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Studies on rice productivity, nitrogen uptake and nitrogen balance in wet seeded rice under integrated nitrogen management practices

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ABSTRACT

A field experiment was conducted during *Rabi* season (Oct. – Jan.) of 2001-02 at wetland of Central farm, Agricultural College and Research Institute, TNAU, Killikulam (8º 48' N 77º42' E and 40m AMSL) to study the rice productivity, N uptake and N balance in wet seeded rice under integrated nitrogen management. The experiment was laid out in randomized block design replicated thrice. Eight integrated nitrogen management practices viz., presowing of *Sesbania* @ 50 kg ha^{-1} and *in situ* incorporation at 45 DAS + 150 kg N ha^{-1}, presowing of *Sesbania* @ 75 kg ha^{-1} and *in situ* incorporation at 45 DAS + 112.5 kg N ha^{-1}, intercropping of *Sesbania* in rice @ 25 kg ha^{-1} and *in situ* incorporation at 40 DAS + 150 kg N ha^{-1} , intercropping of *Sesbania* in rice @ 75 kg and *in situ* incorporation at 40 DAS + 112.5 kg N ha^{-1}, GLM @ 6.25 t ha^{-1} + 150 kg N ha^{-1}, GLM @ 9.38 t ha^{-1} + 112.5 kg N ha^{-1}, FYM @ 12.5 t ha^{-1} + 150 kg N ha^{-1}, FYM @ 18.75 t ha^{-1} + 112.5 kg N ha^{-1} and two levels of inorganic N alone i.e., 150, 112.5 kg ha^{-1} and control (no manure) was adopted. The treatment receiving FYM @ 12.5 t ha^{-1} + 150 kg N ha^{-1} registered significantly the higher grain yield (5538 kg ha^{-1}) straw yield (8693 kg ha^{-1}) and N uptake (154.24 kg ha^{-1}). Application of inorganic N @ 150 kg ha^{-1} alone recorded the lower amount of grain (4382 kg ha^{-1}) and straw (7373 kg ha^{-1}) yield and N uptake (140.45 kg ha^{-1}). The actual post harvest fertility status of the soil also clearly indicated that, integrated application FYM @ 12.5 t ha^{-1} + 150 kg N ha^{-1} recorded highest amount of available N (251.26 kg ha^{-1}), where as in control plot the available N was very low (112.26 kg ha^{-1}). A positive net gain of N over than initial soil status was also recorded in all the integrated nitrogen management practices but in control the report was in negative.

Key words : Wet seeded rice, Integrated nitrogen management, Grain and Straw yield, N uptake, N balance.

INTRODUCTION

Indian agriculture had witnessed a gradual transformation from subsistence farming of early fifties to the present intensive agriculture especially in better-endowed region. Nutrient imbalance is one of the major abiotic constraints limiting productivity of rice. At the same time, in view of increasing nutrient demand, escalating prices of inorganic fertilizer and their possible degradation of cultivable soil health and hazardous to environment, warrants the need for judicious use of chemical fertilizer (Fauci and Dick, 1994; Fageria, 1994). There is immense need to exploit the alternate source of nutrients viz., organic manure, use of legumes in crop rotation and bio fertilizer to sustain the productivity with more environment friendly nutrient management system (Fageria and Baligar, 1997; Collins *et al.*, 1992).

The supplementary and complementary use of organic manures improves the physical, chemical and biological properties of soil and also improves the use efficiency of applied N fertilizer as well as other inputs (Wander *et al.*, 1994; Kalyanasundaram, *et. al*, 1997). According to Pramnik and Mahapatra (1997) and Devi *et al.*, (1999) integrated use of urea and organic N fertilizer is helpful in maintaining higher concentration of soil NH_4- N for long period and realizing higher grain yield and N uptake in lowland rice. Therefore, to study the effect of integrated nitrogen management on rice productivity, N uptake and N balance, an field investigation was carried out by application of organic manures by different sources at different levels along with different levels of inorganic fertilizers to wet seeded (drum seeding) *Rabi* (*Pishanam* season) rice grown in southern parts of Tamil Nadu.

MATERIALS AND METHODS

A field investigation was conducted during *Rabi* season (*Pisahnam* rice) of 2001 -2002 at the wetlands (field number 48 b of 'B' block) of Central farm, Agricultural College and Research Institute, Tamil Nadu Agricultural University, Killikulam (8° 48'N latitude, 77°42' E longitude and 40 m above mean sea level). The soil of the experimental field was moderately deep and sandy clay in texture, with slightly alkaline in reaction (pH 7.6). The fertility status of the soil was low in available nitrogen (172 kg ha^{-1}), high in available phosphorus (24 kg ha^{-1}) and medium in available potassium (176 kg ha^{-1}). The soil was medium status in organic carbon content (0.52 %). The treatments were imposed in randomized

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