

Effect of Integrated Nutrient Management Practices on Growth and Nitrogen Availability of Rice-Wheat Cropping System

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ABSTRACT

A field experiment was conducted during Kharif and Rabi season of 2012-13 and 2013-14 to study the influence of integrated nutrient management in rice-wheat cropping system, comprising inorganic fertilizers and organic manures on growth and soil fertility status, three organic manures, FYM, *Sesbania aculeate* and wheat cut straw were added with the recommended dose of NPK fertilizers. The higher plant height (86 cm) of rice was found in the treatment T₆ receiving 50% NPK through fertilizers and 50% N through FYM but the tallest plant height (98.4 and 98.2) of wheat was noted in T₁₀ and T₆ (50% NPK + 50% N FYM/ *Sesbania*GM in rice and 100% NPK in wheat). The treatment T₆ also gave the highest available nitrogen in soil after harvest of the crop.

Keywords: Rice-wheat, Integrated nutrient management, Organic manure and Inorganic fertilizer

INTRODUCTION

Rice-wheat cropping system is an exhaustive rotation which possesses potentially to meet the food demand of the continuously increasing population, of South East Asia. In spite of fast increase in population, the production of rice and wheat in India has kept pace with demand. About 33% of India's rice area and 42% of wheat area is grown in rice-wheat system. Nearly 65% of the total amount of fertilizer used in the country (27.7 m tonnes) is consumed by both the crops. The results of long-term fertilizer experiments on rice-wheat system indicate that in absence of

organic manures, the soil productivity declines, which might be due to the appearance of deficiencies of secondary and micro-nutrients, and deterioration in soil physical condition caused due to continuous cereal cropping and chemical fertilizers, specially nitrogenous ones. Even balanced application of chemical fertilizers alone does not sustain the soil productivity under continuous cropping whereas inclusion of farm yard manure, green manures and crop residues regulate nutrient uptake and improve physical status of soil (Kumar & Yadav, 1995).

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Green manuring and farmyard manuring may help in reducing the deleterious effects of rice cultivation on soil physical properties. The necessity of organic manuring increases many folds in salt affected soils because of their poor structure and low fertility.

MATERIALS AND METHODS

The field experiment was conducted at Agronomy Research Farm, Narendra Deva University of Agriculture and Technology, Narendra Nagar (Kumarganj) Faizabad (U.P.), during *Kharif* and *Rabi* season of 2012-13 and 2013-14. The soil of the experimental field was alluvial, partially reclaimed sodic soil with pH 8.8 organic carbon 0.27 % available N 102 kg/ha, available P 13.8 kg/ha, available K 355 kg/ha. There were twelve treatment combinations (Table 1) replicated four times in randomized block design. Rice (*var.* 'Sarjoo 52') and wheat (*var.* 'HUW -234') were grown as the test crop. The recommended 100% dose i.e. 120 kg N, 60 kg P₂O₅ and 60 kg K₂O ha⁻¹ for both crops. The plant height of five tagged plants selected randomly from each plot was recorded with the help of meter scale at 30, 60, 90 DAS and at harvest. The length between the base of stem touching the ground and the top of plant was considered as height of plant. Available nitrogen content in soil samples was estimated by alkaline permanganate method as described by Subbiah & Asiza (1956).

RESULT AND DISCUSSION

Plant height

The higher plant height (86 cm) of rice was found in the treatment T₆ receiving 50% NPK through fertilizers and 50% N through FYM but the tallest plant height (98.4 and 98.2) of wheat was noted in T₁₀ and T₆ (50% NPK + 50% N FYM/ *Sesbania* GM in rice and 100% NPK in wheat). Application of higher amounts of nutrient increase the availability of nutrients in root zone and thus greater uptake of nutrients by plants resulted in higher plant height both in rice and wheat crop. Das et al. (2003) also reported similar results.

Available nitrogen after harvest

The maximum available nitrogen (204-2015 kg ha⁻¹) was recorded in the treatment T₆ (50% NPK + 50% N-FYM in rice and 100% NPK in wheat) which remained at par to T₁₀ (50% NPK + 50% N-*Sesbania* GM in rice and 100% NPK in wheat) but significantly higher to the treatments receiving 100% recommended NPK dose through chemical fertilizers alone (T₅) in both the crops. The availability of N in soil increased under the treatments having combination of chemical fertilizers and organic fertilizers because of buildup of organic matter due to application of FYM. Since organic matter contains nitrogen also, the increase in N content was found in those treatments where FYM, prickly *Sesbania* green manure were added. Organic matter also reduces the losses of nitrogen and thus its availability is increased. Similar findings were also observed by Bhandari et al. (1992) and Kumar & Yadav (1995).

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