

Result Demonstration/Applied Research Report

Control of Sorghum Headworms with Selected Insecticides Applied to Grain Sorghum Heads

Cooperator: Danial Hinson

Mr. Kyle Stewart, County Extension Agent – Armstrong Co. (Claude, TX)
Mr. Rick Auckerman, County Extension Agent- Deaf Smith Co. (Hereford, TX)
Dr. Ed Bynum, Extension Entomologist (Amarillo, TX)

SUMMARY

Selected insecticides were evaluated for control of sorghum headworms in grain sorghum heads at the “Milk” growth stage in a field located 1 mile east of Claude, TX. Headworm infestations declined quickly in all treatments after the pretreatment count possibly due to older, larger larvae developing into a pupa over time. Therefore, fewer larvae remained in the sorghum heads at each of the subsequent sample dates. This may have masked the efficacy of the insecticide applications. But, the application of Cobalt (25.2 fl. oz/A) and Mustang Max (3.0 fl. oz/A) did provide better control of headworms than Nufos (1.0 lb ai/A). The level of control with Belt (3.0 fl. oz/A) was between that of Nufos and both Cobalt and Mustang Max, but did not separate statistically. No differences in yield were seen among any of the insecticide treatments and the untreated check. This is only a one year trial and may not represent the impact of treating grain sorghum under different field conditions and headworm infestation levels.

OBJECTIVE

The objective was to determine the effectiveness of selected insecticides for control of sorghum headworms in grain sorghum heads.

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

The experiment was arranged in a randomized complete block design having four (4) replications. Plots were 4 rows (40 in. centers). wide by 50 ft. long. The center two rows were treated with insecticides.

Insecticide Application

Applications of Nufos at 1qt/A, Cobalt at 25.2 fl. oz/A, Belt at 3.0 fl. oz/A, and Mustang Max at 3.0 fl. oz/A were sprayed on Sept. 18, 2009. Each insecticide was mixed with a crop oil concentrate at a rate of equivalent to 1% v/v. Applications were sprayed at 10 gpa with a CO₂ pressurized hand-carried backpack sprayer with the boom held ca. 10 inches above the grain sorghum heads. There were 5 (TX-6 hollow cone) nozzles on 20 inch centers across the boom that treated the middle two rows of a plot. Plants were in the “milk” stage of development when treatments were applied to the test area. Weather conditions during the application were mild (75° F) with winds from the NW at 3 mph.

Insect Samples and Data Analysis

The number of larvae per 10 heads per plot was sampled using the beat bucket technique. All larval samples were taken from the left center row of each 4 row plot. 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). Counts were taken on Sept. 18 before application and at 3, 7, and 10 days following application. Data were analyzed using PROC GLM analysis of variance (SAS, 2009) and means were separated with Tukey's studentized range test (P=0.05).

Weather

Conditions were generally cool during the testing period with the daily high temperatures in the mid to upper 70's and the night time temperatures in the upper 40's to mid 50's.

RESULTS & DISCUSSION

Selected insecticides were evaluated for control of sorghum headworms in a field located 1 mile east of Claude, TX. The number of headworms steadily declined in all treatments from the pretreatment to the 10 DAT count. This is possibly due to older, larger larvae developing into a pupa over time and resulting in fewer larvae remained in sorghum heads at each of the subsequent sample dates. Cobalt and Mustang Max significantly reduced headworms at 3 DAT compared to Nufos and the non-treated check (Table 1). By 7 DAT the natural decline of headworms numbers from larval pupation had dramatically reduced larval numbers. The decrease in larval numbers was much faster in Cobalt and Mustang Max treatments and demonstrates their larvicidal activity was better than Nufos (Figure 1). There were no statistical differences among the treatments for larval reduction of medium and large sized larvae (Table 3 and 4). Mustang Max had statistically fewer small sized larvae than Nufos, but did not differ from the other treatments (Table 2). Overall, the collective reduction of all life stages was better for Cobalt and Mustang Max than Nufos. Larval reduction with Belt was between that of Nufos and Cobalt or Mustang Max, but did not differ statistically from these insecticides or the non-treated check at 3 DAT. No phytotoxicity to the grain sorghum was observed with any of the insecticide treatments. There were no statistical difference among the treatments for number of plants per plot, test weight, and yield (Table 5).

Table 1. Mean number of all headworms per 10 sorghum heads at the pre-treatment (Pretrt) and at 3, 7 and 10 days after treatment (DAT).

Trt No.	Treatment	Label Rate /A	COC	Headworms per 10 Heads ^a			
				Pretrt	3 DAT	7 DAT	10 DAT
1	Nufos	1.0 lb ai	1% v/v	8.0 a	4.5 a	2.3 a	0.8 a
2	Cobalt	25.2 fl oz	1% v/v	9.0 a	1.5 b	0.3 a	0.3 a
3	Belt	3.0 fl oz	1% v/v	7.5 a	3.3 ab	0.3 a	0.5 a
4	Mustang Max	3.0 fl oz	1% v/v	8.8 a	1.0 b	0.5 a	0.3 a
5	Untreated	-----	-----	8.0 a	5.0 a	1.5 a	1.5 a
	CV			46.63	40.37	115.71	123.24
	Replicate Prob(F)			0.719	0.187	0.7	0.834
	Treatment Prob(F)			0.979	0.0019	0.087	0.219

^a Means in a column followed by the same letter are not significantly different according to Tukey's studentized range test (P=0.05, SAS Institute 2009).

Table 2. Mean number of small (<1/4 in.) headworms per 10 sorghum heads at the pre-treatment (Pretrt) and at 3, 7, and 10 days after treatment (DAT).

Trt No.	Treatment	Label Rate /A	COC	Headworms per 10 Heads ^a			
				Pretrt	3 DAT	7 DAT	10 DAT
1	Nufos	1.0 lb ai	1% v/v	2.3 a	1.5 a	0.5 a	0.5 a
2	Cobalt	25.2 fl oz	1% v/v	1.8 a	0.5 ab	0.0 a	0.0 a
3	Belt	3.0 fl oz	1% v/v	1.8 a	1.3 ab	0.0 a	0.3 a
	Mustang						
4	Max	3.0 fl oz	1% v/v	2.3 a	0.0 b	0.0 a	0.3 a
5	Untreated	-----	-----	1.8 a	0.5 ab	0.0 a	0.8 a
	CV			83.21	80.73	258.19	186.26
	Replicate Prob(F)			0.324	0.3425	0.426	0.948
	Treatment Prob(F)			0.975	0.0256	0.0625	0.5681

^a Means in a column followed by the same letter are not significantly different according to Tukey's studentized range test (P=0.05, SAS Institute 2009).

Table 3. Mean number of medium (1/4 in. to 1/2 in.) headworms per 10 sorghum heads at the pre-treatment (Pretrt) and at 3, 7, and 10 days after treatment (DAT).

Trt No.	Treatment	Label Rate /A	COC	Headworms per 10 Heads ^a			
				Pretrt	3 DAT	7 DAT	10 DAT
1	Nufos	1.0 lb ai	1% v/v	3.8 a	2.0 a	1.3 a	0.3 a
2	Cobalt	25.2 fl oz	1% v/v	4.5 a	0.8 a	0.0 a	0.0 a
3	Belt	3.0 fl oz	1% v/v	4.0 a	1.5 a	0.3 a	0.0 a
	Mustang						
4	Max	3.0 fl oz	1% v/v	3.8 a	1.0 a	0.5 a	0.0 a
5	Untreated	-----	-----	3.8 a	3.3 a	0.5 a	0.5 a
	CV			51.209	89.048	137.84	243.43
	Replicate Prob(F)			0.798	0.931	0.331	0.772
	Treatment Prob(F)			0.979	0.212	0.186	0.263

^a Means in a column followed by the same letter are not significantly different according to Tukey's studentized range test (P=0.05, SAS Institute 2009).

Table 4. Mean number of Large (>1/2 in) headworms per 10 sorghum heads at the pre-treatment (Pretrt) and at 3, 7, and 10 days after treatment (DAT).

Trt No.	Treatment	Label Rate /A	COC	Headworms per 10 Heads ^a			
				Pretrt	3 DAT	7 DAT	10 DAT
1	Nufos	1.0 lb ai	1% v/v	2.0 a	1.0 a	0.5 a	0.0 a
2	Cobalt	25.2 fl oz	1% v/v	2.8 a	0.3 a	0.3 a	0.3 a
3	Belt	3.0 fl oz	1% v/v	1.8 a	0.5 a	0.0 a	0.3 a
4	Mustang Max	3.0 fl oz	1% v/v	2.8 a	0.0 a	0.0 a	0.0 a
5	Untreated	-----	-----	2.5 a	1.3 a	1.0 a	0.3 a
	CV			62.031	161.73	180.7	278.88
	Replicate Prob(F)			0.843	0.104	0.522	0.834
	Treatment Prob(F)			0.813	0.383	0.204	0.785

^a Means in a column followed by the same letter are not significantly different according to Tukey's studentized range test (P=0.05, SAS Institute 2009).

Table 5. Yield Summaries

Trt No.	Treatment	Label Rate /A	COC	Mean Values		
				# Heads / plot	Test Wt	Yield (lb/A)
1	Nufos	1.0 lb ai	1% v/v	41.5	51.25	2300
2	Cobalt	25.2 fl oz	1% v/v	36.8	49.56	1963
3	Belt	3.0 fl oz	1% v/v	39.3	49.44	2094
4	Mustang Max	3.0 fl oz	1% v/v	34.5	50.75	1849
5	Untreated	-----	-----	40.8	49.94	1914
	CV			16.63	4.628	25.26
	Replicate Prob(F)			0.7035	0.7538	0.7325
	Treatment Prob(F)			0.5372	0.759	0.7449
				NS	NS	NS

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