

EVALUATION OF NOVEL INSECTICIDE TREATMENTS ON POTATOES IN VIRGINIA - 2007

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Introduction

The Colorado potato beetle (CPB) has been a very destructive pest of potatoes in the United States. Most insecticides used today to control this beetle are systemic neonicotinoid insecticides applied in the soil (Admire Pro, Platinum) with many other foliar options available (Kryocide, Agri-mek, Spintor, Rimon, Capture, neonicotinoids – Actara, Provado; pyrethroids - Warrior Zt, Mustang Max, Capture). However, in addition to making considerations for the use of insecticides that are efficacious in the control of the CPB, growers have to be concerned about the potential of resistance development. Although most newer chemistries are still highly effective today, the CPB has developed resistance to most major classes of insecticides. The objective of this experiment was to evaluate the efficacy of novel insecticides that can provide growers with additional options for control and rotational purposes.

Experimental design & materials

Two experiments were conducted at the Virginia Tech ESAREC, Painter, VA on ‘Superior’ potatoes. Potatoes were planted on 15 Mar in 2 row 20 ft x 3ft plots with unplanted guard rows. Seed pieces were spaced 12 inches apart. The experiment consisted of 12 treatments arranged in a RCB design with 4 reps. All treatments were applied at 38 GPA using a 4-nozzle boom equipped with 110003VS spray tips spaced 20” apart spraying 2 rows at a time and powered by a CO₂ backpack sprayer at 40psi. A total of 2 applications was made on 21 May (67 DAP), 31 May (77 DAP).

Procedures

TRIAL 1:

On 19 May, stand counts (# plants / 1 row) were taken for each plot. All life stages of Colorado potato beetles were counted on 10 randomly picked stems per plot on the following dates at the following crop and pest stages:

- | | | |
|---|--------------------------------------|--|
| - 22 May (1 DAT)
2 nd instars | Growth Stage 3 (tuber initiation) | Larvae 1 st and |
| - 24 May (3 DAT) | Growth Stage 3 (beginning flowering) | Larvae (all instars) |
| - 29 May (8 DAT)
instars) | Growth Stage 4 (end of flowering) | Larvae (all |
| - 1 Jun (1 DAT) | Growth Stage 4 (tuber bulking) | Larvae (mainly > 3 rd instar) |
| - 8 Jun (7 DAT)
appearing | Growth Stage 4 (tuber bulking) | Large Larvae, F1 adult |
| - 15 Jun (14 DAT). | Growth Stage 4 (tuber bulking) | F1 Adults |

On 14 Jun, European corn borer counts per 10 stems were attempted but no damage was detected in any of the plots. On 6 Jun, potato plots were assessed for % defoliation. On 8 Jun (7 DAT), potato leafhopper (PLH) nymphs were counted on 10 randomly-picked, fully expanded compound leaves / plot. On 2 Jul, potato tubers were harvested and weighed. All data were analyzed using analysis of variance procedures. Means were separated using Fisher's LSD at the 0.05 level of significance. Data were sqrt transformed to normalize.

TRIAL 2:

All life stages of Colorado potato beetles were counted on 10 randomly picked stems per plot on the following dates at the following crop and pest stages:

- 21 May (Pre-Count) Growth Stage 3 (tuber initiation)
- 22 May (1 DAT) Growth Stage 3 (tuber initiation) Larvae 1st and 2nd instars
- 24 May (3 DAT) Growth Stage 3 (beginning flowering) Larvae (all instars)
- 29 May (8 DAT) Growth Stage 4 (end of flowering) Larvae (all instars)
- 1 Jun (1 DAT) Growth Stage 4 (tuber bulking) Larvae (mainly over 3rd instar)
- 4 Jun (3 DAT) Growth Stage 4 (tuber bulking) Large Larvae, F1 adult appearing
- 19 Jun (18 DAT). Growth Stage 4 (tuber bulking) F1 Adults

On 14 Jun, European corn borer counts per 10 stems were attempted but no damage was detected in any of the plots. On 6 Jun, potato plots were assessed for % defoliation. On 8 Jun (7 DAT), potato leafhopper (PLH) nymphs were counted on 10 randomly-picked, fully expanded compound leaves / plot. On 28 Jun, potato tubers were harvested and weighed. All data were analyzed using analysis of variance procedures. Means were separated using Fisher's LSD at the 0.05 level of significance. Data were sqrt transformed to normalize.

Results

For both trials, CPB pressure was high, and there was a significant treatment effect on numbers of small larvae, large larvae, new adults, % defoliation, and tuber yield. In general, except for a few sample dates with numbers of small larvae, all treatments provided significant control of CPB, which resulted in significant reductions in defoliation and a higher yield than the untreated control. The Warrior treatment was the least effective among insecticide treatments in the first trial, but still provided some control of CPB. Very few potato leafhoppers were found, and little to no European corn borer damage was found.

Table 1. Trial 1: Summary of foliar insecticide treatments for the control of Colorado potato beetles in potatoes, ESAREC, Painter, VA, 2007

Treatments*	Rate / Acre	Mean no. CPB / 10 stems						Mean no. PLH / 10 leaves	% Defoliation	Yield (cwt / acre)
		Small Larvae		Large Larvae			Adults			
		29-May	8-Jun	29-May	8-Jun	15-Jun	15-Jun			
UTC		45.8a	3.6b	31.0a	43.8a	4.0b	16.4a	1.2	56.0a	190.6e
Voliam Express ¹	4.1 fl. oz	22.8abc	1.0bc	1.8b	1.5b	0.5cd	0.8b	0.5	1.0c	227.7a-e
Voliam Express ¹	5.5 fl. oz	8.3bc	0.3bc	0.5b	0.0b	0.0d	1.5b	0.0	1.0c	229.2a-e
Voliam Express ¹	6.84 fl. oz	4.5c	0.0c	0.5b	0.3b	0.0d	0.0b	0.5	0.5c	258.6ab
Voliam Express ¹	8.2 fl. oz	2.6c	0.0c	0.0b	0.3b	0.0d	0.2b	0.6	0.2c	241.1abc
rynaxypyr	1.64 fl. oz	1.8c	0.0c	0.0b	0.0b	0.0d	1.3b	0.8	0.5c	213.6b-e
rynaxypyr	2.2 fl. oz	0.8c	0.0c	0.0b	0.0b	0.0d	0.0b	0.8	0.5c	236.5a-d
rynaxypyr	2.74 fl. oz	1.0c	0.0c	0.0b	0.0b	0.0d	0.0b	1.0	0.3c	235.3a-e
rynaxypyr	3.3 fl. oz	9.5abc	0.0c	0.0b	0.0b	0.0d	0.5b	1.8	0.8c	211.0cde
Warrior ZT	2.85 fl. oz	42.5ab	5.5a	0.0b	28.3a	12.0a	0.8b	0.0	12.5b	193.4de
Endigo ²	3 fl. oz	0.0c	0.0c	0.0b	0.0b	0.0d	0.0b	0.0	0.7c	268.4a
Leverage 2.7SE	3.75 fl. oz	0.3c	1.0bc	0.0b	0.8b	2.0bc	0.3b	0.8	2.8bc	220.8a-e
<i>P-Value from Anova</i>		0.0611	0.0002	0.0003	0.0000	0.0000	0.0001	NS	0.0000	0.0590

* All treatments received 0.25% v/v Penetrator plus (non-ionic surfactant)

¹rynaxypyr + lambda-cy; ²thiamethoxam +lambda-cy

Table 2. TRIAL 2: Summary of foliar insecticide treatments for the control of Colorado potato beetles in potatoes, ESAREC, Painter, VA, 2007

Treatment	Rate / acre	Mean No. CPB / 10 stems								Mean no. PLH / 10 leaves	% Defoliation	Total Yield (cwt / acre)
		Small Larvae			Large Larvae			Adults				
		24-May	29-May	4-Jun	29-May	4-Jun	19-Jun	22-May	19-Jun			
UTC		15.5ab	60.8a	67.5a	31.3a	161.5a	67.5a	1.5abc	26.5a	2.0 a	63.5 a	190.0 c
Endigo*	2.55 fl. oz	1.5cde	0.0f	0.0b	0.0c	0.0c	0.3d	0.3cd	6.5bc	0.0 d	2.0 b	249.1 ab
Endigo*	3 fl. oz	0.0e	0.3f	0.3b	0.3c	0.0c	0.0d	0.0d	3.0bc	0.0 d	1.5 b	249.0 ab
Endigo*	4 fl. oz	11.5bc	0.0f	0.0b	0.0c	0.0c	0.0d	0.0d	0.3c	0.0 d	1.5 b	265.3 ab
Warrior ZT	3.2 fl. oz	1.5de	14.5cde	3.3b	0.5c	7.0c	8.8c	1.5a-d	2.0c	0.0 d	5.3 b	241.6 ab
Leverage 2.7SE	3.75 fl. oz	1.0de	8.3ef	0.3b	0.3c	0.8c	3.5d	0.8a-d	3.3bc	0.0 d	3.0 b	248.3 ab
Rimon 0.83EC ¹	12 fl. oz	3.3b-e	23.8bcd	0.0b	1.8c	0.8c	1.3cd	2.5a	1.0c	1.0 a-d	2.8 b	273.7 a
Rimon 0.83EC ²	6 fl. oz	8.8bcd	30.3abc	0.0b	0.5c	2.5c	0.3cd	2.3ab	1.5c	0.3cd	2.5 b	253.8 ab
Coragen 35WG	2 oz	13.3bc	6.0def	0.5b	2.8c	0.8c	0.3cd	1.3abc	6.5bc	1.3a-d	3.3 b	253.0 ab
Coragen 35WG	3 oz	36.8a	3.0ef	0.0b	0.0c	0.0c	0.0d	0.5bcd	1.5c	1.5abc	1.8 b	251.2 ab
Coragen 35WG + MSO	3 oz + 0.25% v/v	6.3bcd	3.0ef	0.3b	0.3c	0.0c	0.0d	0.8bcd	2.3c	1.8ab	2.3 b	259.8 ab
Asana XL	9.6 fl. oz	6.8b-e	43.8ab	44.0a	11.8b	61.8b	46.8b	1.0a-d	10.5b	0.5bcd	50.3 a	234.2 b
<i>P-Value from Anova</i>		0.0007	0.0000	0.0000	0.0000	0.0000	0.0000	0.0510	0.0000	0.0369	0.0000	0.0039

¹applied twice at 14 day intervals (9 May and 23 May); ²applied four times at 7 day intervals (9, 21, 31 May and 4 Jun);

*Endigo = thiamethoxam + lambda-cy