RESIDUAL/DIRECT EFFECT OF PHOSPHORUS 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 P application on wheat and subsequent rice crop. After rice harvesting wheat and rice again planted during 2005-06 to notice the cumulative direct and residual effect of P application in rice wheat system. The P was applied as 0, 45 and 90 kg P_2O_5 ha^{-1} with the basal dose of N, K_20 as 120-60 kg $ha^{-1}$to both the crops.Wheat variety Naseer 2000, and rice variety IRRI6 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 earing to study the concentration of P. P levels affected the concentration of P in soil, leaves and grains significantly over check, ranging from 2.02 to 6.53 mg kg^{-1} and 1.62 to 7.52 in soil, 0.09 to 0.20% and 0.072 to 0.22% in leaves while, 0.17 to 0.43 and 0.15 to 0.48% in grains of wheat and rice respectively. The wheat grain yield and yield components (plant height, 1000 grain weight, number of spikes m-2, and spike length) were significantly affected with P application. The wheat yield ranged from 3214 to 4830 kg ha^{-1}. The cumulative application of 45 and 90 kg P_2O_5 ha^{-1} gave an increase of 33.38 and 50.28% over check respectively, while the direct and residual application of 90 kg P_2O_5 ha-1 increased the wheat yield by 50.28 and 6.0% over check respectively. The paddy grain yield and yield components were also affected significantly over check with P application. The paddy yield ranged from 5822 to 7145 kg ha^{-1}. The cumulative application of 45 and 90 kg P_2O_5 ha^{-1} increased the .paddy yield by 14.34 and 22.70% over check respectively while the direct and residual application of 90 kg P_2O_5 ha^{-1} gave an increase of 14.39 and 10.70% over control respectively.

INTRODUCTION

The wheat rice system brings repeated transactions from aerobic to anaerobic soil conditions and result in unique changes in the physical, chemical, biological and nutritive properties of soil. The wheat/rice rotation in one of the world's largest agricultural production system and occupies about 14 million hectares of cultivated land in India, Pakistan, Bangledesh and Nepal. Its production provides grains for more than one billion people or about 20 percent of the world's population (Singh *et al.*, 2002). It is an expensive nutrient (Nisar, 1996) as compared to nitrogen. It is therefore very important to manage properly for achieving of maximum benefit especially under submerged condition where its availability increases (Terman *et al.*, 1970; Ahmed *et al.*, 1984; Saggar *et al.*, 1985; Bhatti and Khattak, 1985).

Phosphorus is a major plant nutrient second after N required in sufficient amount. It plays a vital role in several physiological processes viz photosyn-thesis, respiration, energy storage and cell division/enlargement. It is also an important structural component of many biochemicals viz nucleic acid (DNA and RNA enzymes and coenzymes) and also stimulates root growth and associated with early maturity of crops. It offers increased disease resistance to plants. It prevents from lodging by providing strength to straw. Rehman *et al.* (1991) revealed that on the average basis P was deficient in almost 68 percent, medium in 29 percent while adequate in 3 percent of D.I.Khan soils.

Significant residual effect of P in rice-wheat system was observed.

Residual effect of phosphorus ranged from 24-61 percent over check. The present study had been carried out under submerged soil conditions to determine the P requirements