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Effect of continuous use of inorganic fertilizers and manure on growth and yield attributes of rice in rice-wheat cropping system on a Mollisol

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ABSTRACT

Field experiment was conducted with rice during 2002 in a long term fertilizer experiment which was being carried out since 1971 to study the crop productivity after intensive cropping under various fertilizer and manurial treatments on *Mollisol*. The rotation was rice-wheat and treatments included various combination of N,P ,K ,Zn and FYM .The results obtained indicates that the application of 100% dose of NPK fertilizers + FYM @ 15 t ha⁻¹ produced maximum grain and straw yield and nutrients uptake by rice. Relatively higher uptake of N, P and K by grain and straw was found in 150% NPK in comparison to 100% N+Zn, 100% NP + Zn and 100% NPK but grain and straw yields were lower than above treatments which shows severe deficiency of zinc due to continuous use of heavy fertilization. Yield attributes show that the application of recommended dose of N, P and K with manure @15 t/ha helped in sustaining the yield of rice over the years.

Key words : Long Term Fertilizer Experiment, Rice, FYM

INTRODUCTION

Rice (Oryza sativa L.) and wheat (Triticurn *aestivum*) is a major cropping sequence in Indo-Gangetic plain of north India. The productivity of rice is declining over the years and several constraints have also been identified for lower productivity (Nambiar and Abrol 1989). Yadav et. al (2000) reported that rice-wheat system is more stable under integrated nutrient management system compared with chemical fertilizers practice. Therefore, use of chemical fertilizers alone may not keep pace with time in maintenance of soil health for sustaining productivity .Growing concern about the sustainability of rice based cropping system coupled with increasing prices of chemical fertilizers has led to renewed interest in organic manuring. It has been established that continuous use of chemical fertilizers under intensive cropping system decreases crop yields due to degradation in soil health and nutrient removal by crops with heavy fertilization. Nutrients imbalance in soil with chemical fertilization is also a cause of excess removal of other nutrients from the soil (Bharadwaj et al., 1994). As a result of such cropping, Zn is becoming important limiting factor in rice cultivation under continuous use of chemical fertilizers. Therefore, long-term field experiment can be used for precise monitoring of changes in soil fertility and soil productivity, this helps in solving complex problems related to soil fertility management. Therefore, the present study was undertaken to find out the effect of continuous use

of organic and inorganic fertilizers on the performance of rice in rice-wheat cropping system on a *Mollisol*.

MATERIALS AND METHODS

The present study was carried out during 2002 with rice in an All India Coordinated Research Project on long term fertilizer experiment which was started since 1971 with rice-wheat cropping sequence at Crop Research Centre, G.B. Pant University of Agriculture and Technology, Pantnagar. Soil being silty clay loam had 7.3 pH, 1.48% organic carbon, 392.0 Kg N ha-1, 18.0 Kg P_2O_2 ha⁻¹, 125.0 Kg K₂O ha⁻¹ and 20.0 cmol (P⁺) Kg⁻¹ at the time of experiment initiation. For the above studies, seven treatments namely; T₁ control (no fertilizer and manure), T₂ 50% NPK, T₃ 100% NPK, T₄ 150% NPK, $T_5 100\%$ NP + Zn, $T_6 100\%$ N + Zn and $T_7 100\%$ NPK + FYM were selected among total 12 treatments of long term fertilizer experiment. In this experiment, one month old seedling of rice (Var. Pant Dhan-4) was transplanted at the spacing of 15×20 cm after puddling of the field. The amount of fertilizers was calculated as per treatments on the basis of recommended dose of NPK @ 120:26:37 Kg ha⁻¹. Half N and full P and K fertilizers were supplied through urea, single super phosphate and muriate of potash and applied as basal before transplanting of rice. Remaining half of N was applied into two equal splits; at tillering and flowering. Zinc sulphate was applied @ 50 Kg ha⁻¹ in alternate of approximately four years on soil test basis (soil test value is below critical level of Zn) and FYM is being applied @ 15.0 t ha-1 to every Rabi crops

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