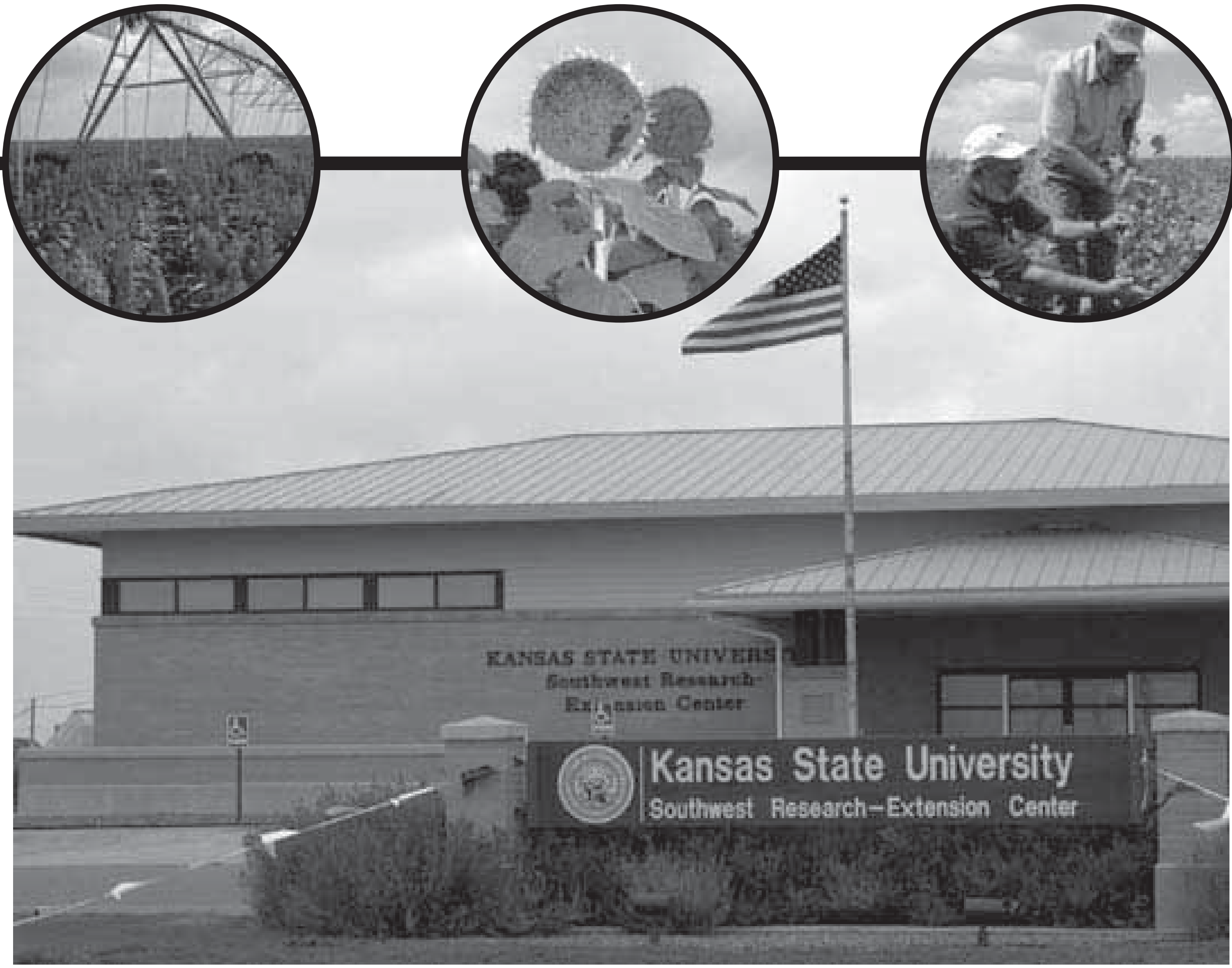
FIELD DAY 2008



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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, GARDEN CITY, KS, 2007 – SOUTH CIRCLE

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SUMMARY

We tested seed and foliar fipronil insecticide treatments applied to five soybean varieties to determine the treatments' effectiveness at reducing *Dectes* stem borers (*Dectes texanus*) in soybean. The foliar treatment of fipronil significantly reduced *Dectes* stem borer infestations 61% and 76%, depending on the variable measured. These treatments increased yield 10.5%. Different soybean varieties had significantly different yields. The seed treatment was evaluated at three different rates. Seed treatments significantly reduced *Dectes* stem borer infestations 85% at the high rate, 70% at the medium rate, and 47% at the low rate. On average, treated plots yielded 1.4% less than untreated plots, but this was not statistically significant. *Dectes* stem borer infestation averaged 68% infested plants. There was a thrips (Thysanoptera: Thripidae) infestation in late June to early July. Sampling indicated that there was a significant difference in number of thrips found on different varieties. The high and medium rate fipronil seed treatment appeared to reduce thrips populations, but differences were not significant.

PROCEDURES

Seed of five commercial soybean varieties in maturity groups III through to IV was machine planted at 16 seeds/row-foot on May 23, 2007, in a half circle of irrigated soybeans on the Southwest Research and Extension Center, Garden City, KS. Plots were four rows wide and 20 ft long. There was a 3-ft-wide alley at each end of the plot. The study design was a randomized complete 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 23 during the peak of the beetle flight (Fig. 1). This treatment targeted the first two instars developing inside 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 24.7 gal/a (7.5 sec/20 ft row at 35 psi). A chronometer was used to measure the time spent on each row to help maintain appropriate speed. The foliar experiment was analyzed as a two-factor ANOVA with four levels of variety and two levels of treatment. The seed treatment experiment was analyzed as an ANOVA with four treatments.

Dectes stem borer infestations were recorded at the end of the season (September 13-27) by dissecting five consecutive plants from two sections from the two outside rows in each plot for a total of 20 plants. Plants were dissected to record entry nodes, upper stem tunneling, tunneling that reached the base of the plant, and presence of live *Dectes* larvae. Percentage of girdled plants was recorded on March 14, 2008, for plants in 3 ft of row. Grain yield data were collected by machine harvesting plots October 5 and converted to bu/a at 13% moisture.

On July 6, thrips samples were taken by collecting 10 plants/plot. Samples were placed in 76-L Berlese funnels, and thrips were collected in 70% methanol. Thrips were filtered on white filter paper using a Buchner funnel. Thrips from each plot were counted using a dissecting microscope. Data were analyzed as an ANOVA with eight treatments.

RESULTS AND DISCUSSION

Dectes stem borer infested 68% of plants in 2007. Timing of the foliar application was a week later than intended (Fig. 1). The foliar fipronil treatment significantly reduced *Dectes* stem borer infestations 69%, 63%, 69%, 70%, and 76% for entry nodes, stem tunneling, base

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tunneling, live larvae, and stem girdling, respectively (Table 1; Fig. 2 and 3). Because the fipronil application was late, some larvae were able to start tunneling in the upper stems; but, fipronil still killed the larvae and gave 69% control. There were no significant differences in *Dectes* infestations across different varieties (Table 1). The foliar treatments reduced girdling (Fig. 4). Yields were significantly different between varieties and between foliar treated and untreated plots. Treated plots averaged 35.8 bu/a, and untreated plots averaged 32.4 bu/a (Table 1; Fig. 5). Variety KS4404RR consistently gave the highest yields (41.2 bu/a treated and 38.1 bu/a untreated), and Dyna-GroDB32C25 consistently gave the lowest yields (30.8 bu/a treated and 20.0 bu/a untreated; Table 1). The fipronil seed treatments significantly reduced *Dectes* stem borer infestations at all treatment rates (Table 2; Fig. 6 and 7). The high rate of treatment reduced infestations 76% to 90%, but the three treatments were not significantly different (Table 2). The seed treatments also reduced girdling 49-97% (Fig. 8). Fipronil seed treated plots had lower grain yields (1.4%), but this was not a significant decrease (Fig. 9).

Soybean varieties KS4404RR and KS4704RR had significantly lower thrips populations than Dyna-Gro DB32C45 and Pioneer 93M92 (Table 3). The fipronil seed treatments at the high and medium rates of application appeared to reduce thrips populations, but differences were not significant (Table 3).

Fig. 1. *Dectes* Stem Beetles in 200 Sweeps in Soybeans 2007

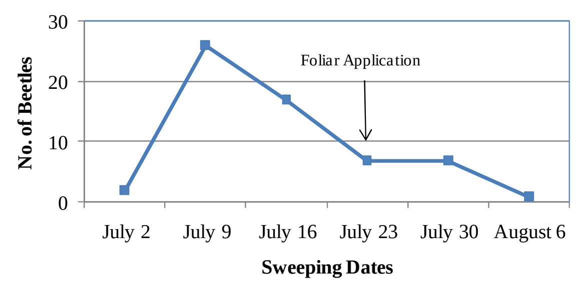


Fig. 2. *Dectes* Stem Borer Entry Nodes Per 20 Plants: Foliar Treatment

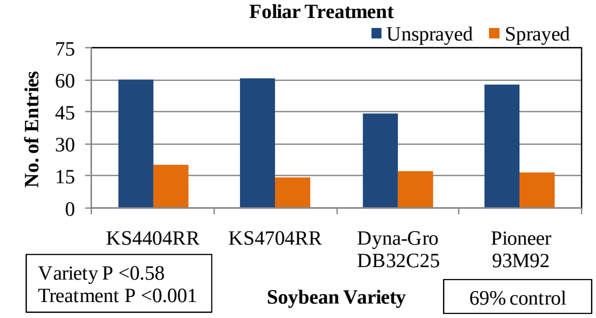


Fig. 3. *Dectes* Stem Borer Larvae Per 20 Plants: Foliar Treatment

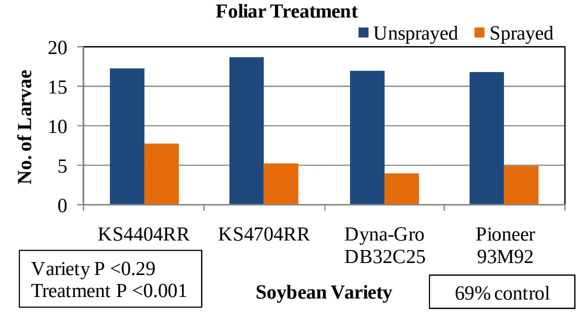
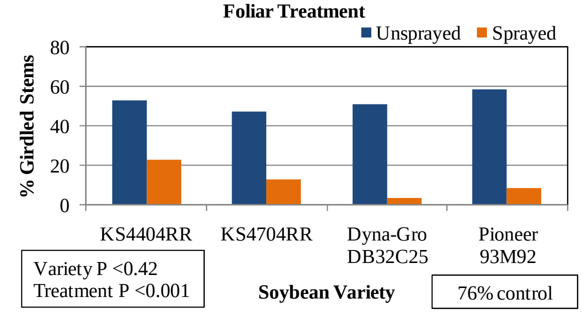


Fig. 4. % Stems Girdled by *Dectes* Stem Borer in Foliar Treatment



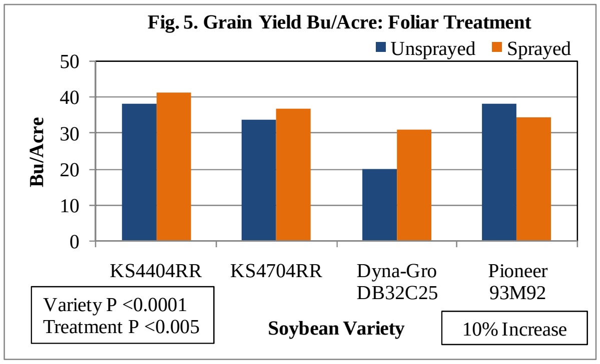


Fig. 5. Grain Yield Bu/Acre: Foliar Treatment

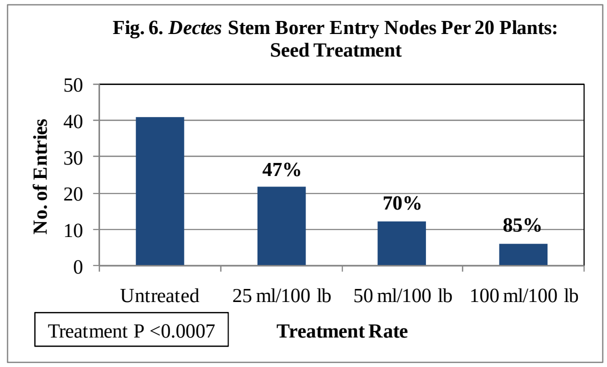


Fig. 6. *Dectes* Stem Borer Entry Nodes Per 20 Plants: Seed Treatment

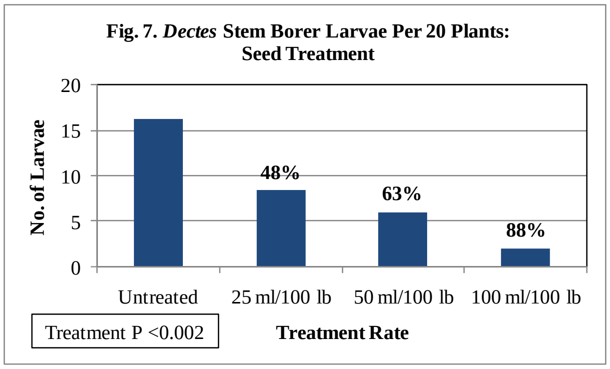


Fig. 7. *Dectes* Stem Borer Larvae Per 20 Plants: Seed Treatment

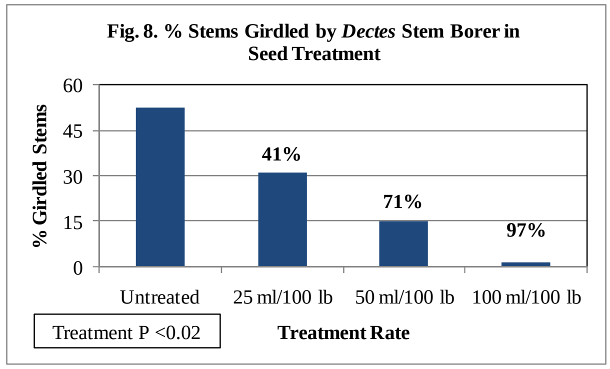


Fig. 8. % Stems Girdled by *Dectes* Stem Borer in Seed Treatment

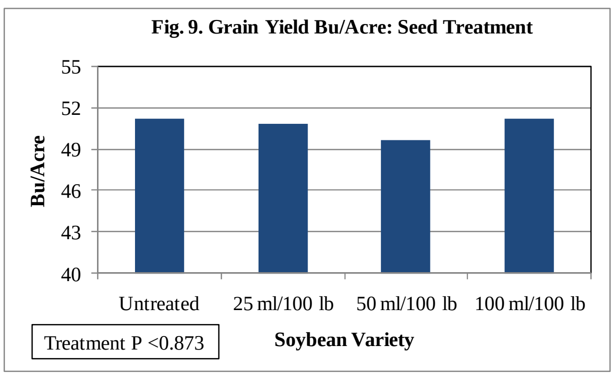


Fig. 9. Grain Yield Bu/Acre: Seed Treatment

Table 1. F-test probability values for ANOVA tests of the two main effects, variety and foliar treatment, Garden City, KS, 2007 – S. Circle

	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			0.589	0.865	0.626	0.298	<0.0001	0.42
Insecticide			<0.0001	<0.0001	<0.0001	<0.001	<0.005	<0.001
V x I Interaction			0.584	0.533	0.305	0.340	0.306	0.34
			Variety Means – Foliar Treatment					
KS4404RR	Early IV	Unsprayed	60.5	32.5	16.8	17.3	38.1	53.4
KS4404RR	Early IV	Sprayed	20.5	15.5	7.0	7.8	41.2	22.9
KS4704RR	Mid IV	Unsprayed	60.8	32.8	18.8	18.8	33.6	47.7
KS4704RR	Mid IV	Sprayed	14.8	11.8	5.3	5.3	36.8	13.4
Dyna-Gro DB32C25	Early III	Unsprayed	44.8	28.3	17.5	17.0	20.0	51.0
Dyna-Gro DB32C25	Early III	Sprayed	17.5	15.8	4.3	4.0	30.8	3.6
Pioneer 93M92	Late III	Unsprayed	58.3	29.3	17.0	16.8	38.0	58.7
Pioneer 93M92	Late III	Sprayed	17.0	14.3	5.0	5.0	34.4	9.0
			Main Effects Means for Treatment					
Mean		Unsprayed	56.0^{a}	30.7^{a}	17.5^{a}	17.5^{a}	32.4^{b}	51.5^{a}
Mean		Sprayed	17.5^{b}	14.4^{b}	5.4^{b}	5.5^{b}	35.8^{a}	12.2^{b}
% Control/ Increase			69%	63%	69%	69%	10%	76%

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 seed treatment, Garden City, KS, 2007 – S. Circle

	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		<0.0007	<0.0009	<0.001	<0.0002	0.873	<0.02
	Variety Means – Fipronil – Seed Treatment						
Pioneer 93M50 100 ml/100 lb	Mid III	6.0^{b}	4.5^{b}	4.0^{b}	2.0^{b}	51.2	1.5^{b}
Pioneer 93M50 50 ml/100 lb	Mid III	12.3^{b}	9.5^{b}	4.8^{b}	6.0^{b}	49.6	15.4^{b}
Pioneer 93M50 25 ml/100 lb	Mid III	21.8^{b}	14.5^{b}	7.8^{b}	8.5^{b}	50.8	31.2^{ab}
Pioneer 93M50 untreated	Mid III	41.0^{a}	23.8^{a}	15.3^{a}	16.3^{a}	51.2	52.5^{a}
	% Control/Yield Increase						
Pioneer 93M50 100 ml/100 lb		85%	81%	74%	88%	0%	97%
Pioneer 93M50 50 ml/100 lb		70%	60%	69%	63%	-3%	71%
Pioneer 93M50 25 ml/100 lb		47%	39%	49%	48%	-1%	41%

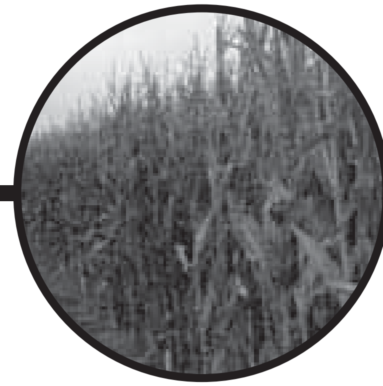
Fipronil treatments were applied as seed treatments.
Within columns, means without a common superscript differ (P < 0.05).

Table 3. F-test probability values and main effects means for ANOVA tests of the thrips populations in soybean plant varieties and seed treatments, Garden City, KS, 2007 – S. Circle

ANOVA F-Test Probability	Soybean Maturity Group	Thrips/10 plants
Varieties		<0.006
	Variety Means - Thrips	
KS4404RR	Early IV	59.8^{b}
KS4704RR	Mid IV	59.0^{b}
Dyna-GroDB32C25	Early III	108.6^{a}
Pioneer 93M92		100.8^{a}
	Fipronil Seed Treatment Means- Thrips	
Pioneer 93M50, 100 ml/100 lb	Mid III	81.8^{a}
Pioneer 93M50, 50 ml/100 lb	Mid III	75.3^{a}
Pioneer 93M50, 25 ml/100 lb	Mid III	101.5^{a}
Pioneer 93M50, untreated	Mid III	101.3^{a}
	% Control	
Pioneer 93M50, 100 ml/100 lb		19%
Pioneer 93M50, 50 ml/100 lb		26%
Pioneer 93M50, 25 ml/100 lb		0%

Within columns, means without a common superscript differ (P < 0.05).





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