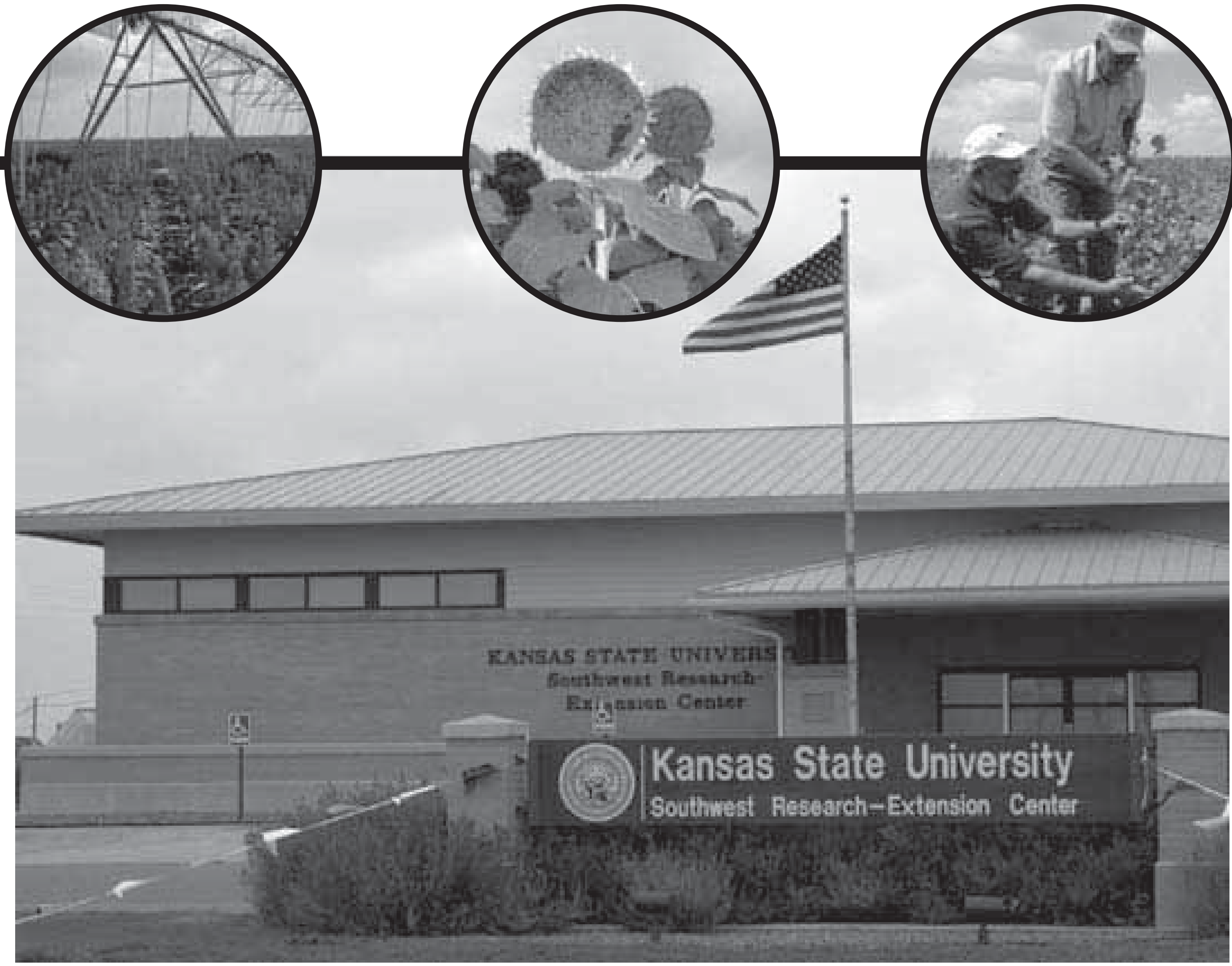
FIELD DAY 2008



Southwest Research-Extension Center

Report of Progress 997

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 – RAMSEY FIELD

Holly Davis[1], Larry Buschman, Terutaka Niide[1], Ankush Joshi, and Chitvan Khajuria[1]

SUMMARY

We tested seed and foliar fipronil insecticide treatments applied to five soybean varieties to determine the treatments' effectiveness for reducing *Dectes* stem borers (*Dectes texanus*) in soybean. Foliar applications of fipronil significantly reduced *Dectes* stem borer infestations in the different varieties between 68% and 74%. These treatments increased yield only 5.4%, which was not statistically significant. The seed treatment was tested at three different rates. The seed treatment significantly reduced *Dectes* stem borer infestations 96% at the high rate, 88% at the medium rate, and 82% at the low rate. However, these treatments increased yield only 3.5%, which was not statistically significant. *Dectes* stem borer infestation averaged 19% infested plants. There was a thrips (Thysanoptera: Thripidae) infestation in mid to late June. There was no significant difference in thrips populations among different soybean varieties. However, all fipronil seed treatments significantly reduced thrips populations relative to untreated plots.

PROCEDURES

Seed of five commercial soybean varieties in maturity groups III through to IV was machine planted at 16 seeds/row-foot on June 5, 2007, in a half circle of irrigated soybeans on the Ramsey Brothers Farm 4 miles north of 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. The foliar treatment of fipronil was applied on July 23 during the *Dectes* stem borer flight (Fig. 1). There was a treated and untreated plot for each variety in each replication. 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 28) by dissecting five consecutive plants from each of the four 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 March 19, 2008, for plants in 3 ft of row. Grain yield data were collected by machine harvest on October 19 and converted to bu/a at 13% moisture.

On June 21, thrips samples were taken by collecting 10 plants/plot. Samples were placed in 76-L Berlese funnels, and thrips were collected in 70% methanol as the preservative. Thrips were filtered onto lined 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 19% of plants in 2007. We were able to apply the foliar fipronil treatment at the peak of beetle flight (Fig. 1). The foliar fipronil treatment significantly reduced *Dectes* stem borer infestations 65% to 94% for entry nodes, stem tunneling, base tunneling, live larvae, and stem girdling (Table 1; Fig. 2 and 3). Because

[1] Kansas State University Department of Entomology, Manhattan, KS

the timing of the application was better, control also was better. There were no significant differences in *Dectes* infestations across different varieties. Foliar treatments significantly reduced girdling (Fig. 4) but only increased yield 5.7%, which was not statistically significant (Table 1; Fig. 5). The fipronil seed treatments significantly reduced *Dectes* stem borer infestations at all rates of application (Table 2; Fig. 6 and 7). The seed treatments also reduced girdling 94% to 100% (Fig. 8) but only increased grain yield 3.5%, which was not statistically significant (Table 2; Fig. 9). The 2007 results suggest there was little yield loss associated with such low *Dectes* stem borer infestations.

There was a thrips (Thysanoptera: Thripidae) infestation in mid to late June. There was no significant difference in thrips populations among different soybean varieties (Table 3). However, all fipronil seed treatments significantly reduced thrips populations relative to the untreated plots (Table 3).

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

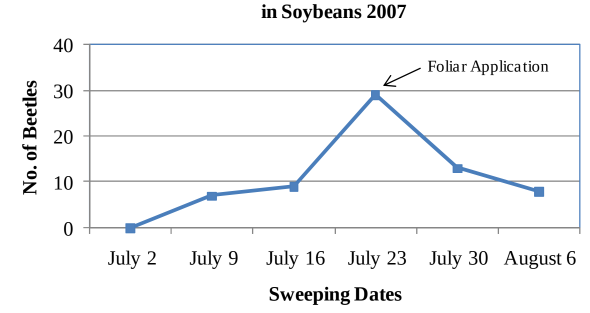


Fig. 2. *Dectes* Stem Borer Entry Nodes Per 20 Plants: Foliar Treatment

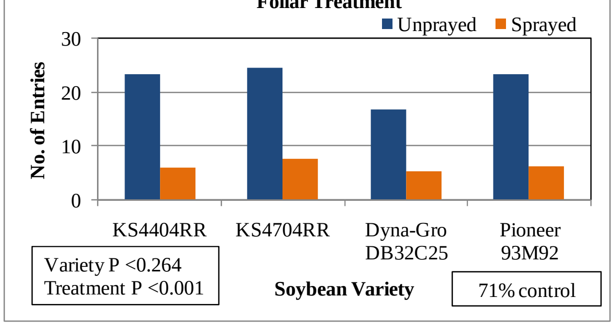


Fig. 3. *Dectes* Stem Borer Larvae Per 20 Plants: Foliar Treatment

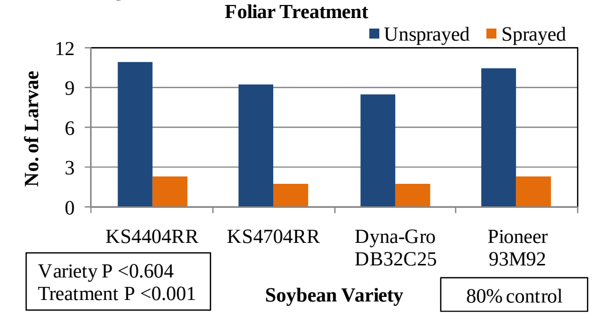


Fig. 4. % Stems Girdled by *Dectes* Stem Borer in Foliar Treatment

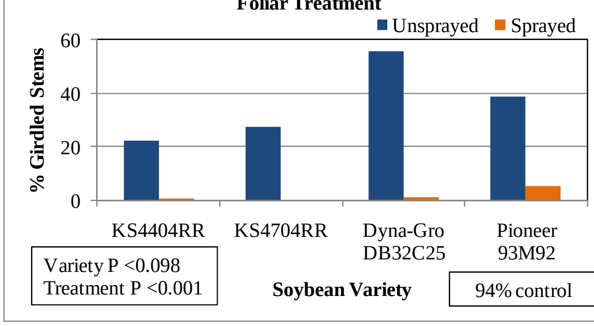


Fig. 5. Grain Yield Bu/Acre: Foliar Treatment

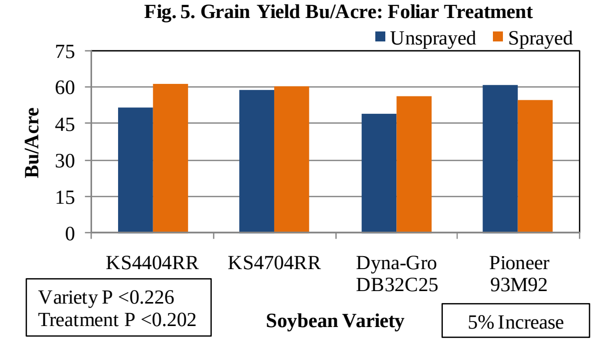
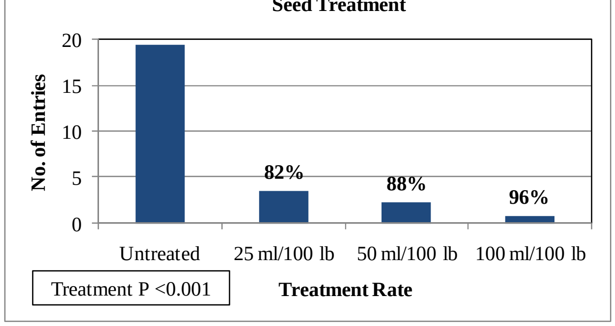


Fig. 6. *Dectes* Stem Borer Entry Nodes Per 20 Plants: Seed Treatment



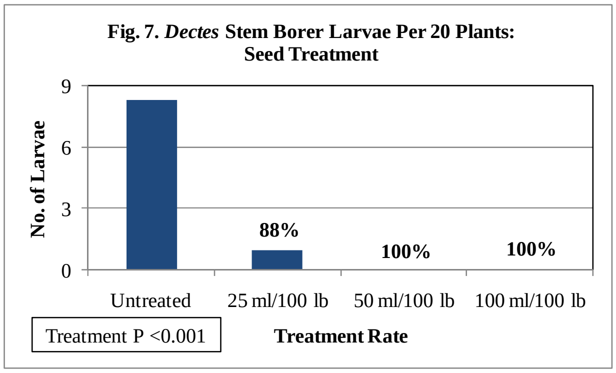


Fig. 7. Dectes Stem Borer Larvae Per 20 Plants: Seed Treatment
No. of Larvae
9
6
3
0
88%
100%
100%
Untreated
25 ml/100 lb
50 ml/100 lb
100 ml/100 lb
Treatment P <0.001
Treatment Rate

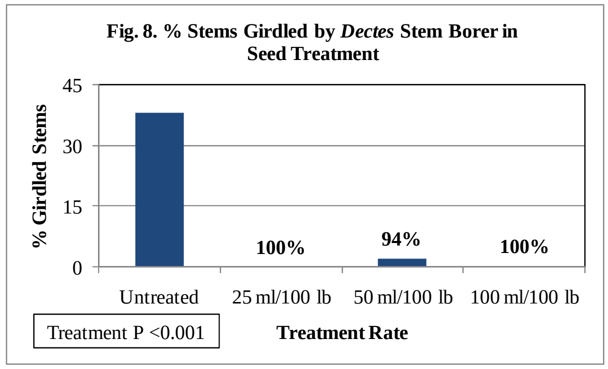


Fig. 8. % Stems Girdled by Dectes Stem Borer in Seed Treatment
% Girdled Stems
45
30
15
0
100%
94%
100%
Untreated
25 ml/100 lb
50 ml/100 lb
100 ml/100 lb
Treatment P <0.001
Treatment Rate

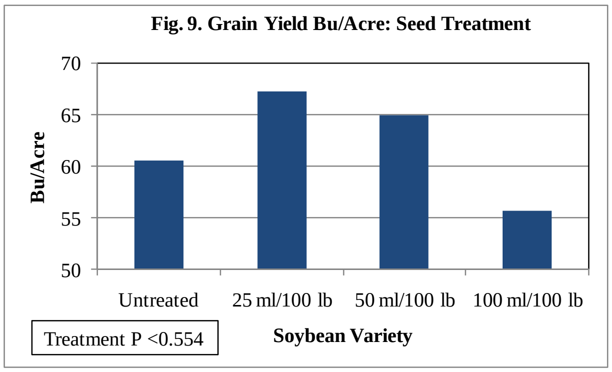


Fig. 9. Grain Yield Bu/Acre: Seed Treatment
Bu/Acre
70
65
60
55
50
Untreated
25 ml/100 lb
50 ml/100 lb
100 ml/100 lb
Treatment P <0.554
Soybean Variety

Table 1. F-test probability values for ANOVA tests of the two main effects, variety and foliar treatment, Garden City, KS, 2006 - Ramsey Field

	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			0.264	0.282	0.619	0.604	0.226	<0.098
Insecticide			<0.001	<0.001	<0.001	<0.001	0.202	<0.001
V x I Interaction			0.575	0.655	0.970	0.868	0.087	0.238
			Variety Means – Foliar Treatment					
KS4404RR	Early IV	Unsprayed	23.5	13.3	10.0	11.0	51.5	22.4
KS4404RR	Early IV	Sprayed	6.0	4.8	1.8	2.3	61.4	0.8
KS4704RR	Mid IV	Unsprayed	24.5	16.5	8.5	9.3	58.8	27.8
KS4704RR	Mid IV	Sprayed	7.8	5.5	1.0	1.8	60.0	0.0
Dyna-Gro DB32C25	Early III	Unsprayed	16.8	11.3	8.8	8.5	49.2	55.6
Dyna-Gro DB32C25	Early III	Sprayed	5.5	4.3	1.8	1.8	56.3	1.6
Pioneer 93M92	Late III	Unsprayed	23.5	16.0	10.3	10.5	60.9	39.0
Pioneer 93M92	Late III	Sprayed	6.3	5.3	2.5	2.3	54.7	5.6
			Main Effects Means for Treatment					
Mean		Unsprayed	22.1^{a}	14.3^{a}	9.4^{a}	9.8^{a}	55.1	36^{a}
Mean		Sprayed	6.4^{b}	5.0^{b}	1.8^{b}	2.0^{b}	58.1	2^{b}
% Control/ Yield Increase			71%	65%	81%	80%	5%	94%

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 seed treatment, Garden City, KS, 2007 - Ramsey Field

	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	0.554	<0.001
	Variety Means – Fipronil – Seed Treatment						
Pioneer 93M50 100 ml/100 lb	Mid III	0.8[b]	0.3[b]	0.0[b]	0.0[b]	55.7	0.0[b]
Pioneer 93M50 50 ml/100 lb	Mid III	2.3[b]	1.5[b]	0.0[b]	0.0[b]	64.9	2.1[b]
Pioneer 93M50 25 ml/100 lb	Mid III	3.5[b]	2.3[b]	0.8[b]	1.0[b]	67.2	0.0[b]
Pioneer 93M50 untreated	Mid III	19.5[a]	14.0[a]	8.5[a]	8.3[a]	60.5	38.1[a]
	% Control/Yield Increase						
Pioneer 93M50 100 ml/100 lb		96%	98%	100%	100%	-8%	100%
Pioneer 93M50 50 ml/100 lb		88%	89%	100%	100%	7%	94%
Pioneer 93M50 25 ml/100 lb		82%	84%	91%	88%	11%	100%

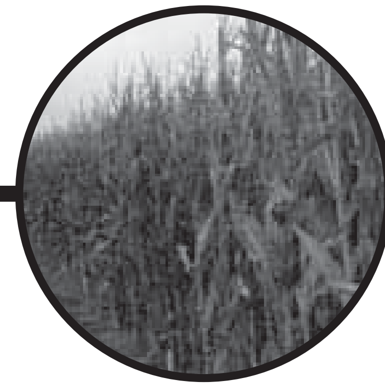
Fipronil treatments were applied as seed treatments.
Within columns, means without a common superscript differ (P < 0.05).

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 - Ramsey Field

ANOVA F-Test Probability	Soybean Maturity Group	Thrips/10 plants
Seed Treatment and Varieties		<0.006
Variety Means - Thrips		
KS4404RR	Early IV	150.8
KS4704RR	Mid IV	236.0
Dyna-GroDB32C25	Early III	248.3
Pioneer 93M92		189.0
Fipronil Seed Treatment Means- Thrips		
Pioneer 93M50, 100 ml/100 lb	Mid III	24.3[b]
Pioneer 93M50, 50 ml/100 lb	Mid III	29.3[b]
Pioneer 93M50, 25 ml/100 lb	Mid III	27.0[b]
Pioneer 93M50, untreated	Mid III	273.3[a]
% Control		
Pioneer 93M50, 100 ml/100 lb		91%
Pioneer 93M50, 50 ml/100 lb		89%
Pioneer 93M50, 25 ml/100 lb		90%

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





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