

Grain Sorghum Update



ARKANSAS GRAIN SORGHUM PERFORMANCE TEST AND HYBRID SELECTION - 2003

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Grain sorghum performance trials were conducted at three locations (Figure 1) in Arkansas in 2002. The information provided includes yield potential, diseases and agronomic considerations for successful grain sorghum production. This publication should help producers select high-yielding hybrids for planting under Arkansas conditions.

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**FIGURE 1. LOCATIONS OF ARKANSAS
GRAIN SORGHUM PERFORMANCE TESTS, 2002**

- 1 – Northeast Research and Extension Center, Keiser – Irrigated & Non-irrigated - Sharkey Silty Clay Soil
- 2 – Pine Tree Branch Experiment Station, Colt – Irrigated – Calloway Silt Loam Soil
- 3 – Cotton Branch Station, Marianna – Irrigated – Calloway Silt Loam Soil
- 4 – Rice Research and Extension Center, Stuttgart – Irrigated - Dewitt Silt Loam Soil
- 5 – Southeast Research and Extension Center, Rohwer – Irrigated & Non-irrigated – Sharkey/Desha Silt Loam Soil

Methods

Grain sorghum hybrids were entered and evaluated in the Arkansas Grain Sorghum Performance Test to provide an unbiased comparison of their performance. In general, recommended cultural practices were used and tailored by site location.

Each test consisted of 34 hybrids replicated four times in a randomized complete block design. For further details concerning agronomic practices, hybrid characteristics and disease reactions, consult the *Arkansas Corn and Grain Sorghum Performance Test – 2002*, Arkansas Agricultural Experiment Station.

Yields of the grain sorghum hybrids in the Arkansas Performance Test for 2002 are located in Tables 1. The two-year and three-year average yields are reported in Table 2.

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Hybrid characteristics are located in Table 3. Reaction to various diseases were provided by Dr. TeBeest based on observations from various test plots in different areas of the state during 2002. Table 4 lists the specific disease reactions.

Hybrid Selection

Numerous grain sorghum hybrids are commercially available in Arkansas. Breeding programs exist for the development of high-yielding hybrids that provide desired agronomic characteristics and disease resistance. These hybrids are released yearly, and many are included in the Arkansas Grain Sorghum Performance Test.

Hybrid selection is an important management decision for successful grain sorghum production. Yield potential is important, but should not be the primary concern when selecting a hybrid. Other characteristics such as lodging potential, disease reaction and head excretion should also be considered. Grain sorghum yields are influenced by the adaptation of the hybrid and by the level of management to maximize the genetic yield potential. No hybrid is superior to all other hybrids under all circumstances. Thus, selecting two or more hybrids is recommended, which not only spreads the risks associated with adverse environmental factors but also benefits management operations such as harvesting.

The performance of a hybrid differs by test site and year. While the yield data from all locations may be helpful, the data from the locations closest to your farm may be the most meaningful. Also, the adaptability of a particular hybrid at the location representing a soil type similar to yours is suggested. Hybrid performance differs by location due to disease and environmental factors. By selecting a hybrid with a two- and three-year yield average, a more realistic performance of that hybrid can be evaluated. Therefore, selecting adapted grain sorghum hybrids with two- and three-year yield histories is important. (See Table 2)

Bacterial Diseases

Bacterial Leaf Spot -Bacterial leaf spot is caused by *Pseudomonas syringae* pv. *syringae*. It is common throughout the state, but especially in south Arkansas. Symptoms include small water-soaked spots on the lower leaves, which gradually enlarge into round lesions, usually with reddish borders. On certain varieties, margins die and turn dark brown. As lesions dry out, the centers become tan to off-white. At this stage, leaf spot can resemble other leaf-spotting problems caused by herbicide drift, fungi, etc. Bacterial leaf spot is common in the spring when wet and windy conditions increase it, but the disease usually decreases during hot and dry summer weather. The bacterium survives in crop debris and certain weedy grasses. Control measures include

crop rotation, destruction of crop residue, good weed control and planting of resistant hybrids.

Bacterial Leaf Streak - Bacterial leaf streak is caused by *Xanthomonas campestris* var *holcicola*. The disease is common throughout Arkansas. Symptoms include water-soaked streaks between the leaf veins that grow to several inches long, and become purple on most hybrids. The streaks often give the leaves a striped appearance when heavily infected. In very susceptible varieties, the stripes join into large blotches, killing the leaf. The disease is most common in the spring under warm wet conditions. It usually becomes less serious during the hot dry summer months. Control measures include crop rotation, destruction of crop residue and planting resistant hybrids.

Fungal Diseases

Anthracnose - Anthracnose is caused by *Colletotrichum sublineolum* (formerly *C. graminicola*). This disease is very common throughout Arkansas and can be found in most fields near harvest. It is favored by warm temperatures, heavy dews and frequent rains. Anthracnose can cause death of seedlings, leaves, stems, peduncles, heads and can cause stalk rot and lodging. Anthracnose symptoms include small purple or tan roundish spots, first noticed on foot-tall plants but often becoming much more severe at flowering and later. Serious yield loss may result if heavily diseased fields are not harvested promptly at maturity. On resistant hybrids, spots stay 1/8" or less in size. On susceptible hybrids, spots grow quickly to 1/2" or more in size and may develop wide yellow borders. Plant resistant hybrids to minimize damage from anthracnose. Plowing down infected crop remains, crop rotation for at least 1 year, and good grassy weed control can also help. Sorghum anthracnose does not affect corn although corn has a similar disease.

Leaf Blight. Leaf blight is caused by *Exserohilum turcicum* and is widespread in Arkansas. The disease is favored by mild temperatures between 64 - 81 F with heavy dews or rain. It may occur early in the season and continue until grain fill unless slowed by dry weather. On susceptible hybrids under favorable weather, yield losses can approach 50%. The fungus survives on weedy grasses, infected residue and infested seed. Symptoms include small reddish or tan spots that grow into large elliptical reddish purple or tan lesions, up to 1/2" wide x 1-6" long. The surface of the lesions may become covered with spores of the fungus, turning the surface dark gray. Control options include resistant hybrids, crop rotation, and control of weedy grasses.

Charcoal Rot - Charcoal rot is caused by a soil-borne fungus, *Macrophomina phaseolina*. It is a major disease of soybean, grain sorghum and corn in Arkansas, especially in non-irrigated fields. High-yielding hybrids appear to be especially susceptible, particularly when drought-stressed. Charcoal rot is noticed late in the

season when headed plants lodge, usually in spots or areas of a field. Other symptoms include a dried, stringy appearance of the stem near the soil line (at the fold on lodged plants) and the presence of very tiny black sclerotia in the stem tissue. The fungus is soil-borne and survives as sclerotia. High temperatures and drought greatly increase the disease. Charcoal rot can be reduced by timely and adequate irrigation, proper application of potash fertilizer according to a recent soil test, and use of the recommended amount of nitrogen fertilizer. Resistant hybrids are not available.

Head Blight and Molds- Head blight and molds are caused by several fungi. *Fusarium moniliforme*, *Fusarium semitectum*, *Curvularia lunata*, *Phoma sorghina*, *Helminthosporium spp.* and *Alternaria spp.* are generally considered to be head molds. Also, *Colletotrichum* (anthracnose) can infect heads under certain conditions. Symptoms of head molds include pink, orange or white grains (*Fusarium*); black grains (*Curvularia*, *Alternaria* or *Helminthosporium*); or grains with small black dots (*Phoma* or *Colletotrichum*). Head blight usually refers to the infection of the neck or parts of the head, resulting in the death of the head or various parts. Head blights can be caused by *Fusarium* or *Colletotrichum*, fungi that also can infect sorghum grain resulting in feed quality problems. Head blights and molds can be minimized by spreading out planting dates so that not all fields flower and head at the same time. Certain hybrids are less susceptible than others but complete resistance is not available. If head molds are heavy within a field, the grain should be tested before being fed to animals since certain *Fusarium* fungi can produce mycotoxins.

Target Spot - Target spot is caused by *Bipolaris sorghicola*. This is a potentially serious disease that was first noticed in Arkansas at serious levels in 2001, but only in an isolated location. Symptoms include reddish or grayish spots which later develop into irregular or barrel-shaped lesions up to 4" long on leaves. Rarely the spots develop a tan center. The fungus attacks all plant parts and can develop all season. The fungus survives in infected debris or on weed hosts such as johnsongrass.

A few hybrids appear to be resistant and should be planted if the disease becomes a problem. Crop rotation and good weed control are also helpful.

Zonate Leaf Spot - Zonate leaf spot is caused by *Gloeocercospora sorghi*. This is a very common disease throughout Arkansas but is generally minor. Symptoms include very large (1-3") circular lesions that have alternating straw-colored and purple rings. Young lesions are purple blotches that may have tan irregularly shaped spots in the centers. The fungus survives in soil and infected plant debris. During warm and wet weather, pinkish-orange slime containing spores may be visible on the lesions. The fungus is spread by rain and water and the disease can be severe in wet periods. Moderately resistant hybrids are available for planting. Crop rotation and good weed control (especially of johnsongrass) minimize the disease.

NEW DISEASE!

Sorghum Ergot - Sorghum ergot is caused by a fungus called *Claviceps africanae*. The disease was introduced into the US a few years ago and has caused significant losses in hybrid seed production fields in certain states. The disease has not caused serious losses in commercial hybrids to date, only in hybrid seed production. Sorghum ergot was first reported in northeast Arkansas in 2000 in a late-planted field of Pioneer hybrid 8313. This hybrid has previously been reported in other states as having sorghum ergot. The disease was not found or reported in Arkansas in 2001 or 2002. Research has shown Pioneer 8313 to be very susceptible to the disease. The fungus usually only infects sterile flowers and produces a fungal ergot that oozes spore-filled honey dew attractive to certain flies and other insects. Spores in the honey dew infect other flowers nearby. Ergots gradually mature and turn darker in color but do not grow larger than individual sorghum grains. Control has thus far not been needed in commercial hybrids but the disease will be monitored the next few years in most grain sorghum states. All commercial hybrid seed is treated to minimize the spread of the disease by seed and crop rotation may become important if the problem increases. Planting grain sorghum at recommended dates should help. Planting late is not a good idea since lower night temperatures in August can lead to sterile flowers that are more easily infected by the fungus.

Table 1. Yields of Grain Sorghum Hybrids in Arkansas Performance Tests, 2002¹

	Keiser Irr.	Keiser Non.	Marianna Irr.	Colt Irr.	Stuttgart Irr.	Rohwer Irr.	Rohwer Non.	Avg.
Brand/Hybrid								
Asgrow A571	6130	5340	6619	6459	7541	7835	7621	6792
Croplan Genetics 414	4110	3588	6042	5839	5399	3899	3587	4638
Croplan Genetics 514	6756	4633	6918	7317	7274	8245	7861	7001
DEKALB DK53	6249	5461	5842	6619	6861	5958	5737	6104
DEKALB DKS51-90	6016	5276	6315	6398	6207	7309	7471	6427
DEKALB DKS54-00	5705	5748	4909	6712	5141	5855	6371	5777
Dyna Gro 732B	5432	4754	6257	5903	6844	5297	5550	5720
Dyna Gro 752B	6182	4314	7164	6412	6415	7361	6949	6400
Dyna Gro 751B	6759	4174	7026	6958	7349	8901	7652	6974
Dyna Gro 762B	6192	5155	6922	6458	7184	6417	6979	6472
Dyna Gro 780B	7051	3600	6674	7115	7525	8171	7636	6825
FFR 318	6418	5308	7103	5626	7085	7230	6700	6496
FFR 322	6806	4747	6489	6428	7147	8457	7685	6823
Garst 5382	5637	4690	5665	6524	6213	7910	6533	6167
Garst 5440	6115	5232	7364	6283	6477	7673	7407	6650
Garst 5515	5696	4709	5972	5564	6600	7295	6995	6119
Golden Acres 3694	6312	5595	6057	5742	6611	6809	6634	6251
Golden Acres 444E	6735	5334	6332	6014	7203	7518	7142	6611
Monsanto X111	5538	5423	6457	6652	7290	8415	6978	6679
Pioneer 84G62	6847	6468	6203	7440	6985	9054	7666	7238
Pioneer Brand 8282	6874	4537	6882	7010	7277	7555	8034	6881
Pioneer Brand 83G66	6793	5773	7316	7375	6714	7969	7304	7035
Southern States SS-650	6688	4308	6550	6832	6842	8253	7655	6733
Southern States SS-800	6052	5436	6520	6411	6680	7678	7036	6545
Terral TV1050	6833	3690	6402	6247	6316	7130	7543	6309
Terral TV93S72	5992	4951	6873	5328	6707	7663	7086	6371
Terral TV9421	6733	4945	7224	6536	6878	7731	6876	6703
Terral TV96H81	5914	4747	6900	6799	7376	7890	7666	6756
Terral TVX93S203	6689	5130	6740	6215	6989	7369	6621	6536
Terral TVX95S201	6221	4480	5450	6900	6407	7601	7334	6342
Terral TVX96H202	5897	4741	6512	6548	6384	7420	7360	6409
Terral TVX99317	6935	5130	5609	7819	7545	8691	7415	7021
Triumph TR461	6655	5289	5112	6487	7095	7434	7972	6578
Triumph TR82-G	6249	3900	7182	7165	7594	8881	8321	7042
Grand mean	6271	4900	6459	6533	6828	7496	7099	6512
LSD (5%)	824	1095	1172	681	1129	1075	1072	
C.V. (%)	9.3	15.9	12.9	7.4	11.7	10.2	10.7	

¹ Keiser Irr. = Northeast Research and Extension Center, Irrigated.

Keiser Non. = Northeast Research and Extension Center, Nonirrigated.

Mar. Irr. = Cotton Branch Station, Marianna, Irrigated.

Colt Irr. = Pine Tree Experiment Station, Irrigated.

Stuttgart Irr. = Rice Research and Extension Center, Irrigated.

Rohwer Irr. = Southeast Research and Extension Center - Rohwer Division, Irrigated

Rohwer Non. = Southeast Research and Extension Center - Rohwer Division, Nonirrigated

Table 2. Two and Three Year Average Yields of Grain Sorghum Hybrids in Arkansas Performance Tests									
	Keiser Irr.		Keiser Non		Colt Irr	Rowher Irr²		Rowher Non²	
Variety	2-year	3-year	2-year	3-year	2-year¹	2-year	3-year	2-year	3-year
Asgrow A571	6868	6947	6149	6402	6157	7075	-	6735	-
DEKALB DK53	6846	7043	6045	6339	6739	5662	6545	6180	6426
DEKALB DKS51-90	6774	6971	6265	6352	6360	6583	-	6661	-
DEKALB DKS54-00	6472	-	6493	-	6513	-	-	-	-
Dyna Gro 751B	7140	7016	5776	5880	6732	7544	8101	7128	7691
Dyna Gro 780B	7441	7562	5328	5616	6865	7334	8241	6520	7760
FFR 322	7242	7242	6164	6156	6521	7637	8131	7126	7627
Garst 5515	6429	-	5878	-	5664	-	-	-	-
Golden Acres 3694	6866	-	6495	-	5513	-	-	-	-
Golden Acres 444E	7245	7071	6369	6547	6193	6680	-	6631	-
Pioneer 84G62	7615	-	7390	-	7195	-	-	-	-
Pioneer 8282	7241	7180	5774	5673	6635	7060	7218	7240	7237
Pioneer 83G66	7150	7119	6351	6255	6877	6730	7445	7060	7352
SS SS-650	7092	7153	5643	5791	6681	7238		6787	-
SS SS-800	6717	6676	6370	6371	6194	6994	7644	6908	7615
Terral TV1050	7293	7398	5559	5864	6565	6449	6987	6743	6810
Terral TV93S72	6798	-	5943	-	6038	-	-	-	-
Terral TV9421	7219	7164	6198	6181	6416	6669	7150	6709	7064
Terral TV96H81	6963	-	6100	-	7472	-	-	-	-
Terral TVX99317	7421	7643	6148	6254	7386	7194	-	6820	-
Triumph TR82-G	7186	7449	5705	6143	7078	7663	8460	7631	8621

¹ Average of 2001 and 2002

² Average of 1999, 2000, and 2002

Brand/Hybrid	Height (in.)	Head Exertion¹	Head Compaction²
Asgrow A571	54	G	2
Croplan Genetics 414	48	G	3
Croplan Genetics 514	55	F	1
DeKalb DK53	56	G	2
DeKalb DKS51-90	56	G	4
DeKalb DKS54-00	58	G	2
Dyna-Gro 732B	51	E	2
Dyna-Gro 752B	58	E	2
Dyna-Gro 751B	58	F	1
Dyna-Gro 762B	57	G	1
Dyna-Gro 780B	61	G	2
FFR 318	57	F	2
FFR 322	55	G	1
Garst 5382	46	G	1
Garst 5440	50	F	3
Garst 5515	54	G	3
Golden Acres 3694	55	G	2
Golden Acres 444E	56	E	4
Monsanto X111	58	G	2
Pioneer Brand 84G62	54	G	2
Pioneer Brand 8282	65	E	3
Pioneer Brand 83G66	58	G	2
Southern States SS-650	55	G	1
Southern State SS-800	54	G	2
Terral TV1050	63	G	2
Terral TV93S72	60	E	2
Terral TV9421	51	G	4
Terral TV96H81	57	F	1
Terral TVX93S203	53	F	1
Terral TVX95S201	53	G	5
Terral TVX96H202	50	G	4
Terral TVX99317	66	G	1
Triumph TR461	55	G	2
Triumph TR82-G	58	F	1

¹ Head Exertion: F = Fair; G = Good; E = Excellent

² Head compaction scale

- 1 - Head short and oval
- 2 - Head long and slender
- 3 - Head elongated and oval
- 4 - Head elongated and rectangular
- 5 - Head open and elongated

Hybrids	Anthraco	Blight	Charcoal Rot	Head Blights	Target Spot	Zonate Leaf Spot
Asgrow A571	2	2.7	-	2	6	4
DeKalb DK53	2	2	-	2	5.3	2.7
DeKalb KD54	2.7	2.7	-	2	5.3	4
DeKalb S190	2.7	2.7	-	2	5.3	4
FFR332	3.3	4	-	2	6	5.3
Mycogen 444E	4	3.3	-	2	5.3	5.3
Pioneer Brand 8313	3.3	2.7	-	2.7	6.7	6
Pioneer Brand 83G66	3.3	2.7	-	2	6.7	6.7
Southern States SS-800	3.3	2	-	2.7	5.3	5.3
Triumph TR461	3.3	5.3	-	2	5.3	4.7
Triumph TR82-G	2.7	2	-	2	3.3	3.3
Terral TV9421	3.3	2	-	2	3.7	5.3
Terral TV1050	2.7	4	-	2	5.3	3.7
Terral TVX99317	3.7	4	2	2	5.3	5.3

Rating Scale

- 1 Immune -- no lesions or visible reaction
- 2 Resistant -- very few plants or leaves infected and very small reactions
- 3 Between 2 & 4, still considered a resistant reaction
- 4 Moderately resistant -- most plants infected and lesions expanding but not chlorotic
- 5 Between 4 & 6 but still considered a moderately resistant reaction
- 6 Moderately susceptible -- nearly all plants infected and lesions expanding and chlorotic margins
- 7 Between 6 & 8 but still moderately susceptible
- 8 Susceptible -- large expanding lesions -- expansive and very chlorotic
- 9 Very susceptible -- leaves or plants dead