

Influence of Row Configuration and Seeding Rate on Grain Sorghum Yield on a Mississippi River Alluvial Soil

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Introduction

Cultural practices are very important in improving grain sorghum yield. Research has found a consistent sorghum yield response to row widths narrower than 40-inches, particularly on alluvial soils. Narrow rows tend to have higher yield than wider rows, particularly on Mississippi River alluvial soils. On Macon Ridge soils, narrow rows are superior to wide rows in years with adequate rainfall, while wider rows are more productive than narrow rows in rain deficient years.

For rows less than 30-inches, crops are generally planted on flat seedbeds, which preclude the use of furrow-irrigation. Multiple rows planted on raised beds maintain cultural advantages of raised beds and permits furrow irrigation. In recent years, planters have been introduced that have the capability of planting twin rows on raised beds. For example, commercial planters are available that plant two rows, 9.5-inches apart, on top of 40-inch wide raised beds. Cultural practices such as seeding and nitrogen (N) rate may interact with row spacing. The objective of this research was to evaluate the influence of row configuration and seeding rate on yield performance of grain sorghum, with and without irrigation.

Procedures

A field experiment was conducted in 2007 on Sharkey silty clay at the Northeast Research Station (NERS) near St. Joseph, LA to evaluate the influence of row configuration and seeding rate on grain sorghum yield. Row configuration treatments consisted of single rows and twin rows planted on 40-inch wide, raised beds. Treatments also included four 20-inch rows (narrow rows) on 80-inch wide, raised beds. Single rows were planted with a John Deere 1700 planter, twin rows with a Monosem planter, and narrow rows with a modified Soybean Special on May 7. Single rows were centered and twin rows centered, 9.5-inches apart, on raised 40-inch wide, raised beds. Pioneer brand 83G66 was planted at seeding rates of 52,500, 78,500, 104,500, and 130,800, which are equivalent to 4, 6, 8, and 10 seed/ft for single row and 2,3,4, and 5 seed/ft for single row and twin row. Prior to planting 120 lb N/acre as 30-0-0-2 was broadcast over the whole experimental area. The trials were duplicated, one receiving no irrigation and one furrow-irrigated scheduled using a 2-inch soil moisture deficit with the 'Arkansas Irrigation Scheduler'. Previous crop was soybean. Cultural practices recommended by the LSU AgCenter were followed.

Experimental design was a randomized complete block with a split plot arrangement of treatments with four replications. Main plot was row configuration and split plot was seeding rates. The seeding rates were repeated within each replication. Grain yield and yield components were determined from the two middle rows of four row plots and is yield is reported at 14% moisture. Tiller counts were based on an early-season seedling count and head counts prior to harvest. Data was analyzed using the GLM procedure of SAS. The LSD (0.10) was used to evaluate treatment differences when the F-test indicated significance ($P \leq 0.10$).

Results and Discussion

Rainfall was below normal in May and June and excessively high in July (16.03 inches) (Table 1). There were three furrow-irrigations in the irrigated trial. Average yields were 6,399 lb/acre in the non-irrigated trial (Table 2) and 6,593 lb/acre in the irrigated trial (Table 3).

Yields for the row configuration treatments had the following yield rank: twin row > single row and narrow row in non-irrigated trial (Table 2) and twin row > single row > narrow row in irrigated trial (Table 3). Yield differences were significant in the non-irrigated trial and not significant in the irrigated trial.

Influence of treatments on yield components are presented in Tables 2 and 3. The plant and head counts were lower for the twin-row treatments compared to both the single and narrow row treatments. One of the surprising results of this study was the lack of tiller formation, particularly at the lower seeding rates, in both the non-irrigated and irrigated trials.

Table 1. Rainfall received at St. Joseph, 2007

Month	Rainfall Inches
May	1.80
June	0.53
July	16.03
August	3.55

Table 2. Influence of row configuration (RC) and seeding rate (SR) on non-irrigated grain sorghum yield and yield components on Sharkey silty clay at St. Joseph, 2007.

Row configuration ¹	Seeding rate ² no/acre	Yield lb/a	Kernel weight g/100	Kernels no/head	Plants no/a	Heads no/a	Tillers no/plant
Single row	52,500	5,797	2.9	1,807	45,740	50,820	1.1
	78,500	6,166	2.8	1,937	54,450	58,810	1.1
	104,500	6,793	2.8	1,388	74,780	77,680	1.0
	130,800	6,314	2.9	963	105,270	106,720	1.0
	Avg.	6,268	2.8	1,523	70,060	73,510	1.1
Twin row	52,500	6,466	2.9	2,371	41,380	42,110	1.0
	78,500	6,920	3.0	2,034	52,270	52,270	1.0
	104,500	6,596	2.8	1,445	76,960	76,960	1.0
	130,800	7,039	2.6	1,757	92,200	84,940	0.9
	Avg.	6,755	2.8	1,902	65,700	64,070	1.0
Narrow row	52,500	5,813	2.9	1,690	52,270	58,080	1.1
	78,500	6,346	2.7	1,690	71,150	68,240	1.0
	104,500	6,440	2.8	883	107,450	108,900	1.0
	130,800	6,095	2.6	859	120,520	117,610	1.0
	Avg.	6,174	2.7	1,280	87,850	88,210	1.0
LSD (0.10):							
RC		180	NS	NS	11,050	16,900	NS
SR		366	0.1	365	9,780	15,850	NS
RC x SR		NS ³	0.2	NS	NS	NS	NS

¹Single row - single row on 40-inch wide, raised beds; Twin row – two rows 9.5-inches apart on 40-inch wide raised beds; Narrow row - four 20-inch rows on 80-inch wide raised beds.

²Seeding rates, 52,500, 78,500, 104,500, and 130,800 seed/acre, are equivalent to 4, 6, 8, and 10 seed/ft on single row and 2, 3, 4, and 5 seed/ft on twin row and narrow row.

³NS=non significant at the 0.10 probability level.

Table 3. Influence of row configuration and seeding rate on irrigated grain sorghum yield and yield components on Sharkey silty clay at St. Joseph, 2007.

Row configuration	Seeding rate no/acre	Yield lb/a	Kernel weight g/100	Kernels no/head	Plants no/a	Heads no/a	Tillers no/plant
Single row	52,500	6,305	2.9	2,127	42,830	46,460	1.1
	78,500	6,602	2.7	2,002	66,070	60,980	0.9
	104,500	6,764	2.6	1,433	77,680	79,130	1.0
	130,800	6,559	2.6	1,226	108,900	96,560	0.9
	Avg.	6,557	2.7	1,700	73,870	70,790	1.0
Twin row	52,500	6,149	2.8	2,557	39,200	38,480	1.0
	78,500	6,606	2.8	2,297	50,820	47,190	0.9
	104,500	7,211	2.7	1,788	81,310	73,330	0.9
	130,800	7,325	2.7	1,528	84,940	82,760	1.0
	Avg.	6,823	2.7	2,040	64,070	60,440	0.9
Narrow row	52,500	5,742	3.1	1,364	50,820	59,530	1.2
	78,500	6,469	3.0	1,395	62,440	63,890	1.0
	104,500	6,600	2.7	1,186	88,570	88,570	1.0
	130,800	6,786	2.7	887	135,040	123,420	0.9
	Avg.	6,399	2.9	1,210	84,220	83,850	1.0
LSD (0.10):							
RC		NS	NS	195	4,910	7,970	NS
SR		241	0.1	269	7,330	6,300	0.1
RC x SR		NS	NS	NS	12,690	10,920	NS