Managing Corn Rootworm Beetles

- Two reasons to control corn rootworm beetles (CRW) are to protect yield potential for the current season and to suppress larvae populations in the next growing season.
- Diligent scouting is required to determine if insecticide applications are needed.
- This year, late planted and volunteer corn could attract CRW.
- Scouting, thresholds, and timing of insecticide applications vary depending on the goals of beetle control.

Background

The corn rootworm complex is argued to be the most widespread and problematic insect pest of corn and is attributed to at least one billion dollars in lost annual revenue for growers across the Cornbelt. Root feeding and pruning by CRW larvae can reduce yield by limiting uptake of water and nutrients, which can prevent corn plants from reaching full genetic potential. In addition, severe feeding can increase the incidence of lodging, decreasing the ability to harvest the crop. As a result, most modern control strategies are implemented in the root zone. Soil-applied insecticides and Bacillus thuringiensis (B.t.) traits, are effective tools for control of larval feeding. However, in some instances significant populations of CRW adults can establish within or near fields where larval control has been implemented. Consequently, management of adults may be necessary.

Logic of Adult Management

There are two distinct reasons that necessitate control of CRW beetles. Primarily, beetles emerge hungry. They prefer feeding on pollen and fresh corn silks, and at high numbers, they can interfere with pollination by clipping emerging corn silks. This type of damage has a direct economic effect on the current crop. The second reason for beetle control is to reduce the number of egg laying females and help suppress the number of larvae the next growing season. The logic is to keep populations within a range where other control measures, such as traits containing B.t or soil-applied insecticides, are effective. Future CRW populations are dependent on both CRW emerging from within the field and those that immigrate from other fields.

It is important to remember that adult control for the purpose of protecting a silking ear may not be the same as beetle control for 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.

Success Depends on Diligent Scouting

Regardless of the objective, adult CRW beetle counts are a key component in assessing whether or not insecticide applications are warranted. This is a labor intensive task and requires that the investigator be able to accurately count beetles, identify males and females, and be able to discern whether a female is laden with eggs (gravid). At least once each week, beginning at early tassel and continuing through early September, should be committed to scouting for rootworm beetles. As the field is transected, collect the following information:

- Randomly select 10 to 25 locations within the field and count the total number of beetles on at least two plants within each location. Minimum number of plants sampled should be between 20 and 50 depending on field size and activity level of beetles. Larger fields sampled when beetles are actively moving through the canopy may require more counts to obtain more representative field averages.

- In between beetle counts, collect beetles and determine the number of males and females in a sample (Figures 1 & 2). Beetles can be captured by hand, with a small sweep net, or use of a motorized hand held vacuum. The proportion of gravid females, or 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 3 & 4).

- If scouting for the purpose of determining the need for a pollination rescue, examine the ear of each plant sampled. Measure the length of silk on each ear. Gently husk the ear and determine whether or not the ear has completed pollination. The silks of pollinated kernels will easily detach by holding the ear parallel to the ground and gently shaking. Silks from unfertilized ovules will fail to fall away from the ear.

Late planted and/or Volunteer corn

All corn fields should be scouted for CRW beetles, including late planted corn fields. Late planted corn can act as a trap crop for adult beetles which may result in high adult counts and a high numbers of egg laying females.
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Weed management is important in fields with volunteer corn that can support or attract CRW. Prevented plant acres are acres that were unable to be planted before the last planting date prior yield loss and insurance claims can be made against them. These fields are often left untouched and in some cases may become volunteer corn fields. Weed management is important in volunteer corn fields because CRW may survive in them or invade them from neighboring fields.

**Thresholds for Ear Protection**

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

**Thresholds for Population Suppression of Egg Laying**

Thresholds vary by state and planting density. In general, if adult beetle populations exceed \(\frac{4}{5}\) - 1 beetle per plant, potential for significant yield loss the next season may exist if no control tactics are instituted.\(^2\) Insecticide applications should be timed when the proportion of gravid females reaches 10% of the females collected. If the number of gravid females exceeds 25% then it is likely that significant egg laying has occurred and reduces the chance that adult control will have much of any affect on larval pressure and subsequent root damage levels the following season.

**Insecticide Applications**

If an 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 lambda-cyhalothrin) typically decrease with increasing temperature, and toxicity of organophosphate insecticides (such as chlorpyrifos) can increase with increasing temperature.\(^3\) Length of residual activity is also affected by rain. Some cases of resistance can be managed by using a combination of insecticides.

Fields should be regularly scouted following an initial adult control tactic to monitor rebounding population levels from extended egg hatch and beetles immigrating from surrounding fields. If sequential applications of insecticides are made, care should be taken to utilize products with alternate modes of action to lower the risk of development of insecticide resistance.

**Integrating Strategies for Effective Management of CRW**

Suppression of corn rootworm adults can be an extremely effective strategy for protecting the yield potential of the current crop, reducing the overall population in the subsequent cropping year. However, adult control tactics should be viewed as one component of a multi-strategy approach where decisions are made based on detailed information attained through a judicious scouting program.

For additional agronomic information, please contact your Asgrow®, DEKALB® and Deltapine® Brands Seed Representative.

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**Figure 1.** One male and numerous female Western corn rootworm beetles. Photo courtesy of John Obermeyer, Purdue Extension Entomology.

**Figure 2.** Gravid eggs (left) can be distinguished by abdomen contents; rub a finger through the contents to separate out eggs. The contents of non-gravid eggs (right) appear gelatinous or ‘slimy’. Photos courtesy of Kevin Black, Growmark.

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Individual results may vary, and performance may vary from location to location and from year to year. This result may not be an indicator of results you may obtain as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible.

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