: flower-bearing year-old stems die. <i>Botryosphaeria</i> canker: lesions appear on new growth and turn into cankers on susceptible varieties. <i>Botryosphaeria</i> stem blight: individual branches die.	The pathogens survive from year to year in infected stems. Spores are spread by wind or rain. <i>Phomopsis</i> infects stems through flowers.	Avoid mechanical injury to stems. Remove diseased canes/shoots. For <i>Phomopsis</i> twig blight, follow the fungicide spray schedule if needed. (See Tables 1 and 2). Fungicides are not likely to be very effective for management of <i>Botryosphaeria</i> .

Table 1. Seasonal fungicide spray schedule for blueberry.¹

Season	Pesticide Application Timing	Disease
Early spring	At planting or, for established plants, while dormant, plus once while conditions favorable (see Table 3)	Phytophthora root rot
Early spring	At bud swell	Exobasidium
Prebloom	Green tip or, for mummy berry, when 1%-5% of blooms are open (whichever occurs first); repeat as directed on label	Mummy berry, Phomopsis twig blight, Exobasidium
Bloom	10%-20% bloom through full bloom (2-3 applications, at interval specified on label)	Mummy berry, Phomopsis twig blight, Botrytis blight, fruit rots, Exobasidium
Petal fall and cover sprays	Immediately following bloom, followed by applications at 7- to 14-day intervals or as directed on label	Fruit rots, Exobasidium
Summer	Preharvest and harvest	Fruit rots
Summer and Fall	Postharvest	Leaf spots

¹Not all applications will be needed in every field every season. Contact your local extension agent if you need help determining if an application needs to be made.

Table 2. Pesticide efficacy¹ and use.

Chemical Name	Product Choices ²	Mode of Action Group(s) ³	Botrytis (Gray Mold)	Exobasidium Fruit and Leaf Spot	Alternaria Fruit Rot	Mummy Berry	Phomopsis Twig Blight	Phytophthora Root Rot	Ripe Rot/Anthracnose Fruit Rot (Colletotrichum ⁷)	Anthracnose Leaf Spot	Rust	Septoria Leaf Spot	Rate ⁴	PHI ⁵	Maximum Use ⁶
copper-containing products labeled for use on blueberries, including ones with basic copper sulfate, copper hydroxide, copper oxychloride, copper octanoate, copper sulfate pentahydrate, or cuprous oxide	some products OMRI listed ^{OG}	M01	-	-	-	-	-	-	-	-	F	-	see label	typically 0 - see label	see label
calcium polysulfide ¹¹	Lime-Sulfur Solution	M02	-	E	-	-	-	-	-	-	-	-	5 - 6 gal	0	48 gal
ziram	76DF	M03	F	-	F	P	G	-	F	F	-	-	3 lb	see note ¹⁰	
captan	50 WP	M04	F	VG	G	F	F	-	G	G	-	F	5 lb	0	70 lb

Chemical Name	Product Choices ²	Mode of Action Group(s) ³	Botrytis (Gray Mold)	Exobasidium Fruit and Leaf Spot	Alternaria Fruit Rot	Mummy Berry	Phomopsis Twig Blight	Phytophthora Root Rot	Ripe Rot/Anthracnose Fruit Rot (Colletotrichum ⁷)	Anthracnose Leaf Spot	Rust	Septoria Leaf Spot	Rate ⁴	PHI ⁵	Maximum Use ⁶
captan	80 WDG	M04	F	VG	G	F	F	-	G	G	-	F	3.12 lb	0	43.75 lb
captan	4L	M04	F	VG	G	F	F	-	G	G	-	F	see label	0	35 qt
chlorothalonil	Bravo Weather Stik, others	M05	-	-	-	-	-	-	-	VG	VG	VG	3-4 pt	42 ¹⁰	12 pt
aluminum tris	O-ethyl phosphonate; Aliette WDG ⁷	P07	-	-	-	-	P	G ¹²	P	VG	-	VG	5 lbs	0.5	4 apps
mono- and di-potassium salts of phosphorous acid	K-Phite 7LP, others	P07	-	-	-	-	-	VG ¹²	-	VG	-	VG	see label (rate varies by product and application method)	0	see label
potassium phosphite	ProPhyt	P07	-	-	-	-	-	VG ¹²	-	VG	-	VG	4 pt		
fenbuconazole ⁸	Inder 2F	3	-	G	-	E	E	-	-	E	G	E	6 fl oz	30	4 apps
mefentrifluconazole	Cevya	3	-	-	-	E	-	-	-	-	VG	-	3-5 fl oz	0	15 fl oz
metconazole	Quash	3	-	-	E	E	E	-	E	E	VG	E	2.5 oz	7	3 apps
propiconazole	Tilt, others	3	-	-	-	E	E	-	-	-	G	VG	6 fl oz	30	5 apps
prothioconazole	Proline 480 SC	3	-	-	-	E	E	-	-	-	E	G	5.7 fl oz	7	2 apps
mefenoxam	Ridomil Gold SL, ReCon Bold SL, Ultra Flourish XHL	4	-	-	-	-	-	G	-	-	-	-	3.6 pt	0	7.2 pt
mefenoxam	Thrive 4M	4	-	-	-	-	-	G	-	-	-	-	56.5 fl oz	0	112.9 fl oz/2 apps
mefenoxam	Ultra Flourish, Vaunt	4	-	-	-	-	-	G	-	-	-	-	7.2 pt	0	14.4 pt
pydiflumetofen and fludioxonil	Miravis Prime	7, 12	-	-	-	-	-	-	E	-	-	-	9-13.4 fl oz	0	26.8 fl oz
cyprodinil and fludioxonil	Switch 62.5 WG	9, 12	E	-	E	F	G	-	E	G	-	G	11-14 oz	0	56 oz
azoxystrobin	Abound Flowable, others	11	-	-	E	F	F	-	E ^R	VG	G	VG	6.0-15.5 fl oz	0	see label
azoxystrobin and propiconazole	Quilt Xcel, others	11, 3	-	-	E	E	E	-	E ^R	E	E	E	14-21 fl oz	30	3 apps
pyraclostrobin and boscalid	Pristine	11, 7	E	F ^R	E	VG	E	-	E ^R	E	F	E	18.5-23 oz	0	4 apps
fenhexamid	Elevate 50WDG	17	E	-	-	F	-	-	-	-	-	-	1.5 lb	0	6 lb
fluazinam	Omega 500F	29	F	-	G	-	G	-	G	-	-	-	20 fl oz	30	120 fl oz

Chemical Name	Product Choices ²	Mode of Action Group(s) ³	Botrytis (Gray Mold)	Exobasidium Fruit and Leaf Spot	Alternaria Fruit Rot	Mummy Berry	Phomopsis Twig Blight	Phytophthora Root Rot	Ripe Rot/Anthracnose Fruit Rot (Colletotrichum)	Anthracnose Leaf Spot	Rust	Septoria Leaf Spot	Rate ⁴	PHI ⁵	Maximum Use ⁶
oxathiapiprolin	Orondis Gold 200	49	-	-	-	-	-	G	-	-	-	-	4.8-9.6 fl oz	1	19.2 fl oz
oxathiapiprolin, mefenoxam	Orondis Gold	49, 4	-	-	-	-	-	G	-	-	-	-	28-55 fl oz	1	2 apps
fish oil	Organic Gem Liquid Fish Fertilizer ^{OG} , Neptune's Harvest Organic Fish Fertilizer ^{OG}	NC	-	-	-	-	-	-	-	-	-	G	see product instructions		
mineral oil	PureSpray Green ^{OG} , others	UNM	-	-	-	-	-	-	-	-	F	-	see label	0	

^{OG} Product has been listed by the Organic Materials Review Institute (OMRI). Check with your organic certifier to ensure acceptability of a particular product.

¹

Efficacy Rating	Abbreviation
Excellent	E
Very Good	VG
Good	G
Fair	F
Poor	P
Resistant	R
Not Effective or Unknown	-

R = indicates that there is a possibility of resistance to the chemical and that the chemical will not be effective, or as effective as noted, if the pathogen is resistant to it.

- = indicates that the chemical is not expected to be effective for managing the disease or that data is lacking.

Actual performance may vary. Ratings are based largely on the [Southeast Regional Blueberry Integrated Management Guide](#) and the Southeast Regional Organic Blueberry Pest Management Guide of the Southern Region Small Fruit Consortium.

² Chemical name (trade name). Reference to commercial or trade names is made for the reader's convenience and with the understanding that no discrimination or endorsement of a particular product is intended by LSU or the LSU AgCenter. In some cases, other brands are available.

³ Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

⁴ Rates are the amount of formulation (product) per acre unless otherwise indicated. Check label for changes.

⁵ Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest. Check label for changes and for reentry interval (REI), which is longer than PHI in some cases.

⁶ Maximum amount per acre per year or growing season. See labels for additional restrictions and changes.

⁷ Make sure to get the Aliette WDG that is labeled for use on blueberries. There is a product of the same name that is not labeled for blueberries.

⁸ If fenbuconazole (Indar 2F) is used during bloom, it should be mixed with captan to prevent a higher incidence of fruit rot.

⁹ Do not apply later than 3 weeks after full bloom.

¹⁰ Do not apply before harvest, to avoid fruit injury.

¹¹ See labels for restrictions and recommendations regarding use at high temperatures and within given time periods before or after oil applications.

¹² When applied as foliar spray.

The blueberry section was revised October 2024 by Mary Helen Ferguson.

Grape

Disease

Symptoms, source of inoculum and management of grape diseases.

Disease	Symptoms	Source of Inoculum	Management
Anthracnose (<i>Elsinoe ampelina</i> = <i>Sphaceloma ampelinum</i>)	Fruit infections have light gray centers and reddish-brown borders resembling a bird's eye. Stem lesions are similar in color and sunken, with slightly raised borders. Leaf spots are gray with dark borders; later, the center of the lesion drops out, giving a ragged effect. Badly infected leaves become distorted and curl down.	The fungus overwinters in infected fruit on the ground or in infected shoots.	Follow the fungicide spray schedule for grapes. Do not apply Pristine to Concord, Worden, Fredonia, Niagara or related grape varieties because of possible injury.
Black rot (<i>Guignardia bidwellii</i>)	The black rot fungus attacks all parts of the grape plant. Leaf infection appears on the upper surface in early June as tiny reddish-brown spots. The lesions enlarge to 1/4 inch or more in diameter and become brown with black borders. A ring of black fungal bodies develops near the outer edge of the brown area. Lesions on stems and tendrils are longer and darker than those on leaves. Stem lesions are narrow, sunken and often split lengthwise on the vine. Infections begin to appear on the fruit when the berries are about half grown. Initially, a small white spot forms that enlarges rapidly until the entire berry is rotten. Affected berries soon turn black, shrivel and dry up. Minute black fungal fruiting bodies develop on the surface of the dried fruit. On muscadines, lesions on berries are small, black and scabby. The fruit does not rot.	The fungus overwinters in mummified fruit on the vine and ground and within lesions on canes.	Pruning out mummies, cankers and dead wood is very important to reduce inoculum load. Follow the fungicide spray schedule for grapes.
Botrytis bunch rot (<i>Botrytis cinerea</i>)	Infected blooms rot and dry out. Infected berries develop off-color and either dry out (during dry weather) or burst (during wet weather).	The fungus overwinters on canes or in buds. Spores are wind dispersed.	Prune out diseased tissue and destroy. Rake up fallen grapes and destroy. Follow the fungicide spray schedule for grapes.
Downy mildew (<i>Plasmopara viticola</i>)	This is primarily a disease of bunch grapes; muscadines are relatively resistant. All green parts of the vine are susceptible. Leaf lesions are yellowish- to reddish-brown and may appear angular if they are vein delimited. Infected shoot tips tend to curl. Leaves and shoots become covered with white mycelium. Berries appear grayish and are covered with the downy felt-like growth of the pathogen.	The pathogen overwinters in infected leaves. Disease development is boosted by wet weather.	Shred and remove or bury by cultivation diseased leaves. Follow the fungicide spray schedule for grapes.

Disease	Symptoms	Source of Inoculum	Management
Phomopsis cane and leaf spot (<i>Phomopsis viticola</i>)	Tiny dark spots with yellow margins form on the leaf blades and veins. Heavily infected basal leaves become distorted and may not develop to full size. Infected fruit turn brown, shrivel and drop from the cluster.	The fungus overwinters in the bark and leaf petioles. During wet springs, fungal spores exude from infected tissues and splash on to new (young) shoot tips. Spores move within the vine, causing localized infections in the vineyard. Fruit and cluster stem infections occur from bloom until the fruit are about the size of a pea.	At pruning, remove dead and diseased wood. Destroy pruned materials and debris by burning, burying or plowing them into the soil. Sanitize pruners with a registered disinfectant after each cut or between vines. Apply a dormant spray of lime sulfur to reduce overwintering inoculum.
Pierce's disease (<i>Xylella fastidiosa</i>)	This is a disease of bunch grapes. Muscadines are resistant. Symptoms may vary, but generally are characterized by a scorching of the leaf margins. Grape clusters wilt and dry; bud leaves are slow to develop and show water stress during dry periods.	The bacterium survives in infected vines and other hosts. It is transmitted by several leafhoppers.	Limiting the spread of the insect vector and destruction of wild weed hosts have had limited success. Soil applications of the insecticide Admire Pro or Scorpion 35SL are recommended. Destroy infected vines.
Powdery mildew (<i>Uncinula necator</i>)	Produces a whitish-gray, powdery-appearing growth on affected tissues. All green tissues are susceptible. Infection of young expanding leaves causes them to become distorted. Infection of blossoms results in poor fruit set. Infection of berries results in splitting or a netlike pattern on the surface.	The fungus overwinters in dormant buds or on other vine surfaces. Spores are wind dispersed.	Follow the fungicide spray schedule for grapes. Sulfur should be included in a fungicide program.

Table 1. Seasonal fungicide spray schedule for grapes

Developmental Stage	Pesticide Application Timing ¹	Diseases
Dormant	Prior to bud swell (bud is visibly swollen but no green or pink tissue is observed) and break	Anthrachnose Phomopsis cane and leaf spot
Bud break and new shoot sprays (prebloom)	Every 7-10 days from 1-inch shoot growth to prebloom	Black rot Downy mildew Phomopsis cane and leaf spot Powdery mildew
Prebloom²	<10% bloom	Anthrachnose Black rot Downy mildew Phomopsis cane and leaf spot Powdery mildew
Bloom	10%-20% bloom	Black rot Botrytis bunch rot Phomopsis cane and leaf spot Powdery mildew
Postbloom	First cover spray at 7-10 days after the prebloom spray	Anthrachnose Black rot Downy mildew Phomopsis cane and leaf spot Powdery mildew
First and second cover sprays	Every 10-14 days following postbloom spray	Anthrachnose Black rot Downy mildew Phomopsis cane and leaf spot Powdery mildew
Berry touch and bunch closure		Botrytis and other fruit rots
Third and subsequent cover sprays	Matured berries ³ Every 10-14 days until the preharvest spray	Anthrachnose Black rot (foliar) Downy mildew (foliar) Phomopsis cane and leaf spot Powdery mildew (foliar)
Veraison	Onset of ripening	Botrytis bunch rot
Preharvest	10-14 days prior to harvest	Botrytis bunch rot Downy mildew Phomopsis cane and leaf spot Powdery mildew
Postharvest	Every 14-21 days until the first killing frost	Downy mildew Powdery mildew

¹ For more detailed information, see the 2023 Southeast Regional Bunch Grape Integrated Management Guide of the Southern Region Small Fruit Consortium (https://secure.caes.uga.edu/extension/publications/files/pdf/AP%20131-1_1.PDF).

² This is one of the most important sprays for downy mildew, powdery mildew, Phomopsis and black rot because it is the stage when grape berries become susceptible to infection by black rot, downy mildew and powdery mildew. All these pathogens become active due to warmer temperatures.

³ Mature berries are now resistant to black rot, downy mildew and powdery mildew. Sprays are applied to manage foliar infections caused by these diseases

Table 2. Efficacy of selected fungicides against grape diseases.**Table Legend**

Efficacy	Rating
Excellent Activity	EA
Good Activity	GA
Moderate Activity	MA
Limited Activity	LA
Very Limited Activity	VLA
No Significant Activity	NSA

Table is reproduced from the 2023 Southeast Regional Bunch Grape Integrated Management Guide of the Southern Region Small Fruit Consortium (https://secure.caes.uga.edu/extension/publications/files/pdf/AP%20131-1_1.PDF).

The efficacy rating could be affected by resistance development. If resistance has occurred, use of fungicides in the same class would likewise show resistance, and a substitute fungicide should be considered for pathogen management.

No data is provided for products not labeled for the specific disease or if the efficacy is unknown. These ratings are benchmarks; actual performance will vary.

Chemical Name	Product Choices	Anthraco	Black Rot	Botrytis Bunch Rot	Downy Mildew	Phomopsis Cane and Leaf Spot	Powdery Mildew
Azoxystrobin			EA	MA ¹	EA ¹	MA	EA ¹
Benzovindiflupyr, isofetamid	Aprovia, Kenja	MA ²	GA	EA ²	EA ²	N/A	GA ²
Boscalid	Endura		EA ¹				GA ²
Boscalid + pyraclostrobin	Pristine	GA	EA	EA ¹	EA ¹	EA	EA
Cyazofami	Ranman				GA		
Captan	Captan, Captec, etc.	MA	MA	LA	GA	GA	NSA
Fixed coppers and bordeaux mixture	various products		MA	MA	MA	LA	LA
Cyflufenamid	Torino		NSA	NSA	NSA	NSA	GA
Cyprodinil	Vanguard		NSA	EA ¹	NSA	NSA	LA
Cyprodinil + fludioxonil	Switch			GA ¹			
Cyprodinil + difenoconazole	Inspire Super		GA	GA ¹			GA
Famoxadone + cymoxanil	Tanos				MA ¹		
Fenhexamid	Elevate		NSA	EA ¹	NSA	NSA	NSA
Ferbam	Ferbam		MA	NSA	LA	LA	NSA
Fenarimol	Rubigan		LA	NSA	NSA	NSA	GA ¹
Fluopicolide	Presidio	NSA	NSA	NSA	EA	NSA	NSA
Iprodione	Rovral, Meteor	NSA	NSA	LA ¹	NSA	NSA	NSA
Kresoxim-methyl	Sovran		EA	VLA ¹	LA ¹	MA	GA ¹
Lime sulfur	dormant application	MA		NSA	NSA	MA	LA
Mancozeb	various: Penncozeb, Dithane, etc.		EA	NSA	EA	EA	NSA
Mandipropamid	Revus	NSA	NSA	NSA	EA	NSA	NSA
Mandipropamid + difenoconazole	Revus Top		GA	NSA	EA	LA ²	GA
Mefenoxam + copper	Ridomil Gold Copper		LA	LA	EA	LA	LA
Mefenoxam + mancozeb	Ridomil Gold MZ		MA	NSA	EA	MA	NSA
Metrafenone	Vivando		NSA	NSA	NSA	NSA	GA
Myclobutanil	Rally		GA	NSA	NSA	NSA	GA ¹

Chemical Name	Product Choices	Anthraco	Black Rot	Botrytis Bunch Rot	Downy Mildew	Phomopsis Cane and Leaf Spot	Powdery Mildew
Phosphonate	ProPhyt, Phostrol, etc.				GA		
Sulfur ³	various		NSA	NSA	NSA	LA	EA
Tebuconazole	Elite		EA	NSA	NSA	NSA	GA ¹
Tetraconazole	Mettle						MA ¹
Thiophanate-methyl	Topsin M		LA	NSA	NSA	MA	GA ¹
Trifloxystrobin	Flint		EA	GA	MA	LA	GA ¹
Triflumazol	Procure and Viticure		LA ¹	NSA	NSA	NSA	EA
Ziram	Ziram		GA	LA	GA	MA	NSA

¹ Resistance (or occasional failure of control) has been observed in some southeastern states; thus, if control failure occurs, it could indicate resistance has developed.

² Insufficient data for the pathogen-chemical combination. The rating was given based on the general knowledge on the material.

³ Sulfur will cause burn on sensitive varieties, especially on hot days, >85 F.

Table 3. Recommended pesticides, rates and pesticide use restrictions for anthracnose (*Elsinoe ampelina*) in grapes.

Product Choices ¹	Chemical Name	Product Mode of Action Group ²	Rate ^{3,4}	PHI ⁵	Maximum Use
Aprovia	benzovindiflupyr	7	8.6-10.5 fl oz	21	31.5 fl oz
Eagle 40WP	myclobutanil	3	3-5 oz	14	1.5 lb
Fosphite	phosphite ⁸ (phosphorous acid salts)	33	1-3 qt	-	-
Inspire Super ⁷	cyprodinil + difenoconazole	3, 9	16-20 fl oz	14	80 fl oz
Kenja 400SC	isofetamid	-	20-22 fl oz	14	66 fl oz
K-phite 7LP	phosphite ⁸ (phosphorous acid salts)	33	1-3 qt	-	-
Mettle 125ME	tetraconazole	3	3-5 fl oz	14	10 fl oz
Ph-D WDG	polyoxin D zinc salt	19	6.2 oz	7	3 app
Pristine ⁶	boscalid + pyraclostrobin	7, 11	8-12.5 oz	14	69 oz
Quadris Top	azoxystrobin+difenoconazole	11,3	12-14 oz	14	56 fl oz
Rampart	phosphite ⁸ (phosphorous acid salts)	33	1-3 qt	-	-
Revus Top	difenoconazole + mandipropamid	3, 40	7 fl oz	14	28 fl oz

¹ Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

² Reference to commercial or trade names is made with the understanding that no discrimination is intended nor endorsement of a particular product by LSU or the LSU AgCenter is implied.

³ Rates are the amount of formulation per acre of wine or sherry grapes unless otherwise indicated. See label for rates and restrictions for table or raisin grapes. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

⁴ All rates refer to foliar applications unless otherwise noted. Refer to label for other application rates and directions.

⁵ Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

⁶ Do not use on Concord or Noiret. Possible foliar injury may also occur on Worden, Fredonia, Niagara, Steuben or Rougeon. See label for additional restrictions.

⁷ Do not use on Concorde or Thomcord.

⁸ Do not apply when temperatures exceed 90 F, shortly after a rain event, or during color break of the fruit.

Table 4. Recommended pesticides, rates and pesticide use restrictions for bitter rot (*Greeneria uvicola*) in grapes.

Product Choices ¹	Chemical Name	Product Mode of Action Group ²	Rate ^{3,4}	PHI ⁵	Maximum Use
Incognito 85WDG	thiophanate-methyl	1	0.8-1.2 lb	14	3.2 lb
Thiophanate-methyl 85WDG	thiophanate-methyl	1	0.6-1.2 lb	14	3.2 lb
T-Methyl 70WSB	thiophanate-methyl	1	0.75-1.5 lb	7	6 lb
Topsin M 70WP	thiophanate-methyl	1	0.75-1.5 lb	7	6 lb

¹ Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

² Reference to commercial or trade names is made with the understanding that no discrimination is intended nor endorsement of a particular product by LSU or the LSU AgCenter is implied.

³ Rates are the amount of formulation per acre of wine or sherry grapes unless otherwise indicated. See label for rates and restrictions for table or raisin grapes. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

⁴ All rates refer to foliar applications unless otherwise noted. Refer to label for other application rates and directions.

⁵ Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

Table 5. Recommended pesticides, rates and pesticide use restrictions for black rot (*Guignardia bidwellii*) in grapes.

Product Choices ¹	Chemical Name	Product Mode of Action Group ²	Rate ^{3,4}	PHI ⁵	Maximum Use
Abound 2SC	azoxystrobin	11	10.5-15.5 fl oz	14	92.3 fl oz
Adament 50WG ¹⁶	tebuconazole + trifloxystrobin	3, 11	3-6 oz	14	48 oz
Aframe	azoxystrobin	11	10.5-15.5 fl oz	14	92.3 fl oz
Aprovia	benzovindiflupyr	7	8.6-10.5 fl oz	21	31.5 fl oz
Azoxy 2SC	azoxystrobin	11	10.5-15.5 fl oz	14	92.3 fl oz
AzoxyStar	azoxystrobin	11	10.5-15.5 fl oz	14	92.3 fl oz
Captan 38.75% ¹⁷	captan	M	1.5-2 qt	0	12 qt
Captec 4L ¹⁷	captan	M	0.75-1 qt/100 gal	0	2 qt
Champ WG ¹⁰	copper hydroxide	M	2-6 lb	0	40 lb
Champion ¹⁰	copper hydroxide	M	0.75-1.75	0	66.7 lb
Cuprofix Ultra 40 Dispers ¹⁰	copper sulfate	M	1.25-3 lb	14	50 lb
Cuproxat ¹⁰	copper sulfate	M	2.5-6 pt	14	98.6 pt
Dithan F45	mancozeb	M	1.2-3.2 qt	66	19.2 qt
Dithan M45	mancozeb	M	1.5-4 lb	66	24 lb
Eagle 20EW	myclobutanil	3	6-10 fl oz	14	46 fl oz
Eagle 40WP	myclobutanil	3	3-5 oz	14	1.5 lb
Elite 45DF	tebuconazole	3	4 oz	14	2 lb

Product Choices ¹	Chemical Name	Product Mode of Action Group ²	Rate ^{3,4}	PHI ⁵	Maximum Use
Flint 50WG ⁷	trifloxystrobin	11	1.5-4 oz ⁸	14	24 oz
Incognito 85WDG	thiophanate-methyl	1	0.8-1.2 lb	14	3.2 lb
Inspire Super ¹¹	cyprodinil + difenoconazole	3, 9	16-20 fl oz	14	80 fl oz
ManKocide ¹⁰	copper hydroxide + mancozeb	M	2.5 lb	66	66.7 lb
Manzate Flowable	mancozeb	M	1.2-3.2 qt	66	19.2 qt
Manzate Max	mancozeb	M	1.2-3.2 qt	67	19.2 qt
Manzate Pro-Stick	mancozeb	M	1.5-4 lb	66	7.5 lb
Mettle 125ME	tetraconazole	3	3-5 fl oz	14	10 fl oz
Orius 20AQ	tebuconazole	3	8.6 oz	14	68.8 oz
Penncozeb 75DF	mancozeb	M	1.5-4 lb	66	24 lb
Penncozeb 80WP	mancozeb	M	1.5-4 lb	66	24 lb
Ph-D WDG	polyoxin D zinc salt	19	6.2 oz	7	3 app
Pristine ⁹	boscalid + pyraclostrobin	7, 11	8-12.5 oz	14	69 oz
Quadris Top	azoxystrobin+difenoconazole	11, 3	12-14 fl oz	14	56 fl oz
Rally 40WSP	myclobutanil	3	3-5 oz	14	1.5 lb
Revus Top	difenoconazole + mandipropamid	3, 40	7 fl oz	14	28 fl oz
Revus Top	difenoconazole + mandipropamid	3, 40	7 fl oz	14	28 fl oz
Roper DF Rainshield	mancozeb	M	1.5-4 lb	66	24 lb
Satori 2.08	azoxystrobin	11	10.5-15.5 fl oz	14	92.3 fl oz
Sonoma 20EW AG	myclobutanil	3	6-10 fl oz	14	45.6 fl oz
Sovran 50WG	kresoxim-methyl	11	3.2-6.4 oz ⁸	14	25.6 oz
Sovran 50WG	kresoxim-methyl	11	3.2-6.4 oz ⁸	14	25.6 oz
Tebuzol 45DF	tebuconazole	3	4 oz	14	2 lb
Thiophanate-methyl 85WDG	thiophanate-methyl	1	0.6-1.2 lb	14	3.2 lb
T-Methyl 70WS ⁸	thiophanate-methyl	1	0.75-1.5 lb	7	6 lb
Topsin M 70WP	thiophanate-methyl	1	0.75-1.5 lb	7	6 lb
Willowood Azoxy 2SC	azoxystrobin	11	10.5-15.5 fl oz	14	92.3 fl oz
Ziram 76DF	ziram	M	3-4 lb	21	28 lb

¹ Reference to commercial or trade names is made with the understanding that no discrimination is intended nor endorsement of a particular product by LSU or the LSU AgCenter is implied.

² Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

³ Rates are the amount of formulation per acre of wine or sherry grapes unless otherwise indicated. See label for rates and restrictions for table or raisin grapes. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

⁴ All rates refer to foliar applications unless otherwise noted. Refer to label for other application rates and directions.

⁵ Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

⁶ For resistance management purposes, only 2 applications per year is recommended.

⁷ Do not use Flint on Concord.

⁸ Rates vary depending on disease. Refer to label for rates and timing.

⁹ Do not use on Concord or Noiret. Possible foliar injury may also occur on Worden, Fredonia, Niagara, Steuben or Rougeon. See label for additional restrictions.

¹⁰ See label for variety restrictions. Add hydrated lime (1-3 lb) per pound of Champ WG to minimize foliar injury.

¹¹ Do not use on Concord or Thomcord.

¹² Use a surfactant when Rubigan EC is applied alone.

¹³ Prebloom apply 2-4 fl oz/A; Postbloom apply 4-6 fl oz/A; cover sprays apply 5-6 fl oz/A.

¹⁴ Prebloom apply 3-4 fl oz/A; Postbloom apply 5-6 fl oz/A; cover sprays apply 5-6 fl oz/A.

¹⁵ Do not apply when temperatures exceed 90 F, shortly after a rain event, or during color break of the fruit.

¹⁶ See label for variety restrictions.

¹⁷ Suppression only

Table 6. Recommended pesticides, rates and pesticide use restrictions for botrytis bunch rot (*Botrytis cinerea*) in grapes.

Product Choices ¹	Chemical Name	Product Mode of Action Group ²	Rate ^{3,4}	PHI ⁵	Maximum Use
Abound 2SC ¹⁷	azoxystrobin	11	10.5-15.5 fl oz	14	92.3 fl oz
Adament 50WG ¹⁶	tebuconazole + trifloxystrobin	3, 11	3-6 oz	14	48 oz
Aframe ¹⁷	azoxystrobin	11	10.5-15.5 fl oz	14	92.3 fl oz
Aprovia	benzovindiflupyr	7	8.6-10.5 fl oz	21	31.5 fl oz
Azoxy 2SC ¹⁷	azoxystrobin	11	10.5-15.5 fl oz	14	92.3 fl oz
AzoxyStar ¹⁷	azoxystrobin	11	10.5-15.5 fl oz	14	92.3 fl oz
Dithan F45	mancozeb	M	1.2-3.2 qt	66	19.2 qt
Dithan M45	mancozeb	M	1.5-4 lb	66	24 lb
Elevate 50WDG	fenhexamid	17	1 lb	0	3 lb
Endura 30WG	boscalid	7	8 oz	14	24 oz
Flint 50WG ⁷	trifloxystrobin	11	1.5-4 oz ⁸	14	24 oz
Gavel 75DF	mancozeb + zoxamide	M, 22	2-2.5 lb	66	15 lb
Inspire Super ¹¹	cyprodinil + difenoconazole	3, 9	16-20 fl oz	14	80 fl oz
Iprodione 4L AG	iprodione	43	1-2 pt	7	4 app
Kenja 400SC	isofetamid	7	20-22 fl oz	14	66 fl oz
Manzate Flowable	mancozeb	M	1.2-3.2 qt	66	19.2 qt
Manzate Max	mancozeb	M	1.2-3.2 qt	67	19.2 qt
Manzate Pro-Stick	mancozeb	M	1.5-4 lb	66	7.5 lb
Meteor	iprodione	43	1-2 pt	7	4 app
Nevado 4F	iprodione	43	1-2 pt	7	4 app
OSO 5%	polyoxin D zinc salt	19	3.75-13 fl oz	0	6 app
Penncozeb 75DF	mancozeb	M	1.5-4 lb	66	24 lb
Penncozeb 80WP	mancozeb	M	1.5-4 lb	66	24 lb
Ph-D WDG	polyoxin D zinc salt	19	6.2 oz	0	3 app
Pristine ^{9,17}	boscalid + pyraclostrobin	7, 11	18.5-23 oz	14	69 oz
Quadris Top ¹⁷	azoxystrobin+difenoconazole	11,3	12-14 oz	14	56 fl oz
Roper DF Rainshield	mancozeb	M	1.5-4 lb	66	24 lb
Rovral 4F	iprodione	43	1-2 pt	7	4 app
Satori 2.08 ¹⁷	azoxystrobin	11	10.5-15.5 fl oz	14	92.3 fl oz
Scala SC	pyrimethanil	9	18 fl oz (alone) 9 fl oz (tank mix)	7	36 fl oz

Product Choices ¹	Chemical Name	Product Mode of Action Group ²	Rate ^{3,4}	PHI ⁵	Maximum Use
Sovran 50WG	kresoxim-methyl	11	3.2-6.4 oz ⁸	14	25.6 oz
Switch 62.5WG	cyprodinil + fludioxonil	9, 12	11-14 oz	7	56 oz
Topsin M 70WP	thiophanate-methyl	1	0.75-1.5 lb	7	6 lb
Vanguard WG	cyprodinil	9	10 oz (alone) 5-10 oz (tank mixtures)	7	30 oz
Vivando	metrafenone	U8	10.3-15.4 fl oz	14	46.2 fl oz
Willowood Azoxy 2SC ¹⁷	azoxystrobin	11	10.5-15.5 fl oz	14	92.3 fl oz

¹ Reference to commercial or trade names is made with the understanding that no discrimination is intended nor endorsement of a particular product by LSU or the LSU AgCenter is implied.

² Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

³ Rates are the amount of formulation per acre of wine or sherry grapes unless otherwise indicated. See label for rates and restrictions for table or raisin grapes. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

⁴ All rates refer to foliar applications unless otherwise noted. Refer to label for other application rates and directions.

⁵ Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

⁶ For resistance management purposes, only 2 applications per year is recommended.

⁷ Do not use Flint on Concord.

⁸ Rates vary depending on disease. Refer to label for rates and timing.

⁹ Do not use on Concord or Noiret. Possible foliar injury may also occur on Worden, Fredonia, Niagara, Steuben or Rougeon. See label for additional restrictions.

¹⁰ See label for variety restrictions. Add hydrated lime (1-3 lb) per pound of Champ WG to minimize foliar injury.

¹¹ Do not use on Concord or Thomcord.

¹² Use a surfactant when Rubigan EC is applied alone.

¹³ Prebloom apply 2-4 fl oz/A; Postbloom apply 4-6 fl oz/A; cover sprays apply 5-6 fl oz/A.

¹⁴ Prebloom apply 3-4 fl oz/A; Postbloom apply 5-6 fl oz/A; cover sprays apply 5-6 fl oz/A.

¹⁵ Do not apply when temperatures exceed 90 F, shortly after a rain event, or during color break of the fruit.

¹⁶ See label for variety restrictions.

¹⁷ Suppression only

Table 7. Recommended pesticides, rates and pesticide use restrictions for downy mildew (*Plasmopara viticola*) in grapes.

Product Choices ¹	Chemical Name	Product Mode of Action Group ²	Rate ^{3,4}	PHI ⁵	Maximum Use
Abound 2SC	azoxystrobin	11	10.5-15.5 fl oz	14	92.3 fl oz
Adament 50WG ¹⁰	tebuconazole + trifloxystrobin	3, 11	3-6 oz	14	48 oz
Aframe	azoxystrobin	11	10.5-15.5 fl oz	14	92.3 fl oz
Aliette	aluminum tris	33	3-5 lb	15	7 app
Alude	phosphite ⁹	33	2.5-5 pt	NA	NA
Aprovia	benzovindiflupyr	7	8.6-10.5 fl oz	21	31.5 fl oz
Azoxy 2SC	azoxystrobin	11	10.5-15.5 fl oz	14	92.3 fl oz
AzoxyStar	azoxystrobin	11	10.5-15.5 fl oz	14	92.3 fl oz
Captan 38.75%	captan	M	1.5-2 qt	0	12 qt
Captec 4L	captan	M	0.75-1 qt/100 gal	0	2 qt
Champ WG ¹⁰	copper hydroxide	M	2-6 lb	0	40 lb
Champion ¹⁰	copper hydroxide	M	0.75-1.75	0	66.7 lb
Cuprofix Ultra 40 Dispers ¹⁰	copper sulfate	M	1.25-3 lb	14	50 lb
Cuproxat ¹⁰	copper sulfate	M	2.5-6 pt	14	98.6 pt
Dithan F45	mancozeb	M	1.2-3.2 qt	66	19.2 qt
Dithan M45	mancozeb	M	1.5-4 lb	66	24 lb
Dithane F45 Rainshield	mancozeb	M	1.2-3.2 qt	66	19.2 qt
Flint 50WG ¹¹	trifloxystrobin	11	1.5-4 oz ⁸	14	24 oz
Forum	dimethomorph	40	6 fl oz	14	24 fl oz
Fosphite	phosphite ⁹	33	1-3 qt	NA	NA
Gavel 75DF	mancozeb + zoxamide	M, 22	2-2.5 lb	66	15 lb
K-phite 7LP	phosphite ⁹	33	1-3 qt	NA	NA
ManKocide ⁷	copper hydroxide + mancozeb	M	2.5 lb	66	66.7 lb
Manzate Flowable	mancozeb	M	1.2-3.2 qt	66	19.2 qt
Manzate Max	mancozeb	M	1.2-3.2 qt	66	19.2 qt
Manzate Pro-Stick	mancozeb	M	1.5-4 lb	66	7.5 lb
Penncozeb 75DF	mancozeb	M	1.5-4 lb	66	24 lb
Penncozeb 80WP	mancozeb	M	1.5-4 lb	66	24 lb
Phostrol	phosphite ⁹	33	2.5-5 pt	NA	NA
Presidio	fluopicolide	43	3-4 fl oz	21	12 fl oz

Product Choices ¹	Chemical Name	Product Mode of Action Group ²	Rate ^{3,4}	PHI ⁵	Maximum Use
Pristine ⁶	boscalid + pyraclostrobin	7, 11	8-12.5 oz	14	69 oz
Quadris Top	azoxystrobin+difenoconazole	11, 3	12-14 fl oz	14	56 fl oz
Rampart	phosphite ⁹	33	1-3 qt	NA	NA
Ranman 400SC	cyazofamid	21	2.1-2.75 fl oz	30	16.5 fl oz
Reason 500SC	fenamidone	11	2.7 fl oz	30	8.1 fl oz
Revus	mandipropamid	40	8 fl oz	14	32 fl oz
Ridomil Gold MZ WG	mefenoxam + mancozeb	4, M	2.5 lb	66	11 lb
Ridomil Gold SL, Ultra Flourish	mefenoxam	NA	3.6 pt	60	0.4 lb ai
Ridomil Gold/Copper	mefenoxam + copper hydroxide	4, M	2.5 lb	42	10 lb
Roper DF Rainshield	mancozeb	M	1.5-4 lb	66	24 lb
Satori 2.08	azoxystrobin	11	10.5-15.5 fl oz	14	92.3 fl oz
Sovran 50WG	kresoxim-methyl	11	3.2-6.4 oz ⁸	14	25.6 oz
Tanos	famoxodone + cymoxanil	11, 27	8 oz	30	72 oz
Willowood Azoxy 2SC	azoxystrobin	11	10.5-15.5 fl oz	14	92.3 fl oz
Zampro	ametoctradin + dimethomorph	45, 40	11-14 fl oz	14	56 fl oz
Ziram 76DF	ziram	M	3-4 lb	21	28 lb

¹ Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

² Reference to commercial or trade names is made with the understanding that no discrimination is intended nor endorsement of a particular product by LSU or the LSU AgCenter is implied.

³ Rates are the amount of formulation per acre of wine or sherry grapes unless otherwise indicated. See label for rates and restrictions for table or raisin grapes. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

⁴ All rates refer to foliar applications unless otherwise noted. Refer to label for other application rates and directions.

⁵ Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

⁶ Do not use on Concord or Noiret. Possible foliar injury may also occur on Worden, Fredonia, Niagara, Steuben or Rougeon. See label for additional restrictions.

⁷ See label for variety restrictions. Add hydrated lime (1-3 lb) per pound of Champ WG to minimize foliar injury.

⁸ Rates vary depending on disease. Refer to label for rates and timing.

⁹ Do not apply when temperatures exceed 90 F, shortly after a rain event, or during color break of the fruit.

¹⁰ See label for variety restrictions.

¹¹ Do not use Flint on Concord.

Table 8. Recommended pesticides, rates and pesticide use restrictions for Phomopsis cane and leaf spot (*Phomopsis viticola*) in grapes.

Product Choices ¹	Chemical Name	Product Mode of Action Group ²	Rate ^{3,4}	PHI ⁵	Maximum Use
Abound 2SC	azoxystrobin	11	10.5-15.5 fl oz	14	92.3 fl oz
Adament 50WG ¹⁶	tebuconazole + trifloxystrobin	3, 11	3-6 oz	14	48 oz
Aframe	azoxystrobin	11	10.5-15.5 fl oz	14	92.3 fl oz
Aprovia	benzovindiflupyr	7	8.6-10.5 fl oz	21	31.5 fl oz
Azoxystrobin	azoxystrobin	11	10.5-15.5 fl oz	14	92.3 fl oz
Azoxystrobin	azoxystrobin	11	10.5-15.5 fl oz	14	92.3 fl oz
Captan 38.75%	captan	M	1.5-2 qt	0	12 qt
Captec 4L	captan	M	0.75-1 qt/100 gal	0	2 qt
Champ WG10	copper hydroxide	M	2-6 lb	0	40 lb
Champion10	copper hydroxide	M	0.75-1.75	0	66.7 lb
Cuprox Ultra 40 Dispers ¹⁰	copper sulfate	M	1.25-3 lb	14	50 lb
Cuproxat ¹⁰	copper sulfate	M	2.5-6 pt	14	98.6 pt
Dithan F45	mancozeb	M	1.2-3.2 qt	66	19.2 qt
Dithan M45	mancozeb	M	1.5-4 lb	66	24 lb
Flint 50WG ⁷	trifloxystrobin	11	1.5-4 oz ⁸	14	24 oz
Gavel 75DF	mancozeb + zoxamide	M, 22	2-2.5 lb	66	15 lb
ManKocide ¹⁰	copper hydroxide + mancozeb	M	2.5 lb	66	66.7 lb
Manzate Flowable	mancozeb	M	1.2-3.2 qt	66	19.2 qt
Manzate Max	mancozeb	M	1.2-3.2 qt	67	19.2 qt
Manzate Pro-Stick	mancozeb	M	1.5-4 lb	66	7.5 lb
Microthiol Dispers ¹⁰	sulfur	M	3-10 lb	NA	NA
Penncozeb 75DF	mancozeb	M	1.5-4 lb	66	24 lb
Penncozeb 80WP	mancozeb	M	1.5-4 lb	66	24 lb
Pristine ⁹	boscalid + pyraclostrobin	7, 11	8-12.5 oz	14	69 oz
Quadris Top	azoxystrobin+difenoconazole	11,3	12-14 oz	14	56 fl oz
Revus Top	difenoconazole + mandipropamid	3, 40	7 fl oz	14	28 fl oz
Roper DF Rainshield	mancozeb	M	1.5-4 lb	66	24 lb
Satori 2.08	azoxystrobin	11	10.5-15.5 fl oz	14	92.3 fl oz
Sovran 50WG	kresoxim-methyl	11	3.2-6.4 oz ⁸	14	25.6 oz
Willowood Azoxystrobin	azoxystrobin	11	10.5-15.5 fl oz	14	92.3 fl oz

¹ Reference to commercial or trade names is made with the understanding that no discrimination is intended nor endorsement of a particular product by LSU or the LSU AgCenter is implied.

² Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

³ Rates are the amount of formulation per acre of wine or sherry grapes unless otherwise indicated. See label for rates and restrictions for table or raisin grapes. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

⁴ All rates refer to foliar applications unless otherwise noted. Refer to label for other application rates and directions.

⁵ Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

⁶ For resistance management purposes, only 2 applications per year is recommended.

⁷ Do not use Flint on Concord.

⁸ Rates vary depending on disease. Refer to label for rates and timing.

⁹ Do not use on Concord or Noiret. Possible foliar injury may also occur on Worden, Fredonia, Niagara, Steuben or Rougeon. See label for additional restrictions.

¹⁰ See label for variety restrictions. Add hydrated lime (1-3 lb) per pound of Champ WG to minimize foliar injury.

¹¹ Do not use on Concord or Thomcord.

¹² Use a surfactant when Rubigan EC is applied alone.

¹³ Prebloom apply 2-4 fl oz/A; Postbloom apply 4-6 fl oz/A; cover sprays apply 5-6 fl oz/A.

¹⁴ Prebloom apply 3-4 fl oz/A; Postbloom apply 5-6 fl oz/A; cover sprays apply 5-6 fl oz/A.

¹⁵ Do not apply when temperatures exceed 90 F, shortly after a rain event, or during color break of the fruit.

¹⁶ See label for variety restrictions.

Table 9. Recommended pesticides, rates and pesticide use restrictions for powdery mildew (*Uncinula necator*) in grapes.

Product Choices ¹	Chemical Name	Product Mode of Action Group ²	Rate ^{3,4}	PHI ⁵	Maximum Use
Abound 2SC	azoxystrobin	11	10.5-15.5 fl oz	14	92.3 fl oz
Aframe	azoxystrobin	11	10.5-15.5 fl oz	14	92.3 fl oz
Aprovia	benzovindiflupyr	7	8.6-10.5 fl oz	21	31.5 fl oz
Azoxy 2SC	azoxystrobin	11	10.5-15.5 fl oz	14	92.3 fl oz
AzoxyStar	azoxystrobin	11	10.5-15.5 fl oz	14	92.3 fl oz
Champ WG ¹⁰	copper hydroxide	M	2-6 lb	0	40 lb
ChamplON ¹⁰	copper hydroxide	M	0.75-1.75	0	66.7 lb
Cuprofix Ultra 40 Disperss ¹⁰	copper sulfate	M	1.25-3 lb	14	50 lb
Cuproxat ¹⁰	copper sulfate	M	2.5-6 pt	14	98.6 pt
Eagle 20EW	myclobutanil	3	6-10 fl oz	14	46 fl oz
Eagle 40WP	myclobutanil	3	3-5 oz	14	1.5 lb
Elevate 50WDG ¹⁷	fenhexamid	17	1 lb	0	3 lb
Elite 45DF	tebuconazole	3	4 oz	14	2 lb
Endura 30WG	boscalid	7	4.5 oz	14	24 oz
Flint 50WG ⁷	trifloxystrobin	11	1.5-4 oz ⁸	14	24 oz
Fosphite	phosphite ⁹	33	1-3 qt	NA	NA
Incognito 85WDG	thiophanate-methyl	1	0.8-1.2 lb	14	3.2 lb
Inspire Super ¹¹	cyprodinil + difenoconazole	3, 9	16-20 fl oz	14	80 fl oz
Kenja 400SC	isofetamid	7	20-22 fl oz	14	66 fl oz
K-phite 7LP	phosphite ⁹	33	1-3 qt	NA	NA
Liquid Sulfur Six	sulfur	M	1-2 pt/100 gal	NA	8 pt
ManKocide ¹⁰	copper hydroxide + mancozeb	M	2.5 lb	66	66.7 lb
Mettle 125ME	tetraconazole	3	3-5 fl oz	14	10 fl oz
Microfine Sulfur	sulfur	M	3.8-25 lb	NA	NA
Microthiol Disperss	sulfur	M	3-10 lb	NA	NA
Orius 20AQ	tebuconazole	3	8.6 oz	14	68.8 oz
OSO 5%	polyoxin D zinc salt	19	3.75-13 fl oz	0	6 app
Ph-D WDG	polyoxin D zinc salt	19	6.2 oz	7	3 app
Pristine ⁹	boscalid + pyraclostrobin	7, 11	8-12.5 oz	14	69 oz
Procure 480SC	triflumizole	3	4-8 oz	7	32 oz

Product Choices ¹	Chemical Name	Product Mode of Action Group ²	Rate ^{3,4}	PHI ⁵	Maximum Use
Quadris Top	azoxystrobin+difenoconazole	11,3	12-14 oz	14	56 fl oz
Quintec	quinoxifen	13	3-6.6 fl oz	14	33 fl oz
Rally 40WSP	myclobutanil	3	3-5 oz	14	1.5 lb
Rampart	phosphite ⁹	33	1-3 qt	NA	NA
Revus Top	difenoconazole + mandipropamid	3, 40	7 fl oz	14	28 fl oz
Rubigan EC ¹²	fenarimol	3	2-6 fl oz ¹³	21	19 fl oz
Satori 2.08	azoxystrobin	11	10.5-15.5 fl oz	14	92.3 fl oz
Sonoma 20EW AG	myclobutanil	3	6-10 fl oz	14	45.6 fl oz
Tebuzol 45DF	tebuconazole	3	4 oz	14	2 lb
Thiophanate-methyl 85WDG	thiophanate-methyl	1	0.6-1.2 lb	14	3.2 lb
T-Methyl 70WSB	thiophanate-methyl	1	0.75-1.5 lb	15	6 lb
Topsin M 70WP	thiophanate-methyl	1	0.75-1.5 lb	7	6 lb
Torino	cyflufenamid	U6	3.4 oz	3	6.8 oz
Vanguard WG ¹⁷	cyprodinil	9	10 oz (alone) 5-10 oz (tank mixtures)	7	30 oz
Vintage SC	fenarimol	3	3-6 fl oz ¹⁴	21	21 fl oz
Willowood Azoxy 2SC	azoxystrobin	11	10.5-15.5 fl oz	14	92.3 fl oz
Yellow Jacket Dusting	sulfur	M	10-20 lb	NA	NA
Yellow Jacket Wettable	sulfur	M	3.8-25 lb	NA	NA

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³ Rates are the amount of formulation per acre of wine or sherry grapes unless otherwise indicated. See label for rates and restrictions for table or raisin grapes. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

⁴ All rates refer to foliar applications unless otherwise noted. Refer to label for other application rates and directions.

⁵ Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

⁶ For resistance management purposes, only 2 applications per year is recommended.

⁷ Do not use Flint on Concord.

⁸ Rates vary depending on disease. Refer to label for rates and timing.

⁹ Do not use on Concord or Noiret. Possible foliar injury may also occur on Worden, Fredonia, Niagara, Steuben or Rougeon. See label for additional restrictions.

¹⁰ See label for variety restrictions. Add hydrated lime (1-3 lb) per pound of Champ WG to minimize foliar injury.

¹¹ Do not use on Concord or Thomcord.

¹² Use a surfactant when Rubigan EC is applied alone.

¹³ Prebloom apply 2-4 fl oz/A; Postbloom apply 4-6 fl oz/A; cover sprays apply 5-6 fl oz/A.

¹⁴ Prebloom apply 3-4 fl oz/A; Postbloom apply 5-6 fl oz/A; cover sprays apply 5-6 fl oz/A.

¹⁵ Do not apply when temperatures exceed 90 F, shortly after a rain event, or during color break of the fruit.

¹⁶ See label for variety restrictions.

¹⁷ Suppression only

The grape section was revised October 2023 by R. Singh.

Strawberry

Integrated Strawberry Disease Management

Strawberries are among the most challenging horticultural crops to grow in the South because of high levels of soilborne pathogens. Chemical use, from preplant to harvest, is a critical component in maintaining crop yield and producing high-quality fruit. Traditionally, disease management in strawberries has relied on the establishment of a clean crop planted into methyl bromide-fumigated soil. With the phase-out of methyl bromide, the use of alternative, more sustainable management strategies is necessary. (For fumigant information see the [Southeast Regional Strawberry Integrated Management Guide](#).)

Rotate your planting site. Rotating where strawberries are planted is an important part of avoiding soilborne disease problems. This is especially important in the absence of fumigation. Try not to plant strawberries in a particular site more than once every three to four years.

Start with clean plants. Purchase plants from a reputable source and inspect them when they arrive. Many disease-causing agents can be brought in on plants, and clean plants are especially important for avoiding anthracnose crown rot (caused by *Colletotrichum gloeosporioides*), Phytophthora crown rot and virus problems.

Minimize plant stress during establishment. Overhead irrigation is recommended during the first one to two weeks after planting bare-root plants. It may also be helpful to provide some overhead water during the first several days after planting plug plants. Drip irrigation can be used after this time.

Correctly diagnose problems. Contact your local extension agent or the LSU AgCenter Plant Diagnostic Center for assistance, if needed. The [Strawberry Diagnostic Key](#) may also be helpful.

Use crop protectants. Prior to using chemicals, have the disease confirmed by a crop specialist. Once the disease has been confirmed, select a labeled product that has been shown to be effective in reducing disease (Table 1), and apply the product at the correct stage of plant development (Table 1). Chemicals with proven efficacy against a pathogen will not reduce disease if applied at the wrong time. Always rotate between products with different modes of action (in different FRAC groups; see Table 2) to prevent the development of fungicide resistance in the pathogen (disease-causing agent). If a pathogen becomes resistant to a product, the product will no longer be effective. Tests of fungal isolates from Louisiana and other states have shown that the gray mold fruit rot pathogen (*Botrytis cinerea*) is likely to be resistant to common fungicides in several FRAC groups and that the anthracnose fruit rot pathogen (*Colletotrichum* sp.) is likely to be resistant to FRAC 11 fungicides. More information is given in the respective sections. Although some details about chemical application are given in Table 3, always see the label for complete instructions and to determine if changes have been made to the label.

Disease

Symptoms, source of inoculum and management of strawberry diseases.

Disease	Symptoms	Source of Inoculum	Management
Angular (Bacterial) Leaf Spot (<i>Xanthomonas fragariae</i>)	First visible as tiny, water-soaked spots on the lower leaf surface that enlarge into angular lesions delimited by leaf veins. Lesions appear translucent when held up to the light. Bacterial ooze may be found on lesions on lower leaf surfaces.	The bacterium survives in infected leaf debris or is introduced on infected planting material. Bacterial cells are spread primarily by rain splashing and wind-driven rain. Disease develops most under cool, wet conditions.	Use disease-free transplants. Spray with copper bactericide or the plant defense activator Actigard, if needed.
Anthrachnose Crown Rot (<i>Colletotrichum gloeosporioides</i> species complex)	Plants wilt suddenly and die during warm weather. Crowns have a reddish discoloration extending into the center. Black lesions occur on leaf petioles or runners. Disease development is inhibited by cool weather.	The fungus is often introduced on infected planting material and survives on infected plant parts. Fungal spores are spread by rain splashing and wind-driven rain.	Use disease-free transplants. Inspect for disease symptoms when plants are received. Dip plants in a fungicide prior to planting if problems with the plant source are identified. Scout fields for disease symptoms during post-planting period. Remove infected plants and treat surrounding plants with fungicides. Do not use an excessive amount of nitrogen fertilizer.
Anthrachnose Fruit Rot (<i>Colletotrichum acutatum</i> species)	Buds, flowers, sepals and/or flower stems (pedicels and peduncles) often turn brown. Spots on fruit are light brown to black and often begin with a water-soaked appearance and then become firm and sunken. Orange to pink spores can develop when weather is humid. Plant stunting and/or death and petiole lesions may be seen before flower blight or fruit rot occur.	The fungus is often introduced on infected planting material and survives on infected plant parts. Fungal spores can be spread by rain splashing, wind-driven rain, workers and equipment.	Use disease-free transplants. Do not use an excessive amount of nitrogen fertilizer. If the presences of <i>C. acutatum</i> has been confirmed, begin fungicide applications for fruit rot at bloom. Because the pathogen can infect fruit, continue fungicide application through harvest (while observing preharvest intervals), if conditions remain favorable for disease. Resistance to the FRAC group 11 fungicides has been found in the pathogen in some instances; three-quarters of 51 samples from Louisiana tested in 2016 were found to be resistant. Captan, Switch, and Miravis Prime are still expected to be effective for managing anthracnose fruit rot. See Table 2 for efficacy ratings of other products.
Botrytis Fruit Rot (Gray Mold) and Crown Rot (<i>Botrytis cinerea</i>)	This fungus attacks flowers, flower parts, fruit and leaves. On the fruit, this disease causes a rot that is at first light brown and soft (not "leaky"). As the berry rots, it becomes covered with a grayish, powdery growth, and in the final stages of rot, it becomes tough and firm in texture. Crown rot can be a problem in the winter when early blossoms are killed by frost and a warm period follows.	The fungus survives in the decaying tissues of strawberries and many other plants. Fungal spores are wind-dispersed.	Removing dying and dead leaves shortly before plants flower may be helpful. However, if anthracnose fruit rot pathogen is present, it may spread in this process. Do not use an excessive amount of nitrogen fertilizer, because a denser plant may result in more disease pressure. Begin applying effective fungicides while flowers are in bloom; most infections that eventually affect fruit are initiated through flowers. Harvest fruit frequently, removing infected and other unmarketable fruit from the field. Fungicide resistance in <i>Botrytis cinerea</i> is a major concern. Resistance has been documented in one or more locations to many of the fungicides previously effective for managing gray mold. In tests of the fungus from five Louisiana strawberry fields in 2019, all isolates were resistant to thiophanate-methyl and pyraclostrobin, and most were resistant to fenhexamid. Some resistance to penthiopyrad, fluopyram, and, to a lesser extent, boscalid were observed, but resistance to isofetamid and pydiflumetofen was not found, even though they are in the same FRAC group as the former three. Two fields had some level of resistance to at least one of the active ingredients in Switch (cyprodinil and fludioxonil). Captan, thiram, isofetamid (Kenja), polyoxin D salts (Ph-D/OSO 5%SC), Miravis Prime, and Switch (in most cases) appear to remain effective options for gray mold. Be sure to rotate among modes of action (FRAC groups). For chemical management of crown rot, choose among captan, Switch and iprodione.

Disease	Symptoms	Source of Inoculum	Management
Common Leaf Spot (False Rust, Bird's Eye Spot) (<i>Mycosphaerella fragariae</i>)	The spots are at first less than 1/8 inch in diameter and purplish-red. Spots enlarge to about 3/16 inch. They have white or gray centers with purplish borders.	The fungus survives from year to year on infected plant parts.	Spray with fungicides if needed. While many fungicides are effective on this disease, consider using myclobutanil, a combination of thiophanate-methyl and captan, or captan alone, unless another fungicide is needed for another purpose.
Leaf Blight (<i>Phomopsis obscurans</i> or <i>Dendrophoma obscurans</i>)	First appears as large, circular, reddish-purple spots that become zonate with age (i.e., they have a dark brown center surrounded by a lighter brown area with a purplish border). Mature spots may be circular, oval or V-shaped.	The fungus lives from year to year primarily on infected plant tissue.	Use disease-free transplants. Spray with fungicides if needed. While many fungicides are effective on this disease, consider using myclobutanil, a combination of thiophanate-methyl and captan, or captan alone, unless another fungicide is needed for another purpose.
Leaf Blotch (<i>Gnomonia</i> sp. or <i>Zythia</i> sp.)	First appears as purplish to brownish blotches on young leaves. Later appears as large, light brown spots on older leaves. Also causes spots on the stem end of fruit.	The fungus lives from year to year primarily on infected plant tissue.	Spray with fungicides if needed. While many fungicides may be effective on this disease, consider using myclobutanil, a combination of thiophanate-methyl and captan, or captan alone, unless another fungicide is needed for another purpose.
Leaf Scorch (<i>Diplocarpon earlianum</i>)	The disease first appears on upper leaf surfaces as small purplish spots that enlarge rapidly into irregular purplish blotches from 1/16 inch to 3/16 inch in diameter. The spots may become numerous and coalesce. In severe cases, the edges of the leaflets curl upward and the tissue dies, giving the plant a scorched appearance.	The fungus survives from year to year on infected leaves.	Practice crop rotation if possible. Use disease-free transplants. Rotate strawberry fields, if possible. Spray with fungicides if needed. While many fungicides may be effective on this disease, consider using myclobutanil, a combination of thiophanate-methyl and captan, or captan alone, unless another fungicide is needed for another purpose.
Pestalotia Leaf Spot and Fruit Rot (<i>Neopestalotiopsis</i> sp.)	A recently identified aggressive <i>Neopestalotiopsis</i> fungus genotype causes spots on strawberry leaves and fruit. Leaf spots sometimes have a distinctive dark border. Tiny black fungal structures can often be seen within leaf and fruit spots. Plants with crown infections may have red coloration on leaves without having leaf spots. Plants may eventually collapse.	Sources include contaminated plants and crop debris (especially intact crowns) remaining in fields. Where soil is fumigated under plastic mulch, the pathogen may survive in row middles. It may spread in wet conditions on clothing and equipment. It is suspected that row covers and spider mites help spread the pathogen.	Obtain plants from a reputable source and check them for symptoms. Practice crop rotation. Avoid working in the field while plants are wet. Work in diseased areas last. Sanitize clothing and equipment. Effective fungicide options for this disease are limited, but use of those shown to be effective is important to suppress disease. Removing plant crowns from the field after harvest would be ideal but may not be practical. If they cannot be removed, perform field operations that break up crowns and cause them to decompose faster. Thiram SC or a rotation of Thiram SC with Switch have been shown to suppress the disease and are considered the best fungicide options when conditions are favorable for disease. Flutriafol (Rhyme) and propiconazole (Tilt) have also shown suppressive activity.
Powdery Mildew (<i>Podosphaera aphanis</i> or <i>Sphaerotheca macularis</i> f. sp. <i>fragariae</i>)	A white powdery growth is present on the undersurface of infected leaves and on fruit. Infected leaves tend to roll up.	The fungus persists from year to year on infected strawberries and other wild hosts. Usually a problem in the spring and early summer months.	Many varieties are resistant to this disease. It is more likely to be a problem in strawberries grown under cover (e.g., high tunnels). Spray with fungicides if needed.

Disease	Symptoms	Source of Inoculum	Management
Phytophthora Crown and Root Rot (<i>Phytophthora cactorum</i> , primarily)	Youngest leaves often wilt first followed by the collapse of the entire plant. Crowns often exhibit extensive brown discoloration that extends from the crown downward or from an infected stolon.	Oospores that survive in the soil or on infected transplants. Spreads primarily in water.	Practice crop rotation if possible. Use disease-free transplants, improve drainage and avoid low spots. Avoid both overirrigation and drought stress. Dip transplants in suitable fungicide prior to planting if problems with the plant source are identified. Remove infected plants and treat surrounding plants with appropriate fungicide. (Note that <i>Phytophthora</i> is a water mold or oomycete pathogen, not a true fungus, so “fungicides” that target them are generally different than those used for true fungi.)
Root-knot Nematodes (<i>Meloidogyne</i> spp.)	Affected plants are stunted, unthrifty, nonproductive and often pale green in color. Galls or knots on the roots are rather small. Numerous secondary roots may develop at the small swellings. Frequently, blackened, rotten roots are associated with root-knot problems.	Root-knot nematodes live from year to year in the soil and on the roots of strawberry plants and many weeds. Root-knot nematodes are more severe in light soil types.	Sample soil for nematodes and fumigate soil if needed. See recommendations in the Nematode Control section of this guide and in the Southeast Regional Strawberry Integrated Management Guide .
Summer Dwarf or Bud Nematodes (<i>Aphelenchoides besseyi</i>)	Affected plants are severely stunted during the summer and early fall. Older leaflets usually are darker green with a greasy appearance. Young leaflets are reduced in size, usually crinkled and somewhat elongated, with shorter petioles. Margins of leaflets may curl upward in the young leaflets and downward in the older leaflets.	Bud nematodes live from year to year on infected daughter plants and in the soil.	Fumigate fields where the disease has occurred. Obtain clean plants. There is no satisfactory treatment to eradicate these nematodes from infected plants.

Table 1. Seasonal fungicide spray schedule for strawberry.¹

Season	Pesticide Application Timing	Diseases
Preplanting	Preplanting fungicide dip ²	Anthrachnose crown rot, Phytophthora crown or root rot
Postplanting until prebloom	Early postplanting	Anthrachnose crown rot, Phytophthora crown or root rot, powdery mildew
Postplanting until prebloom	Warm periods following frost	Botrytis crown rot
Postplanting until prebloom	New growth	Leaf spots (bacterial and fungal), Phytophthora crown or root rot, powdery mildew
Bloom until harvest	Every 7 to 10 days or according to label	Gray mold, anthracnose fruit rot, leaf spots (bacterial and fungal, Phytophthora crown or root rot, powdery mildew

¹ Not all applications will be needed in every field every season. Contact your local extension agent if you need help determining if an application needs to be made.

² If it is known that plants from a particular source have a problem with one of the root or crown rot diseases, bare-root strawberry plants may be dipped in a fungicide suspension prior to planting to provide early season control. Prior to dipping, the plants should be washed with potable water to remove adhering soil.

Table 2. Pesticide efficacy¹ and use.

Chemical Names	Product Choices ²	Mode of Action Group(s) ³	Angular Leaf Spot	Anthrachnose Crown Rot	Anthrachnose Fruit Rot	Botrytis Crown Rot	Botrytis Fruit Rot (Gray Mold)	Common Leaf Spot	Leaf Blight	Leather Rot	Phytophthora Crown or Root Rot and Red Stele Root Rot	Powdery Mildew	Pestalotia Leaf Spot and Fruit Rot	Rate ⁴	PHI ⁵	Maximum Use ⁶
copper-containing products labeled for use on strawberries, including ones with basic copper sulfate, copper hydroxide, copper oxychloride, copper octanoate, copper sulfate pentahydrate, or cuprous oxide	some products OMRI listed ^{OG}	M01	P	-	-	-	-	P	-	P	-	-	-	see label	typically 0 – see label	see label
sulfur ¹²	Yellow Jacket Wettable II ^{OG} ; 90%	M02	-	-	-	-	-	-	-	-	-	G	-	3-50 lb	0	
sulfur ¹²	Microthiol Disperss ^{OG} ; 80%	M02	-	-	-	-	-	-	-	-	-	G	-	5-10 lb	0	
thiram	Thiram SC	M03	-	F	F	F	G	F	F	F	-	-	G	2.0-2.5 qt (1.5-2.5 qt for gray mold)	1	5 or 12 apps ¹³
captan	Captan 50 WP	M04	-	G	G	F	G	F	F	F	-	-	-	3-6 lb	0	48 lb
captan	Captan 80 WDG	M04	-	G	G	F	G	F	F	F	-	-	-	see label	0	30 lb
captan	Captan 4L	M04	-	G	G	F	G	F	F	F	-	-	-	see label	0	24 qt
acibenzolar-S-methyl	Actigard 50WG	P01	P	-	-	-	-	-	-	-	-	-	-	0.5-0.75 oz	0	6 oz
aluminum tris	O-ethyl phosphonate, Aliette WDG ⁷	P07	-	-	-	-	-	-	-	F	F	-	-	2.5-5.0 lb ⁸ (2.5 lb/100 gal for dip)	0.5	30 lb
mono- and dibasic sodium, potassium, and ammonium phosphites	Phostrol	P07	-	-	-	-	-	-	-	F	F	-	-	2.5 – 5.0 pt (2.5 pt/100 gal for dip)	0	
mono- and di-potassium salts of phosphorous acid	K-Phite 7LP, others	P07	-	-	-	-	-	-	-	F	F	-	-	see label (varies by product and application method)	0	see label
potassium phosphite	ProPhyt	P07	-	-	-	-	-	-	-	F	F	-	-	2-4 pt (2 pt/100 gal for dip)	0	

Chemical Names	Product Choices ²	Mode of Action Group(s) ³	Angular Leaf Spot	Anthraxnose Crown Rot	Anthraxnose Fruit Rot	Botrytis Crown Rot	Botrytis Fruit Rot (Gray Mold)	Common Leaf Spot	Leaf Blight	Leather Rot	Phytophthora Crown or Root Rot and Red Stele Root Rot	Powdery Mildew	Pestalotia Leaf Spot and Fruit Rot	Rate ⁴	PHI ⁵	Maximum Use ⁶
cyflufenamid	Torino	U06	-	-	-	-	-	-	-	-	-	VG	-	3.4 oz	0	2 apps
flutianil	Gatten	U13	-	-	-	-	-	-	-	-	-	E	-	6 - 8 fl oz	0	5 apps
thiophanate-methyl	Incognito 85 WDG	1	-	G ^R	-	- ^R	- ^R	G	G	-	-	F ^R	-	0.6-0.8 lb	1	3.2 lb
thiophanate-methyl	Topsin M WSB, T-Methyl 70 WSB	1	-	G ^R	-	- ^R	- ^R	G	G	-	-	F ^R	-	0.75-1 lb	1	4 lb
thiophanate-methyl	Topsin 4.5FL, others	1	-	G ^R	-	- ^R	- ^R	G	G	-	-	F ^R	-	15-20 fl oz	1	4 apps
iprodione	Rovral 4, Meteor	2	-	-	-	VG	G ^R	G	-	-	-	-	-	1.5-2 pt alone; 1 pt if tank mix	Do not apply after first fruiting flower.	1 app
flutriafol	Rhyme	3	-	-	-	-	-	-	-	-	-	E ^R	F	5 - 7 fl oz (7 fl oz for charcoal rot)	0	4 apps
myclobutanil	Rally 40WSP	3	-	-	-	-	-	VG	VG	-	-	E ^R	-	2.5-5 oz	0	30 oz
propiconazole	Tilt, others	3	-	F	F	P	P	G	-	-	-	VG ^R	F	4 fl oz	0	4 apps
tetraconazole	Mettle 125 ME	3	-	-	-	-	-	-	-	-	-	E ^R	-	3-5 fl oz	0	20 fl oz
triflumizole	Procure 480SC, Trionic 4SC	3	-	-	-	-	-	-	-	-	-	E ^R	-	4-8 fl oz	1	4 apps
propiconazole and thiophanate-methyl	Protocol	3, 1	-	G ^R	G ^R	G ^R	G ^R	G	G	-	-	G ^R	-	1.33 pt	1	5.3 pt
difenoconazole and cyprodinil	Inspire Super	3, 9	-	G	G	VG	VG	-	-	-	-	E	-	16-20 fl oz	0	80 fl oz
mefenoxam	Ridomil Gold SL, ReCon Bold SL, Ultra Flourish XHL	4	-	-	-	-	-	-	-	VG ^R	VG	-	-	1 pt ¹⁰	0	3 pt/3 apps
mefenoxam	Thrive 4M	4	-	-	-	-	-	-	-	VG ^R	VG	-	-	15.7 fl oz ¹⁰	0	47.1 fl oz/3 apps
mefenoxam	Ultra Flourish, Vaunt	4	-	-	-	-	-	-	-	VG ^R	VG	-	-	2 pt ¹⁰	0	6 pt/3 apps

Chemical Names	Product Choices ²	Mode of Action Group(s) ³	Angular Leaf Spot	Anthraxnose Crown Rot	Anthraxnose Fruit Rot	Botrytis Crown Rot	Botrytis Fruit Rot (Gray Mold)	Common Leaf Spot	Leaf Blight	Leather Rot	Phytophthora Crown or Root Rot and Red Stele Root Rot	Powdery Mildew	Pestalotia Leaf Spot and Fruit Rot	Rate ⁴	PHI ⁵	Maximum Use ⁶
metalaxyl	Metalaxyl 2E	4	-	-	-	-	-	-	-	VG ^R	VG	-	-	2 qt ¹⁰	0	6 qt/3 apps
metalaxyl	Xylar FC	4	-	-	-	-	-	-	-	VG ^R	VG	-	-	1.4 qt ¹⁰	0	4.3 qt
oxathiapoprolin and mefenoxam	Orondis Gold	4, 49	-	-	-	-	-	-	-	-	VG	-	-	20-62 fl oz	28	124 fl oz
isofetamid	Kenja 400SC	7	-	-	-	-	E	-	-	-	-	GR	-	13.5-15.5 fl oz	0	54 fl oz
penthiopyrad	Fontelis ¹¹	7	-	F	F	-	E ^R	-	-	-	-	GR	-	16-24 fl oz	0	72 fl oz
pydiflumetofen and fludioxonil	Miravis Prime	7, 12	-	G	G	VG	E	-	-	-	-	E	-	9.1 - 13.4 fl oz (11.4 – 13.4 fl oz for anthracnose)	0	26.8 fl oz
pyrimethanil	Scala SC	9	-	-	-	-	G ^R	-	-	-	-	-	-	18 fl oz (9-18 fl oz if tank mixed with other product for grey mold)	1	54 fl oz
cyprodinil and fludioxonil	Switch 62.5 WG	9, 12	-	G	G	VG	E	F	F	-	-	-	G	11-14 oz (5-8 oz/100 gal for dip)	0	56 oz
azoxystrobin	Abound Flowable, others	11	-	G ^R	E ^R	-	F ^R	F	-	VG	-	E ^R	-	6.0-15.5 fl oz (5-8 fl oz/100 gal for dip)	0	see label
pyraclostrobin	Cabrio EG	11	-	G ^R	E ^R	-	F ^R	F	-	VG	-	E ^R	-	12-14 oz	0	70 oz
trifloxystrobin	Flint Extra	11	-	G ^R	E ^R	-	F ^R	F	-	VG	-	E ^R	-	2.5-3 fl oz	0	18 fl oz
azoxystrobin and difenoconazole	Quadris Top	11, 3	-	G ^R	E ^R	-	F ^R	G	-	F	-	E ^R	-	12-14 fl oz	0	56 fl oz
azoxystrobin and propiconazole	Quilt Xcel, others	11, 3	-	G ^R	E ^R	-	F ^R	-	-	-	-	E ^R	-	14 fl oz	0	4 apps
pyraclostrobin and boscalid	Pristine	11, 7	-	G ^R	E ^R	-	G ^R	VG	VG	-	-	E ^R	-	18.5-23 oz	0	115 oz
pyraclostrobin and fluxapyroxad	Merivon	11, 7	-	G ^R	E ^R	-	E ^R	VG	VG	-	-	E ^R	-	see label (varies by disease)	0	3 apps

Chemical Names	Product Choices ²	Mode of Action Group(s) ³	Angular Leaf Spot	Anthrachnose Crown Rot	Anthrachnose Fruit Rot	Botrytis Crown Rot	Botrytis Fruit Rot (Gray Mold)	Common Leaf Spot	Leaf Blight	Leather Rot	Phytophthora Crown or Root Rot and Red Stele Root Rot	Powdery Mildew	Pestalotia Leaf Spot and Fruit Rot	Rate ⁴	PHI ⁵	Maximum Use ⁶
trifloxystrobin and fluopyram	Luna Sensation	11, 7	-	G ^R	E ^R	-	E ^R	VG	VG	-	-	E ^R	-	4-7.6 fl oz (6-7.6 fl oz for gray mold; 7.6 fl oz for Rhizopus fruit rot and Mycosphaerella leaf spot)	0	27.1 fl oz
quinoxifen	Quintec	13	-	-	-	-	-	-	-	-	-	E	-	4-6 fl oz	1	4 apps
fenhexamid	Elevate 50WDG	17	-	-	-	-	E ^R	-	-	-	-	-	-	1.5 lb ⁹	0	6 lb
polyoxin D zinc salt	Ph-D	19	-	-	F	-	G	-	-	-	-	-	-	6.2 oz	0	6 apps
polyoxin D zinc salt	OSO 5%SC ^{OG}	19	-	-	F	-	G	-	-	-	-	-	-	6.5 – 13.0 fl oz	0	78 fl oz

^{OG} Product has been listed by the Organic Materials Review Institute (OMRI). Check with your organic certifier to ensure acceptability of a particular product.

¹

Efficacy Rating	Abbreviation
Excellent	E
Very Good	VG
Good	G
Fair	F
Poor	P
Resistant	R
Not Effective or Unknown	-

R = indicates that there is a possibility of resistance to the chemical and that the chemical will not be effective, or as effective as noted, if the pathogen is resistant to it,
- = indicates that the chemical is not expected to be effective for managing the disease or that data is lacking.

Actual performance may vary. Ratings are based largely on the Southeast Regional Blueberry Integrated Management Guide and the Southeast Regional Organic Blueberry Pest Management Guide of the Southern Region Small Fruit Consortium.

² Chemical name (trade name). Reference to commercial or trade names is made for the reader's convenience and with the understanding that no discrimination or endorsement of a particular product is intended by LSU or the LSU AgCenter. In some cases, other brands are available.

³ Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

⁴ Rates are the amount of formulation (product) per acre unless otherwise indicated. Check label for changes.

⁵ Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest. Check label for changes and for reentry interval (REI), which is longer than PHI in some cases.

⁶ Maximum amount per acre per year or growing season. See labels for additional restrictions and changes.

⁷ Make sure to get the Aliette WDG that is labeled for use on strawberries. There is a product of the same name that is not labeled for strawberries.

⁸ Do not apply more than 3.75 lb product per acre per application in Livingston or Rapides parishes.

⁹ "When plastic mulch is used, do not apply within 16 feet...of naturally vegetated or aquatic areas."

¹⁰ When the product is applied through drip irrigation equipment, adjust the rate according to label instructions for banded applications.

¹¹ Do not apply to cvs. 'Clancy,' 'Jewel,' or 'L'Amour.'

¹² See labels for restrictions and recommendations regarding use at high temperatures and within given time periods before or after oil applications.

¹³ Five applications per year of Thiram SC are allowed in locations west of the Mississippi River, and 12 applications per year are allowed east of the Mississippi River.

The strawberry section was revised September 2024 by Mary Helen Ferguson.

Commercial Crop Production: Sweet Potato

Sweet Potato

Integrated Sweet Potato Disease Management

Successful management of sweet potato diseases requires the same strategies as other vegetables (see Chapter viii). Using resistant varieties, starting with clean seed stock and good sanitation practices are essential to minimizing diseases of sweet potatoes.

Use disease-resistant varieties. Select resistant varieties (Table 1) based on the disease profile for your production region.

Use virus-tested foundation seed. A combination of aphid-transmitted viruses commonly infect sweet potatoes and can significantly reduce yields by up to 25%-40% even though the symptoms they induce may be very mild. It is not yet possible to totally prevent virus infections in sweet potato but using virus-tested foundation seed and a good on-farm seed program can minimize their effects on yield. The LSU AgCenter Sweet Potato Research Station produces virus-tested foundation seed through the [LSU AgCenter Foundation Seed](#) program. To learn more, contact:

Sweet Potato Research Station

LSU AgCenter
130 Sweet Potato Road
Chase, LA 71324

Phone: 318-435-2155
Fax: 318-435-2110

For most growers, it will be necessary to go through a one-year on-farm increase of planting materials from the foundation seed. The foundation seed should be bedded and the seed crops produced should be kept as far away from older virus-infected sweet potato crops as possible to reduce the rate of re-infection with viruses.

Use good sanitation practices. Several bacterial and fungal pathogens that cause sweet potato diseases (bacterial root rot, Fusarium root rot, black rot, foot rot, scurf, as well as root-knot nematode) can be carried in the roots and transmitted onto slips. The use of routine sanitation measures is an essential part of an integrated management program for controlling sweet potato diseases caused by bacteria and fungi. The following sanitation tactics should be used for disease prevention.

1. Select seed free from disease or nematode cracking.
2. Cut transplants at least one inch above the soil rather than pulling slips.
3. Bed in problem-free area and avoid repeated bedding in the same site.
4. Rotate beds and production fields on a regular basis.

Foliar fungicides. Data are lacking to suggest that fungal leaf diseases cause any significant effect on sweet potato yields in the southeastern United States. Thus, while some fungicides (Table 2) may be labeled for controlling these foliar diseases, they have not been evaluated for efficacy or crop tolerance on sweet potatoes in Louisiana. Fungicide sprays for black rot at transplanting are only recommended if black rot was observed on “seed” roots or previous year crop. To avoid the buildup of pathogens with fungicide resistance, fungicides should be alternated with fungicides with a different mode of action (see Chapter iv).

Table 1. Sweet potato variety reactions to common diseases in Louisiana.**Table Legend**

Reaction	Abbreviation
Susceptible Reaction	S
Resistant Reaction	R
Intermediate Reaction	I
Unknown Reaction	-

Variety	Rhizopus Soft Rot	Southern Root-knot Nematode	Guava Root-knot Nematode	Soil Rot	Fusarium Wilt	Sclerotial Blight	Fusarium Root Rot	Bacterial Root Rot
Bayou Belle	R	I-R	S	I-R	R	-	-	S
Beauregard	R	S	S	R-I	R	I	R	S
Bellevue	I	HR	S	R	R	-	-	S
Bonita	S	R	S	I	I-R	-	S-I	S
Burgundy	-	R	-	I-R	R	-	-	S
Centennial	-	S	R	S	I-R	I-S	I	R
Covington	I	I-R	S	I-R	R	-	-	-
Evangeline	R	HR	I-S	I-R	R	-	R	S
Hernandez	I-S	R-I	S	R-I	I-R	-	I	R
Jewel	I	I-R	R	S	R	I	I	I
Murasaki-29	R	HR	R	I-R	R		R	
Orleans	R	S	S	R-I	R	-	R	S
Porto Rico (Unit 1)	-	I-S	-	S	S	S	R-I	R

Table 2. Recommended pesticides, rates and pesticide use restrictions for bacterial root rot (*Dickeya dadantii*) in sweet potato crops.

Consult the current specimen label for further information on each product.

Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Sodium hypochlorite (chlorine)		100-150 ppm ⁵		1 app

¹ Reference to commercial or trade names is made with the understanding that no discrimination is intended nor endorsement of a particular product by LSU or the LSU AgCenter is implied.

² Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

³ Rates are the amount of formulation (product) per acre unless otherwise indicated. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

⁴ Preharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

⁵ Maintain free chlorine between 100-150 ppm, pH 6.5-7.5. Replace wash water as often as possible or when it becomes obviously dirty.

Table 3. Recommended pesticides, rates and pesticide use restrictions for black root rot (*Ceratocystis fimbriata*) in sweet potato crops.

Consult the current specimen label for further information on each product.

Product Choices ¹	Chemical Name	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Mertect 340-F	Thiabendazole (seed root dip only)	1	107 fl oz/100 gal ^{5,6}		1 app

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² Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

³ Rates are the amount of formulation (product) per acre unless otherwise indicated. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

⁴ Preharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

⁵ Treat seed roots for 1-2 mins and plant immediately. Replace wash water as often as possible or when it becomes obviously dirty.

⁶ Do not use treated roots for food or animal feed.

Table 4. Recommended pesticides, rates and pesticide use restrictions for foot rot (*Plenodomus destruens*) in sweet potato crops.

Consult the current specimen label for further information on each product.

Product Choices ¹	Chemical Name	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Mertect 340-F	Thiabendazole (seed root dip only)	1	107 fl oz/100 gal ^{5,6}		1 app

¹ Reference to commercial or trade names is made with the understanding that no discrimination is intended nor endorsement of a particular product by LSU or the LSU AgCenter is implied.

² Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

³ Rates are the amount of formulation (product) per acre unless otherwise indicated. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

⁴ Preharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

⁵ Treat seed roots for 1-2 mins and plant immediately. Replace wash water as often as possible or when it becomes obviously dirty.

⁶ Do not use treated roots for food or animal feed.

Table 5. Recommended pesticides, rates and pesticide use restrictions for *Fusarium* root rot (*Fusarium* spp.) in sweet potato crops.

Consult the current specimen label for further information on each product.

Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Proper curing at harvest, good sanitation practices, use of high-quality seed roots and prevention of wounding by controlling nematodes and insects are the most effective strategies for reducing <i>Fusarium</i> root rot.				

¹ Reference to commercial or trade names is made with the understanding that no discrimination is intended nor endorsement of a particular product by LSU or the LSU AgCenter is implied.

² Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

³ Rates are the amount of formulation (product) per acre unless otherwise indicated. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

⁴ Preharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

Table 6. Recommended pesticides, rates and pesticide use restrictions for *Rhizopus* soft rot (*Rhizopus* spp.) in sweet potato crops.

Consult the current specimen label for further information on each product.

Product Choices ¹	Chemical Name	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Botran 5F	Dicloran	14	0.6 qt/100 gal		1 app ⁵
Scholar SC (in-line dip only)	Fludioxonil	12	16-32 fl oz/100 gal		1 app ^{5,6}
Scholar SC (spray application only)	Fludioxonil	12	16 fl. oz/200,000 lb of sweet potatoes		1 app ⁷
Bio-Save 10 LP		NA	1.1 lb/30 gal		

¹ Reference to commercial or trade names is made with the understanding that no discrimination is intended nor endorsement of a particular product by LSU or the LSU AgCenter is implied.

² Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

³ Rates are the amount of formulation (product) per acre unless otherwise indicated. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

⁴ Preharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

⁵ For postharvest disease control. Dip sweet potatoes for 5 to 10 seconds in a well-agitated suspension. Do not expose treated roots to direct sunlight.

⁶ To apply as a spray use 16 fl oz/200,000 lb of sweet potatoes. Refer to label for application directions. Do not recirculate suspension where black rot is a problem.

⁷ Ensure Scholar SC remains in suspension by using agitation. Ensure proper coverage of the sweet potatoes. Mix 16 fl oz of Scholar SC in an appropriate water, wax/oil emulsion, of aqueous dilution of a was/oil emulsion.

Table 7. Recommended pesticides, rates and pesticide use restrictions for sclerotial blight (*Sclerotium rolfsii*) in sweet potato crops.

Consult the current specimen label for further information on each product.

Product Choices ¹	Chemical Name	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Botran 5F	Dicloran (seed root dip only)	14	0.6 qt/7.5 gal ⁵		1 app
Botran 5F	Dicloran (spray ⁸ application only)	14	5.73 oz/14 gal ⁶		1 app
Quadris Flowable	Azoxystrobin	11	0.4-0.8 fl oz ⁶	0	120 fl. oz./A/yr
Satori	Azoxystrobin	11	0.4-0.8 fl oz ⁶	0	120 fl. oz./A/yr
Willowood Azoxy 2SC	Azoxystrobin	11	0.4-0.8 fl oz ⁶	0	123 fl. oz./A/yr
Aprovia Top	Difenconazole + benzofindiflupyr	7+3	10.5-13.5 fl oz ⁷	14	27 fl oz/A/yr

¹ Reference to commercial or trade names is made with the understanding that no discrimination is intended nor endorsement of a particular product by LSU or the LSU AgCenter is implied.² Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).³ Rates are the amount of formulation (product) per acre unless otherwise indicated. Usually, 100 gallons of water are required to give good coverage with boom sprayers.⁴ Preharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.⁵ Dip seed roots for 10-15 seconds in a well-agitated suspension. Drain and bed immediately. Prepare a fresh suspension daily.⁶ Rates are per 1,000 linear feet of row on a 42-inch plant bed. Refer to the label for modes of application.⁷ No more than two applications of Aprovia Top Fungicide may be applied on a 7-day interval. All other applications must be applied no closer than a 14-day interval.**Table 8. Recommended pesticides, rates and pesticide use restrictions for scurf (*Monilochaetes infusans*) in sweet potato crops.**

Consult the current specimen label for further information on each product.

Product Choices ¹	Chemical Name	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Botran 5F	Dicloran (seed root dip only)	14	0.6 qt/7.5 gal ⁵		1 app
Botran 5F	Dicloran (spray ⁸ application only)	14	5.73 oz/14 gal ⁶		1 app
Mertect 340F	Thiabendazole (seed root dip only)	1	107 fl oz/100 gal ^{7,8}		1 app

¹ Reference to commercial or trade names is made with the understanding that no discrimination is intended nor endorsement of a particular product by LSU or the LSU AgCenter is implied.² Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).³ Rates are the amount of formulation (product) per acre unless otherwise indicated. Usually, 100 gallons of water are required to give good coverage with boom sprayers.⁴ Preharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.⁵ Dip seed roots for 10-15 seconds in a well-agitated suspension. Drain and bed immediately. Prepare a fresh suspension daily.⁶ Rates are per 1,000 linear feet of row on a 42-inch plant bed. Refer to the label for modes of application.⁷ Treat seed roots for 1-2 mins and plant immediately. Replace wash water as often as possible or when it becomes obviously dirty.⁸ Do not use treated roots for food or animal feed.

Table 9. Recommended pesticides, rates and pesticide use restrictions for seed-borne and soilborne fungi that cause decay, damping off or seedling blight in sweet potato crops.

Consult the current specimen label for further information on each product.

Product Choices ¹	Chemical Name	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Dynasty 0.83F	Azoxystrobin	11	0.10 to 0.38 fl oz per 100 lb of propagating roots ¹⁷		1 app
Maxim 4 FS	Fludioxonil	12	0.10 to 0.38 fl oz per 100 lb of propagating roots ¹⁷		1 app

¹ Reference to commercial or trade names is made with the understanding that no discrimination is intended nor endorsement of a particular product by LSU or the LSU AgCenter is implied.

² Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

³ Rates are the amount of formulation (product) per acre unless otherwise indicated. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

⁴ Preharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

⁵ Apply uniformly to roots as a water-based slurry.

Table 10. Recommended pesticides, rates and pesticide use restrictions for soil rot or pox (*Streptomyces ipomoea*) in sweet potato crops.

Consult the current specimen label for further information on each product.

Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Resistant varieties (Table 1) should be used. Soil pH should be maintained below 5.2 to minimize disease severity if a susceptible variety is used.				

¹ Reference to commercial or trade names is made with the understanding that no discrimination is intended nor endorsement of a particular product by LSU or the LSU AgCenter is implied.

² Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

³ Rates are the amount of formulation (product) per acre unless otherwise indicated. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

⁴ Preharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

Table 11. Recommended pesticides, rates and pesticide use restrictions for white rust (*Albugo ipomoeae-panduratae*) in sweet potato crops.
Consult the current specimen label for further information on each product.

Product Choices ¹	Chemical Name	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Quadris Flowable	Azoxystrobin	11	6.0-15.5 fl oz	0	120 fl. oz.
Satori	Azoxystrobin	11	6.0-20.0 fl oz	0	120 fl. oz.
Willowood Azoxy 2SC	Azoxystrobin	11	6.0-15.5 fl oz	0	123 fl. oz.
Reason 500 SC	Fenamidone	11	5.5-8.2 fl oz	14	16.4 fl oz
Cabrio EG	Pyraclostrobin	11	8-16 fl oz ⁵	0	48 fl oz

¹ Reference to commercial or trade names is made with the understanding that no discrimination is intended nor endorsement of a particular product by LSU or the LSU AgCenter is implied.

² Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

³ Rates are the amount of formulation (product) per acre unless otherwise indicated. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

⁴ Preharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

⁵ Do not make more than one (1) application of Cabrio before alternating to a labeled non-Group 11 fungicide with a different mode of action.

Commercial Crop Production: Christmas Trees and Conifers

Christmas Trees and Conifers

Integrated Disease Management

Christmas tree growers face many obstacles to growing healthy trees with the largest challenge being pests. The development of an integrated program for managing diseases as well as insects must begin prior to establishing a crop. Successful management of Christmas tree and conifers diseases requires proper identification of the tree species as well as the disease, good sanitation practices, fungicide spray applications that target the pathogen’s vulnerable life stage and accurate selection of fungicides.

Most diseases of Christmas trees and conifers are caused by fungi and nematodes. Fungal diseases can move rapidly through a plantation as fungal spores are dispersed by wind, rain, animals or physical activities such as mowing, pruning or harvesting. Fungal diseases are easiest to identify when fruiting bodies (if produced) are present on the needles.

Disease

Symptoms and integrated disease management tactics for Christmas trees and conifers.

Disease	Hosts	Symptoms	Cultural Management	Fungicides
Armillaria root rot (<i>Armillaria</i> spp.)	Most Christmas tree and conifers	Reduced terminal growth. Yellowing and eventual browning of all the needles. A white resin forms at the base of the tree and white fans of fungus form between the bark and wood near the base of the tree. Tan-colored mushrooms may form at the base of the tree. Rapid death of young tree groupings may occur.	Remove tree. Dig up stumps, root balls and pruning waste and burn on site. For small trees remove as much soil around the root ball as possible. Do not plant a new tree in the same location.	No fungicides are effective at managing Armillaria root rot. Soil fumigants may suppress disease.
Botryosphaeria canker and dieback (<i>Botryosphaeria dothidea</i>)	All Christmas tree and conifers	Disease is more common on environmentally stressed trees. Branch wilting or dieback. Cankers form on twigs and branches. Wood beneath the bark is reddish-brown. Bark may peel from cankered area.	Maintain proper nutrient and water levels so that trees are not stressed. Protect seedlings from freeze injury. Remove and destroy diseased branches.	Fungicides: No chemicals are available currently.

Disease	Hosts	Symptoms	Cultural Management	Fungicides
Botrytis blight (<i>Botrytis cinerea</i>)	All Christmas tree and conifers	Water-soaked spots on needles and shoots that turn brown and girdle the needle or shoot. Blighted new growth (tip dieback) that resembles cold damage. Gray, fuzzy spores are present on diseased needles and shoots.	Space new plantings to promote good air flow and drying. Remove weeds from under and around the trees. Prune out infected tips. Disinfect shears with Clorox bleach (20%) or 70% ethanol between cuts. Remove infected seedlings from seedling beds to prevent spore dispersal to healthy seedlings.	Fungicides are not effective for established plantings. Apply dicloran (Botran 75W @ 2 lb/a) preventatively to nursery, greenhouse, container and bare rootstocks.
Cercospora needle blight (<i>Cercosporidium sequoia</i>)	Cypress (Arizona, Leyland), juniper, red cedar	Disease is more common on environmentally stressed trees or poorly managed trees. Browning of the needles and scales beginning on the inner portions of the lower branches.	Maintain proper nutrient and water levels so that trees are not stressed. Do not let weeds grow under or between trees.	Apply copper in mid- to late spring. Copper sulfate (i.e., Cuprofix-Ultra 40 Disperss, Cuproxat); copper hydroxide (i.e., Kocide 2000 or 3000, Kentan DF, Badge X2, Champ Formula 2 Flowable).
Diplodia (<i>Sphaeropsis</i>) tip blight (<i>Diplodia pinea</i> formerly <i>Sphaeropsis sapinea</i>)	Pines (Scotch, red, white, Austrian) and other conifers. Rarely found on Douglas fir or spruce.	Discolored needle tips (brown, yellow, gray) on current season's growth. Needles are stunted; shoots may curl. Branch dieback. Small black fruiting bodies form on needles, cones and shoots. Cankers form on stems and branches and ooze resin that drips and adheres to needles. Trees are most susceptible from bud break to needle elongation.	Disease is more common on environmentally stressed trees. Maintain proper nutrient and water levels so that trees are not stressed. Do not let weeds grow under or between trees. Remove and destroy infected twigs, branches and cones during dry weather.	Azoxystrobin (Equation, Heritage, Satori, Quadris); thiophanate-methyl (Cercobin, Incognito 4.5F, Topsin 4.5FL). Rates vary depending on the product.
Pine-oak gall rust (Eastern gall rust) (<i>Cronarium quercuum</i>)	Pines (Scotch, red, Virginia, Mugo, Jack and Austrian). Oaks are an alternate host for Eastern gall rust.	Stunting, deformation and twig and branch dieback. Visible, globe-shaped galls form on the stems or branches. Yellow-orange fruiting bodies form on the surface of mature galls in the spring.	Remove seedlings with galls or cut out branches with galls from established trees. Do not remove branches or trees during sporulation. Monitor and manage gall rust in oak trees that are near the plantation.	Mancozeb (Dithane 75DF Rainshield and Fore 80W Rainshield). Rates vary depending on the product.

Disease	Hosts	Symptoms	Cultural Management	Fungicides
Phytophthora root rot (<i>Phytophthora</i> spp.)	All Christmas tree and conifers	Reduced and stunted growth. Yellowing and eventual browning of all the needles. Bleeding basal cankers and root decay. Rapid tree death.	Do not plant in fields infested with Phytophthora. Plant in well-drained fields; avoid standing water in the fields.	Fungicides are only effective if used in conjunction with good cultural practices. Fungicides are not effective on trees showing moderate to high levels of disease. Fungicides are most effective when applied to seedlings or at transplanting. Dazomat (BasamidG); metalaxyl (Metastar 2E); mefenoxam (Subdue GR, Subdue Maxx). Rates vary depending on the product.
Phomopsis blight (<i>Phomopsis juniperovora</i>)	Juniper, red cedar, Arizona cypress, arborvitae	Shoot tips turn yellow, then brown. Gray cankers on shoots girdle the shoots and cause dieback. Black fruiting bodies can be seen on the canker with a hand lens.	Plant resistant varieties. Prune out diseased shoots when plants are dry. Prune by making a cut 3 inches below the dying shoot. Disinfect shears with Clorox bleach (20%) or 70% ethanol between cuts.	Mancozeb (Fore 80WP Rainshield, Dithane 75DF Rainshield); propiconazole (Banner Maxx, Bumper ES, Fitness, Procon Z, Protocol); copper hydroxide (Kocide 2000 or 3000, Champ Formula 2 Flowable); copper sulfate (Cuprofix Ultra 40 Disperss).
Pine wilt disease (nematode) (<i>Bursaphelenchus xylophilus</i>)	Pines (especially Scotch)	Nematodes are moved from tree to tree by the pine sawyer beetle. Needles turn yellow then reddish-brown and wilt. Needles remain on the tree. Nematodes feed on resin ducts of healthy trees.	Manage beetle infestations. Remove and destroy diseased trees.	No chemicals are available currently.
Seiridium canker or dieback (<i>Seiridium unicorne</i>)	Cypress	Water-stressed trees are very susceptible to disease. Yellowing and browning of upper lateral shoots. Elongated dark brown or purple cankers are observed on stems, branches and branch axils resulting in dieback. Cankers are sunken with raised margins. Wood beneath the bark oozes resin and is reddish-brown in color.	Remove cankered twigs and branches. Prune out infected tips. Disinfect shears with Clorox bleach (20%) or 70% ethanol between cuts. Remove severely diseased trees or trees with cankers on the main trunk.	Effective chemical control is not available currently.

The Christmas tree and conifer section was revised October 2023 by R. Singh.

Commercial Crop Production: Turfgrass

Turfgrass

Integrated Disease Management

Effective turfgrass disease management can be achieved by maintaining healthy and vigorously growing grass. Diseases can be avoided by selecting turfgrass species that are well-adapted to site conditions and the local climate. Establishing a fertility program that promotes turfgrass vigor, adopting optimal mowing heights and using good irrigation practices can minimize fungicide use significantly.

Disease identification key for southern turfgrass.

Developed by G. Holcomb, Professor Emeritus

I. Grass affected in patches.

Patch Size	Leaf Lesions Present	Disease
about 3" in diameter	Yes	Dollar spot
greater than 3" in diameter	No	See rows 1-4 in table below.
Patch Details	Disease	
Ring or arc of lush growth or dead grass; mushrooms present or absent.	Fairy ring	
No ring or arc of lush growth present; no mushrooms present. Grass often affected in streaks, with leaves matted; primarily on rye grass over-seeded on golf courses and Bermudagrass greens.	Pythium blight	
No ring or arc of lush growth present; no mushrooms present. Patches more or less circular, may enlarge to several feet; leaves rotted at the base, can be pulled easily from the leaf sheath.	Large patch ¹	
No ring or arc of lush growth present; no mushrooms present. Affected areas irregular in shape, 8-24 inches in diameter (or larger) with a mixture of yellow and dead grass; roots are sparse, short and black; stolons may be rotted.	Take-all root rot ²	

¹ Formerly known as brown patch.

² Take-all root rot may also resemble chinch bug damage.

Table 1. Fertility and mowing practices for turfgrass.

Grass Type	Nitrogen Fertility Timing	Mowing ¹
Warm season grasses	Summer (April-August)	1-2 inches
Cool season grasses	Fall	2.5 to 4.0 inches

¹ Do not remove more than one-third of the leaf growth during a single mowing. Maintain a sharp blade to minimize mechanical injuries on leaf blades.

II. Grass not affected in patches.

Description	Disease
Chlorotic spots and orange powder (spores that can be rubbed off) on leaves.	Rust
Leaf spots present, but no orange powder present.	See rows 1-3 in table below.
No leaf spots present.	See row 4 or 5 in table below.
Affected Turf Grass Details	Disease
Leaf spots varying in size; occurring primarily on Bermudagrass and ryegrass.	Leaf spots or melting out
Leaf spots oval to irregular in shape with brown borders and tan to gray centers; primarily on St. Augustinegrass.	Gray leaf spot
Leaf spots reddish brown to brown surrounded by a yellow halo; primarily on centipedegrass.	Anthrachnose
Grass covered with an easily removed slimy or crusty growth.	Slime molds ³
Mottle, chlorosis or mosaic on leaves; on St. Augustinegrass or centipedegrass.	St. Augustine decline or Centipede decline ⁴

³ Nonpathogenic. Not a disease.

⁴ Viral diseases caused by *Panicum mosaic virus*.

Table 2. Fungicides labeled for use on commercial turfgrasses for specific disease management.

Fungicide ¹	Large patch	Dollar spot	Gray leaf spot	Leafspots & melting out	Take-all root rot ²	Fairy ring	Pythium blight	Algae
azoxystrobin	Yes	No	Yes	Yes	Yes	Yes	Yes	No
boscalid	No	Yes	No	No	No	No	No	No
captan	No	No	No	Yes	No	No	No	No
chlorothalonil	No	Yes	Yes	Yes	No	No	No	Yes
cyazofamid	No	No	No	No	No	No	Yes	No
ethazole (etridiazole)	No	No	No	No	No	No	Yes	No
fenarimol	No	Yes	No	No	Yes	No	No	No
fludioxonil	No	No	Yes	Yes	No	No	No	No
fluoxastrobin	No	No	Yes	Yes	Yes	No	Yes	No
flutolanil	Yes	No	No	No	No	Yes	No	No
fosetyl-al	No	No	No	No	No	No	Yes	No
iprodione	Yes	Yes	No	Yes	No	No	No	No
mancozeb	No	Yes	Yes	Yes	No	No	Yes	Yes
mefenoxam	No	No	No	No	No	No	Yes	No
metconazole	Yes	Yes	No	No	No	Yes	No	No
myclobutanil	Yes	Yes	No	Yes	Yes	No	No	No
polyoxin D	Yes	No	Yes	Yes	No	Yes ³	No	No
phosphites (various salts)	No	No	No	No	No	No	Yes	No
propamocarb	No	No	No	No	No	No	Yes	No
propiconazole	Yes	Yes	Yes	Yes	Yes	No	No	No
pyraclostrobin	No	Yes ³	Yes	Yes	Yes	Yes	Yes	No
quintozene (PCNB)	No	Yes	No	Yes	No	No	No	No
tebuconazole	Yes	Yes	Yes	No	Yes	No	No	No
thiophanate-methyl	Yes	Yes	Yes	Yes	Yes	No	No	No
thiram	No	Yes	No	No	No	No	No	No
triadimefon	Yes	Yes	Yes	No	Yes	No	No	No
trifloxystrobin	No	Yes	Yes	Yes	No	No	No	No
triticonazole	Yes	Yes	No	No	Yes	No	No	Yes
vinclozolin	No	Yes	No	Yes	No	No	No	No

¹ Active ingredient.² Also known as *Gaeumannomyces graminis* var. *graminis* (Ggg) root decline, Bermuda decline and spring dead spot.³ For disease suppression only.

Table 3. Efficacy¹ of fungicides in managing turfgrass diseases.**Table Legend**

Efficacy	Number
Consistently good	4
Good to excellent control in most experiments	3
Fair to good control in most experiments	2
Inconsistent but performs well in some instances	1
Not effective	-

¹Efficacy data are based on trials using commercial formulations of the fungicides, not the formulations readily available to homeowners. Ratings were compiled by Bruce B. Clarke, Department of Plant Biology, Rutgers University; Paul Vincelli, Department of Plant Pathology, University of Kentucky; Paul Koch, Department of Plant Pathology, University of Wisconsin-Madison; Ming-Yi Chou, Department of Plant Biology, Rutgers University; (PPA-1 Chemical Control of Turfgrass Diseases 2024; <https://publications.ca.uky.edu/ppa-1>).

²Active ingredient.

³Also known as *Gaeumannomyces graminis* var. *avenae* (Ggg) root decline, Bermuda decline and spring dead spot.

⁴Ratings within parentheses are for take-all root decline caused by Ggg.

Fungicide ²	Large patch	Dollar spot	Gray leaf spot	Leaf spots & melting out	Take-all root rot ³	Fairy ring	Pythium blight	Algae
azoxystrobin	4	-	4	3	(3)	3	2	-
boscalid	-	4	-	-	-	-	-	-
chlorothalonil	-	3	2	2				3
copper hydroxide + mancozeb	-	-	-	-	-	-	-	4
cyazofamid	-	-	-	-	-	-	3	-
fenarimol	-	3	-	-	(2)	-	-	-
fludioxonil	-	-	-	3	-	-	-	-
fluopicolide + pfropamocarb	-	-	-	-	-	-	3	-
fluoastrobilin	-	-	-	-	-	-	2	-
flutolanil	4	-	-	-	-	3	-	-
fosetyl-al	-	-	-	-	-	-	2	-
iprodione	2	3	-	4	-	-	-	
mancozeb	-	1	2	3	-	-	2	3
mefenoxam	-	-	-	-	-	-	2	-
metconazole	-	4	2	-	-	3	-	-
myclobutanil	2+	4	-	1	-	-	-	-
polyoxin D	1	-	1	-	-	2+	-	-
phosphite salts	-	-	-	-	-	-	2	-
propamocarb	-	-	-	-	-	-	2	-
propiconazole	2	4	2	2	(2)		-	-
pyraclostrobin	3	2+	4	3	(3)	3	2+	-
quintozene (PCNB)	4	-	-	2	-	-	-	-
tebuconazole	-	4	-	-	-	-	-	-
thiophanate-methyl	-	4	4	2	-	-	-	-
triadimefon	4	4	2	-	(2)	3	-	-
trifloxystrobin	-	-	3	2	-	-	-	-
triticonazole	3	4	-	-	-	-	-	2
vinclozolin	-	4	-	3+	-	-	-	-

Table 4. Fungicides registered for use on commercial turfgrasses only.

Fungicide ¹	Trade Name ²	Product Mode of Action Group (FRAC) ²	Formulation	Rate ⁴	Maximum Use
azoxystrobin	Heritage	11	50WG	0.2-0.4 oz	3.7 oz
azoxystrobin	Heritage G	11	0.31G	2-4 lb	37 lb
azoxystrobin	Heritage TL	11	8.8L	1-2 fl oz	18.5 fl oz
boscalid	Emerald ⁶	7	70WG	0.13-0.18 oz	1.1 oz
captan	Captan	M	50WP	0.13-0.2 lb	N/A
captan	Captan	M	80WDG	0.125 lb	N/A
chlorothalonil	Chlorostar, Chlorothalonil, Ensign	M	82.5WDG	1-5 oz	See label
chlorothalonil	Daconil, Echo, Equus, Initiate, Mainsail, Manicure	M	54F	1-5.5 oz	See label
cyazofamid	Segway	21	34.5F	0.45-0.9 fl oz	2.7 fl oz
ethazole (etridiazole)	Terrazole ⁸	14	35WP	2-4 oz	10 oz
fenarimol	Rubigan	3	11.6L	0.75-8 fl oz	32 fl oz
fludioxonil	Medallion	12	50WP	0.25-0.5 oz	1.5 oz
fluopicolide	Stellar ⁹	43	5.7SC	1.2 fl oz	2.4 fl oz
fluoxastrobin	Disarm	11	480SC	0.09-0.36 fl oz	0.4 fl oz
fluoxastrobin	Disarm	11	0.25G	1.2-4.6 lb	0.4 fl oz
flutolanil	Prostar	7	70WP	1.5-4.5 oz	4.5 oz
fosetyl-al	Chipco Signature	33	80WDG	4-8 oz	180 lb
fosetyl-al	Prodigy Signature	33	80WDG	4-8 oz	181 lb
iprodione	26GT	2	23.3F	3-8 fl oz	35 fl oz
iprodione	Chipco 26019	2	50WP	1.5-4 oz	17.6 oz
iprodione	Iprodione Pro	2	23.3F	3-8 fl oz	35 fl oz
mancozeb	Dithane	M	37F	6.4-12.8 fl oz	See label
mancozeb	Fore	M	75DF	4-8 oz	See label
mancozeb	Manzate, Penncozeb	M	80WP	4-8 oz	See label
mancozeb	Pentathlon	M	37F	6.4-12.8 fl oz	See label
mancozeb	Protect	M	75DF	4-8 oz	See label
mefenoxam	Fenox	4	22.5F	0.2-1 fl oz	3 apps/ season
mefenoxam	Mefenoxam, Ultra Flourish	4	25.1	0.5-1 fl oz	3 apps/ season
mefenoxam	Subdue	4	1G	12.5-25 oz	3 apps/ season

Fungicide ¹	Trade Name ²	Product Mode of Action Group (FRAC) ²	Formulation	Rate ⁴	Maximum Use
metconazole	Tourney	3	50WDG	0.18-0.44 oz	4 lb/A
myclobutanil	Eagle	3	20EW	1-2.4 fl oz	13.8 fl oz
myclobutanil	Hoist	3	40WP	0.6-1.2 oz	7.2 oz
polyoxin D zinc salt	Endorse	19	2.5WP	See label	See label
propamocarb hydrochloride	Banol	28	66.5L	1.3-4 fl oz	12.5 fl oz
propiconazole	Banner	3	14.3L	0.5-4 fl oz	16 fl oz
propiconazole	Spectator	3	41.8L	0.18-1.44 fl oz	5.8 fl oz
propiconazole	Dorado	3	14.3L	0.5-4 fl oz	16 fl oz
propiconazole	Fathom	3	14.3L	0.5-4 fl oz	16 fl oz
propiconazole	Honor Guard	3	14.3L	0.5-4 fl oz	16 fl oz
propiconazole	Propensity	3	14.3L	0.5-4 fl oz	16 fl oz
propiconazole	Propiconazole	3	41.8L	0.18-1.44 fl oz	5.8 fl oz
propiconazole	Savvi	3	14.3L	0.5-4 fl oz	16 fl oz
pyraclostrobin	Insignia	11	20WG	0.5-0.9 oz	5.5 oz
quintozene (PCNB)	Glacier	14	10G	5-7.5 lb	Refer to label
quintozene (PCNB)	Parflo	14	38.3F	11-24 fl oz	Refer to label
quintozene (PCNB)	PCNB	14	75WP	7-16 oz	Refer to label
quintozene (PCNB)	Revere	14	Refer to label	Refer to label	Refer to label
quintozene (PCNB)	Terraclor	14	Refer to label	Refer to label	Refer to label
quintozene (PCNB)	Turfcide	14	Refer to label	Refer to label	Refer to label
tebuconazole	Torque ^{13,6}	3	38.7L	0.6 fl oz	3.6 fl oz
thiophanate-methyl	3336	1	50WP	1-5 fl oz	Refer to label
thiophanate-methyl	Allban	2	46.2F	2-6 fl oz	Refer to label
thiophanate-methyl	Cavalier	3	41.25L	2-6 fl oz	Refer to label
thiophanate-methyl	Quali-Pro TM	4	46.2F	2-6 fl oz	Refer to label
thiophanate-methyl	T-Methyl	5	46.2F	2-6 fl oz	Refer to label
thiophanate-methyl	Transom	6	46.2F	2-6 fl oz	Refer to label
thiophanate-methyl	T-Storm	7	2G	1.5-9 lb	Refer to label
thiram	Defiant	M	75WDG	3.8-7.5 fl oz	Refer to label
thiram	Spotrete	M	44F	3.75-7.1 fl oz	Refer to label
thiram	Thiram	M	42.1L	2.5-5 oz	Refer to label
triadimefon	Bayleton	3	50WP	0.25-2 oz	Refer to label

Fungicide ¹	Trade Name ²	Product Mode of Action Group (FRAC) ²	Formulation	Rate ⁴	Maximum Use
trifloxystrobin	Compass	11	50WDG	0.1-0.25 oz	3 apps
triticonazole	Trinity, Triton	3	19.2L	0.5-2 fl oz	6 fl oz
vinclozolin	Curalan	2	50EG	1 oz	3 oz
vinclozolin	Touché	2	50EG	1 oz	3 oz

¹ Active ingredient

² Reference to commercial or trade names is made with the understanding that no discrimination is intended nor endorsement of a particular product by LSU or the LSU AgCenter is implied.

³ Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

⁴ Rates are the amount of formulation (product) per 1,000 square feet unless otherwise indicated.

⁵ Maximum use per 1,000 square feet per year unless otherwise noted.

⁶ For golf course use only.

⁷ Not for use on home lawns or turf associated with apartments, day care centers, playgrounds or athletic fields next to schools (elementary through high school).

⁸ For use on golf course tees and greens only.

⁹ Premixed with propamocarb for control of *Pythium* spp.

¹⁰ Do not use on Bermudagrass.

¹¹ Helena Prophyt for use on sod farms only. Refer to label for modes of application and restrictions.

¹² Formulation based on phosphorous acid equivalent in lb/gal.

¹³ Bermudagrass may be sensitive.

¹⁴ For use on golf courses and sod farms only.

¹⁵ Not for use on commercial sod.

Table 5. Turfgrass fungicide combinations

Fungicide ¹	Trade Name ³	Product Mode of Action Group ²	Formulation	Rate ⁴	Maximum Use
azoxystrobin + propiconazole	Headway	11, 3	5.7 + 9.5L	0.75-3.0 fl oz	Refer to label
azoxystrobin + propiconazole	Headway G	11, 3	0.31 + 0.75G	2-4 lb	Refer to label
azoxystrobin + chlorothalonil	Renown ⁷	11, M	3 + 45L	2.5-4.5 fl oz	Refer to label
chlorothalonil + propiconazole + fludioxonil	Instrata ⁷	M, 3, 12	29.9 + 4.7 + 1.2L	2.75-11 fl oz	Refer to label
chlorothalonil + thiophanate-methyl	Consyst ⁷	M, 1	50 + 16.7WDG	2-5 oz	Refer to label
chlorothalonil + thiophanate-methyl	Spectro 90 ⁷	M, 2	72 + 18WDG	3-5.8 oz	Refer to label
chlorothalonil + thiophanate-methyl	Peregrine ⁷	M, 3	72 + 18WDG	3-5.8 oz	Refer to label
chlorothalonil + thiophanate-methyl	Quali-Pro TM/C ⁷	M, 4	50 + 16.7WDG	2-5 oz	Refer to label
fluopicolide + propamocarb hydrochloride	Stellar ¹⁴	43, 28	5.54 + 55.4SC	1.2 fl oz	Refer to label
fluoxastrobin + chlorothalonil	Disarm C ⁷	11, M	2.44 + 38.4L	1.5-5.9 fl oz	Refer to label
fluoxastrobin + myclobutanil	Disarm M	11, 3	15.8 + 25.6L	0.25-1.0 fl oz	Refer to label
iprodione+ thiophanate-methyl	26/36 ¹⁵	2, 1	19.65 + 19.65L	1-4 fl oz	14.5 fl oz
iprodione+ thiophanate-methyl	TM + IP ¹⁵	2, 1	19.65 + 19.65L	1-4 fl oz	6 apps/season
mancozeb + copper hydroxide	Junction	M, M	15 + 46.1DF	2-4 oz	Refer to label
propiconazole + chlorothalonil	Concert ⁷	3, M	2.9 + 38.5L	1.5-8.5 fl oz	Refer to label
pyraclostrobin + boscalid	Honor ⁶	11, 7	16.8 + 11.2WG	0.55-1.1 oz	Refer to label
thiophanate-methyl + flutolanil	SysStar	1, 7	28.6 + 51.4WDG	2-3 oz	Refer to label
trifloxystrobin + triadimefon	Armada	11, 3	25L	1-2 fl oz	3 apps
trifloxystrobin + triadimefon	Tartan	11, 3	50WP	0.6-1.2 oz	Refer to label
triticonazole + chlorothalonil	Reserve ⁷	3, M	5 + 40L	3.2-5.4 fl oz	Refer to label

¹ Active ingredient² Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).³ Reference to commercial or trade names is made with the understanding that no discrimination is intended nor endorsement of a particular product by LSU or the LSU AgCenter is implied.⁴ Rates are the amount of formulation (product) per 1,000 square feet unless otherwise indicated.⁵ Maximum use per 1,000 square feet per year unless otherwise noted.⁶ For golf course use only.⁷ Not for use on home lawns or turf associated with apartments, day care centers, playgrounds or athletic fields next to schools (elementary through high school).⁸ For use on golf course tees and greens only.⁹ Premixed with propamocarb for control of *Pythium* spp.¹⁰ Do not use on bermudagrass.¹¹ Helena Prophyt for use on sod farms only. Refer to label for modes of application and restrictions.¹² Formulation based on phosphorous acid equivalent in lb/gal.¹³ Bermuda grass may be sensitive.¹⁴ For use on golf courses and sod farms only.¹⁵ Not for use on commercial sod.

The turf grass section was revised October 2023 by R. Singh.

Commercial Crop Production: Vegetables

Integrated Vegetable Disease Management

Successful management of vegetable diseases requires a disease management program that integrates the use of resistant varieties, balanced soil fertility, irrigation water management, use of good cultural practices, weed and insect control, biocontrol and chemical control. Development and implementation of a disease management plan and good record keeping will increase the overall yield and success of the vegetable crop.

Start with clean seed and/or certified disease-free transplants. Many vegetable disease problems originate with seeds or transplants. Seeds should be purchased from reputable commercial seed companies, and if seeds have not been previously treated, these should be treated following the seed treatment recommendations provided in the Vegetable Seed Treatment section of this guide.

Select resistant varieties. The use of resistant varieties is one of the best management strategies in an integrated pest management program because they are inexpensive compared to the cost of fungicides and bactericides, and they provide seasonal management. Select resistant varieties based on the disease profile for your production region and soil.

Use good cultural practices. Cultural practices are defined as a broad set of techniques that are used to manipulate the environment to improve crop production. Examples of cultural practices that should be considered in an integrated disease management plan follow:

- **Select land suitable for vegetable production.** Start by selecting a site that is well-drained, has good air movement, gets at least six hours of sunlight each day and does not have a history of problems with soilborne diseases. Avoid land surrounded by large established trees. Tree roots that extend well beyond the extent of the limbs can exhaust water and nutrient resources that would otherwise be available to the vegetable crop. Some tree roots also produce a toxin (juglone) that causes toxicity in toxin-sensitive vegetables such as tomatoes, peppers, eggplant, potatoes, asparagus, cabbage and broccoli.
- **Have your soil tested.** Many pathogens that cause disease on plants live and survive for long periods of time in the soil. Soil temperature, moisture, pH and fertility all influence a pathogen's ability to survive and colonize plants. Have your soil tested annually to determine the pH, salts, nutrients and organic matter levels and water-holding capacity. For more information on how to sample, test and assess the quality of your soil contact the LSU AgCenter Soil Testing & Plant Analysis Laboratory. Tests are also available that can determine the population levels of some pathogens in the soil. Contact the LSU AgCenter Plant Diagnostic Center for more information on available pathogen tests.

Plant Diagnostic Center

LSU AgCenter
Department of Plant Pathology & Crop Physiology
302 Life Sciences Bldg.
LSU Campus
Baton Rouge, Louisiana 70803

Phone: 225-578-4562

Fax: 225-578-1415

Website: www.lsuagcenter.com/plantdiagnostics

Soil Test and Plant Analysis Lab

LSU AgCenter
School of Plant, Environmental and Soil Sciences
Baton Rouge, Louisiana 70803

Phone: 225-578-2110

Fax: 225-578-1403

Website: www.lsuagcenter.com/soiltest

- **Use high quality water for irrigation and other agricultural uses.** Untreated surface waters can harbor both plant and human pathogens. If practical, and economical, potable water should be used to irrigate vegetable crops, especially when crops are irrigated using overhead (sprinkler) irrigation systems. Water treatment and filtration practices should be adopted if surface water is the primary source of irrigation water. The timing and frequency of irrigation should also be considered to minimize the risk of disease development. Avoid overwatering and overhead irrigation. Water early in the day so that plants have an adequate amount of time to dry. Consider raised beds to reduce the amount of standing water in the rows.
- **Develop a four-year crop rotation cycle.** Crop rotations are an important component of an IPM program because they interrupt the life cycle of pathogens by placing the pathogens in a nonhost environment. Through this interruption the pathogens are unable to accumulate to levels that could cause significant levels of disease and crop losses. Over a four-year period, plant plants from a different plant family.

- **Use plastic and organic mulch.** Mulch serves as a barrier between the soil and plant tissue and reduces the amount of pathogen that can be splashed onto leaves, stems and fruit. Light-reflective plastic mulches can deter insects that transmit important viral diseases from landing on plants. Do not reuse plastic mulches. Organic mulches help to retain moisture in the soil and improve soil quality.
- **Use good sanitation practices.** By putting a strong emphasis on sanitation practices disease development can be significantly reduced resulting in less disease and ultimately less chemical usage. A good sanitation practice is any technique that eliminates a desirable place for the pathogen to survive and spread. Removal and destruction of crop debris, weeds and infected plants, and cleaning and disinfection of production tools and equipment are examples of good sanitation practices.

Use registered biorational products. Biorational products (products composed of beneficial microorganisms or their products) are viable alternatives to synthetic chemicals for managing diseases in many vegetable production systems. As with chemical pesticides, biorational products can't be used if they are not registered with the Environmental Protection Agency (EPA). Always read the label and follow all safety precautions provided in the label. Do not use biorationals on a nonlabeled crop. A list of biopesticides and fungicide alternatives for vegetables is provided in Table 5.

Use registered chemicals. Fungicides, bactericides and nematicides are important tools for managing diseases and their efficacy and efficiency can be enhanced when incorporated into an integrated disease management program. Pesticides should be used in a manner that minimizes the risk of a pathogen becoming resistant to a pesticide. Always applying mixtures of pesticides or alternate fungicides that have different modes of action to help reduce pesticide resistance development by the pathogen. More information on pesticide-resistance management strategies is provided in Section IV-ii of this guide. A list of fungicide mode of actions for fungicide resistance management in vegetables is provided in Table 6. Always read the label and follow all safety precautions provided in the label. Do not use pesticides on a nonlabeled crop. A list of selected pesticides with known efficacy to various pathogens that can cause disease on vegetables in Louisiana can be found in the tables on the following pages.

Recommended pesticides, rates and pesticide use restrictions for selected vegetable crops.

The symbol ^{OG} indicates a pesticide that has been listed by the Organic Materials Review Institute (OMRI) as approved for use in organic production.

Asparagus

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group (FRAC) ²	Rate ³	PHI ⁴	Maximum Use
Cercospora leaf spot or blight (<i>Cercospora asparagi</i>)	chlorothalonil (various products)	M	2-4 lb	190	12 pt
Cercospora leaf spot or blight (<i>Cercospora asparagi</i>)	mancozeb (various products)	M	See label	See label	See label
Cercospora leaf spot or blight (<i>Cercospora asparagi</i>)	Dexter MAX	M3, 11	2-2.2 lb	180	See label
Crown and spear rot (<i>Phytophthora</i> spp.)	chlorothalonil (various products)	M	2-4 pt	190	12 pt
Crown and spear rot (<i>Phytophthora</i> spp.)	Ridomil Gold SL	4	1 pt	7	4 app
Crown and spear rot (<i>Phytophthora</i> spp.)	Fosphite	33	3-4 qt	2	12 fl oz
Crown and spear rot (<i>Phytophthora</i> spp.)	Phostrol	33	2.5-5.0 pt	0	7 app
Purple spot (<i>Stemphylium</i> spp., <i>Pleospora</i> spp.)	azoxystrobin (various products)	11	6.0-15.5 fl oz	100	92 fl oz
Purple spot (<i>Stemphylium</i> spp., <i>Pleospora</i> spp.)	chlorothalonil (various products)	M	2-4 pt	190	12 pt
Purple spot (<i>Stemphylium</i> spp., <i>Pleospora</i> spp.)	Flint Extra	11	3-3.8 fl oz	180	3 app
Purple spot (<i>Stemphylium</i> spp., <i>Pleospora</i> spp.)	Dexter MAX	M3, 11	2-2.2 lb	180	See label
Rust (<i>Puccinia</i> spp.)	Rally 40W	3	5 oz	180	6 app
Rust (<i>Puccinia</i> spp.)	mancozeb (various products)	3	See label	See label	See label
Rust (<i>Puccinia</i> spp.)	Chlorothalonil 720SC	M	2-4 pt	90	12 pt
Rust (<i>Puccinia</i> spp.)	sulfur ^{OG} 80%	M	20 lb	0	See label
Rust (<i>Puccinia</i> spp.)	sulfur ^{OG} 90%	M	15 lb	0	See label
Rust (<i>Puccinia</i> spp.)	sulfur ^{OG} 98%	M	45 lb	0	See label

¹ Reference to commercial or trade names is made with the understanding that no discrimination is intended nor endorsement of a particular product by LSU or the LSU AgCenter is implied.

² Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

³ Rates are the amount of formulation per acre unless otherwise indicated. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

⁴ Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

Basil

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Downy mildew (<i>Peronospora belbahrii</i>)	Adron	43	4 fl oz	1	12 fl oz
Downy mildew (<i>Peronospora belbahrii</i>)	Ranman 400SC	21	2.75-3.0 fl oz	0	27 fl oz
Downy mildew (<i>Peronospora belbahrii</i>)	Regalia ^{OG}	P5	0.5-1 qt	0	See Label
Downy mildew (<i>Peronospora belbahrii</i>)	Confine Extra	33	1 to 3 qt/20 to 100 gal	0	See Label
Downy mildew (<i>Peronospora belbahrii</i>)	K-Phite	33	1-3 qt/100 gal	0	See Label
Downy mildew (<i>Peronospora belbahrii</i>)	Fosphite	33	3-4 pt/100 gal	0	See Label
Downy mildew (<i>Peronospora belbahrii</i>)	ProPhyt	33	4 fl oz	0	See Label
Downy mildew (<i>Peronospora belbahrii</i>)	Presidio	43	8 fl oz	1	12 fl oz
Downy mildew (<i>Peronospora belbahrii</i>)	Revus	40	3-12 oz	1	32 fl oz
Downy mildew (<i>Peronospora belbahrii</i>)	Actinovate AG ^{OG}	See Label	See Label	0	See Label
Leaf spots (<i>Alternaria</i> spp., <i>Botrytis</i> spp., <i>Fusarium</i> spp.)	Luna Privilege	7	6.84 fl oz	14	13.7 fl oz
Leaf spots (<i>Alternaria</i> spp., <i>Botrytis</i> spp., <i>Fusarium</i> spp.)	Luna Sensation	7, 11	5-7.6 fl oz	7	15.3 fl oz
Leaf spots (<i>Alternaria</i> spp., <i>Botrytis</i> spp., <i>Fusarium</i> spp.)	Switch 62.5WG	9, 12	11-14 oz	7	56 fl oz
Fusarium wilt and Pythium and Rhizoctonia root rots	Confine Extra	33	1 to 3 qt/20 to 100 gal	0	See Label
Fusarium wilt and Pythium and Rhizoctonia root rots	K-Phite	33	2 to 3 qt/20 to 100 gal	0	See Label
Fusarium wilt and Pythium and Rhizoctonia root rots	Fosphite	33	1-3 qt/100 gal	0	See Label
Fusarium wilt and Pythium and Rhizoctonia root rots	ProPhyt	33	3-4 pt/100 gal	0	See Label

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² Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

³ Rates are the amount of formulation per acre unless otherwise indicated. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

⁴ Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

Beans (Snap and Dry)

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Alternaria leaf and pod spot (<i>Alternaria alternata</i>)	Inspire Super ⁵	3, 9	16-20 fl oz	14	80 fl oz
Alternaria leaf and pod spot (<i>Alternaria alternata</i>)	Quilt	11, 3	14 fl oz	7	3 app
Alternaria leaf and pod spot (<i>Alternaria alternata</i>)	Quilt Xcel	11, 37	10.5-14 fl oz	7	3 app
Alternaria leaf and pod spot (<i>Alternaria alternata</i>)	Priaxor Xenium	11	4-8 fl oz	7	2 app
Alternaria leaf and pod spot (<i>Alternaria alternata</i>)	Fontelis	7	14-30 oz	0	72 fl oz
Alternaria leaf and pod spot (<i>Alternaria alternata</i>)	Quadris Flowable	11	6.2-15.4 fl oz	0	92 fl oz
Alternaria leaf and pod spot (<i>Alternaria alternata</i>)	Headline 2.09	11	6-9 fl oz	7	2 app
Alternaria leaf and pod spot (<i>Alternaria alternata</i>)	Actinovate AG ^{OG}	NA	3-12 oz	0	NA
Anthrachnose (<i>Colletotrichum lindemuthianum</i>)	Inspire Super ⁵	11	16-20 fl oz	14	80 fl oz
Anthrachnose (<i>Colletotrichum lindemuthianum</i>)	Aproach ⁵	11	6-12 fl oz	7	24 fl oz
Anthrachnose (<i>Colletotrichum lindemuthianum</i>)	Bravo Ultrex	M	1.25-1.8 lb	7	7.3 lb
Anthrachnose (<i>Colletotrichum lindemuthianum</i>)	Bravo WeatherStix	M	1.375-2 pt	7	8 pt
Anthrachnose (<i>Colletotrichum lindemuthianum</i>)	Topsin M 70WP	1	1.5-2 lb	14	4 lb
Anthrachnose (<i>Colletotrichum lindemuthianum</i>)	Incognito 4.5F	1	30-40 fl oz	14	80 fl oz
Anthrachnose (<i>Colletotrichum lindemuthianum</i>)	85WDG ⁵	1	0.8-1.6 lb	28	3.2 lb
Anthrachnose (<i>Colletotrichum lindemuthianum</i>)	85WDG ⁶	1	0.8-1.6 lb	14	3.2 lb
Anthrachnose (<i>Colletotrichum lindemuthianum</i>)	Quilt	11, 3	14 fl oz	7	42 fl oz
Anthrachnose (<i>Colletotrichum lindemuthianum</i>)	Quilt Xcel	11, 3	10.5-14 fl oz	7	42 fl oz
Anthrachnose (<i>Colletotrichum lindemuthianum</i>)	Priaxor Xenium	7, 11	4-8 fl oz	7	2 apps
Anthrachnose (<i>Colletotrichum lindemuthianum</i>)	Fontelis	7	14-30 fl oz	7	72 fl oz
Anthrachnose (<i>Colletotrichum lindemuthianum</i>)	Quadris Flowable	11	6-15.5 fl oz	0	4 app
Anthrachnose (<i>Colletotrichum lindemuthianum</i>)	Quadris Opti ⁵	11, M	1.6-2.4 pt	0	4 app
Anthrachnose (<i>Colletotrichum lindemuthianum</i>)	Headline 2.09 ⁵	11	6-9 fl oz	21	2 app
Anthrachnose (<i>Colletotrichum lindemuthianum</i>)	Headline 2.09 ⁶	11	6-9 fl oz	7	2 app
Anthrachnose (<i>Colletotrichum lindemuthianum</i>)	Tilt	3	4 fl oz	7	12 fl oz
Anthrachnose (<i>Colletotrichum lindemuthianum</i>)	Cueva ^{OG}	M	0.2-2 gal	NA	NA
Anthrachnose (<i>Colletotrichum lindemuthianum</i>)	Nordox 75WG ^{OG}	M	0.66-2.5 lb	NA	NA

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Halo and common blight (<i>Pseudomonas phaseolicola</i> , <i>Xanthomonas phaseoli</i>)	Kocide 3000	M	0.5-1.25 lb	0	15.8 lb
Halo and common blight (<i>Pseudomonas phaseolicola</i> , <i>Xanthomonas phaseoli</i>)	Kocide 2000	M	0.75-2.25 lb	0	13.5 lb
Halo and common blight (<i>Pseudomonas phaseolicola</i> , <i>Xanthomonas phaseoli</i>)	Champ WG ^{OG}	M	1.58 lb	7	9.48 lb
Halo and common blight (<i>Pseudomonas phaseolicola</i> , <i>Xanthomonas phaseoli</i>)	Nu-Cop 50DF	M	1-1.5 lb	7	9 lb
Halo and common blight (<i>Pseudomonas phaseolicola</i> , <i>Xanthomonas phaseoli</i>)	Badge SC	M	1-2 pt	7	16.6 pt
Halo and common blight (<i>Pseudomonas phaseolicola</i> , <i>Xanthomonas phaseoli</i>)	Badge X2 ^{OG}	M	0.5-1.25 lb	7	2.65 lb
Halo and common blight (<i>Pseudomonas phaseolicola</i> , <i>Xanthomonas phaseoli</i>)	Cuprofix-Ultra 40	M	0.75-2 lb	See Label	11.19 lb
Halo and common blight (<i>Pseudomonas phaseolicola</i> , <i>Xanthomonas phaseoli</i>)	Cuproxat	M	1.5-3.9 pt	See Label	23.4 pt
Halo and common blight (<i>Pseudomonas phaseolicola</i> , <i>Xanthomonas phaseoli</i>)	Cueva ^{OG}	M	0.5-2 gal/100 gal	NA	NA
Halo and common blight (<i>Pseudomonas phaseolicola</i> , <i>Xanthomonas phaseoli</i>)	Nordox 75WG ^{OG}	M	0.6-2.5 lb	NA	NA
Botrytis gray mold (<i>Botrytis cinerea</i>)	Rovral 4 Flowable	2	1.5-2 pt	14	2 app
Botrytis gray mold (<i>Botrytis cinerea</i>)	Topsin M 70WP	1	1.5-2 lb	14	4 lb
Botrytis gray mold (<i>Botrytis cinerea</i>)	Incognito 4.5F	1	30-40 fl oz	14	80 fl oz
Botrytis gray mold (<i>Botrytis cinerea</i>)	85WDG ⁵	1	0.8-1.6 lb	28	3.2 lb
Botrytis gray mold (<i>Botrytis cinerea</i>)	85WDG ⁶	1	0.8-1.6 lb	14	3.2 lb
Botrytis gray mold (<i>Botrytis cinerea</i>)	Fontelis	7	14-30 oz	7	72 fl oz
Botrytis gray mold (<i>Botrytis cinerea</i>)	Endura	7	8-11 oz	7	2 app
Botrytis gray mold (<i>Botrytis cinerea</i>)	Cannonball 50WP	12	7 oz	7	28 oz
Botrytis gray mold (<i>Botrytis cinerea</i>)	Switch 62.5WG	12, 9	11-14 oz	2	56 oz
Botrytis gray mold (<i>Botrytis cinerea</i>)	Bravo Ultrex ⁶	M	2.7 lb	7	10.9 lb
Botrytis gray mold (<i>Botrytis cinerea</i>)	Bravo WeatherStik ⁶	M	3 lb	7	12 pt
Botrytis gray mold (<i>Botrytis cinerea</i>)	Cueva ^{OG}	M	0.5-2 gal/100 gal	NA	NA
Damping-off (<i>Pythium</i> spp.)	Ridomil Gold PC GR	4, 14	0.75 lb/11	NA	1 app
Damping-off (<i>Pythium</i> spp.)	Ridomil Gold SL	4	0.5-1.0 pt/12	NA	1 app

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Damping-off (<i>Pythium</i> spp.)	MetaStar 2E	4	2-4 pt12	NA	1 app
Damping-off (<i>Pythium</i> spp.)	Ultra Flourish	4	1-2 pt12	NA	1 app
Damping-off (<i>Pythium</i> spp.)	Uniform	4, 11	0.34 fl. Oz11	NA	1 app
Damping-off (<i>Rhizoctonia solani</i>)	Quadris 2.08F	11	0.4-0.8 fl oz11	NA	1 app
Damping-off (<i>Rhizoctonia solani</i>)	Headline	11	0.1-0.8 fl oz11	NA	1 app
Damping-off (<i>Rhizoctonia solani</i>)	Blocker 4F	14	2.2-3.3 pt11	NA	1 app
Damping-off (<i>Rhizoctonia solani</i>)	Uniform	4, 14	0.34 fl oz11	NA	1 app
Leaf spots and blights (<i>Alternaria</i> spp., <i>Ascochyta</i> spp., <i>Cercospora</i> spp.)	Aproach ⁵	11	6-12 fl oz	7	24 fl oz
Leaf spots and blights (<i>Alternaria</i> spp., <i>Ascochyta</i> spp., <i>Cercospora</i> spp.)	Bravo Ultrex ⁶	M	1.25-1.8 lb	7	7.3 lb
Leaf spots and blights (<i>Alternaria</i> spp., <i>Ascochyta</i> spp., <i>Cercospora</i> spp.)	Bravo WeatherStik ⁶	M	1.375-2 pt	7	8 pt
Leaf spots and blights (<i>Alternaria</i> spp., <i>Ascochyta</i> spp., <i>Cercospora</i> spp.)	Fontelis	7	14-30 fl oz	0	72 fl oz
Leaf spots and blights (<i>Alternaria</i> spp., <i>Ascochyta</i> spp., <i>Cercospora</i> spp.)	azoxystrobin	11	6.2-15.4 fl oz	0	4 app
Leaf spots and blights (<i>Alternaria</i> spp., <i>Ascochyta</i> spp., <i>Cercospora</i> spp.)	Quadris Opti ⁵	11, M	1.6-2.4 pt	7	4 app
Leaf spots and blights (<i>Alternaria</i> spp., <i>Ascochyta</i> spp., <i>Cercospora</i> spp.)	Headline ⁵	11	6-9 fl oz	21	2 app
Leaf spots and blights (<i>Alternaria</i> spp., <i>Ascochyta</i> spp., <i>Cercospora</i> spp.)	Headline ⁶	11	6-9 fl oz	7	2 app
Rhizocontia web blight and Pod tip rot (<i>Rhizoctonia solani</i>)	Rally 40WSP ^{6,7}	3	4-5 oz	0	20 oz
Rhizocontia web blight and Pod tip rot (<i>Rhizoctonia solani</i>)	Tilt	3	4 fl oz	7	12 fl oz
Rhizocontia web blight and Pod tip rot (<i>Rhizoctonia solani</i>)	azoxystrobin (various products)	11	6-15.5 fl oz	0	4 app
Rhizocontia web blight and Pod tip rot (<i>Rhizoctonia solani</i>)	Quadris Opti ⁵	11, M	1.6-2.4 fl oz	7	4 app
Rhizocontia web blight and Pod tip rot (<i>Rhizoctonia solani</i>)	Quilt	11, 3	14 fl oz	7	42 fl oz
Rhizocontia web blight and Pod tip rot (<i>Rhizoctonia solani</i>)	Quilt Xcel	11, 3	10.5-14 fl oz	7	42 fl oz
Powdery mildew (<i>Erysiphe polygoni</i>)	Endura	7	8-11 oz	7	2 app
Powdery mildew (<i>Erysiphe polygoni</i>)	Priaxor Xenium	7, 11	4-8 fl oz	7	2 app
Powdery mildew (<i>Erysiphe polygoni</i>)	Fontelis	7	14-30 oz	0	72 fl oz
Powdery mildew (<i>Erysiphe polygoni</i>)	Headline ⁵	11	6-9 fl oz	21	2 app

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Powdery mildew (<i>Erysiphe polygoni</i>)	Headline ⁶	11	6-9 fl oz	7	2 app
Powdery mildew (<i>Erysiphe polygoni</i>)	Fosphite	33	1-3 qt/100 gal	0	NA
Powdery mildew (<i>Erysiphe polygoni</i>)	sulfur 80% ^{OG}	M	20 lb	0	NA
Powdery mildew (<i>Erysiphe polygoni</i>)	sulfur 90% ^{OG}	M	15 lb	0	NA
Powdery mildew (<i>Erysiphe polygoni</i>)	sulfur 98% ^{OG}	M	45 lb	0	NA
Powdery mildew (<i>Erysiphe polygoni</i>)	Armcarb 100 ^{OG}	NA	2.5-5 lb	0	NA
Rust (<i>Phakopsora pachyrhizi</i> , <i>Uromyces appendiculatis</i>)	Aproach ⁵	11	6-12 fl oz	7	24 fl oz
Rust (<i>Phakopsora pachyrhizi</i> , <i>Uromyces appendiculatis</i>)	Proline 480SC ^{5,8}	3	5.7 fl oz	7	17 fl oz
Rust (<i>Phakopsora pachyrhizi</i> , <i>Uromyces appendiculatis</i>)	Rally 40WSP	3	4-5 oz	0	20 oz
Rust (<i>Phakopsora pachyrhizi</i> , <i>Uromyces appendiculatis</i>)	Folicur 3.6F ⁵	3	4-6 fl oz	7	12 fl oz
Rust (<i>Phakopsora pachyrhizi</i> , <i>Uromyces appendiculatis</i>)	Folicur 3.6F ⁶	3	4-6 fl oz	7	24 fl oz
Rust (<i>Phakopsora pachyrhizi</i> , <i>Uromyces appendiculatis</i>)	Quilt 1.66SC	3, 11	14 fl oz	7	3 app
Rust (<i>Phakopsora pachyrhizi</i> , <i>Uromyces appendiculatis</i>)	Priaxor Xenium	7, 11	4-8 fl oz	7	2 app
Rust (<i>Phakopsora pachyrhizi</i> , <i>Uromyces appendiculatis</i>)	Fontelis	7	14-30 oz	0	72 fl oz
Rust (<i>Phakopsora pachyrhizi</i> , <i>Uromyces appendiculatis</i>)	azoxystrobin (various products)	11	6.2-15.4 fl oz	0	4 app
Rust (<i>Phakopsora pachyrhizi</i> , <i>Uromyces appendiculatis</i>)	Quadris Opti ⁵	11, M	1.6-2.4 pt	7	4 app
Rust (<i>Phakopsora pachyrhizi</i> , <i>Uromyces appendiculatis</i>)	Headline ⁵	11	6-9 fl oz	21	2 app
Rust (<i>Phakopsora pachyrhizi</i> , <i>Uromyces appendiculatis</i>)	Headline ⁶	11	6-9 fl oz	7	2 app
Rust (<i>Phakopsora pachyrhizi</i> , <i>Uromyces appendiculatis</i>)	Bravo Ultrex ⁵	M	1.25-1.8 lb	7	4 app
Rust (<i>Phakopsora pachyrhizi</i> , <i>Uromyces appendiculatis</i>)	Bravo WeatherStix ⁵	M	1.375-2 pt	7	8pt
Rust (<i>Phakopsora pachyrhizi</i> , <i>Uromyces appendiculatis</i>)	Bravo Ultrex ⁶	M	1.25-2.7 lb	7	10.9 lb
Rust (<i>Phakopsora pachyrhizi</i> , <i>Uromyces appendiculatis</i>)	Bravo WeatherStix ⁶	M	1.375-3 pt	7	12 pt
White mold (<i>Sclerotinia sclerotiorum</i>)	Botran 75W ⁶	14	2.5-4 lb	2	5.3 lb
White mold (<i>Sclerotinia sclerotiorum</i>)	Cannonball WG	12	7 oz	7	28 oz
White mold (<i>Sclerotinia sclerotiorum</i>)	Endura	7	6-9 oz	21	2 apps
White mold (<i>Sclerotinia sclerotiorum</i>)	Fontelis	7	16-30 fl oz	0-14 ¹⁰	72 fl oz
White mold (<i>Sclerotinia sclerotiorum</i>)	Iprodione 4L AG	2	1.5-2 pt	14	2 app
White mold (<i>Sclerotinia sclerotiorum</i>)	Rovral 4F	2	1.5-2 pt	14	2 app
White mold (<i>Sclerotinia sclerotiorum</i>)	Meteor	2	1.5-2 pt	14	2 app

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
White mold (<i>Sclerotinia sclerotiorum</i>)	Nevado 4F	2	1.5-2 pt	14	2 app
White mold (<i>Sclerotinia sclerotiorum</i>)	Omega 500SC ⁹	29	0.5-0.9 pt	14	1.8 pt
White mold (<i>Sclerotinia sclerotiorum</i>)	Omega 500SC ⁵	29	0.5-0.9 pt	30	1.8 pt
White mold (<i>Sclerotinia sclerotiorum</i>)	Priaxor Xenium ⁵	7, 11	4-8 fl oz	21	16 fl oz
White mold (<i>Sclerotinia sclerotiorum</i>)	Priaxor Xenium ⁹	7, 11	4-8 fl oz	7	16 fl oz
White mold (<i>Sclerotinia sclerotiorum</i>)	Proline 480SC ^{5,8}	3	5.7 fl oz	7	17.1 fl oz
White mold (<i>Sclerotinia sclerotiorum</i>)	Switch 62.5WG	9, 12	11-14 oz	7	56 oz
White mold (<i>Sclerotinia sclerotiorum</i>)	85WDG ⁹	1	1.2-1.6 lb	14	3.2 lb
White mold (<i>Sclerotinia sclerotiorum</i>)	85WDG ⁵	1	1.2-1.6 lb	28	3.2 lb
White mold (<i>Sclerotinia sclerotiorum</i>)	Incognito 4.5F ⁹	1	30-40 fl oz	14	80 fl oz
White mold (<i>Sclerotinia sclerotiorum</i>)	Incognito 4.5F ⁵	1	30-40 fl oz	28	80 fl oz
White mold (<i>Sclerotinia sclerotiorum</i>)	Topsin M 70WDG ⁹	1	1.5-2 lb	14	4 lb
White mold (<i>Sclerotinia sclerotiorum</i>)	Topsin M 70WDG ⁵	1	1.5-2 lb	28	4 lb
White mold (<i>Sclerotinia sclerotiorum</i>)	Vertisan	7	16-20 fl oz	21	41 fl oz

¹ Reference to commercial or trade names is made with the understanding that no discrimination is intended nor endorsement of a particular product by LSU or the LSU AgCenter is implied.

² Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

³ Rates are the amount of formulation per acre unless otherwise indicated. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

⁴ Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

⁵ Dry Beans Only

⁶ Snap beans

⁷ Pod tip rot

⁸ White Mold

⁹ Succulent

¹⁰ For head and stem applications the postharvest interval (PHI) is 0 days. For leafy greens the PHI is 14 days.

¹¹ All rates are per 1,000 square feet of row. Refer to the label for modes of application.

¹² Rates refer to band or broadcast applications. Refer to individual labels for per plant in transplant water rates.

Cole Crops (Broccoli, Brussels sprouts, Cabbage, Cauliflower, Chinese Cabbage and Kohlrabi)

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Alternaria leaf spot (<i>Alternaria</i> spp.)	Cabrio	11	12-16 oz	0	64 oz
Alternaria leaf spot (<i>Alternaria</i> spp.)	Bravo Ultrex	M	1.4 lb	7	14.5 lb
Alternaria leaf spot (<i>Alternaria</i> spp.)	Bravo WeatherStix	M	1.5 pt	7	11.7 lb
Alternaria leaf spot (<i>Alternaria</i> spp.)	Kocide 3000	M	0.5-1.25 lb	0	15.8 lb
Alternaria leaf spot (<i>Alternaria</i> spp.)	Kocide 2000	M	0.75-2.25 lb	0	13.5 lb
Alternaria leaf spot (<i>Alternaria</i> spp.)	Champ WG ^{OG}	M	1.58 lb	7	9.48 lb
Alternaria leaf spot (<i>Alternaria</i> spp.)	Nu-Cop 50DF	M	1 lb	7	5 lb
Alternaria leaf spot (<i>Alternaria</i> spp.)	Badge SC	M	1-2 pt	7	16.6 pt
Alternaria leaf spot (<i>Alternaria</i> spp.)	Badge X2 ^{OG}	M	0.5-1.25 lb	7	2.65 lb
Alternaria leaf spot (<i>Alternaria</i> spp.)	Cuprofix-Ultra 40	M	0.75-2 lb	NA	11.19 lb
Alternaria leaf spot (<i>Alternaria</i> spp.)	Cuproxat	M	1.5-3.9 pt	NA	23.4 pt
Alternaria leaf spot (<i>Alternaria</i> spp.)	Cueva ^{OG}	M	0.5-2 gal/100 gal	NA	NA
Alternaria leaf spot (<i>Alternaria</i> spp.)	Nordox 75WG ^{OG}	M	0.6-2.5 lb	NA	NA
Alternaria leaf spot (<i>Alternaria</i> spp.)	Endura	7	6-9 oz	0	2 app
Alternaria leaf spot (<i>Alternaria</i> spp.)	Fontelis	7	14-30 fl oz	0	72 fl oz
Alternaria leaf spot (<i>Alternaria</i> spp.)	Inspire SuperLuna Privilege	3, 97	16-20 fl oz	7	2 app
Alternaria leaf spot (<i>Alternaria</i> spp.)	Luna Sensation	7, 11	4-6.8 fl oz	0	13.7 fl oz
Alternaria leaf spot (<i>Alternaria</i> spp.)	ManKocide	M	5.0-7.6 fl oz	0	15.3 fl oz
Alternaria leaf spot (<i>Alternaria</i> spp.)	Manzate Pro-Stik ⁵	M	1-3 lb	7	80 fl oz
Alternaria leaf spot (<i>Alternaria</i> spp.)	Milstop ^{OG}	M	1.6-2.1 lb	7	12.8 lb
Alternaria leaf spot (<i>Alternaria</i> spp.)	Procure 480SC	3	2-5 lb/100 gal	7	8.8 lb
Alternaria leaf spot (<i>Alternaria</i> spp.)	azoxystrobin (various products)	11	6-8 fl oz	3	2 app
Alternaria leaf spot (<i>Alternaria</i> spp.)	Quadris Top	3, 11	12-14 fl oz	1	56 fl oz
Alternaria leaf spot (<i>Alternaria</i> spp.)	Reason 500SC	11	5.5-8.2 fl oz	2	24.6 fl oz
Alternaria leaf spot (<i>Alternaria</i> spp.)	Serenade ASO ^{OG}	44	2-4 qt	NA	NA
Alternaria leaf spot (<i>Alternaria</i> spp.)	Serenade Max ^{OG}	44	1-3 lb	NA	NA
Alternaria leaf spot (<i>Alternaria</i> spp.)	Switch 62.5WG	9, 12	11-14 oz	7-10	2 app

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Basal stem rot, Phytophthora root rot (<i>Phytophthora</i> spp.) and Damping-off (<i>Pythium</i> spp.)	Ridomil Gold SL	4	1-2 pt ⁶	See Label	1 app
Basal stem rot, Phytophthora root rot (<i>Phytophthora</i> spp.) and Damping-off (<i>Pythium</i> spp.)	Presidio 4F	43	3-4 fl oz	2	4 app
Basal stem rot, Phytophthora root rot (<i>Phytophthora</i> spp.) and Damping-off (<i>Pythium</i> spp.)	MetaStar 2E	4	4-8 pt ⁶	See Label	1 app
Basal stem rot, Phytophthora root rot (<i>Phytophthora</i> spp.) and Damping-off (<i>Pythium</i> spp.)	Ultra Flourish	4	2-4 pt ⁶	See Label	1 app
Black leg (<i>Phoma lingam</i>)	Cabrio	11	12-16 oz	0	64 oz
Black leg (<i>Phoma lingam</i>)	Rovral 4F	2	2 pt	0	2 app
Black leg (<i>Phoma lingam</i>)	Priaxor Xenium	7, 11	6-8.2 fl oz	3	24.6 fl oz
Black rot (<i>Xanthomonas campestris</i> pv. <i>campestris</i>)	Actigard 50WG	P1	0.5-1.0 oz	7	4 apps
Black rot (<i>Xanthomonas campestris</i> pv. <i>campestris</i>)	Kocide 3000	M	0.5-1.25 lb	0	15.8 lb
Black rot (<i>Xanthomonas campestris</i> pv. <i>campestris</i>)	Kocide 2000	M	0.75-2.25 lb	0	13.5 lb
Black rot (<i>Xanthomonas campestris</i> pv. <i>campestris</i>)	Champ WG ^{OG}	M	1.58 lb	7	9.48 lb
Black rot (<i>Xanthomonas campestris</i> pv. <i>campestris</i>)	Nu-Cop 50DF	M	1 lb	7	5 lb
Black rot (<i>Xanthomonas campestris</i> pv. <i>campestris</i>)	Badge SC	M	1-2 pt	7	16.6 pt
Black rot (<i>Xanthomonas campestris</i> pv. <i>campestris</i>)	Badge X2 ^{OG}	M	0.5-1.25 lb	7	2.65 lb
Black rot (<i>Xanthomonas campestris</i> pv. <i>campestris</i>)	Cuprofix-Ultra 40	M	0.75-1.25 lb	See Label	6.6 lb
Black rot (<i>Xanthomonas campestris</i> pv. <i>campestris</i>)	Cuproxat	M	1.5-2.5 pt	See Label	13.1 pt
Black rot (<i>Xanthomonas campestris</i> pv. <i>campestris</i>)	Cueva ^{OG}	M	0.5-2 gal/100 gal	See Label	See Label
Black rot (<i>Xanthomonas campestris</i> pv. <i>campestris</i>)	Nordox 75WG ^{OG}	M	0.6-2.5 lb	See Label	See Label
Cercospora leaf spot (<i>Cercospora brassicola</i>)	Cease Biofungicide ^{OG}	44	3-6 qt/100 gal	0	See Label
Cercospora leaf spot (<i>Cercospora brassicola</i>)	Inspire Super	9	16-20 fl oz	7	80 fl oz
Cercospora leaf spot (<i>Cercospora brassicola</i>)	Luna Sensation	7, 11	7.6 fl oz	0	15.3 fl oz
Cercospora leaf spot (<i>Cercospora brassicola</i>)	Quadris Top	11, 3	12-14 fl oz	1	56 fl oz
Cercospora leaf spot (<i>Cercospora brassicola</i>)	Switch 62.5WG	9, 12	11-14 oz	7	56 oz
Clubroot (<i>Plasmodiophora brassicae</i>)	Omega 500F	29	2.6 pt ⁶	See Label	1 app
Clubroot (<i>Plasmodiophora brassicae</i>)	Blocker 4F	14	5.62 gal ⁶	See Label	22.5 lbs
Clubroot (<i>Plasmodiophora brassicae</i>)	Ranman	21	13-25.8 fl oz ⁶	See Label	1 app
Damping-off, Wire stem (<i>Rhizoctonia solani</i>)	Blocker 4F	14	2.8-3.75 gal ⁶	See Label	1 app

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Damping-off, Wire stem (<i>Rhizoctonia solani</i>)	Uniform	4, 11	0.34 fl. Oz ⁷	See Label	1 app
Damping-off, Wire stem (<i>Rhizoctonia solani</i>)	Quadris Flowable	11	0.4-0.8 fl oz ⁷	See Label	1 app
Downy mildew (<i>Peronospora parasitica</i>)	Aliette 80WDG	33	2-5 lb	3	7 app
Downy mildew (<i>Peronospora parasitica</i>)	Forum	40	6 fl oz	0	3 app
Downy mildew (<i>Peronospora parasitica</i>)	Ultra Flourish	4	0.25-0.5 pt	7	2 pt
Downy mildew (<i>Peronospora parasitica</i>)	Ranman 400SC	21	2.75 fl oz	0	5 app
Downy mildew (<i>Peronospora parasitica</i>)	Presidio 4SC	43	3-4 fl oz	2	12 fl oz
Downy mildew (<i>Peronospora parasitica</i>)	potassium phosphite (various formulations)	33	2-4 pt	0	See Label
Downy mildew (<i>Peronospora parasitica</i>)	Orondis ultra	U15, 40	5.5-8 fl oz	1	32 fl oz
Downy mildew (<i>Peronospora parasitica</i>)	Quadris 2.08F	11	6-15.5 fl oz	0	92.3 fl oz
Downy mildew (<i>Peronospora parasitica</i>)	Revus 2.08SC	40	8. fl oz	1	32 fl oz
Downy mildew (<i>Peronospora parasitica</i>)	Zampro	45, 40	14 fl oz	0	42 fl oz
Powdery mildew (<i>Erysiphe polygoni</i> , <i>E. cruciferarum</i>)	Cabrio EG	11	12-16 oz	0-3 ⁸	64 oz
Powdery mildew (<i>Erysiphe polygoni</i> , <i>E. cruciferarum</i>)	Cease Biofungicide ^{OG}	44	3-6 qt/100 gal	0	See Label
Powdery mildew (<i>Erysiphe polygoni</i> , <i>E. cruciferarum</i>)	Endura 70WP	7	6-9 oz	0-14 ⁹	18 oz
Powdery mildew (<i>Erysiphe polygoni</i> , <i>E. cruciferarum</i>)	Fontelis	7	14-30 fl oz	0	72 fl oz
Powdery mildew (<i>Erysiphe polygoni</i> , <i>E. cruciferarum</i>)	Inspire Super	3, 9	16-20 fl oz	7	80 fl oz
Powdery mildew (<i>Erysiphe polygoni</i> , <i>E. cruciferarum</i>)	Potassium bicarbonate	33	1-3 qt	0	See Label
Powdery mildew (<i>Erysiphe polygoni</i> , <i>E. cruciferarum</i>)	Armcarb 100	33	2.5-5 lb/100 gal	0	See Label
Powdery mildew (<i>Erysiphe polygoni</i> , <i>E. cruciferarum</i>)	Milstop ^{OG}	33	2-5 lb/100 gal	0	See Label
Powdery mildew (<i>Erysiphe polygoni</i> , <i>E. cruciferarum</i>)	Kaligreen Fungicide	33	2.5-3 lb	0	See Label
Powdery mildew (<i>Erysiphe polygoni</i> , <i>E. cruciferarum</i>)	Luna Privilege	7	3.2-6.84 fl oz	0	13.7 fl oz
Powdery mildew (<i>Erysiphe polygoni</i> , <i>E. cruciferarum</i>)	Luna Sensation	7, 11	5.0-7.6 fl oz	0	15.3 fl oz
Powdery mildew (<i>Erysiphe polygoni</i> , <i>E. cruciferarum</i>)	Procure 480SC	3	6-8 fl oz	1	18 fl oz
Powdery mildew (<i>Erysiphe polygoni</i> , <i>E. cruciferarum</i>)	Quadris Top	11, 3	12-14 fl oz	1	56 fl oz
Powdery mildew (<i>Erysiphe polygoni</i> , <i>E. cruciferarum</i>)	Serenade ASO ^{OG}	44	2-6 qt	See Label	See Label
Powdery mildew (<i>Erysiphe polygoni</i> , <i>E. cruciferarum</i>)	Serenade Max ^{OG}	44	1-3 lb	0	See Label
Powdery mildew (<i>Erysiphe polygoni</i> , <i>E. cruciferarum</i>)	Sonata ^{OG}	44	2-4 qt	0	See Label
Powdery mildew (<i>Erysiphe polygoni</i> , <i>E. cruciferarum</i>)	Microfine Sulfur	M	6-25 lb	0	See Label

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Powdery mildew (<i>Erysiphe polygoni</i> , <i>E. cruciferarum</i>)	Microthiol Disperss ^{OG}	M	3-10 lb	See Label	See Label
Powdery mildew (<i>Erysiphe polygoni</i> , <i>E. cruciferarum</i>)	Yellow Jacket Wettable	M	6-25 lb	See Label	See Label
Powdery mildew (<i>Erysiphe polygoni</i> , <i>E. cruciferarum</i>)	Switch 62.5WG	9, 12	10-12 oz	7	56 oz
Rhizoctonia bottom rot	Endura 70WP	7	6-9 fl oz	0	2 app
White mold (<i>Sclerotinia sclerotiorum</i>)	Endura 70WP	7	6-9 oz	0-14 ⁹	2 apps
White mold (<i>Sclerotinia sclerotiorum</i>)	Fontelis	7	16-30 fl oz	3	72 fl oz
White mold (<i>Sclerotinia sclerotiorum</i>)	Luna Sensation	7, 11	7.6 fl oz	0	15.3 fl oz
White rust (<i>Albugo candida</i>)	Cabrio EG	11	12-16 oz	0-3 ⁸	64 oz
White rust (<i>Albugo candida</i>)	Reason 500SC	11	8.2 fl oz	2	24.6 fl oz

¹ Reference to commercial or trade names is made with the understanding that no discrimination is intended nor endorsement of a particular product by LSU or the LSU AgCenter is implied.

² Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

³ Rates are the amount of formulation per acre unless otherwise indicated. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

⁴ Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

⁵ Broccoli and cabbage are covered under a supplemental label (EPA Reg. No. 70506-234).

⁶ Rates refer to band or broadcast applications. Refer to individual labels for per plant in transplant water rates.

⁷ All rates are per 1,000 square feet of row. Refer to the label for modes of application.

⁸ For head and stem applications the postharvest interval (PHI) is 0 days. For leafy greens the PHI is 3 days.

⁹ For head and stem applications the postharvest interval (PHI) is 0 days. For leafy greens the PHI is 14 days.

Cucurbits (Cantaloupe, Cucumbers, Pumpkins, Squash, Watermelons and Zucchini)

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Angular leaf spot (<i>Pseudomonas syringae</i> pv. <i>lachrymans</i>) and Bacterial leaf spot (<i>Xanthomonas campestris</i> pv. <i>cucurbitae</i>)	Actigard 50 WP	P1	0.5-1.0 oz	0	8 oz
Angular leaf spot (<i>Pseudomonas syringae</i> pv. <i>lachrymans</i>) and Bacterial leaf spot (<i>Xanthomonas campestris</i> pv. <i>cucurbitae</i>)	Kocide 3000	M	0.5-1.3 lb	0	17.5 lb
Angular leaf spot (<i>Pseudomonas syringae</i> pv. <i>lachrymans</i>) and Bacterial leaf spot (<i>Xanthomonas campestris</i> pv. <i>cucurbitae</i>)	Kocide 2000	M	1-2.3 lb	0	15 lb
Angular leaf spot (<i>Pseudomonas syringae</i> pv. <i>lachrymans</i>) and Bacterial leaf spot (<i>Xanthomonas campestris</i> pv. <i>cucurbitae</i>)	Champ WG ^{OG}	M	1.5-2 lb	0	10.5 lb
Angular leaf spot (<i>Pseudomonas syringae</i> pv. <i>lachrymans</i>) and Bacterial leaf spot (<i>Xanthomonas campestris</i> pv. <i>cucurbitae</i>)	Nu-Cop 50DF ^{OG}	M	1.5-2 lb	0	18.6 pt
Angular leaf spot (<i>Pseudomonas syringae</i> pv. <i>lachrymans</i>) and Bacterial leaf spot (<i>Xanthomonas campestris</i> pv. <i>cucurbitae</i>)	Badge SC ⁵	M	1-2.5 pt	0	5.3 lb Cu
Angular leaf spot (<i>Pseudomonas syringae</i> pv. <i>lachrymans</i>) and Bacterial leaf spot (<i>Xanthomonas campestris</i> pv. <i>cucurbitae</i>)	Badge X2 ^{OG, 5}	M	0.5-1.3 lb	0	See Label
Angular leaf spot (<i>Pseudomonas syringae</i> pv. <i>lachrymans</i>) and Bacterial leaf spot (<i>Xanthomonas campestris</i> pv. <i>cucurbitae</i>)	Cuprofix-Ultra 40	M	1-2 lb	0	13 lb
Angular leaf spot (<i>Pseudomonas syringae</i> pv. <i>lachrymans</i>) and Bacterial leaf spot (<i>Xanthomonas campestris</i> pv. <i>cucurbitae</i>)	Mastercop	M	0.5-1 pt	0	6 pt
Angular leaf spot (<i>Pseudomonas syringae</i> pv. <i>lachrymans</i>) and Bacterial leaf spot (<i>Xanthomonas campestris</i> pv. <i>cucurbitae</i>)	Cueva ^{OG}	M	0.5-2 gal/100 gal	0	See Label
Angular leaf spot (<i>Pseudomonas syringae</i> pv. <i>lachrymans</i>) and Bacterial leaf spot (<i>Xanthomonas campestris</i> pv. <i>cucurbitae</i>)	Nordox 75WG ^{OG}	M	1.5-2 lb	0	See Label
Angular leaf spot (<i>Pseudomonas syringae</i> pv. <i>lachrymans</i>) and Bacterial leaf spot (<i>Xanthomonas campestris</i> pv. <i>cucurbitae</i>)	ManKocide	M	2-3 lb	5	8 app
Leaf spots (<i>Alternaria</i> , <i>Cercospora</i>), Anthracnose (<i>Colletotrichum</i>), Gummy stem blight (<i>Didymella</i>), Target spot (<i>Corynespora</i>)	Actinovate	See Label	3-12 oz	0	See Label
Leaf spots (<i>Alternaria</i> , <i>Cercospora</i>), Anthracnose (<i>Colletotrichum</i>), Gummy stem blight (<i>Didymella</i>), Target spot (<i>Corynespora</i>)	Cabrio 20WG	11	12-16 oz	0	64 oz
Leaf spots (<i>Alternaria</i> , <i>Cercospora</i>), Anthracnose (<i>Colletotrichum</i>), Gummy stem blight (<i>Didymella</i>), Target spot (<i>Corynespora</i>)	Catamaran	M, 33	4-6 pt	0	50 pt
Leaf spots (<i>Alternaria</i> , <i>Cercospora</i>), Anthracnose (<i>Colletotrichum</i>), Gummy stem blight (<i>Didymella</i>), Target spot (<i>Corynespora</i>)	Bravo Ultrex	M	1.4-2.7 lb	0	19.1 lb
Leaf spots (<i>Alternaria</i> , <i>Cercospora</i>), Anthracnose (<i>Colletotrichum</i>), Gummy stem blight (<i>Didymella</i>), Target spot (<i>Corynespora</i>)	Bravo WeatherStik	M	1.5-3 pt	0	21 pt
Leaf spots (<i>Alternaria</i> , <i>Cercospora</i>), Anthracnose (<i>Colletotrichum</i>), Gummy stem blight (<i>Didymella</i>), Target spot (<i>Corynespora</i>)	Bravo Zn	M	2.3-4.3 pt	0	30 pt

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Leaf spots (<i>Alternaria</i> , <i>Cercospora</i>), Anthracnose (<i>Colletotrichum</i>), Gummy stem blight (<i>Didymella</i>), Target spot (<i>Corynespora</i>)	Chlorothalonil 720SC	M	1.5-3 pt	0	21 pt
Leaf spots (<i>Alternaria</i> , <i>Cercospora</i>), Anthracnose (<i>Colletotrichum</i>), Gummy stem blight (<i>Didymella</i>), Target spot (<i>Corynespora</i>)	Kocide 3000	M	0.5-1.3 lb	0	17.5 lb
Leaf spots (<i>Alternaria</i> , <i>Cercospora</i>), Anthracnose (<i>Colletotrichum</i>), Gummy stem blight (<i>Didymella</i>), Target spot (<i>Corynespora</i>)	Kocide 2000	M	1-2.3 lb	0	15 lb
Leaf spots (<i>Alternaria</i> , <i>Cercospora</i>), Anthracnose (<i>Colletotrichum</i>), Gummy stem blight (<i>Didymella</i>), Target spot (<i>Corynespora</i>)	Champ WG ^{OG}	M	1.5-2 lb	0	10.5 lb
Leaf spots (<i>Alternaria</i> , <i>Cercospora</i>), Anthracnose (<i>Colletotrichum</i>), Gummy stem blight (<i>Didymella</i>), Target spot (<i>Corynespora</i>)	Nu-Cop 50DF ^{OG}	M	1.5-2 lb	0	18.6 pt
Leaf spots (<i>Alternaria</i> , <i>Cercospora</i>), Anthracnose (<i>Colletotrichum</i>), Gummy stem blight (<i>Didymella</i>), Target spot (<i>Corynespora</i>)	Badge SC ⁵	M	1-2.5 pt	0	5.3 lb Cu
Leaf spots (<i>Alternaria</i> , <i>Cercospora</i>), Anthracnose (<i>Colletotrichum</i>), Gummy stem blight (<i>Didymella</i>), Target spot (<i>Corynespora</i>)	Badge X2 ^{OG, 5}	M	0.5-1.3 lb	0	See Label
Leaf spots (<i>Alternaria</i> , <i>Cercospora</i>), Anthracnose (<i>Colletotrichum</i>), Gummy stem blight (<i>Didymella</i>), Target spot (<i>Corynespora</i>)	Cuprofix-Ultra 40	M	1-2 lb	0	13 lb
Leaf spots (<i>Alternaria</i> , <i>Cercospora</i>), Anthracnose (<i>Colletotrichum</i>), Gummy stem blight (<i>Didymella</i>), Target spot (<i>Corynespora</i>)	Mastercop	M	0.5-1 pt	0	6 pt
Leaf spots (<i>Alternaria</i> , <i>Cercospora</i>), Anthracnose (<i>Colletotrichum</i>), Gummy stem blight (<i>Didymella</i>), Target spot (<i>Corynespora</i>)	Cueva ^{OG}	M	0.5-2 gal/100 gal	0	See Label
Leaf spots (<i>Alternaria</i> , <i>Cercospora</i>), Anthracnose (<i>Colletotrichum</i>), Gummy stem blight (<i>Didymella</i>), Target spot (<i>Corynespora</i>)	Nordox 75WG ^{OG}	M	1.5-2 lb		See Label
Leaf spots (<i>Alternaria</i> , <i>Cercospora</i>), Anthracnose (<i>Colletotrichum</i>), Gummy stem blight (<i>Didymella</i>), Target spot (<i>Corynespora</i>)	Luna Privilege	7	6.84 fl oz	0	13.7 fl oz
Leaf spots (<i>Alternaria</i> , <i>Cercospora</i>), Anthracnose (<i>Colletotrichum</i>), Gummy stem blight (<i>Didymella</i>), Target spot (<i>Corynespora</i>)	Luna Sensation	7, 11	7.6 fl oz	0	4 app
Leaf spots (<i>Alternaria</i> , <i>Cercospora</i>), Anthracnose (<i>Colletotrichum</i>), Gummy stem blight (<i>Didymella</i>), Target spot (<i>Corynespora</i>)	Evito 480SC	11	3-5.7 fl oz	1	22.8 fl oz
Leaf spots (<i>Alternaria</i> , <i>Cercospora</i>), Anthracnose (<i>Colletotrichum</i>), Gummy stem blight (<i>Didymella</i>), Target spot (<i>Corynespora</i>)	Gavel 75DF	M, 22	1.5-2 lb	1	8 app
Leaf spots (<i>Alternaria</i> , <i>Cercospora</i>), Anthracnose (<i>Colletotrichum</i>), Gummy stem blight (<i>Didymella</i>), Target spot (<i>Corynespora</i>)	Inspire Super	3, 9	16-20 fl oz	7	80 fl oz
Leaf spots (<i>Alternaria</i> , <i>Cercospora</i>), Anthracnose (<i>Colletotrichum</i>), Gummy stem blight (<i>Didymella</i>), Target spot (<i>Corynespora</i>)	mancozeb Dry formulations	M	2-3 lb	5	25.6 lb
Leaf spots (<i>Alternaria</i> , <i>Cercospora</i>), Anthracnose (<i>Colletotrichum</i>), Gummy stem blight (<i>Didymella</i>), Target spot (<i>Corynespora</i>)	mancozeb Liquid Formulations	M	1.6-2.4 qt	5	19.2 qt
Leaf spots (<i>Alternaria</i> , <i>Cercospora</i>), Anthracnose (<i>Colletotrichum</i>), Gummy stem blight (<i>Didymella</i>), Target spot (<i>Corynespora</i>)	ManKocide	M	2-3 lb	5	24 lb

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Leaf spots (<i>Alternaria</i> , <i>Cercospora</i>), Anthracnose (<i>Colletotrichum</i>), Gummy stem blight (<i>Didymella</i>), Target spot (<i>Corynespora</i>)	Merivon 500 EC	7, 11	4-5.5 fl oz	7	24 fl oz
Leaf spots (<i>Alternaria</i> , <i>Cercospora</i>), Anthracnose (<i>Colletotrichum</i>), Gummy stem blight (<i>Didymella</i>), Target spot (<i>Corynespora</i>)	Monsoon 3.6 F (gummy stem blight only)	3	8 fl oz	See Label	See Label
Leaf spots (<i>Alternaria</i> , <i>Cercospora</i>), Anthracnose (<i>Colletotrichum</i>), Gummy stem blight (<i>Didymella</i>), Target spot (<i>Corynespora</i>)	Pristine 38WG	7, 11	12.5-18.5 oz	0	16.5 oz
Leaf spots (<i>Alternaria</i> , <i>Cercospora</i>), Anthracnose (<i>Colletotrichum</i>), Gummy stem blight (<i>Didymella</i>), Target spot (<i>Corynespora</i>)	Proline 480SC (gummy stem blight only)	3	5.7 fl oz	7	17.1 fl oz
Leaf spots (<i>Alternaria</i> , <i>Cercospora</i>), Anthracnose (<i>Colletotrichum</i>), Gummy stem blight (<i>Didymella</i>), Target spot (<i>Corynespora</i>)	Quadris 2.08F	11	11-15.5 fl oz	0	74 oz
Leaf spots (<i>Alternaria</i> , <i>Cercospora</i>), Anthracnose (<i>Colletotrichum</i>), Gummy stem blight (<i>Didymella</i>), Target spot (<i>Corynespora</i>)	Quadris Opti	11, M	3.2 pt	1	92.3 fl oz
Leaf spots (<i>Alternaria</i> , <i>Cercospora</i>), Anthracnose (<i>Colletotrichum</i>), Gummy stem blight (<i>Didymella</i>), Target spot (<i>Corynespora</i>)	Quadris Top 1.67SC	11, 3	12-14 fl oz	1	4 app
Leaf spots (<i>Alternaria</i> , <i>Cercospora</i>), Anthracnose (<i>Colletotrichum</i>), Gummy stem blight (<i>Didymella</i>), Target spot (<i>Corynespora</i>)	Ridomil Gold Bravo SC	4, M	2.5-3.3 pt	1	56 fl oz
Leaf spots (<i>Alternaria</i> , <i>Cercospora</i>), Anthracnose (<i>Colletotrichum</i>), Gummy stem blight (<i>Didymella</i>), Target spot (<i>Corynespora</i>)	Satori	11	11-15.5 fl oz	0	4 app
Leaf spots (<i>Alternaria</i> , <i>Cercospora</i>), Anthracnose (<i>Colletotrichum</i>), Gummy stem blight (<i>Didymella</i>), Target spot (<i>Corynespora</i>)	Tanos 50WP	11, 27	8 oz	1	92.3 fl oz
Leaf spots (<i>Alternaria</i> , <i>Cercospora</i>), Anthracnose (<i>Colletotrichum</i>), Gummy stem blight (<i>Didymella</i>), Target spot (<i>Corynespora</i>)	Thiophanate-methyl 85WDG	1	0.4 lb	3	4 app
Leaf spots (<i>Alternaria</i> , <i>Cercospora</i>), Anthracnose (<i>Colletotrichum</i>), Gummy stem blight (<i>Didymella</i>), Target spot (<i>Corynespora</i>)	Topsin 4.5FL	1	10 fl oz	1	2.5 lb
Leaf spots (<i>Alternaria</i> , <i>Cercospora</i>), Anthracnose (<i>Colletotrichum</i>), Gummy stem blight (<i>Didymella</i>), Target spot (<i>Corynespora</i>)	Topsin M 70WP	1	0.5 lb	1	60 fl oz
Leaf spots (<i>Alternaria</i> , <i>Cercospora</i>), Anthracnose (<i>Colletotrichum</i>), Gummy stem blight (<i>Didymella</i>), Target spot (<i>Corynespora</i>)	Topsin M WSB	1	0.5 lb	1	3 lb
Leaf spots (<i>Alternaria</i> , <i>Cercospora</i>), Anthracnose (<i>Colletotrichum</i>), Gummy stem blight (<i>Didymella</i>), Target spot (<i>Corynespora</i>)	Trilogy ^{OG}	See Label	1%	See Label	See Label
Bacterial fruit blotch (<i>Acidovorax avena</i> subsp. <i>citrulli</i>)	Actigard 50WG	P1	0.5-1.0 oz	0	8 oz
Bacterial fruit blotch (<i>Acidovorax avena</i> subsp. <i>citrulli</i>)	Kocide 3000	M	0.5-1.3 lb	0	17.5 lb
Bacterial fruit blotch (<i>Acidovorax avena</i> subsp. <i>citrulli</i>)	Kocide 2000	M	1-2.3 lb	0	15 lb
Bacterial fruit blotch (<i>Acidovorax avena</i> subsp. <i>citrulli</i>)	Champ WG ^{OG}	M	1.5-2 lb	0	10.5 lb
Bacterial fruit blotch (<i>Acidovorax avena</i> subsp. <i>citrulli</i>)	Nu-Cop 50DF ^{OG}	M	1.5-2 lb	1	10.5 lb
Bacterial fruit blotch (<i>Acidovorax avena</i> subsp. <i>citrulli</i>)	Badge SC ⁵	M	1-2.5 pt	0	18.6 pt

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Bacterial fruit blotch (<i>Acidovorax avena</i> subsp. <i>citrullii</i>)	Badge X2 ^{OG,5}	M	0.5-1.3 lb	0	5.3 lb Cu
Bacterial fruit blotch (<i>Acidovorax avena</i> subsp. <i>citrullii</i>)	Cuprofix-Ultra 40	M	1-2 lb	0	13 lb
Bacterial fruit blotch (<i>Acidovorax avena</i> subsp. <i>citrullii</i>)	Mastercop	M	0.5-1 pt	0	6 pt
Bacterial fruit blotch (<i>Acidovorax avena</i> subsp. <i>citrullii</i>)	Cueva ^{OG}	M	0.5-2 gal/100 gal	0	See Label
Bacterial fruit blotch (<i>Acidovorax avena</i> subsp. <i>citrullii</i>)	Nordox 75WG ^{OG}	M	1.5-2 lb	1	See Label
Bacterial wilt (<i>Erwinia tracheiphilia</i>)	No bactericides available. Control of the cucumber beetle prior to flowering is the only recommended practice. See Louisiana Insect Pest Management Guide.	NA	NA	NA	NA
Belly (fruit) rot (<i>Rhizoctonia solani</i>)	Aprovia top	3, 7	10.5-13.5 fl oz	0	53.6 fl oz
Belly (fruit) rot (<i>Rhizoctonia solani</i>)	Evito 480SC	11	3-5.7 fl oz	1	22.8 fl oz
Belly (fruit) rot (<i>Rhizoctonia solani</i>)	Quadris	11	11-15.5 fl oz	1	92.3 fl oz
Belly (fruit) rot (<i>Rhizoctonia solani</i>)	Quadris Opti	11, M	3.2 pt	1	4 app
Belly (fruit) rot (<i>Rhizoctonia solani</i>)	Quadris Top 1.67SC	11, 3	12-14 fl oz	1	56 fl oz
Belly (fruit) rot (<i>Rhizoctonia solani</i>)	Satori	11	0.4-0.8 fl oz ⁶	1	1 app
Belly (fruit) rot (<i>Rhizoctonia solani</i>)	Thiophanate-methyl 85WDG	1	0.4 lb	1	2.5 lb
Belly (fruit) rot (<i>Rhizoctonia solani</i>)	Topsin 4.5FL	1	10 fl oz	1	60 fl oz
Belly (fruit) rot (<i>Rhizoctonia solani</i>)	Topsin M 70WP	1	0.5 lb	1	3 lb
Belly (fruit) rot (<i>Rhizoctonia solani</i>)	Topsin M WSB	1	0.5 lb	1	4 lb
Downy mildew (<i>Pseudoperonospora cubensis</i>)	Actigard 50WG	21	0.5-1.0 oz	0	8 oz
Downy mildew (<i>Pseudoperonospora cubensis</i>)	Actinovate AG ^{OG}		3-12 oz	0	See Label
Downy mildew (<i>Pseudoperonospora cubensis</i>)	Aliette WDG	33	2-5 lb	0.5	7 app
Downy mildew (<i>Pseudoperonospora cubensis</i>)	Alude	33	1.3 qt	See Label	6 app
Downy mildew (<i>Pseudoperonospora cubensis</i>)	Cabrio 20WG	11	8-12 oz	0	64 oz
Downy mildew (<i>Pseudoperonospora cubensis</i>)	Catamaran	M, 33	4 pt	0	50 pt
Downy mildew (<i>Pseudoperonospora cubensis</i>)	Bravo Ultrex	M	1.4-1.8 lb	0	19.1 lb
Downy mildew (<i>Pseudoperonospora cubensis</i>)	Bravo WeatherStik	M	1.5-2 pt	0	21 pt
Downy mildew (<i>Pseudoperonospora cubensis</i>)	Bravo Zn	M	2.3-2.8 pt	0	30 pt
Downy mildew (<i>Pseudoperonospora cubensis</i>)	Chlorothalonil 720SC	M	1.5-2 pt	0	21 pt
Downy mildew (<i>Pseudoperonospora cubensis</i>)	Kocide 3000	M	0.5-1.3 lb	0	17.5 lb

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Downy mildew (<i>Pseudoperonospora cubensis</i>)	Kocide 2000	M	1-2.3 lb	0	15 lb
Downy mildew (<i>Pseudoperonospora cubensis</i>)	Champ WG ^{OG}	M	1.5-2 lb	0	10.5 lb
Downy mildew (<i>Pseudoperonospora cubensis</i>)	Nu-Cop 50DF ^{OG}	M	1.5-2 lb	0	10.5 lb
Downy mildew (<i>Pseudoperonospora cubensis</i>)	Badge SC ⁵	M	1-2.5 pt	1	18.6 pt
Downy mildew (<i>Pseudoperonospora cubensis</i>)	Badge X2 ^{OG, 5}	M	0.5-1.3 lb	0	5.3 lb Cu
Downy mildew (<i>Pseudoperonospora cubensis</i>)	Cuprofix-Ultra 40	M	1-2 lb	0	13 lb
Downy mildew (<i>Pseudoperonospora cubensis</i>)	Mastercop	M	0.5-1 pt	0	6 pt
Downy mildew (<i>Pseudoperonospora cubensis</i>)	Cueva ^{OG}	M	0.5-2 gal/100 gal	0	See Label
Downy mildew (<i>Pseudoperonospora cubensis</i>)	Nordox 75WG ^{OG}	M	1.5-2 lb	0	See Label
Downy mildew (<i>Pseudoperonospora cubensis</i>)	Curzate 60DF	M	3.2 oz	1	See Label
Downy mildew (<i>Pseudoperonospora cubensis</i>)	Elumin 4SC	22	8 fl oz	3	16 fl oz
Downy mildew (<i>Pseudoperonospora cubensis</i>)	Evito 480SC	27	3-5.7 fl oz	2	30 oz
Downy mildew (<i>Pseudoperonospora cubensis</i>)	Flint 50WDG	11	4 oz	1	22.8 fl oz
Downy mildew (<i>Pseudoperonospora cubensis</i>)	Forum	11	6 fl oz ⁷	0	16 oz
Downy mildew (<i>Pseudoperonospora cubensis</i>)	Gavel 75DF	40	1.5-2 lb	0	30 fl oz
Downy mildew (<i>Pseudoperonospora cubensis</i>)	mancozeb Dry formulations	M	1.6-2.4 qt	5	25.6 lb
Downy mildew (<i>Pseudoperonospora cubensis</i>)	mancozeb Liquid Formulations	M	2-3 lb	5	19.2 qt
Downy mildew (<i>Pseudoperonospora cubensis</i>)	ManKocide	M	2-5 lb/100 gal	5	24 lb
Downy mildew (<i>Pseudoperonospora cubensis</i>)	Milstop ^{OG}	See Label	3-4 fl oz ⁷	See Label	See Label
Downy mildew (<i>Pseudoperonospora cubensis</i>)	Orondis Ultra (Premix)	40, U15	5.5-8 fl oz	5	32 fl oz
Downy mildew (<i>Pseudoperonospora cubensis</i>)	Presidio 4F	43	50 fl oz/100 gal	0	12 fl oz
Downy mildew (<i>Pseudoperonospora cubensis</i>)	Previcur Flex 6F	28	1.2 pt	2	6 pt
Downy mildew (<i>Pseudoperonospora cubensis</i>)	Pristine 38WG	7, 11	12.5-18.5 oz	2	74 oz
Downy mildew (<i>Pseudoperonospora cubensis</i>)	Quadris 2.08SC	11	11-15.5 fl oz	0	92.3 fl oz
Downy mildew (<i>Pseudoperonospora cubensis</i>)	Quadris Opti	11, M	3.2 pt	1	4 app
Downy mildew (<i>Pseudoperonospora cubensis</i>)	Quadris Top	11, 3	12-14 fl oz	1	56 fl oz
Downy mildew (<i>Pseudoperonospora cubensis</i>)	Ranman 400SC	21	2.1-2.3 fl oz	1	16.5 fl oz
Downy mildew (<i>Pseudoperonospora cubensis</i>)	Reason 500SC	11	5.5 fl oz	0	22 fl oz
Downy mildew (<i>Pseudoperonospora cubensis</i>)	Revus 2.08F	40	8 fl oz ⁷	14	32 fl oz

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Downy mildew (<i>Pseudoperonospora cubensis</i>)	Satori	11	11-15.5 fl oz	0	92.3 fl oz
Downy mildew (<i>Pseudoperonospora cubensis</i>)	Zampro 4.38SC	40, 45	14 fl oz	1	42 fl oz
Downy mildew (<i>Pseudoperonospora cubensis</i>)	Zing	22, M	36 fl oz	0	8 app
Fusarium wilt (<i>Fusarium oxysporum</i>)	No fungicides labeled	NA	NA	NA	NA
Plectorsporium blight (<i>Plectosporium tabacinum</i>)	Cabrio 20WG	11	12-16 oz	0	64 fl oz
Plectorsporium blight (<i>Plectosporium tabacinum</i>)	Dithane F-45 Rainshield	M	1.6-2.4 qt	5	19.2 qt
Plectorsporium blight (<i>Plectosporium tabacinum</i>)	Dithane M-45	M	2-3 lb	5	24 lb
Plectorsporium blight (<i>Plectosporium tabacinum</i>)	Evito 480SC	11	3-5.7 fl oz	1	22.8 fl oz
Plectorsporium blight (<i>Plectosporium tabacinum</i>)	Flint 50WDG	11	1.5-2 oz	0	16 fl oz
Plectorsporium blight (<i>Plectosporium tabacinum</i>)	Merivon 500SC	7, 11	5.5 fl oz	0	16.5 fl oz
Plectorsporium blight (<i>Plectosporium tabacinum</i>)	Quadris Top 1.67SC	11, 3	12-14 fl oz	1	56 fl oz
Plectorsporium blight (<i>Plectosporium tabacinum</i>)	Roper DF Rainshield	M	2-3 lb	5	25.6 lb
Powdery mildew (<i>Sphaerotheca fuliginea</i> , <i>Erysiphe cichoracearum</i>)	Actigard 50WG	P1	0.5-1.0 oz	0	8 oz
Powdery mildew (<i>Sphaerotheca fuliginea</i> , <i>Erysiphe cichoracearum</i>)	Actinovate AG ^{OG}	See Label	3-12 oz	0	See Label
Powdery mildew (<i>Sphaerotheca fuliginea</i> , <i>Erysiphe cichoracearum</i>)	Cabrio 20WG	11	8-12 oz	0	64 oz
Powdery mildew (<i>Sphaerotheca fuliginea</i> , <i>Erysiphe cichoracearum</i>)	Bravo Ultrex	M	1.4-1.8 lb	0	19.1 lb
Powdery mildew (<i>Sphaerotheca fuliginea</i> , <i>Erysiphe cichoracearum</i>)	Bravo WeatherStik	M	1.5-2 pt	0	21 pt
Powdery mildew (<i>Sphaerotheca fuliginea</i> , <i>Erysiphe cichoracearum</i>)	Bravo Zn	M	2.3-2.8 pt	0	30 pt
Powdery mildew (<i>Sphaerotheca fuliginea</i> , <i>Erysiphe cichoracearum</i>)	Chlorothalonil 720SC	M	1.5-2 pt	0	21 pt
Powdery mildew (<i>Sphaerotheca fuliginea</i> , <i>Erysiphe cichoracearum</i>)	Kocide 3000	M	0.5-1.3 lb	0	17.5 lb
Powdery mildew (<i>Sphaerotheca fuliginea</i> , <i>Erysiphe cichoracearum</i>)	Kocide 2000	M	1-2.3 lb	0	15 lb
Powdery mildew (<i>Sphaerotheca fuliginea</i> , <i>Erysiphe cichoracearum</i>)	Champ WG ^{OG}	M	1.5-2 lb	0	10.5 lb
Powdery mildew (<i>Sphaerotheca fuliginea</i> , <i>Erysiphe cichoracearum</i>)	Badge SC ⁵	M	1-2.5 pt	0	18.6 pt

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Powdery mildew (<i>Sphaerotheca fuliginea</i> , <i>Erysiphe cichoracearum</i>)	Badge X2 ^{OG,5}	M	0.5-1.3 lb	0	5.3 lb Cu
Powdery mildew (<i>Sphaerotheca fuliginea</i> , <i>Erysiphe cichoracearum</i>)	Cuprofix-Ultra 40	M	1-2 lb	0	13 lb
Powdery mildew (<i>Sphaerotheca fuliginea</i> , <i>Erysiphe cichoracearum</i>)	Mastercop	M	0.5-1 pt	0	6 pt
Powdery mildew (<i>Sphaerotheca fuliginea</i> , <i>Erysiphe cichoracearum</i>)	Nordox 75WG ^{OG}	M	1.5-2 lb	1	See Label
Powdery mildew (<i>Sphaerotheca fuliginea</i> , <i>Erysiphe cichoracearum</i>)	Endura	7	6.5 oz	0	26 oz
Powdery mildew (<i>Sphaerotheca fuliginea</i> , <i>Erysiphe cichoracearum</i>)	Evito 480SC	11	3-5.7 fl oz	1	22.8 fl oz
Powdery mildew (<i>Sphaerotheca fuliginea</i> , <i>Erysiphe cichoracearum</i>)	Flint	11	1.5-2 oz	0	16 oz
Powdery mildew (<i>Sphaerotheca fuliginea</i> , <i>Erysiphe cichoracearum</i>)	Fontelis	7	12-16 fl oz	1	67 fl oz
Powdery mildew (<i>Sphaerotheca fuliginea</i> , <i>Erysiphe cichoracearum</i>)	Gatten	U13	6-8 fl oz	0	5 app
Powdery mildew (<i>Sphaerotheca fuliginea</i> , <i>Erysiphe cichoracearum</i>)	ManKocide	M	2-3 lb	5	24 lb
Powdery mildew (<i>Sphaerotheca fuliginea</i> , <i>Erysiphe cichoracearum</i>)	Milstop ^{OG}	See Label	2-5 lb/100 gal	See Label	See Label
Powdery mildew (<i>Sphaerotheca fuliginea</i> , <i>Erysiphe cichoracearum</i>)	Merivon 500SC	7, 11	4-5.5 fl oz	0	16.5 fl oz
Powdery mildew (<i>Sphaerotheca fuliginea</i> , <i>Erysiphe cichoracearum</i>)	Prev-AM	7, 11	50 fl oz/100 gal	See Label	See Label
Powdery mildew (<i>Sphaerotheca fuliginea</i> , <i>Erysiphe cichoracearum</i>)	Pristine	7, 11	12.5-18.5 oz	0	74 oz
Powdery mildew (<i>Sphaerotheca fuliginea</i> , <i>Erysiphe cichoracearum</i>)	Procure 50WS	3	4-8 oz	0	40 oz
Powdery mildew (<i>Sphaerotheca fuliginea</i> , <i>Erysiphe cichoracearum</i>)	Quadris	11	11-15.5 fl oz	1	92.3 fl oz
Powdery mildew (<i>Sphaerotheca fuliginea</i> , <i>Erysiphe cichoracearum</i>)	Quadris Opti	11, M	3.2 pt	1	4 app
Powdery mildew (<i>Sphaerotheca fuliginea</i> , <i>Erysiphe cichoracearum</i>)	Quadris Top	11, 3	12-14 fl oz	1	56 fl oz
Powdery mildew (<i>Sphaerotheca fuliginea</i> , <i>Erysiphe cichoracearum</i>)	Quintec 2.08SC (not on cucumber or summer squash)	13	4-6 fl oz	3	24 fl oz

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Powdery mildew (<i>Sphaerotheca fuliginea</i> , <i>Erysiphe cichoracearum</i>)	Rally 40WSP	3	2.5-5 oz	0	1.5 lb a.i.
Powdery mildew (<i>Sphaerotheca fuliginea</i> , <i>Erysiphe cichoracearum</i>)	Satori	11	11-15.5 fl oz	1	92.3 fl oz
Powdery mildew (<i>Sphaerotheca fuliginea</i> , <i>Erysiphe cichoracearum</i>)	Serenade ^{OG} ASO	44	2-6 qt	0	See Label
Powdery mildew (<i>Sphaerotheca fuliginea</i> , <i>Erysiphe cichoracearum</i>)	Serenade ^{OG} Max	44	1-3 lb	0	See Label
Powdery mildew (<i>Sphaerotheca fuliginea</i> , <i>Erysiphe cichoracearum</i>)	Sonata ^{OG}	44	2-4 qt	0	See Label
Powdery mildew (<i>Sphaerotheca fuliginea</i> , <i>Erysiphe cichoracearum</i>)	Sovran	11	3.2-4.8 oz	0	19.2 oz
Powdery mildew (<i>Sphaerotheca fuliginea</i> , <i>Erysiphe cichoracearum</i>)	Microthiol Disperss ^{OG} Cucumbers only Melons, squash, or pumpkins	M2	2-4 lb	See Label	See Label
Powdery mildew (<i>Sphaerotheca fuliginea</i> , <i>Erysiphe cichoracearum</i>)	Surround WP ^{OG}	See Label	25-50 lb	See Label	See Label
Powdery mildew (<i>Sphaerotheca fuliginea</i> , <i>Erysiphe cichoracearum</i>)	Switch 62.5WG	9, 12	11-14 oz	1	56 oz
Powdery mildew (<i>Sphaerotheca fuliginea</i> , <i>Erysiphe cichoracearum</i>)	Torino 0.85SC	U6	3.4 oz	0	2 app
Powdery mildew (<i>Sphaerotheca fuliginea</i> , <i>Erysiphe cichoracearum</i>)	tebuconazole (various formulations)	3	4-6 fl oz	7	24 fl oz
Powdery mildew (<i>Sphaerotheca fuliginea</i> , <i>Erysiphe cichoracearum</i>)	Thiophanate-methyl 85WG	1	0.2-0.4 lb	1	2.5 lb
Powdery mildew (<i>Sphaerotheca fuliginea</i> , <i>Erysiphe cichoracearum</i>)	Topsin 4.5FL	1	10 fl oz	1	60 fl oz
Powdery mildew (<i>Sphaerotheca fuliginea</i> , <i>Erysiphe cichoracearum</i>)	Topsin M 70WP	1	0.5 lb	1	3 lb
Powdery mildew (<i>Sphaerotheca fuliginea</i> , <i>Erysiphe cichoracearum</i>)	Topsin M WSB	1	0.5 lb	1	3 lb
Phytophthora blight or crown rot (<i>Phytophthora capsici</i>)	Elumin	22	8 fl oz	2	16 fl oz
Phytophthora blight or crown rot (<i>Phytophthora capsici</i>)	Forum 4.17SC	40	6 fl oz ⁷	0	30 fl oz
Phytophthora blight or crown rot (<i>Phytophthora capsici</i>)	Omega 500F	29	1.5 pt	See label	See label
Phytophthora blight or crown rot (<i>Phytophthora capsici</i>)	Orondis Gold 200	49, 4	4.8-9.6 fl oz	0	19.2 fl oz
Phytophthora blight or crown rot (<i>Phytophthora capsici</i>)	Orondis Ultra (Premix)	49, 40	5.5-8 fl oz	0	32 fl oz
Phytophthora blight or crown rot (<i>Phytophthora capsici</i>)	Presidio 4F	43	3-4 fl oz	2	12 fl oz

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Phytophthora blight or crown rot (<i>Phytophthora capsici</i>)	Ranman 400SC	21	2.8 fl oz	0	16.f fl oz
Phytophthora blight or crown rot (<i>Phytophthora capsici</i>)	Revus 2.08F	40	8 fl oz	0	32 fl oz
Phytophthora blight or crown rot (<i>Phytophthora capsici</i>)	Zampro 4.38SC	40, 45	14 fl oz	0	42 fl oz
Damping-off, Root rot and Cottony leak (<i>Pythium</i> spp.)	Actinovate AG ^{OG}	See label	3-12 oz	See label	See label
Damping-off, Root rot and Cottony leak (<i>Pythium</i> spp.)	Bio-Tam ^{OG}	See label	1.5-3 oz ⁶	See label	1 app
Damping-off, Root rot and Cottony leak (<i>Pythium</i> spp.)	Confine Extra	33	1-4 qt	0	See label
Damping-off, Root rot and Cottony leak (<i>Pythium</i> spp.)	Rampart	33	1-3 qt/100 gal	0	See label
Damping-off, Root rot and Cottony leak (<i>Pythium</i> spp.)	Fosphite	33	1-3 qt/100 gal	0	6 app
Damping-off, Root rot and Cottony leak (<i>Pythium</i> spp.)	Fungi-phite	33	1-5 qt	0	7 app
Damping-off, Root rot and Cottony leak (<i>Pythium</i> spp.)	Previcur Flex	28	1.2 pt	2	6 pt
Damping-off, Root rot and Cottony leak (<i>Pythium</i> spp.)	Ridomil Gold SL	4	1-2 pt ⁸	See label	1 app
Damping-off, Root rot and Cottony leak (<i>Pythium</i> spp.)	MetaStar 2EC AG	4	4-8 pt ⁸	See label	1 app
Damping-off, Root rot and Cottony leak (<i>Pythium</i> spp.)	Serenade Soil ^{OG}	44	2-6 qt ⁸	See label	See label
Damping-off, Root rot and Cottony leak (<i>Pythium</i> spp.)	Ultra Flourish	4	2-4 pt ⁸	5	4 pt
Scab (<i>Cladosporium cucumerinum</i>)	Actigard 50WP	P1	0.5-1.0 oz		8 oz
Scab (<i>Cladosporium cucumerinum</i>)	Catamaran 5.27SC	M, 33	6 pt	0	50 pt
Scab (<i>Cladosporium cucumerinum</i>)	Bravo Ultrex	M	1.4-1.8 lb	0	19.1 lb
Scab (<i>Cladosporium cucumerinum</i>)	Bravo WeatherStik	M	1.5-2 pt	0	21 pt
Scab (<i>Cladosporium cucumerinum</i>)	Bravo Zn	M	2.3-2.8 pt	0	30 pt
Scab (<i>Cladosporium cucumerinum</i>)	Chlorothalonil 720SC	M	1.5-2 pt	0	21 pt
Scab (<i>Cladosporium cucumerinum</i>)	mancozeb Dry formulations	M	2-3 lb	5	25.6 lb
Scab (<i>Cladosporium cucumerinum</i>)	mancozeb Liquid Formulations	M	1.6-2.4 qt	5	19.2 qt
Scab (<i>Cladosporium cucumerinum</i>)	ManKocide	M	2-3 lb	5	24 lb
Scab (<i>Cladosporium cucumerinum</i>)	Ridomil Gold Bravo SC	4, M	2.5-3.3 pt	0	15.8 lb a.i.
Scab (<i>Cladosporium cucumerinum</i>)	Trilogy ^{OG}	See label	1%	See label	See label

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² Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

³ Rates are the amount of formulation per acre unless otherwise indicated. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

⁴ Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

⁵ Broccoli and cabbage are covered under a supplemental label (EPA Reg. No. 70506-234).

⁶ Rates refer to band or broadcast applications. Refer to individual labels for per plant in transplant water rates.

⁷ All rates are per 1,000 square feet of row. Refer to the label for modes of application.

⁸ For head and stem applications the postharvest interval (PHI) is 0 days. For leafy greens the PHI is 3 days.

⁹ For head and stem applications the postharvest interval (PHI) is 0 days. For leafy greens the PHI is 14 days.

Eggplant

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Damping-off (<i>Pythium</i> spp.)	MetaStar 2E	4	4-8 pt ⁸	7	12 pt
Damping-off (<i>Pythium</i> spp.)	Ridomil Gold SL	4	1 pt ⁸	7	1.5 lb a.i.
Damping-off (<i>Pythium</i> spp.)	Ultra Flourish	4	2 pt ⁸	7	6 pt
Leaf blights and spots (<i>Alternaria</i> spp.) Anthracnose or fruit rot (<i>Colletotrichum coccodes</i>) and Phomopsis fruit rot (<i>Phomopsis vexans</i>)	Actinovate AG ^{OG}	See label	3-12 oz	See label	See label
Leaf blights and spots (<i>Alternaria</i> spp.) Anthracnose or fruit rot (<i>Colletotrichum coccodes</i>) and Phomopsis fruit rot (<i>Phomopsis vexans</i>)	Cabrio 20EG	11	8-12 oz	0	96 oz
Leaf blights and spots (<i>Alternaria</i> spp.) Anthracnose or fruit rot (<i>Colletotrichum coccodes</i>) and Phomopsis fruit rot (<i>Phomopsis vexans</i>)	Kocide 3000	M	0.8-1.5 lb	0	26.3 lb
Leaf blights and spots (<i>Alternaria</i> spp.) Anthracnose or fruit rot (<i>Colletotrichum coccodes</i>) and Phomopsis fruit rot (<i>Phomopsis vexans</i>)	Kocide 2000	M	1.5 lb	0	22.6 lb
Leaf blights and spots (<i>Alternaria</i> spp.) Anthracnose or fruit rot (<i>Colletotrichum coccodes</i>) and Phomopsis fruit rot (<i>Phomopsis vexans</i>)	Champ WG ^{OG}	M	1.6 lb	7	15.8 lb
Leaf blights and spots (<i>Alternaria</i> spp.) Anthracnose or fruit rot (<i>Colletotrichum coccodes</i>) and Phomopsis fruit rot (<i>Phomopsis vexans</i>)	Nu-Cop 50DF ^{OG}	M	1.5 lb	1	15 lb
Leaf blights and spots (<i>Alternaria</i> spp.) Anthracnose or fruit rot (<i>Colletotrichum coccodes</i>) and Phomopsis fruit rot (<i>Phomopsis vexans</i>)	Badge SC ⁵	M	1.5 pt	7	27.8 pt
Leaf blights and spots (<i>Alternaria</i> spp.) Anthracnose or fruit rot (<i>Colletotrichum coccodes</i>) and Phomopsis fruit rot (<i>Phomopsis vexans</i>)	Badge X2 ^{OG, 5}	M	0.8 lb	7	7.9 lb Cu
Leaf blights and spots (<i>Alternaria</i> spp.) Anthracnose or fruit rot (<i>Colletotrichum coccodes</i>) and Phomopsis fruit rot (<i>Phomopsis vexans</i>)	Cuprofix-Ultra 40	M	1.3 lb ⁵	See label	19.8 lb
Leaf blights and spots (<i>Alternaria</i> spp.) Anthracnose or fruit rot (<i>Colletotrichum coccodes</i>) and Phomopsis fruit rot (<i>Phomopsis vexans</i>)	Mastercop	M	0.5-1.5 pt	7	9 pt
Leaf blights and spots (<i>Alternaria</i> spp.) Anthracnose or fruit rot (<i>Colletotrichum coccodes</i>) and Phomopsis fruit rot (<i>Phomopsis vexans</i>)	Nordox 75WG ^{OG}	M	2-4 lb	See label	22.8 fl oz

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Leaf blights and spots (<i>Alternaria</i> spp.) Anthracnose or fruit rot (<i>Colletotrichum coccodes</i>) and Phomopsis fruit rot (<i>Phomopsis vexans</i>)	Aftershock OR Evito	11	2-5.7 fl oz	3	72 fl oz
Leaf blights and spots (<i>Alternaria</i> spp.) Anthracnose or fruit rot (<i>Colletotrichum coccodes</i>) and Phomopsis fruit rot (<i>Phomopsis vexans</i>)	Fontelis	7	16-24 fl oz	0	See label
Leaf blights and spots (<i>Alternaria</i> spp.) Anthracnose or fruit rot (<i>Colletotrichum coccodes</i>) and Phomopsis fruit rot (<i>Phomopsis vexans</i>)	Milstop ^{OG}	See label	2-5 lb/100 gal	See label	See label
Leaf blights and spots (<i>Alternaria</i> spp.) Anthracnose or fruit rot (<i>Colletotrichum coccodes</i>) and Phomopsis fruit rot (<i>Phomopsis vexans</i>)	Priaxor 500 SC	7, 11	4-8 fl oz	0	24 fl oz
Leaf blights and spots (<i>Alternaria</i> spp.) Anthracnose or fruit rot (<i>Colletotrichum coccodes</i>) and Phomopsis fruit rot (<i>Phomopsis vexans</i>)	Quadris Top 1.67SC	11, 3	8-14 fl oz	0	55.3 fl oz
Leaf blights and spots (<i>Alternaria</i> spp.) Anthracnose or fruit rot (<i>Colletotrichum coccodes</i>) and Phomopsis fruit rot (<i>Phomopsis vexans</i>)	Reason 500SC	11	5.5-8.2 fl oz	14	24.6 fl oz
Leaf blights and spots (<i>Alternaria</i> spp.) Anthracnose or fruit rot (<i>Colletotrichum coccodes</i>) and Phomopsis fruit rot (<i>Phomopsis vexans</i>)	Trilogy ^{OG}	See label	1%	See label	See label
Phytophthora blight or crown rot (<i>Phytophthora capsici</i>)	Elumin 4 SC	22	8 fl oz	2	30 fl oz
Phytophthora blight or crown rot (<i>Phytophthora capsici</i>)	Forum SC	40	6 fl oz ⁷	0	30 fl oz
Phytophthora blight or crown rot (<i>Phytophthora capsici</i>)	Micora 2.08F	40	8 fl oz ⁷	1	32 fl oz
Phytophthora blight or crown rot (<i>Phytophthora capsici</i>)	Omega 500F	29	1.5 pt	30	9 pt
Phytophthora blight or crown rot (<i>Phytophthora capsici</i>)	Orondis Gold 200	U15	4.8-9.6 fl oz	0	19.2 fl oz
Phytophthora blight or crown rot (<i>Phytophthora capsici</i>)	Presidio 4SC	43	3-4 fl oz	2	12 fl oz
Phytophthora blight or crown rot (<i>Phytophthora capsici</i>)	Ranman 400SC	21	2.8 fl oz	0	16.5 fl oz
Phytophthora blight or crown rot (<i>Phytophthora capsici</i>)	Reason 500SC	11	8.2 fl oz	14	24.6 fl oz
Phytophthora blight or crown rot (<i>Phytophthora capsici</i>)	Revus 2.08F	40	8 fl oz	1	32 oz
Phytophthora blight or crown rot (<i>Phytophthora capsici</i>)	Ridomil Gold + Copper	4, M	2 lb	7	4 app
Phytophthora blight or crown rot (<i>Phytophthora capsici</i>)	Zampro 525SC	40, 45	14 fl oz	0	42 fl oz
Powdery mildew (<i>Leveillula taurica</i>)	Ariston	M, 27	2-2.4 pt	3	18.1
Powdery mildew (<i>Leveillula taurica</i>)	Cabrio 20EG	11	8-16 oz	0	96 oz
Powdery mildew (<i>Leveillula taurica</i>)	Bravo Ultrex	M	1.4 lb	3	10.9 lb

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Powdery mildew (<i>Leveillula taurica</i>)	Bravo WeatherStik ⁶	M	1.5 pt	3	12 pt
Powdery mildew (<i>Leveillula taurica</i>)	phosphorous acid (various formulations)	33	See label	0	See label
Powdery mildew (<i>Leveillula taurica</i>)	Fontelis	7	16-24 fl oz	0	72 fl oz
Powdery mildew (<i>Leveillula taurica</i>)	Inspire Super	3, 9	16-20 fl oz	0	47 fl oz
Powdery mildew (<i>Leveillula taurica</i>)	Priaxor 500SC	7, 11	6-8 fl oz	0	24 fl oz
Powdery mildew (<i>Leveillula taurica</i>)	Quadris 2.08F	11	6-15.5 fl oz	0	61.5 fl oz
Powdery mildew (<i>Leveillula taurica</i>)	Quadris Top	11, 3	8-14 fl oz	0	55.3 fl oz
Powdery mildew (<i>Leveillula taurica</i>)	Satori	11	6-15.5 fl oz	0	61.5 fl oz
Powdery mildew (<i>Leveillula taurica</i>)	Serenade ^{OG} ASO	44	2-6 qt	0	See label
Powdery mildew (<i>Leveillula taurica</i>)	Serenade ^{OG} Max	44	1-3 lb	0	See label
Powdery mildew (<i>Leveillula taurica</i>)	Sonata ^{OG}	44	2-4 qt	0	See label
Powdery mildew (<i>Leveillula taurica</i>)	Microfine Sulfur ^{OG}	M	22-38 lb	See label	See label
Powdery mildew (<i>Leveillula taurica</i>)	Microthiol Disperss ^{OG}	M	4-6 lb	See label	See label
Powdery mildew (<i>Leveillula taurica</i>)	Yellow Jacket Wettable ^{OG}	M	22-38 lb	See label	See label
Powdery mildew (<i>Leveillula taurica</i>)	Switch 62.5WG	9, 12	11-14 oz	See label	See label
Powdery mildew (<i>Leveillula taurica</i>)	Trilogy ^{OG}	See label	1%	0	46.2 fl oz
Powdery mildew (<i>Leveillula taurica</i>)	Vivando	U8	15.4 fl oz	See label	See label
Southern blight (<i>Sclerotium rolfsii</i>)	Cabrio 20EG	11	12-16 oz	0	96 oz
Southern blight (<i>Agroathelia rolfsii</i>)	Aftershock	11	2-5.7 fl oz	3	22.8 fl oz
Southern blight (<i>Agroathelia rolfsii</i>)	Evito 280 SC	11	2-5.7 fl oz	3	22.8 fl oz
Southern blight (<i>Agroathelia rolfsii</i>)	OSO 5%	19	6.5-13 fl oz	0	4.2 oz a.i.
Southern blight (<i>Agroathelia rolfsii</i>)	Priaxor 500SC	7, 11	4-8 fl oz	0	24 fl oz
Verticillium wilt (<i>Verticillium</i> sp.)	OSO 5%	19	6.5-13 fl oz	0	4.2 oz a.i.

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³ Rates are the amount of formulation per acre unless otherwise indicated. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

⁴ Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

⁵ Do not use in a spray solution with a pH less than 6.5.

⁶ Other product choices that can be applied at the same rate include Echo 720, Equus 720SST and Chloronil 720.

⁷ Do not apply alone. Must be applied as a tank mix with another fungicide with a different mode of action.

⁸ Soil applications. Refer to individual labels for application directions.

Greens (Collards, Kale, Mustard and Turnip)

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Alternaria leaf spot or Black leaf spot (<i>Alternaria brassicae</i>)	Quadris	11	6-15.5 fl oz	0	46 fl oz
Alternaria leaf spot or Black leaf spot (<i>Alternaria brassicae</i>)	Quadris Top	11, 3	12-14 fl oz	1	56 fl oz
Alternaria leaf spot or Black leaf spot (<i>Alternaria brassicae</i>)	Satori	11	12-16 oz	3	64 oz
Alternaria leaf spot or Black leaf spot (<i>Alternaria brassicae</i>)	Cabrio	11	6-9 oz	14	18 oz
Alternaria leaf spot or Black leaf spot (<i>Alternaria brassicae</i>)	Endura	7	14-30 fl oz	0	72 fl oz
Alternaria leaf spot or Black leaf spot (<i>Alternaria brassicae</i>)	Fontelis	7	14-30 fl oz	0	72 fl oz
Alternaria leaf spot or Black leaf spot (<i>Alternaria brassicae</i>)	Kocide 3000	M	0.5-0.8 lb	0	8.8 lb
Alternaria leaf spot or Black leaf spot (<i>Alternaria brassicae</i>)	Kocide 2000	M	0.8-1.5 lb	0	7.6 lb
Alternaria leaf spot or Black leaf spot (<i>Alternaria brassicae</i>)	Champ Formula 2 Flowable	M	0.3-0.7 pt	0	7.3 pt
Alternaria leaf spot or Black leaf spot (<i>Alternaria brassicae</i>)	Champ WG ^{OG}	M	1 lb	0	5.3 lb
Alternaria leaf spot or Black leaf spot (<i>Alternaria brassicae</i>)	Badge SC ⁵	M	1-1.8 pt	0	18.6 pt
Alternaria leaf spot or Black leaf spot (<i>Alternaria brassicae</i>)	Badge X2 ^{OG,5}	M	0.5-0.8 lb	0	2.7 lb Cu
Alternaria leaf spot or Black leaf spot (<i>Alternaria brassicae</i>)	Cuprofix-Ultra 40	M	See label	See label	See label
Alternaria leaf spot or Black leaf spot (<i>Alternaria brassicae</i>)	Mastercop	M	0.8-1.3 lb	0	6.6 lb
Alternaria leaf spot or Black leaf spot (<i>Alternaria brassicae</i>)	Inspire Super	M	0.5-1 pt	0	6 pt
Alternaria leaf spot or Black leaf spot (<i>Alternaria brassicae</i>)	Procure 480 SC	3, 9	16-20 fl oz	7	80 fl oz
Alternaria leaf spot or Black leaf spot (<i>Alternaria brassicae</i>)	Luna Sensation	3	6-8 fl oz	1	18 fl oz
Alternaria leaf spot or Black leaf spot (<i>Alternaria brassicae</i>)	Reason 500 SC	7, 11	5-7.6 fl oz	7	15.3 fl oz
Alternaria leaf spot or Black leaf spot (<i>Alternaria brassicae</i>)	Serenade ^{OG} ASO	11	8.2 fl oz	2	24.6 fl oz
Alternaria leaf spot or Black leaf spot (<i>Alternaria brassicae</i>)	Serenade ^{OG} Max	44	1-3 lb	See label	See label
Alternaria leaf spot or Black leaf spot (<i>Alternaria brassicae</i>)	Sonata ^{OG}	44	2-4 qt	See label	See label
Alternaria leaf spot or Black leaf spot (<i>Alternaria brassicae</i>)	Switch 62.5WG	9, 12	11-14 oz	7	56 oz
Alternaria leaf spot or Black leaf spot (<i>Alternaria brassicae</i>)	Monsoon	3	3-4 fl oz	7	16 fl oz
Alternaria leaf spot or Black leaf spot (<i>Alternaria brassicae</i>)	Onset 3.6L	3	3-4 fl oz	7	16 fl oz
Alternaria leaf spot or Black leaf spot (<i>Alternaria brassicae</i>)	Tebu-Crop 3.6F	3	3-4 fl oz	7	16 fl oz
Alternaria leaf spot or Black leaf spot (<i>Alternaria brassicae</i>)	Toledo	3	3-4 fl oz	7	16 fl oz
Anthrachnose (<i>Colletotrichum higginsianum</i>), Leaf spots (<i>Cercospora</i> spp., <i>Cercospora</i> spp.)	Quadris	11	6-15.5 fl oz	0	46 fl oz

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Anthracnose (<i>Colletotrichum higginsianum</i>), Leaf spots (<i>Cercospora</i> spp., <i>Cercospora</i> spp.)	Quadris Top	11, 3	12-14 fl oz	1	56 fl oz
Anthracnose (<i>Colletotrichum higginsianum</i>), Leaf spots (<i>Cercospora</i> spp., <i>Cercospora</i> spp.)	Satori	11	12-16 oz	3	64 oz
Anthracnose (<i>Colletotrichum higginsianum</i>), Leaf spots (<i>Cercospora</i> spp., <i>Cercospora</i> spp.)	Cabrio 20EG	11	6-9 oz	14	18 oz
Anthracnose (<i>Colletotrichum higginsianum</i>), Leaf spots (<i>Cercospora</i> spp., <i>Cercospora</i> spp.)	Endura 70WG	7	14-30 fl oz	0	72 fl oz
Anthracnose (<i>Colletotrichum higginsianum</i>), Leaf spots (<i>Cercospora</i> spp., <i>Cercospora</i> spp.)	Fontelis 1.67SC	7	14-30 fl oz	0	72 fl oz
Anthracnose (<i>Colletotrichum higginsianum</i>), Leaf spots (<i>Cercospora</i> spp., <i>Cercospora</i> spp.)	Inspire Super 2.82SC	3, 9	16-20 fl oz	7	80 fl oz
Anthracnose (<i>Colletotrichum higginsianum</i>), Leaf spots (<i>Cercospora</i> spp., <i>Cercospora</i> spp.)	Reason 500SC	11	8.2 fl oz	2	24.6 fl oz
Anthracnose (<i>Colletotrichum higginsianum</i>), Leaf spots (<i>Cercospora</i> spp., <i>Cercospora</i> spp.)	Switch 62.5WG	9, 12	11-14 oz	7	56 oz
Anthracnose (<i>Colletotrichum higginsianum</i>), Leaf spots (<i>Cercospora</i> spp., <i>Cercospora</i> spp.)	Monsoon	3	3-4 fl oz	7	16 fl oz
Anthracnose (<i>Colletotrichum higginsianum</i>), Leaf spots (<i>Cercospora</i> spp., <i>Cercospora</i> spp.)	Onset 3.6L	3	3-4 fl oz	7	16 fl oz
Anthracnose (<i>Colletotrichum higginsianum</i>), Leaf spots (<i>Cercospora</i> spp., <i>Cercospora</i> spp.)	Tebu-Crop 3.6F	3	3-4 fl oz	7	16 fl oz
Anthracnose (<i>Colletotrichum higginsianum</i>), Leaf spots (<i>Cercospora</i> spp., <i>Cercospora</i> spp.)	Toledo	3	3-4 fl oz	7	16 fl oz
Bacterial leaf spot (<i>Xanthomonas campestris</i> pv. <i>armoraciae</i>)	Cease	44	3-6 qt/100 gal	0	Chemicals are not effective against this disease.
Bacterial leaf spot (<i>Xanthomonas campestris</i> pv. <i>armoraciae</i>)	Serenade ^{OG} ASO	44	2-6 qt	0	Chemicals are not effective against this disease.
Bacterial leaf spot (<i>Xanthomonas campestris</i> pv. <i>armoraciae</i>)	Serenade ^{OG} Max	44	1-3 lb	0	Chemicals are not effective against this disease.
Bacterial leaf spot (<i>Xanthomonas campestris</i> pv. <i>armoraciae</i>)	Sonata ^{OG}	44	2-4 qt	0	Chemicals are not effective against this disease.

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Black rot (<i>Xanthomonas campestris</i> pv. <i>campestris</i>)	Actigard	21	0.5-1.0 oz	7	4 apps
Black rot (<i>Xanthomonas campestris</i> pv. <i>campestris</i>)	Cease	44	3-6 qt/100 gal	0	See label
Black rot (<i>Xanthomonas campestris</i> pv. <i>campestris</i>)	Kocide 3000	M	0.5-1.3 lb	0	15.8 lb
Black rot (<i>Xanthomonas campestris</i> pv. <i>campestris</i>)	Kocide 2000	M	0.5-0.8 lb	0	8.8 lb
Black rot (<i>Xanthomonas campestris</i> pv. <i>campestris</i>)	Champ Formula 2 Flowable	M	0.8-1.5 lb	0	7.6 lb
Black rot (<i>Xanthomonas campestris</i> pv. <i>campestris</i>)	Champ WG ^{OG}	M	1 lb	0	5.3 lb
Black rot (<i>Xanthomonas campestris</i> pv. <i>campestris</i>)	Badge SC	M	1-1.8 pt	0	18.6 pt
Black rot (<i>Xanthomonas campestris</i> pv. <i>campestris</i>)	Badge X2 ^{OG}	M	0.5-0.8 lb	0	2.7 lb Cu
Black rot (<i>Xanthomonas campestris</i> pv. <i>campestris</i>)	Cuprofix-Ultra 40	M	0.5-1 pt	0	6 pt
Black rot (<i>Xanthomonas campestris</i> pv. <i>campestris</i>)	Mastercop	M	0.5-1 pt	0	6 pt
Black rot (<i>Xanthomonas campestris</i> pv. <i>campestris</i>)	Nordox 75WG ^{OG}	M	1-3 lb	See label	See label
Damping-off (<i>Pythium</i> spp.)	Actinovate AG ^{OG}	See label	3-12 oz	See label	See label
Damping-off (<i>Pythium</i> spp.)	Ridomil Gold SL	See label	0.3-0.5 pt ⁷	See label	1 app
Damping-off (<i>Pythium</i> spp.)	Ultra Flourish	4	0.5-1 pt	See label	4 pt
Damping-off (<i>Pythium</i> spp.)	Confine Extra	33	1-3 qt	See label	See label
Damping-off (<i>Pythium</i> spp.)	Rampart	33	1-3 qt/100 gal	See label	See label
Damping-off (<i>Pythium</i> spp.)	Fosphite	33	1-3 qt/100 gal	See label	See label
Damping-off (<i>Pythium</i> spp.)	Fungi-phite	33	1-5 qt	See label	See label
Damping-off (<i>Pythium</i> spp.)	RootShield Granules	44	2.5-6 lb/ ½acre ⁷	See label	1 app
Downy mildew (<i>Peronospora parasitica</i>)	Actigard 50WG	P1	0.8-1 oz	7	4 oz ¹⁷
Downy mildew (<i>Peronospora parasitica</i>)	Actinovate AG ^{OG}	See label	3-12 oz	See label	See label
Downy mildew (<i>Peronospora parasitica</i>)	Aliette WDG	33	2-5 lb	3	7 app
Downy mildew (<i>Peronospora parasitica</i>)	Alude	33	0.5 gal/40 gal	See label	See label
Downy mildew (<i>Peronospora parasitica</i>)	Cabrio 20EG	11	12-16 oz	0	64 oz
Downy mildew (<i>Peronospora parasitica</i>)	Kocide 3000	M	0.5-0.8 lb	0	8.8 lb
Downy mildew (<i>Peronospora parasitica</i>)	Kocide 2000	M	0.8-1.5	0	7.6 lb
Downy mildew (<i>Peronospora parasitica</i>)	Champ Formula 2 Flowable	M	0.3-0.7 pt	0	7.3 pt
Downy mildew (<i>Peronospora parasitica</i>)	Champ WG ^{OG}	M	1 lb	0	5.3 lb
Downy mildew (<i>Peronospora parasitica</i>)	Badge SC ⁵	M	1.7 pt	5	28.1 pt

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Downy mildew (<i>Peronospora parasitica</i>)	Badge X2 ^{OG, 5}	M	1.8-3.5 lb	5	8 lb
Downy mildew (<i>Peronospora parasitica</i>)	Cuprofix-Ultra 40	M	0.5-1 pt	0	6 pt
Downy mildew (<i>Peronospora parasitica</i>)	Mastercop	M	0.5-1 pt	0	6 pt
Downy mildew (<i>Peronospora parasitica</i>)	Nordox 75WG ^{OG}	M	1-2 lb	See label	See label
Downy mildew (<i>Peronospora parasitica</i>)	Forum 4.16SC	40	6 fl oz ⁶	0	18 fl oz
Downy mildew (<i>Peronospora parasitica</i>)	Micora	40	5.5-8 fl oz ⁶	See label	8 fl oz
Downy mildew (<i>Peronospora parasitica</i>)	Milstop ^{OG}	40	2-5 lb/100 gal	See label	See label
Downy mildew (<i>Peronospora parasitica</i>)	Confine Extra	33	1-3 qt	See label	See label
Downy mildew (<i>Peronospora parasitica</i>)	Rampart	33	1-3 qt/100 gal	See label	See label
Downy mildew (<i>Peronospora parasitica</i>)	Fosphite	33	1-3 qt/100 gal	See label	See label
Downy mildew (<i>Peronospora parasitica</i>)	Fungi-phite	33	1-5 qt	0	6 app
Downy mildew (<i>Peronospora parasitica</i>)	Helena ProPhyt	33	2-4 pt	0	7 app
Downy mildew (<i>Peronospora parasitica</i>)	Presidio 4SC	43	3-4 fl oz	2	12 fl oz
Downy mildew (<i>Peronospora parasitica</i>)	Ranman 400SC	21	2.8 fl oz	0	39.5 fl oz
Downy mildew (<i>Peronospora parasitica</i>)	Reason 500SC	11	5.5-8.2 fl oz	2	24.6 fl oz
Downy mildew (<i>Peronospora parasitica</i>)	Revus 2.08SC	40	8 fl oz	1	32 fl oz
Downy mildew (<i>Peronospora parasitica</i>)	Serenade ^{OG} ASO	44	2-6 qt	0	See label
Downy mildew (<i>Peronospora parasitica</i>)	Serenade ^{OG} Max	44	1-3 lb	0	See label
Downy mildew (<i>Peronospora parasitica</i>)	Sonata ^{OG}	44	2-4 qt	0	See label
Downy mildew (<i>Peronospora parasitica</i>)	Zapro 525SC	40, 45	14 fl oz	0	42 fl oz
Peppery leaf spot (<i>Pseudomonas syringae</i> pv. <i>maculicola</i>)	Actinovate AG ^{OG}	See label	3-12 oz	See label	See label
Peppery leaf spot (<i>Pseudomonas syringae</i> pv. <i>maculicola</i>)	Cease	See label	3-6 qt/100 gal	0	See label
Peppery leaf spot (<i>Pseudomonas syringae</i> pv. <i>maculicola</i>)	Cabrio 20EG	11	12-16 oz	3	64 oz
Peppery leaf spot (<i>Pseudomonas syringae</i> pv. <i>maculicola</i>)	Endura 70WG	7	6-9 oz	14	18 oz
Peppery leaf spot (<i>Pseudomonas syringae</i> pv. <i>maculicola</i>)	Fontelis 1.67SC	7	14-30 fl oz	0	72 fl oz
Peppery leaf spot (<i>Pseudomonas syringae</i> pv. <i>maculicola</i>)	Inspire Super	3, 9	16-20 fl oz	7	80 fl oz
Peppery leaf spot (<i>Pseudomonas syringae</i> pv. <i>maculicola</i>)	MilStop ^{OG}	40	2-5 lb/100 gal	See label	See label
Peppery leaf spot (<i>Pseudomonas syringae</i> pv. <i>maculicola</i>)	Confine Extra	33	1-3 qt	See label	See label
Peppery leaf spot (<i>Pseudomonas syringae</i> pv. <i>maculicola</i>)	Rampart	33	1-3 qt/100 gal	See label	See label

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Peppery leaf spot (<i>Pseudomonas syringae</i> pv. <i>maculicola</i>)	Fosphite	33	1-3 qt/100 gal	See label	See label
Peppery leaf spot (<i>Pseudomonas syringae</i> pv. <i>maculicola</i>)	Luna Sensation	7, 11	5-7.6 fl oz	7	15.3 fl oz
Peppery leaf spot (<i>Pseudomonas syringae</i> pv. <i>maculicola</i>)	Priaxor Xenium	7, 11	6-8.2 fl oz	3	24.6 fl oz
Peppery leaf spot (<i>Pseudomonas syringae</i> pv. <i>maculicola</i>)	Procure 480SC	3	6-8 fl oz	1	18 fl oz
Peppery leaf spot (<i>Pseudomonas syringae</i> pv. <i>maculicola</i>)	Quadris Top	11, 3	12-14 fl oz	1	56 fl oz
Peppery leaf spot (<i>Pseudomonas syringae</i> pv. <i>maculicola</i>)	Quintec	13	4-6 fl oz	1	24 fl oz
Peppery leaf spot (<i>Pseudomonas syringae</i> pv. <i>maculicola</i>)	Serenade ^{OG} ASO	44	2-6 qt	See label	See label
Peppery leaf spot (<i>Pseudomonas syringae</i> pv. <i>maculicola</i>)	Serenade ^{OG} Max	44	1-3 lb	See label	See label
Peppery leaf spot (<i>Pseudomonas syringae</i> pv. <i>maculicola</i>)	Sonata ^{OG}	44	2-4 qt	See label	See label
Peppery leaf spot (<i>Pseudomonas syringae</i> pv. <i>maculicola</i>)	Microfine Sulfur	M	6-25 lb	See label	See label
Peppery leaf spot (<i>Pseudomonas syringae</i> pv. <i>maculicola</i>)	Microthiol Disperss	M	3-10 lb	See label	See label
Peppery leaf spot (<i>Pseudomonas syringae</i> pv. <i>maculicola</i>)	Yellow Jacket Wetttable	M	6-25 lb	See label	See label
Peppery leaf spot (<i>Pseudomonas syringae</i> pv. <i>maculicola</i>)	Switch 62.5WG	9, 12	10-12 oz	7	56 oz
Peppery leaf spot (<i>Pseudomonas syringae</i> pv. <i>maculicola</i>)	Monsoon	3	3-4 fl oz	7	16 fl oz
Peppery leaf spot (<i>Pseudomonas syringae</i> pv. <i>maculicola</i>)	Onset 3.6L	3	3-4 fl oz	7	16 fl oz
Peppery leaf spot (<i>Pseudomonas syringae</i> pv. <i>maculicola</i>)	Tebu-Crop 3.6F	3	3-4 fl oz	7	16 fl oz
Peppery leaf spot (<i>Pseudomonas syringae</i> pv. <i>maculicola</i>)	Toledo	3	3-4 fl oz	7	16 fl oz
Phytophthora root rot (<i>Phytophthora</i> spp.)	Actinovate AG ^{OG}	See label	3-12 oz	See label	See label
Phytophthora root rot (<i>Phytophthora</i> spp.)	Ultra Flourish	4	0.5-1 pt	See label	4 pt
Phytophthora root rot (<i>Phytophthora</i> spp.)	phosphorous acid	See label	See label	See label	See label
Phytophthora root rot (<i>Phytophthora</i> spp.)	Confine Extra	33	1-3 qt/100 gal	See label	See label
Phytophthora root rot (<i>Phytophthora</i> spp.)	Rampart	33	1-3 qt/100 gal	See label	See label
Phytophthora root rot (<i>Phytophthora</i> spp.)	potassium phosphite	See label	See label	See label	See label
Phytophthora root rot (<i>Phytophthora</i> spp.)	Fosphite	33	1-3 qt/100 gal	See label	See label
Phytophthora root rot (<i>Phytophthora</i> spp.)	Fungi-phite	33	1-5 qt	See label	See label
Phytophthora root rot (<i>Phytophthora</i> spp.)	RootShield Granules	44	2.5-6 lb/ ½acre ⁷	See label	1 app
Rhizoctonia basal stem and root rot, Wire stem (<i>Rhizoctonia solani</i>)	Quadris	11	0.4-0.8 fl oz ⁶	See label	1 app
Rhizoctonia basal stem and root rot, Wire stem (<i>Rhizoctonia solani</i>)	Satori	11	0.4-0.8 fl oz ⁶	See label	1 app
Rhizoctonia basal stem and root rot, Wire stem (<i>Rhizoctonia solani</i>)	Cabrio	11	12-16 oz	3	64 oz

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Sclerotinia stem rot (<i>Sclerotinia minor</i> , <i>S. sclerotiorum</i>)	Actinovate AG ^{OG}	See label	3-12 oz	See label	See label
Sclerotinia stem rot (<i>Sclerotinia minor</i> , <i>S. sclerotiorum</i>)	Cabrio	11	12-16 oz	3	64 oz
Sclerotinia stem rot (<i>Sclerotinia minor</i> , <i>S. sclerotiorum</i>)	Endura	7	6-9 oz	14	18 oz
Sclerotinia stem rot (<i>Sclerotinia minor</i> , <i>S. sclerotiorum</i>)	Fontelis	7	16-30 fl oz	0	72 fl oz
White rust (<i>Albugo candida</i>)	Quadris	11	6-15.5 fl oz	0	46 fl oz
White rust (<i>Albugo candida</i>)	Satori	11	6-15.5 fl oz	0	46 fl oz
White rust (<i>Albugo candida</i>)	Cabrio	11	12-16 oz	3	64 oz
White rust (<i>Albugo candida</i>)	Reason 500SC	11	8.2 fl oz	2	24.6 fl oz

¹ Reference to commercial or trade names is made with the understanding that no discrimination is intended nor endorsement of a particular product by LSU or the LSU AgCenter is implied.

² Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

³ Rates are the amount of formulation per acre unless otherwise indicated. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

⁴ Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

⁵ Do not use in a spray solution with a pH less than 6.5.

⁶ Do not apply alone. Must be applied as a tank mix with another fungicide with a different mode of action.

⁷ Soil applications. Refer to individual labels for application directions.

Herbs (Chervil, Cilantro, Coriander, Endive, Fennel, Parsley), Leafy Vegetables (Except Lettuce and Greens)

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Bacterial leaf spot (<i>Pseudomonas syringae</i> pathovars)	No products are currently labeled for bacterial leaf spot of herbs. Hot water treatment of seeds remove bacteria from the seed surface. See Seed Treatment section of this guide for instructions on how to treat seed.	NA	NA	NA	NA
Cercospora and Septoria leaf blights (<i>Cercospora</i> spp., <i>Septoria</i> spp.)	Quadris	11	6-15.5 fl oz	0	92.3 fl oz
Cercospora and Septoria leaf blights (<i>Cercospora</i> spp., <i>Septoria</i> spp.)	Quadris Opti	11, M	2.4-3.7 pt	7	footnote ⁶
Cercospora and Septoria leaf blights (<i>Cercospora</i> spp., <i>Septoria</i> spp.)	Satori	11	6-15.5 fl oz	0	92.3 fl oz
Cercospora and Septoria leaf blights (<i>Cercospora</i> spp., <i>Septoria</i> spp.)	Cabrio	11	12-16 oz	0	64 fl oz
Cercospora and Septoria leaf blights (<i>Cercospora</i> spp., <i>Septoria</i> spp.)	Bravo Ultrex	M	1.8-2.7 lb ⁵	7	21.8 lb
Cercospora and Septoria leaf blights (<i>Cercospora</i> spp., <i>Septoria</i> spp.)	Chlorothalonil 720SC	M	2-3 pt ⁵	7	24 pt
Cercospora and Septoria leaf blights (<i>Cercospora</i> spp., <i>Septoria</i> spp.)	Fontelis	7	14-24 fl oz	3	72 fl oz
Cercospora and Septoria leaf blights (<i>Cercospora</i> spp., <i>Septoria</i> spp.)	Bumper 41.8EC	3	3-4 fl oz ⁵	14	16 fl oz
Cercospora and Septoria leaf blights (<i>Cercospora</i> spp., <i>Septoria</i> spp.)	Bumper ES	3	3-4 fl oz ⁵	14	16 fl oz
Cercospora and Septoria leaf blights (<i>Cercospora</i> spp., <i>Septoria</i> spp.)	Propi-StarEC	3	3-4 fl oz ⁵	14	16 fl oz
Cercospora and Septoria leaf blights (<i>Cercospora</i> spp., <i>Septoria</i> spp.)	Tilt	3	3-4 fl oz ⁵	14	16 fl oz
Cercospora and Septoria leaf blights (<i>Cercospora</i> spp., <i>Septoria</i> spp.)	Switch 62.5WG	9, 12	11-14 oz	0	56 oz
Downy mildew (<i>Peronospora</i> spp.)	Actinovate AG ^{OG}	See Label	3-12 oz	See Label	See Label
Downy mildew (<i>Peronospora</i> spp.)	Aliette WDG	33	2-5 lb	3	7 app
Downy mildew (<i>Peronospora</i> spp.)	Quadris	11	12-15.5 fl oz	See Label	92.3 fl oz
Downy mildew (<i>Peronospora</i> spp.)	Satori	11	12-15.5 fl oz ⁷	See Label	92.3 fl oz
Downy mildew (<i>Peronospora</i> spp.)	Cabrio	11	16 oz	0	64 fl oz
Downy mildew (<i>Peronospora</i> spp.)	Micora	40	5.5-8 fl oz ⁸	See Label	2 app

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Downy mildew (<i>Peronospora</i> spp.)	Confine Extra	33	1-4 qt	See Label	See Label
Downy mildew (<i>Peronospora</i> spp.)	Rampart	33	1-3 qt/100 gal	See Label	See Label
Downy mildew (<i>Peronospora</i> spp.)	Fosphite	33	1-3 qt/100 gal	See Label	See Label
Downy mildew (<i>Peronospora</i> spp.)	Fungi-phite	33	1-2 qt	See Label	See Label
Downy mildew (<i>Peronospora</i> spp.)	Helena ProPhyt	33	2-4 pt	See Label	See Label
Downy mildew (<i>Peronospora</i> spp.)	Presidio	43	3-4 fl oz ⁸	2	12 fl oz
Downy mildew (<i>Peronospora</i> spp.)	Ranman 400SC	21	2.8 fl oz	0	16.5 fl oz
Downy mildew (<i>Peronospora</i> spp.)	Reason 500SC	11	5.5-8.2 fl oz	2	24.6 fl oz
Downy mildew (<i>Peronospora</i> spp.)	Revus	40	8 fl oz	1	32 fl oz
Downy mildew (<i>Peronospora</i> spp.)	Serenade ^{OG} ASO	44	2-6 qt	0	See Label
Downy mildew (<i>Peronospora</i> spp.)	Serenade ^{OG} Max	44	1-3 lb	0	See Label
Downy mildew (<i>Peronospora</i> spp.)	Sonata ^{OG}	44	2-4 qt	0	See Label
Downy mildew (<i>Peronospora</i> spp.)	Tanos	27, 11	8-10 oz	1	48 oz
Downy mildew (<i>Peronospora</i> spp.)	Zampro	45, 40	14 fl oz	0	42 fl oz
Damping-off (<i>Pythium</i> spp.)	Ridomil Gold SL	4	1-2 pt ⁹	7	1 lb a.i.
Damping-off (<i>Pythium</i> spp.)	Ultra Flourish	4	2-4 pt ⁹	7	4 pt
Damping-off (<i>Pythium</i> spp.)	Confine Extra	33	1-4 qt	See Label	See Label
Damping-off (<i>Pythium</i> spp.)	Rampart	33	1-3 qt/100 gal	See Label	See Label
Damping-off (<i>Pythium</i> spp.)	Fosphite	33	1-3 qt/100 gal	See Label	See Label
Damping-off (<i>Pythium</i> spp.)	Ranman	21	2.8 fl oz ⁹	See Label	16.5 fl oz
Damping-off (<i>Pythium</i> spp.)	Rootshield Granules	44	2.5-6 lb/ ½acre ⁹	0	1 app
Damping-off (<i>Pythium</i> spp.)	Uniform	4, 11	0.34 fl oz ¹⁰	See Label	1 app
Damping-off (<i>Rhizoctonia solani</i>)	Confine Extra	33	1-4 qt	See Label	See Label
Damping-off (<i>Rhizoctonia solani</i>)	Rampart	33	1-3 qt/100 gal	See Label	See Label
Damping-off (<i>Rhizoctonia solani</i>)	Fosphite	33	1-3 qt/100 gal	See Label	See Label
Damping-off (<i>Rhizoctonia solani</i>)	Rootshield Granules	44	2.5-6 lb/ ½acre ⁹	0	1 app
Damping-off (<i>Rhizoctonia solani</i>)	Serenade Soil	44	2-6 qt ⁹	See Label	See Label
White rust (<i>Albugo occidentalis</i>)	Quadris	11	6-15.5 fl oz	0	92.3 fl oz
White rust (<i>Albugo occidentalis</i>)	Satori	11	6-15.5 fl oz ⁷	0	92.3 fl oz

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
White rust (<i>Albugo occidentalis</i>)	Cabrio	11	8-12 fl oz	0	64 fl oz
White rust (<i>Albugo occidentalis</i>)	Presidio	43	3-4 fl oz ⁸	2	12 fl oz
White rust (<i>Albugo occidentalis</i>)	Ranman 400SC	21	2.8 fl oz	0	16.5 fl oz
White rust (<i>Albugo occidentalis</i>)	Reason 500SC	11	5.5-8.2 fl oz	2	24.6 fl oz
White rust (<i>Albugo occidentalis</i>)	Serenade ^{OG} ASO	44	2-6 qt	0	See Label
White rust (<i>Albugo occidentalis</i>)	Serenade ^{OG} Max	44	1-3 lb	0	See Label
White rust (<i>Albugo occidentalis</i>)	Tanos	27, 11	8-10 oz	1	48 oz

¹ Reference to commercial or trade names is made with the understanding that no discrimination is intended nor endorsement of a particular product by LSU or the LSU AgCenter is implied.

² Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

³ Rates are the amount of formulation per acre unless otherwise indicated. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

⁴ Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

⁵ Not labeled for all herbs or leafy greens. Rate varies depending on the crop type. Refer to label for labeled crops and specific rates.

⁶ Do not exceed 18 lb. a.i. per acre of chlorothalonil containing products. Do not exceed 1.5 lb. a.i. per acre of azoxystrobin containing products.

⁷ Satori must not be tank mixed with another fungicide (i.e., Ambush WP, Pounce WP, Franchise) that may increase the penetration of Satori. Refer to label for addition restrictions.

⁸ Do not apply alone. Must be applied as a tank mix with another fungicide with a different mode of action.

⁹ Soil applications. Refer to individual labels for application directions.

¹⁰ All rates are per 1,000 square feet of row. Refer to the label for modes of application.

Lettuce

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Bacterial spot (<i>Xanthomonas campestris</i> pv. <i>vitians</i>)	Actinovate AG ^{OG}	See label	3-12 oz	See label	See label
Bacterial spot (<i>Xanthomonas campestris</i> pv. <i>vitians</i>)	Serenade ^{OG} ASO	44	2-6 qt	0	See label
Bacterial spot (<i>Xanthomonas campestris</i> pv. <i>vitians</i>)	Serenade ^{OG} Max	44	1-3 lb	0	See label
Bacterial spot (<i>Xanthomonas campestris</i> pv. <i>vitians</i>)	Sonata ^{OG}	44	2-4 qt	0	See label
Bottom rot (<i>Rhizoctonia solani</i>)	Quadris	11	0.4-0.8 fl oz ^{5,6}	0	92.3 fl oz
Bottom rot (<i>Rhizoctonia solani</i>)	Satori	11	0.4-0.8 fl oz ^{5,6}	0	92.3 fl oz
Bottom rot (<i>Rhizoctonia solani</i>)	Endura	7	8-11 oz	14	22 oz
Bottom rot (<i>Rhizoctonia solani</i>)	Iprodione 4L AG	2	1.5-2 pt	14	3 app
Bottom rot (<i>Rhizoctonia solani</i>)	Meteor	2	1.5-2 pt	14	3 app
Bottom rot (<i>Rhizoctonia solani</i>)	Nevado 4F	2	1.5-2 pt	14	3 app
Bottom rot (<i>Rhizoctonia solani</i>)	Rovral 4F	2	1.5-2 pt	14	3 app
Botrytis rot (or gray mold) (<i>Botrytis cinerea</i>)	Botran 5F (At planting)	14	0.6 qt	14	3.2 qt ⁷
Botrytis rot (or gray mold) (<i>Botrytis cinerea</i>)	Botran 5F (Pre-thinning)	14	0.6-1.8 qt	14	3.2 qt ⁷
Botrytis rot (or gray mold) (<i>Botrytis cinerea</i>)	Botran 5F (Post-thinning)	14	1.8-3.2 qt	14	3.2 qt ⁷
Botrytis rot (or gray mold) (<i>Botrytis cinerea</i>)	Endura	7	8-11 oz	14	22 oz
Botrytis rot (or gray mold) (<i>Botrytis cinerea</i>)	Fontelis	7	16-24 fl oz	3	72 fl oz
Botrytis rot (or gray mold) (<i>Botrytis cinerea</i>)	Meteor	2	1.5-2 pt	14	3 app
Botrytis rot (or gray mold) (<i>Botrytis cinerea</i>)	Nevado 4F	2	1.5-2 pt	14	3 app
Botrytis rot (or gray mold) (<i>Botrytis cinerea</i>)	Rovral 4F	2	1.5-2 pt	14	3 app
Botrytis rot (or gray mold) (<i>Botrytis cinerea</i>)	Merivon	7, 11	8-11 fl oz	1	33 fl oz
Botrytis rot (or gray mold) (<i>Botrytis cinerea</i>)	Switch 62.5WG	9, 12	11-14 oz	0	56 oz
Downy mildew (<i>Bremia lactucae</i> , <i>Peronospora</i> spp.)	Quadris	11	12-15.5 fl oz	0	92.3 fl oz
Downy mildew (<i>Bremia lactucae</i> , <i>Peronospora</i> spp.)	Satori	11	12-15.5 fl oz ⁹	0	92.3 fl oz
Downy mildew (<i>Bremia lactucae</i> , <i>Peronospora</i> spp.)	Actigard 50WG	21	0.8-1 oz	7	4 oz ¹¹
Downy mildew (<i>Bremia lactucae</i> , <i>Peronospora</i> spp.)	Actinovate AG ^{OG}	See label	3-12 oz	See label	See label
Downy mildew (<i>Bremia lactucae</i> , <i>Peronospora</i> spp.)	Aliette WDG	33	2-5 lb	3	7 app
Downy mildew (<i>Bremia lactucae</i> , <i>Peronospora</i> spp.)	Alude	33	0.5 gal/40 gal	See label	See label
Downy mildew (<i>Bremia lactucae</i> , <i>Peronospora</i> spp.)	Cabrio	11	12-16 oz	0	64 oz

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Downy mildew (<i>Bremia lactucae</i> , <i>Peronospora</i> spp.)	Kocide 3000	M	0.8-1.5 lb	0	26.6 lb
Downy mildew (<i>Bremia lactucae</i> , <i>Peronospora</i> spp.)	Champ Formula 2F	M	0.7-1.3 pt	0	22 pt
Downy mildew (<i>Bremia lactucae</i> , <i>Peronospora</i> spp.)	Badge SC ⁸	See label	1.7 pt	5	28.1 pt
Downy mildew (<i>Bremia lactucae</i> , <i>Peronospora</i> spp.)	Badge X2 ^{OG, 8}	M	1.8-3.5 lb	5	8 lb
Downy mildew (<i>Bremia lactucae</i> , <i>Peronospora</i> spp.)	Nordox 75WG ^{OG}	M	1-2 lb	See label	See label
Downy mildew (<i>Bremia lactucae</i> , <i>Peronospora</i> spp.)	Manzate Pro-Stick	M	1.6-2.1 lb	See label	See label
Downy mildew (<i>Bremia lactucae</i> , <i>Peronospora</i> spp.)	ManKocide	M	1-2 lb	10	12.8 lb
Downy mildew (<i>Bremia lactucae</i> , <i>Peronospora</i> spp.)	Merivon Xenium	M	8-11 fl oz	1	33 fl oz
Downy mildew (<i>Bremia lactucae</i> , <i>Peronospora</i> spp.)	Micora	7, 11	5.5-8 fl oz ¹⁰	10	26 lb
Downy mildew (<i>Bremia lactucae</i> , <i>Peronospora</i> spp.)	Milstop ^{OG}	40	2-5 lb/100 gal	See label	2 app
Downy mildew (<i>Bremia lactucae</i> , <i>Peronospora</i> spp.)	Orondis Ultra	See label	5.5-8 fl oz	1	32 fl oz
Downy mildew (<i>Bremia lactucae</i> , <i>Peronospora</i> spp.)	Orondis Gold 200	40, U15	4.8-9.6 fl oz	0	19.2 fl oz
Downy mildew (<i>Bremia lactucae</i> , <i>Peronospora</i> spp.)	Confine Extra	See label	1-4 qt	See label	See label
Downy mildew (<i>Bremia lactucae</i> , <i>Peronospora</i> spp.)	Rampart	33	1-3 qt/100 gal	See label	See label
Downy mildew (<i>Bremia lactucae</i> , <i>Peronospora</i> spp.)	Fosphite	See label	1-3 qt/100 gal	See label	See label
Downy mildew (<i>Bremia lactucae</i> , <i>Peronospora</i> spp.)	Fungi-phite	33	1-2 qt	See label	6 app
Downy mildew (<i>Bremia lactucae</i> , <i>Peronospora</i> spp.)	Helena ProPhyt	33	2-4 pt	2	7 app
Downy mildew (<i>Bremia lactucae</i> , <i>Peronospora</i> spp.)	Presidio	43	3-4 fl oz ¹⁰	See label	12 fl oz
Downy mildew (<i>Bremia lactucae</i> , <i>Peronospora</i> spp.)	Prev-AM	See label	50 fl oz/100 gal	2	See label
Downy mildew (<i>Bremia lactucae</i> , <i>Peronospora</i> spp.)	Previcur Flex	28	2 pt	0	8 pt
Downy mildew (<i>Bremia lactucae</i> , <i>Peronospora</i> spp.)	Ranman	21	2.8 fl oz	2	16.5 fl oz
Downy mildew (<i>Bremia lactucae</i> , <i>Peronospora</i> spp.)	Reason 500SC	11	5.5-8.2 fl oz	1	24.6 fl oz
Downy mildew (<i>Bremia lactucae</i> , <i>Peronospora</i> spp.)	Revus	40	8 fl oz	1	32 fl oz
Downy mildew (<i>Bremia lactucae</i> , <i>Peronospora</i> spp.)	Serenade ^{OG} ASO	44	2-6 qt	0	See label
Downy mildew (<i>Bremia lactucae</i> , <i>Peronospora</i> spp.)	Serenade ^{OG} Max	44	1-3 lb	0	See label
Downy mildew (<i>Bremia lactucae</i> , <i>Peronospora</i> spp.)	Sonata ^{OG}	44	2-4 qt	0	See label
Downy mildew (<i>Bremia lactucae</i> , <i>Peronospora</i> spp.)	Tanos	27, 11	8-10 oz	1	48 oz
Downy mildew (<i>Bremia lactucae</i> , <i>Peronospora</i> spp.)	Zampro	40, 45	14 fl oz	0	42 fl oz
Lettuce drop (<i>Sclerotinia minor</i> , <i>S. sclerotiorum</i>)	Botran 5F (At planting)	14	0.6 qt	14	3.2 qt7

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Lettuce drop (<i>Sclerotinia minor</i> , <i>S. sclerotiorum</i>)	Botran 5F (Pre-thinning)	14	0.6-1.8 qt	14	3.2 qt ⁷
Lettuce drop (<i>Sclerotinia minor</i> , <i>S. sclerotiorum</i>)	Botran 5F (Post-thinning)	14	1.8-3.2 qt	14	3.2 qt ⁷
Lettuce drop (<i>Sclerotinia minor</i> , <i>S. sclerotiorum</i>)	Endura	7	8-11 oz	14	22 oz
Lettuce drop (<i>Sclerotinia minor</i> , <i>S. sclerotiorum</i>)	Fontelis	7	16-24 fl oz	3	72 fl oz
Lettuce drop (<i>Sclerotinia minor</i> , <i>S. sclerotiorum</i>)	Iprodione 4L AG	2	1.5-2 pt	14	3 app
Lettuce drop (<i>Sclerotinia minor</i> , <i>S. sclerotiorum</i>)	Meteor	2	1.5-2 pt	14	3 app
Lettuce drop (<i>Sclerotinia minor</i> , <i>S. sclerotiorum</i>)	Nevado 4F	2	1.5-2 pt	14	3 app
Lettuce drop (<i>Sclerotinia minor</i> , <i>S. sclerotiorum</i>)	Rovral 4F	2	1.5-2 pt	14	3 app
Lettuce drop (<i>Sclerotinia minor</i> , <i>S. sclerotiorum</i>)	Merivon Xenium (S. minor only)	7, 11	8-11 fl oz	1	33 fl oz
Lettuce drop (<i>Sclerotinia minor</i> , <i>S. sclerotiorum</i>)	Switch 62.5WG	9, 12	11-14 oz	0	56 oz
Powdery mildew (<i>Erysiphe cichoracearum</i>)	Actinovate AG ^{OG}	See label	3-12 oz	See label	See label
Powdery mildew (<i>Erysiphe cichoracearum</i>)	Quadris	11	12-15.5 fl oz	0	92.3 fl oz
Powdery mildew (<i>Erysiphe cichoracearum</i>)	Satori	11	12-15.5 fl oz ⁹	0	92.3 fl oz
Powdery mildew (<i>Erysiphe cichoracearum</i>)	Cabrio	11	12-16 oz	0	64 oz
Powdery mildew (<i>Erysiphe cichoracearum</i>)	Endura	7	8-11 oz	14	22 oz
Powdery mildew (<i>Erysiphe cichoracearum</i>)	Fontelis	7	16-24 fl oz	3	72 fl oz
Powdery mildew (<i>Erysiphe cichoracearum</i>)	Milstop ^{OG}	See label	2-5 lb/100 gal	See label	See label
Powdery mildew (<i>Erysiphe cichoracearum</i>)	Merivon Xenium	7, 11	4-11 fl oz	1	33 fl oz
Powdery mildew (<i>Erysiphe cichoracearum</i>)	Confine Extra	33	1-4 qt	See label	See label
Powdery mildew (<i>Erysiphe cichoracearum</i>)	Rampart	33	1-3 qt/100 gal	See label	See label
Powdery mildew (<i>Erysiphe cichoracearum</i>)	Fosphite	33	1-3 qt/100 gal	See label	See label
Powdery mildew (<i>Erysiphe cichoracearum</i>)	Prev-Am	See label	50 fl oz/100 gal	See label	See label
Powdery mildew (<i>Erysiphe cichoracearum</i>)	Procure 480SC	3	6-8 fl oz	0	18 fl oz
Powdery mildew (<i>Erysiphe cichoracearum</i>)	Quintec	13	4-6 fl oz	1	24 fl oz
Powdery mildew (<i>Erysiphe cichoracearum</i>)	Rally 40WSP	3	5 oz	3	4 app
Powdery mildew (<i>Erysiphe cichoracearum</i>)	Serenade ^{OG} ASO	44	2-6 qt	0	See label
Powdery mildew (<i>Erysiphe cichoracearum</i>)	Serenade ^{OG} Max	44	1-3 lb	0	See label
Powdery mildew (<i>Erysiphe cichoracearum</i>)	Sonata ^{OG}	44	2-4 qt	0	See label
Powdery mildew (<i>Erysiphe cichoracearum</i>)	Microthiol Disperss	M	5-10 lb	0	See label

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Powdery mildew (<i>Erysiphe cichoracearum</i>)	Switch 62.5WG	9, 12	11-14 oz	See label	56 oz
Powdery mildew (<i>Erysiphe cichoracearum</i>)	Trilogy ^{OG}	See label	1%	See label	See label
Damping-off (<i>Pythium</i> spp.)	Ridomil Gold SL	4	1-2 pt ⁵	7	1 lb a.i.
Damping-off (<i>Pythium</i> spp.)	Ultra Flourish	4	2-4 pt ⁵	7	4 pt
Damping-off (<i>Pythium</i> spp.)	Confine Extra	33	1-4 qt	See label	See label
Damping-off (<i>Pythium</i> spp.)	Rampart	33	1-3 qt/100 gal	See label	See label
Damping-off (<i>Pythium</i> spp.)	Fosphite	33	1-3 qt/100 gal	See label	See label
Damping-off (<i>Pythium</i> spp.)	Fungi-phite	33	1-2 qt	See label	6 app
Damping-off (<i>Pythium</i> spp.)	Previcur Flex	28	2 pt ⁵	2	8 pt
Damping-off (<i>Pythium</i> spp.)	Ranman	21	2.8 fl oz ⁵	0	16.5 fl oz
Damping-off (<i>Pythium</i> spp.)	Rootshield Granules	44	2.5-6 lb/ ½acre ⁵	See label	1 app
Damping-off (<i>Pythium</i> spp.)	Uniform	4, 11	0.34 fl oz ⁶	See label	1 app

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² Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

³ Rates are the amount of formulation per acre unless otherwise indicated. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

⁴ Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

⁵ Soil applications. Refer to individual labels for application directions.

⁶ All rates are per 1,000 square feet of row. Refer to the label for modes of application.

⁷ Rates are cumulative. Do not apply more than 3.2 qt. per acre per year.

⁸ Do not use in a spray solution with a pH less than 6.5.

⁹ Satori must not be tank mixed with another fungicide (i.e., Ambush WP, Pounce WP, Franchise) that may increase the penetration of Satori. Refer to label for addition restrictions.

¹⁰ Do not apply alone. Must be applied as a tank mix with another fungicide with a different mode of action.

¹¹ Do not use more than one application of Actigard 50WG on head lettuce intended for bag purposes.

Okra

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Cercospora leaf spot (<i>Cercospora abelmoschi</i> , <i>C. malayensis</i>)	Bravo Ultrex	M	1.4 lb	3	10.9 lb
Cercospora leaf spot (<i>Cercospora abelmoschi</i> , <i>C. malayensis</i>)	Bravo WeatherStix	M	1.5 pt	3	12 pt
Cercospora leaf spot (<i>Cercospora abelmoschi</i> , <i>C. malayensis</i>)	Chloronil	M	1.5 pt	3	12 pt
Cercospora leaf spot (<i>Cercospora abelmoschi</i> , <i>C. malayensis</i>)	Equus 720SST	M	1.5 pt	3	12 pt
Cercospora leaf spot (<i>Cercospora abelmoschi</i> , <i>C. malayensis</i>)	tebuconazole	3	4-6 fl oz	3	24 fl oz
Downy mildew	Micora	40	5.5-8 fl oz	0	2 app
Powdery mildew (<i>Erysiphe cichoracearum</i>)	Ariston	27, M	2-4.4 pt	3	17.5 pt
Powdery mildew (<i>Erysiphe cichoracearum</i>)	Bravo Ultrex	M	1.4 lb	3	10.9 lb
Powdery mildew (<i>Erysiphe cichoracearum</i>)	Bravo WeatherStix	M	1.5 pt	3	12 pt
Powdery mildew (<i>Erysiphe cichoracearum</i>)	Chloronil	M	1.5 pt	3	12 pt
Powdery mildew (<i>Erysiphe cichoracearum</i>)	Equus720SST	M	1.5 pt	3	12 pt
Powdery mildew (<i>Erysiphe cichoracearum</i>)	Kentan DF	M	0.5-1.5 lb	See label	5.25 lb
Powdery mildew (<i>Erysiphe cichoracearum</i>)	Kocide 3000	M	0.75-1.5 lb	0	17.5 lb
Powdery mildew (<i>Erysiphe cichoracearum</i>)	Kocide 2000	M	1.5-3 lb	0	15 lb
Powdery mildew (<i>Erysiphe cichoracearum</i>)	Mastercop	M	0.5-1.5 pt	See label	9 pt
Powdery mildew (<i>Erysiphe cichoracearum</i>)	Milstop ^{OG}	See label	2-5 lb/100 gal	0	See label
Powdery mildew (<i>Erysiphe cichoracearum</i>)	Confine Extra	33	1-4 qt	0	See label
Powdery mildew (<i>Erysiphe cichoracearum</i>)	Fosphite	33	1-3 qt	0	See label
Powdery mildew (<i>Erysiphe cichoracearum</i>)	KPhite	33	1-4 qt	0	See label
Powdery mildew (<i>Erysiphe cichoracearum</i>)	Rampart	33	1-3 qt/100 gal	0	See label
Powdery mildew (<i>Erysiphe cichoracearum</i>)	Inspire Super	3, 9	16-20 fl oz	0	47 fl oz
Powdery mildew (<i>Erysiphe cichoracearum</i>)	Quadris Flowable	11	6-15.5 fl oz	0	61.5 fl oz
Powdery mildew (<i>Erysiphe cichoracearum</i>)	Quadris Top	11, 3	8-14 fl oz	7	55.3 fl oz
Powdery mildew (<i>Erysiphe cichoracearum</i>)	Rally 40WSP	3	2.5-5 oz	0	1.25 lb a.i
Powdery mildew (<i>Erysiphe cichoracearum</i>)	Serenade ASO ^{OG}	44	2-6 qt	See label	See label

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Powdery mildew (<i>Erysiphe cichoracearum</i>)	Serenade MAX ^{OG}	44	1-3 lb	See label	See label
Powdery mildew (<i>Erysiphe cichoracearum</i>)	Microthiol Disperss ^{OG}	M	3-10 lb	See label	See label
Powdery mildew (<i>Erysiphe cichoracearum</i>)	Switch 62.5WG	9, 12	11-14 oz	0	56 oz
Powdery mildew (<i>Erysiphe cichoracearum</i>)	Trilogy ^{OG}	See label	0.5-1%/100 gal	See label	See label
Powdery mildew (<i>Erysiphe cichoracearum</i>)	Vivando	U8	15.4 fl oz	0	46.2 fl oz
Damping-off (<i>Rhizoctonia</i> spp.)	Quadris 2.08F	11	0.4-0.8 fl oz ⁵	See label	1 app

¹ Reference to commercial or trade names is made with the understanding that no discrimination is intended nor endorsement of a particular product by LSU or the LSU AgCenter is implied.

² Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

³ Rates are the amount of formulation per acre unless otherwise indicated. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

⁴ Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

⁵ All rates are per 1,000 square feet of row. Refer to the label for modes of application.

Onions (Dry, Green, Shallots and Spanish), Garlic and Leeks

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Bacterial leaf blight (<i>Xanthomonas axonopodis</i> pv. <i>allii</i> , <i>Pseudomonas syringae</i> pv. <i>porri</i>)	Actigard 50WG (dry only)	21	0.75-1 oz	7	4 oz
Bacterial leaf blight (<i>Xanthomonas axonopodis</i> pv. <i>allii</i> , <i>Pseudomonas syringae</i> pv. <i>porri</i>)	Kentan DF	M	1.5 lb	0	6 lb
Bacterial leaf blight (<i>Xanthomonas axonopodis</i> pv. <i>allii</i> , <i>Pseudomonas syringae</i> pv. <i>porri</i>)	Kocide 3000	M	0.75-1.5 lb	0	20 lb
Bacterial leaf blight (<i>Xanthomonas axonopodis</i> pv. <i>allii</i> , <i>Pseudomonas syringae</i> pv. <i>porri</i>)	Kocide 2000	M	1.5 lb	0	17.1 lb
Bacterial leaf blight (<i>Xanthomonas axonopodis</i> pv. <i>allii</i> , <i>Pseudomonas syringae</i> pv. <i>porri</i>)	Mastercop	M	0.5-1.5 pt	7	9 pt
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Aliette WDG (dry only)	33	2-3 lb	7	7 app
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Cabrio EG	11	8-12 oz	7	72 oz
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Cease Biofungicide ^{OG}	44	3-6 qt/100 gal	0	See label
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Bravo Ultrex (Dry and Garlic)	M	0.9-2.7 lb	7	18.2 lb
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Bravo (Dry and Garlic)	M	1-3 pt	7	20 pt
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Bravo ZN (Dry and Garlic)	M	1.5-4.25 pt	7	29 pt
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Chloronil 720 (Dry and Garlic)	M	1-3 pt	7	20 pt
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Chlorothalonil	M	1-3 pt	7	20 pt
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Echo 720 (Dry and Garlic)	M	1-2 pt	7	1.5 lb a.i.
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Equus 720SST (Dry and Garlic)	M	1-3 pt	7	20 pt
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Equus 500ZN (Dry and Garlic)	M	1.5-4.25 pt	7	29 pt
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Intiate (Dry and Garlic)	M	1-3 pt	7	20 pt
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Initiate ZN (Dry and Garlic)	M	1.5-4.25 pt	7	29 pt
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Bravo Ultrex (Green, leeks, shallots)	M	1.47-2.7 lb	14	8.2 lb
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Bravo (Green, leeks, shallots)	M	1.5-3 pt	14	9 pt
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Bravo ZN (Green, leeks, shallots)	M	2.25-4.25 pt	14	17 pt
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Chloronil 720 (Green, leeks, shallots)	M	1.5-3 pt	14	9 pt
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Chlorothalonil	See label	1.5-3 pt	14	9 pt
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Echo 720 (Green, leeks, shallots)	M	1.5-3 pt	14	6.7 lb a.i.
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Equus 720SST (Green, leeks, shallots)	M	1.5-3 pt	14	9 pt

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Equus 500ZN (Green, leeks, shallots)	M	2.25-4.25 pt	14	13 pt
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Intiate (Green, leeks, shallots)	M	1.5-3 pt	14	3 apps
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Initiate ZN (Green, leeks, shallots)	M	2.25-4.25 pt	14	13 pt
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Badge SC	M	1.5 pt	NA	21.1 pt
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Badge X2 ^{OG}	M	0.75 lb	NA	6 lb a.i.
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Champ DP DRY	M	1.33 lb	NA	16 lb
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Champ Formula 2	M	1.33 pt	NA	16.5 pt
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Champ WG ^{OG}	M	2 lb	NA	12 lb
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Kentan DF	M	2 lb	NA	6 lb a.i.
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Kocide 3000	M	0.75-1.5 lb	NA	20 lb
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Kocide 2000	M	1.5 lb	NA	17.1 lb
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Nordox WG ^{OG}	M	1.25-2.5 lb	NA	See label
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Cuprofix Ulta 40 (dry, green, garlic)	M	1.25-2.25 lb	NA	15 lb
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Cuproxat	M	2.5-4.9 pt	7	29.6 pt
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Fontelis	7	16-24 fl oz	3	72 fl oz
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Helena Prophyt	See label	4 pt	0	7 apps
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Inspire Super (green)	3,9	16-20 fl oz	14	60 fl oz
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Inspire Super (dry)	3,9	16-20 fl oz	7	80 fl oz
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Iprodione 4L AG (dry onions only)	2	1 pt	7	5 app
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Meteor (dry onions only)	2	1 pt	7	10 app
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Nevado 4F (dry onions only)	2	1 pt	7	10 app
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Rovral 4 Flowable (dry onions only)	2	1 pt	7	10 app
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Dithane F45 Rainshield	M	2.4 qt	7	24 qt
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Dithane M45	M	3 lb	7	30 lb
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Manzate Flowable (dry, garlic, shallot)	M	2.4 qt	7	24 qt
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Manzate Max (dry, garlic, shallot)	M	1.6-2.4 qt	7	24 qt
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Manzate Pro-Stick (dry, garlic, shallot)	M	3 lb	7	30 lb
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Penncozeb 75DF (dry, garlic, shallot)	M	2-3 lb	7	24 lb
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Penncozeb 80WP (dry, garlic, shallot)	M	2-3 lb	7	24 lb

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	ManKocide (dry only)	M	2.5 lb	7	20 lb
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Merivon	7, 11	8-11 fl oz	7	33 fl oz
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Omega 500F	29	1 pt	7	6 app
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Pristine	7, 11	10.5-18.5 oz	7	111 oz
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Amtide (Dry, garlic and shallots)	3	2-8 fl oz	14	16 fl oz
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Bumper 41.8EC (Dry, garlic and shallots)	3	2-8 fl oz	14	16 fl oz
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Bumper ES (Dry, garlic and shallots)	3	2-8 fl oz	14	16 fl oz
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Fitness (Dry, garlic and shallots)	3	2-8 fl oz	14	16 fl oz
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Tilt (Dry, garlic and shallots)	3	2-8 fl oz	14	16 fl oz
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Topaz (Dry, garlic and shallots)	3	2-8 fl oz	14	16 fl oz
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Amtide (Green and leeks)	3	2-8 fl oz	0	16 fl oz
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Bumper 41.8EC (Green and leeks)	3	2-8 fl oz	0	16 fl oz
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Bumper ES (Green and leeks)	3	2-8 fl oz	0	16 fl oz
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Fitness (Green and leeks)	3	2-8 fl oz	0	16 fl oz
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Tilt (Green and leeks)	3	2-8 fl oz	0	16 fl oz
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Topaz (Green and leeks)	3	2-8 fl oz	0	16 fl oz
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Quadris	11	9-15.5 fl oz	0	92.3 fl oz
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Quadris Opti (dry, garlic only)	11, M	1.6-3.2 pt	7	3 apps
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Quadris Opti (green, leek, shallots)	11, M	1.6-3.2 pt	14	3 apps
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Quadris Top (dry only)	11, 3	12-14 fl oz	7	56 fl oz
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Quadris Top (green only)	11, 3	12-14 fl oz	7	42 fl oz
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Quilt (dry only)	11, 3	14-27.5 fl oz	14	55.3 fl oz
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Quilt (green only)	11, 3	14-27.5 fl oz	0	55.3 fl oz
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Quilt Xcel (dry only)	11, 3	14-26 fl oz	14	56 fl oz
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Quilt Xcel (green only)	11, 3	14-26 fl oz	0	56 fl oz
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Reason 500SC	11	5.5 fl oz	7	22 fl oz
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Ridomil Gold Bravo (dry, garlic)	4, M	2.5 pt	7	15 lb a.i.
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Ridomil Gold Bravo (green, leeks, shallots)	4, M	2.5 pt	14	6.75 lb a.i.
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Satori	11	6-12 fl oz	0	92.3 fl oz

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Scala SC	9	9-18 fl oz	7	54 fl oz
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Serenade ASO ^{OG}	44	2-6 qt	7	See label
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Serenade MAX ^{OG}	44	1-3 lb	3	See label
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Switch 62.5WG	9, 12	11-14 oz	7	56 oz
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Tanos	11, 27	8 oz	7	84 oz
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Monsoon (Dry, garlic and shallot)	3	4-6 fl oz	7	12 fl oz
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Onset 3.6L (Dry, garlic and shallot)	3	4-6 fl oz	7	12 fl oz
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Tebustar 3.6L (Dry, garlic and shallot)	3	4-6 fl oz	7	12 fl oz
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Toledo 3.6F (Dry, garlic and shallot)	3	4-6 fl oz	7	12 fl oz
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Monsoon (Green and leeks)	3	4-6 fl oz	7	24 fl oz
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Onset 3.6L (Green and leeks)	3	4-6 fl oz	7	24 fl oz
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Tebustar 3.6L (Green and leeks)	3	4-6 fl oz	7	24 fl oz
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Toledo 3.6F (Green and leeks)	3	4-6 fl oz	7	24 fl oz
Botrytis leaf blight, Neck rot, Purple blotch and Stemphylium blight	Vangard WG (Green and leeks)	9	10 oz	7	28 oz
Downy mildew (<i>Peronospora destructor</i>)	Actigard 50WG (dry only)	21	0.75-1 oz	7	4 oz
Downy mildew (<i>Peronospora destructor</i>)	Actinovate AG	44	3-12 oz	0	See label
Downy mildew (<i>Peronospora destructor</i>)	Aliette WDG (dry only)	33	2-3 lb	7	7 app
Downy mildew (<i>Peronospora destructor</i>)	Alude	33	2 qt/100 gal	See label	See label
Downy mildew (<i>Peronospora destructor</i>)	Cabrio EG	11	12 oz	7	72 oz
Downy mildew (<i>Peronospora destructor</i>)	Cease Biofungicide ^{OG}	44	3-6 qt/100 gal	0	See label
Downy mildew (<i>Peronospora destructor</i>)	Bravo Ultrex (Dry and Garlic)	M	0.9-2.7 lb	7	18.2 lb
Downy mildew (<i>Peronospora destructor</i>)	Bravo (Dry and Garlic)	M	1-3 pt	7	20 pt
Downy mildew (<i>Peronospora destructor</i>)	Bravo ZN (Dry and Garlic)	M	1.5-4.25 pt	7	29 pt
Downy mildew (<i>Peronospora destructor</i>)	Chloronil 720 (Dry and Garlic)	M	1-3 pt	7	20 pt
Downy mildew (<i>Peronospora destructor</i>)	Chlorothalonil (Dry and Garlic)	M	1-3 pt	7	20 pt
Downy mildew (<i>Peronospora destructor</i>)	Echo 720 (Dry and Garlic)	M	1-2 pt	7	1.5 lb a.i.
Downy mildew (<i>Peronospora destructor</i>)	Equus 720SST (Dry and Garlic)	M	1-3 pt	7	20 pt
Downy mildew (<i>Peronospora destructor</i>)	Equus 500ZN (Dry and Garlic)	M	1.5-4.25 pt	7	29 pt
Downy mildew (<i>Peronospora destructor</i>)	Intiate (Dry and Garlic)	M	1-3 pt	7	20 pt

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Downy mildew (<i>Peronospora destructor</i>)	Initiate ZN (Dry and Garlic)	M	1.5-4.25 pt	7	29 pt
Downy mildew (<i>Peronospora destructor</i>)	Bravo Ultrex (Green, leeks, shallots)	M	1.47-2.7 lb	14	8.2 lb
Downy mildew (<i>Peronospora destructor</i>)	Bravo (Green, leeks, shallots)	M	1.5-3 pt	14	9 pt
Downy mildew (<i>Peronospora destructor</i>)	Bravo ZN (Green, leeks, shallots)	M	2.25-4.25 pt	14	17 pt
Downy mildew (<i>Peronospora destructor</i>)	Chloronil 720 (Green, leeks, shallots)	M	1.5-3 pt	14	9 pt
Downy mildew (<i>Peronospora destructor</i>)	Chlorothalonil (Green, leeks, shallots)	See label	1.5-3 pt	14	9 pt
Downy mildew (<i>Peronospora destructor</i>)	Echo 720 (Green, leeks, shallots)	M	1.5-3 pt	14	6.7 lb a.i.
Downy mildew (<i>Peronospora destructor</i>)	Equus 720SST (Green, leeks, shallots)	M	1.5-3 pt	14	9 pt
Downy mildew (<i>Peronospora destructor</i>)	Equus 500ZN (Green, leeks, shallots)	M	2.25-4.25 pt	14	13 pt
Downy mildew (<i>Peronospora destructor</i>)	Intiate (Green, leeks, shallots)	M	1.5-3 pt	14	3 apps
Downy mildew (<i>Peronospora destructor</i>)	Initiate ZN (Green, leeks, shallots)	M	2.25-4.25 pt	14	13 pt
Downy mildew (<i>Peronospora destructor</i>)	Badge SC	M	1.5 pt	NA	21.1 pt
Downy mildew (<i>Peronospora destructor</i>)	Badge X2 ^{OG}	M	0.75 lb	NA	6 lb a.i.
Downy mildew (<i>Peronospora destructor</i>)	Champ DP DRY	M	1.33 lb	NA	16 lb
Downy mildew (<i>Peronospora destructor</i>)	Champ Formula 2	M	1.33 pt	NA	16.5 pt
Downy mildew (<i>Peronospora destructor</i>)	Champ WG ^{OG}	M	2 lb	NA	12 lb
Downy mildew (<i>Peronospora destructor</i>)	Kentan DF	M	2 lb	NA	6 lb a.i
Downy mildew (<i>Peronospora destructor</i>)	Kocide 3000	M	0.75-1.5 lb	NA	20 lb
Downy mildew (<i>Peronospora destructor</i>)	Kocide 2000	M	1.5 lb	NA	17.1 lb
Downy mildew (<i>Peronospora destructor</i>)	Cuprofix Ultra 40 (dry, green, garlic)	M	1.25-2.25 lb	NA	15 lb
Downy mildew (<i>Peronospora destructor</i>)	Cuproxat	M	2.5-4.9 pt	7	29.6 pt
Downy mildew (<i>Peronospora destructor</i>)	Forum	40	6 fl oz	0	30 fl oz
Downy mildew (<i>Peronospora destructor</i>)	Dithane F45 Rainshield	M	2.4 qt	7	24 qt
Downy mildew (<i>Peronospora destructor</i>)	Dithane M45	M	3 lb	7	30 lb
Downy mildew (<i>Peronospora destructor</i>)	Manzate Flowable (dry, garlic, shallot)	M	2.4 qt	7	24 qt
Downy mildew (<i>Peronospora destructor</i>)	Manzate Max (dry, garlic, shallot)	M	1.6-2.4 qt	7	24 qt
Downy mildew (<i>Peronospora destructor</i>)	Manzate Pro-Stick (dry, garlic, shallot)	M	3 lb	7	30 lb
Downy mildew (<i>Peronospora destructor</i>)	Penncozeb 75DF (dry, garlic, shallot)	M	2-3 lb	7	24 lb
Downy mildew (<i>Peronospora destructor</i>)	Penncozeb 80WP (dry, garlic, shallot)	M	2-3 lb	7	24 lb

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Downy mildew (<i>Peronospora destructor</i>)	ManKocide (dry only)	M	2.5 lb	7	20 lb
Downy mildew (<i>Peronospora destructor</i>)	Omega 500F	29	1 pt	7	6 app
Downy mildew (<i>Peronospora destructor</i>)	Orondis Opti	M5, U15	1.75-2.5 pt	14	10 pt
Downy mildew (<i>Peronospora destructor</i>)	Orondis Ultra A	U15	2-4.8 fl oz	0	19.2 fl oz
Downy mildew (<i>Peronospora destructor</i>)	Orondis Ultra B	40	8 fl oz	7	24 fl oz
Downy mildew (<i>Peronospora destructor</i>)	Orondis Ultra (Premix)	40, U15	5.5-8 fl oz	7	32 fl oz
Downy mildew (<i>Peronospora destructor</i>)	Confine Extra	33	1-4 qt	0	See label
Downy mildew (<i>Peronospora destructor</i>)	Phostrol (dry only)	33	2.5-3.75 pt	0	7 app
Downy mildew (<i>Peronospora destructor</i>)	Rampart	33	1-3 qt/100 gal	0	See label
Downy mildew (<i>Peronospora destructor</i>)	Fosphite	33	1-3 qt/100 gal	0	6 app
Downy mildew (<i>Peronospora destructor</i>)	Fungi-phite	33	1-5 qt	0	7 app
Downy mildew (<i>Peronospora destructor</i>)	Helena ProPhyt	33	4 pt	0	See label
Downy mildew (<i>Peronospora destructor</i>)	Presidio	43	3-4 fl oz	2	12 fl oz
Downy mildew (<i>Peronospora destructor</i>)	Pristine	7, 11	18.5 oz	7	111 oz
Downy mildew (<i>Peronospora destructor</i>)	Quadris	11	9-15.5 fl oz	0	92.3 fl oz
Downy mildew (<i>Peronospora destructor</i>)	Quadris Opti (dry, garlic only)	11, M	1.6-3.2 pt	7	3 apps
Downy mildew (<i>Peronospora destructor</i>)	Quadris Opti (green, leek, shallots)	11, M	1.6-3.2 pt	14	3 apps
Downy mildew (<i>Peronospora destructor</i>)	Quilt Xcel (dry only)	11, 3	14-26 fl oz	14	56 fl oz
Downy mildew (<i>Peronospora destructor</i>)	Quilt Xcel (green only)	11, 3	14-26 fl oz	0	56 fl oz
Downy mildew (<i>Peronospora destructor</i>)	Reason 500SC	11	5.5 fl oz	7	22 fl oz
Downy mildew (<i>Peronospora destructor</i>)	Revus	40	8 fl oz	7	32 fl oz
Downy mildew (<i>Peronospora destructor</i>)	Ridomil Gold Bravo (dry, garlic)	4, M	2.5 pt	7	15 lb a.i.
Downy mildew (<i>Peronospora destructor</i>)	Ridomil Gold Bravo (green, leeks, shallots)	4, M	2.5 pt	14	6.75 lb a.i.
Downy mildew (<i>Peronospora destructor</i>)	Ridomil Gold MZ WG	4, M	2.5 lb	7	4 app
Downy mildew (<i>Peronospora destructor</i>)	Ridomil Gold Copper	4, M	2 lb	10	0.4 lb a.i.
Downy mildew (<i>Peronospora destructor</i>)	Ridomil Gold Copper	4, M	2 lb	7	0.3 lb a.i.
Downy mildew (<i>Peronospora destructor</i>)	Satori	11	6-12 fl oz	0	92.3 fl oz
Downy mildew (<i>Peronospora destructor</i>)	Serenade ASO ^{OG}	44	2-6 qt	7	See label
Downy mildew (<i>Peronospora destructor</i>)	Serenade MAX ^{OG}	44	1-3 lb	3	See label

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Downy mildew (<i>Peronospora destructor</i>)	Trilogy ^{OG}	See label	1%/100 gal	See label	See label
Downy mildew (<i>Peronospora destructor</i>)	Zampro	45, 40	14 fl oz	0	42 fl oz
Damping-off (<i>Pythium</i> spp.)	Ridomil Gold SL	4	0.5-1 pt ⁵	See label	1 lb a.i.
Damping-off (<i>Pythium</i> spp.)	Ultra Flourish	4	1-2 pt ⁵	0	4 pt
Damping-off (<i>Pythium</i> spp.)	Metastar 2E	4	2-4 pt ⁵	See label	1 app
Damping-off (<i>Pythium</i> spp.)	Uniform	11, 4	0.34 fl oz ⁶	See label	1 app
Southern blight (<i>Agroathelia rolfsii</i>)	Blocker 4F	14	4.5-7.5 pt/100gal	0	7.5 lb a.i.
Southern blight (<i>Agroathelia rolfsii</i>)	Aftershock	11	2-5.7 fl oz	0	22.8 fl oz
Southern blight (<i>Agroathelia rolfsii</i>)	Evito 480SC	11	2-5.7 fl oz	0	22.8 fl oz
Southern blight (<i>Agroathelia rolfsii</i>)	Priaxor	11, 7	4-8 fl oz	0	24 fl oz
Southern blight (<i>Agroathelia rolfsii</i>)	Cabrio	11	12-16 oz	0	96 fl oz
White rot (<i>Sclerotinia cepivorum</i>)	Cannonball WP (dry, garlic, shallots only)	12	7 oz	7	32 oz
White rot (<i>Sclerotinia cepivorum</i>)	Botran 5F (dry, garlic, shallots only)	14	2-3.2 qt	See label	1 app
White rot (<i>Sclerotinia cepivorum</i>)	Botran 75W (dry, garlic, shallots only)	14	3-5.3 lb	See label	1 app
White rot (<i>Sclerotinia cepivorum</i>)	Fontelis (dry, garlic, shallots only)	7	16-24 fl oz	3	72 fl oz
White rot (<i>Sclerotinia cepivorum</i>)	Monsoon (dry, garlic, shallots only)	3	20.5 fl oz	See label	1 app
White rot (<i>Sclerotinia cepivorum</i>)	Onset 3.6L (dry, garlic, shallots only)	3	20.5 fl oz	See label	1 app
White rot (<i>Sclerotinia cepivorum</i>)	Orious 3.6F (dry, garlic, shallots only)	3	20.5 fl oz	See label	1 app
White rot (<i>Sclerotinia cepivorum</i>)	Tebu-crop 3.6F (dry, garlic, shallots only)	3	20.5 fl oz	See label	1 app
White rot (<i>Sclerotinia cepivorum</i>)	Tebustar 3.6L (dry, garlic, shallots only)	3	20.5 fl oz	See label	1 app
White rot (<i>Sclerotinia cepivorum</i>)	Tebustar 3.6L (dry, garlic, shallots only)	3	20.5 fl oz	See label	1 app
White rot (<i>Sclerotinia cepivorum</i>)	Quadris OPTI (dry, garlic, shallots only)	11, M	1.6-3.2 pt	7	3 apps
White rot (<i>Sclerotinia cepivorum</i>)	Quilt Xcel (dry, garlic, shallots only)	3, 11	17.5-26 fl oz	14	56 fl oz

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
White rot (<i>Sclerotinia cepivorum</i>)	Switch 62.5WG (dry, garlic, shallots only)	9, 12	7-14 oz	See label	1 app
White rot (<i>Sclerotinia cepivorum</i>)	85 WDG (dry, garlic, shallots only)	1	0.4-0.6 oz ⁶	See label	1 app
White rot (<i>Sclerotinia cepivorum</i>)	Incognito 4.5F (dry, garlic, shallots only)	1	40 fl oz	See label	1 app
White rot (<i>Sclerotinia cepivorum</i>)	Topsin 4.5FL (dry, garlic, shallots only)	1	40 fl oz	See label	1 app
White rot (<i>Sclerotinia cepivorum</i>)	Topsin M 70WDG (dry, garlic, shallots only)	1	2 lb	See label	1 app
White rot (<i>Sclerotinia cepivorum</i>)	Topsin M 70WP (dry, garlic, shallots only)	1	2 lb	See label	1 app
White rot (<i>Sclerotinia cepivorum</i>)	Topsin M WSB (dry, garlic, shallots only)	1	2 lb	See label	1 app

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² Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

³ Rates are the amount of formulation per acre unless otherwise indicated. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

⁴ Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

⁵ Rates refer to band or broadcast applications. Refer to individual labels for per plant in transplant water rates.

⁶ All rates are per 1,000 square feet of row. Refer to the label for modes of application.

Peas (Garden, Green and Sweet)

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Gray mold (<i>Botrytis cinerea</i>)	Endura 70WG	7	8-11 oz	7	2 app
Gray mold (<i>Botrytis cinerea</i>)	Fontelis 1.67F	7	14-30 fl oz	0	72 fl oz
Gray mold (<i>Botrytis cinerea</i>)	Priaxor 500SC	11, 7	4-8 fl oz	7	16 fl oz
Powdery mildew (<i>Erysiphe pisi</i>)	Actinovate AG ^{OG}	See label	3-12 oz	See label	See label
Powdery mildew (<i>Erysiphe pisi</i>)	Kocide 3000	M	0.5-1.3 lb	0	13.2 lb
Powdery mildew (<i>Erysiphe pisi</i>)	Kocide 2000	M	1-2.3 lb	7	11.3 lb
Powdery mildew (<i>Erysiphe pisi</i>)	Champ WG ^{OG}	M	1.6 lb	0	7.9 lb
Powdery mildew (<i>Erysiphe pisi</i>)	Badge SC ⁵	M	1-2.5 pt	0	13.9 pt
Powdery mildew (<i>Erysiphe pisi</i>)	Badge X2 ^{OG, 5}	M	0.5-1.3 lb	0	4 lb
Powdery mildew (<i>Erysiphe pisi</i>)	Cuprofix Ultra-40	M	1-2 lb	0	9.9 lb
Powdery mildew (<i>Erysiphe pisi</i>)	Cuproxat	M	2-3.9 pt	0	19.5 pt
Powdery mildew (<i>Erysiphe pisi</i>)	Endura 70WG	7	8-11 oz	7	22 oz
Powdery mildew (<i>Erysiphe pisi</i>)	Fontelis 1.67F	7	14-30 fl oz	0	72 fl oz
Powdery mildew (<i>Erysiphe pisi</i>)	MasterCop	M	0.5-1 pt	0	7 pt
Powdery mildew (<i>Erysiphe pisi</i>)	Milstop ^{OG}	See label	2-5 lb/100 gal	See label	See label
Powdery mildew (<i>Erysiphe pisi</i>)	Confine Extra	33	1-3 qt	See label	See label
Powdery mildew (<i>Erysiphe pisi</i>)	Rampart	33	1-3 qt/100 gal	See label	See label
Powdery mildew (<i>Erysiphe pisi</i>)	Fosphite	33	1-3 qt/100 gal	See label	See label
Powdery mildew (<i>Erysiphe pisi</i>)	Fungi-phite	33	1-2 qt	See label	6 app
Powdery mildew (<i>Erysiphe pisi</i>)	Helena ProPhyt	33	2-4 pt	See label	7 app
Powdery mildew (<i>Erysiphe pisi</i>)	Priaxor 500SC	11, 7	4-8 fl oz	7	16 fl oz
Powdery mildew (<i>Erysiphe pisi</i>)	Sonata ^{OG}	44	2-4 qt	0	See label
Powdery mildew (<i>Erysiphe pisi</i>)	Microfine Sulfur	M	3.8-36 lb	0	See label
Powdery mildew (<i>Erysiphe pisi</i>)	Microthiol Disperss	M	3-10 lb	0	See label
Powdery mildew (<i>Erysiphe pisi</i>)	Yellow Jacket Wettable	M	3.8-36 lb	0	See label
Powdery mildew (<i>Erysiphe pisi</i>)	Top Cop with Sulfur	M	2 qt	0	See label
Powdery mildew (<i>Erysiphe pisi</i>)	Trilogy ^{OG}	See label	1%	See label	See label
Damping-off (<i>Pythium</i> spp.)	Actinovate AG ^{OG}	See label	3-12 oz	See label	See label

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Damping-off (<i>Pythium</i> spp.)	Ridomil Gold SL	4	0.5-1 pt ⁶	0	1 app
Damping-off (<i>Pythium</i> spp.)	Ultra Flourish	4	1-2 pt ⁶	3	2 pt
Damping-off (<i>Pythium</i> spp.)	Confine Extra	33	1-4 qt	See label	See label
Damping-off (<i>Pythium</i> spp.)	Rampart	33	1-3 qt/100 gal	See label	See label
Damping-off (<i>Pythium</i> spp.)	Fosphite	33	1-3 qt/100 gal	See label	See label
Damping-off (<i>Pythium</i> spp.)	Fungi-phite	33	1-2 qt	See label	6 app
Damping-off (<i>Pythium</i> spp.)	Helena Prophyt	33	2-4 pt	See label	7 app
Rust (<i>Uromyces</i> sp.)	Fontelis 1.67F	7	14-30 fl oz	0	72 fl oz
Rust (<i>Uromyces</i> sp.)	Priaxor 500SC	11, 7	4-8 fl oz	7	16 fl oz
Rust (<i>Uromyces</i> sp.)	Quadris 2.08F	11	6.2 fl oz	0	92 fl oz
White mold (<i>Sclerotinia sclerotiorum</i>)	Contans WG ^{OG}	See label	See label	0	1 app
White mold (<i>Sclerotinia sclerotiorum</i>)	Endura 70WG	7	8-11 oz	7	2 app
White mold (<i>Sclerotinia sclerotiorum</i>)	Fontelis	7	14-30 fl oz	0	72 fl oz
White mold (<i>Sclerotinia sclerotiorum</i>)	Priaxor 500SC	11, 7	4-8 fl oz	7	16 fl oz

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² Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

³ Rates are the amount of formulation per acre unless otherwise indicated. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

⁴ Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

⁵ Do not use in a spray solution with a pH less than 6.5.

⁶ Rates refer to band or broadcast applications. Refer to individual labels for per plant in transplant water rates.

Peas (Southern, Dry)

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Alternaria leaf and pod spot (<i>Alternaria alternata</i>)	Quilt 1.66SC	3, 11	14 fl oz	7	3 app
Alternaria leaf and pod spot (<i>Alternaria alternata</i>)	Priaxor 4.17SC	7, 11	4-8 fl oz	7	2 app
Alternaria leaf and pod spot (<i>Alternaria alternata</i>)	Fontelis	7	14-30 oz	0	72 fl oz
Alternaria leaf and pod spot (<i>Alternaria alternata</i>)	Quadris 2.08F	11	6.2-15.4 fl oz	0	92 fl oz
Alternaria leaf and pod spot (<i>Alternaria alternata</i>)	Headline 2.09	11	6-9 fl oz	7	2 app
Alternaria leaf and pod spot (<i>Alternaria alternata</i>)	Actinovate AG ^{OG}	See label	3-12 oz	0	See label
Anthrachnose (<i>Colletotrichum lindemuthianum</i>)	Bravo Ultrex	M	1.25-1.8 lb	7	7.3 lb
Anthrachnose (<i>Colletotrichum lindemuthianum</i>)	Bravo WeatherStix	M	1.375-2 pt	7	8 pt
Anthrachnose (<i>Colletotrichum lindemuthianum</i>)	Topsin M 70WP	1	1.5-2 lb	14	4 lb
Anthrachnose (<i>Colletotrichum lindemuthianum</i>)	Incognito 4.5F	1	30-40 fl oz	14	80 fl oz
Anthrachnose (<i>Colletotrichum lindemuthianum</i>)	Thiophanate-methyl 85WDG	1	0.8-1.6 lb	28	3.2 lb
Anthrachnose (<i>Colletotrichum lindemuthianum</i>)	Quilt 1.66SC	11, 3	14 fl oz	0	42 fl oz
Anthrachnose (<i>Colletotrichum lindemuthianum</i>)	Quilt Xcel	11, 3	10.5-14 fl oz	0	42 fl oz
Anthrachnose (<i>Colletotrichum lindemuthianum</i>)	Priaxor 4.17SC	7, 11	4-8 fl oz	7	2 apps
Anthrachnose (<i>Colletotrichum lindemuthianum</i>)	Fontelis	7	14-30 fl oz	7	72 fl oz
Anthrachnose (<i>Colletotrichum lindemuthianum</i>)	Quadris 2.08F	11	6-15.5 fl oz	0	4 app
Anthrachnose (<i>Colletotrichum lindemuthianum</i>)	Quadris Opti	11, M	1.6-2.4 pt	0	4 app
Anthrachnose (<i>Colletotrichum lindemuthianum</i>)	Headline	11	6-9 fl oz	21	2 app
Anthrachnose (<i>Colletotrichum lindemuthianum</i>)	Tilt	3	4 fl oz	7	12 fl oz
Anthrachnose (<i>Colletotrichum lindemuthianum</i>)	Cueva ^{OG}	M	0.2-2 gal	See label	See label
Anthrachnose (<i>Colletotrichum lindemuthianum</i>)	Nordox 75WG ^{OG}	M	0.66-2.5 lb	See label	See label
Bacterial blight (<i>Pseudomonas syringae</i> pv. <i>pisi</i> , <i>P. s.</i> pv. <i>syringae</i>)	Kocide 3000	M	0.5-1.25 lb	0	15.8 lb
Bacterial blight (<i>Pseudomonas syringae</i> pv. <i>pisi</i> , <i>P. s.</i> pv. <i>syringae</i>)	Kocide 2000	M	0.75-2.25 lb	0	13.5 lb
Bacterial blight (<i>Pseudomonas syringae</i> pv. <i>pisi</i> , <i>P. s.</i> pv. <i>syringae</i>)	Champ WG ^{OG}	M	1.58 lb	7	9.48 lb
Bacterial blight (<i>Pseudomonas syringae</i> pv. <i>pisi</i> , <i>P. s.</i> pv. <i>syringae</i>)	Badge SC	M	1-2 pt	7	16.6 pt
Bacterial blight (<i>Pseudomonas syringae</i> pv. <i>pisi</i> , <i>P. s.</i> pv. <i>syringae</i>)	Badge X2 ^{OG}	M	0.5-1.25 lb	7	2.65 lb
Bacterial blight (<i>Pseudomonas syringae</i> pv. <i>pisi</i> , <i>P. s.</i> pv. <i>syringae</i>)	Cuprofix-Ultra 40	M	0.75-2 lb	See label	11.19 lb
Bacterial blight (<i>Pseudomonas syringae</i> pv. <i>pisi</i> , <i>P. s.</i> pv. <i>syringae</i>)	Cuproxat	M	1.5-3.9 pt	See label	23.4 pt

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Bacterial blight (<i>Pseudomonas syringae</i> pv. <i>pisi</i> , <i>P. s.</i> pv. <i>syringae</i>)	Cueva ^{OG}	M	0.5-2 gal/100 gal	See label	See label
Bacterial blight (<i>Pseudomonas syringae</i> pv. <i>pisi</i> , <i>P. s.</i> pv. <i>syringae</i>)	Nordox 75WG ^{OG}	M	0.6-2.5 lb	See label	See label
Botrytis gray mold (<i>Botrytis cinerea</i>) and White mold (<i>Sclerotinia sclerotiorum</i>)	Proline 480SC (white mold)	3	4.3-5.7 fl oz	7	3 app
Botrytis gray mold (<i>Botrytis cinerea</i>) and White mold (<i>Sclerotinia sclerotiorum</i>)	Aproach	11	8-12 fl oz	7	24 fl oz
Botrytis gray mold (<i>Botrytis cinerea</i>) and White mold (<i>Sclerotinia sclerotiorum</i>)	Rovral 4F	2	1.5-2 pt	14	2 app
Botrytis gray mold (<i>Botrytis cinerea</i>) and White mold (<i>Sclerotinia sclerotiorum</i>)	Topsin M 70WP	1	1.5-2 lb	14	4 lb
Botrytis gray mold (<i>Botrytis cinerea</i>) and White mold (<i>Sclerotinia sclerotiorum</i>)	Incognito 4.5F	1	30-40 fl oz	14	80 fl oz
Botrytis gray mold (<i>Botrytis cinerea</i>) and White mold (<i>Sclerotinia sclerotiorum</i>)	85 WDG	1	0.8-1.6 lb	28	3.2 lb
Botrytis gray mold (<i>Botrytis cinerea</i>) and White mold (<i>Sclerotinia sclerotiorum</i>)	Fontelis	7	14-30 oz	7	72 fl oz
Botrytis gray mold (<i>Botrytis cinerea</i>) and White mold (<i>Sclerotinia sclerotiorum</i>)	Endura	7	8-11 oz	7	2 app
Botrytis gray mold (<i>Botrytis cinerea</i>) and White mold (<i>Sclerotinia sclerotiorum</i>)	Cannonball 50WP	12	7 oz	7	28 oz
Botrytis gray mold (<i>Botrytis cinerea</i>) and White mold (<i>Sclerotinia sclerotiorum</i>)	Switch 62.5WG	12, 9	11-14 oz	2	56 oz
Botrytis gray mold (<i>Botrytis cinerea</i>) and White mold (<i>Sclerotinia sclerotiorum</i>)	Cueva ^{OG}	M	0.5-2 gal/100 gal	See label	See label
Damping-off (<i>Pythium</i> spp.)	Ridomil Gold PC GR	4, 14	0.75 lb ⁶	See label	1 app
Damping-off (<i>Pythium</i> spp.)	Ridomil Gold SL	4	0.5-1.0 pt ⁵	See label	1 app
Damping-off (<i>Pythium</i> spp.)	MetaStar 2E	4	2-4 pt ⁵	See label	1 app
Damping-off (<i>Pythium</i> spp.)	Ultra Flourish	4	1-2 pt ⁵	See label	1 app
Damping-off (<i>Pythium</i> spp.)	Uniform	4, 11	0.34 fl. oz ⁶	See label	1 app
Damping-off (<i>Rhizoctonia</i> spp.)	Quadris 2.08F	11	0.4-0.8 fl oz ⁶	See label	1 app
Damping-off (<i>Rhizoctonia</i> spp.)	Headline	11	0.1-0.8 fl oz ⁶	See label	1 app
Damping-off (<i>Rhizoctonia</i> spp.)	Blocker 4F	14	2.2-3.3 pt ⁶	See label	1 app
Damping-off (<i>Rhizoctonia</i> spp.)	Uniform	4, 14	0.34 fl oz ⁶	See label	1 app
Leaf spots and blights (<i>Alternaria</i> spp., <i>Ascochyta</i> spp., <i>Cercospora</i> spp.)	Aproach	11	6-12 fl oz	7	24 fl oz

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Leaf spots and blights (<i>Alternaria</i> spp., <i>Ascochyta</i> spp., <i>Cercospora</i> spp.)	Bravo Ultrex	M	1.25-1.8 lb	7	7.3 lb
Leaf spots and blights (<i>Alternaria</i> spp., <i>Ascochyta</i> spp., <i>Cercospora</i> spp.)	Bravo WeatherStix	M	1.375-2 pt	7	8 pt
Leaf spots and blights (<i>Alternaria</i> spp., <i>Ascochyta</i> spp., <i>Cercospora</i> spp.)	Fontelis	7	14-30 fl oz	0	72 fl oz
Leaf spots and blights (<i>Alternaria</i> spp., <i>Ascochyta</i> spp., <i>Cercospora</i> spp.)	Quadris 2.08F	11	6.2-15.4 fl oz	0	4 app
Leaf spots and blights (<i>Alternaria</i> spp., <i>Ascochyta</i> spp., <i>Cercospora</i> spp.)	Quadris Opti	11, M	1.6-2.4 pt	See label	4 app
Leaf spots and blights (<i>Alternaria</i> spp., <i>Ascochyta</i> spp., <i>Cercospora</i> spp.)	Headline	11	6-9 fl oz	21	2 app
Powdery mildew (<i>Erysiphe pisi</i>)	Endura	7	8-11 oz	7	2 app
Powdery mildew (<i>Erysiphe pisi</i>)	Priaxor 4.17SC	7, 11	4-8 fl oz	7	2 app
Powdery mildew (<i>Erysiphe pisi</i>)	Fontelis	7	14-30 oz	0	72 fl oz
Powdery mildew (<i>Erysiphe pisi</i>)	Headline (dry beans)	11	6-9 fl oz	21	2 app
Powdery mildew (<i>Erysiphe pisi</i>)	Nu-Cop 50DF	M	1.5 lb	1	7.5 lb
Powdery mildew (<i>Erysiphe pisi</i>)	Fosphite	33	1-3 qt/100 gal	See label	See label
Powdery mildew (<i>Erysiphe pisi</i>)	sulfur 80% ^{OG}	M2	20 lb	0	See label
Powdery mildew (<i>Erysiphe pisi</i>)	sulfur 90% ^{OG}	M2	15 lb	0	See label
Powdery mildew (<i>Erysiphe pisi</i>)	sulfur 98% ^{OG}	M2	45 lb	0	See label
Powdery mildew (<i>Erysiphe pisi</i>)	Armcarb 100 ^{OG}	See label	2.5-5 lb	0	See label
Rhizocontia web blight, Pod tip rot, (<i>Rhizoctonia</i> spp.)	Tilt	3	4 fl oz	7	12 fl oz
Rhizocontia web blight, Pod tip rot, (<i>Rhizoctonia</i> spp.)	Quadris 2.08F	11	6-15.5 fl oz	0	4 app
Rhizocontia web blight, Pod tip rot, (<i>Rhizoctonia</i> spp.)	Quadris Opti	11, M	1.6-2.4 fl oz	See label	4 app
Rhizocontia web blight, Pod tip rot, (<i>Rhizoctonia</i> spp.)	Quilt	11, 3	14 fl oz	7	42 fl oz
Rhizocontia web blight, Pod tip rot, (<i>Rhizoctonia</i> spp.)	Quilt Xcel	11, 3	10.5-14 fl oz	7	42 fl oz
Rust (<i>Phakopsora pachyrhizi</i> , <i>Uromyces</i> spp.)	Approach	11	6-12 fl oz	7	24 fl oz
Rust (<i>Phakopsora pachyrhizi</i> , <i>Uromyces</i> spp.)	Proline 480SC	3	5.7 fl oz	7	17 fl oz
Rust (<i>Phakopsora pachyrhizi</i> , <i>Uromyces</i> spp.)	Rally 40WSP	3	4-5 oz	0	20 oz
Rust (<i>Phakopsora pachyrhizi</i> , <i>Uromyces</i> spp.)	Folicur 3.6F	3	4-6 fl oz	7	12 fl oz
Rust (<i>Phakopsora pachyrhizi</i> , <i>Uromyces</i> spp.)	Quilt 1.66SC	3, 11	14 fl oz	7	3 app

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Rust (<i>Phakopsora pachyrhizi</i> , <i>Uromyces</i> spp.)	Priaxor 4.17SC	7, 11	4-8 fl oz	7	2 app
Rust (<i>Phakopsora pachyrhizi</i> , <i>Uromyces</i> spp.)	Fontelis	7	14-30 oz	0	72 fl oz
Rust (<i>Phakopsora pachyrhizi</i> , <i>Uromyces</i> spp.)	Quadris 2.08F	11	6.2-15.4 fl oz	0	4 app
Rust (<i>Phakopsora pachyrhizi</i> , <i>Uromyces</i> spp.)	Quadris Opti	11, M	1.6-2.4 pt	14	4 app
Rust (<i>Phakopsora pachyrhizi</i> , <i>Uromyces</i> spp.)	Headline	11	6-9 fl oz	21	2 app
Rust (<i>Phakopsora pachyrhizi</i> , <i>Uromyces</i> spp.)	Bravo Ultrex	M	1.25-1.8 lb	7	4 app
Rust (<i>Phakopsora pachyrhizi</i> , <i>Uromyces</i> spp.)	Bravo WeatherStix	M	1.375-2 pt	7	8pt

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² Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

³ Rates are the amount of formulation per acre unless otherwise indicated. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

⁴ Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

⁵ Rates refer to band or broadcast applications. Refer to individual labels for per plant in transplant water rates.

⁶ All rates are per 1,000 square feet of row. Refer to the label for modes of application.

Peppers

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Anthraxnose fruit rot (<i>Colletotrichum</i> spp.)	Actinovate AG ^{OG}	See label	3-12 oz	See label	See label
Anthraxnose fruit rot (<i>Colletotrichum</i> spp.)	Aprvoia Top	3, 11	10.5-13.5 fl oz	0	53.6 fl oz
Anthraxnose fruit rot (<i>Colletotrichum</i> spp.)	Ariston	27, M	2-2.44 pt	3	18.1 pt
Anthraxnose fruit rot (<i>Colletotrichum</i> spp.)	Quadris	11	6-15.5 fl oz	0	61.5 fl oz
Anthraxnose fruit rot (<i>Colletotrichum</i> spp.)	Quadris Top	11, 3	8-14 fl oz	0	55.3 fl oz
Anthraxnose fruit rot (<i>Colletotrichum</i> spp.)	Satori	11	6-15.5 fl oz	0	61.5 fl oz
Anthraxnose fruit rot (<i>Colletotrichum</i> spp.)	Cabrio EG	11	8-12 oz	0	96 fl oz
Anthraxnose fruit rot (<i>Colletotrichum</i> spp.)	Bravo Ultrex	M	1.4 lb	3	10.9 lb
Anthraxnose fruit rot (<i>Colletotrichum</i> spp.)	Chloronil 720	M	1.5 pt	3	12 pt
Anthraxnose fruit rot (<i>Colletotrichum</i> spp.)	Echo 720	M	1.5 pt	3	9 lb a.i.
Anthraxnose fruit rot (<i>Colletotrichum</i> spp.)	Equus 720SST	M	1.5 pt	3	12 pt
Anthraxnose fruit rot (<i>Colletotrichum</i> spp.)	Kocide 3000	M	0.8-1.3 lb	0	39.5 lb
Anthraxnose fruit rot (<i>Colletotrichum</i> spp.)	Kocide 2000	M	1.5-2.3 lb	0	33.9 lb
Anthraxnose fruit rot (<i>Colletotrichum</i> spp.)	Badge SC	M	1-2.3 pt	3	41.7 pt
Anthraxnose fruit rot (<i>Colletotrichum</i> spp.)	Badge X2 ^{OG}	M	0.8-1.3 lb	3	11.9 lb Cu
Anthraxnose fruit rot (<i>Colletotrichum</i> spp.)	Cuprofix-Ultra 40	M	0.8-2 lb	3	29.5 lb
Anthraxnose fruit rot (<i>Colletotrichum</i> spp.)	Nordox 75WG ^{OG}	M	2-4 lb	0	See label
Anthraxnose fruit rot (<i>Colletotrichum</i> spp.)	Dexter Xcel	M3, 11, 3	48 fl oz	14	378 fl oz
Anthraxnose fruit rot (<i>Colletotrichum</i> spp.)	Flint	11	3-4 oz	3	16 fl oz
Anthraxnose fruit rot (<i>Colletotrichum</i> spp.)	Fontelis	7	24 fl oz	0	72 fl oz
Anthraxnose fruit rot (<i>Colletotrichum</i> spp.)	Inspire Super	9, 3	16-20 fl oz	0	47 fl oz
Anthraxnose fruit rot (<i>Colletotrichum</i> spp.)	ManKocide	M	2-3 lb	See label	39 lb
Anthraxnose fruit rot (<i>Colletotrichum</i> spp.)	MasterCop	M	0.5-3 pt	7	30 pt
Anthraxnose fruit rot (<i>Colletotrichum</i> spp.)	Priaxor	7, 11	4-8 fl oz	0	24 fl oz
Anthraxnose fruit rot (<i>Colletotrichum</i> spp.)	Reason 500SC	11	5.5-8.2 fl oz	14	24.6 fl oz
Anthraxnose fruit rot (<i>Colletotrichum</i> spp.)	Serenade Optimum	44	4-20 oz	See label	See label
Anthraxnose fruit rot (<i>Colletotrichum</i> spp.)	Tanos	11, 27	8-10 oz	3	72 oz
Anthraxnose fruit rot (<i>Colletotrichum</i> spp.)	Top Cop with Sulfur	11, M	2 qt	See label	See label

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Anthracnose fruit rot (<i>Colletotrichum</i> spp.)	Topguard EQ	11, 3	4-8 fl oz	0	4 app
Anthracnose fruit rot (<i>Colletotrichum</i> spp.)	Trilogy	See label	1%	See label	See label
Bacterial soft rot (<i>Pectobacterium carotovora</i> subsp. <i>carotovora</i>)	Tanos	11, 27	8-10 oz	3	72 oz
Bacterial seedling blight (<i>Pseudomonas syringae</i> pv. <i>syringae</i>)	Actigard 50WG (Chile only)	21	0.3-0.8 oz	14	6 oz
Bacterial seedling blight (<i>Pseudomonas syringae</i> pv. <i>syringae</i>)	Actinovate AG ^{OG}	See label	3-12 oz	See label	See label
Bacterial seedling blight (<i>Pseudomonas syringae</i> pv. <i>syringae</i>)	Agri-Mycin 17 ^{OG,5}	See label	200 ppm	See label	See label
Bacterial seedling blight (<i>Pseudomonas syringae</i> pv. <i>syringae</i>)	Cease	See label	3-6 qt/100 gal	See label	See label
Bacterial seedling blight (<i>Pseudomonas syringae</i> pv. <i>syringae</i>)	Kocide 3000	M	0.8-1.3 lb	0	39.5 lb
Bacterial seedling blight (<i>Pseudomonas syringae</i> pv. <i>syringae</i>)	Kocide 2000	M	1.5-2.3 lb	0	33.9 lb
Bacterial seedling blight (<i>Pseudomonas syringae</i> pv. <i>syringae</i>)	Champ WG ^{OG}	M	1.6 lb	0	23.7 lb
Bacterial seedling blight (<i>Pseudomonas syringae</i> pv. <i>syringae</i>)	Badge SC	M	1-2.3 pt	3	41.7 pt
Bacterial seedling blight (<i>Pseudomonas syringae</i> pv. <i>syringae</i>)	Badge X2 ^{OG}	M	0.8-1.3 lb	3	11.9 lb Cu
Bacterial seedling blight (<i>Pseudomonas syringae</i> pv. <i>syringae</i>)	Cuprofix-Ultra 40	M	0.8-2 lb	3	29.5 lb
Bacterial seedling blight (<i>Pseudomonas syringae</i> pv. <i>syringae</i>)	Cuproxat	M	2.4-3.8 pt	3	58.4 pt
Bacterial seedling blight (<i>Pseudomonas syringae</i> pv. <i>syringae</i>)	Nordox 75WG ^{OG}	M	2-4 lb	0	See label
Bacterial seedling blight (<i>Pseudomonas syringae</i> pv. <i>syringae</i>)	ManKocide	M	2-3 lb	7	39 lb
Bacterial seedling blight (<i>Pseudomonas syringae</i> pv. <i>syringae</i>)	MasterCop	M	0.5-3 pt	See label	30 pt
Bacterial seedling blight (<i>Pseudomonas syringae</i> pv. <i>syringae</i>)	Serenade ^{OG} ASO	44	2-6 qt	See label	See label
Bacterial seedling blight (<i>Pseudomonas syringae</i> pv. <i>syringae</i>)	Serenade ^{OG} Optimum	44	14-20 oz	See label	See label

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Bacterial seedling blight (<i>Pseudomonas syringae</i> pv. <i>syringae</i>)	Serenade ^{OG} MAX	44	1-3 lb	See label	See label
Bacterial seedling blight (<i>Pseudomonas syringae</i> pv. <i>syringae</i>)	Tanos	27, 11	8-10 oz	3	72 oz
Bacterial seedling blight (<i>Pseudomonas syringae</i> pv. <i>syringae</i>)	Top Cop with Sulfur	M	2 qt	See label	See label
Bacterial leaf spot (<i>Xanthomonas</i> spp.)	Actigard 50WG (Chile only)	P1	0.3-0.8 oz	14	6 oz
Bacterial leaf spot (<i>Xanthomonas</i> spp.)	Actinovate AG ^{OG}	See label	3-12 oz	See label	See label
Bacterial leaf spot (<i>Xanthomonas</i> spp.)	Agri-Mycin 17 ^{OG,5}	See label	200 ppm	See label	See label
Bacterial leaf spot (<i>Xanthomonas</i> spp.)	Cease	See label	3-6 qt/100 gal	See label	See label
Bacterial leaf spot (<i>Xanthomonas</i> spp.)	Kocide 3000	M	0.8-1.3 lb	0	39.5 lb
Bacterial leaf spot (<i>Xanthomonas</i> spp.)	Kocide 2000	M	1.5-2.3 lb	0	33.9 lb
Bacterial leaf spot (<i>Xanthomonas</i> spp.)	Champ WG ^{OG}	M	1.6 lb	0	23.7 lb
Bacterial leaf spot (<i>Xanthomonas</i> spp.)	Badge SC	M	1-2.3 pt	3	41.7 pt
Bacterial leaf spot (<i>Xanthomonas</i> spp.)	Badge X2 ^{OG}	M	0.8-1.3 lb	3	11.9 lb Cu
Bacterial leaf spot (<i>Xanthomonas</i> spp.)	Cuprofix-Ultra 40	M	0.8-2 lb	3	29.5 lb
Bacterial leaf spot (<i>Xanthomonas</i> spp.)	Cuproxat	M	2.4-3.8 pt	3	58.4 pt
Bacterial leaf spot (<i>Xanthomonas</i> spp.)	Nordox 75WG ^{OG}	M	2-4 lb	0	
Bacterial leaf spot (<i>Xanthomonas</i> spp.)	ManKocide	M	2-3 lb	7	39 lb
Bacterial leaf spot (<i>Xanthomonas</i> spp.)	MasterCop	M	0.5-3 pt	See label	30 pt
Bacterial leaf spot (<i>Xanthomonas</i> spp.)	Serenade ^{OG} ASO	44	2-6 qt	See label	See label
Bacterial leaf spot (<i>Xanthomonas</i> spp.)	Serenade ^{OG} Optimum	44	14-20 oz	See label	See label
Bacterial leaf spot (<i>Xanthomonas</i> spp.)	Serenade ^{OG} MAX	44	1-3 lb	See label	See label
Bacterial leaf spot (<i>Xanthomonas</i> spp.)	Tanos	27, 11	8-10 oz	3	72 oz
Bacterial leaf spot (<i>Xanthomonas</i> spp.)	Top Cop with Sulfur	M	2 qt	See label	See label

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Blossom-end rot	Blossom-end rot results from a calcium (Ca) deficiency in young, rapidly expanding pepper fruit tissues. The disorder can be intensified by excess nitrogen. Have soil and water tested for Ca levels prior to planting. Foliar applications of Ca fertilizers are not likely to prevent or reduce. Blossom-end rot incidence, as Ca ions are not actively mobilized from the leaf downward to the fruits.	NA	NA	NA	NA
Cercospora leaf spot (or Frogeye leaf spot) (<i>Cercospora capsici</i>)	Bravo Ultrex	M	1.4 lb	3	10.9 lb
Cercospora leaf spot (or Frogeye leaf spot) (<i>Cercospora capsici</i>)	Chloronil 720	M	1.5 pt	3	12 pt
Cercospora leaf spot (or Frogeye leaf spot) (<i>Cercospora capsici</i>)	Echo 720	M	1.5 pt	3	9 lb a.i.
Cercospora leaf spot (or Frogeye leaf spot) (<i>Cercospora capsici</i>)	Equus 720SST	M	1.5 pt	3	12 pt
Cercospora leaf spot (or Frogeye leaf spot) (<i>Cercospora capsici</i>)	Kocide 3000	M	0.8-1.3 lb	0	39.5 lb
Cercospora leaf spot (or Frogeye leaf spot) (<i>Cercospora capsici</i>)	Kocide 2000	M	1.5-2.3 lb	0	33.9 lb
Cercospora leaf spot (or Frogeye leaf spot) (<i>Cercospora capsici</i>)	Badge SC	M	1-2.3 pt	3	41.7 pt
Cercospora leaf spot (or Frogeye leaf spot) (<i>Cercospora capsici</i>)	Badge X2 ^{OG}	M	0.8-1.3 lb	3	11.9 lb Cu
Cercospora leaf spot (or Frogeye leaf spot) (<i>Cercospora capsici</i>)	Cuprofix-Ultra 40	M	0.8-2 lb	3	29.5 lb
Cercospora leaf spot (or Frogeye leaf spot) (<i>Cercospora capsici</i>)	Nordox 75WG ^{OG}	M	2-4 lb	0	See label
Cercospora leaf spot (or Frogeye leaf spot) (<i>Cercospora capsici</i>)	Manzate Pro-Stick	M	1.6-3.2 lb	7	12.8-9.2 lb ⁶
Cercospora leaf spot (or Frogeye leaf spot) (<i>Cercospora capsici</i>)	ManKocide	M	2-3 lb	7	39 lb
Cercospora leaf spot (or Frogeye leaf spot) (<i>Cercospora capsici</i>)	MasterCop	M	0.5-3 pt	See label	30 pt
Cercospora leaf spot (or Frogeye leaf spot) (<i>Cercospora capsici</i>)	Quadris Top 29.6SC	11, 3	8-14 fl oz	0	55.3 fl oz
Cercospora leaf spot (or Frogeye leaf spot) (<i>Cercospora capsici</i>)	Top Cop with Sulfur	M	2 qt	See label	See label

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Cercospora leaf spot (or Frogeye leaf spot) (<i>Cercospora capsici</i>)	Topguard EQ	11, 3	4-8 fl oz	0	4 app
Phytophthora crown and root rot (<i>Phytophthora capsici</i>)	Elumin	22	8 fl oz	2	16 fl oz
Phytophthora crown and root rot (<i>Phytophthora capsici</i>)	Ridomil Gold SL	4	1 pt ⁷	7	1.5 lb a.i.
Phytophthora crown and root rot (<i>Phytophthora capsici</i>)	Ultra Flourish	4	2 pt ⁷	7	6 pt
Phytophthora crown and root rot (<i>Phytophthora capsici</i>)	Metastar 2E	4	4-8 pt ⁷	7	12 pt
Phytophthora crown and root rot (<i>Phytophthora capsici</i>)	Orondis Gold B	4	1 pt	7	2 app
Phytophthora crown and root rot (<i>Phytophthora capsici</i>)	Orondis Gold 200	U15	4.8-9.6 fl oz	0	19.2 fl oz
Phytophthora crown and root rot (<i>Phytophthora capsici</i>)	Zampro	45, 40	14 fl oz	4	42 fl oz
Phytophthora foliar blight and fruit rot (<i>Phytophthora capsici</i>)	Badge SC	M	1-2.3 pt	0	41.7 pt
Phytophthora foliar blight and fruit rot (<i>Phytophthora capsici</i>)	Badge X2 ^{OG}	M	0.8-1.3 lb	0	11.9 lb Cu
Phytophthora foliar blight and fruit rot (<i>Phytophthora capsici</i>)	Forum	40	6 fl oz ⁸	0.5	30 fl oz
Phytophthora foliar blight and fruit rot (<i>Phytophthora capsici</i>)	Elumin	22	8 fl oz	2	16 fl oz
Phytophthora foliar blight and fruit rot (<i>Phytophthora capsici</i>)	Manzate Pro-Stick	M	1.6-3.2 lb	0	12.8-19.2lb ⁶
Phytophthora foliar blight and fruit rot (<i>Phytophthora capsici</i>)	ManKocide	M	2-3 lb	0	39 lb
Phytophthora foliar blight and fruit rot (<i>Phytophthora capsici</i>)	Micora	40	8 fl oz ⁸	See label	2 app
Phytophthora foliar blight and fruit rot (<i>Phytophthora capsici</i>)	Presidio	43	3-4 fl oz	2	12 fl oz
Phytophthora foliar blight and fruit rot (<i>Phytophthora capsici</i>)	Orondis Gold 200	U15	4.8-9.6 fl oz	0	19.2 fl oz
Phytophthora foliar blight and fruit rot (<i>Phytophthora capsici</i>)	Orondis Ulta (Premix)	U15, 40	5.5-8 fl oz	1	32 fl oz
Phytophthora foliar blight and fruit rot (<i>Phytophthora capsici</i>)	Ranman	21	2.1-2.8 fl oz	0	16.5 fl oz
Phytophthora foliar blight and fruit rot (<i>Phytophthora capsici</i>)	Reason 500SC	11	8.2 fl oz	14	24.6 fl oz
Phytophthora foliar blight and fruit rot (<i>Phytophthora capsici</i>)	Revus	40	8 fl oz	1	32 fl oz

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Phytophthora foliar blight and fruit rot (<i>Phytophthora capsici</i>)	Tanos	27, 11	8-10 oz	3	72 oz
Phytophthora foliar blight and fruit rot (<i>Phytophthora capsici</i>)	Zampro	45, 40	14 fl oz	4	42 fl oz
Damping-off (<i>Pythium</i> spp.)	Ridomil Gold SL	4	1 pt ⁷	7	4 app
Damping-off (<i>Pythium</i> spp.)	Ridomil Gold/Copper	4, M	1 pt ⁷	7	4 app
Damping-off (<i>Pythium</i> spp.)	Ultra Flourish	4	2 pt ⁷	7	6 pt
Damping-off (<i>Pythium</i> spp.)	Metastar 2E	4	4-8 pt ⁷	7	12 pt
Damping-off (<i>Pythium</i> spp.)	Confine Extra	33	1-3 qt	See label	See label
Damping-off (<i>Pythium</i> spp.)	Rampart	33	1-3 qt/100 gal	See label	See label
Damping-off (<i>Pythium</i> spp.)	Fosphite	33	1-3 qt/100 gal	See label	See label
Damping-off (<i>Pythium</i> spp.)	Fungi-phite	33	1-2 qt	See label	See label
Damping-off (<i>Pythium</i> spp.)	Orondis Gold B	4	1	7	2 app
Damping-off (<i>Pythium</i> spp.)	Previcur Flex	28	1.2 pt ⁹	5	6 app
Damping-off (<i>Pythium</i> spp.)	Rootshield Granules	44	2.5-6 lb/0.5acre ⁷	See label	6 pt
Damping-off (<i>Pythium</i> spp.)	Serenade Soil	44	2-6 qt ⁷	See label	1 app
Southern blight (<i>Agroathelia rolfsii</i>)	Blocker 4F	14	4.5-7.5 pt/100gal	0	7.5 lb a.i.
Southern blight (<i>Agroathelia rolfsii</i>)	Aftershock	11	2-5.7 fl oz	0	22.8 fl oz
Southern blight (<i>Agroathelia rolfsii</i>)	Evito 480SC	11	2-5.7 fl oz	0	22.8 fl oz
Southern blight (<i>Agroathelia rolfsii</i>)	Priaxor	11, 7	4-8 fl oz	0	24 fl oz
Southern blight (<i>Agroathelia rolfsii</i>)	Cabrio	11	12-16 oz	0	96 fl oz
Target spot (<i>Corynespora cassiicola</i>)	Cabrio 20EG	11	8-12 oz	0	96 oz
Target spot (<i>Corynespora cassiicola</i>)	Endura	7	3.5 oz	0	21 oz
Target spot (<i>Corynespora cassiicola</i>)	Fontelis	7	16-24 fl oz	0	72 fl oz
Target spot (<i>Corynespora cassiicola</i>)	Aftershock	11	2-5.7 fl oz	3	22.8 fl oz
Target spot (<i>Corynespora cassiicola</i>)	Evito 480SC	11	2-5.7 fl oz	3	22.8 fl oz
Target spot (<i>Corynespora cassiicola</i>)	Inspire Super	9, 3	16-20 fl oz	0	47 fl oz
Target spot (<i>Corynespora cassiicola</i>)	Priaxor	7, 11	4-8 fl oz	0	24 fl oz

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Viruses	A list of viruses of pepper can be found in Table 1. Plant resistant varieties. For viruses transmitted by insects, control of the insect vector using insecticides, polyethylene or polyethylene coated mulches and/ or trap crops are recommended. Seed treatments and good sanitation practices are recommended for noninsect transmitted viruses.	NA	NA	NA	NA

¹ Reference to commercial or trade names is made with the understanding that no discrimination is intended nor endorsement of a particular product by LSU or the LSU AgCenter is implied.

² Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

³ Rates are the amount of formulation per acre unless otherwise indicated. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

⁴ Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

⁵ **Transplant production only.**

⁶ West of the Mississippi river do not apply more than 12.8 lb. product per acre per year. East of the Mississippi river do not apply more than 19.2 lb. product per acre per year.

⁷ Soil applications. Refer to individual labels for application directions.

⁸ Do not apply alone. Must be applied as a tank mix with another fungicide with a different mode of action.

⁹ Rates refer to band or broadcast applications. Refer to individual labels for per plant in transplant water rates.

Potato (Irish)

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Bacterial stem rot (<i>Pectobacterium carotovora</i>)	Tanos	27, 11	8 oz	14	6 app
Early blight (<i>Alternaria solani</i>)	Aftershock	11	2-3.8 fl oz	7	22.8 fl oz
Early blight (<i>Alternaria solani</i>)	Quadris	11	6-15.5 fl oz	14	123 fl oz
Early blight (<i>Alternaria solani</i>)	Quadris Opti	11, M	1.6 pt	14	6 app
Early blight (<i>Alternaria solani</i>)	Quadris Top	11, M	8-14 fl oz	14	55.3 fl oz
Early blight (<i>Alternaria solani</i>)	Satori	11	6-15.5 fl oz	14	123 fl oz
Early blight (<i>Alternaria solani</i>)	Cabrio Plus	11, M	2-2.9 lb	14	17.4 lb
Early blight (<i>Alternaria solani</i>)	Bravo Ultrex	M	0.7-1.4 lb ⁵	7	13.6 lb
Early blight (<i>Alternaria solani</i>)	Bravo WeatherStik	M	0.8-1.5 pt ⁵	30	18 pt
Early blight (<i>Alternaria solani</i>)	Bravo Zn	M	1.1-2.3 pt ⁵	7	21.5 pt
Early blight (<i>Alternaria solani</i>)	Chlorothalonil 720SC	M	0.8-1.5 pt ⁵	7	15 pt
Early blight (<i>Alternaria solani</i>)	Kocide 3000	M	0.5-1.8 lb	0	83.3 lb
Early blight (<i>Alternaria solani</i>)	Kocide 2000	M	0.8-3 lb	0	71.4 lb
Early blight (<i>Alternaria solani</i>)	Champ WG ⁰⁶	M	1-4 lb	5	50 lb
Early blight (<i>Alternaria solani</i>)	Badge SC ⁶	M	1-3 pt	5	88.2 pt
Early blight (<i>Alternaria solani</i>)	Badge X2 ^{06,6}	M	0.5-1.8 lb	5	25 lb Cu
Early blight (<i>Alternaria solani</i>)	Cuprofix-Ultra 40	M	0.8-3 lb	5	62.5 lb
Early blight (<i>Alternaria solani</i>)	MasterCop	M	0.5-1.5 pt	5	6 pt
Early blight (<i>Alternaria solani</i>)	Dexter Max	M3, 11	1.6-2.1 lb	14	16 lb
Early blight (<i>Alternaria solani</i>)	Dexter SC	11	6-20 fl oz	14	120 fl oz
Early blight (<i>Alternaria solani</i>)	Endura	7	2.5-4.5 oz	10	2 app
Early blight (<i>Alternaria solani</i>)	Evito 480SC	11	2-3.8 fl oz	7	22.8 fl oz
Early blight (<i>Alternaria solani</i>)	Gavel 75DF	M, 22	1.5-2 lb	14	12 lb
Early blight (<i>Alternaria solani</i>)	Gem 500SC	11	2.9-3.8 fl oz	7	23 fl oz
Early blight (<i>Alternaria solani</i>)	Headline and Headline SC	11	6-9 fl oz	3	72 fl oz
Early blight (<i>Alternaria solani</i>)	Iprodione 4L AG	2	1-2 pt	14	4 app
Early blight (<i>Alternaria solani</i>)	Meteor	2	1-2 pt	14	4 app
Early blight (<i>Alternaria solani</i>)	Nevado 4F	2	1-2 pt	14	4 app

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Early blight (<i>Alternaria solani</i>)	mancozeb dry formulations	M	0.5-2 lb	14	14-15 lb
Early blight (<i>Alternaria solani</i>)	mancozeb liquid Formulations	M	0.4-1.6 qt	14	11.2 qt
Early blight (<i>Alternaria solani</i>)	ManKocide	M	1.5-5 lb	14	74.7 lb
Early blight (<i>Alternaria solani</i>)	Ridomil Gold Bravo SC	4, M	2.5 pt	14	footnote ⁷
Early blight (<i>Alternaria solani</i>)	Ridomil Gold MZ WG	4, M	2.5 lb	14	footnote ⁷
Early blight (<i>Alternaria solani</i>)	Luna Privilege	7	4-6.8 fl oz	7	13.7 fl oz
Early blight (<i>Alternaria solani</i>)	Previcur Flex	28	0.7-1.2 pt	7	10 lb
Early blight (<i>Alternaria solani</i>)	Priaxor	7, 11	4-8 fl oz	14	6 pt
Early blight (<i>Alternaria solani</i>)	Quash	3	2.5-4 oz	1	16 oz
Early blight (<i>Alternaria solani</i>)	Reason 500SC	11	5.5-8.2 fl oz	14	16 fl oz
Early blight (<i>Alternaria solani</i>)	Revus Top	3, 40	5.5-7.7 fl oz	14	24.6 fl oz
Early blight (<i>Alternaria solani</i>)	Rovral 4 Flowable	2	1-2 pt	7	28 fl oz
Early blight (<i>Alternaria solani</i>)	Scala SC	9	7 fl oz		4 app
Early blight (<i>Alternaria solani</i>)	Serenade ^{OG} ASO	44	2-6 qt	0	See label
Early blight (<i>Alternaria solani</i>)	Serenade ^{OG} MAX	44	1-3 lb	0	See label
Early blight (<i>Alternaria solani</i>)	Sonata ^{OG}	44	2-4 qt	0	See label
Early blight (<i>Alternaria solani</i>)	Tanos	27, 11	6 oz	14	6 app
Early blight (<i>Alternaria solani</i>)	Top Cop with Sulfur	M	2-3 qt	See label	See label
Early blight (<i>Alternaria solani</i>)	Agri-Tin	30	2.5-3.8 oz	7	11.3 oz
Early blight (<i>Alternaria solani</i>)	Super Tin 4L	30	4-6 fl oz	7	18 fl oz
Early blight (<i>Alternaria solani</i>)	Super Tin 80WP	30	2.5-5 oz	21	10 oz
Early blight (<i>Alternaria solani</i>)	Vertisan	7	10-24 fl oz	7	72 fl oz
Late blight (<i>Phytophthora infestans</i>)	Aftershock	11	3.8 fl oz	7	22.8 fl oz
Late blight (<i>Phytophthora infestans</i>)	Ariston	27, M5	2 pt	14	17.5 pt
Late blight (<i>Phytophthora infestans</i>)	Quadris	11	6-15.5 fl oz	14	123 fl oz
Late blight (<i>Phytophthora infestans</i>)	Quadris Opti	11, M	1.6 pt	14	6 app
Late blight (<i>Phytophthora infestans</i>)	Quadris Top	11, 3	8-14 fl oz	14	55.3 fl oz
Late blight (<i>Phytophthora infestans</i>)	Satori	11	6-15.5 fl oz	14	123 fl oz
Late blight (<i>Phytophthora infestans</i>)	Cabrio Plus	11, M	2.9 lb	14	17.4 lb

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Late blight (<i>Phytophthora infestans</i>)	Bravo Ultrex	M	0.7-1.4 lb ⁵	7	13.6 lb
Late blight (<i>Phytophthora infestans</i>)	Bravo WeatherStik	M	0.8-1.5 pt ⁵	30	18 pt
Late blight (<i>Phytophthora infestans</i>)	Bravo Zn	M	1.1-2.3 pt ⁵	7	21.5 pt
Late blight (<i>Phytophthora infestans</i>)	Chlorothalonil 720SC	M	0.8-1.5 pt ⁵	7	15 pt
Late blight (<i>Phytophthora infestans</i>)	Kocide 3000	M	0.5-1.8 lb	0	83.3 lb
Late blight (<i>Phytophthora infestans</i>)	Kocide 2000	M	0.8-3 lb	0	71.4 lb
Late blight (<i>Phytophthora infestans</i>)	Champ WG ^{OG}	M	1-4 lb	5	50 lb
Late blight (<i>Phytophthora infestans</i>)	Badge SC ⁵	M	1-3 pt	5	88.2 pt
Late blight (<i>Phytophthora infestans</i>)	Badge X2 ^{OG,6}	M	0.5-1.8 lb	5	25 lb Cu
Late blight (<i>Phytophthora infestans</i>)	Cuprofix-Ultra 40	M	0.8-3 lb	5	62.5 lb
Late blight (<i>Phytophthora infestans</i>)	Mastercop	M	0.5-1.5 pt	5	6 pt
Late blight (<i>Phytophthora infestans</i>)	Dexter Max	11, M3	1.6-2.1 lb	14	16 lb
Late blight (<i>Phytophthora infestans</i>)	Dexter SC	11	6-20 fl oz	14	120 fl oz
Late blight (<i>Phytophthora infestans</i>)	Evito 480SC	40	3.8 fl oz	7	22.8 fl oz
Late blight (<i>Phytophthora infestans</i>)	Forum	22, M	6 fl oz	4	30 fl oz
Late blight (<i>Phytophthora infestans</i>)	Gavel 75DF	11	1.5-2 lb	14	12 lb
Late blight (<i>Phytophthora infestans</i>)	Gem 500SC	11	3.8 fl oz	7	23 fl oz
Late blight (<i>Phytophthora infestans</i>)	Headline and Headline SC	M	6-12 fl oz	3	72 fl oz
Late blight (<i>Phytophthora infestans</i>)	mancozeb dry formulations	M	0.5-2 lb	14	14-15 lb
Late blight (<i>Phytophthora infestans</i>)	mancozeb liquid Formulations	M	0.4-1.6 qt	14	11.2 qt
Late blight (<i>Phytophthora infestans</i>)	ManKocide	4, M	1.5-5 lb	14	74.7 lb
Late blight (<i>Phytophthora infestans</i>)	Ridomil Gold Bravo	4, M	2.5 pt	14	footnote ⁷
Late blight (<i>Phytophthora infestans</i>)	Ridomil Gold MZ WG	29	2.5 lb	14	10 lb
Late blight (<i>Phytophthora infestans</i>)	Omega 500SC	See label	5.5 fl oz	14	3.5 pt
Late blight (<i>Phytophthora infestans</i>)	Confine Extra	33	1-3 qt	See label	See label
Late blight (<i>Phytophthora infestans</i>)	Rampart	33	1-3 qt/100 gal	See label	See label
Late blight (<i>Phytophthora infestans</i>)	Fosphite	33	1-3 qt/100 gal	See label	See label
Late blight (<i>Phytophthora infestans</i>)	Fungi-phite	33	1-2 qt	See label	6 app
Late blight (<i>Phytophthora infestans</i>)	Helena Prophyt	28	2-4 pt	See label	7 app

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Late blight (<i>Phytophthora infestans</i>)	Previcur Flex	7, 11	0.7-1.2 pt	14	6 pt
Late blight (<i>Phytophthora infestans</i>)	Priaxor	21	4-8 fl oz	7	24 fl oz
Late blight (<i>Phytophthora infestans</i>)	Ranman	11	1.4-2.8 fl oz	7	27.5 fl oz
Late blight (<i>Phytophthora infestans</i>)	Reason 500SC	3, 40	5.5-8.2 fl oz	14	24.6 fl oz
Late blight (<i>Phytophthora infestans</i>)	Revus Top	See label	5.5-7.7 fl oz	14	28 fl oz
Late blight (<i>Phytophthora infestans</i>)	Serenade ^{OG} ASO	44	2-6 qt	See label	See label
Late blight (<i>Phytophthora infestans</i>)	Serenade ^{OG} MAX	44	1-3 lb	0	See label
Late blight (<i>Phytophthora infestans</i>)	Sonata ^{OG}	27, 11	2-4 qt	0	See label
Late blight (<i>Phytophthora infestans</i>)	Tanos	M	6-8 oz	0	6 app
Late blight (<i>Phytophthora infestans</i>)	Top Cop with Sulfur	30	2-3 qt	14	See label
Late blight (<i>Phytophthora infestans</i>)	Agri-Tin	30	2.5-3.8 oz	7	11.3 oz
Late blight (<i>Phytophthora infestans</i>)	Super Tin 4L	30	4-6 fl oz	7	18 fl oz
Late blight (<i>Phytophthora infestans</i>)	Super Tin 80WP	45, 40	2.5-5 oz	21	10 oz
Late blight (<i>Phytophthora infestans</i>)	Zampro	22, M5	11-14 fl oz	4	42 fl oz
Late blight (<i>Phytophthora infestans</i>)	Zing!	See label	24-34 fl oz	7	8 app
Speckle leaf spot (or pepper spotting)	Speckle leaf spot is a result of high ozone levels in the atmosphere and is most likely to occur during the tuber bulking stage. The disorder is intensified by high levels of automobile exhausts, humid with cloudy overcast days and foggy conditions with heavy dew. 'LaChipper' is insensitive to ozone damage.	NA	NA	NA	NA
White mold (<i>Sclerotinia sclerotiorum</i>)	Cabrio Plus	11, M	2.9 lb	14	17.4 lb
White mold (<i>Sclerotinia sclerotiorum</i>)	Endura	7	2.5-4.5 oz	10	20 oz
White mold (<i>Sclerotinia sclerotiorum</i>)	Headline or Headline SC	11	6-12 fl oz	3	72 fl oz
White mold (<i>Sclerotinia sclerotiorum</i>)	Iprodione 4L AG	2	2 pt	14	4 app
White mold (<i>Sclerotinia sclerotiorum</i>)	Meteor	2	2 pt	14	4 app
White mold (<i>Sclerotinia sclerotiorum</i>)	Nevado 4F	2	2 pt	14	4 app
White mold (<i>Sclerotinia sclerotiorum</i>)	Omega 500SC	29	5.5-8 fl oz	14	3.5 pt
White mold (<i>Sclerotinia sclerotiorum</i>)	Luna Privilege	7	6-6.8 fl oz	7	13.7 fl oz
White mold (<i>Sclerotinia sclerotiorum</i>)	Priaxor	7, 11	4-8 fl oz	7	24 fl oz

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
White mold (<i>Sclerotinia sclerotiorum</i>)	Rovral 4 Flowable	2	2 pt	14	4 app
White mold (<i>Sclerotinia sclerotiorum</i>)	Serenade ^{OG} ASO	44	2-6 qt	0	See label
White mold (<i>Sclerotinia sclerotiorum</i>)	Serenade ^{OG} MAX	44	1-3 lb	0	See label
White mold (<i>Sclerotinia sclerotiorum</i>)	Sonata ^{OG}	44	2-4 qt	0	See label
White mold (<i>Sclerotinia sclerotiorum</i>)	85 WDG	1	0.8-1.2 lb	21	3.2 lb
White mold (<i>Sclerotinia sclerotiorum</i>)	Incognito 4.5F	1	20-30 fl oz	21	80 fl oz
White mold (<i>Sclerotinia sclerotiorum</i>)	Nufarm T-methyl 70WSB	1	1-1.5 lb	21	4 lb
White mold (<i>Sclerotinia sclerotiorum</i>)	Topsin M 70WDG	1	1-1.5 lb	21	4 lb
White mold (<i>Sclerotinia sclerotiorum</i>)	Vertisan	7	14-24 fl oz	7	72 fl oz

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² Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

³ Rates are the amount of formulation per acre unless otherwise indicated. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

⁴ Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

⁵ Use a lower rate of chlorothalonil when vines are first exposed and leaf wetness occurs. Increase the rate when vines close between rows or late blight forecasting measures 18 disease severity values, or the crop reaches 300 P-days. Refer to labels for detailed application and timing instructions.

⁶ Do not use in a spray solution with a pH less than 6.5.

⁷ Do not exceed 11.3 lb. a.i. per acre of chlorothalonil containing products. Do not exceed 0.2 a.i. per season of soil-applied and 0.4 lb a.i. per season of foliar-applied mefenoxam.

Root crops (Beet, Carrot, Parsnip, Radish and Turnip)

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Downy mildew (<i>Peronospora parasitica</i>)	Actinovate AG ^{OG}	See label	3-12 oz	See label	See label
Downy mildew (<i>Peronospora parasitica</i>)	Bravo Ultrex (parsnip only)	M	1.4-1.8 lb	10	7.3 lb
Downy mildew (<i>Peronospora parasitica</i>)	Bravo WeatherStik (parsnip only)	M	1.5-2 pt	10	8 pt
Downy mildew (<i>Peronospora parasitica</i>)	Chlorothalonil 720SC (parsnip only)	M	1.5-2 pt	10	8 pt
Downy mildew (<i>Peronospora parasitica</i>)	Echo 90DF (parsnip only)	M	1.4-1.8 lb	10	6 lb
Downy mildew (<i>Peronospora parasitica</i>)	Confine Extra	33	1-3 qt	See label	See label
Downy mildew (<i>Peronospora parasitica</i>)	Rampart	33	1-3 qt/100 gal	See label	See label
Downy mildew (<i>Peronospora parasitica</i>)	Fosphite	33	1-3 qt/100 gal	See label	See label
Downy mildew (<i>Peronospora parasitica</i>)	Fungi-phite	33	1-2 qt	See label	6 app
Downy mildew (<i>Peronospora parasitica</i>)	Serenade ^{OG}	See label	See label	See label	See label
Downy mildew (<i>Peronospora parasitica</i>)	Serenade ^{OG} ASO	44	2-6 qt	0	See label
Downy mildew (<i>Peronospora parasitica</i>)	Serenade ^{OG} MAX	44	1-3 lb	0	See label
Downy mildew (<i>Peronospora parasitica</i>)	Sonata ^{OG}	44	2-4 qt	0	See label
Downy mildew (<i>Peronospora parasitica</i>)	Top Cop with Sulfur	M	2 qt	0	See label
Downy mildew (<i>Peronospora parasitica</i>)	Trilogy ^{OG}	See label	1%	See label	See label
Leaf spots and blights (<i>Alternaria</i> spp., <i>Cercospora</i> spp.)	Quadris	11	9-15.5 fl oz	0	123 fl oz
Leaf spots and blights (<i>Alternaria</i> spp., <i>Cercospora</i> spp.)	Satori	11	9-15.5 fl oz	0	123 fl oz
Leaf spots and blights (<i>Alternaria</i> spp., <i>Cercospora</i> spp.)	Cabrio	11	8-12 oz	0	48 oz
Leaf spots and blights (<i>Alternaria</i> spp., <i>Cercospora</i> spp.)	Bravo Weather Stik	M	1.5-2 pt	0	20 pt
Leaf spots and blights (<i>Alternaria</i> spp., <i>Cercospora</i> spp.)	Bravo Zn	M	2.3-2.8 pt	0	29 pt
Leaf spots and blights (<i>Alternaria</i> spp., <i>Cercospora</i> spp.)	Equus 720SST	M	1.5-2 pt	0	20 pt
Leaf spots and blights (<i>Alternaria</i> spp., <i>Cercospora</i> spp.)	Kocide 3000	M	0.8-1.5 lb	0	16.7 lb
Leaf spots and blights (<i>Alternaria</i> spp., <i>Cercospora</i> spp.)	Kocide 2000	M	1.5-2.8 lb	0	14.3 lb
Leaf spots and blights (<i>Alternaria</i> spp., <i>Cercospora</i> spp.)	Champ Formula 2	M	1.3 pt	0	13.7 pt
Leaf spots and blights (<i>Alternaria</i> spp., <i>Cercospora</i> spp.)	Badge SC	M	1-1.8 pt	0	17.6 pt
Leaf spots and blights (<i>Alternaria</i> spp., <i>Cercospora</i> spp.)	Badge X2 ^{OG}	M	0.8-1.5 lb	0	5 lb Cu
Leaf spots and blights (<i>Alternaria</i> spp., <i>Cercospora</i> spp.)	Cuprofix-Ultra 40	M	1.3 lb	0	12.5 lb
Leaf spots and blights (<i>Alternaria</i> spp., <i>Cercospora</i> spp.)	Cuproxat	M	2.5 pt	0	24.6 pt

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Leaf spots and blights (<i>Alternaria</i> spp., <i>Cercospora</i> spp.)	Endura	7	4.5 oz	0	22.5 oz
Leaf spots and blights (<i>Alternaria</i> spp., <i>Cercospora</i> spp.)	Fontelis	7	16-30 fl oz	0	61 fl oz
Leaf spots and blights (<i>Alternaria</i> spp., <i>Cercospora</i> spp.)	Gem 500SC	11	1.9-2.9 fl oz	7	11.5 fl oz
Leaf spots and blights (<i>Alternaria</i> spp., <i>Cercospora</i> spp.)	MasterCop	See label	0.5-1.5 pt	See label	6 pt
Leaf spots and blights (<i>Alternaria</i> spp., <i>Cercospora</i> spp.)	Merivon	7, 11	4-5.5 fl oz	7	16.5 fl oz
Leaf spots and blights (<i>Alternaria</i> spp., <i>Cercospora</i> spp.)	Pristine	7, 11	8-10.5 oz	0	63 oz
Leaf spots and blights (<i>Alternaria</i> spp., <i>Cercospora</i> spp.)	Amtide 41.8%	3	4 fl oz	14	16 fl oz
Leaf spots and blights (<i>Alternaria</i> spp., <i>Cercospora</i> spp.)	Bumper 48.1EC	3	4 fl oz	14	16 fl oz
Leaf spots and blights (<i>Alternaria</i> spp., <i>Cercospora</i> spp.)	Tilt	3	4 fl oz	14	16 fl oz
Leaf spots and blights (<i>Alternaria</i> spp., <i>Cercospora</i> spp.)	Quardis Opti	11, M5	2.4 pt	0	6 app
Leaf spots and blights (<i>Alternaria</i> spp., <i>Cercospora</i> spp.)	Quadris Top	11, 3	12-14 fl oz	7	56 fl oz
Leaf spots and blights (<i>Alternaria</i> spp., <i>Cercospora</i> spp.)	Switch 62.5WG	9, 12	11-14 oz	7	56 oz
Leaf spots and blights (<i>Alternaria</i> spp., <i>Cercospora</i> spp.)	Switch 62.5WG (radish only)	9, 12	11-14 oz	7	28 oz
Leaf spots and blights (<i>Alternaria</i> spp., <i>Cercospora</i> spp.)	Top Cop with Sulfur	M	2 qt	See label	See label
Damping-off (<i>Pythium</i> spp.)	Ridomil Gold GR	4	20-40 lb ⁵	See label	See label
Damping-off (<i>Pythium</i> spp.)	Metastar 2E	4	4-8 pt ⁶	See label	See label
Damping-off (<i>Pythium</i> spp.)	Confine Extra	33	1-3 qt	See label	See label
Damping-off (<i>Pythium</i> spp.)	Rampart	33	1-3 qt/100 gal	See label	See label
Damping-off (<i>Pythium</i> spp.)	Fosphite	33	1-3 qt/100 gal	See label	See label
Damping-off (<i>Pythium</i> spp.)	Fungi-phite	33	1-2 qt	See label	See label
Damping-off (<i>Pythium</i> spp.)	Serenade Soil	44	2-6 qt ⁶	See label	See label
Damping-off (<i>Rhizoctonia</i> spp.)	Quadris 2.08F	11	0.4-0.8 fl oz ⁷	See label	1 app
Damping-off (<i>Rhizoctonia</i> spp.)	Satori	11	0.4-0.8 fl oz ⁷	See label	1 app

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² Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

³ Rates are the amount of formulation per acre unless otherwise indicated. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

⁴ Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

⁵ Rates refer to band or broadcast applications. Refer to individual labels for per plant in transplant water rates.

⁶ Soil applications. Refer to individual labels for application directions.

⁷ All rates are per 1,000 square feet of row. Refer to the label for modes of application.

Spinach

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Anthrachnose (<i>Colletortichum dematium</i>) and Leaf spots (<i>Cercospora beticola</i>)	Quadris	11	6-15.5 fl oz	0	92.3 fl oz
Anthrachnose (<i>Colletortichum dematium</i>) and Leaf spots (<i>Cercospora beticola</i>)	Satori	11	6-15.5 fl oz	0	92.3 fl oz
Anthrachnose (<i>Colletortichum dematium</i>) and Leaf spots (<i>Cercospora beticola</i>)	Cabrio	11	12-16 oz	0	64 oz
Anthrachnose (<i>Colletortichum dematium</i>) and Leaf spots (<i>Cercospora beticola</i>)	Kocide 3000	M	0.8-1.3 lb	0	13.2 lb
Anthrachnose (<i>Colletortichum dematium</i>) and Leaf spots (<i>Cercospora beticola</i>)	Kocide 2000	M	1.5-2.3 lb	0	11.3 lb
Anthrachnose (<i>Colletortichum dematium</i>) and Leaf spots (<i>Cercospora beticola</i>)	Champ Formula 2	M	1.3-2.7 pt	0	10.9 pt
Anthrachnose (<i>Colletortichum dematium</i>) and Leaf spots (<i>Cercospora beticola</i>)	Champ WG ^{OG}	M	1-1.6 lb	0	7.9 lb
Anthrachnose (<i>Colletortichum dematium</i>) and Leaf spots (<i>Cercospora beticola</i>)	Badge SC ⁵	M	1-2.3 pt	0	13.9 pt
Anthrachnose (<i>Colletortichum dematium</i>) and Leaf spots (<i>Cercospora beticola</i>)	Badge X2 ^{OG,5}	M	0.8-1.3 lb	0	4 lb Cu
Anthrachnose (<i>Colletortichum dematium</i>) and Leaf spots (<i>Cercospora beticola</i>)	Nordox 75WG ^{OG}	M	2-3 lb	0	See label
Anthrachnose (<i>Colletortichum dematium</i>) and Leaf spots (<i>Cercospora beticola</i>)	Cuprofix Ultra 40	M	1.3-2 lb	0	9.9 lb
Anthrachnose (<i>Colletortichum dematium</i>) and Leaf spots (<i>Cercospora beticola</i>)	Mastercop	M	0.5-1 pt	0	5 pt
Anthrachnose (<i>Colletortichum dematium</i>) and Leaf spots (<i>Cercospora beticola</i>)	Fontelis	7	14-24 fl oz	3	72 fl oz
Anthrachnose (<i>Colletortichum dematium</i>) and Leaf spots (<i>Cercospora beticola</i>)	Merivon	7, 11	4-11 fl oz	1	33 fl oz
Anthrachnose (<i>Colletortichum dematium</i>) and Leaf spots (<i>Cercospora beticola</i>)	Switch 62.5WG	9, 12	11-14 oz	0	56 oz
Anthrachnose (<i>Colletortichum dematium</i>) and Leaf spots (<i>Cercospora beticola</i>)	Top Cop with Sulfur	M	2-4 qt	0	See label
Anthrachnose (<i>Colletortichum dematium</i>) and Leaf spots (<i>Cercospora beticola</i>)	Topguard	11, 3	6-8 fl oz	7	4 app
Downy mildew (<i>Peronospora farinosa</i> f. sp. <i>spinaciae</i>)	Quadris	11	12-15.5 fl oz	0	92.3 fl oz
Downy mildew (<i>Peronospora farinosa</i> f. sp. <i>spinaciae</i>)	Satori	11	12-15.5 fl oz	0	92.3 fl oz

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Downy mildew (<i>Peronospora farinosa</i> f. sp. <i>spinaciae</i>)	Actigard 50WG	21	0.5-0.8 oz	7	2.3 oz
Downy mildew (<i>Peronospora farinosa</i> f. sp. <i>spinaciae</i>)	Actinovate AG ^{OG}	44	3-12 oz	0	See label
Downy mildew (<i>Peronospora farinosa</i> f. sp. <i>spinaciae</i>)	Aliette WDG	33	2-5 lb	3	7 app
Downy mildew (<i>Peronospora farinosa</i> f. sp. <i>spinaciae</i>)	Cabrio EG 20%	11	12-16 oz	0	64 oz
Downy mildew (<i>Peronospora farinosa</i> f. sp. <i>spinaciae</i>)	Cease	44	3-6 qt/100 gal	See label	See label
Downy mildew (<i>Peronospora farinosa</i> f. sp. <i>spinaciae</i>)	Kocide 3000	M	0.8-1.3 lb	0	13.2 lb
Downy mildew (<i>Peronospora farinosa</i> f. sp. <i>spinaciae</i>)	Champ Formula 2	M	1.3-2.7 pt	0	10.9 pt
Downy mildew (<i>Peronospora farinosa</i> f. sp. <i>spinaciae</i>)	Champ WG ^{OG}	M	1-1.6 lb	0	7.9 lb
Downy mildew (<i>Peronospora farinosa</i> f. sp. <i>spinaciae</i>)	Badge SC ⁵	M	1-2.3 pt	0	13.9 pt
Downy mildew (<i>Peronospora farinosa</i> f. sp. <i>spinaciae</i>)	Badge X2 ^{OG, 5}	M	0.8-1.3 lb	0	4 lb Cu
Downy mildew (<i>Peronospora farinosa</i> f. sp. <i>spinaciae</i>)	Nordox 75WG ^{OG}	M	2-3 lb	See label	See label
Downy mildew (<i>Peronospora farinosa</i> f. sp. <i>spinaciae</i>)	Curzate 60DF	27	5 oz	1	30 oz
Downy mildew (<i>Peronospora farinosa</i> f. sp. <i>spinaciae</i>)	Ridomil Gold SL	4	0.3 pt ⁶	3-2 ¹⁸	2 app
Downy mildew (<i>Peronospora farinosa</i> f. sp. <i>spinaciae</i>)	Ultra Flourish	4	0.3 pt ⁶	3-2 ¹⁸	2 app
Downy mildew (<i>Peronospora farinosa</i> f. sp. <i>spinaciae</i>)	Ultra Flourish	4	0.5 pt ⁶	3-2 ¹⁸	1.6 pt
Downy mildew (<i>Peronospora farinosa</i> f. sp. <i>spinaciae</i>)	Merivon 4.18SC	7, 11	4-11 fl oz	1	33 fl oz
Downy mildew (<i>Peronospora farinosa</i> f. sp. <i>spinaciae</i>)	Micora	40	5.5-8 fl oz ⁷	See label	2 app
Downy mildew (<i>Peronospora farinosa</i> f. sp. <i>spinaciae</i>)	MilStop ^{OG}	See label	2-5 lb/100 gal	See label	See label
Downy mildew (<i>Peronospora farinosa</i> f. sp. <i>spinaciae</i>)	Alude	33	0.5 gal/40 gal	See label	See label
Downy mildew (<i>Peronospora farinosa</i> f. sp. <i>spinaciae</i>)	Confine Extra	33	1-4 qt	See label	See label
Downy mildew (<i>Peronospora farinosa</i> f. sp. <i>spinaciae</i>)	Rampart	33	1-3 qt/100 gal	See label	See label
Downy mildew (<i>Peronospora farinosa</i> f. sp. <i>spinaciae</i>)	Fosphite	33	1-3 qt/100 gal	See label	See label
Downy mildew (<i>Peronospora farinosa</i> f. sp. <i>spinaciae</i>)	Fungi-phite	33	1-2 qt	See label	6 app
Downy mildew (<i>Peronospora farinosa</i> f. sp. <i>spinaciae</i>)	Helena Prophyt	33	2-4 pt	See label	7 app
Downy mildew (<i>Peronospora farinosa</i> f. sp. <i>spinaciae</i>)	Presidio	43	3-4 fl oz	2	12 fl oz
Downy mildew (<i>Peronospora farinosa</i> f. sp. <i>spinaciae</i>)	Ranman	21	2.8 fl oz	0	16.5 fl oz
Downy mildew (<i>Peronospora farinosa</i> f. sp. <i>spinaciae</i>)	Reason 500SC	11	5.5-8.2 fl oz	2	24.6 fl oz
Downy mildew (<i>Peronospora farinosa</i> f. sp. <i>spinaciae</i>)	Revus	40	8 fl oz	1	32 fl oz
Downy mildew (<i>Peronospora farinosa</i> f. sp. <i>spinaciae</i>)	Serenade ^{OG} ASO	44	2-6 qt	See label	See label

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Downy mildew (<i>Peronospora farinosa</i> f. sp. <i>spinaciae</i>)	Serenade ^{OG} MAX	44	1-3 lb	See label	See label
Downy mildew (<i>Peronospora farinosa</i> f. sp. <i>spinaciae</i>)	Sonata ^{OG}	44	2-4 qt	See label	See label
Downy mildew (<i>Peronospora farinosa</i> f. sp. <i>spinaciae</i>)	Tanos	11,27	8-10 oz	1	84 oz
Downy mildew (<i>Peronospora farinosa</i> f. sp. <i>spinaciae</i>)	Top Cop with Sulfur	M	2-4 qt	See label	See label
Downy mildew (<i>Peronospora farinosa</i> f. sp. <i>spinaciae</i>)	Trilogy ^{OG}	See label	1%	See label	See label
Downy mildew (<i>Peronospora farinosa</i> f. sp. <i>spinaciae</i>)	Zampro	40,45	14 fl oz	0	42 fl oz
Damping-off (<i>Pythium</i> spp.)	Ridomil Gold SL	4	1-2 pt ⁹	3-21 ¹⁰	1 app
Damping-off (<i>Pythium</i> spp.)	Ultra Flourish	4	0.5 pt ⁶	3-21 ¹⁰	1 app
Damping-off (<i>Pythium</i> spp.)	Confine Extra	33	1-4 qt	See label	See label
Damping-off (<i>Pythium</i> spp.)	Rampart	33	1-3 qt/100 gal	See label	See label
Damping-off (<i>Pythium</i> spp.)	Fosphite	33	1-3 qt/100 gal	See label	See label
Damping-off (<i>Pythium</i> spp.)	Fungi-phite	33	1-2 qt	See label	6 app
Damping-off (<i>Pythium</i> spp.)	Ranman	21	2.8 fl oz ⁹	0	16.5 fl oz
Damping-off (<i>Pythium</i> spp.)	Rootshield Granules ^{OG}	See label	2.5-6 lb/ ½ acre ⁹	See label	1 app
White rust (<i>Albugo occidentalis</i>)	Quadris	11	6-15.5 fl oz	0	92.3 fl oz
White rust (<i>Albugo occidentalis</i>)	Satori	11	6-15.5 fl oz	0	92.3 fl oz
White rust (<i>Albugo occidentalis</i>)	Actigard	21	See label	See label	See label
White rust (<i>Albugo occidentalis</i>)	Aliette WDG	33	See label	See label	See label
White rust (<i>Albugo occidentalis</i>)	Cabrio	11	8-12 oz	0	64 oz
White rust (<i>Albugo occidentalis</i>)	Kocide 3000	M	0.8-1.3 lb	0	13.2 lb
White rust (<i>Albugo occidentalis</i>)	Kocide 2000	M	1.5-2.3 lb	0	11.3 lb
White rust (<i>Albugo occidentalis</i>)	Champ Formula 2	M	1.3-2.7 pt	0	10.9 pt
White rust (<i>Albugo occidentalis</i>)	Champ WG ^{OG}	M	1-1.6 lb	0	7.9 lb
White rust (<i>Albugo occidentalis</i>)	Badge SC5	M	1-2.3 pt	0	13.9 pt
White rust (<i>Albugo occidentalis</i>)	Badge X2 ^{OG,5}	M	0.8-1.3 lb	0	4 lb Cu
White rust (<i>Albugo occidentalis</i>)	Nordox 75WG ^{OG}	M	2-3 lb	See label	See label
White rust (<i>Albugo occidentalis</i>)	Cuprofix 40 Disperss	M	1.3-2 lb	0	9.9 lb
White rust (<i>Albugo occidentalis</i>)	Mastercop	M	0.5-1 pt	0	5 pt
White rust (<i>Albugo occidentalis</i>)	Ridomil Gold SL	4	0.3 pt ⁶	3-21 ¹⁰	2 app

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
White rust (<i>Albugo occidentalis</i>)	Ultra Flourish	4	0.5 pt ⁶	3-21 ¹⁰	2 app
White rust (<i>Albugo occidentalis</i>)	Merivon	7, 11	4-11 fl oz	1	33 fl oz
White rust (<i>Albugo occidentalis</i>)	Presidio	43	3-4 fl oz	2	12 fl oz
White rust (<i>Albugo occidentalis</i>)	Ranman	21	2.8 fl oz	0	16.5 fl oz
White rust (<i>Albugo occidentalis</i>)	Reason 500SC	11	5.5-8.2 fl oz	2	24.6 fl oz
White rust (<i>Albugo occidentalis</i>)	Serenade ^{OG} ASO	44	2-6 qt	See label	See label
White rust (<i>Albugo occidentalis</i>)	Serenade ^{OG} MAX	44	1-3 lb	See label	See label
White rust (<i>Albugo occidentalis</i>)	Tanos	11, 27	8-10 oz	1	84 oz
White rust (<i>Albugo occidentalis</i>)	Top Cop with Sulfur	M	2-4 qt	See label	See label

¹ Reference to commercial or trade names is made with the understanding that no discrimination is intended nor endorsement of a particular product by LSU or the LSU AgCenter is implied.

² Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

³ Rates are the amount of formulation per acre unless otherwise indicated. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

⁴ Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

⁵ Do not use in a spray solution with a pH less than 6.5.

⁶ Shank applications only. Apply 21 days after planting or after the first cutting. Refer to label for additional application instructions.

⁷ Do not apply alone. Must be applied as a tank mix with another fungicide with a different mode of action.

⁸ **Transplant production only.**

⁹ Soil applications. Refer to individual labels for application directions.

¹⁰ PHI varies depending on the rate and mode of application. Refer to label for specific PHI.

Tomato (Fresh Market)

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Anthracnose fruit rot (<i>Colletotrichum</i> spp.)	Actinovate AG ^{OG}	See label	3-12 oz	See label	See label
Anthracnose fruit rot (<i>Colletotrichum</i> spp.)	Aprovia Top	7, 3	10.5-13.5 fl oz	0	4 app
Anthracnose fruit rot (<i>Colletotrichum</i> spp.)	Ariston	M, 27	2.0-2.44 pt	3	17.5 pt
Anthracnose fruit rot (<i>Colletotrichum</i> spp.)	Quadris	11	5-6.2 fl oz	0	37 fl oz
Anthracnose fruit rot (<i>Colletotrichum</i> spp.)	Quadris Opti	11, M	1.6 pt	0	5 app
Anthracnose fruit rot (<i>Colletotrichum</i> spp.)	Quadris Top	11, 3	8 fl oz	0	47 fl oz
Anthracnose fruit rot (<i>Colletotrichum</i> spp.)	Satori	11	5-6.2 fl oz	0	61.5 fl oz
Anthracnose fruit rot (<i>Colletotrichum</i> spp.)	Cabrio	11	8-12 oz	0	96 fl oz
Anthracnose fruit rot (<i>Colletotrichum</i> spp.)	Bravo Ultrex	M	1.8-2.6 lb	0	18.3 lb
Anthracnose fruit rot (<i>Colletotrichum</i> spp.)	Chloronil 720	M	2-2.8 pt	0	20 pt
Anthracnose fruit rot (<i>Colletotrichum</i> spp.)	Echo 90DF	M	2-3 pt	0	15.1 lb a.i.
Anthracnose fruit rot (<i>Colletotrichum</i> spp.)	Equus 720SST	M	2-2.8 pt	0	20 pt
Anthracnose fruit rot (<i>Colletotrichum</i> spp.)	Kocide 3000	M	0.8-1.8 lb	0	26.7 lb
Anthracnose fruit rot (<i>Colletotrichum</i> spp.)	Kocide 2000	M	1.5-2.3 lb	0	22.8 lb
Anthracnose fruit rot (<i>Colletotrichum</i> spp.)	Champ WG ^{OG}	M	1.1 lb	3	16 lb
Anthracnose fruit rot (<i>Colletotrichum</i> spp.)	Badge SC	M	1.8 pt	3	28.1 pt
Anthracnose fruit rot (<i>Colletotrichum</i> spp.)	Badge X2 ^{OG}	M	0.8-1.8 lb	3	8 lb Cu
Anthracnose fruit rot (<i>Colletotrichum</i> spp.)	Cuprofix-Ultra 40	M	0.8-3 lb	3	20 lb
Anthracnose fruit rot (<i>Colletotrichum</i> spp.)	Cuproxat	M	2.5-5 pt	3	39.4 pt
Anthracnose fruit rot (<i>Colletotrichum</i> spp.)	Dexter Xcel	M3, 11, 3	36 fl oz	7	216 fl oz
Anthracnose fruit rot (<i>Colletotrichum</i> spp.)	Dexter Max	11, M3	0.8-1.1 lb	5	9.14 lb
Anthracnose fruit rot (<i>Colletotrichum</i> spp.)	Nordox 75WG ^{OG}	M	2-4 lb	0	See label
Anthracnose fruit rot (<i>Colletotrichum</i> spp.)	Flint	11	3-4 oz	3	16 fl oz
Anthracnose fruit rot (<i>Colletotrichum</i> spp.)	Fontelis 1.67SC	7	24 fl oz	0	72 fl oz
Anthracnose fruit rot (<i>Colletotrichum</i> spp.)	Inspire Super 2.82SC	9, 3	16-20 fl oz	0	47 fl oz
Anthracnose fruit rot (<i>Colletotrichum</i> spp.)	mancozeb dry formulations	M	0.5-3 lb ⁵	5	21-22.4 lb
Anthracnose fruit rot (<i>Colletotrichum</i> spp.)	mancozeb liquid Formulations	M	0.6-2.4 qt ⁵	5	16.8 qt
Anthracnose fruit rot (<i>Colletotrichum</i> spp.)	ManKocide	M	1-3 lb	5	42.7-58 lb ⁵

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Anthracnose fruit rot (<i>Colletotrichum</i> spp.)	MilStop ^{OG}	See label	2-5 lb/100 gal	See label	See label
Anthracnose fruit rot (<i>Colletotrichum</i> spp.)	OSO 5%	19	3.75-13 fl oz	0	4.2 oz a.i
Anthracnose fruit rot (<i>Colletotrichum</i> spp.)	Mettle 125ME	3	6-8 fl oz	0	16 fl oz
Anthracnose fruit rot (<i>Colletotrichum</i> spp.)	Priaxor	7, 11	4-8 fl oz	0	24 fl oz
Anthracnose fruit rot (<i>Colletotrichum</i> spp.)	Revus Top	3, 40	5.5-7 fl oz	1	28 fl oz
Anthracnose fruit rot (<i>Colletotrichum</i> spp.)	Serenade ^{OG} , Optimum	44	4-20 oz	3	72 oz
Anthracnose fruit rot (<i>Colletotrichum</i> spp.)	Tanos	27, 11	8-10 oz	See label	See label
Anthracnose fruit rot (<i>Colletotrichum</i> spp.)	Top Cop with Sulfur	M	2 qt	0	4 app
Anthracnose fruit rot (<i>Colletotrichum</i> spp.)	Topguard EQ	11, 3	4-8 fl oz	See label	See label
Anthracnose fruit rot (<i>Colletotrichum</i> spp.)	Trilogy ^{OG}	See label	1%	See label	See label
Bacterial leaf spot (<i>Xanthomonas</i> spp.)	Actigard 50WG	P1	0.3-0.8 oz	14	6 oz
Bacterial leaf spot (<i>Xanthomonas</i> spp.)	Actinovate AG ^{OG}	See label	3-12 oz	See label	See label
Bacterial leaf spot (<i>Xanthomonas</i> spp.)	Agri-Mycin 17 ^{OG, 6}	See label	200 ppm	See label	See label
Bacterial leaf spot (<i>Xanthomonas</i> spp.)	Kocide 3000	M	0.8-1.8 lb	0	26.7 lb
Bacterial leaf spot (<i>Xanthomonas</i> spp.)	Kocide 2000	M	1.5-3 lb	0	22.8 lb
Bacterial leaf spot (<i>Xanthomonas</i> spp.)	Champ WG ^{OG}	M	1.1 lb	0	16 lb
Bacterial leaf spot (<i>Xanthomonas</i> spp.)	Badge SC	M	1.8 pt	3	28.1 pt
Bacterial leaf spot (<i>Xanthomonas</i> spp.)	Badge X2 ^{OG}	M	0.8-1.8 lb	3	8 lb Cu
Bacterial leaf spot (<i>Xanthomonas</i> spp.)	Cuprofix-Ultra 40	M	0.8-3 lb	3	20 lb
Bacterial leaf spot (<i>Xanthomonas</i> spp.)	Cuproxat	M	2.5-5 pt	3	39.4 pt
Bacterial leaf spot (<i>Xanthomonas</i> spp.)	Nordox 75WG ^{OG}	M	2-4 lb	0	See label
Bacterial leaf spot (<i>Xanthomonas</i> spp.)	ManKocide	M	1.3 lb	5	42.7-58 lb ⁷
Bacterial leaf spot (<i>Xanthomonas</i> spp.)	MasterCop	M	0.5-3 pt	See label	30 pt
Bacterial leaf spot (<i>Xanthomonas</i> spp.)	Serenade ^{OG} ASO	44	2-6 qt	See label	See label
Bacterial leaf spot (<i>Xanthomonas</i> spp.)	Serenade ^{OG} Optimum	44	14-20 oz	See label	See label
Bacterial leaf spot (<i>Xanthomonas</i> spp.)	Serenade ^{OG} MAX	44	1-3 lb	See label	See label
Bacterial leaf spot (<i>Xanthomonas</i> spp.)	Tanos	27,11	8 oz	3	72 oz
Bacterial leaf spot (<i>Xanthomonas</i> spp.)	Top Cop with Sulfur	M	2-3 qt	See label	See label
Bacterial speck (<i>Pseudomonas syringae</i> pv. <i>syringae</i>)	Agri-Mycin 17 ^{OG, 6}	See label	200 ppm	See label	See label

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Bacterial speck (<i>Pseudomonas syringae</i> pv. <i>syringae</i>)	Kocide 3000	M	0.8-1.8 lb	0	26.7 lb
Bacterial speck (<i>Pseudomonas syringae</i> pv. <i>syringae</i>)	Kocide 2000	M	1.5-3 lb	0	22.8 lb
Bacterial speck (<i>Pseudomonas syringae</i> pv. <i>syringae</i>)	Champ WG ^{OG}	M	2 lb	0	16 lb
Bacterial speck (<i>Pseudomonas syringae</i> pv. <i>syringae</i>)	Badge SC	M	1.8 pt	3	28.1 pt
Bacterial speck (<i>Pseudomonas syringae</i> pv. <i>syringae</i>)	Badge X2 ^{OG}	M	0.8-1.8 lb	3	8 lb Cu
Bacterial speck (<i>Pseudomonas syringae</i> pv. <i>syringae</i>)	Cuprofix-Ultra 40	M	0.8-3 lb	3	20 lb
Bacterial speck (<i>Pseudomonas syringae</i> pv. <i>syringae</i>)	Cuproxat	M	2.3 pt	3	39.4 pt
Bacterial speck (<i>Pseudomonas syringae</i> pv. <i>syringae</i>)	Nordox 75WG ^{OG}	M	2-4 lb	0	See label
Bacterial speck (<i>Pseudomonas syringae</i> pv. <i>syringae</i>)	mancozeb dry formulations	M	0.5-3 lb ⁸	5	21-22.4 lb
Bacterial speck (<i>Pseudomonas syringae</i> pv. <i>syringae</i>)	mancozeb liquid Formulations	M	0.6-2.4 qt ⁸	5	16.8 qt
Bacterial speck (<i>Pseudomonas syringae</i> pv. <i>syringae</i>)	ManKocide	M	1.3 lb	5	42.7-58 lb ⁷
Bacterial speck (<i>Pseudomonas syringae</i> pv. <i>syringae</i>)	MasterCop	M	0.5-3 pt	See label	30 pt
Bacterial speck (<i>Pseudomonas syringae</i> pv. <i>syringae</i>)	Serenade ^{OG} ASO	44	2-6 qt	See label	See label
Bacterial speck (<i>Pseudomonas syringae</i> pv. <i>syringae</i>)	Serenade ^{OG} Optimum	44	14-20 oz	See label	See label
Bacterial speck (<i>Pseudomonas syringae</i> pv. <i>syringae</i>)	Serenade ^{OG} MAX	44	1-3 lb	See label	See label
Bacterial speck (<i>Pseudomonas syringae</i> pv. <i>syringae</i>)	Tanos	27, 11	8 oz	3	72 oz
Bacterial speck (<i>Pseudomonas syringae</i> pv. <i>syringae</i>)	Top Cop with Sulfur	M	2-3 qt	See label	See label
Bacterial wilt (<i>Ralstonia solanacearum</i>)	No bactericides available. Plant resistant varieties, crop rotations and soil solarization	NA	NA	NA	NA
Blossom-end rot	Blossom-end rot results from a calcium (Ca) deficiency in young, rapidly expanding tomato fruit tissues. The disorder can be intensified by excess nitrogen. Have soil and water tested for Ca levels prior to planting. Foliar applications of Ca fertilizers are not likely to prevent or reduce blossom-end rot incidence, as Ca ions are not actively mobilized from the leaf downward to the fruits.				
Buckeye rot (<i>Phytophthora parasitica</i>)	Quadris	11	5-6.2 fl oz	0	37 fl oz
Buckeye rot (<i>Phytophthora parasitica</i>)	Quadris Opti	11, M	1.6 pt	0	5 app
Buckeye rot (<i>Phytophthora parasitica</i>)	Quadris Top	11, 3	8 fl oz	0	47 fl oz
Buckeye rot (<i>Phytophthora parasitica</i>)	Satori	11	5-6.2 fl oz	0	61.5 fl oz

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Buckeye rot (<i>Phytophthora parasitica</i>)	Dexter Max	11, M3	0.8-1.1 lb	5	9.14 lb
Buckeye rot (<i>Phytophthora parasitica</i>)	Gavel 75DF	22, M	1.5-2 lb	5	8-16 lb ⁵
Buckeye rot (<i>Phytophthora parasitica</i>)	Orondis Opti (Premix)	U15, M5	1.75-2.5 pt	0	10 pt
Buckeye rot (<i>Phytophthora parasitica</i>)	Orondis Ultra (Premix)	40, U15	5.5-8 fl oz	1	32 fl oz
Buckeye rot (<i>Phytophthora parasitica</i>)	Ridomil Gold Copper	4, M1	2 lb	14	6 lb
Buckeye rot (<i>Phytophthora parasitica</i>)	Serenade ^{OG} Optimum	44	4-20 oz	See label	See label
Buckeye rot (<i>Phytophthora parasitica</i>)	Tanos	27, 11	8 oz	3	72 oz
Early blight (<i>Alternaria solani</i>), Leaf spot (<i>Septoria lycopersici</i>) and Target spot (<i>Corynespora cassicola</i>)	Ariston	M, 27	1.9-3 pt	3	17.5 pt
Early blight (<i>Alternaria solani</i>), Leaf spot (<i>Septoria lycopersici</i>) and Target spot (<i>Corynespora cassicola</i>)	Quadris	11	5-6.2 fl oz	0	37 fl oz
Early blight (<i>Alternaria solani</i>), Leaf spot (<i>Septoria lycopersici</i>) and Target spot (<i>Corynespora cassicola</i>)	Quadris Opti	11, M	1.6 pt	0	5 app
Early blight (<i>Alternaria solani</i>), Leaf spot (<i>Septoria lycopersici</i>) and Target spot (<i>Corynespora cassicola</i>)	Quadris Top	11, 3	8 fl oz	0	47 fl oz
Early blight (<i>Alternaria solani</i>), Leaf spot (<i>Septoria lycopersici</i>) and Target spot (<i>Corynespora cassicola</i>)	Satori	11	5-6.2 fl oz	0	61.5 fl oz
Early blight (<i>Alternaria solani</i>), Leaf spot (<i>Septoria lycopersici</i>) and Target spot (<i>Corynespora cassicola</i>)	Cabrio	11	8-12 oz	0	96 fl oz
Early blight (<i>Alternaria solani</i>), Leaf spot (<i>Septoria lycopersici</i>) and Target spot (<i>Corynespora cassicola</i>)	Bravo Ultrex	M	1.3-1.8 lb	0	18.3 lb
Early blight (<i>Alternaria solani</i>), Leaf spot (<i>Septoria lycopersici</i>) and Target spot (<i>Corynespora cassicola</i>)	Chloronil 720	M	1.4-2 pt	0	20 pt
Early blight (<i>Alternaria solani</i>), Leaf spot (<i>Septoria lycopersici</i>) and Target spot (<i>Corynespora cassicola</i>)	Echo 90DF	M	1.4-2 pt	0	15.1 lb a.i.
Early blight (<i>Alternaria solani</i>), Leaf spot (<i>Septoria lycopersici</i>) and Target spot (<i>Corynespora cassicola</i>)	Equus 720SST	M	1.4-2 pt	0	20 pt
Early blight (<i>Alternaria solani</i>), Leaf spot (<i>Septoria lycopersici</i>) and Target spot (<i>Corynespora cassicola</i>)	Kocide 3000	M	0.8-1.8 lb	0	26.7 lb
Early blight (<i>Alternaria solani</i>), Leaf spot (<i>Septoria lycopersici</i>) and Target spot (<i>Corynespora cassicola</i>)	Kocide 2000	M	1.5-2.3 lb	0	22.8 lb
Early blight (<i>Alternaria solani</i>), Leaf spot (<i>Septoria lycopersici</i>) and Target spot (<i>Corynespora cassicola</i>)	Champ WG ^{OG}	M	1.1 lb	3	16 lb
Early blight (<i>Alternaria solani</i>), Leaf spot (<i>Septoria lycopersici</i>) and Target spot (<i>Corynespora cassicola</i>)	Badge SC	M	1.8 pt	3	28.1 pt

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Early blight (<i>Alternaria solani</i>), Leaf spot (<i>Septoria lycopersici</i>) and Target spot (<i>Corynespora cassicola</i>)	Badge X2 ^{OG}	M	0.8-1.8 lb	3	8 lb Cu
Early blight (<i>Alternaria solani</i>), Leaf spot (<i>Septoria lycopersici</i>) and Target spot (<i>Corynespora cassicola</i>)	Cuprofix-Ultra 40	M	0.8-3 lb	3	20 lb
Early blight (<i>Alternaria solani</i>), Leaf spot (<i>Septoria lycopersici</i>) and Target spot (<i>Corynespora cassicola</i>)	Cuproxat	M	2.5-5 pt	3	39.4 pt
Early blight (<i>Alternaria solani</i>), Leaf spot (<i>Septoria lycopersici</i>) and Target spot (<i>Corynespora cassicola</i>)	Nordox 75WG ^{OG}	M	2-4 lb	0	9.14 lb
Early blight (<i>Alternaria solani</i>), Leaf spot (<i>Septoria lycopersici</i>) and Target spot (<i>Corynespora cassicola</i>)	Evito 480SC or Aftershock	11, M3	0.8-1.1 lb	5	216 fl oz
Early blight (<i>Alternaria solani</i>), Leaf spot (<i>Septoria lycopersici</i>) and Target spot (<i>Corynespora cassicola</i>)	Dexter Xcel	M3, 11, 3	36 fl oz	7	22.8 fl oz
Early blight (<i>Alternaria solani</i>), Leaf spot (<i>Septoria lycopersici</i>) and Target spot (<i>Corynespora cassicola</i>)	Dexter Max	11	2-5.7 fl oz	3	16 fl oz
Early blight (<i>Alternaria solani</i>), Leaf spot (<i>Septoria lycopersici</i>) and Target spot (<i>Corynespora cassicola</i>)	Flint	11	2-3 oz	3	72 fl oz
Early blight (<i>Alternaria solani</i>), Leaf spot (<i>Septoria lycopersici</i>) and Target spot (<i>Corynespora cassicola</i>)	Fontelis	7	24 fl oz	0	8-16 lb ⁸
Early blight (<i>Alternaria solani</i>), Leaf spot (<i>Septoria lycopersici</i>) and Target spot (<i>Corynespora cassicola</i>)	Gavel 75DF	22, M	1.5-2 lb	5	47 fl oz
Early blight (<i>Alternaria solani</i>), Leaf spot (<i>Septoria lycopersici</i>) and Target spot (<i>Corynespora cassicola</i>)	Inspire Super	9, 3	16-20 fl oz	0	21-22.4 lb
Early blight (<i>Alternaria solani</i>), Leaf spot (<i>Septoria lycopersici</i>) and Target spot (<i>Corynespora cassicola</i>)	mancozeb dry formulations	M	0.5-3 lb ⁸	5	16.8 qt
Early blight (<i>Alternaria solani</i>), Leaf spot (<i>Septoria lycopersici</i>) and Target spot (<i>Corynespora cassicola</i>)	mancozeb liquid Formulations	M	0.6-2.4 qt ⁸	5	42.7-58 lb ⁸
Early blight (<i>Alternaria solani</i>), Leaf spot (<i>Septoria lycopersici</i>) and Target spot (<i>Corynespora cassicola</i>)	ManKocide	M	1-3 lb	5	7.5 pt
Early blight (<i>Alternaria solani</i>), Leaf spot (<i>Septoria lycopersici</i>) and Target spot (<i>Corynespora cassicola</i>)	MilStop ^{OG}		2-5 lb/100 gal	3	27.1 fl oz
Early blight (<i>Alternaria solani</i>), Leaf spot (<i>Septoria lycopersici</i>) and Target spot (<i>Corynespora cassicola</i>)	Luna Sensation	28	5-7.6 fl oz	0	16 fl oz
Early blight (<i>Alternaria solani</i>), Leaf spot (<i>Septoria lycopersici</i>) and Target spot (<i>Corynespora cassicola</i>)	Mettle 125ME	7, 11	6-8 fl oz	5	24 fl oz
Early blight (<i>Alternaria solani</i>), Leaf spot (<i>Septoria lycopersici</i>) and Target spot (<i>Corynespora cassicola</i>)	Previcur Flex	3	0.7-1.5 pt	0	24.6 fl oz
Early blight (<i>Alternaria solani</i>), Leaf spot (<i>Septoria lycopersici</i>) and Target spot (<i>Corynespora cassicola</i>)	Priaxor	7, 11	4-8 fl oz	14	28 fl oz

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Early blight (<i>Alternaria solani</i>), Leaf spot (<i>Septoria lycopersici</i>) and Target spot (<i>Corynespora cassicola</i>)	Reason 500SC	11	5.5-8.2 fl oz	1	See label
Early blight (<i>Alternaria solani</i>), Leaf spot (<i>Septoria lycopersici</i>) and Target spot (<i>Corynespora cassicola</i>)	Revus Top 4.16F	3, 40	5.5-7 fl oz	0	See label
Early blight (<i>Alternaria solani</i>), Leaf spot (<i>Septoria lycopersici</i>) and Target spot (<i>Corynespora cassicola</i>)	Serenade ^{OG} ASO	44	2-6 qt	0	35 fl oz
Early blight (<i>Alternaria solani</i>), Leaf spot (<i>Septoria lycopersici</i>) and Target spot (<i>Corynespora cassicola</i>)	Serenade ^{OG} Optimum	44	4-20 oz	0	56 oz
Early blight (<i>Alternaria solani</i>), Leaf spot (<i>Septoria lycopersici</i>) and Target spot (<i>Corynespora cassicola</i>)	Serenade ^{OG} MAX	44	1-3 lb	1	72 oz
Early blight (<i>Alternaria solani</i>), Leaf spot (<i>Septoria lycopersici</i>) and Target spot (<i>Corynespora cassicola</i>)	Scala SC	9	7 fl oz	0	See label
Early blight (<i>Alternaria solani</i>), Leaf spot (<i>Septoria lycopersici</i>) and Target spot (<i>Corynespora cassicola</i>)	Switch 62.5WG	9, 12	11-14 oz	3	See label
Early blight (<i>Alternaria solani</i>), Leaf spot (<i>Septoria lycopersici</i>) and Target spot (<i>Corynespora cassicola</i>)	Tanos	27, 11	8-10 oz	See label	See label
Early blight (<i>Alternaria solani</i>), Leaf spot (<i>Septoria lycopersici</i>) and Target spot (<i>Corynespora cassicola</i>)	Top Cop with Sulfur	M	2 qt	See label	See label
Early blight (<i>Alternaria solani</i>), Leaf spot (<i>Septoria lycopersici</i>) and Target spot (<i>Corynespora cassicola</i>)	Trilogy ^{OG}	See label	1%	See label	See label
Fusarium wilt (<i>Fusarium oxysporum</i>) and Verticillium wilt (<i>Verticillium</i> sp.)	No fungicides available. Soil protectants such as Serenade Soil, resistant varieties and crop rotations are recommended.	NA	NA	NA	NA
Gray leaf spot (<i>Stemphylium</i> spp.)	Aprovia Top	7, 3	10.5-13.5 fl oz	0	53.6 fl oz
Gray leaf spot (<i>Stemphylium</i> spp.)	Bravo Ultrex	M	1.8-2.6 lb	0	18.3 lb
Gray leaf spot (<i>Stemphylium</i> spp.)	Chloronil 720	M	2-2.8 pt	0	20 pt
Gray leaf spot (<i>Stemphylium</i> spp.)	Echo 90DF	M	2-3 pt	0	15.1 lb a.i.
Gray leaf spot (<i>Stemphylium</i> spp.)	Equus 720SST	M	2-2.8 pt	0	20 pt
Gray leaf spot (<i>Stemphylium</i> spp.)	Dexter Xcel	M3, 11, 3	36 fl oz	7	216 fl oz
Gray leaf spot (<i>Stemphylium</i> spp.)	Dexter Max	11, M3	0.8-1.1 lb	5	9.14 lb
Gray leaf spot (<i>Stemphylium</i> spp.)	Flint 50WDG	11	3-4 oz	3	16 fl oz
Gray leaf spot (<i>Stemphylium</i> spp.)	Gavel 75DF	22, M	1.5-2 lb	5	8-16 lb ⁸
Gray leaf spot (<i>Stemphylium</i> spp.)	Inspire Super 2.82SC	9, 3	16-20 fl oz	0	47 fl oz
Gray leaf spot (<i>Stemphylium</i> spp.)	mancozeb dry formulations	M	0.5-3 lb ⁸	5	21-22.4 lb
Gray leaf spot (<i>Stemphylium</i> spp.)	mancozeb liquid Formulations	M	0.6-2.4 qt ⁸	5	16.8 qt

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Gray leaf spot (<i>Stemphylium</i> spp.)	ManKocide	M	1-3 lb	5	42.7-58 lb ⁸
Gray leaf spot (<i>Stemphylium</i> spp.)	Luna Sensation	7, 11	7.6 fl oz	3	27.1 fl oz
Gray leaf spot (<i>Stemphylium</i> spp.)	Mettle 125ME	3	6-8 fl oz	9	47 fl oz
Gray leaf spot (<i>Stemphylium</i> spp.)	Quadris Top	11, 3	8 fl oz	0	16 fl oz
Gray leaf spot (<i>Stemphylium</i> spp.)	Revus Top	3, 40	5.5-7 fl oz	1	See label
Gray leaf spot (<i>Stemphylium</i> spp.)	Ridomil Gold Bravo	4, M	2.5 pt	5	28 fl oz ⁹
Gray mold (<i>Botrytis cinerea</i>)	Actinovate AG ^{OG}	See label	3-12 oz	See label	See label
Gray mold (<i>Botrytis cinerea</i>)	Ariston	27, M5	1.9-3 pt	3	17.5 pt
Gray mold (<i>Botrytis cinerea</i>)	Botran 75W	14	See label	See label	See label
Gray mold (<i>Botrytis cinerea</i>)	Cabrio EG	11	12-16 oz	0	96 oz
Gray mold (<i>Botrytis cinerea</i>)	Bravo Ultrex	M	1.3-1.8 lb	0	18.3 lb
Gray mold (<i>Botrytis cinerea</i>)	Chloronil 720	M	1.4-2 pt	0	20 pt
Gray mold (<i>Botrytis cinerea</i>)	Echo 90DF	M	1.4-2 pt	0	15.1 lb a.i.
Gray mold (<i>Botrytis cinerea</i>)	Equus 720SST	M	1.4-2 pt	0	20 pt
Gray mold (<i>Botrytis cinerea</i>)	Endura 70 WG	7	9-12.5 oz	See label	25 oz
Gray mold (<i>Botrytis cinerea</i>)	Fontelis 1.67SC	7	24 fl oz	0	72 fl oz
Gray mold (<i>Botrytis cinerea</i>)	Inspire Super	3, 9	16-20 fl oz	0	80 fl oz
Gray mold (<i>Botrytis cinerea</i>)	Luna Sensation	7, 11	7.6 fl oz	3	27.1 fl oz
Gray mold (<i>Botrytis cinerea</i>)	Priaxor Xenium	7, 11	4-8 fl oz	0	24 fl oz
Gray mold (<i>Botrytis cinerea</i>)	Scala SC	9	7 fl oz	1	35 fl oz
Gray mold (<i>Botrytis cinerea</i>)	Switch 62.5WG	9, 12	11-14 oz	0	56 oz
Late blight (<i>Phytophthora infestans</i>)	Aftershock	11	5.7 fl oz	3	22.8 fl oz
Late blight (<i>Phytophthora infestans</i>)	Ariston	27, M5	1.9-3 pt	3	17.5 pt
Late blight (<i>Phytophthora infestans</i>)	Quadris	11	6.2 fl oz	0	37 fl oz
Late blight (<i>Phytophthora infestans</i>)	Quadris Opti	11, M	1.6 pt	0	5 app
Late blight (<i>Phytophthora infestans</i>)	Quadris Top	11, 3	8 fl oz	0	47 fl oz
Late blight (<i>Phytophthora infestans</i>)	Satori	11	5-6.2 fl oz	0	61.5 fl oz
Late blight (<i>Phytophthora infestans</i>)	Cabrio	11	8-16 oz	0	96 fl oz
Late blight (<i>Phytophthora infestans</i>)	Bravo Ultrex	M	1.3-1.8 lb	0	18.3 lb

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Late blight (<i>Phytophthora infestans</i>)	Chloronil 720	M	1.4-2 pt	0	20 pt
Late blight (<i>Phytophthora infestans</i>)	Echo 90DF	M	1.4-2 pt	0	15.1 lb a.i.
Late blight (<i>Phytophthora infestans</i>)	Equus 720SST	M	1.4-2 pt	0	20 pt
Late blight (<i>Phytophthora infestans</i>)	Kocide 3000	M	0.8-1.8 lb	0	26.7 lb
Late blight (<i>Phytophthora infestans</i>)	Kocide 2000	M	1.5-2.3 lb	0	22.8 lb
Late blight (<i>Phytophthora infestans</i>)	Champ WG ^{OG}	M	1.1 lb	3	16 lb
Late blight (<i>Phytophthora infestans</i>)	Badge SC	M	1.8 pt	3	28.1 pt
Late blight (<i>Phytophthora infestans</i>)	Badge X2 ^{OG}	M	0.8-1.8 lb	3	8 lb Cu
Late blight (<i>Phytophthora infestans</i>)	Cuprofix-Ultra 40	M	0.8-3 lb	3	20 lb
Late blight (<i>Phytophthora infestans</i>)	Cuproxat	M	2.5-6 pt	3	39.4 pt
Late blight (<i>Phytophthora infestans</i>)	Nordox 75WG ^{OG}	M	2-4 lb	0	See label
Late blight (<i>Phytophthora infestans</i>)	Dexter Xcel	M3, 11, 3	36 fl oz	7	216 fl oz
Late blight (<i>Phytophthora infestans</i>)	Dexter Max	11, M3	0.8-1.1 lb	5	9.14 lb
Late blight (<i>Phytophthora infestans</i>)	Evito 480 SC	11	5.7 fl oz	3	22.8 fl oz
Late blight (<i>Phytophthora infestans</i>)	Flint 50WDG	11	2-3 oz	3	16 fl oz
Late blight (<i>Phytophthora infestans</i>)	Forum 4.18F	40	6 fl oz	4	30 fl oz
Late blight (<i>Phytophthora infestans</i>)	Gavel 75DF	22, M	1.5-2 lb	5	8-16 lb ⁸
Late blight (<i>Phytophthora infestans</i>)	mancozeb dry formulations	M	0.5-3 lb ⁸	5	21-22.4 lb
Late blight (<i>Phytophthora infestans</i>)	mancozeb liquid Formulations	M	0.6-2.4 qt ⁸	5	16.8 qt
Late blight (<i>Phytophthora infestans</i>)	ManKocide	M	1-3 lb	5	42.7-58 lb ⁸
Late blight (<i>Phytophthora infestans</i>)	MiiStop ^{OG}	See label	2-5 lb/100 gal	See label	See label
Late blight (<i>Phytophthora infestans</i>)	OSO 5%	19	3.75-13 fl oz	0	4.2 oz a.i.
Late blight (<i>Phytophthora infestans</i>)	Orondis Opti (Premix)	M5, U15	1.75-2.5 pt	0	10 pt
Late blight (<i>Phytophthora infestans</i>)	Orondis Ultra (Premix)	40, U15	5.5-8 fl oz	1	32 fl oz
Late blight (<i>Phytophthora infestans</i>)	Previcur Flex	28	0.7-1.5 pt	5	7.5 pt
Late blight (<i>Phytophthora infestans</i>)	Presidio	43	3-4 fl oz	2	12 fl oz
Late blight (<i>Phytophthora infestans</i>)	Priaxor	7, 11	8 fl oz	0	24 fl oz
Late blight (<i>Phytophthora infestans</i>)	Ranman 400SC	21	2.1-2.8 fl oz	0	16.5 fl oz
Late blight (<i>Phytophthora infestans</i>)	Reason 500SC	11	5.5-8.2 fl oz	14	24.6 fl oz

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Late blight (<i>Phytophthora infestans</i>)	Gold Bravo SC	4, M	2.5 pt	5	* footnote ⁹
Late blight (<i>Phytophthora infestans</i>)	Gold/Copper	4, M	2 lb	14	3 app
Late blight (<i>Phytophthora infestans</i>)	Gold MZ WG	4, M	2.5 lb	5	10 lb
Late blight (<i>Phytophthora infestans</i>)	Revus Top	3, 40	5.5-7 fl oz	1	28 fl oz
Late blight (<i>Phytophthora infestans</i>)	Serenade ^{OG} ASO	44	2-6 qt	0	See label
Late blight (<i>Phytophthora infestans</i>)	Serenade ^{OG} Optimum	44	4-20 oz	0	See label
Late blight (<i>Phytophthora infestans</i>)	Serenade ^{OG} MAX	44	1-3 lb	0	See label
Late blight (<i>Phytophthora infestans</i>)	Tanos	27, 11	8-10 oz	3	72 oz
Late blight (<i>Phytophthora infestans</i>)	Top Cop with Sulfur	M	2 qt	See label	See label
Late blight (<i>Phytophthora infestans</i>)	Topguard EQ	11, 3	4-8 fl oz	0	4 app
Late blight (<i>Phytophthora infestans</i>)	Zampro	45, 40	14 fl oz	4	42 fl oz
Late blight (<i>Phytophthora infestans</i>)	Zing	22, M	36 fl oz	5	8 app
Leaf mold (<i>Cladosporium fulvum</i>)	Dexter Xcel	M3, 11, 3	36 fl oz	7	216 fl oz
Leaf mold (<i>Cladosporium fulvum</i>)	Aprovia Top	3, 7	10.5-13.5 fl oz	0	53.6 fl oz
Leaf mold (<i>Cladosporium fulvum</i>)	Gavel 75DF	22, M	1.5-2 lb	5	8-16 lb ⁵
Leaf mold (<i>Cladosporium fulvum</i>)	Inspire Super	9,3	16-20 fl oz	0	47 fl oz
Leaf mold (<i>Cladosporium fulvum</i>)	mancozeb dry formulations	M	0.5-3 lb ⁸	5	21-22.4 lb
Leaf mold (<i>Cladosporium fulvum</i>)	mancozeb liquid Formulations	M	0.6-2.4 qt ⁸	5	16.8 qt
Leaf mold (<i>Cladosporium fulvum</i>)	ManKocide	M	1-3 lb	5	42.7-58 lb ⁸
Leaf mold (<i>Cladosporium fulvum</i>)	OSO 5%	19	3.75-13 fl oz	0	4.2 oz a.i
Leaf mold (<i>Cladosporium fulvum</i>)	Mettle 125ME	3	6-8 fl oz	0	16 fl oz
Leaf mold (<i>Cladosporium fulvum</i>)	Quadris Top	11, 3	8 fl oz	0	47 fl oz
Leaf mold (<i>Cladosporium fulvum</i>)	Ridomil Gold Bravo	4, M	2.5 pt	See label	*footnote ⁹
Leaf mold (<i>Cladosporium fulvum</i>)	Revus Top	3, 40	5.5-7 fl oz	1	28 fl oz
Leaf mold (<i>Cladosporium fulvum</i>)	Tanos	27, 11	8 oz	3	72 oz
Southern blight (<i>Agroathelia rolfsii</i>)	Aftershock	11	2-5.7 fl oz	3	22.8 fl oz
Southern blight (<i>Agroathelia rolfsii</i>)	Aprovia Top	3, 7	10.5-13.5 fl oz	0	53.6 fl oz
Southern blight (<i>Agroathelia rolfsii</i>)	Blocker 4F	14	4.5 to 7.5 pt/100 gal	0	7.5 lb a.i.
Southern blight (<i>Agroathelia rolfsii</i>)	Cabrio 20EG	11	12-16 oz	0	96 oz

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Southern blight (<i>Agroathelia rolfsii</i>)	Evito 480SC	11	2-5.7 fl oz	3	22.8 fl oz
Southern blight (<i>Agroathelia rolfsii</i>)	Fontelis	7	1-1.6 fl oz ¹⁰	0	24 fl oz
Southern blight (<i>Agroathelia rolfsii</i>)	Priaxor 500SC	7, 11	4-8 fl oz	0	24 fl oz
White mold or Timber rot (<i>Sclerotinia sclerotiorum</i>)	Cabrio 20EG	11	12-16 oz	0	96 fl oz
White mold or Timber rot (<i>Sclerotinia sclerotiorum</i>)	Priaxor 500SC	7, 11	4-8 fl oz	0	24 fl oz
Viruses	A list of viruses of tomato can be found in Table 2. Plant resistant varieties. Table 3 provides a list of varieties with resistance to Tomato spotted wilt virus (TSWV). For viruses transmitted by insects, control of the insect vector using insecticides, polyethylene or polyethylene coated mulches and/or trap crops are recommended. Seed treatments and good sanitation practices are recommended for noninsect transmitted viruses.				

¹ Reference to commercial or trade names is made with the understanding that no discrimination is intended nor endorsement of a particular product by LSU or the LSU AgCenter is implied.

² Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

³ Rates are the amount of formulation per acre unless otherwise indicated. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

⁴ Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

⁵ Rates vary based on proximity to the Mississippi (west vs. east of the Mississippi river). Refer to labels for exact rates.

⁶ **Transplant production only.**

⁷ West of the Mississippi river do not apply more than 42.3 lb. per crop per year. East of the Mississippi river do not apply more than 58 lb. per crop per year.

⁸ Rates vary based on proximity to the Mississippi (west vs. east of the Mississippi river). Refer to labels for exact rates.

⁹ Do not exceed 15 lb. a.i. per acre of chlorothalonil containing products. Do not exceed 0.5 lb. a.i. per acre of foliar applied azoxystrobin containing products. Refer to label for additional restrictions.

¹⁰ All rates are per 1,000 square feet of row. Refer to the label for modes of application.

Tomato (Greenhouse)

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Bacterial canker	No bactericides are available. Seed treatments and good sanitation practices are recommended.	NA	NA	NA	NA
Fusarium crown and root Rot (<i>Fusarium oxysporum</i>)	No fungicides available. Resistant varieties, seed treatments and good sanitation practices are recommended.	NA	NA	NA	NA
Gray leaf spot (<i>Stemphylium solani</i>)	Gavel 75DF	22, M	1.5-2 lb	5	8-16 lb ⁵
Gray leaf spot (<i>Stemphylium solani</i>)	Inspire Super	9, 3	16-20 fl oz	0	47 fl oz
Gray leaf spot (<i>Stemphylium solani</i>)	mancozeb dry formulations	M	0.5-3 lb ⁵	5	21-22.4 lb
Gray leaf spot (<i>Stemphylium solani</i>)	mancozeb liquid Formulations	M	0.6-2.4 qt ⁵	5	16.8 qt
Gray leaf spot (<i>Stemphylium solani</i>)	ManKocide	M	1-3 lb	5	42.7-58 lb ⁵
Gray leaf spot (<i>Stemphylium solani</i>)	Tanos	27, 11	8 oz	3	72 oz
Gray mold and Ghost spot (<i>Botrytis cinerea</i>)	Actinovate AG ^{OG}	See label	3-12 oz	See label	See label
Gray mold and Ghost spot (<i>Botrytis cinerea</i>)	Botran 75W	14	1/100 gal	0	4 app
Gray mold and Ghost spot (<i>Botrytis cinerea</i>)	Fontelis 1.67SC	7	16-24 fl oz	0	72 fl oz
Gray mold and Ghost spot (<i>Botrytis cinerea</i>)	Scala SC	9	7 fl oz ⁶	1	35 fl oz
Gray mold and Ghost spot (<i>Botrytis cinerea</i>)	Switch 62.5WG	9, 12	11-14 oz ⁷	0	56 oz
Leaf mold (<i>Cladosporium fulvum</i>)	Gavel 75DF	22, M	1.5-2 lb	5	8-16 lb ⁵
Leaf mold (<i>Cladosporium fulvum</i>)	Inspire Super	9, 3	16-20 fl oz	0	47 fl oz
Leaf mold (<i>Cladosporium fulvum</i>)	mancozeb dry formulations	M	0.5-3 lb ⁵	5	21-22.4 lb
Leaf mold (<i>Cladosporium fulvum</i>)	mancozeb liquid Formulations	M	0.6-2.4 qt ⁵	5	16.8 qt
Leaf mold (<i>Cladosporium fulvum</i>)	ManKocide	M	1-3 lb	5	42.7-58 lb ⁵
Leaf mold (<i>Cladosporium fulvum</i>)	Tanos	27, 11	8 oz	3	72 oz
Powdery mildew (<i>Oidium neolycopersici</i>)	Fontelis	7	16-24 fl oz	0	72 fl oz
Powdery mildew (<i>Oidium neolycopersici</i>)	Inspire Super	9, 3	16-20 fl oz	0	47 fl oz
Powdery mildew (<i>Oidium neolycopersici</i>)	Microthiol Disperss ^{OG}	M	5 lb	See label	See label
Powdery mildew (<i>Oidium neolycopersici</i>)	Confine Extra	33	1-4 qt	See label	See label
Powdery mildew (<i>Oidium neolycopersici</i>)	Rampart	33	1-3 qt/100 gal	See label	See label
Powdery mildew (<i>Oidium neolycopersici</i>)	Pre-AM	See label	50 fl oz/100 gal	See label	See label
Powdery mildew (<i>Oidium neolycopersici</i>)	Quadris Top	11, 3	8 fl oz	0	47 fl oz

Disease (Pathogen)	Product Choices ¹	Product Mode of Action Group ²	Rate ³	PHI ⁴	Maximum Use
Powdery mildew (<i>Oidium neolycopersici</i>)	Rally 40WSP	3	2.5-4 fl oz	0	1.3 lb a.i.
Powdery mildew (<i>Oidium neolycopersici</i>)	Serenade ^{OG} ASO	44	2-6 qt	0	See label
Powdery mildew (<i>Oidium neolycopersici</i>)	Serenade ^{OG} Optimum	44	4-20 oz	0	See label
Powdery mildew (<i>Oidium neolycopersici</i>)	Serenade ^{OG} MAX	44	1-3 lb	0	See label
Powdery mildew (<i>Oidium neolycopersici</i>)	Switch 62.5WG	9, 12	11-14 oz ⁷	0	56 oz
Powdery mildew (<i>Oidium neolycopersici</i>)	Trilogy ^{OG}	See label	1%	See label	See label
Damping-off (<i>Pythium</i> spp.)	Confine Extra	33	1-4 qt	See label	See label
Damping-off (<i>Pythium</i> spp.)	Rampart	33	1-3 qt/100 gal	See label	See label
Damping-off (<i>Pythium</i> spp.)	Previcur Flex	28	12.8 fl oz/100 gal ⁸	0	4 app
Viruses and Viroids ⁹	A list of viruses and viroids of tomato can be found in Table 2. For viruses and viroids transmitted by insects, control of the insect vector using insecticides, screens, double entry doors and/or trap crops are recommended. Seed treatments and good sanitation practices are recommended for noninsect transmitted viruses and viroids. Plant-resistant varieties are listed in Table 3.		NA	NA	NA

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² Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

³ Rates are the amount of formulation per acre unless otherwise indicated. Usually, 100 gallons of water are required to give good coverage with boom sprayers.

⁴ Postharvest interval (PHI) is the minimum number of days allowed between the last application and harvest.

⁵ Rates vary based on proximity to the Mississippi (west vs. east of the Mississippi river). Refer to labels for exact rates.

⁶ Ventilate for at least 3 hours after application.

⁷ Do not apply to cherry or grape type tomatoes in the greenhouse.

⁸ Apply in the evenings through a drip irrigation system. Refer to label for additional application instructions and restrictions.

⁹ Viroids are the smallest "organisms" known to cause plant diseases. Viroids can also be transmitted by seeds, vegetative propagation, pollen, grafting and insects. Viroids are easily spread by contact with contaminated pruning tools, farm equipment, clothing, crop handling and contact between neighboring plants.

Table 1. Pepper virus diseases and modes of transmission.

Virus	Transmission
Alfalfa mosaic virus (AMV)	Aphids
Cucumber mosaic virus ¹ (CMV)	Aphids
Pepper mild mottle virus (PMMoV)	Seed Mechanical
Pepper mottle virus (PeMoV)	Aphids
Potato virus Y (PVY)	Aphids
Tobacco etch virus ² (TEV)	Aphids
Tobacco mosaic virus (TMV)	Seed Mechanical
Tomato spotted wilt virus (TSWV)	Thrips

¹ CMV is the most important virus disease of peppers worldwide.

² TEV and PVY normally occur together. Planting PVY-resistant varieties often helps control TEV because resistance to both viruses is closely linked.

Table 2. Tomato virus diseases and modes of transmission.

Virus	Transmission
Cucumber mosaic virus (CMV)	Aphids
Pepino mosaic virus ¹ (PeMV)	Mechanical
Potato leaf roll virus (PLRV)	Aphids
Potato virus Y (PVY)	Aphids
Tobacco etch virus (TEV)	Aphids
Tobacco mosaic virus (TMV)	Seed Mechanical
Tomato yellow leaf curl virus (TYLCV)	Whiteflies (silver leaf)
Tomato ringspot virus (TRSV)	Dagger nematode
Tomato spotted wilt virus (TSWV)	Thrips

¹ Reported mostly on tomatoes produced in the greenhouse.

Table 3. Tomato varieties with resistance to tomato spotted wilt virus and source of seeds.

Variety	Growth Habit	Source
Amelia	Fresh Market (indeterminate)	Harris Moran Seed Co.
Bella Rosa	Fresh Market (indeterminate)	Sakata
BHN 444	Fresh Market (indeterminate)	BHNSeed
BHN 602	Fresh Market (indeterminate)	BHNSeed
BHN 640	Fresh Market (indeterminate)	BHNSeed
Crista	Fresh Market (indeterminate)	Harris Moran Seed Co.
Finishline	Fresh Market (indeterminate)	Syngenta
Fletcher	Fresh Market (indeterminate)	North Carolina State University
Florida 7964	Fresh Market (indeterminate)	University of Florida
Mountain Glory	Fresh Market (indeterminate)	NCSU
Nico	Fresh Market (indeterminate)	Harris Moran Seed Co.
Red Defender	Fresh Market (indeterminate)	Harris Moran Seed Co.
Redline	Fresh Market (indeterminate)	Syngenta
Talladega	Fresh Market (indeterminate)	Syngenta
Top Gun	Fresh Market (indeterminate)	Twilley Seeds
BHN 685	Roma (saladette or determinate)	BHNSeed
Health Kick	Roma (saladette or determinate)	Park Seed
Muriel	Roma (saladette or determinate)	Sakata
Picus	Roma (saladette or determinate)	Seminis

Table 4. Example spray program for foliar disease control in tomato production. (when early blight is a consistent threat)

Table reproduced from the 2024 Southeastern U.S. Vegetable Handbook. Table prepared by S. Bost, Plant Pathologist, University of Tennessee

Harvest Period	Week	Chemical (Refer to the Label for rates.)	Number of Applications of Chemical Per Season ¹
Before Harvest	1	Mancozeb + Actigard ²	Mancozeb, 1; Actigard, 1
Before Harvest	2	Mancozeb + Copper	Mancozeb, 2; Copper, 1
Before Harvest	3	Fontelis ³ + Actigard	Fontelis, 1; Actigard, 2
Before Harvest	4	Mancozeb+ Copper	Mancozeb, 3; Copper, 2
Before Harvest	5	Inspire Super ³ + Actigard	Inspire Super 1; Actigard, 3
Before Harvest	6	Mancozeb + Copper	Mancozeb, 4; Copper, 3
Before Harvest	7	Fontelis + Actigard	Fontelis, 2; Actigard, 4
Before Harvest	8	Mancozeb + Copper	Mancozeb, 5; Copper, 4
Before Harvest	9	Inspire Super + Actigard	Inspire Super, 2; Actigard, 5
Before Harvest	10	Chlorothalonil + Copper	Chlorothalonil, 1; Copper, 5
During Harvest	11	Fontelis + Copper	Fontelis, 3; Copper, 6
During Harvest	12	Chlorothalonil + Copper	Chlorothalonil, 2; Copper, 7
During Harvest	13	Inspire Super + Copper	Inspire Super, 3; Copper, 8
During Harvest	14	Chlorothalonil + Copper	Chlorothalonil, 3; Copper, 9
During Harvest	15	Chlorothalonil + Copper	Chlorothalonil, 4; Copper, 10
		Finish season with Chlorothalonil	

¹ For most products, the total number of applications per season is restricted by the label.² In areas or seasons in which bacterial spot or speck problems are not expected, Actigard and Copper can be omitted.³ If late blight occurs, appropriate fungicides must be added. Fontelis and Inspire Super do not have any late blight activity.

Table 5. Biopesticides and fungicide alternatives for vegetables.

Active Ingredient	Product	Crops	Target Diseases/Pests	Greenhouse Use	OMRI Listed
acibenzolar-S-methyl	Actigard ¹	Chili pepper, cucurbits, lettuce, onion, spinach and tomato	Bacterial blights ⁴ , Downy mildew, Powdery mildew	No	No
<i>Bacillus amyloliquefaciens</i> D747	DoubleNickel ²	Most vegetables ⁵ , strawberries, citrus, fruit and nuts	Bacterial blights, Downy mildew, Leaf spots, Powdery mildew ⁴	Yes	Yes
<i>Bacillus pumilus</i> QST2808	Ballad Plus ³ Sonata	Bulb vegetables, cole crops, cucurbits, legumes, pepper, root crops, sweet corn and tomato	Early blight, Downy mildew, Late blight Leaf blights, Powdery mildew, Rust	Yes	Yes
<i>Bacillus subtilis</i> MBI 600	Subtilex NG ⁶	Cucurbits, eggplant, pepper and tomato	Powdery mildew ⁶ , Root diseases	Yes	No
<i>Bacillus subtilis</i> QST713	Cease ⁷ Serenade Max ⁷	Cole crops, cucurbits, leafy vegetables, legumes, pepper and tomato	Downy mildew, Leaf blights, Powdery mildew	Yes	Yes
Bacteriophage (Phage)	Agriphage ⁸	Most vegetables ⁵	Bacterial canker (foliar only), Bacterial speck, Bacterial spot	Yes	No
<i>Coniothyrium minitans</i>	Contans ⁹	Most vegetables ⁵	Lettuce drop, Timber rot, White mold	Yes	Yes
<i>Gladiolus cantenulatum</i>	PreStop Biofungicide	Most vegetables ⁵	Botrytis stem canker, Root diseases, Seed rots	Yes	No
<i>Gladiolus virens</i> GL-21	SoilGard 12G ¹⁰	Most vegetables ⁵	Root diseases, Seed rots	Yes	Yes
hydrogen peroxide	Oxidate Terricide	Most vegetables ⁵	Root diseases, Leaf blights	Yes	Yes
<i>Myrothecium verrucaria</i>	DiTera DF	Cole crops, cucurbits, eggplant, leafy vegetables, legumes, pepper, root and tuber vegetables and tomato	Nematodes	Yes	Yes
neem Oil	Trilogy ¹¹	Vegetables	Foliar diseases	Yes	Yes
Oils from cottonseed, corn and garlic	Mildew Cure ¹¹	Cucurbits and tomato	Powdery mildew	Yes	No
Oils from clove, rosemary and thyme	Sporatec ¹²	Most vegetables ⁵	Fungal leaf blights, Powdery mildew	Yes	Yes
Oil from soybean	Oleotrol-M ¹³	Most vegetables ⁵	Botrytis gray mold, Downy mildew, Powdery mildew	Yes	Yes
<i>Paecilomyces lilacinus</i>	MeloCon WG	Most vegetables ⁵	Nematodes	Yes	Yes
phosphorous compounds	Alude Fosphite Fungi-Phite Phostrol ProPhyt Rampart	Most vegetables ⁵	Downy mildew, Leaf blights, Powdery mildew	Yes	No
potassium bicarbonate ¹⁴	Armicarb Kaligreen Milstop	Most vegetables ⁵	Fungal leaf blights, Powdery mildew	Yes	Yes (except Armicarb)

Active Ingredient	Product	Crops	Target Diseases/Pests	Greenhouse Use	OMRI Listed
Potassium salts of fatty acids	M-Pede ¹⁵	Most vegetables ⁵	Powdery mildew	Yes	Yes
potassium silicate	Sil-MATRIX ¹⁶	Most vegetables ⁵	Botrytis, gray mold, Powdery mildew	Yes	Yes
<i>Pseudomonas chloroaphis</i>	Atezec	Most vegetables ⁵	Stem and root diseases	Yes (no field use allowed)	No
<i>Reynoutria sachalinensis</i> extract	Regalia ¹⁷	Most vegetables ⁵	Fungal leaf blights, Powdery mildew	Yes	Yes
<i>Streptomyces griseoviridis</i>	Mycostop ¹⁸	Most vegetables ⁵	Seedling, root and stem rots	Yes	Yes
<i>Streptomyces lydicus</i>	Actinovate AG ⁶	Most vegetables ⁵	Foliar blights, Seedling, root and stem rots	Yes	Yes
<i>Streptomyces lydicus</i> + iron, molybdenum and humic acid	Actino-Iron ⁹	Most vegetables ⁵	Seedling, root and stem rots	Yes	Yes
<i>Trichoderma harzianum</i> ¹⁸	T-22 RootShield PlantShield	Cole crops, eggplant, leafy vegetables, pepper and tomato	Seedling, root and stem rots	Yes	Yes
<i>Trichoderma viride</i>	Binab	Most vegetables ⁵	Seedling, root and stem rots	Yes	No

¹ Do not apply to plants stressed by heat, cold or moisture extremes.

² pH of spray solution should be between 6.0 and 8.0.

³ Labeled for sweet corn only.

⁴ Target diseases or pests are crop dependent. Refer to label for specific diseases and crop.

⁵ Most vegetables are covered on the label. Refer to the label for specific crops and diseases.

⁶ Apply to soil or potting medium; use as a foliar spray for powdery mildew.

⁷ Works best when applied prior to disease development and used in an integrated program.

⁸ Product is strain specific. Contact your State Vegetable Pathologist Extension Specialist for information on identifying bacterial strains. Apply in the evening or during cloud cover days.

⁹ Apply to soil or potting medium.

¹⁰ Do not apply in conjunction with chemical fungicides.

¹¹ May cause leaf burn; test a small number of plants before spraying entire crop.

¹² Addition of a spray adjuvant (spreader or penetrant) is recommended.

¹³ Tank-mix with a spreader-sticker.

¹⁴ pH of spray solution should not be below 7.0.

¹⁵ To avoid plant injury, do not mix with surfactants or apply to stressed plants. Product also has insecticidal properties.

¹⁶ Tank-mix with a nonionic surfactant for best results.

¹⁷ First application should be made before symptoms appear.

¹⁸ Can be added to potting mix or applied in-furrow to field soil.

Table 6. Various fungicides for use on vegetable crops.

Table reproduced from the 2024 Southeastern U.S. Vegetable Handbook.
Table prepared by R. Singh, Plant Pathologist, Louisiana State University.

Common Name	Trade Name(s)
azoxystrobin	Aframe (Syngenta)
azoxystrobin	Aubrac (AgChem Access)
azoxystrobin	Azoxystrobin SC (Willowood)
azoxystrobin	Azoxystar (Albaugh)
azoxystrobin	Dynasty (Syngenta)
azoxystrobin	Equation (Cheminova)
azoxystrobin	Equation SC (Cheminova)
azoxystrobin	Quadris (Syngenta)
azoxystrobin	Satori (Loveland Products)
azoxystrobin	Trevo (Innvictis Crop Care)
azoxystrobin	Willowood Azoxystrobin 2SC (Willowood USA)
chlorothalonil	Bravo Ultrex (Syngenta)
chlorothalonil	Bravo Weather Stik (Syngenta)
chlorothalonil	Bravo Zn (Syngenta)
chlorothalonil	Chloronil 720 (Syngenta) Chlorothalonil 720SC (Arysta) Echo 720 (SipcamAdvan) Echo 90DF (SipcamAdvan) Echo Zn (SipcamAdvan) Equus 500 Zn (MANA)
chlorothalonil	Equus 500ZN (Adama)
chlorothalonil	Equus 720SST (Adama)
chlorothalonil	Equus DF (Adama)
chlorothalonil	Initiate 720 (Loveland Products)
chlorothalonil	Initiate ZN (Loveland Products)
copper hydroxide	Champ DP Dry Prill (Nufarm)
copper hydroxide	Champ Formula 2 Flowable (Nufarm)
copper hydroxide	Champ WG (Nufarm)
copper hydroxide	Champion Wettable Powder (Nufarm)
copper hydroxide	Kentan DF (Isagro USA)

Common Name	Trade Name(s)
copper hydroxide	Kocide DF (DuPont; Certis USA)
copper hydroxide	Kocide 2000 (DuPont; Certis USA)
copper hydroxide	Kocide 3000 (DuPont; Certis USA)
copper hydroxide	Nu Cop 3L (Albaugh)
copper hydroxide	Nu Cop 50WP (Albaugh)
copper hydroxide	Nu Cop HB (Albaugh)
copper octanoate	Camelot-O (Sepro)
copper (cuprous) oxide	Nordox (NORDOX Industrier AS)
copper (cuprous) oxide	Nordox 75WG (NORDOX Industrier AS)
copper sulfate (basic)	Basic Copper 53 (Albaugh)
copper sulfate (basic)	Cuprofix Ultra 40 Disperss (UPI)
copper sulfate (basic)	Cuproxat (NuFarm)
copper sulfate pentahydrate	Mastercop (Adama)
copper sulfate pentahydrate	Aliette WDG Fungicide (Bayer)
fosetyl-Al	Linebacker WDG (NovaSource)
fludioxonil	Cannonball (Syngenta)
fludioxonil	Dyna-Shield Fludioxonil (Loveland)
fludioxonil	Maxim 4FS (Syngenta)
fludioxonil	Scholar SC (Syngenta)
fludioxonil	Spirato 480FS (Nufarm)
iprodione	Enclosure 4 (Devgen)
iprodione	Iprodione 4L AG (Arysta)
iprodione	Meteor (UPI)
iprodione	Nevado 4F (MANA)
iprodione	Rovral 4 Flowable Fungicide (Bayer: FMC)
mancozeb	Dithane F-45 Rainshield (Dow) Dithane M-45 (Dow)
mancozeb	Koverall (Cheminova)
mancozeb	Manzate Flowable (UPI)

Common Name	Trade Name(s)
mancozeb	Manzate Max (UPI)
mancozeb	Manzate Pro-Stick (UPI)
mancozeb	Penncozeb 4FL (UPI)
mancozeb	Penncozeb 75DF (UPI)
mancozeb	Penncozeb 80WP (UPI)
mancozeb	Roper DF Rainshield (Loveland Products)
mefenoxam	Ridomil Gold GR (Syngenta)
mefenoxam	Ridomil Gold SL (Syngenta)
mefenoxam	Ultra Flourish (Nufarm)
myclobutanil	Rally 40WSP (Dow)
myclobutanil	Sonoma 25EW AG (Albaugh)
myclobutanil	Sonoma 40WSP (Albaugh)
pentachloronitrobenzene (PCNB)	Blocker 4F
phosphite (potassium)	Helena Prophyt (Helena)
phosphite (potassium)	Confine Extra (Winfield Solutions)
phosphite (potassium)	Reveille (Helena)
phosphite (mono-and-dibasic salts)	Phostrol (Nufarm)
phosphorous acid (mono-and-dipotassium salts)	Alude (Cleary)
phosphorous acid (mono-and-dipotassium salts)	Fosphite Fungicide (JK Biotech)
phosphorous acid (mono-and-dipotassium salts)	Fungi-Phite (Plant Protectants)
phosphorous acid (mono-and-dipotassium salts)	K-Phite 7LP AG (Plant Food Systems)
phosphorous acid (mono-and-dipotassium salts)	Rampart (Loveland Products)
propamocarb hydrochloride	Previcur Flex (Bayer)
propamocarb hydrochloride	Promess (Agriphar)
propiconazole	AmTide Propiconazole 41.8% EC (AmTide)
propiconazole	Bumper 41.8EC (Adama)

Common Name	Trade Name(s)
propiconazole	Bumper ES (Adama)
propiconazole	Fitness (Loveland Products)
propiconazole	Propi-star EC (Albaugh)
propiconazole	Propicure 3.6F (Direct Ag Source)
propiconazole	Propimax EC (Dow AgroSciences)
propiconazole	Shar-Shield PPZ (Sharda USA)
propiconazole	Tilt (Syngenta)
propiconazole	Topaz (Winfield Solutions)
propiconazole	Willowood Propicon 3.6EC (Willowood USA)
sulfur	Cosavet-DF (Sulphur Mills Limited)
sulfur	CSC 80% Thiosperse (Martin Resources) CSC Dusting Sulfur (Martin Resources) CSC Thioben 90 (Martin Resources) CSC Wettable Sulfur (Martin Resources)
sulfur	Dusting Sulfur (Loveland Products; Wilbur-Ellis) First Choice Dusting Sulfur (Loveland Products) IAP Dusting Sulfur (Independent Agribusiness Professionals)
sulfur	InteGro Magic Sulfur Dust (InteGro Inc.)
sulfur	Kumulus DF (Arysta) Liquid Sulfur Six (Helena) Micro Sulf (Nufarm)
sulfur	Microfine Sulfur (Loveland Products)
sulfur	Microthiol Disperss (UPI)
sulfur	Special Electric Sulfur (Wilbur-Ellis)
sulfur	Spray Sulfur (Wilbur-Ellis)
sulfur	Sulfur 6L (Arysta) Sulfur 90W (Drexel) Sulfur DF (Wilbur-Ellis)
sulfur	That Flowable Sulfur (Stoller Enterprises)
sulfur	Thiolux (Loveland Products)
sulfur	Wettable Sulfur (Helena)
sulfur	Yellow Jacket Dusting Sulfur (Georgia Gulf Sulfur)
sulfur	Yellow Jacket Wettable Sulfur (Georgia Gulf Sulfur)
tebuconazole	AmTide TEBU 3.6F (AmTide)
tebuconazole	Barrier (Real Farm Technologies)

Common Name	Trade Name(s)
tebuconazole	Folicur (Bayer)
tebuconazole	Monsoon (Loveland Products)
tebuconazole	Onset 3.6L (Winfield Solutions)
tebuconazole	Orius 3.6F (Adama)
tebuconazole	Solera Tebuconazole 3.6F (Solera)
tebuconazole	Tebu-Crop 3.6F (Sharda USA)
tebuconazole	Tebucon 3.6F (Repar Corp.)
tebuconazole	TebuStar 3.6L (Albaugh)
tebuconazole	Tebuzol 3.6F (UPI)
tebuconazole	Toledo 3.6F (Rotam)
thiophanate-methyl	Cercobin (Cheminova)
thiophanate-methyl	Incognito 4.5F (Adama)
thiophanate-methyl	Incognito 85 WDG (Adama)
thiophanate-methyl	Thiophanate-Methyl 85 WDG (Adama)
thiophanate-methyl	T-Methyl 4.5F (Nufarm)
thiophanate-methyl	T-Methyl 70W WSB (Nufarm)
thiophanate-methyl	Topsin 4.5FL (UPI)
thiophanate-methyl	Topsin M 70WDG (UPI)

Table 7. Fungicide mode of actions for fungicide-resistance management.

Table reproduced from the 2024 Southeastern U.S. Vegetable Handbook. Table prepared by L. M. Quesada-Ocampo, Plant Pathologist, NCSU.

FRAC Code	Fungicide Resistance Risk	Group Name	Example Active ingredients	Example Products
P1	Unknown	Benzo-thiadiazole (BTH)	acibenzolar-S-methyl	Actigard
M1	Low	Inorganic copper	fixed copper	Copper (generic)
M2	Low	Inorganic sulfur	sulfur	Sulfur (generic)
M3	Low	Dithiocarbamates	mancozeb	Mancozeb (generic)
M5	Low	Chloronitriles	chlorothalonil	Chlorothalonil (generic)
1	High	Methyl benzimidazole carbamates (MBC)	thiophanate-methyl	Topsin M
2	Medium to high	Dicarboximides	iprodione	Rovral
3	Medium	Demethylation inhibitors (DMI)	triflumizole myclobutanil	Procure Rally
4	High	Phenylamide	mefenoxam	Ridomil Gold
7	Medium to high	Succinate dehydrogenase inhibitors (SDHI)	boscalid penthiopyrad	Endura Fontelis
9	Medium	Anilino-pyrimidines (AP)	pyrimethanil	Scala
11	High	Quinone outside inhibitors (QoI)	pyraclostrobin trifloxystrobin azoxystrobin	Cabrio Flint Quadris
12	Low to medium	Phenylpyrroles (PP)	fludioxinil	Maxim
13	Medium	Aza-naphthalenes	quinoxifen	Quintec

FRAC Code	Fungicide Resistance Risk	Group Name	Example Active ingredients	Example Products
14	Low to medium	Aromatic hydrocarbons (AH)	dichloran	Botran
21	Medium to high	Quinone inside Inhibitors (Qil)	cyazofamid	Ranman
22	Low to medium	Benzamides (toluamides) Thiazole carboxamide	zoxamide	Gavel (contains zoxamide and mancozeb)
27	Low to medium	Cyanoacetamide-oximes	cymoxanil	Curzate
28	Low to medium	Carbamates	propamocarb	Presidio
29	Unknown	Dinitroanilines	fluazinam	Omega
33	Low	Phosphonates	fosetyl-Al	Aliette
40	Low to medium	Carboxylic acid amides (CAA)	dimethomorph mandipropamid	Forum Revus
43	High	Benzamides	fluopicolide	Presidio

This vegetable section was revised October 2023 by R. Singh.

Home Gardens

Fruit and Nut Trees

Table 1: Fungicides available for disease management for home fruit and nut production.

Chemical	Product Name	Type of Fungicide	Crops	Diseases Controlled	Comments
calcium polysulfides	Hi-Yield Improved Lime Sulfur Spray	Contact	Most fruits, do not use on apricots	Anthrachnose, brown rot, leaf curl, leaf spot, mummy berry, powdery mildew, rust, scab and shot hole	Highly toxic. Do not apply when temperatures exceed 85 F. Do not apply with oil or near the time of an oil application.
captan	Bonide Captan 50WP, Hi-Yield Captan 50W Fungicide	Contact	Apples, apricots, blueberries, cherries, grapes, nectarines, peaches, plums and strawberries	Bitter rot, black rot, Botrytis rot, brown rot, cedar-apple rust, downy mildew, fly-speck, forg-eye, fruit rots and spots, leaf spots, mummy berry, quince rust, scab and sooty blotch	Bonide Captan 50 WP can be used on blackberries for anthracnose and Botrytis gray mold.
captan + insecticides	Bonide A Complete Fruit Tree Spray Concentrate, Godon's Liquid Fruit Tree Spray, Martin's Rescue One Spray Protection	Contact	Apples, apricots, cherries, grapes, nectarines, peaches, plums and strawberries	Bitter rot, black rot, Botrytis rot, brown rot, cedar-apple rust, downy mildew, fly-speck, forg-eye, fruit rots and spots, leaf spots, quince rust, scab and sooty blotch	None
chlorothalonil	Bonide Fung-onil Multi-purpose Fungicide ¹ , Ferti-lome Broad Spectrum Landscape and Garden Fungicide ¹ , GardenTech Daconil Fungicide ¹ , Gordon's Multi-Purpose Fungicide, Hi-Yield Vegetable, Flower, Fruit and Ornamental Fungicide and Ortho Max Garden Disease Control Concentrate	Contact	Apricots, blueberries, cherries, nectarines, peaches, plums and prunes	Anthrachnose, brown rot (blosson and twig blights), cherry leaf spot, leaf curl, mummy berry, scab and shot hole	None
copper	Bonide Copper Spray or Dust, Bonide Liquid Copper Fungicide ¹ , Concern Copper Soap Fungicide, Gordon's Bordeaux Mixture, Hi-Yield Bordeaux Mix Fungicide, Hi-Yield Copper Fungicide, Lilly Miller Cueva Copper Soap Fungicide	Contact	Apples, apricots, berries, cherries, citrus, grapes, nectarines, peaches, pears, pecans, plums, prunes, quince and strawberries	Angular leaf spot, anthracnose, bacterial canker, bacterial leaf spot, bitter rot, black rot, blotch, brown rot, can cankers, cedar-apple rust, downy mildew, fire blight, fruit spots, gray mold, leaf blights, leaf curl, leaf scorch, leaf spot, melanose, powdery mildew, quince rust, leaf curl, scab and shot hole	Do not apply after shuck split or before harvest on stone fruits. Do not apply after early bloom on blueberries.
copper + insecticides	Bonide Garden Dust and Bonide Dragoon Dust with Copper	Contact	Apples, apricots, berries, cherries, citrus, grapes, nectarines, peaches, pears, pecans, plums, prunes, quince and strawberries	Angular leaf spot, anthracnose, bacterial canker, bacterial leaf spot, bitter rot, black rot, blotch, brown rot, can cankers, cedar-apple rust, downy mildew, fire blight, fruit spots, gray mold, leaf blights, leaf curl, leaf scorch, leaf spot, melanose, powdery mildew, quince rust, leaf curl, scab and shot hole	None

Chemical	Product Name	Type of Fungicide	Crops	Diseases Controlled	Comments
mancozeb	Bonide Mancozeb Flowable with Zinc Concentrate	Contact	Grapes	Black rot, bunch rot, Eutypa dieback (formerly known as dead arm) and downy mildew	None
myclobutanil	Eagle 20EW, Spectracide Immunox Multi-Purpose Fungicide Spray Concentrate	Systemic	Apples, apricots, cherries, grapes, nectarines, peaches, plums and prunes	Anthracnose, black rot, brown rot, powdery mildew, rust, scab and shot hole	None
neem oil	Bonide Rose Rx 3 in 1 ¹ , Bonide Tomato and Vegetable 3 in 1, Concern Garden Defense Multi-Purpose Spray ¹ , Ferti-lome Rose, Flower and Vegetable Spray, Bardens Alive! Shield-All II, Garden Safe Fungicide 3-in-1 ¹ , Green Light Neem Concentrate, Green Light Powdery Mildew Killer RTU, Natural Guard Neem Py, Southern Ag Triple Action Neem Oil	Contact	All fruits	Anthracnose, black rot, Botrytis blight, downy mildew, fungal leaf spots, powdery mildew, rust and scab	None
neem oil + insecticides	Ferti-lome Triple Action Plus ¹ , Green Light Neem ¹ Ready-To-Use	Contact	All fruits and nuts	Anthracnose, Botrytis, downy mildew, fungal leaf spots and blights, powdery mildew, rust and scab	None
phosphorus acid	Monterey Garden-Fos Systemic Fungicide	Systemic	Apples, berries, citrus, grapes, loquats, pears, quince, stone fruits and strawberries	Apple scab, downy mildew, fire blight and root and collar and fruit rots caused by <i>Photophthora</i> spp.	None
potassium carbonate	Garden-ville Potassium Bicarbonate	Contact	All fruits	Powdery mildew	None
propiconazole	Bonide Infuse Systemic Disease Control, Ferti-lome Liquid Systemic Fungicide II, Gordon's Systemic Fungicide	Systemic	Apples, citrus, pecans and walnuts	Anthracnose, fungal leaf spots, powdery mildew, rust and scab	None
propiconazole	Bonide Infuse Systemic Disease Control, Bonide Infuse Systemic Disease Control Lawn and Landscape Ready to Spray	Systemic	Apricots, cherries, nectarines, peaches, plums and prunes	Brown rot (blossom blight and fruit), cherry leaf spot and powdery mildew	None
streptomycin sulfate	Ferti-lome Fire Blight Spray	Contact	Apple and pear	fire blight	None
sulfur	Bonide Sulfur Plant Fungicide, Ferti-lome Dusting Sulfur, Green Light Wettable Dusting Sulfur, Hi-Yield Wettable Dusting Sulfur, Lill Miller Sulfur Dust, Safer Brand Garden Fungicide II, Southern Ag Wettable or Dusting Sulfur (peaches only)	Contact	Apples, berries, cherries, citrus, grapes, nectarines, peaches, pears, plums, prunes and strawberries	Black rot, brown rot, cedar-apple rust, frog-eye, leaf spot, powdery mildew, quince rust, rust, scab, shot hole and sooty blotch	None
sulfur + potassium salts	Safer Brand 3-in-1 Garden Spray ¹	Contact	Apples, grapes, pears and strawberries	Powdery mildew	None

¹Available in concentrate and ready-to-use formulations.

Landscapes

Table 1: Fungicides available for disease management in home landscapes.

Chemical	Product Name	Type of Fungicide	Crops	Diseases Controlled	Comments
calcium polysulfides	Hi-Yield Improved Lime Sulfur Spray	Contact	Roses and most landscape trees and shrubs	Anthrachnose, black spot, powdery mildew and rust	Highly toxic. Do not apply when temperatures exceed 85 F. Do not apply with oil or near the time of an oil application.
captan	Bonide Captan 50WP, Hi-Yield Captan 50W Fungicide, SA-50 Home and Garden Captan Fungicide	Contact	Azalea, camellis, carnation, chrysanthemum, gladiolus, tuberous begonia and rose	Black spot, Botrytis flower blight, damping-off, fungal leaf spots, petal blight, rust and tuber rot	Hi-Yield Captan 50W Fungicide can only be used on azalea, camellia, chrysanthemum and rose.
captan + insecticides	Bonide A Complete Fruit Tree Spray Concentrate, Gordon's Liquid Fruit Tree Spray, Martin's Rescue One Spray Protection	Contact	Evergreens, flowers and roses	Black spot, flower blight, leaf spots and rust	None
chlorothalonil	Bonide Fung-onil Multi-purpose Fungicide ¹ , Ferti-lome Broad Spectrum Landscape and Garden Fungicide ¹ , Garden Tech Daconil Fungicide ¹ , Hi-Yield Vegetable Flower Fruit and Ornamental Fungicide, Ortho Disease B Gon Garden Fungicide Concentrate, Ortho Max Garden Disease Control Concentrate, SA-50 Liquid Ornamental and Vegetable Flowable Fungicide	Contact	Most landscape plants	Anthrachnose, Botrytis blight, downy mildew, fungal leaf spots and blights, powdery mildew and rust	None
mancozeb	Bonide Mancozeb Flowable with Zinc Concentrate, SA-50 Dithane M-45	Contact	Most landscape plants	Anthrachnose, downy mildew, fungal leaf spots and blights and rust	None
myclobutanil	Spectracide Immunox Multi-purpose Fungicide Spray Concentrate	Systemic	Most landscape plants	Anthrachnose, black spot, blossom blight, Cercospora leaf spot, petal blight, powdery mildew, rust and scab	None
myclobutanil + insecticide + fertilizer	Spectracide Immunox 3-in-1 Insect and Disease Control Plus Fertilizer, Spectracide Immunox Plus Insect and Disease Control, Spectracide Immunox Plus Insect and Disease Multi-purpose Concentrate	Systemic	A variety of landscape plants	Anthrachnose, black spot, blossom blight, Cercospora leaf spot, petal blight, powdery mildew, rust and scab	None

Chemical	Product Name	Type of Fungicide	Crops	Diseases Controlled	Comments
neem oil	Bonide Rose Rx 3-in-1 ¹ , Bonide Tomato and Vegetable 3-in-1, Concern Garden Defense Multi-purpose Spray ¹ , Ferti-lome Rose Flower and Vegetable Spray, Gardens Alive! Shield-All II, Green Light Neem Concentrate, Green Light Powdery Mildew Killer RTU, Green Light Rose Defense, Green Light Rose Defense Ready-To-Use, Garden Safe Fungicide 3-in-1 ¹ , Natural Guard Neem Py, Southern Ag Triple Action Neem Oil	Contact	Most landscape plants and houseplants	Anthrachnose, black spot, Botrytis, downy mildew, fungal leaf spots and blights, powdery mildew, rust and scab	Can be used for organic gardening. Do not use on sensitive plants (flowers of impatiens, fuchsia, hibiscus and some rose and carnation varieties).
neem oil + insecticides	Ferti-lome Triple Action Plus ¹ , Green Light NeemII Ready-To-Use, Green Light Rose Defense II Ready-To-Use	Contact	Most landscape flowers, shrubs and houseplants	Anthrachnose, black spot, Botrytis, downy mildew, fungal leaf spots and blights, powdery mildew, rust and scab	Do not use on sensitive plants (flowers of impatiens, fuchsia, hibiscus and some rose and carnation varieties).
phosphorus acid	Monterey Garden-Fos Systemic Fungicide	Systemic	Most landscape plants	Bacterial blight, downy mildew, <i>Phytophthora</i> and <i>Pythium</i>	None
potassium carbonate	Garden-ville Potassium Bicarbonate	Contact	Most landscape plants	Powdery mildew	None
propiconazole	Bonide Infuse Systemic Disease Control, Bonide Infuse Systemic Disease Control Lawn and Landscape Ready to Spray, Ferti-lome Liquid Systemic Fungicide II, Ferti-lome Liquid Systemic Fungicide II Ready to Spray, Gordon's Systemic Fungicide	Systemic	Most landscape plants	Anthrachnose, black spot, fungal leaf spots, powdery mildew, rust and scab	Do not apply to African violets, begonias, Boston ferns or geraniums.
propiconazole	Bonide Infuse Systemic Disease Control, Bonide Infuse Systemic Disease Control Lawn and Landscape Ready to Spray	Systemic	Most landscape plants	Bulb, corm, rhizome, root, crown and stem rots	Do not apply to African violets, begonias, Boston ferns, or geraniums. Do not apply to home orchards.
streptomycin sulfate	Ferti-lome Fire Blight Spray	Contact	Chrysanthemum, dieffenbachia, philodendron, pyracantha and rose	Fire blight, bacterial wilt, bacterial stem rot, bacterial leaf spot and crown gall	For crown gall, apply as a soil drench.
sulfur	Bonide Sulfur Plant Fungicide, Ferti-lome Dusting Sulfur, Green Light Wettable Dusting Sulfur, Lilly Miller Sulfur Dust, Safer Brand Garden Fungicide II, Southern Ag Wettable or Dusting Sulfur	Contact	Most landscape plants	Powdery mildew, rust, downy mildew and Botrytis blight	Do not re-enter treated area for 24 hours after application. Do not use during periods of high temperatures (85 F or higher) or within 2 to 4 weeks of using an oil spray.
sulfur + insecticides	Bayer Advanced Nataria Insect Diseases and Mite Control	Contact	Most landscape plants	Black spot, Botrytis blight, downy mildew, leaf spots, powdery mildew, rust and scab	None
sulfur + potassium salts	Safer Brand 3-in-1 Garden Spray ¹	Contact	Most landscape plants	Black spot, leaf spots, powdery mildew and rust	Do not use in full sun, when temperature exceeds 90 F, or within 4 weeks of using an oil spray.
tebuconazole	Bayer Advanced Disease control for Roses, Flowers and Shrubs	Systemic	Most landscape plants and houseplants	Black spot, leaf spots, powdery mildew and rust	Do not apply to plants grown for food.

Chemical	Product Name	Type of Fungicide	Crops	Diseases Controlled	Comments
tebuconazole + insecticides	Bayer Advanced 3-in-1 Insect, Disease and Mite Control ¹	Systemic	Most landscape plants and houseplants	Anthrachnose, black spot, leaf spot, petal blight, powdery mildew, rust and scab	Apply as a foliar spray every 7-14 days as necessary. Do not apply to plants grown for food.
tebuconazole + insecticides	Bayer Advanced All-in-One Rose and Flower Care, Bonide Rose Rx Systemic Drench	Systemic	Most landscape shrubs and flowers	Leaf spots (including black spot), powdery mildew, rust and southern blight	Apply as a drench every 6 weeks. Do not apply to plants grown for food.
thiophanate methyl	Bonide Infuse Systemic Disease Control Lawn and Landscape; Ferti-lome Halt Systemic Rose, Flower, Lawn, Ornamental Fungicide; SA-50 Thiomyl Turf and Ornamental Systemic Fungicide	Systemic	Most landscape plants	Anthrachnose, flower blight, fungal bulb/corm/rhizome rots, fungal leaf spots and blights, fungal root/crown/stem rots, petal blight, powdery mildew and scab	Apply as a foliar spray, soil drench or bulb soak.
triforine	Ortho RosePride Disease Control Concentrate, Ortho RosePride Rose and Shrub Disease Control Concentrate	Systemic	A variety of landscape plants	Azalea petal blight, black spot, Entomosporium leaf spot, powdery mildew and rust	Do not use on plants grown for food.
triforine + insecticides	Ortho Orthenex Insect and Disease Control ¹	Systemic	A variety of landscape plants	Azalea petal blight, black spot, Entomosporium leaf spot, powdery mildew and rust	Do not use on plants grown for food.

¹Available in concentrate and ready-to-use formulations.

Lawns

Table 1: Fungicides available for disease management of home lawns.

Chemical	Product Name	Type of Fungicide	Diseases Controlled	Comments
captan	Hi-Yield Captan Fungicide 50WP, Southern Ag Home & Garden Captan Fungicide 50WP	Contact	Damping-off, large patch, leaf spots (melting out), root rot	None
copper	Ferti-lome Blackspot Powdery Mildew Control, SA-50 Southern Ag Liquid Copper Fungicide, Bonide Liquid Copper Soap Liquid Fungicide	Contact	Alga, ascochyta leaf blight, dollar spot, rust	Do not mix with liquid fertilizers. Don't use in spray solutions with a pH of less than 6.5. May cause staining of masonry, etc.
myclobutanil	Ferti-lome F Stop, Green Light Fung-Away Systemic Lawn Fungicide, Spectracide Immunox Lawn Disease Control (Concentrate or Granules), Spectracide Immunox Multi-purpose Fungicide Spray Concentrate	Systemic	Anthracnose, dollar spot, fusarium blight, large patch, leaf spot (melting out), spring dead spot, take-all patch, zoysia patch	None
myclobutanil + insecticide + fertilizer	Spectracide Immunox 3-in-1 Insect & Disease Control Plus Fertilizer, Spectracide Immunox Plus Insect & Disease Control, Spectracide Immunox Plus Insect & Disease Control Multipurpose Concentrate	Systemic	Dollar spot, large patch, leaf spot (melting out), spring dead spot, summer patch	None
phosphorus acid	Monterey Garden-Fos Systemic Fungicide	Systemic	Pythium blight, Pythium root rot	None
propiconazole	Bayer Advanced Fungus Control for Lawns Ready to Spray, Bayer Advanced Fungus Control for Lawns Ready to Spread Granules II, Bonide Infuse Systemic Disease Control Lawn & Landscape Ready to Spray, Ferti-lome Liquid Systemic fungicide II, Gordon's Systemic Fungicide	Systemic	Anthracnose, dollar spot, fusarium blight, gray leaf spot, large patch, leaf spot (melting out), powdery mildew, rust and take-all patch	None
thiophanate-methyl	Bonide Infuse Systemic Disease Control Lawn & Landscape Granules; Ferti-lome Halt Systemic Rose, Flower, Lawn, Ornamental Fungicide; SA-50 Thiomyl Turf and Ornamental Systemic Fungicide	Systemic	Anthracnose, dollar spot, fusarium blight, large patch, leaf spot (melting out), summer patch	None
triadimefon	Bonide Fungi-onil Lawn Disease Control, Bayer Advanced Fungus Control For Lawns, Green Light Fung-Away Systemic Lawn Fungicide Spray, High Yield Fungicide Granules	Systemic	Dollar spot, fairy rings, gray leaf spot, large patch, take-all patch	None

¹Available in concentrate and ready-to-use formulations.

Table 2: Efficacy of available fungicides for disease management of home lawns.¹**Table Legend**

Efficacy ¹	Number
Consistently good to excellent results	4
Good to excellent control in most experiments	3
Fair to good control in most experiments	2
Inconsistent but performs well in some instances	1
Not Effective	-

Fungicides	Dollar spot	Large patch	Take-all patch, Bermuda decline, Ggg ²	Gray leaf spot	Leaf spots, Melting out	Fairy rings
azoxystrobin	-	4	(3) ³	4	3	3
myclobutanil	4	2	-	-	1	-
propiconazole	4	2	-2	2	2	-
triadimefon	4	4	-2	2	-	3
thiophanate-methyl	4	-	-	4	2	-

¹Efficacy data are based on trials using commercial formulations of the fungicides, not the formulations readily available to homeowners. Ratings were compiled by Drs. Vincelli and Williams at the University of Kentucky (PPA-1 Chemical Control of Turfgrass Diseases 2020; <http://pest.ca.uky.edu/PSEP/Manuals/ppa1.pdf>).

²*Gaeumannomyces graminis* var. *avenae*

³Ratings within parentheses are for take-all patch caused by *Gaeumannomyces graminis* var. *avenae* (Ggg).

Vegetables

Table 1: Fungicides available for disease management for home vegetable gardens.

Chemical	Product Name	Type of Fungicide	Crops	Diseases Controlled	Comments
captan	Hi-Yield Captan 50W Fungicide	Contact	Beans, beats, cabbage, corn, melons, peas, spinach, squash and swiss chard	Damping-off diseases	Seed treatment only
chlorothalonil	Bonide Fung-onil Multi-purpose Fungicide; Ferti-lome Broad Spectrum Landscape & Garden Fungicide, GardenTech Daconil® Fungicide; Hi-Yield Vegetable, Flower, Fruit and Ornamental Fungicide, Scotts Ortho® MAX® Garden Disease Control	Contact	Most vegetables	Anthrachnose, Botrytis gray mold, downy mildew, early blight, fruit rots, fungal leaf spots and blights, gummy stem blight, late blight, powdery mildew, rust	None
copper	Bonide Copper Dust, Bonide Garden Dust (also contains an insecticide), Bonide Liquid Copper Fungicide, Bonide Dragoon Dust with Copper, Concern Copper Soap Fungicide, Liqui-Cop Copper Fungicide Garden Spray, Natural Guard Copper Soap Fungicide, SA-50 Southern Ag Liquid Copper Fungicide	Contact	Most vegetables	Anthrachnose, bacterial leaf spots and blights, early blight, fungal leaf spots and blights, gummy stem blight, powdery mildew, scab, white rust	Can be used for organic gardening. Do not mix with liquid fertilizers. Do not use in spray solutions with a pH of less than 6.5. May cause staining of masonry, concrete, etc.
mancozeb	Bonide Mancozeb Flowable with Zinc, Southern Ag Dithane M-45	Contact	Asparagus, corn, cucurbits, onions, potaoes and tomatoes	Anthrachnose, early blight, fungal leaf spots and blights, gummy stem blight, rust	None
myclobutanil	Spectracide Multi-purpos® Fungicide	Systemic	Asparagus, cucurbits, snap beans and tomatoes	Pod tip rot, powdery mildew, rust	Do not spray within 14 days of harvest.
phosphorus acid	Monterey Garden-Fos Systemic Fungicide	Systemic	Most vegetables	Root, crown and fruit rots caused by <i>Phytophthora</i> and <i>Pythium</i> species; downy mildew; late blight	None
propiconazole	Bonide Fung-onil Lawn and Garden Disease Control Ready to Spray, Bonide Infuse Systemic Disease Control Lawn and Landscape Ready to Spray, Ferti-lome Ready to Spray Liquid Systemic Fungicide, Maxide Dual Action Disease Killer Ready to Spray	Systemic	Sweet corn	Leaf spots and blights and rust	Do not spray within 14 days of harvest.

Chemical	Product Name	Type of Fungicide	Crops	Diseases Controlled	Comments
sulfur	Bonide Garden Dust, Bonide Sulfur Plant Fungicide, Bonide Tomato and Vegetable 3 in 1, Ferti-lome Dusting Sulfur, Hi-Yield Dusting Wettable Sulfur, Safer Brand Garden Fungicide II, Southern Ag Wettable or Dusting Sulfur	Contact	Beans (may injure some varieties), cole crops, onions and peas	Botrytis gray mold, downy mildew, powdery mildew, rust	Do not re-enter treated area for 24 hours after application. Do not use during periods of high temperatures (85 F or higher) or within 2-4 weeks of using an oil spray. Do not use on cucurbits (cucumbers, squash, melons, etc.).
sulfur + potassium salts	Safer Brand 3-in-1 Garden Spray ¹	Contact	Beans, cucumbers, peas, potatoes and squash	Powdery mildew	Do not use in full sun when temperature exceeds 90 F or within 4 weeks of an oil spray.

¹Available in concentrate and ready-to-use formulations.

Table 2: Biopesticides available for disease management for home vegetable gardens.

Product Name	Crops	Diseases Controlled	Comments
Bayer Advanced Serenade Garden Disease Control	Most vegetables	Alternaria spots and blight, Botrytis blight, gummy stem blight, onion purple blotch, powdery mildew	None
GreenCure Foliar Fungicide	Most vegetables	Leaf spots and blights, powdery mildew	None
BioSafe Disease Control	All vegetables	Leaf spots and blights, powdery mildew	None
Novozyme Actinovate Lawn and Garden	Most vegetables and herbs	Botrytis gray mold, damping-off diseases and leaf spots and rust	None
Novozyme Actino-Iron Lawn and Garden	Most vegetables and herbs	Damping-off diseases and leaf spots and rust	None
BioWorks RootShield Home & Garden	Most vegetables	Damping-off diseases and root and crown rots	Apply to seed, plant roots and soil only.
SaferGro Mildew Cure	All vegetables	Powdery mildew	None
BioWork MilStop	Most vegetables	Powdery mildew	None
Neem Oils (many brands)	Most vegetables	Powdery mildew, rusts	None
Dr. Earth Final Stop Disease Control Fungicide	Most vegetables	Botrytis gray mold, leaf spots and blights and powdery mildew	None
Simple Success Companion Biological Fungicide	Most vegetables and herbs	Damping-off diseases and root and crown rots	None

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Nematode Management

All crops grown in Louisiana are subject to some type of nematode attack. Some nematodes are very damaging, such as root-knot, reniform, and cyst nematodes. Other nematodes cause only minor root damage, such as stunt, spiral, and stubby-root nematodes. Different crops, and even varieties within a crop, may differ in their response to each nematode species. Chemical control should be used if a nematode population appears to be at damaging levels and is likely to cause significant yield loss.

Notes for all tables in this chapter:

¹ Reference to commercial or trade names is made with the understanding that no discrimination is intended nor is endorsement of a particular product by LSU or the LSU AgCenter implied.

² Rates are the amount of formulation (product) per acre unless otherwise indicated.

Managing nematodes in field crops.

Cotton

Product Choices ¹	Rate ²	Comments
Telone II	3-6 gal	Apply fumigant 1 week before planting at a depth of 14 inches beneath the soil surface. Soil should not be excessively wet at the time of application.
AgLogic 15G	3.5-7 lb	Apply granules in seed furrow and cover with soil.
Vydate C-LV	17 fl oz (foliar)	Apply at 1-7 true leaf stage and a second application 14 days later. Use after initial treatment with a nematocide. For reniform, root-knot, and lance nematodes.
Acceleron INT-710	Seed application	Use in fields with low to moderate nematode levels only.
Avicta Duo COT202	Seed application	Use in fields with low to moderate nematode levels only.
Avicta Duo Cotton	Seed application	Use in fields with low to moderate nematode levels only.
Poncho Votivo	Seed application	Use in fields with low to moderate nematode levels only.
AERIS Seed Applied System	Seed application	Use in fields with low to moderate nematode levels only.
Majestene	7.2-19.6 fl oz / 1,000 ft row	In-furrow spray on or below seed.
Velum	5.0-6.8 fl oz	In-furrow spray on or below seed. Do not apply more than 13.7 fl oz per year.
Averland FC	3.5 fl oz	In-furrow spray on or below seed. Do not apply more than 7.0 fl oz per year.

Corn

Product Choices ¹	Rate ²	Comments
Mocap 15G	10-13 lb (40-in rows)	Apply in a 12-15-inch band at planting. Incorporate into top 2-4 inches of soil.
Counter 15G Lock 'n Load	6-8 oz / 1,000 ft row	Apply in a 7-inch band.
Counter 20G Lock 'n Load	4.5-6 oz / 1,000 ft row	Apply in a 4-5 inch band over open seed furrow in front of press wheel or apply in-furrow.
Counter 20G Smartbox	4.5-6 oz / 1,000 ft row	Apply in a 4-5 inch band over open seed furrow in front of press wheel or apply in-furrow.
Avicta Complete Corn 250	Seed application	Use in fields with low to moderate nematode levels only.
Avicta Complete Corn 500	Seed application	Use in fields with low to moderate nematode levels only.
Avicta Duo Corn	Seed application	Use in fields with low to moderate nematode levels only.
Avicta Duo 250 Corn	Seed application	Use in fields with low to moderate nematode levels only.
Poncho Votivo	Seed application	Use in fields with low to moderate nematode levels only.
Telone II	3-6 gal	Apply soil fumigant 1 week before planting at a depth of 14 inches beneath the soil surface. Soil should not be excessively wet at the time of application.
Averland FC	4-6 fl oz	Apply in-furrow. Do not apply more than 6 fl oz per year.

Grain Sorghum

Product Choices ¹	Rate ²	Comments
Counter 15G Lock 'n Load	7 oz / 1,000 ft row	Apply in a 5-7 inch band behind planter shoe in front of press wheel and lightly incorporate with chains or tines.
Counter 20G Lock 'n Load	5.2 oz / 1,000 ft row	Apply in a 5-7 inch band behind planter shoe in front of press wheel and lightly incorporate with chains or tines.
Counter 20G Smartbox	5.2 oz / 1,000 ft row	Apply in a 5-7 inch band behind planter shoe in front of press wheel and lightly incorporate with chains or tines.
Poncho Votivo	Seed application	Use in fields with low to moderate nematode levels only.

Peanut

Product Choices ¹	Rate ²	Comments
Vydate C-LV	34-68 fl oz (soil)	Apply in a 7-inch band and incorporate.
Vydate C-LV	17 fl oz (foliar)	Apply 28 days after planting and again after an additional 14 days.
Velum	6.84 fl oz	In-furrow spray on or below seed. Do not apply more than 13.7 fl oz per year.

Soybean

Product Choices ¹	Rate ²	Comments
Poncho Votivo	Seed application	Use in fields with low to moderate nematode levels only.
ILeVO	Seed application	Use in fields with low to moderate nematode levels only.
Avicta Complete Beans 500	Seed application	Use in fields with low to moderate nematode levels only.
Majestene	7.3-19.6 fl oz / 1,000 ft row	Apply at planting in-furrow or in a T-band.
Velum	3-6 fl oz	Apply at planting in-furrow.
Telone II	3-6 gal	Apply pre-plant under the row. Reserve for heavy nematode pressure.

Sugarcane

Product Choices ¹	Rate ²	Comments
Mocap 15G	1.8-3.6 lb / 1,000 ft row	Apply in a 12-15 inch band over seed pieces and cover with soil.
Nimitz	3.5-7 pints	Apply broadcast or banded at-planting or at ratoon.

Sweet Potato

Product Choices ¹	Rate ²	Comments
Mocap 15G	1.6-2.1 lb / 1,000 ft row	Apply in a 12-15 inch band.
Mocap EC	5.1-6.9 oz / 1,000 ft row	Apply in a 12-15 inch band.
Nimitz	3.5-7 pints	Application can be made at planting or pre-plant. Apply in a moist, well-prepared bed. EU export restrictions apply.
AgLogic 15G	10-20 lb	Apply in a 12-inch band over open furrow or soil surface and cover immediately during bed forming.
Vydate L	2 gal	Apply within a week of planting and incorporate 4-6 inches.
Velum	6.84 fl oz	Apply as an in-furrow spray using ground equipment.
Telone II	6-8 gal	Apply pre-plant beneath the row, 7-10 days prior to planting.
Vapam HL	See manufacturer's label	Must be applied 3 weeks prior to planting.
K-Pam HL	See manufacturer's label	Must be applied 3 weeks prior to planting.
Salibro	15.4-61.4 fl oz	Apply broadcast and incorporate into soil, or apply as an in-furrow spray. EU export restrictions apply.

Managing nematodes in fruit trees and small fruit crops.

Blackberry, Boysenberry, Dewberry, Raspberry, Strawberry

Product Choices ¹	Rate ²	Comments
Telone II	27-35 gal (broadcast)	Apply 14 days prior to planting. Use 2 chisels spaced 12 inches apart per row. Inject to a depth of 10 inches.
Telone C-17	32.4-42 gal (broadcast)	Apply 14 days prior to planting. Use 2 chisels spaced 12 inches apart per row. Inject to a depth of 10 inches.
Telone C-35	39-50 gal (broadcast)	Apply 14 days prior to planting. Use 2 chisels spaced 12 inches apart per row. Inject to a depth of 10 inches.
Telone EC	9-24 gal (broadcast)	Apply by drip irrigation equipment. Soil should be moist 9 inches beneath the surface.
DiTera DF	13-100 lb (broadcast)	Incorporate by mechanical means, irrigation, or rainfall.

Strawberry (specific)

Product Choices ¹	Rate ²	Comments
Telone C-17	32.4-37 gal	Waiting period of 1 week for every 10 gal applied.
Telone C-35	39-45 gal	Waiting period of 1 week for every 10 gal applied.
Paladin	35-51.3 gal	Follow label and observe temperature dependent waiting interval before planting (21-42 days).
Velum	6.0-6.5 fl oz	Apply through low-pressure drip. Do not apply more than 13.7 fl oz per year.
Nimitz	3.5-7 pt	Apply 7 days prior to transplanting.

Fruit Tree Sites (preplant)

Product Choices ¹	Rate ²	Comments
Vapam HL	50-75 gal	Apply by chemigation and observe waiting period.
K-Pam HL	30-62 gal	Apply by chemigation and observe waiting period.
Telone II	27-35 gal	Waiting period of 1 week for every 10 gal applied.
Telone C-17	32.4-42 gal	Waiting period of 1 week for every 10 gal applied.
Telone C-35	39-50 gal	Waiting period of 1 week for every 10 gal applied.

Citrus

Product Choices ¹	Rate ²	Comments
Velum	6.84 fl oz	Apply by chemigation through low-pressure drip.
DiTera DF	13-100 lb (broadcast)	Incorporate by mechanical means, irrigation, or rainfall.
Movento	8-10 fl oz (foliar)	Do not apply during bloom phase.
Vydate L	2 gal	Apply in 20 gal of water and incorporate to a depth of 4-8 inches. Use on nonbearing trees only.

Apple, Peach, Nectarine

Product Choices ¹	Rate ²	Comments
Vydate L	2 gal	Apply in 20 gal of water and incorporate to a depth of 4-8 inches. Use on nonbearing trees only.
DiTera DF	13-100 lb (broadcast)	Incorporate by mechanical means, irrigation, or rainfall.

Other Pome and Stone Fruits

Product Choices ¹	Rate ²	Comments
Velum	6.5-6.84 fl oz	Apply through low-pressure drip. Do not apply more than 13.7 fl oz per year.
Movento	6-9 fl oz (foliar)	Do not apply during bloom.
Nimitz	3.5-7 pints	Apply first application after flower buds start to swell and second application after harvest.

Managing nematodes in home gardens.

Root-knot and reniform nematodes cause problems on many vegetables grown in the home garden. Cultural practices and resistant varieties can help reduce the amount of damage in the garden.

Cultural Practices

1. Plant early before nematodes become active in soil.
2. Rotate crops in the garden.
3. Rotate the location of the garden each year.
4. Add organic matter to the soil in the form of green manures, compost, or mulches to stimulate natural enemies of nematodes and improve growing conditions within the soil for plants.
5. Use fallow plowing during parts of the summer to reduce nematode levels.
6. Keep the garden clean of weeds and grasses, which often serve as natural hosts for nematodes.
7. Keep soil fertility levels high and have the soil pH in the correct range for your soil type.
8. Provide extra water during prolonged dry periods.
9. Remove crops immediately after they are finished producing, especially the roots.
10. Most of the marigolds (except Signet types) are effective trap crops against root-knot nematodes. Plant the marigolds solid for at least two to three months and then plant vegetables.

Resistant Varieties or Crops

- Root-knot nematode resistant varieties include:
 - **Tomatoes**
 - Vine types: Big Beef, Champion, Terrific, Better Boy, Mountain Fresh Plus.
 - Bush types: Celebrity, Crista, Fresh Plus, Sanibel.
 - Others: Muriel Roma, Small Fry.
 - **Southern Peas** - Mississippi Silver and Mississippi Purple.
- Reniform nematode-resistant crops include broccoli, cauliflower, corn, okra, onion, peanut, radish, and turnip. This also includes sweet potatoes Avoyelles, Bellevue, Bonita, Burgundy, Evangeline, Covington and Jewel.

Managing nematodes in field and commercial ornamentals.

Product Choices ¹	Rate ²	Comments
Paladin	35-51.3 gal (broadcast)	Follow label and observe temperature dependent waiting interval before planting (21-42 days).
Dominus	10-40 gal	Waiting interval of 10-14 days before planting.
Telone II	42-55 gal	Wait at least 1 week for every 10 gal applied before planting.
Telone C-17	50-66 gal	Wait at least 1 week for every 10 gal applied before planting.
Telone C-35	60-79 gal	Wait at least 1 week for every 10 gal applied before planting.
DiTera DF	13-100 lb (broadcast)	Apply pre-plant, at plant, or post-plant. Multiple applications may be required.
Vapam HL	37-75 gal	Tarping may be used to improve efficacy.
K-pam	30-62 gal	Tarping may be used to improve efficacy.
Pylon	5.2-10 fl oz / 100 gal (foliar)	For foliar nematodes. Make first application at first signs of damage and second at 7-14 days.
Basamid G	302-446 lb	Mechanically incorporate to a depth of 6 inches. Follow label and observe temperature dependent waiting interval before planting.
Mocap EC	2 qt (broadcast)	Incorporate 2-4 inches. Stock may be transplanted into the treated area after 72 hours. Pertains to field nursery stock only.

Managing nematodes in turfgrass.

Pre-plant

Product Choices ¹	Rate ²	Comments
Basamid G	302-446 lb	Mechanically incorporate to a depth of 6 inches. Follow label and observe temperature dependent waiting interval before planting.
Dominus	10-40 gal	Waiting interval of 10-14 days before planting.

Post-plant

Product Choices ¹	Rate ²	Comments
Multiguard Protect	8 gal (initially)	After initial treatment, apply maintenance rates at 14- to 18-day intervals. Irrigate to a depth of 6 inches.
Multiguard Protect	5.5-8 gal (for maintenance)	Can be applied up to 6 times per year.
Indemnify	8.5-17 fl oz	Apply in 87-218 gallons of water per acre.
Nortica	30-100 lb	Apply every 3 months as necessary and irrigate to a depth of 4 inches.
Nortica 10 WP	35-50 lb	Apply every 3 months as necessary and irrigate to a depth of 4 inches.
Telone II	5-10 gal	Use on established turf for sod farms. Not for golf greens.
Divanem	3.13-6.25 fl oz	Apply at this rate on a 14-21-day interval.
Divanem	6.25-12.2 fl oz	Apply at this rate on a 21-28 day interval.
Quali-Pro Total	16-24 fl oz	Apply at this rate on a 14-21 day interval.
Quali-Pro Total	24-57 fl oz	Apply at this rate on a 21-28 day interval.

Managing nematodes in vegetables crops.

Beans (Snap, Lima)

Product Choices ¹	Rate ²	Comments
Mocap 15G	13-20 lb	Mechanically incorporate to a depth of 2-4 inches.

Brassica Leafy Vegetables

Product Choices ¹	Rate ²	Comments
Velum	6.5-6.84 fl oz	Apply by chemigation through low-pressure drip. Do not apply more than 13.7 fl oz per year.
Movento	4-5 fl oz (foliar)	Apply when sufficient leaf surface is available. Do not apply more than 10 fl oz per year.
Nimitz	3.5-7 pt	Apply 30 days before planting as broadcast incorporated, banded and incorporated, or by chemigation. Do not apply more than once per crop and 7 pts per year.

Cabbage (Specific)

Product Choices ¹	Rate ²	Comments
DiTera DF	13-100 lb (broadcast)	Apply pre-plant, at plant, or post-plant. Multiple applications may be required.
Mocap EC	2.4 oz / 1,000 ft row	Apply in a 15-inch band. Mechanically incorporate to a depth of 2-4 inches. Do not use a seed furrow treatment or allow granules to contact the seed.
Mocap 15G	13 lb	Mechanically incorporate to a depth of 2-4 inches.

Carrot (Specific)

Product Choices ¹	Rate ²	Comments
Vydate L	1-2 gal	Apply in-furrow using a minimum of 20 gal of water. Do not apply more than 2.5 gal per year.
Salibro	30.7-61.4 fl oz	Apply broadcast and incorporate.

Cole Crops (Broccoli, Cabbage, Cauliflower)

Product Choices ¹	Rate ²	Comments
DiTera DF	13-100 lb (broadcast)	Apply pre-plant, at plant, or post-plant. Multiple applications may be required.

Cucumber (Specific)

Product Choices ¹	Rate ²	Comments
Mocap 15G	13 lb	Mechanically incorporate to a depth of 2-4 inches.

Cucurbits (Cucumbers, Melons, Squash, Pumpkins, etc.)

Product Choices ¹	Rate ²	Comments
Nimitz	3.5-5 pt	Apply 7-10 days before planting as broadcast incorporated, banded and incorporated, or by chemigation. Do not apply more than twice per crop and 7 pts per year.
Majestene	4-8 qt	Apply by soil drench or chemigation. Can be used prior to planting, at plant, or after planting.
Vydate L	1-2 gal (broadcast)	Incorporate 2-4 inches. Do not apply more than 3 gal per year.
Vydate L	2-4 pt (foliar)	Foliar spray 2-4 weeks after planting and 2-3 weeks after last application
DiTera DF	13-100 lb (broadcast)	Apply pre-plant, at plant, or post-plant. Multiple applications may be required.
Paladin	35-51.3 gal (broadcast)	Follow label and observe temperature dependent waiting interval before planting (21-42 days).
Salibro	15.3-23 fl oz	Apply broadcast and incorporate, or through drip chemigation.

Eggplant (Specific)

Product Choices ¹	Rate ²	Comments
Vydate L	1 gal (band) or 4 pt (foliar)	Apply in a band 2-3 weeks after transplanting and again 4 weeks later. Do not apply more than 3 gal per year.

Fruiting Vegetables (Eggplant, Okra, Pepper, Tomato)

Product Choices ¹	Rate ²	Comments
Movento	4-5 fl oz (foliar)	Apply when sufficient leaf surface is available. Do not apply more than 10 fl oz per year.
Velum	6.5-6.84 fl oz	Apply by chemigation through low-pressure drip. Do not apply more than 13.7 fl oz per year.
Majestene	4-8 qt	Apply by soil drench or chemigation. Can be used prior to planting, at plant, or after planting.
Nimitz	3.5-7 pt	Apply 7-10 days before planting as broadcast incorporated, banded and incorporated, or by chemigation. Do not apply more than once per crop and 7 pts per year.
Salibro	30.7-61.4	Apply broadcast and incorporate, or apply through drip chemigation.

Irish Potato

Product Choices ¹	Rate ²	Comments
Mocap 15G	40-80 lb	Apply uniformly and mechanically incorporate to a depth of 2-4 inches.
Mocap EC	1-2 gal (broadcast)	Apply uniformly and mechanically incorporate to a depth of 2-4 inches.
Movento	4-5 fl oz	Apply when sufficient leaf surface is available. Do not apply more than 10 fl oz per year.
Velum	6.5-6.84 fl oz	Apply with overhead chemigation. Do not apply more than 13.7 fl oz per year.
Vydate C-LV	34-68 fl oz	Apply in-furrow with a minimum of 20 gal of water.
Salibro	30.7-61.4 fl oz	Apply broadcast and incorporate.

Leafy Vegetables

Product Choices ¹	Rate ²	Comments
Nimitz	3.5-7 pt	Apply 7-10 days before planting as broadcast incorporated, banded and incorporated, or by chemigation. Do not apply more than twice per crop and 7 pts per year.
Velum	6.5-6.84 fl oz	Apply with overhead chemigation. Do not apply more than 13.7 fl oz per year.
Movento	4-5 fl oz (foliar)	Apply when sufficient leaf surface is available. Do not apply more than 10 fl oz per year.
DiTera DF	13-100 lb (broadcast)	Apply pre-plant, at plant, or post-plant. Multiple applications may be required.

Pepper (Specific)

Product Choices ¹	Rate ²	Comments
Vydate L	2 pt (transplant water)	Add material to transplant water. Use a minimum of 200 gal of water. Do not apply more than 12 pt per year.
Vydate L	2 pt (drip chemigation)	Supplemental control after a labeled fumigant such as Telone, Vapam, or K-Pam. Do not apply more than 12 pt per year.
Paladin	35-51.3 gal (broadcast)	Follow label and observe temperature dependent waiting interval before planting (21-42 days).

Sweet Corn

Product Choices ¹	Rate ²	Comments
Conter 20G Lock 'n Load	4.5-6 oz / 1,000 ft row	Apply in-furrow. Do not exceed 6.5 lb per year
Counter 20G Smartbox	4.5-6 oz / 1,000 ft row	Apply in-furrow. Do not exceed 6.5 lb per year
Mocap 15G	40 lb (broadcast)	Mechanically incorporate to a depth of 2-4 inches. Waiting interval of 3 days before planting.

Tomato (Specific)

Product Choices ¹	Rate ²	Comments
DiTera DF	13-100 lb (broadcast)	Apply pre-plant, at plant, or post-plant. Multiple applications may be required.
Vydate L	2-4 pt	Apply by chemigation every 1-2 weeks. Do not apply more than 12 pt per year.
Paladin	35-51.3 gal (broadcast)	Follow label and observe temperature dependent waiting interval before planting (21-42 days)

Vegetables - General (Soil Fumigants)

Product Choices ¹	Rate ²	Comments
Telone II	9-12 gal (broadcast)	Apply 2-3 weeks prior to planting.
Telone C-17	10.8-17.1 gal (broadcast)	Apply 2-3 weeks prior to planting.
Telone C-35	13-20.5 gal (broadcast)	Inject 12-14 inches beneath the row.
Telone EC	9-18 gal (broadcast)	Use with drip irrigation and reduce rate to match row width.
Vapam HL	37.5-75 gal	Inject and tarp.
K-Pam HL	30-60 gal	Inject and tarp.
Dominus	10-40 gal	Waiting interval of 10-14 days before planting.

The nematode section was revised October 2023 by T. Watson.

Seed Treatments, In-Furrow Sprays and Granular Fungicide Options

Field Crops

Seed Treatments, In-Furrow Sprays and Granular Fungicide Options for Field Crops

Seed treatments offer potential benefits to ensure desirable crop stands. Although seed treatment will not make poor seed germinate, when the correct treatment is used on certified seed, it may prevent or reduce seed decays, seedling blights, and other diseases. Seed treatments may act in two ways: 1) they may reduce pathogens on seed and 2) they may help protect the seed and seedlings from pathogenic organisms in the soil. In the past, in-furrow sprays or granules were used; however, because of convenience these options have mostly been replaced with seed treatments. Nevertheless, in-furrow and granular fungicides remain effective for many diseases and may be more effective than seed treatments in problem areas.

Corn, Grain Sorghum, Rice, and Wheat

Fungicide seed treatments are commonly applied to large and small grain seed. Depending on the package, fungicides from groups 3, 4, 7, 11, and/or 12 are most commonly applied to seed. Data from LSU AgCenter field trials indicate slight increases in stand or emergence; however, seed-applied fungicides very rarely provide economic benefit in these crops. Producers can save input costs by not treating or over-treating these crops prior to planting. If a field has a history of soilborne seedling disease, fungicide seed treatments may be useful in these situations.

Soybean

Fungicide seed treatments from the same groups listed above are commonly applied to soybean and will provide economic benefit in the event of seedling disease development. Seedling disease issues are more common in soybean than in the crops above. Generally, generic fungicides from groups 3, 4, and/or 11 are sufficient to protect seed and seedlings from pathogens in soybean.

Cotton

Do not plant cotton without a fungicide seed treatment! Do your homework by figuring out what is already on the seed. If there are a minimum of three different modes-of-action present, over-treating likely is not necessary. If the decision is made to over-treat, use a different mode of action. Significant cost savings can be realized depending on the seed company and seed treatment options.

The following table lists labeled available active ingredients commonly used in field crop production, their mode of action, and the targeted organisms listed by companies. This list may not be all-inclusive as many new products are continually developed and multiple online sources were used to compile this information.

Always refer to product labels for rate and use information.

Active Ingredients	FRAC Code	Targeted Pathogens
copper hydroxide, copper oxychloride	M1	<i>Pseudomonas syringae</i> , <i>Xanthomonas translucens</i> , <i>Tilletia caries</i> ; damping-off/seedling diseases
thiram, mancozeb	M3	Seed decay, damping-off, and seedling blights caused by many seedborne and soilborne organisms
thiabendazole	1	Seed decay, damping-off, and seedling blights caused by many seedborne and soilborne organisms
iprodione	2	<i>Rhizoctonia solani</i>
difenoconazole, imazalil, ipconazole, myclobutanil, prothioconazole, tebuconazole, triticonazole	3	<i>Alternaria</i> , <i>Aspergillus</i> , <i>Botrytis</i> , <i>Cochliobolus</i> , <i>Fusarium</i> , <i>Penicillium</i> , <i>Sclerotinia</i> , and <i>Sphacelotheca</i> spp.; <i>Thielaviopsis basicola</i> , <i>Tilletia caries</i> , <i>Tilletia foetida</i> , <i>Urocystis agropyri</i> , <i>Ustilago nuda</i> var. <i>tritici</i> , <i>Rhizoctonia solani</i> , <i>Cochliobolus sativus</i>
mefenoxam, metalaxyl	4	<i>Pythium</i> and <i>Phytophthora</i> spp.
boscalid, carboxin, fluxapyroxad, penflufen, penthiopyrad, sedaxane	7	<i>Cochliobolus</i> , <i>Fusarium</i> , and <i>Pythium</i> spp.; <i>Rhizoctonia solani</i> , <i>Blumeria graminis</i> , <i>Puccinia recondita</i> , <i>Septoria tritici</i> , <i>Cephalosporium gramineum</i> , <i>Ustilago tritici</i> , <i>Sphacelotheca reiliana</i>
azoxystrobin, fenamidone, fluoxastrobin, pyraclostrobin, trifloxystrobin	11	<i>Aspergillus</i> , <i>Cladosporium</i> , <i>Colletotrichum</i> , <i>Fusarium</i> , <i>Penicillium</i> , <i>Pythium</i> , and <i>Phomopsis</i> spp.; <i>Rhizoctonia solani</i> , <i>Sclerotinia rolfsii</i> , <i>Sclerotium rolfsii</i> , and <i>Sphacelotheca reiliana</i>
fludioxinil	12	Seedborne and soilborne fungi which cause seed decay, damping-off and seedling blights
etridiazole, PCNB, tolclofos-methyl	14	<i>Pythium</i> , <i>Fusarium</i> , and other <i>Deuteromycete</i> species causing seed decay and seedling blights; <i>Rhizoctonia solani</i>
ethaboxam	22	Multiple fungal species; <i>Phytophthora</i> spp.

This section was updated/revised September 2024 by Trey Price.

Vegetables

Seed Disinfestation and Protection

Bacterial, fungal and viral plant pathogens can be introduced into a crop on or within seeds. Generally, the earlier a pathogen comes into contact with the crop, the greater the potential for a plant disease to develop. Seed treatments are an effective means of preventing seedborne bacterial diseases and damping-off diseases. It is important to note that not all seed sanitizers are approved for organic vegetable production by the Organic Materials Review Institute (www.omri.org; 541-343-7600). Organic producers must verify that a seed treatment is OMRI approved prior to applying a seed treatment.

Seed sanitation to eradicate bacterial or viral plant pathogens – When treating vegetable seeds, it is critical to follow the directions exactly, because germination can be reduced by the treatment and/or the pathogen may not be eliminated completely. The effect of a treatment on germination should be determined on a small lot of seeds prior to treating large amounts of seed. Treatments should not be applied to pelleted seed, previously treated seed or old or poor quality seed. A protective fungicide treatment (see below) can be applied to the seed following treatment for bacterial pathogens.

Seed treatments to prevent damping-off diseases – Most commercially available vegetable seeds come treated with at least one fungicide and/or insecticide. Vegetable producers who would like to apply their own seed treatment should purchase nontreated seed. Although many fungicides are labeled for use on vegetable seeds, most fungicides are restricted to commercial treatment only and should not be applied by producers. Labeled fungicides can be applied to seed following treatment for bacterial pathogens (see above). **Do not use fungicide treated seed for food or feed.**

Seed Disinfestants

Hot water treatment

Soaking seeds in hot water can reduce seedborne fungi and bacteria from the seed coat, if not eradicated. Hot water soaking will not kill pathogens associated with the embryo nor will it remove seedborne plant viruses from the seed surface.

1. Place seeds loosely in a weighted cheesecloth or nylon bag.
2. Warm the seeds by soaking it for 10 minutes in 100 F (37 C) water.
3. Transfer the warmed seeds into a water bath already heated to the temperature recommended for the vegetable seeds (Table 1). The seeds should be completely submerged in the water for the recommended amount of time (Table 1). Agitation of the water during the treatment process will help maintain a uniform temperature in the water bath.
4. Transfer the hot water treated seeds into a cold-water bath for five minutes to stop the heating action.
5. Remove seeds from the cheesecloth or nylon bag and spread them evenly on a clean paper towel or a sanitized drying screen to dry. Do not dry seeds in areas where fungicides, pesticides or other chemicals are located.
6. Seeds can be treated with a labeled fungicide to protect against damping-off pathogens.

Table 1. Recommended temperatures and treatment times for hot-water disinfestation of selected vegetable seeds.

Vegetable Crops	Water Temperature (°F, °C)	Soaking Time (minutes)
Broccoli	122/50	20-25
Brussels sprouts	122/50	25
Cabbage	122/50	25
Carrot	122/50	15-20
Cauliflower	122/50	20
Celery	122/50	25
Chinese cabbage	122/50	20
Collard	122/50	20
Cucumber ¹	122/50	20
Eggplant	122/50	25
Garlic	120/49	20
Kale, Kohlrabi	122/50	20
Lettuce	118/48	30
Mint	112/44	10
Mustard, Cress, Radish	122/50	15
Onion	115/46	60
Pepper	125/51	30
Rape, Rutabaga	122/50	20
Shallot	115/46	60
Spinach	122/50	25
Tomato ²	122/50	25
Turnip	122/50	20

¹ Cucurbit seeds other than cucumbers can be severely damaged by hot-water treatment and should be disinfested using chlorine bleach.

² Germination may be delayed by 2-3 days depending on the crop variety.

Chlorine bleach treatment

Treating seeds with a solution of chlorine bleach can effectively remove bacterial pathogens and some viruses (i.e., Tobacco mosaic virus) that are borne on the surface of seeds.

1. Add one quart (946 ml) of Clorox® bleach to five quarts (4.7 L) of potable water.
2. Add a drop or two of liquid dish detergent or a commercial surfactant such as Activator 90 or Silwet to the disinfectant solution.
3. Add seeds to the disinfectant solution (one pound of seeds per four quarts of disinfectant solution) and agitate for one minute. Prepare fresh disinfectant solution for each batch of seeds to be treated.
4. Rinse the seeds in a cold-water bath for five minutes to remove residual disinfectant.
5. Spread seeds evenly on clean paper towel or a sanitized drying screen to dry. Do not dry seeds in areas where fungicides, pesticides or other chemicals are located.
6. Seeds can be treated with a labeled fungicide to protect against damping-off pathogens.

Hydrochloric acid treatment

Tomato seeds can be treated with a dilute solution of hydrochloric acid (HCl) solution to eliminate seedborne bacterial pathogens such as *Xanthomonas* spp. (Bacterial leaf spot), *Pseudomonas syringae* pv. *tomato* (Bacterial speck) and *Clavibacter michiganensis* subsp. *michiganensis* (Bacterial canker). Hydrochloric acid can also be used to remove Tobacco mosaic virus from the surface of tomato seeds. **Do not use HCl treated seeds for food or animal feed.**

1. Prepare a 5% solution of HCl by adding one part acid to 19 parts potable water. Prepare the acid solution in a well ventilated area and avoid direct skin contact with the acid.
2. Soak seeds for six hours with gentle agitation.
3. Carefully drain the acid off of the seeds and rinse seeds under running potable water for 30 minutes. Alternatively, rinse the seeds 10-12 times with potable water to remove residual acid.
4. Spread seeds evenly on a clean paper towel or a sanitized drying screen to dry. Do not dry seeds in areas where fungicides, pesticides or other chemicals are located.
5. Seeds can be treated with a labeled fungicide to protect against damping-off pathogens.

Trisodium phosphate treatment

Tomato seeds can be treated with trisodium phosphate (TSP) to eradicate seed-transmitted *Tobacco mosaic virus*. **Do not use TSP treated seeds for food or animal feed.**

1. Prepare a 10% solution of TSP (one part TSP in nine parts potable water). Trisodium phosphate is available at most home supply or paint stores. Avoid direct skin contact with the TSP solution.
2. Soak seeds for 15 minutes in the disinfectant solution.
3. Rinse the seeds in a cold water bath for five minutes to remove residual disinfectant.
4. Spread seeds evenly on a clean paper towel or a sanitized drying screen to dry. Do not dry seed in areas where fungicides, pesticides or other chemicals are located.
5. Seeds can be treated with a labeled fungicide to protect against damping-off pathogens.

Procedure for Testing Seed Germination after Seed Disinfecting Treatments

1. Randomly select 100 seeds from each seed lot.
2. Treat 50 seeds using one of the sanitizers described above.
3. After the treated seeds have dried and **before** application of a protectant fungicide, plant the treated and nontreated seeds separately in flats containing planting mix according to standard practice. Label each group as treated or nontreated.
4. Allow the seeds to germinate and grow until the first true leaf appears (to allow for differences in germination rates to be observed).
5. Count seedlings in each group separately.
6. Determine the percent germination for each group:

$$\frac{\text{number of seedlings emerged}}{\text{number of seeds planted}} \times 100$$

7. Compare percent germination between the treated and nontreated groups. Percent germination should be within 5% of each other.

Seed Protectants

Fungicide label registrations are always changing, thus the information provided in this publication may become invalid at anytime. Always read the entire, most recent label carefully and follow all directions and restrictions before using one of the recommended seed protectants.

Thiram and Captan

Thiram is the most commonly used seed-protectant fungicides for vegetable crops, however, Captan is also labeled as a seed protectant for many vegetables (Table 2). Purchase treated seed, or coat seed by placing seed and fungicide in a closed container and shaking until seeds are uniformly coated. **Do not use Thiram or Captan treated seeds for food or animal feed.**

Table 2. Recommended seed treatment dosage rates for selected vegetable seeds

Vegetable Crop	Thiram ¹ 50WP Ounces (dry wt ³)/100 lb seed	Captan ² Fluid ounces/100 lb seed
Beans (Lima)	3	- ⁴
Beans (Snap)	2	2.5
Broccoli, Brussels sprouts, Cabbage, Cauliflower	8	1.5
Cantaloupe, Cucumber	4.5	2.5
Carrots	8	-
Cowpeas	2	2.5
Endive	8	-
Eggplant	6	-
Kale, Kohlrabi	8	-
Leafy greens (collard, lettuce, mustard, spinach, Swiss chard, turnip)	8	1.5
Okra	6	-
Pea	3	2.5
Peppers	8	2.5
Pumpkin, Squash, Watermelon	4.5	1.5
Radish	8	1.5
Tomato	6	-
All other vegetable seed	8	-

¹ Thiram belongs to the Fungicide Resistance Action committee (FRAC) group M3.

² Captan belongs to the Fungicide Resistance Action committee (FRAC) group M4.

³ See table 4 for dry weight conversions.

⁴ The dash indicates that the fungicide is not labeled for and/or recommended for the specified vegetable seeds.

Fungicide Seed Protectants for Potatoes

Properly treated seed potatoes can increase stand and improve stand uniformity. Proper application of seed potato protectants is essential because excess use of chemical can result in phytotoxicity and inadequate coverage can result in poor stand. **Dip treatments are not recommended** as pathogens can easily be spread from treated to nontreated seeds using this mode of application. **Do not use treated seeds for food or animal feed.**

Table 3a. Recommended seed treatment dosage rates and Fungicide Resistance Action Committee (FRAC) group for Irish potatoes

Active Ingredient	Product Name	Rate ¹ /100lb	Rate/acre	FRAC ² Group
fludioxonil + mancozeb	Maxim MZ	0.5 lb	- ³	12, M
penflufen + prothioconazole	Ernesto Silver	0.37 oz	-	7, 3
flutolanil + mancozeb	MonCoat MZ	0.75 lb	-	7,M
flutolanil	Moncut DF	-	0.71-1.1 lb ⁴	7

¹ Apply as a dust. See Table 4 for dry weight conversions.

² Abbreviation for Fungicide Resistance Action Committee.

³ The dash indicates that the fungicide is not labeled for and/or recommended for the specified application.

⁴ Apply uniformly over and around the seeds as an in-furrow spray. Refer to label for detailed application instructions.

Table 4. Metric conversions for dry weight measures.

Imperial	Metric
1 pound	454 grams
1 ounce	28.4 grams
0.035 ounce	1 gram
1 teaspoon (0.16 ounces)	

Table 3b. Recommended seed treatment dosage rates and Fungicide Resistance Action Committee (FRAC) group for sweet potatoes

Active Ingredient	Product Name	Rate ¹ /100lb	Rate/acre	FRAC ² Group
dicloran	Botran 75W	-	3.0-5.0 lb ^{3, 4}	14

¹ Apply as a dust. See Table 4 for dry weight conversions.

² Abbreviation for Fungicide Resistance Action Committee.

³ Apply uniformly over and around the seeds as an in-furrow spray. Refer to label for detailed application instructions.

⁴ Do not plant tomatoes as a follow-up crop.

Soil Treatments

Management of Nematodes and Soilborne Diseases

Several plant-parasitic nematodes and plant pathogens inhabit the soil and can cause disease in or damage to crops. Soil fumigants (Table 1) can kill plant-parasitic nematodes, soilborne pathogens, insects and weeds in the soil – thereby improving seedling and crop performance. Soil fumigants also kill any beneficial microorganisms in the soil, however, and should be combined with cultural practices that promote good soil health. In addition, many fumigants can be administered only in the presence of a certified applicator. Certified applicators must successfully complete one of the soil fumigant training programs listed on the EPA website (<http://www.epa.gov/fumiganttraining>). More information on fumigants registered for nematode management in various crops can be found in the nematode sections of this guide.

Unlike conventional farming systems, organic farming systems cannot rely on soil fumigants for disease management. Soil sterilants (Table 2) and microbial biopesticides (Table 3) are alternatives to fumigants. Soil sterilants are simple, safe and economical and are just as effective as fumigants when used in combination with good cultural practices. Although microbial biopesticides are less toxic than soil fumigants, they have a more limited target range, and the efficacy of microbial biopesticides is more variable than fumigants. Information on cultural practices and resistant varieties available to manage nematodes in home gardens can be found in the Nematode-Home Garden section of this guide.

Table 1. Soil fumigants and rates for control of nematodes, soilborne pathogens and weeds.

Product Choices ^{1,2}	Rate ³	Pests Controlled
Metam CLR 42% Soil Fumigant	37.5-75 gal	Soilborne fungi and fungal-like micro- organisms ⁴ , Nematodes, Weeds
Nimitz	3.5-5 pt	Nematodes
Telone C-17 Soil Fungicide and Nematicide	10.8-45 gal	Garden centipedes, Nematodes, Soilborne fungi and fungal-like micro-organisms ⁴
Vapam HL	37.5-75 gal	Nematodes, Weeds, Soilborne fungi and fungal-like micro- organisms ⁴

¹ Reference to commercial or trade names is made with the understanding that no discrimination is intended nor endorsement of a particular product by LSU or the LSU AgCenter is implied.

² Not for use in greenhouses or other enclosed areas.

³ Rates are the amount of formulation per treated acre for shank applications unless otherwise indicated. Rates vary depending on the crop and soil type. Always refer to the label for correct rates.

⁴ Includes Clubroot of crucifers, Oak root fungus, *Phytophthora*, *Pythium*, *Rhizoctonia*, *Sclerotinia* and *Verticillium*.

Table 2. Soil sterilants for control of soilborne plant pathogens, insects, nematodes and weeds.

Sterilant	Method
Dry heat	180 F, 30 minutes
Steam heat	145-165 F, 30 minutes
Soil solarization	99 F, 2-4 weeks

Table 3. Microbial biopesticides for the management of soilborne plant pathogens in organic farming.¹

Product Choices ²	Biocontrol Organism	Target Diseases	Rate ³	Crop ⁵
Actinovate AG	<i>Streptomyces lydicus</i>	Damping-off and root rots (<i>Fusarium</i> spp., <i>Phytophthora</i> spp., <i>Pythium</i> spp., <i>Rhizoctonia</i> spp., <i>Verticillium</i> spp.); Root decay (<i>Phymatotrichum omnivorum</i>)	3-12 oz ⁴	Food crops grown from seed
Actinovate SP	<i>Streptomyces lydicus</i>	Damping-off and root rots (<i>Fusarium</i> spp., <i>Phytophthora</i> spp., <i>Pythium</i> spp., <i>Rhizoctonia</i> spp., <i>Verticillium</i> spp.); Root decay (<i>Phymatotrichum omnivorum</i>)	4-6 oz/100 gal (ornamentals), 18-54 oz/100 gal (turf)	Ornamentals, Turfgrass
Cease	<i>Bacillus subtilis</i>	Sclerotinia diseases (<i>S. minor</i> , <i>S. sclerotiorum</i>)	3-6 qt/100 gal	Leafy vegetables
Contans WG	<i>Coniothyrium minitans</i>	Sclerotinia diseases (<i>S. minor</i> , <i>S. sclerotiorum</i>)	1-4 lb	Most crops
Mycostop	<i>Streptomyces griseoviridis</i> Strain K61	Damping-off and root rots (<i>Alternaria</i> spp., <i>Fusarium</i> spp., <i>Phomopsis</i> spp., <i>Pythium</i> spp.)	1-2 g/cubic yard	Container ornamentals, Vegetable transplants
Plant Shield® HC Biological Foliar and Root	<i>Trichoderma harzianum</i>	Damping-off and root rots (<i>Fusarium</i> spp., <i>Pythium</i> spp., <i>Rhizoctonia</i> spp.)	4 oz/100 gal ⁴	Container ornamentals, Vegetable transplants
Regalia	Extract of <i>Reynoutria sachalinensis</i>	Damping-off and root rots (<i>Fusarium</i> spp., <i>Phytophthora</i> spp., <i>Pythium</i> spp., <i>Rhizoctonia</i> spp., <i>Verticillium</i> spp.); Sclerotinia diseases (<i>S. minor</i> , <i>S. sclerotiorum</i>), Southern blight (<i>Agroathelia rolfsii</i>), Clubroot (<i>Plasmodiophora brassicae</i>), Common scab (<i>Streptomyces scabies</i>)	1-4 qt	Cotton, Oil seed crops, Peanut, Tobacco, Vegetables
Root Shield® Granules	<i>Trichoderma harzianum</i>	Damping-off and root rots (<i>Pythium</i> spp., <i>Rhizoctonia</i> spp.), Wilts (<i>Fusarium</i> spp.)	3-12 lb	Bedding plants, Flowers, Herbs, Hydroponic crops, Oil seed crops, Ornamentals, Pome and stone fruit, Tree nuts, Vegetables
SoilGard12G	<i>Trichoderma virens</i>	Damping-off and root rots (<i>Pythium</i> spp., <i>Rhizoctonia</i> spp.)	See label ⁵	Bedding plants, Herbs, Ornamentals, Vegetables
T22 HC	<i>Trichoderma harzianum</i>	Damping-off and root rots (<i>Fusarium</i> spp., <i>Pythium</i> spp., <i>Rhizoctonia</i> spp.)	16-32 oz	Herbs, Vegetables

¹ For more information on microbial biopesticides for the management of soilborne pathogens in organic farming, refer to the Ohio State University factsheet HYG-3310-08 (Raudales and McSpadden Gardener, 2008).

² Reference to commercial or trade names is made with the understanding that no discrimination is intended or endorsement of a particular product implied by LSU or the LSU AgCenter.

³ Rates are the amount of formulation per acre unless otherwise indicated.

³ For agronomic field and row crops, alfalfa hay and forage, small grains and corn apply 1-3 oz/acre.

⁴ For use on plants in containers, plug trays or flats.

⁵ Rates vary considerably depending on crop and production stage. Refer to labels for specific rates and timing.

The soil treatments section was revised October 2023 by R. Singh.

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