Research Shows Next Generation Seed Requires New Approach to Fertility

Results show rootworm-resistant hybrids have higher nutritional needs than conventional counterparts

PLYMOUTH, Minn. (August 4, 2010) – Forty-seven percent of U.S. corn acres are planted to stacked-trait insect-resistant hybrids this season, but little is known about the effect of the rootworm-resistant gene on corn nutrient uptake and the exact nutrition needed to optimize yields. That's why researchers at the University of Illinois – Champaign are comparing the nutritional needs of rootworm-resistant corn hybrids to their conventional counterparts. Their preliminary research shows the nutrient uptake of resistant hybrids is significantly greater than the hybrids' conventional counterparts.

"Understanding the effect of the resistant gene on corn nutrient uptake and grain nutrient concentration is critical information for nutrient and crop management," says Dr. Fred Below, professor of Plant Physiology, University of Illinois. "Because rootworm larval feeding is suppressed and therefore the root system protected from damage, we expected the rootworm-resistant hybrids would have higher nutrient uptake than their conventional counterparts.

"Results of our initial trials show that the per acre removal rates of nutrients (N, P, K, S, Zn) are from 14 to 27 percent greater for hybrids with the rootworm- resistant gene. In fact, both the yield and the concentration of nutrients in the grain were higher for the transgenic hybrids." Table A illustrates the differences.

Nutrient Removal as a Result of Biotechnology Traits

		Non RW resistant	Rootworm resistant	Difference
Yield / Acre		179 bu	205 bu	14%
Nutrient Removal / Acre	N	110 lbs	126 lbs	14%
	P	17 lbs	21 lbs	24%
	K	26 lbs	31 lbs	19%
	S	8.9 lbs	10.4 lbs	17%
	Zn	2.2 oz	2.8 oz	27%

Champaign, IL 2008, average of two hybrid pairs

Research conducted at the University of Illinois – Champaign shows the nutrient uptake of rootworm-resistant hybrids is significantly greater than those hybrids' conventional counterparts, indicating biotech hybrids may have greater nutritional needs. **Click table to download as image.**

"As we look at these results we see very large increases of Zn and P removal, in particular, which means soil test levels of these nutrients may rapidly decrease," Below points out. "As corn

rootworm resistant hybrids become increasingly popular and are planted every year, it will be important to take these trends into account as nutrient management plans and fertilizer recommendations are formulated."

Hybrids with Bt traits for rootworm resistance develop more intact roots and greater root mass than their non-resistant counterparts. With this broader-reaching root mass, the plants' ability to take up nutrients more efficiently is improved. In addition, because the roots are not disrupted by insect feeding, the plants' internal water flow is better. These factors combine to make the plant more efficient at probing the soil for nutrients it needs for growth and grain development.

"Even though nutrient uptake is more efficient, this study indicates the total amount of nutrients needed by the rootworm-resistant hybrids is higher," explains Dan Froehlich, director of Agronomy at The Mosaic Company, which collaborated on the research project. "That suggests that some nutrient response curves we are using today to formulate fertility recommendations may not be valid for current genetics."

With nearly half of U.S. corn acres planted to transgenic hybrids costing as much as $100 to $140 per acre for seed, it is important growers apply the nutrition needed to optimize yields and their return on these genetics. This is just one study being conducted by Dr. Below and other researchers at the University of Illinois to evaluate the nutritional needs of today's new-generation crop genetics.