Field Efficacy evaluation of HGW86, Coragen, and other insecticides for control of insect pests on potato

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Two experiments with different treatments and objectives were conducted on separate farm locations in 2008. At both locations, potato seed pieces (var. Kennebec) were spaced 10 inches apart within rows. Plots were three rows 15 ft long, spaced 36 inches apart, and arranged in a randomized block design with four replicates. Standard fertility, weed control, and cultural practices were applied, including hilling and irrigation.

In-furrow soil insecticides were tested at the Central Maryland Research and Education facility, Beltsville, MD. The field site had a history of wireworm infestations; thus, the primary objective was to evaluate control efficacy against this important soil pest. Treatments were: three rates of HGW86 (cyazypyr), HGW86 as a seed piece dressing, Admire Pro, Regent, Vydate, and the untreated control. All treatments were applied in-furrow at planting on 18 April, except for Vydate which was shipped too late for soil incorporation. Vydate at 2 qts was applied as a band over the hilled rows on 25 April, followed by a second broadcast spray at the 1 qt rate on 3 June.

In the second experiment, two rates of Coragen as a foliar spray were tested at the Central Maryland Research and Education facility, Upper Marlboro, MD. This experiment was part of a larger study to establish a relationship between field efficacy data and laboratory bioassay responses of the same field populations. Treatments were applied on 2 June when larval populations reached the action threshold in most plots.

All treatments were applied using a CO_2 backpack sprayer calibrated to deliver 20 gal/acre at 40 psi. A single nozzle wand was used for in-furrow applications, whereas foliar treatments were applied with a 10 ft boom with six flat fan nozzles directed over the top of the foliage.

At both locations, sampling for Colorado potato beetle stages was conducted by counting adults, egg masses, small larvae (1st and 2nd instars), and large larvae (3rd and 4 instars) on six plant hills of the middle row of each plot. For the in-furrow experiment, samples of leaflets and plants were also examined for potato leafhopper adults and nymphs, and for European corn borer galleries, respectively. At harvest, the center row of each plot at Beltsville was dug with a tractor-driven potato digger, and the tubers (>100) were examined for entry holes caused by wireworms. Mixed model SAS procedure was used to test for treatment effects after adjustments were made for lack of normality. The Tukey option was used to test for significance among multiple mean comparisons.

Unfortunately, the wireworm population was very low at the Beltsville location, so it was not possible to test for differences among in-furrow treatments. No data were recorded because the untreated plots had practically zero counts, which was surprising given the previous infestations encountered at this location. In addition, colonizing densities of Colorado potato beetles and larval injury were low in all plots and did not exceed economic damage levels. Adult beetles collected from the Upper Marlboro site on 24 June were manually introduced in each plot at Beltsville at the rate of one adult per foot of row. However, this attempt failed to establish a larval infestation. The low adult survival was likely due to residual systemic activity of the

treatments but differences were not observed. Because of the highly skewed data (many zeros), larval counts were not statistically analyzed; however, the HGW86 rates and Admire Pro performed at least numerically better than the other treatments, in comparison with the control (Table 1). For leafhopper control, Admire Pro was the only treatment that significantly controlled this sucking insect. Hopperburn injury was evident in all plots except those treated with Admire Pro. In contrast, Admire Pro was ineffective against European corn borer, whereas the higher in-furrow rates of HGW86, the seed dressing of HGW86, and Regent all significantly reduced the number of galleries compared to the untreated control.

At Upper Marlboro, defoliation caused primarily by Colorado potato beetle larvae in the untreated plots ranged from 30 to 50% by mid June. Plots treated with both rates of Coragen had significantly fewer early and late larvae compared to counts in untreated plots (Table 2), and differences were greatest at four days post-treatment for early larvae (treatment by date interaction: $F_{(6,21)} = 7.43$, $P < 0.001$) and late larvae (treatment by date interaction: $F_{(6,21)} = 6.24$, $P < 0.001$).

Table 1. Effects of in-furrow applications of insecticide formulations on insect pests of potato. Data on leafhopper and corn borer infestations are averages of one sampling date (2 and 24 July, respectively). Counts of larvae are averaged over two sampling dates (6 and 12 June). Central Maryland Research and Education Center, Beltsville, MD. 2008.

Treatments Formulation	Rate/acre	Potato leafhoppers /15 leaflets	European corn borer galleries /10 plant hills	Colorado potato beetle (counts/10 rowfeet) Early larvae (instars 1+2)	Late larvae (instars 3+4)
HGW86	0.066 lb	14.3 ab	4.3 ab	0.00	0.00
HGW87	0.134 lb	19.7 a	1.8 b	0.17	0.08
HGW88	0.176 lb	17.0 ab	0.5 b	0.00	0.00
HGW89	4 mg/seed	21.3 a	2.5 b	0.00	0.00
Admire Pro	7 fl.oz	2.8 c	11.5 a	0.00	0.00
Regent 4SC	2.9 fl.oz	16.3 ab	0.8 b	4.08	0.92
Vydate	2 qts + 1 qt	11.3 b	11.3 a	0.25	1.83
Untreated		15.5 ab	10.0 a	8.92	8.75

Means within a column followed by the same letter or no letters are not significantly different (P= 0.05).

Table 2. Effects of the rates of Coragen on Colorado potato beetle populations in potato. Data are averaged over all sampling dates (6 and 10 June). One treatment of each rate was applied on 2 June. Central Maryland Research and Education Center, Upper Marlboro, MD. 2008.

Treatments Formulation	Rate/acre	Colorado potato beetle stages per 6 plants Adults	Egg masses	Early larvae (instars 1+2)	Late larvae (instars 3+4)
Coragen	3.5 oz	2.9	0.8	1.6 b	2.8 b
Coragen	5 oz	2.4	0.8	0.8 b	2.5 b
Untreated		1.6	0.5	16.3 a	27.1 a

Means within a column followed by the same letter or no letters are not significantly different (P= 0.05). `