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EFFICACY OF IN-SEASON APPLICATIONS OF SYSTEMIC INSECTICIDE TO CONTROL DECTES STEM BORERS IN SOYBEAN

by

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SUMMARY

Eight systemic insecticides were applied to the soil and 7 systemic insecticides were applied to the foliage and tested for their effectiveness in reducing Dectes stem borers (*Dectes texanus texanus*) in soybean. The insecticides were applied during the beetle flight to target the first two instars of the insect developing inside the plants. Of the soil insecticides tested, only the late application (August 3) of fipronil and imidacloprid seemed to reduce Dectes stem borer infestations, and there were no significant differences for grain yield. Fipronil and clothianidin were found to be the most effective foliar treatments tested for reducing Dectes stem borer infestations. There was a significant increase in yield (5.6 bu/acre average for two treatments) associated with the fipronil treatments; this implies a 8.9% physiological yield loss due to Dectes stem borers when approximately 50% of the plants showed tunneling.

PROCEDURES

This trial was conducted in soybean, DSS3772 RR (maturity group 3.8), planted May 29, 2004 on the Ramsey Brothers Farm 3 miles north of Garden City, Kansas. Two sets of plots were established, one for soil-applied insecticides and one for foliar-applied insecticides. In each experiment, 15 treatments were assigned in a randomized complete-block design with five replications. Plots were four rows (10 ft) wide and 20 ft long, with a 5-ft alley across the ends of the plots. Treatments were 8 systemic insecticides applied to the soil and 7 systemic insecticides applied to the foliage. The insecticides were applied during the beetle flight to target the first two instars of the insect developing inside the plants. The soil-applied treatments were applied July 19 and August 3, when the soybeans were 18 and 30 inches high, respectively. The granular soil treatments were measured out into small containers for each row and hand scattered beside the soybean plants. (This did not work as well as planned, and the insecticide often ran out before reaching the end of the row. Therefore, insect samples were taken from the treated end of the rows, where the actual dose would have been higher than stated). The liquid soil treatments were applied with a back-pack sprayer with a hand-held wand with a single nozzle (fan LF3 80°) that was held close to the ground to apply a 6-inch band 6 inches from the base of the plants. All soil-applied insecticides were incorporated by hand raking the soil. The foliar treatments were applied July 22 and August 13 or 17 with the back–pack sprayer and a hand-held boom with two nozzles (Conejet TXVS 6), each directed at a single row from 12 inches to each side. In all treatments, the sprayer was calibrated to deliver 20 gal/acre (7.5 sec per 20-ft row at 30 psi). A timer was used to maintain appropriate speed.

Dectes stem borer infestations were recorded for 20 plants in each plot from three of the replicates at the end of the season (Sept. 28 to Oct. 27). The plants were pulled and inspected for entry nodes where the larvae had tunneled from the leaf petiole into the stem. The plants were then dissected to record tunneling at the base of the plant, and the presence or absence of the larvae.

Grain yield was determined by machine harvesting all 4 rows from each plot from all five replicates and converting to bu/acre at 12% moisture.

RESULTS AND DISCUSSION

None of the granular insecticides applied to the soil seemed to reduce Dectes stem borer infestations (Table 1). Of the liquid insecticides applied to the soil, only the August 3 applications of fipronil and imidacloprid significantly reduced Dectes stem borer infestations, and there were no significant differences for grain yield (Table 1).

Of the liquid insecticides applied to the foliage, only fipronil and clothianidin seemed effective in reducing Dectes stem borer infestations (Table 1). For clothianidin, it seems that the first application was a little more effective than the second application. There was a significant increase in yield (4.6 to 6.6 bu/acre) for the fipronil treatments. This implies a 7 to 11% physiological yield loss due to Dectes stem borer infestations. The early clothianidin treatment had the third-highest yield in the test, but was not statistically different from the untreated check.

This is one of the first studies to document physiological yield losses to Dectes stem borer. Fipronil, imidacloprid, and clothianidin are not currently labeled on soybeans, but their use in future research trials will be important in establishing yield losses associated with Dectes stem borer and may stimulate additional research that could lead to these or other products eventually gaining registration for use by producers for the management of Dectes stem borer infestations.

Figure 1. Treatment application dates relative to Dectes stem borers in 100 sweeps from July 8 to August 17, 2004, at Garden City, Kansas. Plants grew from 6-leaf stage to 36 inches tall during this time.

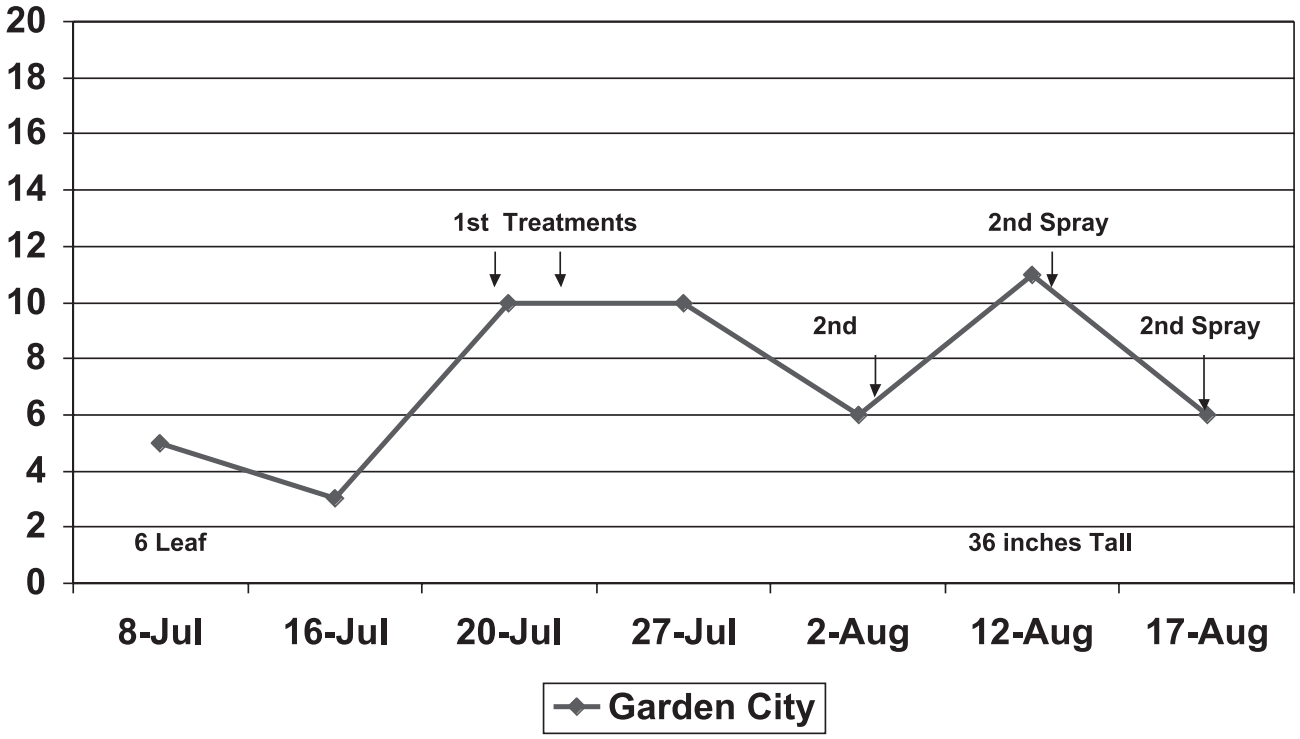

Table 1. Efficacy of soil-applied systemic insecticides against the Dectes stem borers in soybean, Southwest Research-Extension Center, Garden City, Kansas, 2004.

	Insecticide	Rate oz/1000 ft 7/19	Rate oz/1000 ft 8/3	Entry nodes /20 plants	Stem tunneling /20 plants	Live larvae /20 plants	Grain yield bu/acre
1	Check	—	—	20.3 a	10.7 a	9.3 a	61.5
2	disulfoton (Di-Syston 15G)	8	—	16.7 ab	8.0 a	6.3 a	62.8
3	aldicarb (Temik 15G)	9.2	—	21.0 a	10.0 a	8.7 a	61.8
4	terbufos (Counter 20CR)	6	—	27.0 a	11.7 a	10.0 a	62.5
5	phorate (Thimet 15G)	12	—	23.3 a	11.3 a	10.0 a	60.7
6	clothianidin (TM-44401 50WP)	0.17	—	23.0 a	11.7 a	10.7 a	62.8
7	carbofuran (Furadan 4F)	5	—	17.3 ab	9.0 a	9.0 a	65.4
8	fipronil (Regent 4SC)	0.24	—	13.7 ab	6.7 ab	5.3 a	62.8
9	imidacloprid (Provado 1.6F)	1.44	—	17.3 ab	9.0 a	8.3 a	62.5
10	disulfoton (Di-Syston 15G)	—	8	22.3 a	11.3 a	10.3 a	63.2
11	aldicarb (Temik 15G)	—	9.2	25.7 a	10.7 a	7.7 a	64.2
12	clothianidin (TM-44401 50WP)	—	0.17	28.3 a	11.3 a	8.0 a	59.9
13	carbofuran (Furadan 4F)	—	5	19.7 ab	9.7 a	8.7 a	63.1
14	fipronil (Regent 4SC)	—	0.24	7.7 b	2.3 b	1.0 b	63.2
15	imidacloprid (Provado 1.6F)	—	1.44	9.7 ab	4.7 b	4.0 b	63.4
	P-value	—	—	0.0409	0.0127	0.0077	0.8275
	LSD	—	—	11.779	4.880	4.505	—

Table 2. Efficacy of systemic insecticides applied to foliage against the Dectes stem borers in soybean, Southwest Research-Extension Center, Garden City, Kansas, 2004.

	Insecticide	Rate oz/acre 7/22	Rate oz/acre 8/13 & 8/17	Entry nodes /20 plants	Stem tunneling /20 plants	Live larvae /20 plants	Grain yield bu/acre
1	Check	—	—	19.0 a	10.3 ab	10.0 ab	62.3 cde
2	carbofuran (Furadan 4F)	8	—	21.3 a	10.0 ab	9.7 ab	60.6 de
3	disulfoton (Disyston 8EC)	9.2	—	19.0 a	9.3 b	9.3 ab	63.3 bcde
4	fipronil (Regent 4SC)	6	—	0.0 c	0.0 d	0.0 d	66.9 ab
5	imidacloprid (Provado 1.6F)	12	—	18.7 a	11.0 ab	11.0 ab	61.9 cde
6	abamectin (Agri-Mek 0.15 EC)	0.17	—	18.0 a	10.7 ab	10.7 ab	61.2 cde
7	dimethoate (Dimethoate 400)	5	—	16.0 ab	9.3 b	9.3 ab	61.9 cde
8	clothianidin (TM-44401 50WP)	0.24	—	8.7 bc	4.3 c	4.3 c	64.7 bc
9	carbofuran (Furadan 4F)	1.44	—	13.3 ab	8.0 b	8.0 b	59.8 e
10	disulfoton (Disyston 8EC)	—	8	17.7 a	10.3 ab	9.7 ab	60.8 cd
11	fipronil (Regent 4SC)	—	9.2	3.3 c	0.3 d	0.3 d	68.9 a
12	imidacloprid (Provado 1.6F)	—	0.17	18.3 a	10.7 ab	10.3 ab	63.8 bcd
13	abamectin (Agri-Mek 0.15 EC)	—	5	15.3 ab	10.3 ab	9.7 ab	62.6 cde
14	dimethoate (Dimethoate 400)	—	0.24	21.0 a	13.0 a	12.0 a	61.5 cde
15	clothianidin (TM-44401 50WP)	—	1.44	15.3 ab	9.7 b	9.0 ab	62.4 cde
	P-value	—	—	0.0005	>0.0001	>0.0001	0.0018
	LSD	—	—	8.793	3.231	3.048	3.983

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