

Result Demonstration/Applied Research Report

Comparison of Grain Sorghum Headworm Larval Densities in Clump-Planting and Conventional Planted Grain Sorghum

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SUMMARY

Clump-planting grain sorghum has shown some promising results to increase dryland yields by 15% to 25% by reducing tillers and increasing the size of the sorghum head. Clumping plants together could influence the number of sorghum headworm larvae developing in a clump. The counts of sorghum headworm larvae did show more larvae per sorghum head in the clump-planting compared to the conventional planted sorghum. These data suggest additional studies are needed before definitive conclusions can be made about larval densities in clump-planted grain sorghum.

OBJECTIVE

Compare larval densities of the sorghum headworm in grain sorghum heads of clump-planted and conventional planted grain sorghum.

MATERIALS & METHODS

Agronomic Practices

Location:	1 mile E of Hwy 287 on FM 1151
Variety:	Channel NC+ 5B90
Date Planted:	June 22, 2009
Planting Rate:	19,000 seeds/A
Row Width:	40 inches
Previous crop:	Wheat
Tillage System:	Conventional
Irrigation:	none, Dryland

Fertilizer: 40 lb of N/A
 Herbicide: 1.5 qts/A of Atrazine and 1 qt./A of Alachlor

Experimental Design and Data Analysis

The experiment was arranged in a paired comparison design having 40 sample units per treatment. Data were analyzed using PROC TTest analysis (SAS, 2009) at $t_{0.05,30} = 2.042$.

Planting Designs

Comparison of sorghum headworm infestations were made between two different planting designs (Clumped vs Conventional). In the clumped planting design, four grain sorghum seeds were planted 1 inch apart every 30 inches down the row. This was accomplished by plugging all openings on the planting plate except for 4 consecutive openings on one side of the plate and another 4 consecutive openings on the opposite side (180°) of the plate.

In the conventional planting design, seeds were planted continuously down a row at a planting rate of 19,000 seeds per acre.

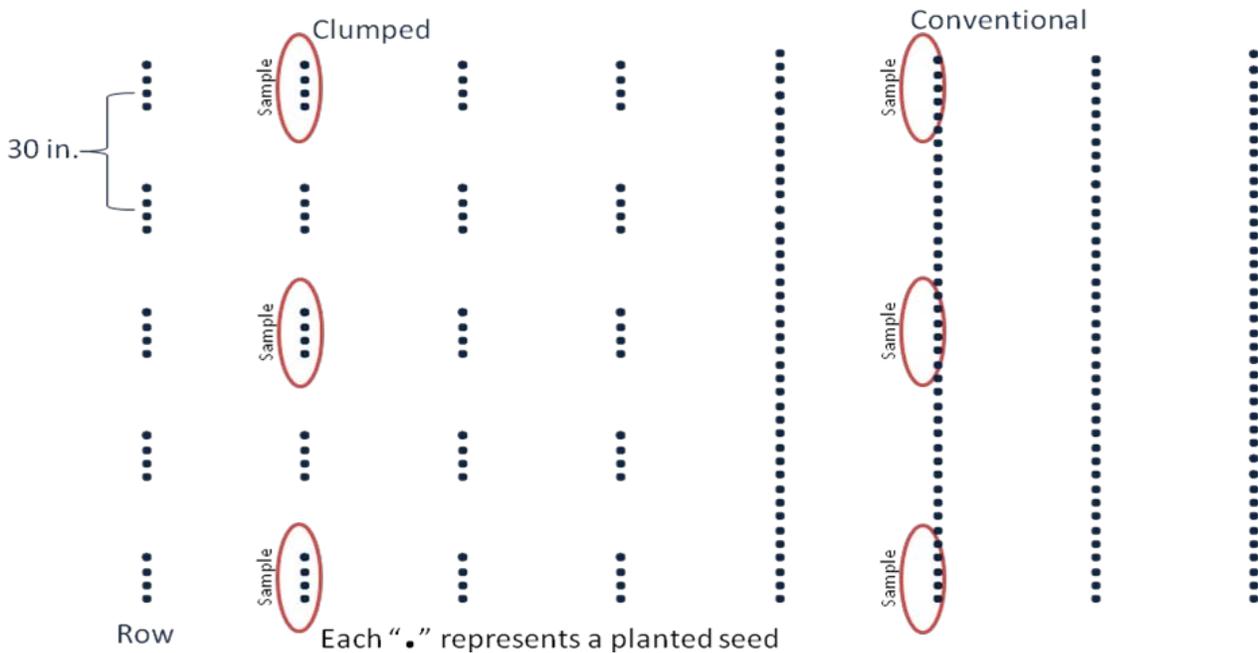


Figure 1. Schematic of Clump vs Conventional Planting Designs

Insect and Plant Samples

The number of larvae per 2 grain sorghum heads at each sample unit was sampled on September 21 using the beat bucket technique. In the clumped planting design, this meant counting the number of larvae in two heads per clump and sampling 40 every other clump down a row. Correspondingly to each clump sample, two heads in the adjacent conventionally planted rows were sampled for headworm larvae. Larvae were separated into three categories (small - <1/4 inch long, medium - 1/4 inch to 1/2 inch long, and large - >1/2 inch long sizes).

The number of grain sorghum heads were recorded in both conventional and clump-planting when sampling larval numbers. Since the number of grain sorghum heads per clump represents the number of heads every 30 inch row section, the number of heads per 30 inch row section were also counted in the conventionally planted row.

Weather

Conditions were generally cool when the grain sorghum headworms were infesting the grain sorghum heads from mid September until counting sorghum headworms. Daily high temperatures were in the mid to upper 70's and the night time temperatures in the upper 40's to mid 50's.

RESULTS & DISCUSSION

Dryland grain sorghum production on the Texas High Plains depends on timely rains for good yields. Management practices which improve the use of available moisture are needed to optimize yield production and boost yields. A strategy which has shown promise in dryland sorghum is to use clump-planting. This planting plan drops 3 to 4 seeds an inch apart every 30 inches down the row on 30-inch to 40-inch rows. The concept is that planting clumps will reduce tillers under dry conditions allowing better use of soil moisture to produce larger heads and improve yields by 15% to 25%.

While at a crop tour at this field, we observed that sorghum heads were infested with sorghum headworm larvae. Sorghum moths lay eggs on the sorghum heads and the hatching larvae feed on the developing grain. In conventional planted sorghum, larvae are free to move from plant to plant down the row, but with the clump-planting the sorghum headworm larvae would not be able to move to other plants as easily. If clump-planted sorghum has few tillers and fewer sorghum heads per acre, the larval densities per head could be greater in the clump-planting compared to conventional planted grain sorghum.

Examining grain sorghum heads in both the clump-planting and the conventional planted grain sorghum showed statistically more sorghum headworm larvae (all stages) in the clump-planting (average 0.83 per head) compared to the conventional planted sorghum (average 0.55 per head) (Table 1 and Figure 2). When comparing larval numbers by larval size the clump-planting had more medium sized larvae. The differences in larval number cannot be attributed to the clump-planting having fewer grain heads because both planting designs had similar number of grain heads per 30 inch spacing (Table 1 and Figure 3). These counts were for all heads, including tillers, within the designated sample area. At 4 seed per clump, there would be approximately 1.4 tillers per plant in the clump-planting. In the conventional planting with a planting rate of 19,000 seeds per acre, there was approximately 1.7 tillers per plant. Good timely rains in August may have contributed to both planting designs have similar number of heads and estimated tillers.

The preliminary results from this one year sample suggests that there could be more sorghum head worm larvae in clump-planted grain sorghum than conventional planted grain sorghum. Further studies are needed before definitive conclusions can be drawn. Even if more larvae are present in clump-planted grain sorghum, the damage per head may not be any worse than the conventional planted sorghum because of the potential for increased in grain yield.

Table 1. Mean number sorghum headworm larvae per head and number grain heads for clumped and conventional planted grains sorghum.

Planting Design	Larvae per head			All Larvae	Mean no. grain heads ^a
	Small (<1/4 in.)	Medium (1/4 to 1/2)	Large (>1/2 in.)		
Clumped	0.14 a	0.5 a	0.19 a	0.83 a	9.5 a
Conventional	0.13 a	0.23 b	0.20 a	0.55 b	9.8 a
df	39	39	39	39	39
t value	0.19	3.02	-0.21	2.26	-0.82
Prob>(t)	0.8516	0.0045	0.8379	0.0297	0.4168

^a Number of plants for each 30 in. linear row distance

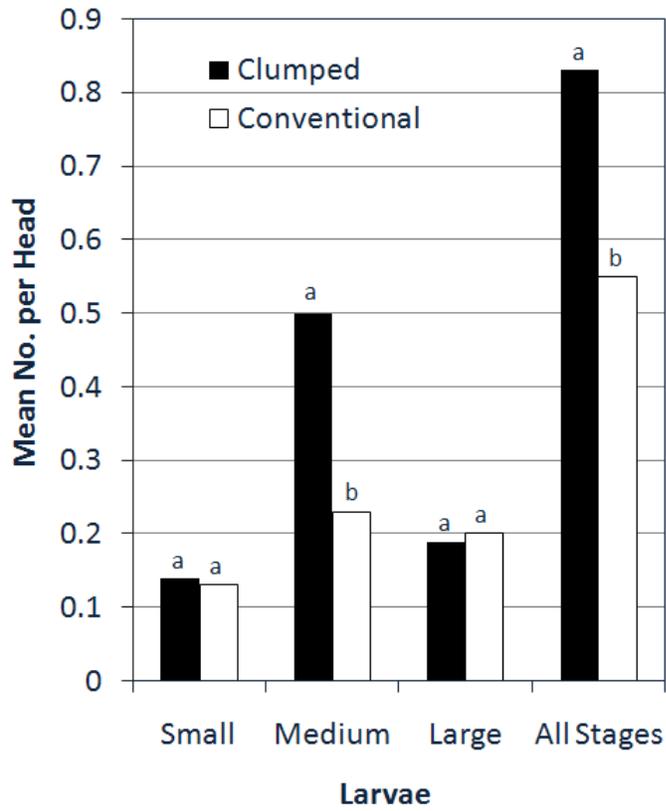


Figure 2. Mean number of sorghum headworm larvae when dryland grain sorghum is planted conventionally or clumped.

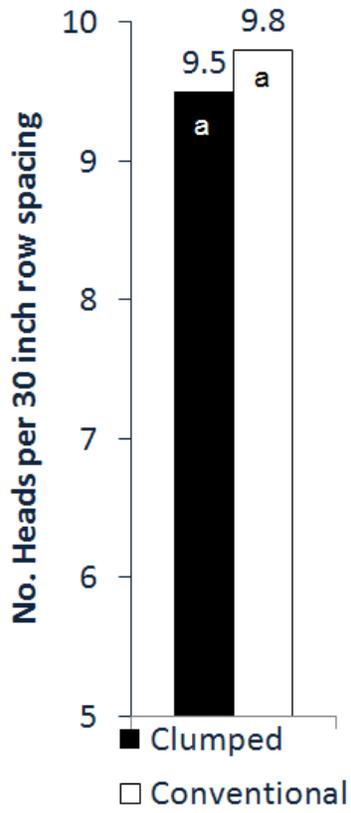


Figure 3. Mean number of grain sorghum heads in a 30 inch section per row for conventional or clumped planted grain sorghum.

ACKNOWLEDGEMENTS

We would like to express our appreciation to Mr. Roger Schilling for allowing us to conduct this trial on his farm.

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