

Influence of Row Configuration, Single versus Twin Row, Seeding Rate, and Nitrogen 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 (dual-versus single-row) and seeding and N rate on yield performance of grain sorghum, with and without irrigation.

Procedures

A field experiment was conducted in 2006 on Sharkey clay at the Northeast Research Station (NERS) near St. Joseph, LA to evaluate the influence of row configuration, seeding rate, and N rate on grain sorghum yield. Single rows were planted with a John Deere 1700 planter and dual rows with a Monosem planter on May 19. 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 two seeding rates, 78,500 and 104,500 seed/acre, which are equivalent to 6 and 8 seed/ft for single row and 3 and 4 seed/ft for twin rows. Nitrogen rates of 90, 120 and 150 lb N/acre were injected using a variable-rate applicator soon after plant emergence. Single and dual knives were used on each bed for the single and twin-row configurations, respectively. There were also two irrigation treatments, a control and a furrow-irrigated treatment scheduled using a 2-inch soil moisture deficit with the 'Arkansas Irrigation Scheduler'. Previous crop was soybean. Cultural practices as recommended by the LSU AgCenter were followed.

Experimental design was a randomized complete block with a split-split plot arrangement of treatments. Main plot was irrigation, split plot was row configuration and seed and N rate were factorially randomized as split-split plots. Grain yield was determined from the two middle rows of four row plots and is reported at 14% moisture. Yield components, heads/acre, kernel weight, and kernels/head, were also determined. 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 ranged from 0.38 inches in June to 5.09 inches in May (Table 1). There were three furrow-irrigations for the 2.0-inch SMD irrigation treatment. Yields were similar between irrigation treatments, 6,354 lb/acre in non-irrigated plots and 6,234 lb/acre in irrigated plots (Table 2).

Highest yield occurred for the twin row treatments, 6,474 lb/acre for twin row and 6,115 lb/acre for single row (Table 2). The yield component contributing the most to the twin row yield response was heads/acre, 73,110 heads/acre for twin row compared to 62,880 heads/acre for single row. There may have been more tillering for twin rows, since the intra-row spacing was greater than the single row for a given seeding rate. Optimum N rate was between 90 and 120 lb N/acre (Table 2).

Although there was a statistical difference in yield between seeding rates, the yield difference was relatively small (Table 3). The increase in heads/acre for the higher seeding rate was relatively small for both row configuration treatments.

Table 1. Rainfall at the NERS in St. Joseph, 2006.

Month	Rainfall
	inches
May	5.09
June	0.38
July	4.62
August	4.10

Table 2. Influence of irrigation, row configuration and nitrogen rate on grain sorghum yield and yield components on Sharkey silty clay at St. Joseph, 2006.

Irrigation	Row configuration	Nitrogen Rate lb/a	Grain yield lb/a	Heads no/a	Kernel weight g/100	Kernels no/head
Non-irrigated	Single row	90	6,141	62,850	2.6	1,730
		120	6,294	61,890	2.6	1,860
		150	6,016	62,540	2.6	1,750
	Twin row	90	6,520	73,290	2.3	1,730
		120	6,520	74,030	2.4	1,690
		150	6,636	71,560	2.4	1,720
Irrigated	Single row	90	5,949	64,760	2.6	1,700
		120	6,142	62,440	2.6	1,770
		150	6,146	62,800	2.5	1,770
	Twin row	90	6,313	74,420	2.3	1,670
		120	6,474	73,170	2.4	1,650
		150	6,381	72,220	2.5	1,610
LSD (0.10):			154	NS	NS	NS
Treatment Means:						
Irrigation:						
Non-irrigated			6,354	67,690	2.5	1,750
Irrigated			6,234	68,300	2.5	1,700
LSD (0.10):			NS ¹	NS	NS	NS
Row configuration:						
Single row			6,115	62,880	2.6	1,760
Twin row			6,474	73,110	2.4	1,680
LSD (0.10):			63	1,210	0.1	NS
Nitrogen rate, lb/a:						
90			6,231	68,830	2.5	1,710
120			6,357	67,880	2.5	1,740
150			6,295	67,280	2.5	1,710
LSD (0.10):			77	NS	NS	NS

¹NS=non-significant at the 0.10 probability level.

Table 3. Influence of row configuration (RC) and seeding rate (SR), averaged across irrigation and N treatments, on grain yield and yield components on Sharkey silty clay at St. Joseph, 2006.

Row configuration	Seeding rate ¹	Grain yield	Heads	Kernel weight	Kernels
	no/a	lb/a	no/a	g/100	no/head
Single row	78,500	6,045	56,500	2.7	1,870
	104,500	6,184	69,260	2.5	1,660
	Average	6,115	62,880	2.6	1,770
Twin row	78,500	6,455	66,740	2.4	1,790
	104,500	6,493	79,490	2.4	1,565
	Average	6,474	73,120	2.4	1,680
LSD (0.10):					
Row configuration (RC)		63	1,207	0.1	NS
Seeding rate (SR)		90	3,350	0.1	103
RC x SR		NS	NS	NS	NS

¹Seeding rates, 78,500 and 104,500 seed/acre, are equivalent to 6 and 8 seed/ft for single row and 3 and 4 seed/ft for twin row.