WHAT YOU’LL LEARN

- Silk protection and reducing the potential for egg laying are two reasons for controlling corn rootworm (CRW) beetles.
- When timed correctly, the suppression of CRW beetles can be an extremely effective strategy for protecting the yield potential of the current crop and potentially reducing the overall larval population the following year.

Background

The annual economic loss to Corn Belt farmers from corn rootworm (CRW) activity has been estimated to be at least one billion dollars. Root pruning and silk clipping by CRW larvae and beetles (adults) respectively, can keep products from realizing their genetic yield potential by limiting uptake of water and nutrients (root pruning) and by loss of potential kernels (silk clipping). Additionally, severe root feeding can increase the incidence of root lodging, which can result in loss at the combine header.

Rootworm larvae have been managed through crop rotation, soil-applied insecticides, and Bacillus thuringiensis (B.t.) traits, such as products with Genuity® SmartStax® technology. Management of CRW beetles has been accomplished through intensive scouting and the application of timely economic threshold-warranted foliar insecticides.

Two CRW species, the western (Diabrotica virgifera virgifera LeConte) and the northern (Diabrotica barberi Smith & Lawrence), account for the majority of CRW damage in the Corn Belt. The larvae are very similar and difficult to distinguish apart. The western CRW beetle is identifiable by the stripes (female) or nearly blackish (male) wings (Figure 1). Northern CRW adults are green to yellowish green (Figure 1); females are slightly longer and have larger abdomens.

Consideration for Beetle Management

Two distinct reasons may warrant the control of CRW beetles:

- Beetle populations and silk clipping are interfering with ovule (potential kernels) fertilization at an economic threshold level.
- A significant population of gravid females can lay large amounts of eggs that can hatch the next season (except for the northern CRW extended diapause northern variant). The logic is to keep larval populations the following season within a range where other control measures such as B.t. traits or soil-applied insecticides are effective.

Silk Feeding Threshold: In general, treatment with foliar insecticides to control beetles during pollination is warranted when: 1) beetle counts of 5 or more per plant are found, 2) fewer than 75% of the plants have emerged silks, and 3) clipped silks are present.

Egg Laying Threshold: In general, if adult beetle populations exceed an average of 0.75 - 1.0 beetle/plant, the potential for significant yield loss the next season in continuous corn may exist if no control methods are utilized. Insecticide applications should be timed to be applied when the proportion of gravid (egg filled) females reaches 10% of the females collected in a sampling survey. The opportunity for adult control is diminished if the number of gravid females exceeds 25% because it is likely that significant egg laying has already occurred and controls will not have much affect on the following season’s larval pressure and subsequent root damage levels.

Thresholds for silk feeding and egg laying can vary by state and plant populations. Farmers should consult local university extension information for applicable thresholds.

Intensive Scouting Required

Regardless of the objective, CRW beetle counts are a key component in assessing the need for warranted insecticide applications. Scouting for CRW beetles should occur at least once each week, beginning at early tassel and continuing through early September. This is a labor intensive task that requires the scout to accurately count beetles, identify males and females, and be able to determine if females are gravid.

All corn fields should be scouted for CRW beetles, especially late planted corn fields, prevented plant acres with volunteer corn, and corn fields in geographies where extended diapause of northern CRW is common. In other areas, the presence of the western CRW variant may necessitate scouting of soybean fields for egg-laying adults. Late planted corn can act as a trap crop for CRW beetles, which may result in high adult counts and a high number of egg-laying females. Prevented plant fields are fields that were unable to be planted before the last insurance defined planting date. These fields are often left untouched and if the prior crop was corn, may become populated with volunteer corn plants that can be hosts for CRW.

Weed management is also important in volunteer corn or other untouched fields. Grassy weeds, such as foxtail species, may support CRW larvae or attract CRW beetles from neighboring fields.

Northern CRW diapause variant eggs “jump” a growing season before hatching; therefore, crop rotation does not provide the desired management. Western CRW female variants have the ability to feed and lay eggs in soybean fields which would result in the following season corn crop being infested with CRW larvae.
Scouting Guidelines
Randomly select 10 to 25 locations within the field and at each location, count the total number of beetles on at least two plants. Minimum number of plants sampled should be between 20 and 50 depending on field size and the activity level of the beetles. When beetles are actively moving through the canopy of larger fields, additional counts to calculate a more representative field average may be required.

Between beetle counts, collect beetles and determine the number of males and females in the sample. Beetles can be captured by hand, with a small sweep net, or use of a motorized hand held vacuum. The proportion of females carrying eggs in the sample should be determined. This is done by selecting females with swollen abdomens and gently squeezing to express abdomen contents. Expression of a gelatinous, opaque or milky substance, when rubbed between the fingers, reveals the presence of individual eggs that are slightly granular in texture which indicates that the female is gravid and is actively laying eggs or will be within the next few days (Figure 2).

If scouting to determine the need for warranted silk-clipping controls, examine the ear of each sampled plant for silk feeding. Gently husk the ear, hold the ear parallel to the ground, and gently shake to determine if the ear has completed pollination. The silks of pollinated kernels will easily detach while silks from unfertilized ovaries will remain attached (Figure 3).

Insecticide Applications
If a foliar insecticide application is warranted, always read and follow label directions. If compatible, the use of two insecticides may improve beetle control due to temperature effects on insecticide activity. Activity of pyrethroid insecticides (such as lambdacyhalothrin) typically decrease with increasing temperature, and toxicity of organophosphate insecticides (such as chlorpyrifos) can increase with increasing temperature. Length of residual activity is also affected by rain or irrigation. Some insect populations that are resistant to certain insecticides may be managed by using combinations of insecticides with different sites of action.

After an initial adult control application and reentry restrictions have expired, field scouting should resume to observe for rebounding population levels. Extended egg hatch and beetles immigrating from surrounding fields can repopulate the field. If sequential applications of insecticides are to be made, care should be taken to utilize products with alternate sites of action to lower the risk of insects developing insecticide resistance.

Adult control for the purpose of protecting a silking ear may not be the same as beetle control for future population suppression. The latter requires a more intensive scouting and monitoring schedule to be effective. Prevention of egg laying may require multiple insecticide applications, and the proper timing may or may not coincide with an application during pollination.

Multi-Approach Strategy for CRW Management
When timed correctly, the suppression of CRW adults can be an extremely effective strategy for protecting the yield potential of the current crop and potentially reducing the overall larval population the following year. However, adult control methods should be viewed as one component of a multi-approach strategy, where decisions are made based on detailed information attained through a judicious scouting program.

Sources:

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