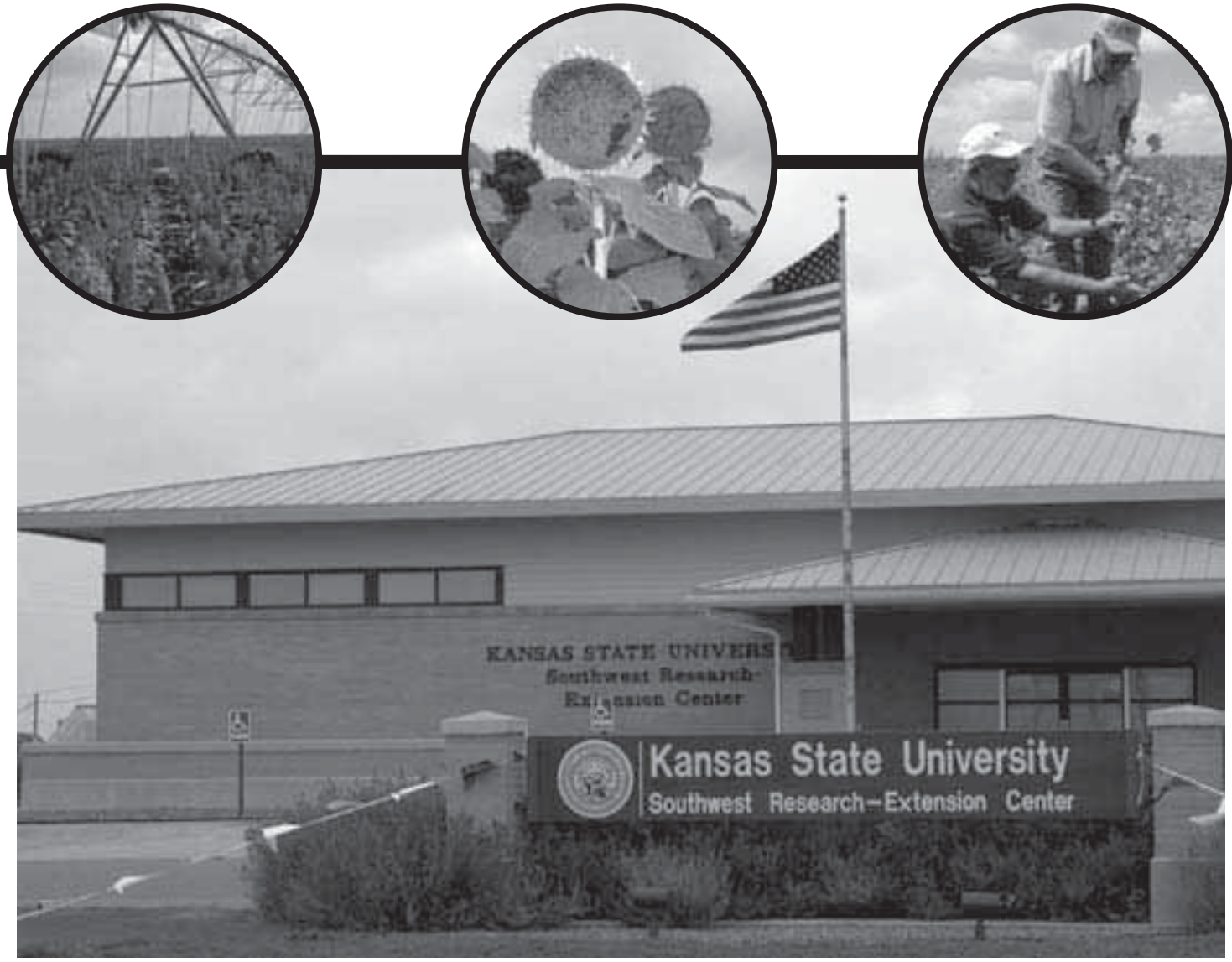
FIELD DAY 2008



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Kansas State University Agricultural Experiment Station and Cooperative Extension Service

EFFICACY OF FIPRONIL APPLIED AS FOLIAR AND SEED TREATMENT TO CONTROL *DECTES* STEM BORERS IN SOYBEAN, SCANDIA, KS, 2007

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SUMMARY

We tested the systemic insecticide fipronil applied as a foliar spray or as a seed treatment for effectiveness at suppressing *Dectes* stem borer (*Dectes texanus*) in commercial soybean varieties. Both foliar and seed treatments significantly reduced *Dectes* damage on soybean. There were slight differences in levels of infestation for the four tested varieties, but foliar treatment was effective in each variety. The three doses of fipronil seed treatment significantly reduced *Dectes* infestations. There was a small increase in effectiveness of the highest dose of fipronil over the lowest dose, but this difference was not statistically significant. Treated plots yielded 1.4 to 7.3 bu/a more than untreated plots, but this difference was not statistically significant.

PROCEDURES

Seed of four commercial soybean varieties in maturity groups III and IV were used for evaluating the efficacy of a systemic insecticide, fipronil, applied as foliar treatment. Seed was machine planted at 16 seeds/row-ft on May 28 at the North Central Kansas Experiment Field near Scandia, KS. Plots were four rows wide and 28 ft long. The study design was a randomized block with four replications. There was a treated and untreated plot of each variety in each replication. The foliar treatment of fipronil was applied on July 26 during the beetle flight. This treatment targeted the first two instars developing inside the leaf petioles of the plants. The foliar treatment was applied with a backpack sprayer using a handheld boom with two nozzles (Conejet TXVS 6) directed at a single row. Nozzles were held 6 to 8 in. from the plants to maximize coverage of the upper canopy. The sprayer was calibrated to deliver 4.2 oz/a Regent SC (9.4 sec/25-ft row at 30 psi). A chronometer was used to measure the time spent on each row to help maintain appropriate speed.

Dectes stem borer infestations were observed at the end of the season (September 21) by dissecting two sets of five consecutive plants from each of the two outside rows in each plot for a total of 20 plants. Entry nodes, upper stem tunneling, tunneling that reached the base of the plant, and presence of live larvae were recorded. Percentage of plants girdled was recorded on April 15, 2008. For statistical analysis, the SAS-ANOVA procedure was used to analyze the two factors, variety, and insecticide treatment. Means were compared with LSD. Soybean seed (Pioneer 93M50, maturity group III), was treated with the three rates of fipronil (Regent 500TS); 25, 50, and 100 g /100 kg (a.i.) seed. Other seed was saved to be planted as the check. Seed treatments were planted with the four varieties that were planted for foliar treatment evaluations. Grain yield data on both treatments were collected by machine harvest on November 2 and converted to bu/a at 13% moisture. The SAS-ANOVA procedure was used for statistical analysis, and means were compared with LSD.

RESULTS AND DISCUSSION

Dectes stem borer infestation averaged 61% to 76% plants infested in untreated plots of the four tested varieties. Both foliar and seed treatments of fipronil significantly suppressed *Dectes* stem borer infestations on soybean. Treated plants had significantly lower numbers of entry nodes, stem tunneling, tunneling to the base, and live larva found in 20 sample plants dissected compared with untreated plants (Table 1; Fig. 1 and 2). The percentage of plants infested was also significantly higher in untreated than in treated plants. Although 61% to 76% of

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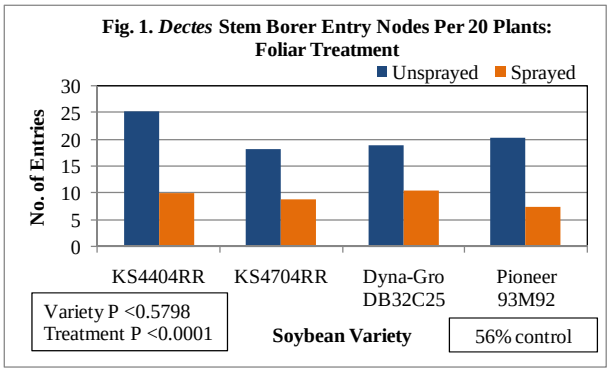
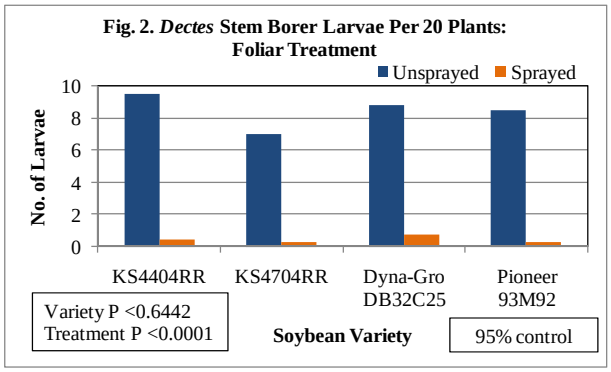
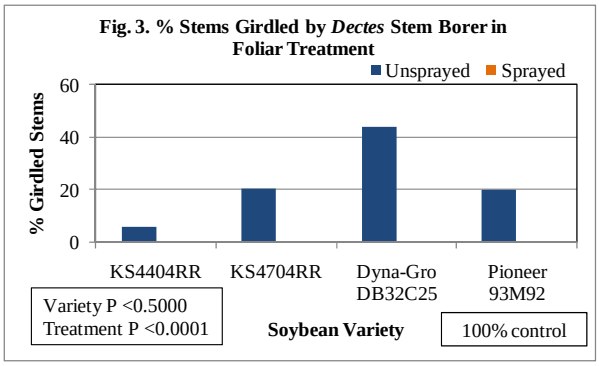
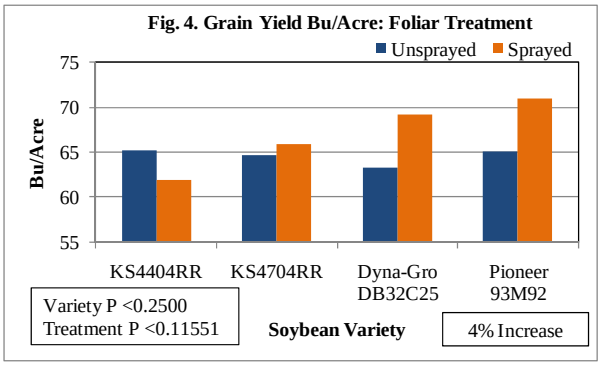
untreated plants were infested, only 6% to 44% were girdled by the end of the season (Table 1; Fig. 3). Treated plots had virtually no girdling. Average percent control among four varieties ranged from 56% to 100%. Timing of foliar spray appeared to be effective for killing early instars of *Dectes* developing inside leaf petioles of the plants and also appeared to kill larger larvae tunneling in the stem before they reached base of the plant.

All of the seed treatments also significantly reduced all *Dectes* stem borer variables relative to untreated plants (Table 2; Fig. 5 and 6). Percentage of infested plants was reduced 86% to 98%, and the percentage of plants girdled was reduced 100%. Average percent control for the three doses ranged from 83% to 100%. Residual activity of the fipronil seed treatments remained effective even into August, when *Dectes* larvae were tunneling into plant stems. There were no statistical differences in efficacy of the three seed treatment doses. There was a small increase in effectiveness of the highest dose of fipronil over the lowest dose, but this difference was not statistically significant. Both, foliar and seed treatments reduced girdling (Tables 1 and 2; Fig. 3 and 7). Treated plots yielded 1.4 to 7.3 bu/a more than untreated plots, but this difference was not statistically significant. We were not able to show a significant physiological yield loss associated with *Dectes* stem borer infestations (Tables 1 and 2; Fig. 4 and 8).









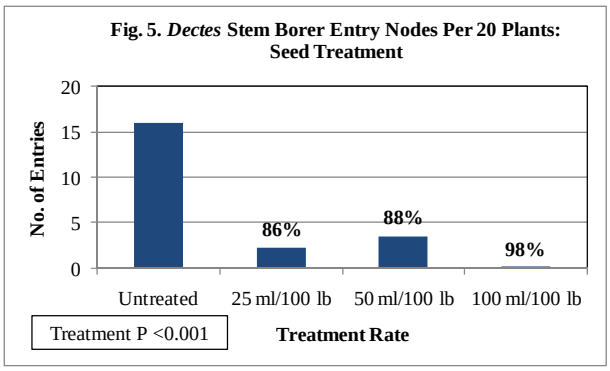


Fig. 5. *Dectes* Stem Borer Entry Nodes Per 20 Plants: Seed Treatment
No. of Entries
20
15
10
5
0
86%
88%
98%
Untreated
25 ml/100 lb
50 ml/100 lb
100 ml/100 lb
Treatment P <0.001
Treatment Rate

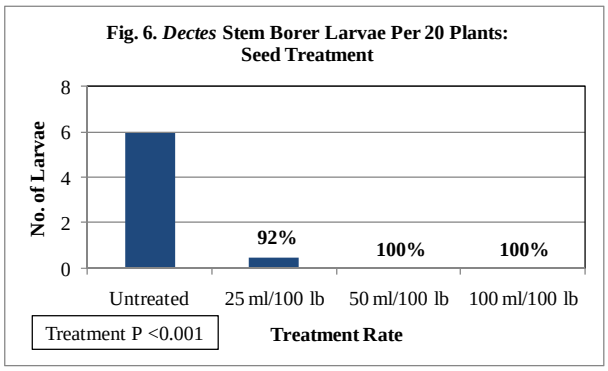


Fig. 6. *Dectes* Stem Borer Larvae Per 20 Plants: Seed Treatment
No. of Larvae
8
6
4
2
0
92%
100%
100%
Untreated
25 ml/100 lb
50 ml/100 lb
100 ml/100 lb
Treatment P <0.001
Treatment Rate

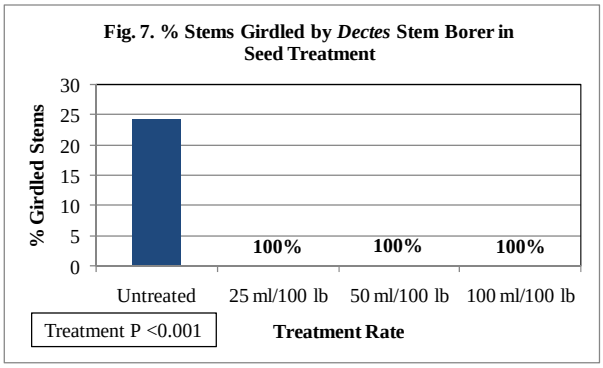


Fig. 7. % Stems Girdled by *Dectes* Stem Borer in Seed Treatment
% Girdled Stems
30
25
20
15
10
5
0
100%
100%
100%
Untreated
25 ml/100 lb
50 ml/100 lb
100 ml/100 lb
Treatment P <0.001
Treatment Rate

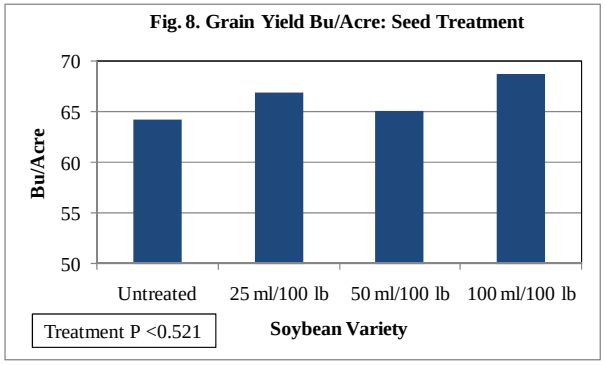


Fig. 8. Grain Yield Bu/Acre: Seed Treatment
Bu/Acre
70
65
60
55
50
Untreated
25 ml/100 lb
50 ml/100 lb
100 ml/100 lb
Treatment P <0.521
Soybean Variety

Table 1. F-test probability values for ANOVA tests of the two main effects, variety and insecticide treatment, Irrigation Experiment Field, Scandia, KS, 2007

	Soybean Maturity Group	Treatment	Entry Nodes/20 plants	Stem Tunneling /20 plants	Base Tunneling /20 plants	Live Larvae/ 20 plants	Grain Yield bu/a	Girdled Stems %
			ANOVA F-Test Probability – Foliar Treatment					
Variety			0.5798	0.3855	0.0337	0.6442	0.2500	<0.5000
Insecticide			<0.0001	<0.0001	<0.0001	<0.0001	0.1151	<0.0001
V x I Interaction			0.6988	0.372	0.0948	0.7939	0.1258	<0.5000
			Variety Means – Foliar Treatment					
KS4404RR	Early IV	Unsprayed	25.3	16.8	5.8	9.5	65.2	6.3
KS4404RR	Early IV	Sprayed	10.0	6.5	0.3	0.5	62.0	0.0
KS4704RR	Mid IV	Unsprayed	18.3	11.8	3.3	7.0	64.6	20.5
KS4704RR	Mid IV	Sprayed	8.8	5.3	0.0	0.3	65.9	0.0
Dyna-Gro DB32C25	Early III	Unsprayed	19.0	12.5	8.5	8.8	63.3	44.0
Dyna-Gro DB32C25	Early III	Sprayed	10.5	8.0	0.5	0.8	69.2	0.0
Pioneer 93M92	Late III	Unsprayed	20.5	14.3	5.0	8.5	65.0	20.3
Pioneer 93M92	Late III	Sprayed	7.5	4.8	0.3	0.3	70.9	0.0
			Main Effects Means for Treatment					
Mean		Unsprayed	20.8[a]	13.8[a]	5.6[a]	8.4[a]	64.5	22.8[a]
Mean		Sprayed	9.2[b]	6.1[b]	0.3[b]	0.4[b]	67.0	0.0[b]
% Control/ Yield Increase			55.7%	55.8%	94.6%	95.2%	+3.9%	100.0%

Fipronil treatments were applied as foliar treatments.
Within columns, means without a common superscript differ ($P < 0.05$).

Table 2. F-test probability values and main effects means for ANOVA tests of the application rates of the insecticide treatment, Irrigation Experiment Field, Scandia, KS, 2007

	Soybean Maturity Group	Entry Nodes/20 plants	Stem Tunneling /20 plants	Base Tunneling /20 plants	Live Larvae/ 20 plants	Grain Yield bu/a	Girdled Stems %
	ANOVA F-Test Probability – Seed Treatment						
Insecticide Treatment		<0.001	<0.001	<0.001	<0.001	0.521	<0.001
	Variety Means – Fipronil – Seed Treatment						
Pioneer 93M50 100 ml/100 lb	Mid III	0.3[b]	0.0[b]	0.0[b]	0.0[b]	68.7	0.0[b]
Pioneer 93M50 50 ml/100 lb	Mid III	3.5[b]	1.8[b]	0.0[b]	0.0[b]	65.0	0.0[b]
Pioneer 93M50 25 ml/100 lb	Mid III	2.3[b]	1.5[b]	0.3[b]	0.5[b]	66.9	0.0[b]
Pioneer 93M50 untreated	Mid III	16.0[a]	11.0[a]	3.5[a]	6.0[a]	64.2	24.5[a]
	% Control/Yield Increase						
Pioneer 93M50 100 ml/100 lb		98.1%	100%	100%	100%	7.0%	100%
Pioneer 93M50 50 ml/100 lb		88.2%	83.6%	100%	100%	1.2%	100%
Pioneer 93M50 25 ml/100 lb		86.3%	85.4%	91.4%	91.7%	4.2%	100%

Fipronil treatments were applied as seed treatments.
Within columns, means without a common superscript differ ($P < 0.05$).

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