2024 GRAIN SORGHUM HYBRIDS FOR GRAIN

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INTRODUCTION

Grain sorghum hybrid performance is annually evaluated in official hybrid trials (OHTs) by LSU AgCenter researchers to provide Louisiana growers, seedsmen, county agents and consultants with unbiased performance data for grain sorghum hybrids submitted for evaluation by private companies. Selection of superior hybrids that are well adapted for a given region is essential for maximizing yield and profit.

HYBRID SELECTION

Grain yield is usually considered the most important characteristic on which to base hybrid selection, followed closely by maturity group: early, medium/early, medium, medium/full, and full. The selection of hybrid maturity is usually based on available rainfall or irrigation received season-long. Hybrids that are high yielding in Louisiana are predominantly in medium or medium/full maturity groups. Additional hybrid selection criteria include lodging, weathering, plant height, test weight, heading date, stay-green, head exertion, panicle or head type, tolerance to sugar cane aphids, greenbug resistance, anthracnose and other disease ratings.

To assist producers with hybrid selection, the LSU AgCenter conducts annual grain sorghum OHTs at several locations across the state. These trials provide producers with unbiased information on hybrid performance across different soil types and environmental conditions. During 2023, 20 hybrids were included in the six trial locations in Alexandria, Baton Rouge, Bossier City, Crowley, St. Joseph and Winnsboro (Tables 4-9). Agronomic details for each location are included in Table 1. Selection criteria abbreviations and descriptions are defined in Table 2.

Also, three on-farm core block demonstrations were conducted in Franklin, Grant and Tensas parishes (Tables 10 and 11). This information should be used to complement the OHT information.

Table 1. Locations and agronomic milestones for the grain sorghum official hybrid trials, 2023.

Location	Soil Type	Previous Crop	Planting Date	Harvest Date	Row Spacing	Seeding Rate	Irrigated
Alexandria	Coushatta silt loam	Cotton	4/19/23	8/23/23	38”	80,000	No
Baton Rouge	Thibaut silty clay	Soybean	4/26/23	8/21/23	30”	80,000	No
Bossier City	Moreland silty clay loam	Fallow	4/19/23	8/15/23	40”	80,000	Yes
Crowley	Crowley silt loam	Soybean	4/20/23	8/10/23	30”	80,000	No
St. Joseph	Commerce silt loam	Soybean	4/18/23	9/1/23	38”	80,000	No
Winnsboro	Gigger-Gilbert complex	Corn	4/17/23	8/29/23	40”	80,000	Yes

Table 2. Performance attributes measured in the grain sorghum official hybrid trials, 2023.

Attribute	Abbreviation	Description
Yield	YLD	Grain yield, bushels per acre (bu/A), adjusted to 14.0% moisture
Grain moisture	GM	Grain moisture at harvest (%)
Test weight	TW	Volume weight of grain (lb/bu)
Heading date	MH or HD	Date of head emergence in 50% of plants, days after planting (DAP) or day of year (DOY)
Plant height	PH	From soil surface to top of the head (in)
Head type	HT	Head structure rating where 1=closed, 3=intermediate, and 5=open
Head exertion	HEX	Distance from the flag leaf to the base of the head (in)
Lodging	LOD	Plants that are lodged at harvest (%)
Midge damage	MD	Total percentage of head damage
Bird damage	BD	Total percentage of head damage or 0-9 scale where 0=none and 9=all
Seed quality	SQ	Grain brightness and plumpness rating where 0=low quality and 9=high quality
Head disease	HEAD	Grain mold rating (0=no disease and 9=head completely consumed)
Anthracnose	ANT	Anthracnose rating (0=no disease and 9=foliage completely obliterated)
Grain weathering	GW	Weathering rating (0=no damage and 9=not at all marketable)
General disease	DIS	Disease rating (0=no disease, 9=absolutely destroyed)
Stand	STD	Stand establishment (0=none, 9=best)

Producers are encouraged to consult individual companies for hybrid recommendations and plant on-farm trials. However, the OHTs can still be an excellent supplemental source of information, particularly for yield comparison among hybrids from the same company. Please review the results from all trials that are relevant to your farming location and look for hybrids that have desirable, consistent results over years and locations. Do not rely on only one source of hybrid-performance information. Plant two or more hybrids to mitigate risk. Place more value on replicated trials when compared to strip trials.

PROCEDURES

The OHTs were conducted using a randomized complete block experimental design with four replications. Analyses of variance and least-significant differences (LSD) were calculated only if differences existed at the 90% confidence level. If differences were significant, an LSD at the 10% probability level was calculated. If the LSD (0.10) for yield in a trial is 10 bushels per acre, there is a 10% chance that two hybrids with a reported yield difference of 10 bushels per acre are genetically equal and a 90% probability they have a difference in genetic potential in that particular environment. LSD values are influenced by how well soil fertility, stand establishment, plot length, harvest efficiency and other variables are controlled and by the number of replications for each hybrid. The letters NS are used in the tables to indicate lack of significance (not significantly different) at the 10% probability level. The coefficient of variation (CV) reflects the magnitude of experimental error (random variation not accounted for by hybrids and replications) in relation to the trial mean. A high CV means that relative differences among hybrids were not consistent among replications, which reduces the precision of the test.

Yield data for 2023 across locations as well as 2022 data for repeated hybrids is summarized in Table 3. Individual location summaries are in Tables 4 through 9. Also, participating seed companies and their hybrid entries are listed in Table 3.

Table 3. Summary of yield performance of grain sorghum hybrids in the 2023 official hybrid trials.[1]

Company	Hybrid	CR[2]	ALEX	WN NT[3]	WN T[3]	SJ	BC	BR	2023 AVG[4]	2022 AVG	2021 AVG
Dyna-Gro	GX22937	91.7	103.8	95.6	97.6	78.8	92.9	88.3	92.7		
Pioneer	83G19	82.0	93.9	102.5	106.3	76.2	101.4	68.8	90.2	99.6	92.7
Bayer	DKS 51-01	80.3	90.1	102.8	109.5	72.5	97.1	76.0	89.8	95.0	96.4
Pioneer	83P11	84.7	105.0	95.4	96.7	77.8	82.0	84.0	89.3	103.8	99.2
Dyna-Gro	M72GB71	95.6	86.6	107.4	106.1	56.3	101.9	71.3	89.3	90.5	96.6
Bayer	DKS 45-60	74.1	108.0	93.7	86.8	81.6	92.6	83.6	88.6	98.7	
Pioneer	84P80	85.0	90.0	96.2	85.1	92.2	82.5	82.6	87.6	98.9	101.4
Bayer	DKS 54-07	82.8	86.7	97.7	100.2	76.6	88.8	79.3	87.4	90.5	94.6
Dyna-Gro	M67GB87	92.6	88.4	90.7	91.3	76.1	82.5	79.6	85.9	93.8	90.8
Bayer	DKS 44-07	87.7	88.5	92.7	89.4	78.3	79.4	80.0	85.1	96.5	
Pioneer	83P27	76.9	80.3	91.5	92.2	75.8	85.3	90.9	84.7		
Bayer	DKS 40-76	77.7	95.6	91.9	93.7	68.6	80.3	81.8	84.2		
Dyna-Gro	GX22934	86.3	85.9	88.9	93.3	70.2	75.1	79.2	82.7	91.0	
Dyna-Gro	M71GR91	84.8	82.6	95.4	93.6	60.0	76.9	77.4	81.5	91.1	93.4
Bayer	DKS 50-07	74.7	92.6	86.8	89.7	65.0	71.6	81.7	80.3	93.2	95.6
Bayer	DKS 37-07	68.6	82.6	85.1	85.7	75.3	75.3	72.9	77.9	93.0	
Dyna-Gro	GX22932	73.7	98.9	57.5	61.4	82.8	66.1	67.4	72.5		
LSD (P=0.10)		15.6	18.1	7.8	8.0	13.1	6.6	10.8			
CV (%)		16.0	16.6	7.2	7.2	14.9	6.6	10.9			
Grand Mean		82.3	91.7	92.4	92.8	74.4	84.2	79.1	85.3	95.0	95.6

[1]All yields expressed in bushels per acre and adjusted to 14.0% moisture.
[2]ALEX=Alexandria; BR=Baton Rouge; BC=Bossier City; CR=Crowley; SJ=St. Joseph; WN=Winnsboro.
[3]In Winnsboro half of the plots were non-treated (NT), and the other half were treated (T) with 4 fl oz/A Priaxor at boot stage.
[4]AVG=Average across locations and years.

Table 4. Official grain sorghum hybrid trial, Dean Lee Research and Extension Center, Alexandria, 2023.

Company	Hybrid	PH (in)	HEX (in)	HT (1-5)	DIS (0-9)	GM (%)	TW (lb/bu)	YLD (bu/A)
Bayer	DKS 45-60	58.5	6.1	3.8	3.8	11.1	59.5	108.0
Pioneer	83P11	59.7	5.4	1.3	4.0	11.1	58.6	105.0
Dyna-Gro	GX22937	59.7	5.1	1.5	4.0	11.1	59.8	103.8
Dyna-Gro	GX22932	53.5	3.7	1.0	4.3	11.2	59.3	98.9
Bayer	DKS 40-76	57.0	6.1	4.3	4.3	11.2	59.6	95.6
Pioneer	83G19	57.5	2.7	4.3	4.3	11.0	58.9	93.9
Bayer	DKS 50-07	59.5	4.8	1.8	3.8	11.2	59.3	92.6
Bayer	DKS 51-01	63.8	6.9	2.3	3.8	11.0	59.1	90.1
Pioneer	84P80	57.8	3.2	4.3	5.3	11.1	59.7	90.0
Bayer	DKS 44-07	57.8	3.5	1.0	4.8	10.9	58.6	88.5
Dyna-Gro	M67GB87	58.1	3.2	1.5	4.0	11.1	59.3	88.4
Bayer	DKS 54-07	61.1	4.4	1.5	3.8	11.1	59.4	86.7
Dyna-Gro	M72GB71	57.0	3.2	1.8	3.8	11.1	58.7	86.6
Dyna-Gro	GX22934	60.8	4.5	2.0	4.5	11.2	59.0	85.9
Bayer	DKS 37-07	54.4	4.7	4.0	4.3	11.1	58.9	82.6
Dyna-Gro	M71GR91	56.8	2.6	1.3	4.3	11.1	59.1	82.6
Pioneer	83P27	58.8	3.0	5.0	3.8	11.0	60.0	80.3
LSD (P=0.10)		2.7	1.6	0.7	1.5	0.2	1.5	18.1
CV (%)		3.8	32.3	24.7	29.8	1.2	2.1	16.6
Grand Mean		58.3	4.3	2.5	4.1	11.1	59.2	91.7

Numbers shaded within a column are not significantly different from the numerically greatest value.

Table 5. Official grain sorghum hybrid trial, Doyle Chambers Central Research Station, Baton Rouge, 2023.

Company	Hybrid	STD (0-9)	HD (DOY)	PH (in)	DIS (0-9)	TW (lb/bu)	YLD (bu/A)
Pioneer	83P27	7.8	188.0	53.0	3.5	57.2	90.9
Dyna-Gro	GX22937	7.5	189.3	51.0	4.0	57.1	88.3
Pioneer	83P11	8.5	191.0	52.3	2.5	57.2	84.0
Bayer	DKS 45-60	7.8	190.0	52.0	4.5	57.7	83.6
Pioneer	84P80	8.3	189.0	54.8	4.0	57.2	82.6
Bayer	DKS 40-76	7.5	188.8	47.5	2.5	56.2	81.8
Bayer	DKS 50-07	8.0	188.8	51.3	2.8	56.8	81.7
Bayer	DKS 44-07	6.8	187.3	48.0	4.8	58.1	80.0
Dyna-Gro	M67GB87	8.0	188.3	55.0	2.5	54.5	79.6
Bayer	DKS 54-07	8.8	189.8	54.5	3.3	57.3	79.3
Dyna-Gro	GX22934	8.0	188.0	55.5	3.3	57.6	79.2
Dyna-Gro	M71GR91	8.5	190.3	52.0	3.5	57.2	77.4
Bayer	DKS 51-01	9.0	189.8	55.0	3.3	56.3	76.0
Bayer	DKS 37-07	7.5	185.5	51.5	4.3	56.5	72.9
Dyna-Gro	M72GB71	8.5	189.5	54.3	4.0	57.2	71.3
Pioneer	83G19	8.3	192.0	53.0	4.0	54.1	68.8
Dyna-Gro	GX22932	7.3	181.8	47.5	4.5	53.0	67.4
LSD (P=0.10)		0.8	1.5	1.5	0.8	1.6	10.8
CV (%)		10.9	0.7	3.3	19.7	2.4	10.9
Grand Mean		8.0	188.6	53.2	3.6	56.5	79.1

Numbers shaded within a column are not significantly different from the numerically greatest value.

Table 6. Official grain sorghum hybrid trial, Red River Research Station, Bossier City, 2023.

Company	Hybrid	MH (DAP)	PH (in)	HEX (in)	HT (1-5)	BD (0-9)	TW (lb/bu)	YLD (bu/A)
Dyna-Gro	M72GB71	68.0	56.5	4.0	2.0	1.6	58.8	101.9
Pioneer	83G19	70.8	55.0	3.8	2.5	2.4	57.3	101.4
Bayer	DKS 51-01	68.8	57.5	4.8	2.5	2.9	59.2	97.1
Dyna-Gro	GX22937	64.3	56.8	5.5	2.0	2.8	58.4	92.9
Bayer	DKS 45-60	66.3	56.3	7.0	2.3	2.9	52.1	92.6
Bayer	DKS 54-07	67.8	57.5	5.4	1.5	3.1	59.5	88.8
Pioneer	83P27	61.8	56.0	2.8	3.8	4.3	56.1	85.3
Dyna-Gro	M67GB87	64.8	57.5	3.0	1.3	3.3	55.3	82.5
Pioneer	84P80	63.0	57.5	2.8	2.3	3.3	60.6	82.5
Pioneer	83P11	68.3	54.3	3.6	1.3	2.1	57.1	82.0
Bayer	DKS 40-76	64.5	54.8	7.3	2.3	3.0	58.2	80.3
Bayer	DKS 44-07	62.8	54.5	2.8	1.8	2.8	70.7	79.4
Dyna-Gro	M71GR91	64.3	57.3	3.5	1.8	3.6	59.1	76.9
Bayer	DKS 37-07	63.8	55.3	4.6	3.5	3.9	59.3	75.3
Dyna-Gro	GX22934	65.3	59.0	3.6	2.0	3.6	58.4	75.1
Bayer	DKS 50-07	64.8	54.5	2.0	2.0	4.1	59.4	71.6
Dyna-Gro	GX22932	61.3	54.8	3.4	2.3	3.6	54.7	66.1
LSD (P=0.10)		2.3	2.1	1.8	0.8	0.8	8.4	6.6
CV (%)		2.9	3.2	37.0	31.1	20.3	12.1	6.6
Grand Mean		65.3	56.2	4.1	2.2	3.1	58.5	84.2

Numbers shaded within a column are not significantly different from the numerically greatest value.

Table 7. Official grain sorghum hybrid trial, Rice Research Station, Crowley, 2023.

Company	Hybrid	MH (DAP)	PH (in)	HEX (in)	HT (1-5)	GM (%)	TW (lb/bu)	YLD (bu/A)
Dyna-Gro	M72GB71	69.3	45.0	1.0	2.0	15.7	56.9	95.6
Dyna-Gro	M67GB87	67.0	43.8	1.8	2.0	12.4	53.4	92.6
Dyna-Gro	GX22937	67.0	42.0	1.0	2.0	14.8	58.3	91.7
Bayer	DKS 44-07	63.3	43.0	0.8	2.0	13.7	56.3	87.7
Dyna-Gro	GX22934	68.3	44.3	0.0	2.0	15.1	58.2	86.3
Pioneer	84P80	66.8	42.5	0.0	2.8	14.6	57.4	85.0
Dyna-Gro	M71GR91	68.5	42.5	0.5	2.3	16.9	59.3	84.8
Pioneer	83P11	69.3	40.8	0.8	2.0	16.6	57.8	84.7
Bayer	DKS 54-07	71.3	45.0	0.3	2.0	15.6	58.9	82.8
Pioneer	83G19	68.8	45.5	0.0	3.0	16.2	54.5	82.0
Bayer	DKS 51-01	69.5	45.8	1.3	2.3	13.7	53.3	80.3
Bayer	DKS 40-76	67.3	42.0	1.8	2.3	13.2	54.9	77.7
Pioneer	83P27	63.8	43.0	1.0	3.3	13.7	55.4	76.9
Bayer	DKS 50-07	69.3	41.3	0.8	2.0	15.9	58.0	74.7
Bayer	DKS 45-60	68.8	40.3	2.8	2.0	16.6	57.2	74.1
Dyna-Gro	GX22932	60.5	42.3	0.3	2.0	10.3	49.7	73.7
Bayer	DKS 37-07	62.5	42.5	0.5	3.0	13.1	53.0	68.6
LSD (P=0.10)		2.3	2.1	1.8	0.8	0.8	8.4	6.6
CV (%)		2.9	3.2	37.0	31.1	20.3	12.1	6.6
Grand Mean		65.3	56.2	4.1	2.2	3.1	58.5	84.2

Numbers shaded within a column are not significantly different from the numerically greatest value.

Table 8. Official grain sorghum hybrid trial, Northeast Research Station, St. Joseph, 2023.

Company	Hybrid	PH (in)	HEX (in)	HT (1-5)	GM (%)	TW (lb/bu)	YLD (bu/A)
Pioneer	84P80	58.5	3.5	4.5	16.7	48.9	92.2
Dyna-Gro	GX22932	53.0	2.5	1.8	20.7	43.1	82.8
Bayer	DKS 45-60	58.8	5.3	4.0	17.5	53.4	81.6
Dyna-Gro	GX22937	58.8	4.1	2.8	17.5	54.2	78.8
Bayer	DKS 44-07	55.9	3.0	1.8	17.8	48.3	78.3
Pioneer	83P11	58.9	3.4	2.8	17.7	50.9	77.8
Bayer	DKS 54-07	60.6	4.5	2.0	20.8	50.1	76.6
Pioneer	83G19	56.4	2.9	4.0	22.4	46.9	76.2
Dyna-Gro	M67GB87	60.4	1.8	1.3	18.1	49.6	76.1
Pioneer	83P27	62.1	4.1	4.5	19.0	48.8	75.8
Bayer	DKS 37-07	57.5	5.1	5.0	20.8	53.7	75.3
Bayer	DKS 51-01	61.9	4.0	2.8	19.2	50.1	72.5
Dyna-Gro	GX22934	61.3	2.9	3.5	18.2	52.8	70.2
Bayer	DKS 40-76	57.8	4.4	5.0	20.0	50.1	68.6
Bayer	DKS 50-07	61.2	5.6	1.3	20.8	49.4	65.0
Dyna-Gro	M71GR91	63.0	3.7	1.3	19.4	49.6	60.0
Dyna-Gro	M72GB71	61.1	2.9	1.3	22.6	49.4	56.3
LSD (P=0.10)		2.1	1.8	0.8	0.8	8.4	6.6
CV (%)		3.2	37.0	31.1	20.3	12.1	6.6
Grand Mean		56.2	4.1	2.2	3.1	58.5	84.2

Numbers shaded within a column are not significantly different from the numerically greatest value.

Table 9. Official grain sorghum hybrid trial, Macon Ridge Research Station, Winnsboro, 2023.

Company	Hybrid	PH (in)	HEX (in)	HT (1-5)	ANT 0-9 (NT)	ANT 0-9 (T)	BD 0-9 (NT)	BD 0-9 (T)	GM % (NT)	GM % (T)	TW lb/bu (NT)	TW lb/bu (T)	YLD bu/A (NT)	YLD bu/A (T)
Bayer	DKS 51-01	57.8	5.5	3.0	0.3	0.5	0.8	0.5	13.1	13.0	56.8	56.4	102.8	109.5
Pioneer	83G19	55.0	2.9	4.3	0.3	0.3	0.8	0.5	13.1	13.2	55.9	55.4	102.5	106.3
Dyna-Gro	M72GB71	59.4	4.7	3.0	1.0	1.0	0.3	0.0	13.2	13.0	56.6	56.6	107.4	106.1
Bayer	DKS 54-07	59.5	4.2	2.5	0.0	1.0	0.8	0.8	13.1	13.0	57.7	57.8	97.7	100.2
Dyna-Gro	GX22937	57.7	5.8	2.0	2.3	0.0	1.3	1.8	12.7	13.0	56.4	56.7	95.6	97.6
Pioneer	83P11	57.6	4.9	2.0	0.5	0.8	1.0	0.8	13.7	13.1	55.8	55.8	95.4	96.7
Bayer	DKS 40-76	53.1	5.8	5.0	1.0	0.8	0.3	0.8	12.8	12.8	55.8	56.2	91.9	93.7
Dyna-Gro	M71GR91	57.7	5.6	2.0	0.8	0.5	1.8	1.3	13.0	13.4	56.9	57.4	95.4	93.6
Dyna-Gro	GX22934	59.0	5.8	2.0	1.0	0.3	1.3	1.5	13.8	13.3	56.9	57.2	88.9	93.3
Pioneer	83P27	59.3	4.6	4.8	0.8	0.5	2.0	2.8	13.7	14.3	54.3	54.4	91.5	92.2
Dyna-Gro	M67GB87	56.5	5.0	1.5	0.5	0.8	2.3	1.5	13.5	12.7	54.8	55.1	90.7	91.3
Bayer	DKS 50-07	59.0	5.1	2.0	1.0	0.5	1.3	2.3	13.2	12.7	56.7	57.0	86.8	89.7
Bayer	DKS 44-07	54.4	5.1	1.5	1.5	1.3	1.0	1.5	12.7	13.1	56.7	56.7	92.7	89.4
Bayer	DKS 45-60	58.1	9.1	3.0	1.3	0.3	2.3	1.8	12.8	12.4	56.9	56.6	93.7	86.8
Bayer	DKS 37-07	54.8	5.1	4.3	0.5	1.0	1.3	1.3	12.7	12.7	56.7	56.6	85.1	85.7
Pioneer	84P80	56.1	4.3	4.0	0.5	0.8	1.5	1.5	12.8	13.1	55.6	55.6	96.2	85.1
Dyna-Gro	GX22932	54.4	4.8	1.3	0.3	0.5	2.5	3.0	13.7	12.1	52.2	53.3	57.5	61.4
Mean		2.5	1.3	0.8	0.7	0.9	0.9	1.0	0.6	0.8	1.3	0.9	7.8	8.0
CV (%)		3.6	20.8	25.2	80.3	125.5	57.3	58.8	4.1	5.2	1.9	1.3	7.2	7.2
LSD (0.10)		57.0	5.2	2.8	0.8	0.6	1.3	1.4	13.1	13.0	56.0	56.2	92.4	92.8

Numbers shaded within a column are not significantly different from the numerically greatest value.

Table 10. Locations and agronomic milestones for the grain sorghum on-farm core block demonstrations, 2023.

Location	Soil Type	Previous Crop	Planting Date	Harvest Date	Row Spacing	Seeding Rate	Irrigation
Grant	Silty clay loam	Soybean	4/14/23	8/3/23	38”	150,000	None
Franklin	Silt loam	Corn	4/17/23	9/8/23	40”	80,000	Furrow
Tensas	Silt loam	Soybean	4/19/23	8/31/23	38”	80,000	None

Table 11. Summary of yield performance of grain sorghum hybrids in the 2023 on-farm core block demonstrations.[1]

Company	Hybrid	Grant	Franklin	Tensas	Average
Dyna-Gro	M72GB71	129.2	102.7	66.3	99.4
Pioneer	83P11	120.6	99.4	76.7	98.9
Bayer	DKS44-07	129.0	97.1	64.7	96.9
Dyna-Gro	M67GB87	107.3	101.5	81.0	96.6
Pioneer	83G19	120.7	93.6	75.2	96.5
Bayer	DKS50-07	121.8	87.2	75.0	94.7
Bayer	DKS37-07	103.7	82.0	70.3	85.3
Dyna-Gro	M71GR91	114.1	88.6	51.9	84.9
Average		118.3	94.0	70.1	94.2

[1]*All yields expressed in bushels per acre and adjusted to 14.0% moisture.*

PLANTING

Date

In south Louisiana, the recommended planting range is between April 1 and May 1. In north Louisiana, the range typically is between April 15 and May 15. Early planting is one of the most important cultural practices a producer can adopt to maximize grain sorghum yields because yields decrease progressively with later planting dates. The five-day average soil temperature should be at least 60 degrees Fahrenheit at a 2-inch depth, although an ideal temperature for quick germination and establishment of grain sorghum is near 65 degrees Fahrenheit. The minimum soil temperature for germination and emergence of sorghum is approximately 55 degrees Fahrenheit, but slow growth should be expected. In addition, a later-planted crop will likely be vulnerable to greater disease and insect pressure, particularly from the sorghum midge and sugarcane aphid. After June 15, it is less risky to plant soybean than grain sorghum.

Seeding Rate and Depth

Grain sorghum should be planted at a rate of approximately 75,000 seeds per acre. This is equivalent to five to six seeds per row foot on 38- to 40-inch centers, four to five on 30- to 36-inch centers, and three to four on 20-inch centers. If rows are 10 inches or less, three seeds per row foot should be adequate. Seed should be planted in adequate moisture no deeper than 2 inches. Optimum depth ranges from ¾ to 1 ½ inches.

Sorghum seed varies in size from 12,000 (38 grams per 1,000 seed) to 18,000 (25 grams per 1,000 seed) seeds per pound. If using pounds per acre to plant, growers should be aware that populations can vary greatly (Table 12). Consequently, seeding rates should be based on seed per acre and not pounds per acre. Seed number per pound will be stated on the seed bag tag.

Table 12. Effect of seed size on planting rate and plant population when planting is based on pounds per acre.

Hybrid	A	B
Seed weight grams/1,000 seed	38	25
Number of seeds per pound	12,000	18,000
Number of seeds @ 6 lbs/acre	72,000	108,000

Row Spacing

Sorghum responds positively to narrow row spacing (30 inches or less). Plants are more efficient when each plant is given space to intercept sunlight and competition from other plants is minimized. In addition, narrow rows promote shading of the soil surface, which reduces evaporation losses and weed competition.

PREDICTING SORGHUM DEVELOPMENT BASED ON AIR TEMPERATURE

Grain sorghum growth stages can be determined from planting through black layer. The duration of each growth stage is closely correlated to air temperature and hybrid maturity group (Table 13). We know that daily minimum and maximum temperatures vary from year to year and between locations. Consequently, the number of calendar days from planting to emergence, panicle initiation, flowering and black layer varies and is not a good indication of crop developmental stages. As a result, thermal accumulation more reliably estimates crop development. It is estimated as the cumulative number of growing degree units (GDU) between growth stages, for example, from planting to emergence, to panicle initiation and so forth. For grain sorghum, GDUs accumulated each day are calculated as follows:

$$GDU = \frac{\text{daily max. air temp.} + \text{daily min. air temp.}}{2} - \text{base temp.}$$

The base temperature, or lower temperature limit, of sorghum development is 50 degrees Fahrenheit, while the upper limit is 100 degrees Fahrenheit. Air temperatures greater than 100 degrees Fahrenheit are entered as 100 degrees Fahrenheit, and temperatures less than 50 degrees Fahrenheit are entered as 50 degrees Fahrenheit.

Table 13. Cumulative growing degree units (F) from planting to successive growth stages for early and full season grain sorghum hybrids.

Growth Stage	Cumulative GDUs (F)	Cumulative GDUs (F)
Planting	Early season hybrid	Full season hybrid
Emergence	200	200
3-leaf	500	500
4-leaf	575	575
5-leaf	660	660
Panicle initiation	924	1,365
Flag leaf visible	1,287	1,470
Boot	1,683	1,750
Heading	1,749	1,890
Flowering	1,848	1,995
Soft dough	2,211	2,310
Hard dough	2,508	2,765
Black layer	2,673	3,360

Source: Texas A&M University

FERTILITY

Soil testing is the foundation of a sound fertility program and is the only way to gauge soil amendment (i.e., lime and fertilizers) needs correctly and efficiently. Proper fertility is critical for optimizing grain sorghum yield. The vast majority of grain sorghum fields will require the addition of fertilizer. The estimated uptake of nitrogen, phosphorus, potassium and sulfur by grain sorghum (125 bu/a) is presented in Table 14. The values presented are not the amount of nutrients that need to be applied, but rather the total uptake by the grain sorghum crop from soil, fertilizer and other sources.

Table 14. Approximate amount of nutrient uptake by grain sorghum (125 bu/a).

	Quantity in pounds	Quantity in pounds
Element	Grain	Stover
Nitrogen (N)	82.5	70.0
Phosphorus (P_2O_5)	48.8	20.0
Potassium (K_2O)	33.8	103.8
Sulfur (S)	7.5	15.0

Source: International Plant Nutrition Institute, May 2014.

Soil pH

Soil pH affects the availability of nutrients. The optimal soil pH for grain sorghum ranges from 5.8 to 6.5. Continued cultivation and the use of chemical fertilizers, especially those containing ammonium and sulfur, tend to decrease soil pH over time. Irrigation with water high in calcium carbonate, on the other hand, tends to increase soil pH. Soil samples should be collected and analyzed for degree of acidity or alkalinity. Lime is generally recommended at pH values below 6.1, and general guidelines to raise pH are detailed in Table 15. Soil texture and buffer capacity are required for an accurate estimate of lime requirements. If lime is needed, applications should occur during the fall to provide enough time for it to react with the soil.

The relative neutralizing value (RNV) of lime affects the application amount. This value is based on the individual material fineness and calcium carbonate equivalent (CCE), which is the amount of pure calcium carbonate to which the selected material corresponds, with finer materials reacting more quickly than coarse materials. A liming material with a CCE of 100 is “stronger” than one with a CCE of 90. Consequently, less volume of the stronger material would be needed to increase the pH of a given soil.

Table 15. Lime recommendations for grain sorghum (Mehlich 3 extraction).

Soil pH	Lime (tons/acre)[1]
Above 6.1	0
5.8-6.1	1
5.0-5.8	2
Below 5	3

[1]Amount of limestone needed to adjust soil pH to a desired level for grain sorghum depends on the initial soil pH, clay content and buffer capacity (resistance to pH change). Testing soil pH is an excellent indicator of the need for lime and is sometimes combined with soil texture to estimate lime requirement. However, most soil testing laboratories offer a buffer lime-requirement test that provides a more accurate estimate of the quantity of lime that should be applied.

Nitrogen

Nitrogen can be applied before or at planting, and split applications can be used. Apply nitrogen in a split application with 50% to 75% applied before or at planting and the balance no later than the 6- to 8-leaf stage. All of the required nitrogen can be applied pre-plant or at planting, but this increases the risk of fertilizer burn on seedlings and nitrogen loss from leaching or volatilization. Nitrogen should be applied between 100 to 125 or 125 to 150 pounds per acre on upland and alluvial soils, respectively. A rough rule of thumb is to apply 1.12 pounds of actual nitrogen for each bushel of grain sorghum produced.

Phosphorus

Grain sorghum utilizes phosphorus early during the growth period, so this nutrient should be applied pre-plant or at planting (Table 16). Soil testing is recommended to determine appropriate levels for each field, but most soils require 40 to 60 pounds of P2O5 per acre. Band applications of phosphorus will increase efficiency in very acidic or alkaline soils. Also, starter fertilizers can be beneficial for soils that have a high pH or have low phosphorus levels.

Table 16. Phosphorus recommendations for grain sorghum based on soil test levels (ppm) and pounds of P_2O_5 to apply per acre.

Very low	Low	Medium	High	Very high
<10 ppm	10-19 ppm	20-34 ppm	35-50 ppm	>50 ppm
80 lbs	60 lbs	40 lbs	0 lbs	0 lbs

Potassium

Grain sorghum uses potassium early during the growing season, so this nutrient should be applied pre-plant or at planting (Table 17). Soil testing is recommended to apply appropriate levels for each field, but 40 to 60 pounds of K_2O per acre will be needed

Table 17. Potassium recommendations based on soil test levels (ppm) and soil type for grain sorghum.

Soil Type	VL ppm	VL K_2O	L ppm	L K_2O	M ppm	M K_2O	H ppm	H K_2O	VH ppm	VH K_2O
Clay	<141	80	141-210	60	211-316	40	317-334	0	>334	0
Clay loam	<123	80	123-175	60	176-263	40	264-282	0	>282	0
F. sandy loam	<53	80	53-87	60	88-122	40	123-141	0	>141	0
Loamy sand	<35	80	35-52	60	53-78	40	79-123	0	>123	0
Silty clay	<141	80	141-210	60	211-316	40	317-334	0	>334	0
Silt clay loam	<123	80	123-175	60	176-263	40	264-282	0	>282	0
Silt loam	<70	80	70-105	60	106-140	40	141-158	0	>158	0
V.F. sandy loam	<53	80	53-87	60	88-122	40	123-141	0	>141	0

Sulfur

A grain sorghum crop (125 bu/a) takes up about 23 pounds per acre sulfur with about 8 pounds per acre removed in the grain at harvest. When a soil test is utilized to determine if sulfur is needed, values of less than 12 ppm (Mehlich 3 extraction) suggest that additional sulfur may be needed. The typical recommended rate of sulfur is 20 pounds per acre in the sulfate form.

Zinc

Zinc was one of the first micronutrients recognized as essential for plants and the most common that limits yield. Although zinc is required in small amounts, maximum yield is impossible without it. If zinc is lower than 1 ppm, apply 10 pounds per acre of zinc in a soluble form, such as zinc sulfate or zinc chelate (Table 18). Among the inorganic zinc sources on the market, the most common sources are sulfates, oxides and oxysulfates. Zinc sulfate and zinc chelates essentially are 100% water-soluble, while zinc oxides essentially are insoluble in a single crop season and thus unavailable to the crop to be planted. Oxysulfates are a mixture of sulfates and oxides, with varying proportions of sulfates and oxides and different solubility levels (0.7% to 98.3%). The effectiveness of these can be highly variable, depending on solubility. Low solubility materials may have some value in a long-term buildup program, but when immediate results are the goal, highly soluble fertilizers are the best choices. For acceptable in-season efficacy, a zinc-fertilizer source should be at least 50% water-soluble. If a soil test shows zinc is between 1 and 2.25 ppm, apply 5 pounds of zinc per acre when broadcasting. Less is needed if using a banded application.

Table 18. Zinc recommendations for grain sorghum based on soil test levels (ppm) and pounds of zinc to apply per acre (Mehlich 3 extraction).

Low	Medium	High
<1 ppm	1-2.25 ppm	>2.25 ppm
10 lbs	5 lbs	0 lbs

Pest Control

Weeds compete with grain sorghum for light, nutrients and soil moisture, thus reducing yield and grain quality. For each inch of soil moisture used by weeds, 5 to 7 bushels per acre of grain yield can be lost. Weeds also may harbor insects and diseases that could potentially impact yield and quality. The most critical period for weed control is the first four weeks after planting. If weeds are controlled during this time and maintained throughout the season, little reduction in grain sorghum yield is expected. However, weed escapes can be a major yield threat and can interfere with harvest. Herbicides commonly used for weed control in grain sorghum can be found in the 2023 Louisiana Suggested Chemical Weed Management Guide. Information concerning proper herbicide rates, application timings and other details also can be found within the guide. The Insect and Plant Disease Management Guides also are available to guide decisions.

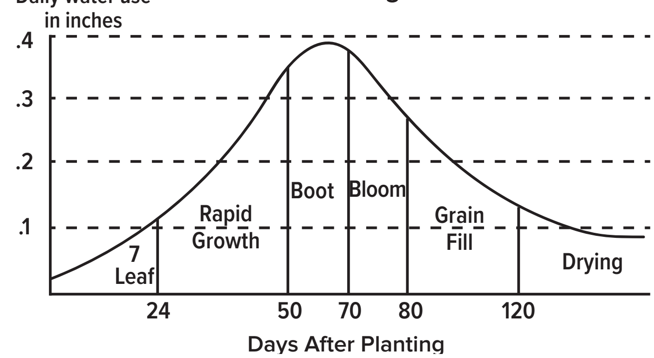
Water

Grain sorghum has a reputation for drought tolerance, which makes it a good choice for dryland situations. A sorghum crop that receives 21 inches of usable water during the growing season will use 6 to 8 inches to produce the head, while the other 13 to 15 inches will produce approximately 100 bushels of grain per acre. Moisture stress early in the season will limit head size (number of seeds per head) and delay maturity. If stress occurs later in the season, the seed size is greatly reduced. The number of heads is not affected by moisture stress unless drought is severe enough to prevent head formation.

During the seedling stage, only a small amount of moisture in the soil surface is required to establish the crop. More moisture is lost during this stage through evaporation from the soil surface than through plant uptake. Water conserving practices, such as residue management, timely planting for quick establishment, narrow row spacing and weed control will minimize soil moisture losses.

About 30 to 35 days after emergence, five to six true leaves are visible, and the plant begins rapid growth. Nearly half of the total seasonal water will be used during this stage prior to heading. The most critical period for water availability for sorghum begins about one week before head emergence, or boot stage, and continues through two weeks past flowering (Figure 1). Sorghum plants require adequate soil moisture during this period for maximum yield. Optimum soil moisture prior to boot stage will ensure the highest potential seed set. The actual seed number and seed size will be dependent upon the availability of soil moisture following flowering. Moisture demand drops quickly after the grain has reached soft-dough stage. This combined drop in moisture demand, natural drought tolerance and the extensive root system of sorghum generally makes late irrigation unprofitable.

Figure 1. Estimated Daily Water Use for Grain Sorghum



Harvest Aids

In Louisiana, grain sorghum producers may consider harvest aids, particularly glyphosate, to manage sorghum dry down and harvest for several reasons. Currently, sodium chlorate and glyphosate are labeled for application in grain sorghum for several reasons, including:

- Easier threshing.
- Drying out the late-emerging head and nonproductive sucker-head tillers that otherwise could delay harvest.
- Reducing differences in harvest maturity across a field that has different soil types.
- Killing the sorghum plant, which reduces moisture and nutrient loss from the soil.
- Hastening the decay of the crown, which could interfere with planting the following year.
- Accelerating harvest to meet a delivery or pricing deadline.
- Reducing the presence of moist, weedy material in the grain.

On a cautionary note, applying harvest aids to sorghum fields with stalk or charcoal rot can increase lodging if prompt harvest does not occur.

Applications should not be made prior to black layer and if seed moisture is above 30%, or grain yield will be reduced. Furthermore, if a harvest aid is applied at black layer, harvest should occur in the next seven to 10 days.

Determining Harvest Losses

As a rule of thumb, 17 to 20 kernels per square foot are equivalent to 1 bushel per acre. To aid in determining losses, a 1-square-foot frame may be constructed from heavy wire. It is recommended to take at least three ground counts at each location. Also, when making ground counts for kernels, look for lost heads. One 10-inch head per 10-foot area is approximately 1 bushel per acre.

Ratooning

As a member of the grass family, sorghum has a panicle-type inflorescence and tillering characteristics that make it able to completely regenerate the above-ground portion of the plant. This characteristic allows producers to seek a second grain crop within the same growing season. Ratooning practices begin with shredding the sorghum stalks down. The decision to ratoon is made only after 5 to 6 inches of regrowth is observed which is then followed by 40 to 60 pounds of nitrogen. One can usually plan on the ratoon crop to yield from one-quarter to one-third of the main grain crop. A great ratoon crop seldom follows a poor main crop. Damage and feeding by birds are the most devastating potential problems to the ratoon crop.

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Tashia Monaghan, Research Associate

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Chris Roider, Research Farm Manager
Kelly Arceneaux, Research Associate
Hanamareddy Biradar, International Scholar
Steven Abernathy, Graduate Research Assistant

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Rasel Parvej, Assistant Professor/Soil Fertility Specialist
Trey Price, Associate Professor/Plant Pathologist
Scott Washam, Research Farm Manager
Myra Purvis, Research Associate
Dustin Ezell, Research Associate
Moklasur Rahman, Research Associate
Jamil Uddin, Postdoctoral Researcher

LSU AgCenter Red River Research Station
William Waltman, Research Farm Manager
Rusty Anderson, Research Associate

LSU AgCenter H. Rouse Caffey Rice Research Station
Manoch Kongchum, Associate Professor/Agronomist
James Leonards, Research Associate
Jacob Fluitt, Research Associate
Bradley Beard, Research Associate

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