



Integrated Pest Management of Weevils 2019

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RATIONALE & OBJECTIVES

- Alfalfa (forage and seed) growers in Washington State reported experiencing reduced control of alfalfa weevil with certain organophosphate and pyrethroid insecticides.
- Researchers hypothesized that resistance was developing in some weevil populations.
- In-field trials and laboratory bioassays were undertaken on populations of weevils with varying degrees of historic exposure to the insecticides of concern.

STUDY DESCRIPTION

Field study:

- 6 insecticides + untreated control = 7 treatments.
- Each treatment applied to 4 replicates measuring 12' by 20' (240 ft²).
- Two locations: near Goldendale, WA (with a history of routine insecticide exposure) and near Prosser, WA (with no insecticide exposure history).

Laboratory bioassays:

- 6 weevil populations:
 - 3 from Goldendale, 2 from Touchet, WA, and 1 from Prosser.
- Subjected to dose response bioassays via our Potter precision spray tower.
- 4 insecticides tested at maximum field rate and serial dilutions (75%, 50%, 25%, 10%, 5%, and 0%).
- 4 replicates of 5 weevil grubs evaluated at 24 and 48 hours after treatment.

RESULTS IN BRIEF

- In the field study, we observed greater weevil grub mortality in the relatively insecticide-naïve Prosser population than in the population at the Goldendale site with its history of multiple insecticide sprays.
- In the laboratory study, there was a definite trend in that the weevil grubs from the 3 Goldendale populations

were more tolerant to exposure to lambda-cyhalothrin than the Touchet and Prosser populations.

- The Prosser population exhibited an unexpected tolerance to chlorpyrifos and indoxacarb, which is unexplained but may relate to spraying in adjacent wine grape vineyards, hop yards, or fruit orchards.

ADDITIONAL RESULTS/DISCUSSION

The most notable field failure reported by growers in 2018 was with the formulated pre-mix insecticide Cobalt. Marketed by Corteva Agriscience, Cobalt is a mixture of the organophosphate insecticide chlorpyrifos and the synthetic pyrethroid lambda-cyhalothrin.

In our field trials, we tested 6 insecticides. We did not include Cobalt; we included Cobalt's two active ingredients, chlorpyrifos (Lorsban Advanced) and lambda-cyhalothrin (Warrior II with Zeon). Weevil grub mortality in our field studies was greater at the Prosser site (aka "Roza site," referencing the irrigation district) for most of the insecticides tested (**Figure 1**). Most notably, chlorpyrifos and lambda-cyhalothrin nearly eradicated weevil grubs on our Prosser trial (**Figure 1a**) but only provided 75 and 70% control, respectively, in Goldendale (**Figure 1b**), indicating that the weevils in Goldendale are developing tolerance to these two insecticides.

Chlorantraniliprole (Coragen) is an insecticide that targets mainly caterpillars, hence we saw relatively low mortality in weevils at both sites. Spinosad (Entrust) targets caterpillars, thrips, and vinegar flies and is organically certified by the USDA and WSDA. Cyantraniliprole (Exirel) is not registered for use on alfalfa; it controls a wide range of insect pests including weevils on crops for which it is registered.

In our laboratory bioassays, at the maximum field rate concentration we tested, fewer than 50% of the weevils from Goldendale were killed, while mortality of was 80% in weevils from the Prosser field and 100% in weevils from both Touchet fields. No trend was seen among the populations exposed to chlorpyrifos.

Figure 1a. Alfalfa weevil grubs per five 180° sweeps \pm standard error on Prosser alfalfa field.

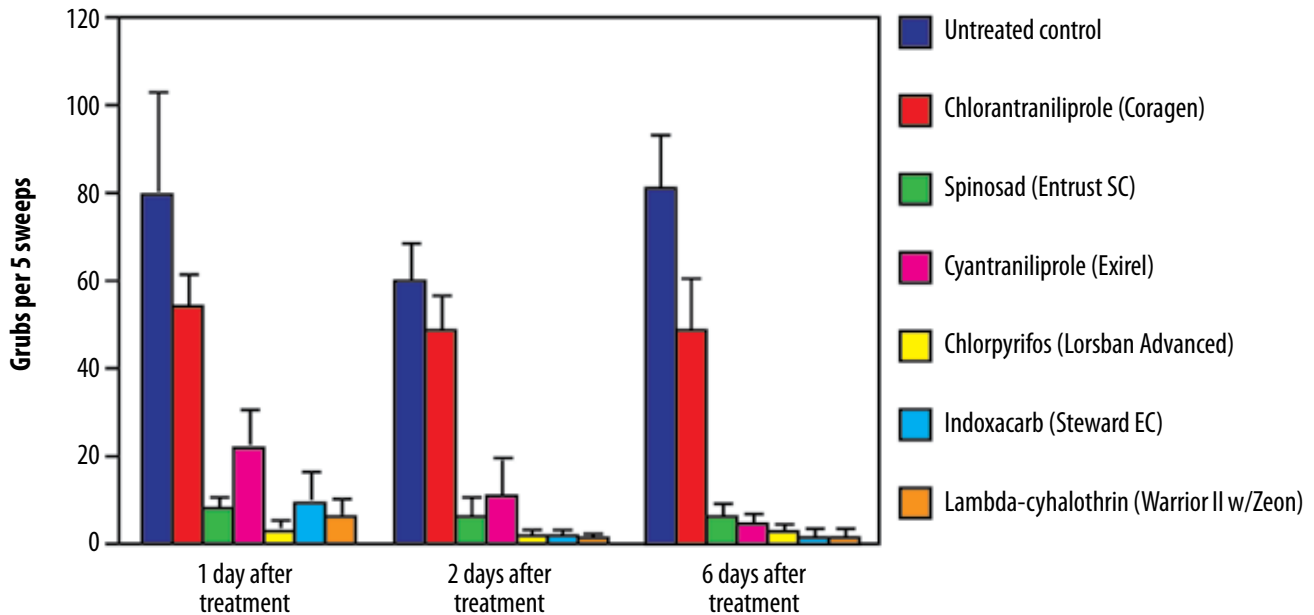
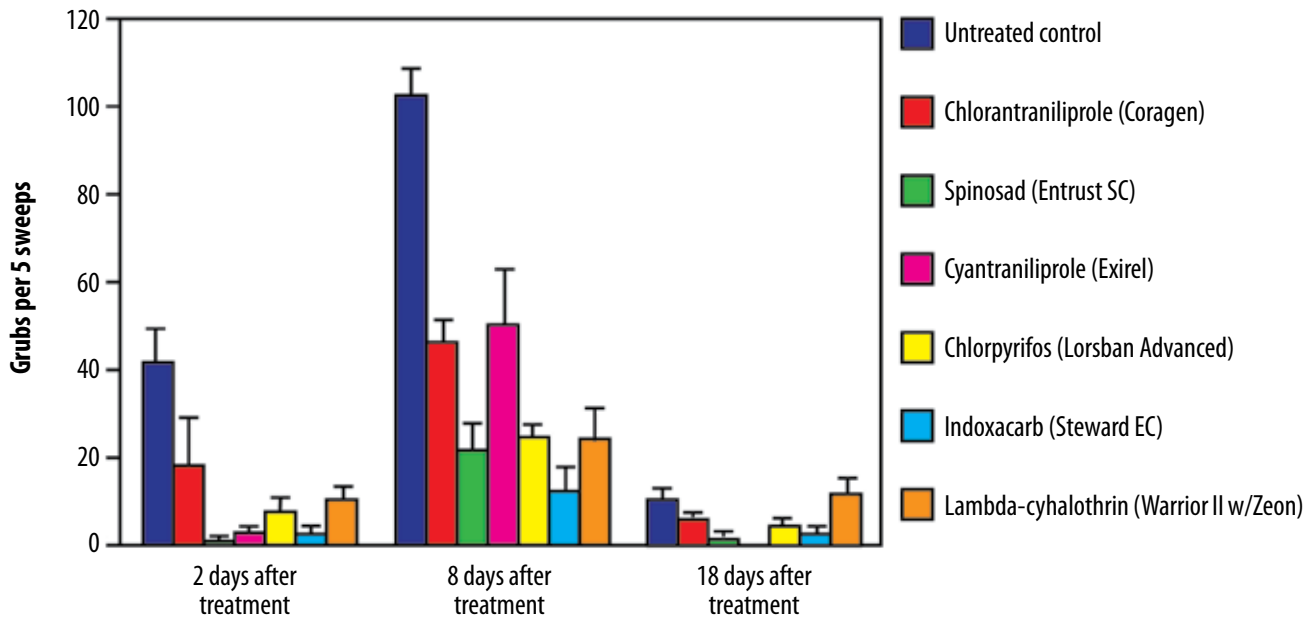


Figure 1b. Alfalfa weevil grubs per five 180° sweeps \pm standard error on Goldendale alfalfa field.



CONCLUSIONS/SUGGESTIONS

- Certain populations of alfalfa weevil appear to be developing resistance to lambda-cyhalothrin products such as Warrior II with Zeon.
- Indoxacarb (Steward EC) is a recommended insecticide and was the superior insecticide in our field trials.
- Spinosad (Entrust SC), an organically certified insecticide, provided acceptable control of weevils and could be used in rotation with other insecticides.
- Cyantraniliprole (Exirel) is not registered on alfalfa, but all populations tested seemed to be susceptible, so registration of this insecticide should be pursued.