

UNDERSTANDING POTASSIUM FERTILITY IN POTATOES

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Most growers throughout North America have seen yields increase over the past few years. Regions that harvested average yields of 300 cwt per acre 10 or 15 years ago are harvesting average yields of 400 to 500 cwt per acre today. Much of the improvement has come from better pest control, water management and cultural practices. However, higher yields demand more from the soil. Growers cannot use the same fertilizer “recipe” they used 10 years ago and still reap greater yields.

A recent study on potassium was conducted by Dr. Terry Tindall, a certified crop advisor and agronomic services manager for the J.R. Simplot Company, and Dr. Dale Westermann, a soil scientist at the USDA-ARS research station in Kimberly, ID. It is the first of a series of articles that will examine nutrient management and provide growers inside information on the latest research and recommendations on various nutrients.

Why Potassium?

Potassium is a crucial element for potatoes and other crops. In fact, the Potato Handbook from the University of Idaho Cooperative Extension System refers to potatoes as a potassium-responsive crop.

Potato plants require the nutrient for enzyme functions and osmotic regulation (cell structure and strength). The nutrient is highly mobile within conductive tissues and aids in the transport of starch and sugars.

Potassium-deficient plants are sometimes stunted with a slight black pigmentation in their leaves, which often turns necrotic or gives the leaf a copper colored tone. The younger leaves may also develop a rough surface. Potassium deficiency sometimes masks disease symptoms such as early blight or black dot.

To avoid these deficient symptoms growers should always manage their crop with adequate potassium to maintain tissue at optimum K levels.

Potato plants will transport excessive potassium to the tubers, which causes tuber dry matter to decrease because of the increasing water content. This concerns processors because of the lowered specific gravities. Insufficient potassium will lead to decreased tuber dry matter through reduced starch formation and reduced photosynthesis materials needed for growth.

Involved Detailed Study

Tindall and Westermann conducted a recent study over several years to determine potassium uptake and K fertilizer application relationships for Russet Burbank potatoes in several fields in southern Idaho and northern Utah.

They took plant samples consisting of petioles from the fourth leaves and tops, tubers and roots and analyzed them for potassium concentrations. They started sampling at early tuber growth in late June and continued on a 21-day interval until vine kill.

K Balance

One of the most important results of Tindall’s and Westermann’s research is that petiole concentrations of potassium in Russet Burbank potatoes should remain at about 7 percent. Tindall indicates that “ petiole K concentration from the fourth petiole should never fall below 7% K until at least 20 days prior to vine kill”. They derived that percentage from the K balance, which takes into account the ratio between total plant uptake of potassium and tuber uptake.

When the ratio is greater than one, the plant is taking more potassium from the environment than it needs for tuber growth. If it is less than one, it is not taking enough potassium for optimum tuber growth.

Tindall and Westermann also found that the potassium concentration in the petiole samples from the fourth leaves was linearly related to the concentration in leaves with photosynthetic activity and tuber concentrations. That indicates petiole samples from the fourth leaves are a good indication of the potassium status of plants.

“Many Idaho soils which were once thought to be sufficient in K are now looked at as needing K fertilizer applications to achieve a growers yield and quality goals”, says Tindall.

Tindall also indicates that “where recommendations call for high levels of fertilizer K, it is also recommended to consider splitting the rates into a fall and spring portion. These split applications will decrease concerns growers might have with salt effects.” If a grower observes decreasing concentrations of tissue K that fall below the 7% sufficiency range and there is still plenty of growing season left, in-season applications of K are recommended. Applications can be made by injecting a soluble K source such as potassium nitrate, ammonium thiosulfate, or small amounts of KCl through the irrigation water. For more precise recommendations or to fine tune your management plans for troubled spots feel free to contact your local Certified Crop Advisor.