

Herbicide Drift

Herbicide drift to nontarget plants can cause significant damage to your crops resulting to a significant monetary loss. What is herbicide drift? How to prevent it? How to identify it? These are all questions that producers may have to answer to protect their operation.

This publication provides information on types of drift, best management practices and a detailed documentation of common herbicides and respective symptoms.

TYPES OF DRIFT:



Particle drift: Spray droplets can move long distances by wind. This occurs more often with fine droplets and high winds. Spray when wind speeds are 3 to 7 mph. Glyphosate and paraquat are examples of herbicides prone to particle drift.



Vapor drift: Pesticide volatilizes/forms gas and moves off target. As temperatures increase, herbicide volatility can increase. 2,4-D and dicamba are potentially volatile herbicides.

Temperature Inversions Explained

Normally the temperature decreases with increasing altitude. However, during an inversion you will observe a layer where the temperature increases with height instead of decreasing. Inversions occur when warm air, which is lightweight, rises upward into the atmosphere and cool air, which is heavy, settles near the ground. When cool air settles below warm air, there's no mixing of the air. Spray droplets aren't dispersed but stay in a concentrated mass that can move off-target with any airflow. Even subtle airflow can then carry the concentrated mass of droplets off-target, potentially affecting areas that were not intended to be sprayed.

At low wind speeds, the lack of air movement further restricts vertical mixing, allowing inversions to persist for longer durations. As a result, any spray droplets released during these conditions may be trapped and carried off-target, increasing the risk of unintended drift and potential negative impacts.

Signs of a potential temperature inversion include:

Smoke or vapor movement: Observe the movement of smoke, fog or vapor near the surface. Inversions tend to trap these substances causing them to move horizontally or linger close to the ground without dispersing vertically. If you notice smoke or vapor staying close to the surface and not rising, it could indicate the presence of an inversion.

Very little air movement: Inversions can create a stable layer where the wind near the surface is light or calm while the upper atmosphere may have stronger winds. If you observe calm or very light winds near the ground while stronger winds are present aloft, it may suggest the presence of an inversion.

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BEST MANAGEMENT PRACTICES FOR APPLICATIONS

- Use only approved herbicide formulations.
- Read and follow label directions.
- Know tank mix restrictions.
- Use appropriate spray nozzles and settings that produce larger droplets, reducing the likelihood of drift. Air induction nozzles are recommended.
- Be mindful of windspeed and direction.
- Adjust boom height to ensure the spray is directed at the target area and doesn't disperse into the air.
- Avoid spraying during temperature inversions, which occur when cool air is trapped near the ground and can cause the pesticide to remain suspended and drift.
- Maintain proper buffer zones which are areas around sensitive sites.
- Use drift retardants when appropriate.

Plan! Careful planning is essential for successful pesticide application. Consider factors such as weather forecasts, crop growth stage and pest life cycles to determine the most effective timing for pesticide application. This proactive approach can optimize the efficacy of the pesticide while minimizing environmental impact.

HERBICIDES PRONE TO OFF-TARGET MOVEMENT AND THEIR SYMPTOMS

Glyphosate

Trade names: Various Roundup trade names, Honcho, Glyphos, Ranger, Eraser, Rodeo, Makaze, Enlist Duo (2,4-D + glyphosate) and others.

How it's used: Nonselective herbicide with activity on broadleaves and grasses, aquatic sites, non-cropland areas, Roundup Ready/glyphosate tolerant crops.

How it works: Primarily absorbed by green plant foliage and stems. Once absorbed, it is translocated within the plant to the growing points such as shoot and root apical meristems. Glyphosate works by inhibiting the activity of the enzyme called EPSP synthase (5-enolpyruvylshikimate-3-phosphate synthase). EPSP synthase is involved in the synthesis of three essential aromatic amino acids in plants: tyrosine, tryptophan, and phenylalanine. These amino acids are building blocks for various proteins and other compounds necessary for plant growth and development.

Glyphosate Drift Symptoms

- Leaf chlorosis may occur, which refers to the yellowing or whitening of plant leaves. Glyphosate drift can cause chlorosis, which typically starts in the growing points but can also occur at the leaf edges or tips and gradually spreads inward. In severe cases, affected leaves may become necrotic (brown or black) and die.
- Affected leaves may exhibit abnormal growth patterns, such as curling or cupping. Leaves may appear twisted or deformed compared to healthy plants.
- Plants may exhibit reduced growth and overall stunting. This symptom can be particularly noticeable in young plants or actively growing shoots.
- Affected plants may show disrupted or abnormal shoot and branch development. They may produce abnormal or bushy growth patterns with excessive branching or the development of multiple buds.

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Photo by Kiki Fontenot

The above photo displays typical glyphosate symptoms when drift occurs. When a high rate or direct hit occurs, the damage is usually complete necrosis of tissues.

- Glyphosate drift can interfere with the reproductive processes of plants, resulting in reduced flowering or fruit set. Plants may produce fewer flowers, and the formation of fruits or seeds may be compromised.
- In severe cases, glyphosate drift can cause necrosis, which is the death of plant tissues. Necrotic patches or areas may appear brown or black and can spread throughout the plant.

Paraquat

Trade names: Gramoxone, Firestorm, Helmquat, Parazone.

How it's used: Nonselective burn down of vegetation prior to planting crops and used as crop desiccant prior to harvest. More effective as an herbicide on annual weeds than perennial weeds.

How it works: Disrupts membranes and causes cell leakage and rapid desiccation of tissues.

Paraquat Drift Symptoms

- Rapid wilting and desiccation noticeable within 24 hours.
- Faster activity on bright sunny days.
- Complete leaf necrosis with a direct hit in as little as one to three days.
- Necrotic spotting.
- Paraquat burns leaf tissue, often resulting in white to yellow spots surrounded by a brown halo.
- Does not translocate inside plant.



Photo by Kiki Fontenot



Note the brown spots with darker halos around them on the tomato foliage impacted by paraquat.

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2,4-D

Trade names: Weedar 64, Weedone, Savage, Enlist, Enlist Duo (2,4-D + glyphosate).

How it's used: Broadleaf weed control in several crops including 2,4-D tolerant broadleaf crops and aquatic areas. Only works on broadleaves.

How it works: Auxin-mimicking herbicide also stimulates RNA polymerase, resulting in subsequent increases in RNA, DNA, and protein biosynthesis. Abnormal increases in these processes lead to uncontrolled cell division and growth, which results in vascular tissue destruction.

Stimulates ethylene production – epinasty.

2,4-D Drift Symptoms

- Twisting, severely abnormal growth and shoestring appearance are common symptoms of injury from 2,4-D and other similar phenoxy herbicides. Also may cause strapping of leaves.
- Tomatoes, cotton and okra are highly susceptible to 2,4-D. Visible symptoms are possible within minutes of application.

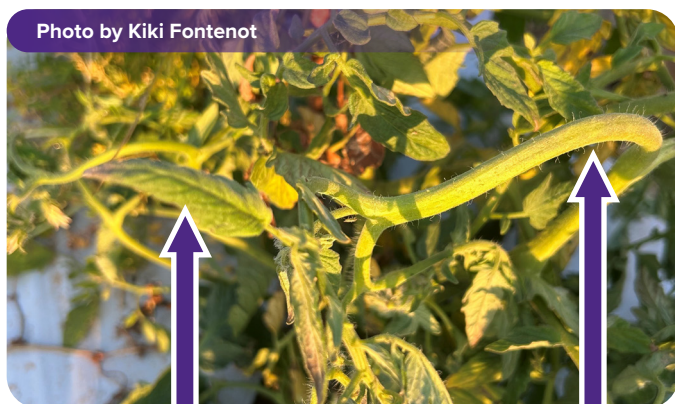


Photo by Kiki Fontenot



Notice the severe bending of the branch to the left side and the extended leaf. The extended leaf looks as though someone stretched it out. This is typical 2,4-D damage.

Dicamba

Trade names: Xtendimax, Engenia, Clarity, Banvel, Weedmaster.

How it's used: Broadleaf weed control in several grass crops and dicamba tolerant broadleaf crops. Legumes are susceptible to dicamba.

How it works: At low doses, dicamba has similar hormonal properties to natural auxins. High concentrations of dicamba in plant tissues induce abnormal and uncontrollable growth, disrupting normal plant functions and resulting in death. Disruption of transport systems and interference with nucleic acid metabolism.

Dicamba Drift Symptoms

- Twisting, bending of stems and petioles; leaf curling and cupping and development of abnormal tissues and secondary roots.
- Similar to 2,4-D but often more leaf cupping. Often difficult to differentiate between 2,4-D and dicamba damage.
- More active on legumes and cucurbits than 2,4-D.
- Plant death in three to five weeks.



Photos by Ronald Strahan



Dicamba drift looks similar to 2,4-D drift with the bending stems on the left photos. Notice the necrosis in the cupped leaves on the right photo.

MITIGATING HERBICIDE DAMAGE TO SPECIALTY CROPS

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Additional publications in this series:

- Pesticide Tank Cleaning Notes and Procedures
- Tank Mix Instructions
- Drifted? Action Plan Response to Drift Damage

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