



## Balanced Crop Nutrition: Corn Rootworm and Potassium Uptake

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Hybrids designed to resist corn rootworm require an extra boost of one of the most important nutrients, potassium (K).

According to a recent University of Illinois study led by Dr. Fred Below, corn rootworm-resistant hybrids require more K than their conventional counterparts. The research suggests that farmers adopting these hybrids reevaluate their potassium rates to ensure plants receive optimal nutrition.

To further support Dr. Below's findings, the International Plant Nutrition Institute's (IPNI's) study of soil fertility levels showed that in many states, potassium levels are declining, a strong indicator that farmers' current fertilization rates are not adequate to fully support high-yielding corn crops.

Below and his University of Illinois team examined six different hybrid pairs (same genetics with and without corn rootworm protection) at two locations over the course of two years. As anticipated, results indicated that corn rootworm-protected hybrids had a 9 percent increase in biomass compared to those without insect protection, and yielded, on average, 10 percent more than their conventional counterparts.

At the same time, the corn rootworm-protected hybrids showed an increase in nutrient uptake due to increased plant growth and higher yields. Surprisingly, the corn rootworm-resistant hybrid nutrient uptake did not affect nitrogen, potassium and sulfur removal equally. The increase in potassium uptake was greater than the increase in other nutrients.

### Importance of Potassium to Plant Growth

Potassium, a vital nutrient for plant growth, is second to nitrogen in terms of quantity a corn plant needs, requiring an average uptake of around 274 pounds per acre of potassium to produce a 200-bushel-per-acre corn crop.

Potassium is essential for optimal growth. It performs a number of functions that ensure healthy, stress-resistant plants.

Vital in regulating water, potassium helps to create concentration gradients inside the plant and, in turn, supports water uptake into the plant, which is essential in times when water is not readily available. In addition, potassium regulates the plants' leaf tissue openings (stomata) to keep moisture in the plant, thus reducing water loss through the leaves and helping to maintain stalk strength and standability.

Potassium also activates enzymes required for growth, which helps prevent disease and control insects. It ensures that sugars and proteins produced within the plant do not build up in the plant's tissues. Tissues with high levels of sugars and proteins attract insects and are more susceptible to disease, acting as excellent food sources for pests.

**Corn rootworm-protected hybrids yielded, on average, 10 percent more than their conventional counterparts, and showed a 13 percent increase in potassium uptake.**

#### **> FACT**

200-bushel-per-acre corn requires around 274 pounds per acre of potassium.



## Soil Solution and Potassium Levels

Most soils have high total potassium levels; however, the plant can only take up very small amounts of potassium at any one time. Potassium exists in the soil solution, is absorbed into soil particles, and held in mineral forms. As the plant takes it up, other forms of potassium can slowly reenter the soil solution, but depending on the form and the soil type, this process can be very slow. As a result, the natural soil often cannot adequately provide sufficient potassium levels to a growing crop, and potassium fertilizer is needed to sustain high crop yields.

The majority of potassium uptake happens during the rapid vegetative growth stage and over a relatively short period of time. In general, as much as 80 percent of potassium uptake occurs prior to corn tasseling, with the greatest uptake happening between leaf stages 6 and 10.

Potassium deficiencies can create a vicious cycle of unmet needs for a corn crop under pressure. Stressful conditions, such as those created by drought, disease and insect pressure, can interfere with root development and access to soil potassium. And yet, a good supply of potassium can minimize the damage that pests and stressful conditions create.

The latest IPNI soil survey, taken from 4.5 million soil samples across North America, shows the overall decline in potassium soil test levels since the same study was conducted in 2005. Of greatest concern were the results from east of the Mississippi River, showing many areas at or below critical soil test levels.

Without reviewing and amending potassium rates as needed, further decline in soil potassium levels will occur and yield losses will result.

### Implication to Fertility Needs

Research shows that getting enough potassium into the plant quickly to support growth and mitigate stresses is difficult without adequate fertilization.

A 13 percent increase in potassium uptake by rootworm-resistant hybrids, as demonstrated in Dr. Below's study, proves the significance of reevaluating fertility plans to maximize the high-yield potential that is possible through biotechnology advancements.

Peak crop nutrition management practices are aimed at matching plant nutrient needs with nutrients from soil and fertilizer to optimize yield and get the greatest return on these genetics within each field.

### > FACT

The investment in high-tech seed must be combined with a strong fertility program and balanced crop nutrition to get the greatest return.

**A good supply of potassium can minimize the damage that pests and stressful conditions create.**



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