# PHOSPHORUS AND POTASSIUM NUTRITION UNDER CONSERVATION TILLAGE

**D.D. Howard**
**Plant and Soil Science Department**
**West Tennessee Experiment Station**

## Abstract

Information on phosphorus ($P_2O_5$) and potassium ($K_2O$) nutrition for no-tillage (NT) cotton ***(Gossypium hirsutum*** L.) production is limited. Research was initiated in 1994 and continued through 1997 on a Loring silt loam at the Milan Experiment Station evaluating $P_2O_5$ and $K_2O$ fertilization rates for conventional- (CT) and NT production systems. Mehlich I extractable P was low and extractable K was medium. The experimental design was a split plot. Main plots were tillage with $P_2O_5$- $K_2O$ rates sub-plots. The $P_2O_5$ rates were 0, 40, 80, and 120 lb/acre while the $K_2O$ rates were 0, 30, and 60 lb/acre. Treatments were replicated four times. Research was initiated in 1995 and continued in 1997 on a Lexington silt loam at the West Tennessee Experiment Station, a Loring silt loam at the Milan Experiment Station and on a Memphis silt loam at Ames Plantation evaluating $K_2O$ fertilization of NT cotton. Mehlich I extractable K was high, high, and low for the three soils respectively. The experimental design for the K tests was a RCB with treatments replicated five times. $K_2O$ rates of 0, 30, 60, 90, 120, 150, and 180 lb/acre were surface applied at each location. All experiments were fertilized with 80 lb N/acre after planting. D&PL 50 was planted 1995 and 1996 with D&PL 5409 planted in 1997. Experiments were planted in May.

Both CT and NT yields of the P-K experiment on the Loring soil were significantly affected by year-by-treatment interaction. Yearly CT and NT yields were increased by applying 40 lb $P_2O_5$/acre three of the four years. In 1997, yields of both tillage systems were increased with $P_2O_5$-$K_2O$ rates up to 120 lb $P_2O_5$/acre. This is an exceptionally large deviation from the previous three years results. The 1997 response may be a result of the cool wet spring. Because of this data, the four-year average data was also affected. The extractable P levels for both tillage systems corresponding to the 40 lb $P_2O_5$ rate are classified as medium while that corresponding to the 120 lb $P_2O_5$ rate would be classified as high.

Yields from the Lexington soil (high ext. K) were not increased by $K_2O$ fertilization in 1995. They were however, increased in 1996 by applying 60 lb $K_2O$/acre and in 1997 by applying 90 lb $K_2O$/acre. Extractable K corresponding to these two fertilization rates were approximately 207 and 246 lb K/acre for 1996 and 1997, respectively. For the three years, yields were increased by applying $K_2O$ rates up to 90 lb/acre which corresponds to approximately 246 lb extractable K/acre. Yields from the Loring soil (high ext. K) were unaffected by fertilization one of the three years. In 1995, yields were increased with $K_2O$ rates up to 150 lb/acre while in 1997 applying $K_2O$ rates up to 90 lb/acre increased yields. The 1995 extractable K would be approximately 430 lb/acre while the 1997 level would be 281 lb/acre. The three-year average data indicates yield increases with rates up to 90 lb $K_2O$/acre which corresponds with an extractable K level of approximately 281 lb/acre. Yields from the Memphis soil (low ext. K) were increased each year with $K_2O$ fertilization. In 1995 and 1997 applying rates up to 90 lb $K_2O$/acre increased yields. This fertilization rate corresponds to approximately 160 lb extractable K/acre. In 1996, the yield was increased by applying 120 lb $K_2O$/acre which corresponds to 200 lb extractable K. Over the three years, yields were increased by applying $K_2O$ rates up to 150 lb/acre which corresponds to an extractable K level of approximately 240 lb K/acre. For the three soils, three-year average yields were increased by applying K fertilizers when Mehlich I extractable K were less than 240 lb/acre based on the 1996 soil test data. Annual yields differed from this rate based on the soil and year.

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