

Increasing Profitability of Corn Production by Improving Phosphorus and Potassium Fertilizer Recommendations

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Value to Growers

A balanced nutrition is a must for producing high corn grain yields. A grower cannot produce high corn yields if his soil does not supply optimum amounts of plant nutrients. Crop fertilization is one of the largest investments a corn grower will make. He may spend 30 to 40% of his budget on fertilization costs. Phosphorus and potassium fertilization will increase corn grain yield in many Arkansas soils. Application of above optimum rate of any plant nutrient will be a waste of farmer's money and the excess fertilizer can be lost to the environment. Phosphorus losses from farmland has been implicated as a major contributing factor to the pollution of the Gulf of Mexico. Therefore, current fertilization practices in the Mississippi River Delta are under close scrutiny by various federal and state regulatory agencies. Historically, in the absence of sound scientific data, such scrutiny has resulted in unnecessary stringent environmental regulations. Field and laboratory research are needed to develop improved corn fertilization recommendations and reliable plant tests for determining in season corn phosphorus and potassium fertilizer needs. Information from such research will help the growers to apply the right rate of phosphorus and/or potassium fertilizers, save money, produce high yields, and protect the environment.

Study Objectives:

For corn production under cropping conditions in Arkansas evaluate:

1. The effect of phosphorus (P) fertilizer application rates on corn grain yield,
2. The effect of potassium (K) fertilizer application rates on corn grain yield,
3. The suitability of corn ear-leaf and young plants for predicting plant P status,
4. The suitability of corn ear-leaf, young plants for predicting plant K status,
5. Phosphorus fertilizer use efficiency,
6. Potassium fertilizer use efficiency.

Research Results

In 2012 phosphorus fertilization did not influence corn grain yield at sites with Medium or Optimum soil test P but significantly ($P \leq 0.10$) increased grain yields at sites with Low or Very Low soil test P. Phosphorus fertilization significantly ($P \leq 0.10$) increased corn ear-leaf P concentration at two sites with low and very low soil test P, but not at sites with medium or above optimum soil test P. Grain yield of the corn fertilized with 0 and 160 lb P_2O_5 /acre ranged from 177 to 234 and 194 to 231 bu/acre, respectively. These results are consistent with the current University of Arkansas corn fertilization recommendations. Potassium fertilization significantly ($P \leq 0.10$) increased corn grain yield at Cross and Prairie County only. Corn ear-leaf K concentration was significantly ($P \leq 0.10$) increased by K application at Clay, Cross, and Prairie County. We have collected data on the effect of phosphorus or potassium fertilization rates on corn grain yield in soils with a various range of soil test phosphorus or potassium from 14 sites during the three years of this project. We will use the data to evaluate our current corn phosphorus and potassium fertilization practices and identify the gaps in our knowledge. We have also collected data on the concentration of phosphorus and potassium in young corn plants, grown at 12 sites. This data will be used to determine if chemical analysis of a young corn plant can be used as an in-season diagnostic tool to predict corn phosphorus or potassium nutrition status. This information will provide a valuable insight into potassium and phosphorus use efficiency for modern, high yielding corn hybrids grown under current cropping system in Arkansas. Arkansas growers can use the information from this project to make more informed decisions on phosphorus and potassium fertilization practices, improve their profit margins, and protect the environment.