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Report

Evaluation of Pre-plant and Lay-By Soil-Incorporated Insecticides for Control of Sweetpotato Pests

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Abstract. Pre-plant-incorporated and lay-by incorporated insecticides were evaluated for efficacy against foliage- and root-feeding insect pests of sweetpotato in a field in Calhoun Co., MS.

Key words: *Diabrotica*, *Systena*, wireworm, sugarcane beetle.

Methods

The trial was located in Calhoun Co., MS (location: N 33° 56' 05.96", W 89° 08' 44.42"). Planting date and harvest date were 31 May 2008 and 2 September 2008, respectively.

Table 1 shows the insecticides used in this trial. Pre-plant-incorporated (PPI) insecticides were applied 30 May 2008. Rows within plots were levelled with a do-all followed by insecticide application at 40 PSI and 10 GPA applied with a spray tractor equipped with a compressed-air plot sprayer and two Greenleaf 8001 air injection flat-fan nozzles per row. The spray system was rinsed with water and evacuated with compressed air between each plot. Replicates were along the rows, and rows were hipped as soon as all plots within a replicate were treated with insecticide. Lay-by-incorporated (LBI) treatments were applied 23 June 2008 with the same equipment and settings as the pre-plant incorporated application, but were incorporated into the soil by using a rotary hoe.

Table 1. Materials tested for control of insects in sweetpotato.

Treatment	Formulation	Common Name	Source
Poncho	5FS	clothianidin	Bayer Crop Science
Rynaxapyr	1.67EC	chlorantraniliprole	DuPont
Assail	30SG	acetamiprid	CEREXAGRI
Belt	4FS	flubendiamide	Bayer Crop Science
Brigade	2EC	bifenthrin	FMC Corporation
Lorsban	4EC	chlorpyrifos	Dow AgroSciences
Platinum	2F	thiamethoxam	Syngenta Crop Protection

Plots for both treatments were 4 rows (40 inch spacing) wide by 50 ft long and were separated from other plots by a 2-row buffer on the sides and 12 feet at the ends of each plot. Plots were harvested by digging 50 marketable roots per plot with a shovel. Roots were then washed, dried, and examined for insect damage. Root damage types and probable insect causes were:

Very narrow winding channels (1–2 mm wide) = sweetpotato flea beetle.
Narrow channels (1–5 mm wide), usually on distal end of root = white fringed beetle.
Broad rough, shallow gouges (5–10 mm wide), usually contiguous = white grubs.
Broad, rough, shallow to deep gouges (>10 mm wide), often with separate shallow holes = sugarcane beetle.
Broad, shallow to deep gouges and holes, usually at the upper end of the potato = cutworms and armyworms.
Very small pinholes = *Systena* flea beetles.
Small round holes clumped on the potato surface, sometimes with irregular shaped cavities underneath = *Diabrotica* spp.
Rather deep, round holes or with enlarged cavities, usually randomly spaced = wireworms.

Insects in foliage during the season were sampled weekly by taking 25 sweeps in the center 2 rows with a standard sweep net, placing the insects in plastic bags, and returning them to the laboratory for counting and identification.

Data were summarized by replicate prior to analysis. Analysis of variance (ANOVA) of percentage data was computed on arcsin (square root(x)). Means for sweetpotato flea beetle sweep-net samples required transformation ($\log_{10}$) to satisfy the assumption of uniformity as verified by the Cochran *C* test. Means were separated by using Fisher's LSD test ($p = 0.10$).

Results

The mean number of sweetpotato flea beetles in plots treated with Lorsban 4E followed by Brigade 2E was significantly lower than in water treated control plots (Table 2). The mean number of yellowstriped armyworms was significantly higher in plots treated with Platinum 2FS (PPI) than in all other treated plots, except those treated with Belt 4FS (PPI) or Poncho 5FS (PPI) (Table 2. No other results differed from those of the water-treated control plots for percentage of damaged potatoes or insect counts in sweep-net samples. However, the percentage of damaged potatoes and the percentage of potatoes damaged with deep-hole, small-hole or pinhole damage (WSD complex) was marginally lower in plots treated with Brigade 2E (PPI plus LBI) compared to plots treated PPI with Platinum 2FS, Poncho 5FS or Assail 30SG (Table 3). None of the treatments differed from the water-treated control. These differences are unexplained. However, it is possible that some compounds, being systemic, may alter the attractiveness of sweetpotato plants to some insects or affect the soil inhabiting flora in some way as to benefit insect feeding on the expanded roots.

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Table 2. Mean insects per 25 sweeps averaged across sample dates.

Treatment	Rate Lb AI/Acre	Lady Beetles	Sweet-potato Flea Beetle[1]	Systena Flea Beetles	Spotted Cucumber Beetle	Loopers	Yellow-striped Armyworm
Assail 30SG fb[2] Assail 30SG	0.3/0.3	0.47 a	4.63 c	0.19 a	0.13 a	0.00 ab	0.06 a
Belt 4FS LB	0.3	0.44 a	4.68 c	0.09 a	0.06 a	0.19 a	0.19 ab
Brigade 2E fb Brigade 2E	0.3/0.3	0.38 a	1.65 ab	0.25 a	0.06 a	0.09 a	0.09 a
Lorsban 4E fb Brigade 2E	2.0/0.3	0.38 a	1.01 a	0.09 a	0.00 a	0.03 a	0.06 a
Platinum 2FS	0.3	0.75 a	2.21 abc	0.13 a	0.06 a	0.03 a	0.31 b
Poncho 5FS	0.3	0.47 a	3.87 bc	0.06 a	0.09 a	0.00 a	0.19 ab
Rynaxapyr 1.67 EC	0.3	0.38 a	2.44 bc	0.19 a	0.06 a	0.03 a	0.03 a
Water	---	0.78 a	4.77 c	0.06 a	0.09 a	0.03 a	0.13 a
Prob. F		0.2928	0.0032	0.3144	0.5407	0.2201	0.0152

Means within a column not followed by a common letter differ significantly (LSD; p=0.1).
[1]Means for sweetpotato flea beetle back-transformed from log10(x) transformed data.
[2]fb=followed by soil incorporated, lay-by application of insecticide.

Table 3. Mean percentage of potatoes with WSD[1] damage, sugarcane beetle damage or no damage in plots evaluating Pre-Plant-Incorporated and lay-by-incorporated insecticide applications.

Treatment	Rate Lb AI/Acre	Undamaged	WSD[1]	Sugarcane Beetle
Assail 30SG fb[a] Assail 30SG	0.3/0.3	64.1 ab	28.5 bc	1.5 bc
Belt 4FS	0.3	78.4 abc	12.8 ab	2.8 c
Brigade 2E fb Brigade 2E	0.3/0.3	90.7 c	6.9 a	0.5 abc
Lorsban 4E fb Brigade 2E	2.0/0.3	85.1 bc	10.5 ab	2.2 bc
Platinum 2FS	0.3	70.7 ab	27.0 bc	0.0 a
Poncho 5FS	0.3	59.5 a	37.3 c	0.5 abc
Rynaxapyr 1.67 EC	0.3	80.0 abc	16.2 abc	0.1 ab
Water	---	72.3 abc	23.2 abc	0.1 ab
Prob. F		0.0867	0.0999	0.0694

Means within a column not sharing a common letter differ significantly (LSD; $p = 0.10$). Means are transformed back from arcsin(sqrt(x)) transformed data.
[1] WSD = Percentage of potatoes with small hole, deep hole and pinhole damage caused by the wireworm, *Systena* spp, and *Diabrotica* spp. complex.