

PERFORMANCE OF SORGHUM IN NARROW AND CONVENTIONAL ROW PLANTINGS AT THREE POPULATION DENSITIES

Clarence Chopelas Farm, San Patricio County, 2000

Jeffrey R. Stapper, Roy D. Parker, Lawrence L. Falconer and Stephen D. Livingston
County Extension Agent, Extension Entomologist, Economist-Management and Agronomist, respectively
Sinton and Corpus Christi, Texas

OBJECTIVES: The irrigated field study was designed to evaluate row spacing and plant density effects on sorghum yield, and to measure insect abundance under the test conditions. Ways need to be found to increase sorghum yield as a means of reducing unit production costs.

MATERIALS/METHODS: Pioneer 8313 hybrid sorghum was planted on 7 Mar 2000 on the Clarence Chopelas Farm in western San Patricio County in 19 and 38-inch rows using three plant populations. All seed was Gaucho-treated. Target plant populations were 65, 85 and 105 thousand per acre. To achieve these populations, seeding rates of 76.5, 100.0 and 123.5 thousand per acre were used. Sorghum was planted with a John Deere 1720 MaxEmerge Plus Vacumeter planter and plots were arranged in a randomized complete block design with 3 replications. Individual plots for the 19-inch and 38-inch row plantings were 24 and 12 rows wide, respectively. Plots were 1,320 ft long. Soil at the site was a Victoria clay, pH 8.4 and conditions for seed germination were favorable after planting. Cotton had been grown on the site in 1999. Fertilizer applied was 208-48-0-1 Zn-8 S. Atrazine 4L (1.3 lb/acre) was broadcast for weed control. Only 38-inch rows were cultivated. Rainfall was measured at each corner on the front of the test and consisted of 3.5 (14 Mar), 0.2 (3 Apr), 1.0 (12 Apr), 0.2 (2 May), 1.0 (11 May), 0.7 (19 May), 1.0 (28 May) and 0.8 (10 Jun) inches or a total of 8.4 inches during the growing season. Irrigation dates and amounts were 9 Mar = 0.75 inches, 23 Apr = 1.25 inches, 4 May = 1.25 inches, 12 May = 1.25 inches and 16 Jun = 1.25 inches.

Treatment effects were determined by (1) measuring soil moisture levels with Watermark brand sensors (read with Watermark soil moisture meter) placed at 12 and 24-inch depths in each plot of the low and high plant population treatments, (2) sampling 20 sorghum heads in each replication over a 6-week period to determine the percentage grain moisture in order to assist in determining irrigation ending date, (3) counting the number of plants in 10 row-ft on 3 rows in each plot on 6 Apr, (4) counting the number of greenbugs, corn leaf aphids and yellow sugarcane aphids on 10 lower leaves in each plot on 13, 19 and 25 May, (5) examining 10 grain heads in each plot for rice stink bugs and headworms on 5 Jun, (6) hand harvesting 10 row ft at 3 locations in each plot on 22 Jun to obtain samples for seed size and number analysis, and (7) harvesting plots with a commercial combine on 25 Jun. Grain weights were adjusted to 14% moisture.

RESULTS/DISCUSSION: Final plant populations were higher than targeted but good separation and statistically significant differences were obtained among these 3 plant stand treatments (Table 1). Seed size was significantly reduced in the 19-inch row planting compared with 38-inch rows (greater numbers required for a pound of seed). No effect on seed size was found due to plant densities examined in this study. Yields were greater in all 19-inch plantings compared with the 38-inch row plantings. To determine the economic impact, seed cost for the various populations was determined and \$6.00/acre was subtracted

for one cultivation of the 38-inch row planting. The Gaucho cost was \$1.36/lb of seed. Net dollar values over seed cost and cultivation averaged \$177.95/acre in the 19-inch row plantings and \$148.43/acre in the 38-inch row planting.

Greenbug, corn leaf aphid and yellow sugarcane aphids were low in all row spacing and plant population configurations (Tables 2-4). Row spacing and plant population did not affect rice stink bug or headworm numbers (Table 5).

ACKNOWLEDGMENTS: Appreciation is expressed to the Sorghum PROFIT Initiative Project funded by the Texas Legislature and to Clarence Chopelas for his interest, time and equipment in conducting this study. Thanks are extended to Pioneer Hi-Bred Company for weighing equipment at harvest and to Charles Stichler, Extension Agronomist, for his technical assistance.

Table 1. Comparison of sorghum yields from row spacing and plant population treatments, Clarence Chopelas Farm, San Patricio County, TX, 2000.

| Row spacing | Plant stand treatment ^a | Plant pop. (1000's/acre) | Seed/lb 1000's | Yield (lb/acre) | Seed & cultivation cost \$/acre ^b | Net \$ value over seed & cultivation cost ^c |
|--------------|------------------------------------|--------------------------|----------------|-----------------|--|--|
| 19-inch | 1 | 74.9 c | 21.6 a | 6087 a | 12.98 | 180.59 |
| | 2 | 95.2 b | 21.4 a | 6095 a | 16.96 | 176.86 |
| | 3 | 120.1 a | 21.4 a | 6206 a | 20.95 | 176.40 |
| 38-inch | 1 | 80.9 c | 20.2 b | 5444 b | 18.98 | 154.14 |
| | 2 | 94.6 b | 20.2 b | 5286 b | 22.96 | 145.13 |
| | 3 | 112.0 a | 19.7 b | 5439 b | 26.95 | 146.01 |
| LSD (P=0.05) | | 6.614 | .7497 | 315.7 | | |
| P > F | | .0001 | .0006 | 0001 | | |

^a Means in a column followed by the same letter are not significantly different by ANOVA (LSD). Seeding rates consisted of 76.5, 100.0 and 123.5 thousand seed per acre with target plant stand objectives of 65, 85 and 105 thousand plants/acre (85% germination). Plant stands in this table were the actual population obtained.

^b The seed cost, including Gaucho treatment (\$2.46/lb) was based on original seeding rates shown in footnote "a" assuming 14,500 seed/lb. Cultivation cost was considered to be \$6.00/acre and only 38-inch rows were cultivated.

^c Sorghum value based on \$3.18/cwt.

Table 2. Greenbug numbers in sorghum planted in rows spaced on 19 and 38-inch centers at 3 population densities, Clarence Chopelas Farm, San Patricio County, TX, 2000.

| Row spacing | Plant stand treatment ^a | Greenbugs per 10 lower leaves | | | |
|--------------|------------------------------------|-------------------------------|--------|--------|------------|
| | | 67 DAP ^b | 73 DAP | 79 DAP | Season Avg |
| 19-inch | 1 | 11.3 a | 4.3 a | 0.0 a | 5.2 a |
| | 2 | 3.7 a | 16.0 a | 0.0 a | 6.6 a |
| | 3 | 8.7 a | 9.7 a | 0.0 a | 6.1 a |
| 38-inch | 1 | 4.0 a | 2.0 a | 0.3 a | 2.1 a |
| | 2 | 8.7 a | 1.7 a | 1.7 a | 4.0 a |
| | 3 | 2.0 a | 4.0 a | 0.0 a | 2.0 a |
| LSD (P=0.05) | | NS | NS | NS | NS |
| P > F | | .7438 | .5920 | .5447 | .7150 |

^a Means in a column followed by the same letter are not significantly different by ANOVA (LSD). Planting rates consisted of 76.5, 100.0 and 123.5 thousand seed per acre with target plant stand objectives of 65, 85 and 105 thousand plants/acre (85% germination). See Table 1 for actual plant stands obtained.

^b DAP = Days after planting corresponding to 13, 19 and 25 May, respectively.

Table 3. Corn leaf aphid numbers in sorghum planted in rows spaced on 19 and 38-inch centers at 3 population densities, Clarence Chopelas Farm, San Patricio County, TX, 2000.

| Row spacing | Plant stand treatment ^a | Corn leaf aphids per 10 lower leaves | | | |
|--------------|------------------------------------|--------------------------------------|--------|--------|------------|
| | | 67 DAP ^b | 73 DAP | 79 DAP | Season Avg |
| 19-inch | 1 | 9.3 a | 11.0 a | 0 a | 6.8 a |
| | 2 | 3.7 a | 2.0 a | 0 a | 1.9 a |
| | 3 | 2.0 a | 2.0 a | 0 a | 1.3 a |
| 38-inch | 1 | 8.7 a | 0.3 a | 0 a | 3.0 a |
| | 2 | 0.0 a | 0.0 a | 0 a | 0.0 b |
| | 3 | 0.7 a | 0.7 a | 0 a | 0.5 b |
| LSD (P=0.05) | | NS | NS | NS | NS |
| P > F | | .5466 | .5424 | - | .0678 |

^a Means in a column followed by the same letter are not significantly different by ANOVA (LSD). Planting rates consisted of 76.5, 100.0 and 123.5 thousand seed per acre with target plant stand objectives of 65, 85 and 105 thousand plants/acre (85% germination). See Table 1 for actual plant stands obtained.

^b DAP = Days after planting corresponding to 13, 19 and 25 May, respectively.

Table 4. Yellow sugarcane aphid numbers in sorghum planted in rows spaced on 19 and 38-inch centers at 3 population densities, Clarence Chopelas Farm, San Patricio County, TX, 2000.

| Row spacing | Plant stand treatment ^a | Yellow sugarcane aphids/10 lower leaves | | | |
|--------------|------------------------------------|---|--------|--------|------------|
| | | 67 DAP ^b | 73 DAP | 79 DAP | Season Avg |
| 19-inch | 1 | 14.7 a | 14.7 a | 0 a | 9.8 a |
| | 2 | 0.7 a | 3.7 a | 0 a | 1.5 a |
| | 3 | 5.3 a | 0.0 a | 5.3 a | 3.5 a |
| 38-inch | 1 | 22.3 a | 4.3 a | 0.3 a | 9.0 a |
| | 2 | 14.3 a | 4.3 a | 0.7 a | 6.4 a |
| | 3 | 5.7 a | 13.7 a | 0.3 a | 6.6 a |
| LSD (P=0.05) | | NS | NS | NS | NS |
| P > F | | .1438 | .3714 | .5234 | .3291 |

^a Means in a column followed by the same letter are not significantly different by ANOVA (LSD).
^a Planting rates consisted of 76.5, 100.0 and 123.5 thousand seed per acre with target plant stand objectives of 65, 85 and 105 thousand plants/acre (85% germination). See Table 1 for actual plant stands obtained.

^b DAP = Days after planting corresponding to 13, 19 and 25 May, respectively.

Table 5. Rice stink bug and headworm numbers in sorghum planted in rows spaced on 19 and 38-inch centers at 3 population densities, Clarence Chopelas Farm, San Patricio County, TX, 2000.

| Row spacing | Plant stand treatment ^a | Number per 10 heads (5 Jun) | | | |
|--------------|------------------------------------|-----------------------------|--------|--------|------------------------|
| | | Rice stink bugs | | | Headworms ^b |
| | | Nymphs | Adults | Total | |
| 19-inch | 1 | 6.3 a | 8.0a | 14.3 a | 3.7 a |
| | 2 | 2.0 a | 3.7 a | 5.7 a | 0.7 a |
| | 3 | 2.7 a | 3.7 a | 6.3 a | 1.7 a |
| 38-inch | 1 | 8.0 a | 6.0 a | 14.3 a | 4.3 a |
| | 2 | 3.7 a | 10.3 a | 14.0 a | 0.3 a |
| | 3 | 3.7 a | 7.3 a | 11.0 a | 1.7 a |
| LSD (P=0.05) | | NS | NS | NS | NS |
| P > F | | .0806 | .5040 | .3816 | .1777 |

^a Means in a column followed by the same letter are not significantly different by ANOVA (LSD). Planting rates consisted of 76.5, 100.0 and 123.5 thousand seed per acre with target plant stand objectives of 65, 85 and 105 thousand plants/acre (85% germination). See Table 1 for actual plant stands obtained.

^b Headworms consisted of 37.8% corn earworm and 62.2% fall armyworm.