COLORADO POTATO BEETLE MANAGEMENT OPTIONS

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The Colorado potato beetle (CPB), *Leptinotarsa decemlineata* Say, is the most serious insect pest of potato in the eastern U.S. Adults and larvae feed on potato foliage and even modest levels of defoliation will reduce tuber yield. Among the many tactics available to manage CPB infestations, insecticide use continues to be the most commonly used. CPB is notorious for developing resistance to insecticides, so preservation of new chemistries is critical. Rotating insecticides belonging to different classes is one of the most effective strategies to delay the development of resistance.

Fig. 1. Colorado potato beetle adult

Imidacloprid (Admire Pro) has been the most remarkable insecticide used to control CPB infestations in potato since Temik. Admire has been used in New York since 1995, typically on an annual basis. Although Admire still works on many farms, the number of instances where it is “not as good as it used to be” is increasing. Perhaps, resistance to imidacloprid is developing in those CPB populations? In situations where Admire or other neonicotinoid insecticides may not be performing as expected, another insecticide from a novel class of chemistry should be considered. In 2011, cyantraniliprole (a.k.a. cyazypyr) was evaluated for managing CPB. This product belongs to a novel insecticide class called the anthranilic diamides and is currently named HGW86 10 OD, but will be marketed as Benevia. Registration is targeted for the fourth quarter in 2012. **This article summarizes the efficacy of cyantraniliprole against CPB**.

Materials and Methods

Insecticides were evaluated for their efficacy against CPB on potato at the ACDS Research Inc. farm near North Rose, NY (GPS coordinates: 43.192193, -76.923287). White-skinned potato (var. ‘Genesee’) seeds (=‘B’ grade tubers) were planted on 5 May 2011. Planting density was 1 tuber per foot. Each plot included two 25-ft long rows flanked by a single unplanted row. Rows were spaced apart by 36 inches and plots were separated by a 5 ft alley within rows. This experiment included 5 insecticide treatments **(see Table 1)** plus an untreated control arranged in a randomized complete block with each treatment replicated 5 times. Provado 1.6 F (imidacloprid) and Blackhawk (spinosad) were included as standards. Other insect pests such as potato leafhopper, potato aphid, green peach aphid and European corn borer were rarely encountered in this trial.

Foliar applications of each treatment were made on 13 and 20 June (pre bloom) and 1 August (post bloom). Applications were made using a hand-held sprayer. The sprayer boom had 3 hollow-cone nozzles (ConeJet TXVS-12) in which the middle nozzle was directed over the top of the plant and the side nozzles were on drop pipes directed into the canopy. The sprayer was calibrated to deliver 28.5 gallons of spray per acre at 40 psi. Efficacy of treatments was evaluated by (1) recording the number of CPB life stages per plant during the first generation,

(2) a visual defoliation rating of all plants in the plot during bloom near the end of the first generation, and (3) marketable tuber yield. During the first generation, numbers of egg masses (EM), adults (AD), small larvae (SL) (=1^{st} and 2^{nd} instars) and large larvae (LL) (=3^{rd} and 4^{th} instars) were recorded per plant from 10 randomly selected plants per plot. Plots were sampled on 16, 20 and 27 June and 5 and 11 July (season total presented here). Because the second generation was relatively small, data were not taken beyond 11 July. On 4 July, near the end of the first generation, a visual estimate of defoliation was made for each plot following a 13-point scale (0%, 0.5-3%, 3.5-9%, 9.5-17%, 17.5-27%, 27.5-38%, 38.5-50%, 50.5-62%, 62.5-73%, 73.5-81%, 81.5-92%, 92.5-97% and 97.5-100%). Both rows in the plot were bisected and then each sub-plot was assigned a defoliation rating. The mean of the four estimates was used in the statistical analysis. On 14 September, the left hand row in each plot was harvested and the numbers of Grade 'A' (>1.5 in. in diam.) and Grade 'B' (<1.5 in diam.) tubers were weighed.

All data were analyzed using an analysis of variance procedure of SAS (PROC GLM) and treatment means were compared using Fisher's Protected LSD at $P<0.05$. Before analyses were performed, numbers of insects per plant were transformed using a $\log_{10}(x + 1)$ function. Defoliation levels were compared using the midpoint of each defoliation range (e.g., for the range 27.5-38, the value 32.75 was used in the analysis). Non-transformed data are presented.

RESULTS

CPB pressure was relatively high at this test site **(Table 1)**. Before treatments were initiated on 13 June, the numbers of CPB ADs, EMs, SL and LL were 0.25, 2.0, 18.2 and 8.3 per plant, respectively. Overwintered adults colonized the trial in late May to early June and first-generation adults emerged in early to mid-July. Peak first-generation larval populations occurred between 16 and 27 June. The total numbers of ADs, SL and LL were significantly lower in all treated plots compared with the untreated control **(Table 1).** Levels of CPB defoliation were significantly lower in treated plots than in the untreated control **(Table 1).** Levels of defoliation in treated plots did not exceed 1% and no significant differences existed among treatments.

Table 1. Mean numbers of CPB life stages on potato plants and levels of defoliation from the first generation in a field trial near North Rose, New York in 2011. Foliar applications of treatments were made on 13 and 20 June and again on 1 August.

Product	Rate (amount of product/ acre)	Mean numbers per plant [a]				% Defoliation
		EM	AD	SL	LL	
HGW86 10 OD	3.37 fl oz	0.52	0.72 b	6.8 bc	1.36 bcd	0.4 b
HGW86 10 OD	6.75 fl oz	0.58	0.36 b	10.2 b	1.68 bc	0.4 b
HGW86 10 OD	10.1 fl oz	0.58	0.56 b	9.2 b	2.26 b	0.3 b
Provado 1.6F	3.8 fl oz	1.14	0.50 b	4.6 c	0.58 d	0.7 b
Blackhawk	3.2 fl oz	0.42	0.64 b	5.9 bc	0.86 cd	1.0 b
Untreated	-	0.28	7.18 a	28.6 a	40.52 a	36.5 a

[a] Means followed by the same letter within a column are not significantly different (Fisher's Protected LSD; tested at $P<0.05$; n=5).

Mean marketable tuber yield (As, Bs and total yield) was significantly greater in all treatments compared with the untreated control **(Table 2).** As the rate of HGW86 10 OD increased, there was a trend for numerically greater marketable A tuber weights, but these differences were not significant **(Table 2).** Similar to the levels of defoliation, marketable yield in plots treated with Blackhawk was numerically lower than yield in the other treatments, but the difference was not significant **(Table 2).**

Table 2. Marketable potato tuber yield in treatments that received various insecticide treatments in a field near North Rose, NY in 2011. Treatments were made on 13 and 20 June and 1 August.

Product	Rate (per acre)	Mean Marketable Tuber Yield per 25 ft [a]		
		Grade 'A' (>1.5 in. in diam.) Weight (lbs)	Grade 'B' (<1.5 in. in diam.) Weight (lbs)	Total Marketable Weight (lbs)
HGW86 10 OD	3.37 fl oz	23.4 a	2.4 a	25.8 a
HGW86 10 OD	6.75 fl oz	27.4 a	2.2 a	29.5 a
HGW86 10 OD	10.1 fl oz	28.6 a	2.3 a	30.9 a
Provado 1.6F	3.8 fl oz	28.8 a	2.3 a	31.2 a
Blackhawk	3.2 fl oz	23.9 a	1.5 a	25.4 a
Untreated		12.7 b	1.7 a	14.4 b

[a] Means followed by the same letter within a column are not significantly different (Fisher's Protected LSD; tested at $P<0.05$; n= 5).

CONCLUSIONS

All rates of cyantraniliprole were highly effective against CPB as were Provado and Blackhawk. There was no indication that this CPB population was resistant to either imidacloprid or spinosad. Cyantraniliprole will be an effective option for managing CPB infestations in the future. Strategies including cyantraniliprole with or without other foliar-applied products like Blackhawk will be developed so that in some years they can be used instead of at-plant treatments of neonicotinoids like Admire.

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