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Research Notes

Effect of integrated nutrient management on yield and yield attributes of lowland rice

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Rice is the most important and extensively grown food crop of the world in general and of India in particular. High cost of fertilizer and the low purchasing capacity of the small marginal peasants of the country, restrict the use of fertilizer inputs. Under such condition, there is need to explore the possibilities of using the native renewable sources of the plant nutrition. The bio-organic and organic manures are getting global importance for rice cultivation, since the efficiency of applied mineral nutrients by the crop is markedly influenced in presence of this readily available sources viz. various organic manures. The FYM is very common source of plant nutrients amongst the farmers of *Chhattisgarh* which is prepared easily and contains substantial amount of plant nutrients. Rice straw is also a good source of organic manure, which helps in maintenance of soil organic matter and in improving soil physical condition and biological activity. Green manure crop, Sunnhemp *(Crotoleria juncea)* is also well known for its role in soil fertility and supplying a part of nutrient requirement in the rice based cropping, as it contains high amount of N, P, K and micronutrients but it requires sufficient water prior to transplanting for complete decomposition.

The experiment was conducted in *Kharif*, 2000 at the instructional farm, College of Agriculture, IGAU, Raipur. The soil was clay loam in texture *(Alfisols)* and neutral in pH. The available NPK status in soil was 218 kg, 17.2 kg and 311 kg ha^{-1}, respectively. Under this experiment mainly nitrogen was applied in different doses through FYM, rice straw and green-manure (sunnhemp) and inorganic fertilizers and applied in the same ratio. The treatments consisted of 12 integrated nutrient management, laid out in randomized block design with three replications. The 12 treatment combinations were - F_0-Control; F -Farmer's practice (50:30:20 kg NPK ha^{-1}); ^{1} F_2- 25% RDF (20:15:10 kg NPK ha^{-1}); F_3- 50% RDF (40:30:20 kg NPK ha^{-1}); F_4- 75% RDF (60:45:30 kg NPK ha^{-1}); F_5- (00% RDF (80:60:40 kg NPK ha^{-1}); F -$_6$50% RDF + 50% N (FYM); F_7- 50% RDF + 50% N (Rice straw); F_8- 50% RDF + 50% N (Sunnhemp); F_9- 75% RDF <-25% N (FYM); F_{10}- 75% RDF + 25% N (Rice straw) and F_{11} - 75% RDF + 25% N (sunnhemp). The fertilizers were applied as per the treatments. Entire quantity of phosphorus and potassium were applied before transplanting through single-super phosphate and muriate of potash, respectively. Nitrogen was applied in the form of urea as per the treatments. In treatments F_6 and F_9, 84.6 and 42.3 kg FYM $plot^{-1}$, respectively was applied along with chemical fertilizer. In the same manner, green manure crop sunnhemp was incorporated in F_8 and F_{11} treatments @ 62.6 and 31.2 kg $plot^{-1}$, respectively along with the chemical fertilizers. Similarly, in treatments F_7 and F_{10}. 70.6 and 35.3 kg rice straw $plot^{-1}$, respectively were incorporated to meet out the requirements of these treatments. Twenty

five days old seedlings of variety 'Kranti' were transplanted at a spacing of 20 x 10 cm. The herbicide anilophos @ 1.5 kg a.i ha^{-1} was applied five days after transplanting and spraying of monocrotophos @ 1.5 kg a.i ha^{-1} was done at 28 and 42 DAT to reduce the infestation of stemborers. The data collected from field observations and that recorded in laboratory were subjected to statistical analysis by standard analysis of variance technique of randomized block design as described by Gomez and Gomez, (1984).

The data given in Table 1 reveal that significantly higher number of grains $panicle^{-1}$ (122.0) was recorded in F_8 which was at par with F_{11}, (121.20). The number of fertile grains $panicle^{-1}$ was found significantly higher (112.4) in F_8 than others. The grain yield (g) was significantly higher (6.5) under F_8 followed by F_5 (6.4), F_{11} (6.3), F_9 (6.3). and F_6 (5.9). The straw yield (g) did not follow the trend of grain yield (g). The straw yield (g) under F_5 (7.6) was significantly higher than others, which was also at par with F_8 (7.6), F11 (7.5) and F_9 (7.4) treatments. The lowest number of sterile grains $panicle^{-1}$ was recorded in F_8 (6.5) which was at par with F_5 (6.9) treatment. Different integrated nutrient management treatments did not show any significant impact on panicle length and sterility percentage.

Table 1. Yield attributes and yield of rice as influenced by integrated nutrient management.

Integrated nutrient management	Panicle length, cm	Grains $panicle^{-1}$ no.	Fertile grains $panice^{-1}$ no.	sterile grains $panicle^{-1}$, no.	Sterility Percent %	Grain yield t ha^{-1}	Straw yield t ha^{-1}
F_0 - Control	20.9	98.3	85.7	13.0	12.8	2.1	2.8
F_1 - FP (50:30:20 kg NPK ha^{-1})	20.8	102.0	92.8	11.8	11.9	5.0	5.0
F_2 - 25% RDF (20:15:10 kg NPK ha^{-1})	20.2	99.0	87.5	12.4	12.3	4.3	4.3
F_3 - 50% RDF (40:30:20 kg NPK ha^{-1})	20.4	99.3	87.1	12.1	12.0	4.6	4.5
F_4 - 75% RDF (60:45:30 kg NPK ha^{-1})	20.6	104.4	95.7	11.3	11.8	4.5	4.5
F_5 - 100% RDF (80:60:40 kg NPK ha^{-1})	22.1	117.2	106.7	6.9	8.3	6.4	7.6
F_6 - 50% RDF + 50% N (FYM)	21.4	113.3	103.0	9.0	9.2	5.9	6.1
F_7 - 50% RDF + 50% N (Rice straw)	21.6	110.0	98.7	9.4	10.3	4.7	6.2
F_8 - 50% RDF + 50% N (Sunnhemp)	23.2	122.0	112.4	6.5	7.9	6.5	7.6
F_9 - 75% RDF + 25% N (FYM)	22.8	117.8	104.0	7.8	9.2	6.3	7.4
F_{10} - 75% RDF + 25% N (Rice straw)	21.0	111.5	101.0	8.5	9.5	4.7	6.0
F_{11} - 75% RDF + 25% N (Sunnhemp)	23.0	121.2	107.3	7.6	9.0	6.3	7.5
SEm+	0.05	1.10	1.13	0.14	1.64	0.47	0.40
LSD (P=0.05)	NS	3.23	3.30	0.42	NS	1.39	1.18

Results of Rekhi *et al.* (1982) revealed that 18.1 to 53 percent of fertilizer N was utilized by the rice plant, 25.1 to 41.5 percent was immobilized by the soil and 4.8 to 7.2 percent lost by denitrification. Maskina *et al.* (1988) and Sharma and Mittra (1989) also reported the same availability of nitrogen for plant uptake when it was applied through organic manures. Tiwari *et al.* (2000) reported that in rice, uptake of N was higher in the treatment 60 kg N green manure than application of 60 kg N alone. The additive effect of green manure might be due to its better C:N ratio, for mineralization and FYM may had wider C:N ratio so that immobilization of released nitrogen might occur first followed by its mineralization and release of nitrogen for plant uptake. The above statement suggest that the availability of nitrogen for plant uptake is almost same, even then, the effect of sunnhemp treatment on yield attributes and yield of rice is much better than other treatments. This might be due to release of nutrients for plant uptake including micro elements and other growth hormones, enzymes, proteins etc. Green manure, when incorporated into the soil after 35 to 42 days of growth proved to be beneficial to the crop as C:N ratio was from 14:3:1 to 13:5:1 (Singh *et al.*, 1994). The mineralization of added green manure was further stimulated by anaerobic condition of the soil (Sahrawat, 1979), and adequate quantities of nutrients were released for healthy growth of plant from the initial stage. Manguiat *et al.* (1992) observed that available soil N released to a maximum of four weeks after incorporation of green manure and decreased afterwards. However, the added advantage, especially at higher rates was possibly because of build-up of ample nutrient reserves in the soil and its assured and continued supply to the growing plant.

References

Gomez, K.A. and Gomez, A.A. (1984). Statistical procedures for agricultural research. A. Wiley-Inter Sci. Publication. John Wiley and sons, New York

Manguiat, I.J., Guinto, D.F., Perez, A.S. and Pintor, R.M. 1992. Response of rainfed lowland rice to green manure with *Sesbania rostrata*. *Tropical-Agric.* **69(1) :** 73-77.

Maskina, M.S., Singh, Y. and Singh, B. (1998). Wheat straw management for rice on a coarse textured soil. *IRR1*. **12(2) :** 40

Rekhi, R.S., Meelu, O.P. and Gupta, R.K. (1982). Lysimeter studies on recovery of ^{15}N- labelled urea in wetland rice. *Plant and Soil.* **66 :** 57-66.

Sahrawat, K.L. (1999). Nitrogen losses in rice soils. *Fertilizer News.* **24 :** 38-48.

Sharma, A.R. and Mitra, B.N. (1989). Effect of combinations of organic materials and nitrogen fertilizer on growth, yield and nitrogen uptake of rice. *J. Agril. Sci.* **111 :**: 495-501.

Singh, Y., Singh, B., Khera, T.S., Meelu, O.P., Singh, Y. and Singh, Y. (1994). Integrated management of green manure, farmyard manure and nitrogen fertilizer in a rice-wheat rotation in north-western India. *Arid Soil Rex. and Rehabilitation.* **8(2) :**19-205.

Tiwari, V.N., Tiwari, K.N. and Awasthi, P.N. (2000). Role of *Sesbania rostrata* and phospho-microbe at varying levels of N in sustaining the production and productivity of soil under rice-wheat chickpea cropping sequence. *J. Indian Soc. Soil Sci.* **48(2) :** 257-262.