GRAIN SORGHUM HYBRIDS FOR GRAIN 2019

HYBRID SELECTION

Most producers will agree that grain yield is the most important characteristic on which to base hybrid selection. The second characteristic to consider is the maturity group — early, medium/early, medium, medium/full or full. The selection of hybrid maturity is usually based on available water for the season, whether through rainfall or irrigation. Hybrids that are high yielding in Louisiana are predominantly in the medium or medium/full maturity groups. Additional hybrid selection criteria include lodging susceptibility, weathering, plant height, test weight, stay-green, head exertion, panicle or head type, tolerance to sugar cane aphids, greenbug resistance and disease resistance.

To assist grain sorghum producers with hybrid selection, the LSU AgCenter conducts annual grain sorghum hybrid performance trials 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. In 2018, seven trials were conducted at the LSU AgCenter research stations located at St. Joseph (2), Alexandria, Bossier City, Crowley, Baton Rouge and Winnsboro (Tables 1 and 2). The St. Joseph and Crowley locations were not harvested because of bird damage.

Also, three on-farm core block demonstrations were conducted in Avoyelles, Beauregard and Rapides parishes (Tables 3 and 4). This information should be used to supplement but not replace the hybrid performance trial information.

Producers are encouraged to consult individual companies for their recommendations and also plant their own on-farm trials. Company data is not considered independent in the manner that public trials are conducted. However, these tests can still be an excellent source of information, particularly comparing yields among hybrids from the same company.

In summary, review the results from all the trials that you can find that are relevant to your farming location and look for hybrids that have good, consistent results over years and locations. Do not rely on only one source of hybrid performance information. Plant two or more hybrids to spread out your risk. Place more value on replicated trials when comparing to strip trials.

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Table 1. Cultural practices for the LSU AgCenter's hybrid performance trials, 2018.							
Location	**Soil Type**	**Previous Crop**	**Planting Date**	**Harvest Date**	**Row Spacing**	**Seeding Rate**	**Irrigation**
Alexandria	Coushatta silt loam	Soybeans	4/18/18	8/20/18	38″	80,000	No
Winnsboro	Gigger silt loam	Soybeans	5/1/18	8/16/18	40″	80,000	No
Bossier	Moreland silty clay loam	Corn	5/1/18	8/17/18	40″	80,000	Yes
B. Rouge	Commerce silt loam	Gr. Sorg.	4/24/18	8/14/18	38″	80,000	No

Table 2. Yield results of hybrids entered in the LSU AgCenter's hybrid performance trials, 2018.						
Company	**Hybrid**	**BR[1]**	**ALEX**	**BC**	**WN**	**Average**
		bu/acre @ 14.0%				
DeKalb	DKS 51-01	91.6	123.1	80.2	61.5	89.1
Pioneer	83P17	86.9	109.0	76.3	81.9	88.5
Dyna-Gro	M74GB17	92.0	117.4	78.9	57.0	86.3
Dyna-Gro	GX 17379	88.7	125.6	59.8	67.4	85.4
Pioneer	84P80	86.5	116.3	67.3	63.1	83.3
Dyna-Gro	GX 17962	91.3	119.5	73.6	47.9	83.1
DeKalb	DKS 47-07	83.1	115.1	67.9	64.4	82.6
Dyna-Gro	M73GR55	83.4	113.9	81.4	51.1	82.5
Dyna-Gro	GX 17948	67.4	119.5	55.0	81.9	81.0
Dyna-Gro	GX 17968	78.2	111.5	66.9	63.8	80.1
Simplot	GS 7117	86.5	123.3	56.4	50.4	79.2
Dyna-Gro	GX 16833	90.6	113.1	55.5	54.2	78.4
Simplot	GS 7016	80.6	116.6	55.1	59.5	78.0
DeKalb	DKS 53-53	63.3	123.4	49.5	66.4	75.7
Simplot	GS 7215	80.7	120.6	45.2	41.5	72.0
Pioneer	83P99	64.4	92.7	66.9	57.6	70.4
Average		81.97	116.3	64.62	60.14	
CV, (%)		10.07	9.86	19.21	15.52	
LSD (0.10)		9.81	13.62	14.75	11.09	

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

[1]BR=Baton Rouge; Alex=Alexandria; BC=Bossier City; WN=Winnsboro

Table 3. Cultural practices for the on-farm core block demonstrations, 2018.								
Location	**Soil Type**	**Prev. Crop**	**Planting Date**	**Harvest Date**	**Row Spac.**	**Seed Rate**	**Irr.**	**GPS Coord.**
Avoyelles	Tensas-Sharkey silty clay	Soybean	4/19	8/15	36	117,000	No	31.120256N, 91.913829W
Beauregard	Caddo Messer silt loam	Soybean	4/16	8/27	30	70,000	No	30.831264N, 93.381872W
Rapides	Coushatta silt loam	Soybean	5/4	8/22	38	80,000	No	31.172581N, 92.409558W

Table 4. Yield performance of hybrids entered in the on-farm core block demonstrations, 2018.				
Hybrid Name	**Avoyelles**	**Beauregard**	**Rapides**	**Average**
	Yield (bushels per acre)[1]			
DeKalb DKS51-01	68	115	105	95.9
DeKalb DKS53-53	93	94	84	90.4
Sorghum Partners SP7715	86	89	92	89.1
Sorghum Partners SP78M30	86	97	72	85.0
DeKalb DKS47-07	57	101	94	83.8
Dyna-Gro M74GB17	84	90	71	81.5
Dyna-Gro GX17379	91	93	60	81.1
Sorghum Partners SP74C40	81	90	50	73.9
Dyna-Gro M73GR55	80	76	50	68.5
Average	81	94	75	

[1]*Adjusted to 14 percent moisture.*

PLANTING

Date

Plant grain sorghum as early as possible during the recommended planting date range. 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 greatly with later planting dates. The five-day average soil temperature should be at least 60 degrees Fahrenheit at the 2-inch depth, although an ideal temperature for quick germination and establishment of grain sorghum is near 65 degrees Fahrenheit. The minimum soil temperature at the desired planting depth for germination and emergence of sorghum is about 55 degrees Fahrenheit but slow growth should be expected. In addition, a later-planted crop normally will be subjected to more insect pressure, especially from sorghum midges and sugarcane aphids, and disease pressure. When the option is to plant soybeans or grain sorghum after June 15, it usually is better to plant soybeans 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 foot of row on 40-inch rows, four to five seeds per foot of row on 30-to-36-inch rows, and three to four seeds per foot of row on 20-inch rows. If rows are 10 inches or fewer, three seeds per foot of row should be adequate. Seed should be planted deep enough to reach soil moisture but no deeper than 2 inches. The best depth typically is three-quarters of an inch to 1 ½ inches deep.

Sorghum seed has by far the smallest seed when compared to corn and soybeans. It also varies greatly in size from 12,000 (38 grams per 1,000 seed) to 18,000 (25 grams per 1,000 seed) seed per pound. If planting were by weight of seed per acre, one would be seeded more thickly than the other (Table 1). Therefore, seeding rates should be based on seed/acre and not pounds per acre of seed. Seed number per pound will be stated on the seed bag tag.

Row Spacing

More than any other row crop, sorghum responds positively to a narrow row spacing of 30 inches or fewer. 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.

Table 1. 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 seed per pound	12,000	18,000
Number of seed @ 6 lbs./acre	72,000	108,000

PREDICTING SORGHUM DEVELOPMENT BASED ON AIR TEMPERATURE

Growth stages of grain sorghum can be determined from planting through black layer. The duration of each growth stage is closely correlated to air temperature and the maturity group of the hybrid (Table 1). 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 time more reliably estimates crop development than the number of calendar days. 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:

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

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 1. Cumulative growing degree units (F) from planting to successive growth stages for short- and long-season grain sorghum hybrids.

Growth stage	Cumulative GDUs (F)	
Planting	Short-season hybrid	Long-season hybrid
Emergence	200	200
3-leaf	500	500
4-leaf	575	575
5-leaf	660	660
Panicle initiation	924	1365
Flag leaf visible	1287	1470
Boot	1683	1750
Heading	1749	1890
Flowering	1848	1995
Soft dough	2211	2310
Hard dough	2508	2765
Black layer	2673	3360

Source: Texas A&M University

FERTILITY

Soil testing is the foundation of a sound fertility program. This is the only way for a crop manager to be efficient in applying the correct rates of lime and fertilizer. Proper fertility is critical for optimizing crop yields in grain sorghum. Seldom is there a field that does not require the addition of fertilizer. The estimated uptake of N, P, K and S by a 125-bushel-per-acre grain sorghum crop is presented in Table 1. Be aware that the values presented are not the amounts of nutrients that need to be applied, but rather the total uptake by the corn crop from soil, fertilizer and other sources.

Table 1. Approximate amount of nutrients in a 125-bushel-per-acre grain sorghum crop.

	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 to plant roots. The optimal soil pH for grain sorghum is 5.8 to 6.5. Continued cultivation and the use of chemical fertilizers, especially those containing ammonium and sulfur, tends 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 checked for the degree of acidity or alkalinity. Lime is generally recommended at pH values below 6.1 (Table 2). Recommendations in Table 2 are general guidelines to raise pH. Soil texture and the buffer capacity of the soil are required for a more accurate estimate of the amount of lime that is needed. If lime is needed, it is recommended to apply it during the fall to provide enough time for it to react with the soil.

The relative neutralizing material (RNV) of lime affects the amount that is needed to be applied. The RNV of a material is based on its fineness and calcium carbonate equivalence (CCE or the amount of pure calcium carbonate to which the selected material corresponds), with finer materials reacting more quickly than coarse materials. An ag lime material with a CCE of 100 is "stronger" than an ag lime material with a CCE of 90. Consequently, less volume would be needed to increase the pH of a given soil.

Table 2. 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, soil clay content and soil buffer capacity (resistance to pH change). Testing soil pH is an excellent indicator of the need for lime and, in combination with soil texture, is sometimes used 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 which should be applied.

Nitrogen

Nitrogen can be applied before or at planting, or the split application method can be adopted. Apply nitrogen in a split application with 50 to 75 percent applied before or at planting and the balance no later than the 6- to 8-leaf stage. All the nitrogen can be applied preplant or at planting, but this increases the risk of fertilizer burn on seedlings and nitrogen loss from leaching or volatilization. Nitrogen should be applied at rates between 100 to 125 and 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 N for each bushel of grain sorghum produced.

Phosphorus

Grain sorghum uses phosphorus early in its growth cycle, so this nutrient should be applied preplant or at planting (Table 3). Soil testing is recommended to apply appropriate levels for each field, but in many soils 40 to 60 pounds of P2O5 per acre will be needed. Banding phosphorus will increase its efficiency when the soil pH is very acidic or alkaline. Also, starter fertilizers can be beneficial for soils that have a high pH or have low phosphorus levels.

Potassium

Grain sorghum uses potassium early in its growth cycle, so this nutrient should be applied preplant or at planting (Table 4). Soil testing is recommended to apply appropriate levels for each field, but in many soils 40 to 60 pounds of K2O per acre will be needed.

Sulfur

A typical 125-bushel-per-acre grain sorghum crop takes up about 23 pounds per acre 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) generally suggest that additional sulfur may be needed. The typical recommended rate is 20 pounds of sulfur in the sulfate form per acre.

Zinc

Zinc was one of the first micronutrients recognized as essential for plants and the one most commonly limiting yields. Although it is required in small amounts, high yields are impossible without it. If zinc is lower than 1 ppm, apply 10 pounds of zinc in a soluble form, such as zinc sulfate or zinc chelate, per acre (Table 5). 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 percent water-soluble, while zinc oxides essentially are insoluble in a single crop season, 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 percent to 98.3 percent). 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 percent 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 3. Phosphorus recommendations for grain sorghum.				
Soil test for phosphorus (ppm)				
Very low	Low	Medium	High	Very high
<10	10-19	20-34	35-50	>50
Pounds per acre P_2O_5				
80	60	40	0	0

Table 4. Potassium recommendations for grain sorghum.										
Soil Type	**V. Low**		**Low**		**Med.**		**High**		**V. High**	
	ppm	**K2O**	**ppm**	**K2O**	**ppm**	**K2O**	**ppm**	**K2O**	**ppm**	**K2O**
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

Table 5. Zinc recommendations for grain sorghum.		
Mehlich 3 zinc (ppm)		
Low	Medium	High
<1	1-2.25	>2.25
Pounds per acre of zinc		
10	5	0

WEED CONTROL

Weeds compete with grain sorghum for light, nutrients and soil water, thus reducing yield and grain quality. In addition, they harbor insects and diseases that could potentially impact yield and quality. Furthermore, for each inch of soil moisture used by weeds (not to mention nitrogen) can be worth 5 to 7 bushels per acre of grain yield. The most critical period for weed control is the first 4 weeks after planting. If weeds are controlled during this time, and control is maintained through the remainder of the season, little reduction in grain sorghum yield will occur. Yield reduction from weeds that emerge four weeks after planting is usually minimal. However, weed escapes can be a major interference with harvest. Herbicides commonly used for weed control in grain sorghum can be found in the 2018 Louisiana Suggested Chemical Weed Management Guide (Publication 1565). Do not forget to check herbicide labels for rates, application timing and other restrictions because herbicide labels are constantly being updated.

WATER

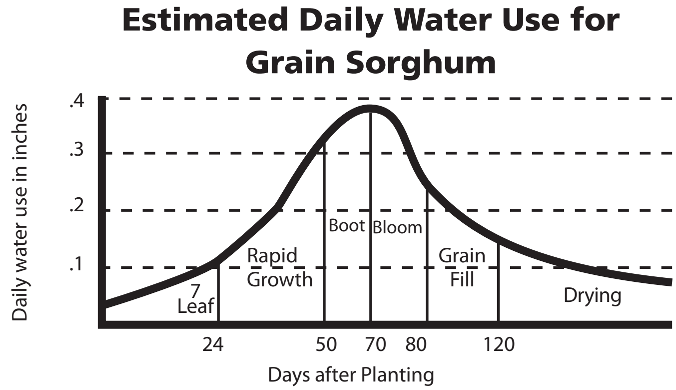
Grain sorghum has a reputation for drought tolerance, which makes it a good choice under dryland or non-irrigated situations. A sorghum crop that receives 21 inches of usable water during the growing season will use 6 to 8 inches to produce the head, while the other 13 to 15 inches will produce approximately 100 bushels of grain per acre. Moisture stress early in the season will limit head size (number of seed 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 it is so severe as 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 the crop canopy. 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 the "boot stage," and continues through two weeks past flowering (Figure 1). Sorghum plants require good soil moisture during this period for maximum yields. Adequate soil moisture prior to the boot stage will assure the highest potential seed set. The actual seed number and seed size will be dependent upon the availability of soil moisture following flowering. Moisture demands drop quickly after the grain has reached the "soft-dough" stage. This combined drop in moisture demand, natural drought tolerance, and the extensive root system of sorghum generally make late irrigations 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 several purposes: easier threshing; drying out the late-emerging head and non-productive 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 next year's planting; hastening harvest to meet a delivery or pricing deadline; and reducing the presence of moist weedy material in the grain in weedy fields. On a cautionary note, applying harvest aids to sorghum fields with stalk or charcoal rot can make fields especially prone to lodging if a harvest aid is used and a prompt harvest does not occur.

Applications should not be made prior to black layer, and seed moisture must be below 30 percent, or grain yields will be reduced. Furthermore, if a harvest aid is applied at black layer, be ready to harvest in the next 7 to 10 days.

DETERMINING HARVEST LOSSES

As a rule of thumb, 17-20 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 head. 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 aboveground 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 followed by the application of 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. Seldom does a great ratoon crop follow a poor main crop. Damage from feeding by birds is the most devastating potential problem to the ratoon crop. Blackbirds have deterred many producers from considering sorghum ratooning.

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