Managing Corn Rootworm in 2012 - Minnesota

Higher than normal winter and spring temperatures are conducive to high survival rates of overwintering corn rootworm (CRW) and have created the potential for heavy CRW pressure this season. In addition, the dry conditions this year can help slow root development which makes the existing roots even more important for water and nutrient uptake as well as plant support. Corn rootworm have shown they can adapt (extended diapauses and soybean variant), which makes them one of the toughest pests to control. To manage this pest growers should be able to identify both the western corn rootworm (Diabrotica virgifera virgifera, WCRW) and northern corn rootworm (Diabrotica barberi, NCRW), identify root damage, and use an integrated pest management system. Management tactics may include: utilizing crop rotation, planting Genuity® SmartStax® RIB Complete® corn blend with its dual mode of action against CRW, and using a soil insecticide when YieldGard VT Triple® or Genuity® VT Triple PRO® products are planted. To reduce CRW populations and pressure, if going back to corn the following year, growers should also scout adult CRW and apply a foliar insecticide if thresholds are met.

Life Cycle
CRW eggs overwinter in the soil and larvae begin to hatch and feed on corn roots in late May or early June (Figure 1). Larval feeding can decrease yield potential and increase the risk of root lodging (Figure 2). Larvae (Figure 3) feed on roots for approximately three weeks, which is the time it takes to reach pupation. Adult emergence begins in early July with peak emergence occurring around the beginning of August. Adult beetles feed on corn leaves, pollen, and soft kernels, but cause the most damage when feeding on silks.

Practices that Favor CRW Populations
Production practices that may favor increases in CRW populations include: planting continuous corn, late planted corn fields relative to others in the area, and planting late maturity hybrids such as those used for silage. Full season hybrids used by many silage growers are often prime targets for escalating CRW beetle populations since they pollinate later in the season when other desirable adult CRW food sources have deteriorated.

Recommendations for High CRW Areas
Crop Rotation. Crop rotation, to soybean or an alternative crop, is one of the most effective methods to lower CRW pressure in the field. However, in certain areas of the Corn Belt extended diapause populations of NCRW and the soybean variant of WCRW can interfere with the timing of preventative crop rotation efforts. The eggs of the extended diapause biotypes of NCRW require two or more winters to develop and hatch. In addition, the soybean variant biotype of the female adult WCRW migrates to soybean fields to lay their eggs, which can infest the next year’s corn crop. Consequently, a corn/soybean rotation for extended diapause NCRW or rotation to an alternate crop for the soybean variant should be used as one part of a multiple tool, integrated pest management system for prevention of CRW root damage.

Scouting is an integral part of successful CRW management. Root damage ratings are a good measurement of current control methods and efficacy, but do little to help plan control strategies for successive years. CRW beetle counts are a
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key component in assessing the potential number of eggs that may be laid in a field the following year. CRW beetle populations are dependent on the CRW emerging from within the field and also those that immigrate from other fields. Because future CRW populations and densities are independent of the performance of the B.t. trait technology or any other insect management tactics employed during the existing crop season, scouting should serve as the primary source of information used to formulate an effective control strategy for the following year. Scouting becomes increasingly important for growers in high pressure areas that utilize practices conducive to increasing CRW populations.

Assess control strategy with root damage ratings. Since root damage cannot be seen above ground, root digs are imperative to help assess your current CRW management strategy. Normally, scouting for CRW larval damage should take place in mid-July. However, warm weather has caused an early hatch; therefore, scouting for CRW larvae should start now. To do so, dig a series of corn root balls (one foot in diameter), shake off the soil, and wash roots. Root damage due to CRW larval feeding consists of brown feeding scars often along the side of the roots, tunneling inside the larger roots, and root pruning with the roots eaten back toward the base of the stalk (Figure 4). Injury may be limited to a single root, or consist of multiple whorls of roots chewed back. The Iowa State Node Injury Scale can be used to evaluate feeding damage (http://www.ent.iastate.edu).

This year rootless corn may be a concern in some areas. Similar to CRW damage, rootless corn plants may appear vigorous and healthy but can later fall over due to limited root support from lack of growth. However, the appearance of rootless corn syndrome is desiccated, shriveled and discolored roots or it appears as though the nodal roots never existed (Figure 5).

Scouting for CRW beetles. Because CRW beetle counts help estimate the extent of CRW larval damage a grower might expect the next year, Monsanto recommends field scouting for CRW beetles during the key months when peak CRW beetle activity occurs (Figures 6 and 7). Typically this occurs in July—August but due to overlapping generations and the early hatch, growers should be scouting now. In a typical year, peak CRW beetle activity occurs in July-August. Thresholds vary by state and planting density. In general, if adult beetle populations exceed ¼ - 1 beetle per plant, the potential for significant yield loss the next season may exist if no control tactics are instituted. In the majority of areas, selecting a trait product such as Genuity® SmartStax® RIB Complete® corn blend provides excellent control of CRW. In general, if adult CRW populations are greater than 3-5 beetles per plant or trait performance was less than expected, secondary control tactics may be warranted in addition to the B.t. trait technology. Where secondary control tactics are required, well-timed foliar adult beetle sprays can be effective in keeping CRW populations at manageable levels when used in conjunction with B.t. CRW technology. Timing of insecticide applications is critical to reduce CRW damage or egg lay.
Insecticide Applications. Always read and follow label directions. If compatible, the use of two insecticides may improve beetle control due to temperature effects on insecticide activity. Toxicity of pyrethroid insecticides (such as lambda-cyhalothrin) can decrease with increasing temperature, and toxicity of organophosphate insecticides (such as methyl parathion) can increase with increasing temperature. Length of residual activity is also affected by rain. Some cases of resistance can be managed by using a combination of insecticides.

Additionally, overall control is influenced by CRW beetle emergence, mobility, and crop stage of fields. A “receiver” field pollinates later than surrounding corn fields and is attractive to beetles. “Donor” fields have finished pollinating, and beetle populations are migrating from these fields. “Neutral” fields are pollinating at the same time within an area and therefore have less risk of receiving a mass movement of beetles. Beetle management may be more successful in “donor” and “neutral” fields compared to “receiver” fields due to the reduced risk of population resurgence after insecticide application. Careful long-term management is needed in “receiver” fields because of the potential for increased egg laying from CRW that migrate into the field.

After treating for CRW beetles, monitor fields weekly. If beetle numbers exceed 0.5 beetles per plant, retreatment is warranted. Late maturing fields are particularly susceptible to CRWs moving in from closer, earlier maturing fields.)

Best Management Practices (BMP)
Under high CRW pressure the dual modes of action of Genuity® SmartStax® RIB Complete® corn blend provide the most consistent control of CRW. In high pressure areas, fields where YieldGard VT Triple® or Genuity® VT Triple PRO® have been planted for three or more continuous years the use of multiple tactics can help decrease the CRW populations to a manageable level. First crop rotation is one of the most effective methods to lower CRW pressure in the field. Second, growers can utilize a soil-applied insecticide at planting to control CRW larvae. Third, foliar spray(s) can be used to control beetles, which can reduce egg laying and subsequent CRW the following year.

Refuge Compliance
The reason for planting a refuge is to maintain a population of B.t. susceptible insects that are not exposed to the B.t. protein or toxin. Implementing an Insect Resistance Management (IRM) plan can help preserve the benefits and insect protection of corn products that contain B.t. technology (B.t. corn). Following the approved refuge compliance plan for each type of B.t. corn technology is the only strategy to help prevent pest resistance. Compliance means correctly meeting all of the refuge requirements, which can vary by product. Adherence to refuge requirements gives growers continued access to the technology, and is also important for the commercialization of next generation biotech traits. Given the benefits of B.t. corn products, growers, seed dealers, and trait providers have a responsibility to ensure proper stewardship to keep the technology viable and available in the industry.