



CORN TRAIT RESPONSE TO CORN ROOTWORM INFESTATION UNDER DROUGHT CONDITIONS

Northern corn rootworm (NCRW) and western corn rootworm (WCRW) are economically important pests of corn. They are responsible for nearly a billion dollars annually in crop losses and control costs¹. Historically crop rotation has been an effective method for preventing larval root damage. However, in certain areas of the Corn Belt, rotation is no longer as effective due to extended diapause populations of NCRW and the soybean variant of WCRW. Growers must consider how to best protect their potential yield, including the use of insecticides and corn traits targeting insect control. Yield data provided by four trials carried out in harsh drought and heat conditions presented an opportunity to study the response of corn traits to corn root worm (CRW) infestation. The excessive heat and lack of moisture provided an excellent environment for highlighting the yield protection provided by Monsanto traits.

MATERIALS AND METHODS

Four separate demonstration trials using several corn insect traits were conducted in 2012 at the Monsanto Learning Center at Monmouth, IL to investigate:

- Effects of CRW control measures on nitrogen (N) rate and uptake
- Impact of full rate insecticide application on CRW control and effect on potential yield
- Effects of CRW infestation on the timing and rate of N application
- Effects of fungicide application on stress mitigation

These experiments were established and maintained following common agricultural practices in the state of Illinois in a rain-fed agricultural system. The severe heat and drought during the 2012 growing season presented an additional opportunity to study the yield response of corn traits to CRW infestation under drought conditions.

Corn products with the following traits were used: Genuity® SmartStax®, Genuity® VT Triple PRO®, YieldGard VT Triple®, Genuity® VT Double PRO®, and Roundup Ready® Corn 2. Planting was carried out between April 25 and 27, 2012 on 10' x 100' conventional-till, continuous corn plots at a seeding rate of 36,000–38,000 seeds/acre. There were 1-3 replications of each of the four trial treatments. Conventional tillage consisted of using a chisel plow in the fall and a soil finisher in the spring. All Genuity® VT Double PRO® and Roundup Ready® Corn 2 plots received an

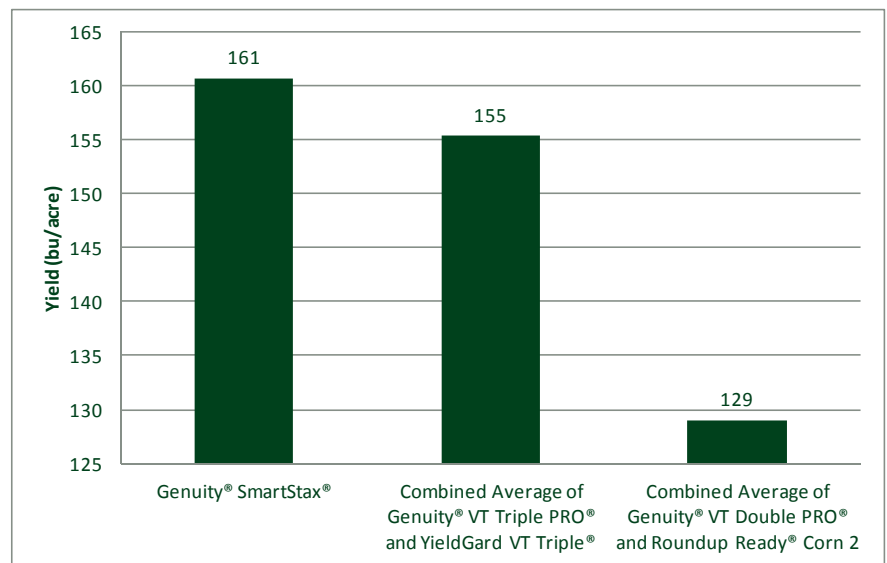


Figure 1. Effects of drought on corn yield by corn trait response to CRW infestation.

application of Force® 3G insecticide at planting. All experiments were harvested between September 12 and 13, 2012. Yield data was adjusted to 15% moisture content.

RESULTS

The results of the four separate experiments were combined. Products containing the same CRW traits were grouped together regardless of their relative maturities. Average corn yield was substantially lower in products lacking CRW control traits compared to those with CRW control traits (Figure 1). Genuity® SmartStax® corn, with dual modes of action, outperformed traits with a single mode of action for CRW control (Genuity® VT Triple PRO® and YieldGard VT Triple®). CRW control traits provide effective insect protection and enhance the plant's ability to assimilate N, Phosphorus, Potassium and other micronutrients such as zinc. They also provide better drought tolerance over non-CRW traired products^{2,3}.

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▶ from previous page

Figure 2 shows the root system of a non-CRW trait corn product treated with Force[®] 3G insecticide (left) compared to a Genuity[®] product with CRW protection (right). The non-CRW trait corn product on the left, treated with Force[®] 3G insecticide, experienced more feeding and has a more compact root system, which can decrease the potential uptake of water and nutrients from the soil and can increase the potential for stalk stability issues.



Figure 2. Comparison of corn product effects of CRW infestation. Left: a non-CRW trait corn product treated with the insecticide Force[®] 3G. Right: a CRW trait corn product without insecticide treatment.

SUMMARY COMMENTS

Excessive heat and lack of moisture this season provided an excellent environment to assess the efficacy of various corn products against corn rootworm. Yield results demonstrated that while single mode of action CRW trait corn products outperformed non-CRW trait products, Genuity[®] SmartStax[®] with dual modes of action was the highest performer. Visual inspection also supported the benefit of CRW trait corn products. It is important that growers ensure all refuge requirements are properly implemented to help ensure long term durability and effectiveness of these insect control traits.

REFERENCES

- ¹Burchett, A. 2001. Operation rootworm: Can biotechnology beat the billion dollar bug? Farm J. 125(11):16-18.
- ²Below, F.E, J.W. Haegele, and M.L. Ruffo. 2009. Mineral nutrition of rootworm resistant corn. Illinois Fertilizer Conference Proceedings. <http://frec.ifca.com/2010/report9/>
- ³Thompson, G. and K. Narva. 2009. Corn with transgenic insect protection traits utilized in combination with drought tolerance and/or reduced inputs, particularly fertilizer. United States Patent Application Publication. Pub. No. US 2009/0300980 A1.

The information discussed in this report is from a single site, non-replicated, one-year demonstration. This informational piece is designed to report the results of this demonstration and is not intended to infer any confirmed trends. Please use this information accordingly.

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