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Report

Evaluation of Pre-plant Soil-Incorporated Insecticides for Control of Sweetpotato Pests, 2009

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Abstract Preplant-incorporated insecticides were evaluated for efficacy against root-feeding insect pests of sweetpotato in research plots at Mississippi State University, Mississippi State, MS. Preplant-incorporated insecticides did not affect numbers of insects sampled in sweetpotato foliage; however, all treatments provided nearly complete control of root-damaging insects that caused damage to nearly 80% of roots in water-treated check plots. Combining chlorpyrifos and bifenthrin as a pre-plant soil-incorporated application provided no additional benefit in this trial compared with either compound used alone.

Key words: *Diabrotica*, *Systena*, wireworm, *Ipomoea batatas*.

Introduction

Chlorpyrifos and bifenthrin are well established as effective preventive applications for the management of soil-borne insect pests of sweetpotatoes. In this trial, clothianidin (Poncho 5FS) at 0.3 lb AI/acre (0.336 kg/ha) alone, chlorpyrifos (Lorsban 4E) at 2 lb AI/acre (2.24 kg AI/ha), and bifenthrin (Brigade 2E) at 0.3 lb AI/acre (0.336 kg AI/ha) alone and in combination were evaluated as preplant-incorporated insecticide applications for the control of root-damaging insects to determine any benefit of combined application.

Methods

This trial was initiated to evaluate pre-plant soil-incorporated insecticide (PPI) applications for management of soil-borne sweetpotato pests, particularly to evaluate use of chlorpyrifos and bifenthrin applied as a mixture. The trial was conducted at the R.R. Foil Plant Research Center, Mississippi State, MS (N 33° 28.712'; W 88° 46.978'). Planting date and harvest dates were 17 June 2009 and 10 September 2009, respectively. Some skips were replanted about 1 July 2009. PPI insecticides were applied 16 June 2009. Plots were four rows (40 in [1.01 m] spacing) wide by 50 ft (15.25 m) long. Previously hipped rows within plots were prepared for insecticide application by levelling with a do-all followed by insecticide application at 40 PSI (276 KPa) and 10 GPA (93.5 L/ha) applied by using 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. Compounds used were: Brigade 2EC (bifenthrin, FMC Corporation), Lorsban 4EC (chlorpyrifos, DOW AgroScience), and Poncho 5FS (chlothianidin, Bayer Crop Science). Plots were treated with recommended rates of Valor® herbicide (Valent U.S.A. Corporation) prior to planting and Command® herbicide (FMC Corporation) 24 h after planting, and were cultivated with a rotary hoe once during early July. Sweetpotatoes were shovel harvested by digging fifty marketable roots per plot from the center two rows of each plot. Roots were then washed, dried, and examined for damage caused by insects in the WSD (wireworm, *Systena*, and *Diabrotica*) complex. Root damage types and probable insect causes were: very small pinholes: *Systena* flea beetles; small round holes clumped on the potato surface, sometimes with irregular shaped cavities underneath: *Diabrotica* spp.; and rather deep, round holes or holes with enlarged cavities, usually randomly spaced: wireworms. Insects in foliage were sampled several times during the season by taking 25 sweeps in the center two rows with a 38-cm diameter sweep net. Data were summarized across sample dates by replicate prior to analysis. Analysis of variance (ANOVA) of percentage data was computed on arcsin (square root(x)) transformed data. Means were separated with Fisher's LSD test (p = 0.05).

Results

There were no significant treatment-associated differences in insect numbers sampled in sweetpotato foliage based on the mean of three sample dates (Table 1.) There was significantly less damage from the WSD insect complex in insecticide-treated plots than in the water-treated check plots (Table 2). This was true of small-hole damage typical of cucumber beetle larvae and deep-hole damage associated with wireworms (Table 2). Pinhole damage associated with *Systena* flea beetle larvae was rare, and there were no other types of insect damage. Results of this trial indicate that under these conditions, addition of bifenthrin to chlorpyrifos as a PPI application provided no better efficacy than either of the two compounds alone, and that all treatments provided nearly complete control of the WSD complex larvae until harvest.

Table 1. Mean insects per 25 sweeps summarized across three sample dates in August.

Treatment Lb (AI)/acre [kg AI/ha]	Lady Beetles	*Systena* Flea Beetle	12-Spotted Cucumber Beetle	Banded Cucumber Beetle	Yellow-striped Armyworm	Loopers
Brigade 0.3 [0.336]	0.3	0.3	0.6	3.9	0.2	0.7
Lorsban 2.0 [2.24]	0.3	0.5	0.6	4.3	0.1	0.8
Lorsban 2.0 [2.24] + Brigade 0.3 [0.336]	0.2	0.1	0.4	3.2	0.2	0.1
Poncho 0.3 [0.336]	0.3	0.2	0.8	3.7	0.2	0.6
Water	0.7	0.5	1.3	5.2	0.0	0.3
Prob. F	0.179	0.231	0.126	0.308	0.360	0.289

Table 2. Percentage of sweetpotatoes damaged by the WSD* complex and with small-hole (possibly caused by cucumber beetle larvae) and deep-hole damage (probably attributed to wireworms).

Treatment Lb (AI)/acre [kg AI/ha]	WSD*	Small Holes	Deep Holes
Brigade 0.3 [0.336]	1.4 a	0.0 a	1.4 a
Lorsban 2.0 [2.24]	3.0 a	1.4 a	0.9 a
Lorsban 2.0 [2.24] + Brigade 0.3 [0.336]	5.5 a	1.3 a	5.2 a
Poncho 0.3 [0.336]	3.7 a	1.4 a	1.0 a
Water	78.9 b	45.6 b	50.1 b
Prob. F	<0.0001	<0.0001	<0.0001

Means within a column not sharing a common letter differ significantly (LSD, p = 0.05). Means were back-transformed from the arcsin(sqrt(x))-transformed data.
*WSD: Damage associated with either wireworms (click beetle larvae), flea beetle larvae (*Systena* spp.), or cucumber beetle larvae (*Diabrotica* spp.).

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