Valuation of Corn Rootworm Control Tactics Under Varying Levels of Pressure

- Predicting the extent of corn rootworm (CRW) feeding is difficult and is dependent on numerous environmental and biological factors that are beyond a grower's control.
- Yield potential can be decreased and the risk of root lodging increased by CRW larval feeding.
- Favorable practices for CRW include continuous corn, late-planted fields, and use of late-maturing corn products.

Importance of Corn Rootworm Larvae Control

Historical estimates suggest western corn rootworm (WCRW) and northern corn rootworm (NCRW) are responsible for nearly 1 billion dollars annually in crop losses and control costs.[1] Larval feeding can decrease yield potential and increase the risk of root lodging (Figure 1). Although the average yield advantage is 20 bu/acre, data shows there can be an even greater impact of up to 80 bu/acre yield loss due to corn rootworm (CRW).[2] Predicting the extent of CRW damage is very difficult, but the potential for damaging populations is more probable under certain circumstances.

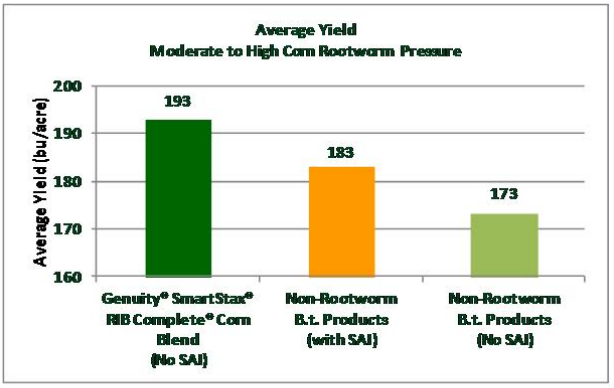
Practices that Can Increase Corn Rootworm Pressure

Figure 1. Corn rootworm larvae.

In all areas of the Corn Belt, production practices that favor growth in CRW populations include, continuous corn rotations, late-planted corn fields, and/or the planting of late-maturing corn products for the area. For example, full season products used by many silage growers are often prime targets for escalating CRW beetle populations because they pollinate when other desirable adult CRW food sources have deteriorated.

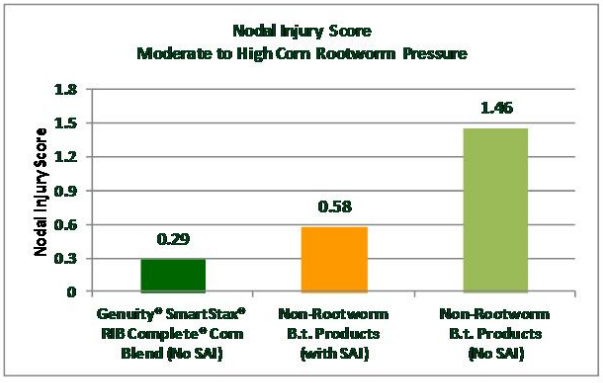
Management Options

- Crop rotation has been and continues to be a recommended method to effectively control CRW larvae. However, crop rotation is no longer as effective in specific areas of the Corn Belt due to NCRW extended diapause populations and the WCRW soybean variant.
- Seeds containing dual modes of action (MOA) Bacillus thuringiensis (B.t.) protection for CRW larvae, such as Genuity® SmartStax® RIB Complete® Corn Blend, have proven to be a consistent CRW control tool.
- Consider using soil-applied insecticides (SAI) labeled for control of CRW larvae with non-B.t. or single MOA B.t. seed products. Planting single MOA seed products such as Genuity® VT Triple PRO® or Genuity® VT Triple PRO® RIB Complete® Corn Blend products is not recommended when less than satisfactory control of CRW was achieved with the technology in the previous growing season.



SAI = Soil-Applied Insecticide
TD Sites in IL, IA, KS, CO, NE, WI, MI, IN, MN, SD, OH, DE (2010-2013)
100-112RM; N = 46 protocol site years under moderate and high CRW pressure
*Moderate Pressure = untreated check averaged >0.5-1.0
*High Pressure = locations where untreated check averaged >1.0

Figure 2. Expected long-term average yield.



SAI = Soil-Applied Insecticide; NIS = Nodal Injury Score
TD Sites in IL, IA, KS, CO, NE, WI, MI, IN, MN, SD, OH, DE (2010-2013)
100-112RM; N = 33 protocol site years under moderate and high CRW pressure
*Moderate Pressure = untreated check averaged >0.5-1.0
*High Pressure = locations where untreated check averaged >1.0

Figure 3. Expected long-term nodal injury score.

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Research

In efforts to define the value provided by B.t. traits and SAI's, Monsanto Technology Development Representatives conducted CRW control studies from 2010 to 2013 in twelve states to evaluate the CRW protection efficacy of Genuity® SmartStax® RIB Complete® Corn Blend products compared to similar products without B.t. CRW protection.

All products were adapted to the testing area and had their respective seed treatments. Nodal injury scores (NIS) and yield data were collected from the studies.

Results and Discussion

In Moderate- to High-Pressure Situations[2] - Genuity SmartStax RIB Complete Corn Blend products provided an average advantage of 20 bu/acre over non-CRW B.t. protected corn products (Figure 2). When an SAI was used with non-CRW B.t. protected products, there was a 10 bu/acre average advantage for Genuity SmartStax RIB Complete Corn Blend products (Figure 2). Genuity SmartStax RIB Complete Corn Blend products had an NIS score of 0.29 compared to scores of 0.58 and 1.46 for non-CRW B.t. protected products with and without an SAI respectively (Figure 3). An SAI would add about $16/acre to the cost of production and should be considered when selecting seed products.

In Low-Pressure Situations[2] - Genuity SmartStax RIB Complete Corn Blend products provided an 8 bu/acre average advantage over non-CRW B.t. products that did not have an SAI.[4] If farmers determine they have a low risk of damage from a CRW infestation, and decide to plant a non-CRW B.t. product without an SAI, an average 8 bu/acre in yield potential could be lost. The use of an SAI with non-CRW B.t. products may provide adequate levels of CRW control in instances of low pressure. However, due to the difficulty of predicting damage levels, growers run an exceptional risk of underestimating damage potential; thereby, incurring a substantial loss in yield. In the short-term, growers may realize modest cost savings. However, the use of non-CRW B.t. products alone or with an SAI will likely cost growers more in the long-term.

Additional Considerations

Regardless of high or low CRW pressure, Genuity SmartStax RIB Complete Corn Blend products can provide farmers a better opportunity to maintain and increase profitability. Along with the $16/acre cost for an SAI, consideration should be given to:

- Soil-applied insecticides are relatively insoluble and protection is limited to a relatively small portion of the root zone.
- Genuity SmartStax RIB Complete Corn Blend products offer earworm B.t. protection. Lost yield attributable to earworm feeding can be as high as 7%.[3]
- Genuity SmatStax RIB Complete Corn Blend products are treated with Acceleron® Seed Applied Solutions plus Poncho®/VOTiVO® seed treatment that includes a 500 rate of clothianadin, which has shown an average increased yield potential of 3.7 bu/acre over other basic seed treatments.[4]
- Farmers, through market research, have placed a value of $5/acre on refuge in the bag products.[5]

Genuity Rootworm Management App

iPad® device users can download an app that allows farmers to complete assessments in each field to determine the potential risk of corn rootworm damage. The tool follows proven pest management recommendations for scouting, crop rotation, utilizing dual MOA when planting, and suggesting specific insecticides based on crop type. The app also allows growers to take notes, access scouting reports, set alerts, and share results by email. The app can be downloaded from Genuity.com/RootwormManager or the iTunes® App Store.

Sources

[1]Croff, C.D. and Mitchell, P.D. 2007. When does it pay to plant RW Bt corn in Wisconsin? Proceedings of the 2007 Wisconsin Fertilizer, Aglime & Pest Management Conference, Vol. 46.

[2]TD Sites in IL, IA, KS, CO, NE, WI, MI, IN, MN, SD, OH, DE (2010-2013).

[3]Boyd, M. and Bailey, W. 2001. Corn earworm in Missouri. MU Guide, G7110. University of Missouri-Columbia.

[4]2011 and 2012 Internal Monsanto Commercial Field Trials.

[5]2011 Market probe farmer quantitative study.

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For additional agronomic information, please contact your local seed representative. Individual results may vary, and performance may vary from location to location and from year to year.This publication was developed in partnership with Technology, Development & Agronomy by Monsanto.