

## Phosphorus, Potassium Improve Nitrogen-Use Efficiency

NORCROSS, Ga.—Balanced fertilization with phosphorus and potassium, to replace harvested nutrients and to build and sustain soil tests at optimum levels, is a proven best management practice.

Productivity is at risk in many farm fields across the U.S. and Canada. Recent soil testing summaries for North America indicate that in more than 60 percent of the states and provinces, 40 percent or more of the analyzed soil samples test medium or lower in phosphorus.

About 50 percent of the states and provinces report that 40 percent or more of the analyzed soil samples test medium or lower in soil test potassium. In several states and provinces, the percentage of samples testing medium or lower in both nutrients ranged as high as 70 to 80 percent. These soil test results indicate that phosphorus and potassium needs are not being met on many farms.

Phosphorus plays a critical role in photosynthesis, genetic coding, and energy transfer in all plants. Phosphorus, like potassium, is essential for nitrogen fixation in legumes. Top

and root growth of virtually all crops is increased with balanced phosphorus and potassium nutrition. Corn research in Illinois and wheat research in Colorado, for example, have shown that response to nitrogen is reduced when phosphorus is deficient. Similar results have been reported for brome grass in Kansas research. With adequate phosphorus, response to nitrogen is improved through increased nitrogen and phosphorus uptake, hastened maturity, increased nitrogen-use efficiency, and increased yields. These effects work together for increased profit potential, improved root growth with adequate phosphorus can also enhance the capture of soil and fertilizer nitrogen and can reduce the amount of residual nitrate-nitrogen, which may be prone to leaching or runoff losses. Adequate phosphorus increases crop yields and profit potential while minimizing the potential for environmental nitrogen loss.

Potassium plays a critical role in enzyme activation, water use, photosynthesis, transport of sugars, protein synthesis, and starch synthesis

in plants. Potassium is especially important in its interaction with nitrogen throughout the growth cycle. It affects both nitrate absorption and reduction to amino acids and protein formation in plants. Adequate potassium in the field results in higher crop yields and higher nitrogen-use efficiency. Crops respond to higher potassium levels when nitrogen is sufficient, and greater yield response to nitrogen occurs when potassium is sufficient.

A balance between nitrogen and potassium results in greater uptake and less residual soil nitrogen that could potentially impact the environment. Ohio researchers reported that total plant nitrogen uptake was increased 75 percent by optimum potassium fertilization when using 160 pounds of nitrogen per acre. At 240 pounds of nitrogen per acre, optimum potassium fertilization raised nitrogen uptake by 48 percent over no potassium fertilization. Optimum potassium fertilization increased the nitrogen concentration in the grain as well as the total amount of the applied nitrogen removed in the grain. Optimum potassium fertilization enhanced

nitrogen-use by the crop and reduced the residual soil nitrate, resulting in lower nitrate leaching loss.

With current crop prices and stiff global competition, crop advisers and good farm managers must continue to emphasize high yields to maximize the potential for profit. Balanced fertilization with phosphorus and potassium, according to soil tests, is necessary for sustained, profitable crop production. Fertilization with phosphorus and potassium replaces harvested plant nutrients, sustains yields, enhances water-use efficiency, and protects the environment by increasing nitrogen-use efficiency. Nutrient management plans for 1999 should emphasize adequate phosphorus and potassium for attaining and sustaining profitable crop yields, and to enhance nitrogen-use efficiency for protection of the environment.

For more information, contact Dr. Cliff S. Snyder, Midsouth Director, PPI, P.O. Drawer 2440, Conway, AR 72033-2440, (501) 336-8110, e-mail: csnyder@ppi-far.org.

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