RESIDUAL/DIRECT EFFECT OF POTASSIUM APPLICATION ON WHEAT AND RICE YIELD UNDER RICE-WHEAT SYSTEM

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ABSTRACT

A field experiment was started during 2004-05 to study the effect of K application on wheat and subsequent rice crop. After rice harvesting again wheat and rice were planted in 2005-06 to find out the direct, residual and cumulative effect of K fertilization in rice wheat system. The K was applied as 0, 30 and 60 kg K_2O ha^{-1} with the basal dose on N, P_2O_5 as 120-90 kg ha^{-1} to both the crops. Wheat variety Nasir 2000 and rice variety IRRI-6 were planted in Randomized Complete Block Design with three replications in a permanent layout. The soil leaf and grain samples from both the crops were collected/analyzed before earring to determine K concentration. K levels affected the soil, leaves and grains of wheat and rice significantly over check. The K in soil ranged from 63 to 214 and 52 to 259 mg kg^{-1}, in leaves ranged from 0.067 to 2.46 and 0.053 to 3.06% while in grains ranged from 0.27 to 0.53 and 0.24 to 0.60% respectively in wheat and rice. The wheat yield and yield components (plant height, number of spikes m^{-2}, spike length and 1000 grain weight) were significantly affected with K application. The wheat yield ranged from 3235 to 4591 kg ha^{-1}. The cumulative application of 30 and 60 kg K_2O ha^{-1} gave an increase of 32.51 and 41.91 percent direct and residual application of 60 kg K_2O ha^{-1} increased the yield by 31.25 and 19.41 percent over check respectively. Similarly the paddy grain yield and yield components (plant height, No. of panicles m^{-2}, spike/plant, spike length and 1000 grain wt were significantly affected with K application. Paddy yield ranged from 5795 to 7075 kg ha^{-1}. The cumulative application of 30 and 60 kg K_2O ha^{-1} to rice and wheat gave an increase of 7.4 and 22.05% over check. The direct and residual application of 60 kg K_2O ha^{-1} increased the paddy yield by 9.0 and 4.2 percent over check respectively.

INTRODUCTION

In Pakistan, wheat and rice fulfill major national food grain requirements. In order to feed its rapidly growing population the wheat is going to be imported. If the productivity of rice wheat system is not enhanced and population growth is not checked the situation will be aggravated. Despite the prime position of wheat and rice in the food and the economy of the country, productivity of rice-wheat cropping system is poor (Zia *et al.*, 1992). Average rice yield is 1.7 t ha^{-1} and for wheat 1.9 t ha^{-1} in Sindh and 1.94 t ha^{-1} in Punjab (MINFA, 1993). There is evidence that productivity of the system is declining. Since rice-wheat is nutrient exhaustive production system. It may result in nutrient imbalance in the soil. It is believed that irrational use of fertilizer and nutrients imbalance in soil are major factors for poor crop yields in rice wheat-system (NFDC, 1994).

Potassium is one of the major essential plant nutrient required for normal growth and development of plants. It is the essential plant food element more frequently found in larger quantities in crop plants than any other element. Before the introduction of new high yielding fertilizer responsive varieties and intensive use of nitrogen, the soils were not stressed for their potassium supply. As a result of more intensive cropping system use of high yielding varieties and the unbalanced use of nitrogen, lack of potassium in now increasingly becoming limiting factor on soil that were previously considered to have sufficient available potassium, correction of wide spread phosphorus deficiencies has been another factor that has contributed to a better response of rice to potassium application. Crop removal of nutrients is one of the main