Alfalfa Weevil Growing-Degree Day Calculator Validation

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Introduction
Alfalfa weevil (Hypera postica) continues to be a problem for Wyoming alfalfa hay producers, and the 2017 growing season was no different. Many hay producers report that spraying for the pest at least once a year is necessary to produce good alfalfa crops. At initially barely noticeable densities of just two larvae per plant stem, alfalfa weevil can cause yield losses of more than 400 lb/ac to the first and second cuttings combined. Low alfalfa weevil densities can also reduce the feed quality of hay. At high densities, you can’t fail to notice them as the swather head will be covered with the wriggling green larvae.

Since alfalfa weevil grow and develop incrementally with increasing spring temperatures above 48°F, a growing degree-day (GDD) calculator can be utilized to determine the approximate dates to monitor fields for damage and time insecticide spray applications. GDD calculators are nothing new and are used widely in agriculture. In 1993, a GDD chart was published as part of a University of Wyoming Extension alfalfa weevil bulletin (type ‘B-983’ into the Search Publications bar at www.wyoextension.org/publications/). The bulletin includes average degree-day values for seven locations across Wyoming to give farmers approximate calendar dates to monitor for critical weevil activity. Unfortunately, the chart is not very precise because varying spring weather can change weevil development by several weeks, year to year.

Objectives
We are working on validating an internet-based GDD calculator to allow farmers to use their local weather station data to predict alfalfa weevil development. This would provide more accurate local sample dates and keep weevil monitoring efforts to a minimum by focusing the sample times to critical periods in the pest’s lifecycle.

Materials and Methods
Validation of the GDD calculator started in 2017 and is continuing this year. We are comparing the computer’s projected developmental stages for alfalfa weevil to actual developmental stages in field populations in several areas of the state. The developmental stages that will be monitored include egg hatch, instar 1, instar 4, and adult development (instar is the developmental stage of the larval forms of insects.) Collaborators collected samples of alfalfa weevils from producers’ fields in the Bighorn Basin, Fremont County, and Sheridan areas. Samples were also collected from hay fields at the Sheridan Research and Extension (R&E) Center and Powell R&E Center. Sampling took place from March through late June both years.

A minimum of two fields were selected in each area to collect samples, and sampling occurred approximately four times at the designated developmental stages. Scott Schell, associate research scientist in the University of Wyoming’s Department of Ecosystem Science and Management, is overseeing sample identification. The data from the samples will be compared to the growth stage predicted by the GDD model based on near real-time temperature data from numerous weather stations.

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Results and Discussion
A web-based GDD calculator has been developed, and we are now in the ‘ground-truthing’ phase of the project. This phase involves determining whether the GDD calculator is accurately predicting larval development by sampling for insects during the growing season from different regions of the state. Data from 2017 collections revealed multiple growth stages of weevils present at the sampling dates. In some instances, year-old adult weevils were found with multiple larval stages and new adults. This suggests that there are multiple hatches and an overlap of life cycles occurring, which could be part of the reason why weevil populations are now more difficult to manage in Wyoming than in the past. The final accuracy of the web-based GDD calculator in predicting important sampling dates will not be determined until after this year’s field sampling season. We anticipate releasing additional information in next year’s Field Days Bulletin.

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