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ENTOMOLOGY RESEARCH REPORT - 2014

Field evaluations of registered and experimental insecticides for managing Colorado potato beetle on potatoes

The Colorado potato beetle (*Leptinotarsa decemlineata*, Say, Coleoptera: Chrysomelidae) is the most widespread and destructive insect pest of potato crops in the eastern United States and Canada. Its ability to develop resistance makes it important to continue testing the efficacy insecticides in the field. Such tests provide data on comparative effectiveness of products and data to help support future registrations and use recommendations.

METHODS

Fifteen insecticide treatments and an untreated control (Table 1) were tested at the MSU Montcalm Research Farm for control of Colorado potato beetle. 'Atlantic' potato seed pieces were planted 12 in. apart, with 34 in. row spacing on 28 May 2014. Treatments were replicated four times in a randomized complete block design. Plots were 50 ft. long and three rows wide with untreated guard rows bordering each plot.

Treatment 1 was applied as a seed treatment, and treatments 2-5 were sprayed in-furrow at planting (Table 1). Two treatments (6 and 7 in Table 1) were a mix of at-planting and foliar sprays. Foliar treatments were first applied at 80% Colorado potato beetle egg hatch on 25 June 2014. Based on the economic threshold of *more than one large larva per plant*, additional first generation foliar sprays were needed for Treatment 7 (10 and 17 July), Treatment 8 (10 July), and Treatments 10-15 (3 July); no subsequent applications were necessary for any of the other foliar treatments. All applications were made using a single-nozzle hand-held boom with a flat tip nozzle (30 gallons/acre and 30 psi).

Post-spray counts of first generation Colorado potato beetle adults, small larvae (1^{st} and 2^{nd} instars), and large larvae (3^{rd} and 4^{th} instars) from five randomly selected plants from the middle row of each plot were made weekly, on 1, 9, 16 July. Plots were visually rated for defoliation weekly by estimating total defoliation per plot.

The numbers of small larvae, large larvae, and adults, were transformed log (x + 0.1) prior to analysis. Analysis of variance was used for data analysis and ad-hoc Tukey means separation was used to compare treatment means ($P < 0.05$).

RESULTS

Except for Treatments 15 and 16, all treatments resulted in significantly fewer large larvae than the untreated control (Figure 1). The neonicotinoid, Platinum, at-planting application continues to perform well, providing excellent first generation beetle control. Similar in performance is the newly registered cyazypyr, Verimark, at the higher rate (13.5 oz/A). The lower rate of Verimark (6.75 oz/A) was somewhat less effective although not statistically significant from the high rate; it performed similarly to the Verimark seed treatment. Among the combined at-planting and foliar applications, Treatment 6 provided excellent first generation beetle control, while Treatment 7 provided less protection, although the difference between the two treatments was not statistically significant. For the two foliar applications (Treatments 8 and 9), Blackhawk

*Bt – Bacillus thuringiensis

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provided significantly weaker control, with two applications needed, than the newly registered Exirel, which with only one application was able to suppress larval numbers below threshold in the first generation. *Bacillus thuringiensis* effectively suppressed large larvae below threshold with two foliar applications during the first generation.

The untreated plots had significantly greater defoliation compared to all other treatments except for Treatments 14 and 15. The seasonal defoliation average was 21.6% in the untreated plots, compared to less than 8% for all other treatments. Differences in defoliation among insecticide treated plots ranged from 1 to 10% (except for treatments 14 and 15 which were similar to the control).

In summary, some neonicotinoid insecticides, such as Platinum are still providing sufficient Colorado potato beetle control during the first generation, but new chemistries like cyazypr (Verimark, Exirel) are proving to be effective alternatives to neonicotinoids.

Table 1. Insecticide treatments in the 2014 MSU potato trial, Montcalm Research Farm.

#	Product name	Application rate	Mode of application
1	Verimark (66 lb seed/50' plot)	0.3 fl oz/plot = 8.87ml/plot	at planting, on seed
2	Platinum	2.66 oz/A	at-plant in furrow
3	Verimark	6.75 oz/A (pH 4-6)	at-plant in furrow
4	Verimark	13.5 oz/A (pH 4-6)	at-plant in furrow
5	Admire Pro	7 oz/A	at-plant in furrow
6	Platinum	2.66 oz/A	at-plant in furrow
	Gladiator + NIS	19 oz/A + 0.25% v/v	foliar broadcast
7	Capture	25.5 oz/A	at-plant in furrow
	Admire Pro	5.22 oz/A	at-plant in furrow
	Gladiator + NIS	19 oz/A + 0.25% v/v/	foliar broadcast
8	Blackhawk	2.5 oz/A	foliar broadcast
9	Exirel	5 oz/A (pH 4-6)	foliar broadcast
10	*Bt + NIS		foliar broadcast
11	Peptide + *Bt* + NIS	1x	foliar broadcast
12	Peptide + *Bt* + NIS	2x	foliar broadcast
13	Peptide + *Bt* + NIS	4x	foliar broadcast
14	Peptide + NIS	2x	foliar broadcast
15	Peptide + NIS	24x	foliar broadcast
16	untreated control		

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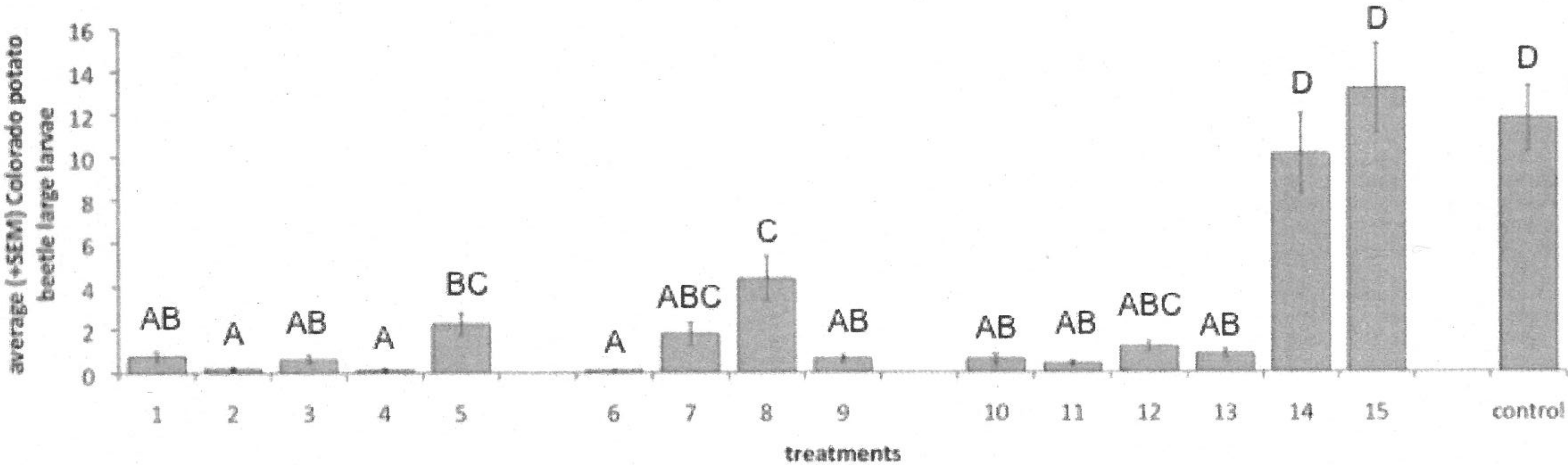

Figure 1. Average number of large larvae across three weekly sampling dates during the first generation of Colorado potato beetles at the Montcalm Research Farm Insecticide trial. Bars that share the same letters are not statistically different from each other. Treatment numbers correspond to numbers in the Table 1.

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