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Nutrient Management Options In Rice-Sunflower Cropping System To Sustain Productivity And Conserve The Soil Fertility

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ABSTRACT

Indian soils are degrading fast due to heavy removal of nutrients by intensive cultivation. Fertilizers have a quick reaction in supplying the nutrients. The organic sources decompose slowly and supply the nutrients for a long time. They are available in plenty. The integrated nutrient supply system was evaluated for rice-sunflower cropping system in relation to the fertilizer application. Rice fertilized with recommended level of 120 kg N ha^{-1} was subjected to severe lodging through excessive vegetative growth due to the occurrence of high intensity rains at maturity. This led to severe yield loss. The substitution of 25% N fertilizer with organic nitrogen through FYM, vermicompost, *Glyricidia* or *Crotalaria* increased the availability of NPK ha^{-1} in the soil at the end of each season. Both rice and sunflower were benefited by the additional supply of P and K and other micronutrients along with the nitrogen which were available steadily through their slow decomposition. They acted as buffer to save the rice crop from severe lodging and sustained the yields with no severe loss of grain. The two crops recovered more quantity of N, P and K. The production of sunflower was also influenced by the residual effect of organic sources of nutrients applied to the preceding rice crop.

INTRODUCTION

Rice (*Oryza sativa*) is the staple food for over half of the world's population Jacques Diouf, (2004). Its water requirement is very high. Intensive cultivation of short duration and low water requirement crops like sunflower (*Helianthus annuus* L.) is becoming increasingly popular as a sequence crop to rice in India Sharanappa and Shivaraj, (1993). The nutrients are mined in large quantities due to the intensive cultivation. This makes the soils sick. The Indian soils have rapidly degraded in their nutrient status. Motsara (2002) estimated that 90 % of the soils are presently deficient in available N, 80 % in P and 50 % in K. It is realized that the organic manures are the potential sources to sustain the microbial activity and improve the physical constituents of the soil while they can partly substitute the requirement of N, P and K fertilizers. They also supplement the micronutrients. The integrated nutrient supply to the crops through organic manures and fertilizers has confirmed the advantages of restoring the soil fertility, sustained productivity and feasibility (Bhandari *et al*., 1992; Kumar and Yadav, 1995; Modgal *et al*. 1995; Abrol *et al*., 1997; Raju and Reddy, 2000). These organic manures leave behind sufficient residual effect for the sequence crops (Singh *et al*., 1996; Hegde, 1998). Information on the role of nutrient management options in rice-sunflower system is warranted.

This experiment was conducted to elicit information on the relative role of different sources of organic manures in conjunction with the fertilizers applied to rice crop in contrast to the sole dependence on fertilizers. Attempts were also made to study the residual effect of integrated use of organic manures and fertilizers on the performance of succeeding sunflower crop raised with different level of fertilizers.

MATERIALS AND METHODS

The site of the experiment was at the Agricultural College, Hyderabad in India. The soil was sandy loam in texture. The experiment was conducted in different fields during 2001 and 2002. The soil had a pH of 7.3 and the electrode conductivity was 0.24 dSm^{-1} in the first year. These values were 7.2 and 0.30 respectively during the second year. The organic carbon was low (0.23 and 0.31 %). The soil available nitrogen content was low (215 and 210 kg ha^{-1}). The available phosphorus (26 and 24 kg P_2O_5 ha^{-1}) and available potassium (265 and 260 kg K_2O ha^{-1}) were medium. Rice nurseries of variety Tellahamsa which were 30-d-old were transplanted in the rainy season on 10 July in 2001 and 16 July in 2002 under submerged conditions. Sunflower hybrid APSH-11 maturing in 90 days was grown after rice on 12 and 1 November during 2001 and 2002 during non-rainy season.

Rice was grown with eight treatments and three

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