GRAIN SORGHUM HYBRIDS FOR GRAIN 2022

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NOTES

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 commercial 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 grain sorghum producers with hybrid selection, the LSU AgCenter conducts annual grain sorghum OHTs at several locations across the state. These trials provide grain sorghum producers with unbiased information on hybrid performance across different soil types and environmental conditions. During 2021, 15 hybrids were included in the five trial locations in Alexandria, Bossier City, Crowley, St. Joseph and Winnsboro (Tables 4-8). 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 Avoyelles, Rapides and St. Landry parishes (Tables 9 and 10). This information should be used to supplement but not replace the OHT information.

Table 1. Locations and agronomic milestones for the grain sorghum official hybrid trials, 2021.

Location	Soil Type	Previous Crop	Planting Date	Harvest Date	Row Spacing	Seeding Rate	Irrigated
Alexandria	Coushatta silt loam	Soybean	5/27/21	9/27/21	38”	80,000	No
Bossier City	Moreland silty clay loam	Cotton	4/22/21	8/24/21	40”	80,000	No
Crowley	Crowley silt loam	Fallow	4/6/21	8/4/21	30”	80,000	No
St. Joseph	Sharkey clay	Soybean	5/16/21	9/10/21	38”	80,000	No
Winnsboro	Gigger-Gilbert complex	Corn	4/13/21	9/8/21	40”	80,000	No

Table 2. Performance attributes measured in the grain sorghum official hybrid trials, 2021.

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	Date of head emergence in 50% of plants (days after planting).
Plant height	PH	From soil surface to top of the head (inches).
Head type	HT	Measure of head structure, with ratings of 1-5; 1=closed,3=intermediate, and 5=open.
Head exertion	HEX	Distance from the flag leaf to base of the head (inches).
Lodging	LOD	Plants that are lodged at harvest (%).
Midge damage	MD	Total percentage of head damage.
Bird damage	BD	Total percentage of head damage.
Foliar disease	FOLD	Foliar disease rating (0-9 scale, where 0 = no disease and 9 = foliage completely infected, used in situations where multiple diseases occur).

Producers are encouraged to consult individual companies for hybrid recommendations and plant their own 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 comparing 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 2021 across locations is summarized in Table 3. Individual location summaries are located in Tables 4 through 8. 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 2021 official hybrid trials.[1]

Company	Hybrid	ALEX[2]	BC	CR	SJ	WN	AVG
Pioneer	84P72	81.2	108.4	81.6	145.0	105.8	104.4
Dyna-Gro	GX20998	95.1	108.4	70.8	129.0	105.4	101.7
Pioneer	84P80	64.6	104.3	88.5	142.1	107.5	101.4
Dyna-Gro	GX20970	84.0	99.4	83.0	133.9	97.6	99.6
Pioneer	83P11	66.9	105.0	99.1	135.6	89.4	99.2
Pioneer	84P68	70.2	102.2	81.4	140.1	100.1	98.8
Dyna-Gro	M72GB71	64.5	104.4	79.8	134.4	100.2	96.6
Dyna-Gro	M63GB78	81.9	108.4	72.9	132.3	87.2	96.5
Dyna-Gro	GX21965	49.3	106.1	79.1	152.0	95.8	96.4
Bayer	DKS51-01	51.1	108.1	74.3	139.1	109.3	96.4
Bayer	DKS50-07	65.1	109.7	84.0	119.8	99.7	95.6
Bayer	DKS54-07	67.0	102.8	63.3	145.1	94.8	94.6
Dyna-Gro	M71GR91	64.5	112.7	73.2	120.5	96.1	93.4
Pioneer	83G19	46.7	104.6	85.9	142.2	84.4	92.7
Dyna-Gro	M67GB87	64.2	103.9	74.6	132.3	79.1	90.8
	Mean	67.7	105.9	79.4	136.2	96.8	
	CV (%)	23.2	8.0	9.8	8.3	10.4	
	LSD (0.10)	18.7	NS	9.3	15.6	11.9	

[1]All yields expressed in bushels per acre and adjusted to 14.0% moisture.
[2]ALEX=Alexandria; BC=Bossier City; CR=Crowley; SJ= St. Joseph; WN=Winnsboro; and AVG=average.

Table 4. Grain sorghum official hybrid trial, Dean Lee Research Station, Alexandria, 2021.

Hybrid	YLD (14.0%)	GM	TW	MH	PH	HT	HEX	LOD	MD	BD	FOLD1[1]	FOLD2[1]
	bu/a	%	lb/bu	DAP	in	1-5	in	%	%	%	0-9	0-9
GX20998	95.1	12.6	51.4	51.0	56.2	2.5	7.0	0.0	0.0	0.0	1.5	4.0
GX20970	84.0	12.8	53.4	52.5	58.7	1.5	4.1	0.0	0.0	0.0	2.8	5.5
M63GB78	81.9	13.4	50.6	51.3	56.7	4.0	5.5	0.0	0.0	0.0	2.3	5.0
84P72	81.2	13.9	52.5	53.3	61.2	1.3	5.4	0.0	0.0	0.0	2.8	6.0
84P68	70.2	13.8	52.6	51.5	58.7	2.8	4.7	0.0	0.0	0.0	1.8	5.0
DKS54-07	67.0	15.7	52.4	54.8	63.9	1.3	5.9	0.0	0.0	0.0	1.5	4.3
83P11	66.9	15.9	50.9	52.5	65.1	1.0	4.0	0.0	0.0	0.0	2.3	5.3
DKS50-07	65.1	16.9	52.3	51.5	61.3	1.5	5.7	0.0	0.0	0.0	2.3	5.5
84P80	64.6	15.0	51.6	51.8	59.3	2.0	4.2	0.0	0.0	0.0	2.8	6.0
M71GR91	64.5	17.8	52.9	52.3	60.1	1.0	5.2	0.0	0.0	0.0	2.0	4.0
M72GB71	64.5	15.9	52.2	53.5	61.8	1.5	4.6	0.0	0.0	0.0	3.0	6.3
M67GB87	64.2	14.8	50.2	52.3	65.6	1.3	5.6	0.0	0.0	0.0	1.0	2.8
DKS51-01	51.1	15.0	51.9	52.5	62.5	2.5	6.4	0.0	0.0	0.0	1.3	3.8
GX21965	49.3	16.2	52.1	51.5	58.1	2.8	4.9	0.0	0.0	0.0	2.0	4.3
83G19	46.7	17.8	49.5	52.0	63.2	2.8	4.0	0.0	0.0	0.0	3.3	5.8
Mean	67.7	15.1	51.8	52.3	60.8	2.0	5.1	0.0	0.0	0.0	2.2	4.9
CV (%)	23.2	17.3	2.6	2.7	3.0	29.5	22.5	0.0	0.0	0.0	28.0	19.0
LSD (0.10)	18.7	NS	1.6	1.7	2.1	0.7	1.4	NS	NS	NS	0.7	1.1

Numbers shaded within a column are not significantly different from the numerically greatest value.
[1]Overall foliar disease ratings conducted on August 16 and 26.

Table 5. Grain sorghum official hybrid trial, Red River Research Station, Bossier City, 2021.

Hybrid	YLD (14.0%)	GM	TW	MH	PH	HT	HEX	LOD	BD
	bu/a	%	lb/bu	DAP	in	1-5	in	%	%
M71GR91	112.7	14.9	57.7	67.8	56.0	1.8	4.3	0.0	27.5
DKS50-07	109.7	14.3	56.1	68.3	58.8	1.5	4.0	0.0	11.3
GX20998	108.4	14.3	56.2	68.3	57.8	1.8	5.5	0.0	10.0
M63GB78	108.4	14.3	54.9	65.3	57.0	2.5	4.3	0.0	20.0
84P72	108.4	14.1	55.6	66.8	58.3	2.8	3.8	0.0	15.0
DKS51-01	108.1	14.4	56.8	68.5	62.0	2.3	4.3	0.0	32.5
GX21965	106.1	14.7	55.9	67.8	59.3	2.0	3.0	0.0	18.8
83P11	105.0	15.4	55.5	64.5	60.0	1.8	5.0	0.0	23.8
83G19	104.6	14.7	55.1	68.0	60.3	1.8	4.0	0.0	16.3
M72GB71	104.4	14.9	57.0	69.5	59.5	1.8	3.3	0.0	10.0
84P80	104.3	14.7	55.8	67.3	60.5	3.0	2.8	0.0	26.3
M67GB87	103.9	14.6	55.0	66.5	61.5	1.3	3.5	0.0	28.8
DKS54-07	102.8	14.6	54.7	69.5	61.3	1.3	4.0	0.0	21.3
84P68	102.2	15.6	55.6	65.8	59.8	2.0	3.3	0.0	12.5
GX20970	99.4	13.8	55.8	66.0	59.8	1.5	5.5	0.0	18.8
Mean	105.9	14.6	55.8	67.3	59.5	1.9	4.0	0.0	19.5
CV (%)	8.0	5.3	2.4	3.3	4.8	40.5	48.7	0.0	45.3
LSD (0.10)	NS	NS	NS	2.6	NS	0.9	NS	NS	10.5

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

Table 6. Grain sorghum official hybrid trial, Rice Research Station, Crowley, 2021.

Hybrid	YLD (14.0%)	GM	TW	MH	PH	HT	HEX	LOD	MD	BD	FOLD[1]
	bu/a	%	lb/bu	DAP	in	1-5	in	%	%	%	0-9
83P11	99.1	17.0	54.0	66.8	57.3	2.8	5.3	0.0	0.0	0.0	5.5
84P80	88.5	16.1	51.2	67.0	59.0	3.3	6.3	0.0	0.0	0.0	5.5
83G19	85.9	16.9	51.1	68.3	55.0	3.5	5.5	0.0	0.0	0.0	3.9
DKS50-07	84.0	16.6	52.6	69.3	57.3	2.0	6.0	0.0	0.0	0.0	5.0
GX20970	83.0	16.4	51.8	68.8	53.5	2.3	6.0	0.0	0.0	0.0	7.3
84P72	81.6	16.3	49.8	68.3	56.5	3.5	5.0	0.0	0.0	0.0	6.6
84P68	81.4	15.7	49.0	65.5	55.5	4.0	7.0	0.0	0.0	0.0	7.0
M72GB71	79.8	16.4	50.6	71.0	59.8	2.3	3.0	0.0	0.0	0.0	3.9
GX21965	79.1	16.3	49.2	72.3	56.3	3.3	4.0	0.0	0.0	0.0	3.6
M67GB87	74.6	16.8	49.7	72.0	58.3	2.0	5.0	0.0	0.0	0.0	4.4
DKS51-01	74.3	16.6	51.3	72.8	60.3	2.8	5.5	0.0	0.0	0.0	2.1
M71GR91	73.2	17.1	51.8	70.3	58.8	2.3	4.0	0.0	0.0	0.0	3.5
M63GB78	72.9	16.1	49.9	66.5	52.3	3.8	6.8	0.0	0.0	0.0	5.0
GX20998	70.8	16.4	52.9	70.3	57.0	2.5	6.0	0.0	0.0	0.0	3.1
DKS54-07	63.3	17.1	50.7	73.3	59.8	2.3	6.5	0.0	0.0	0.0	3.4
Mean	79.4	16.5	51.0	69.5	57.1	2.8	5.5	0.0	0.0	0.0	4.7
CV (%)	9.8	2.4	2.7	2.4	4.0	16.9	38.0	0.0	0.0	0.0	16.5
LSD (0.10)	9.3	0.5	1.7	2.0	2.7	0.6	NS	NS	NS	NS	0.9

Numbers shaded within a column are not significantly different from the numerically greatest value.
[1]Overall foliar disease ratings conducted on July 25.

Table 7. Grain sorghum official hybrid trial, Northeast Research Station, St. Joseph, 2021.

Hybrid	YLD (14.0%)	GM	TW	PH	HT	HEX	LOD	MD	BD
	bu/a	%	lb/bu	in	1-5	in	%	%	%
GX21965	152.0	15.1	55.4	56.4	2.3	5.5	0.0	0.0	16.7
DKS54-07	145.1	16.1	55.5	61.8	1.3	6.7	0.0	0.0	10.0
84P72	145.0	14.8	55.4	53.4	2.0	3.4	0.0	0.0	21.7
83G19	142.2	15.3	53.2	53.4	3.0	2.8	0.0	0.0	15.0
84P80	142.1	14.7	54.6	54.6	2.7	3.3	0.0	0.0	22.7
84P68	140.1	14.7	54.1	54.3	4.0	3.3	0.0	0.0	21.7
DKS51-01	139.1	13.9	55.7	57.5	2.3	5.9	0.0	0.0	26.7
83P11	135.6	14.8	53.9	54.1	1.3	5.7	0.0	0.0	8.3
M72GB71	134.4	14.8	56.1	58.5	1.7	5.5	0.0	0.0	8.3
GX20970	133.9	14.7	53.2	54.2	1.7	5.9	0.0	0.0	8.3
M63GB78	132.3	14.2	50.9	55.6	3.7	6.6	0.0	0.0	16.7
M67GB87	132.3	15.6	51.5	59.6	1.0	5.2	0.0	0.0	43.3
GX20998	129.0	14.3	52.2	51.9	2.3	6.7	0.0	0.0	10.0
M71GR91	120.5	15.5	54.7	57.7	1.0	6.1	0.0	0.0	18.3
DKS50-07	119.8	15.3	55.9	58.2	1.0	6.3	0.0	0.0	16.7
Mean	136.2	14.9	54.2	56.1	2.1	5.3	0.0	0.0	17.6
CV (%)	8.3	3.3	2.4	2.8	20.0	23.0	0.0	0.0	69.9
LSD (0.10)	15.6	0.7	1.8	2.1	0.6	1.7	NS	NS	NS

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

Table 8. Grain sorghum official hybrid trial, Macon Ridge Research Station, Winnsboro, 2021.

Hybrid	YLD (14.0%)	GM	TW	MH	PH	HT	HEX	LOD	MD	BD
	bu/a	%	lb/bu	DAP	in	1-5	in	%	%	%
DKS51-01	109.3	14.1	56.5	77.8	58.5	1.5	5.3	0.0	0.0	0.0
84P80	107.5	16.4	54.4	71.0	58.8	3.5	2.9	0.0	0.0	0.0
84P72	105.8	14.5	54.6	72.0	52.5	2.8	2.0	0.0	0.0	0.0
GX20998	105.4	14.4	54.9	73.8	52.0	1.8	4.1	0.0	0.0	0.0
M72GB71	100.2	14.5	56.1	79.0	59.8	1.8	2.8	0.0	0.0	0.0
84P68	100.1	15.2	54.2	72.0	52.5	4.5	4.6	0.0	0.0	0.0
DKS50-07	99.7	15.5	55.7	74.5	52.6	1.5	6.0	0.0	0.0	1.3
GX20970	97.6	14.3	55.6	73.0	53.0	2.0	3.9	0.0	0.0	2.5
M71GR91	96.1	14.5	56.2	77.5	58.3	1.3	4.3	0.0	0.0	1.3
GX21965	95.8	14.0	55.3	78.3	54.4	2.5	3.4	0.0	0.0	8.8
DKS54-07	94.8	14.4	56.2	79.0	57.3	2.0	4.4	0.0	0.0	7.5
83P11	89.4	19.1	51.6	74.5	54.8	2.0	4.3	0.0	0.0	1.3
M63GB78	87.2	15.4	51.0	73.0	50.3	4.0	4.9	0.0	0.0	7.5
83G19	84.4	16.6	53.0	76.0	56.0	3.3	2.1	0.0	0.0	2.5
M67GB87	79.1	16.0	52.4	76.5	54.5	1.3	2.9	0.0	0.0	2.5
Mean	96.8	15.2	54.5	75.2	55.0	2.4	3.8	0.0	0.0	2.3
CV (%)	10.4	12.4	2.0	1.4	4.2	25.8	60.7	0.0	0.0	249.5
LSD (0.10)	11.9	2.2	1.3	1.3	2.8	0.7	NS	NS	NS	NS

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

Table 9. Locations and agronomic milestones for the grain sorghum on-farm core block demonstrations, 2021.

Location	Soil Type	Previous Crop	Planting Date	Harvest Date	Row Spacing	Seeding Rate	Irr.	GPS Coord.
Avoyelles	Coushatta silt loam	Soybean	4/7/21	8/20/21	36”	85,000	No	31.074078, -91.937336
Rapides	Coushatta silt loam	Corn	4/21/21	8/26/21	38”	150,000	No	31.300060, -92.624115
St. Landry	Patoutville-Crowley complex	Soybean	4/28/21	8/25/21	15”	87,500	No	30.645447, -92.180120

Table 10. Summary of yield performance of grain sorghum hybrids in the 2021 on-farm core block demonstrations.[1]

Company	Hybrid	Avoyelles	Rapides	St. Landry	Average
Pioneer	84P80	101.2	117.3	102.7	107.1
Bayer	DKS51-01	94.5	117.4	93.2	101.7
Dyna-Gro	M71GR91	94.8	118.5	89.4	100.9
Pioneer	83G19	84.5	119.2	95.3	99.7
Dyna-Gro	M67GB87	87.8	119.7	88.4	98.6
Bayer	DKS54-07	75.8	124.7	82.7	94.4
Bayer	DKS50-07	79.0	116.6	86.8	94.1
Dyna-Gro	M72GB71	64.7	117.8	81.9	88.1
	Mean	85.3	118.9	90.1	

[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 rather 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 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 11). 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 11. 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 12). 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 12. 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 bushels per acre) is presented in Table 13. 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 13. 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
Phosphorus (P_2O_5)	48.75	20
Potassium (K_2O)	33.75	103.75
Sulfur (S)	7.5	15

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 14. 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 14. 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 15). Soil testing is recommended to determine appropriate levels for each field, but most soils require 40 to 60 pounds of P_2O_5 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 15. 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 16). Soil testing is recommended to apply appropriate levels for each field, but 40 to 60 pounds of K_2O per acre will be needed in most soils.

Table 16. Potassium recommendations based on soil test levels (ppm) and soil type for grain sorghum.

Soil Type	VL	VL	L	L	M	M	H	H	VH	VH
	ppm	K_2O	ppm	K_2O	ppm	K_2O	ppm	K_2O	ppm	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 17). 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 17. 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 2021 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 management decisions.

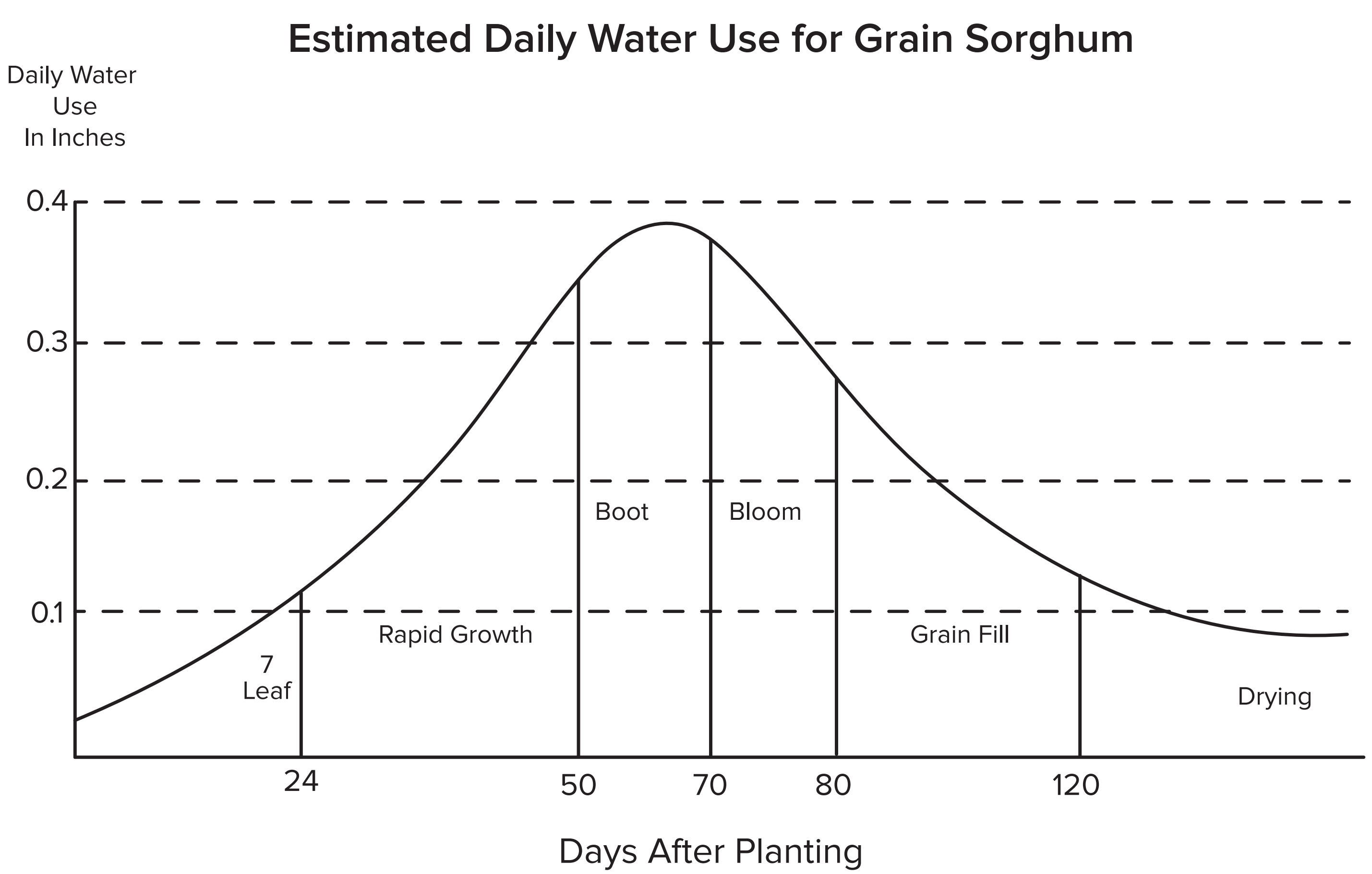
WATER

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



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.

NOTES

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