Update on Alfalfa Weevil Insecticide Resistance Study

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Over the past several years, field efficacy trials have indicated a steady decline in percent control for some of our commonly used alfalfa weevil control products in Oklahoma. This trend is also showing up in western alfalfa production regions. Resistance to pyrethroid insecticides (group 3 MOA) is beginning to strengthen, especially those containing the active ingredient lambda-cyhalothrin. These chemistries are currently the most economical products we have and provide the mainstay of weevil management.

As discussed back in March, alfalfa weevils developing resistance to a given pyrethroid runs the risk of developing cross-resistance to all mode-of-action group 3 insecticides. As resistance continues to develop, this could render our most utilized and economical insecticide class ineffective.

The Oklahoma Alfalfa Weevil Insecticide Resistance Study is a statewide collaboration working to:

- Identify the level of resistance to pyrethroid and other insecticides in locations where it has established.
- Map the spread of resistance throughout Oklahoma.
- Identify risk factors for the development of insecticide-resistant alfalfa weevil.
- Develop resistance management recommendations for producers to mitigate economic impacts of insecticide resistance.

To identify levels of resistance, vial bioassays conducted the past two years provided evidence that resistance to products containing lambda-cyhalothrin is occurring.

In 2020, weevil collections were made at four locations throughout the state, representing the southwest, central, north-central, and northwest. Weevil were placed in glass vials for bioassay determination. Vial bioassays are a globally recognized means for quick measurement of the concentration or potency of a substance by its effect on living cells or tissues. The results from the four locations indicated an average of 19.75 % control. Generally, control of 80 % or above is expected for most field applications (Fig.1). Two field tests for alfalfa weevil insecticide efficacy were also conducted, producing an average 31.0 % control.



For the 2021 season, in addition to lambda products, we expanded testing and looked at pyrethroid chemistries beyond lambda-cyhalothrin to see if crossresistance is forming in other labeled products.

Vial bioassays for lambda-cyhalothrin in four locations produced an average of 21.6 % control. The accompanying field efficacy trial was 46.2 %. Three additional products having different active ingredients (Cobalt, Baythroid XL, and Mustang Maxx) in the group 3 MOA class and one (Steward EC) in group 22 were also tested, with near 100.0 % control (Fig. 2). It should be noted the Cobalt used in this comparison was an older version of the product containing gamma-cyhalothrin in combination with chlorpyrifos.



The good news, while lambda cyhalothrin products continue to show resistance both in bioassays and field tests, other group-three pyrethroid products as well as products outside group 3, at this point, are still doing a good job with control showing no evidence of cross-resistance. Keep in mind, cost per acre will vary with non-Lambda cyhalothrin based products and products outside the group 3 MOA class, ranging from \$5.00 - \$20.00 or more dollars per acre. Generic forms may not be available.

At this point, our recommendations are to incorporate an integrated resistance management (IRM) program in conjunction with a comprehensive <u>integrated pest</u> <u>management</u> (IPM) approach.

As we discussed last time, a key element of effective resistance management is the use of insecticide rotations or sequences of different insecticide mode-ofaction classes. Unfortunately, labeled options outside the group 3 class is limited. Scouting, calibration, following label recommendations, and spray timing are also important factors to consider.

We continue to look at other management strategies such as early stubble treatments, harrowing, and harvest timing for help in control. However, dependence on insecticides as a control measure for alfalfa weevils will continue to be a key management tool. Insecticide resistance will continue to evolve. Hopefully, new chemistries are on the horizon, until then, utilizing an integrated resistance management plan allows growers to be proactive in delaying and managing resistance. More information about alfalfa weevil resistance can be found online at EPP-7102, Managing Alfalfa Weevil Insecticide Resistance.