Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2017; SP1: 278-280

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Effect of Integrated Nutrient Management on rice (*Oryza sativa* L.) productivity and Soil Fertility

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Abstract
A field experiment was conducted at Instructional Farm of Narendra Deva University of Agriculture and Technology, Kumarganj, Faizabad (U.P.) during the *Kharif* 2013 to evaluate the Effect of Integrated Nutrient Management on rice (*Oryza sativa* L.) productivity and Soil Fertility. Twelve treatments comprised with different integrated modules of organic, inorganic and biofertilizer combinations. The various integrated nutrient management modules significantly influenced the yield and combination of different organic and inorganic source of nutrient. Among integrated modules the application of 100% RDF received maximum yield (60.61 grain and 78.86 straw q ha^{-1}) and soil health the combination of FYM+GM+BGA by 75% RDF+ 25% N (FYM+GM+BGA). The longe time application of nutrient combination of organic source of nutrient in effect of soil physical properties, chemical and biological properties of soil. Application of recommended dose of RDF+FYM +GM+BGA highest increase. Inclusion of FYM, Green Manure (GM) and BGA through inorganic source in the treatment increased the Physical Properties of soil.

Keywords: *INM yield of rice and soil properties*

Introduction
Rice is one of the important cereal food crop for more than half of the world's population The global requirement of rice by 2050 AD world by 800 million tones, which is 26% higher than the present level of production. In India it is grown over an area 43.95 million hectare with a production of 106.54 million tones in 2013-14 *Anonymous* (2014) [1]. The area and production of rice in the state is about 13.84 mha and 14.00 mt, respectively with productivity of 2358 $kgha^{-1}$ *Anonymous* (2014) [1]. The ever increasing population of the country is forcing the planners to produce more and more with ever shrinking natural resources. Continuous use of high analysis fertilizers accelerated the mining of micro and secondary nutrients which brought down the productivity. Declining trend in productivity due to continuous use of chemical fertilizers alone has been observed. Therefore, emphasis should be to optimize the use of chemical fertilizers and to improve their use efficiency. Enhancing the productivity and soil fertility to feed the ever growing population from shrinking natural resources. The combined use of fertilizer, organic and biofertilizers increase the productivity of crops with significant residual effect in soil. In addition to saving of available nutrients integrated nutrient management also improved the soil organic carbon and nutrient status of the soil. The significant improvement microbial papulation of soil with the application of treatment consisting T_{12}-50 % RDF + 50 % N (FYM, Green manure and BGA) followed by T_{11}-50% RDF + 50 %-N (FYM and green manure) was recorded. Application of FYM, green manure and BGA along with 75% and 50% recommended dose of NPK significantly increased actinomycetes population in soil over sole application of NPK through inorganic fertilizers. The Increment in microbial population might be due to release of extracellular nitrogen substance and fixation of atmosphere nitrogen. These results are also corroborated with the finding of Singh *et al* (2011) [4], Krishna Kumar S. (2005) [2] and Selvi *et al.* (2004) [5].

Materials and Methods
The field experiment was conducted at Student's Instructional farm of Narendra Deva University of Agriculture and Technology, Kumarganj, Faizabad during *Kharif*, 2013 to explore the possibility of substituting fertilizer with FYM, Green manure (Dhaincha) and biofertiliser (Blue green algae) is an integrated manner for the crop. The treatment consisting of chemical fertilizer with different combination of organics (FYM, Green manure and BGA) viz. T_1 (control), T_2 (100% RDF) T_3 (75% RDF), T_4 (50% RDF), T_5 (75% RDF + 25% N-FYM), T_6 (75% RDF +25% N-GM), T_7 (75% RDF +25% N-FYM + GM), T_8 (75% RDF +

(75% RDF + 25% N-FYM + GM + BGA), T_9 (50% RDF + 50% N-FYM), T_{10} (50% RDF + 50% N-GM), T_{11} (50% RDF + 50% N-FYM+GM) and T_{12} (50%RDF + 50% N-FYM + GM + BGA) were comprised in Randomized Block replicated as thrice. The experimental soil was silty loam in texture having pH (1:25) 8.58, EC 0.41dSm^{-1}, Organic Carbon 2.40 g kg^{-1}, Available Nitrogen 170.50, Phosphorus 08.81, Potassium 215.52, Sulphur 8.97 kg ha^{-1} and Zinc 0.63 mg kg^{-1}. FYM, green manure (Dhaincha) and BGA were applied as per treatment. FYM, Green manure and BGA were incorporated before transplanting of rice seedling and BGA crust was applied uniformly in the plots 5-7 days after transplanting. Whereas half dose of nitrogen entire dose of phosphorus potash and Zinc were applied as basal application in the form of urea, diammonium phosphate, muriate of potash and zinc sulphate, respectively, remaining half dose of nitrogen was applied in two equally at tillering and panicle initiation stages. The farm yard manure was applied before fifteen days of transplanting and zinc sulphate was applied in the last plough. The seedling were transplanted with spacing of 20 x 10cm all the cultural practices were followed to raise a good crop. The grain and straw yield were recorded at maturity. The soil samples were collected as initial before and after harvest of the crop and analysed for chemical properties by following standard methods (Jackson, 1973) [8]. The plant samples were collected N, P, K, S and Zn content (Jackson, 1973) [8] and nutrient uptake by grain and straw was computed. The experimental data were statistically analyzed using MSTATC.

Results and Discussion

CropYield

Data on crop yield in the application of RDF alone in combination of organic manure and biofertiliser are presented in table 1. The highest grain and straw yield (60.61 and 78.86 q ha^{-1}) was recorded of rice were obtained with the application of 100% RDF through inorganic fertilizer which was however, on followed by 75% RDF+25%N-FYM+GM+BGA (59.96 grain and 78.35 straw q ha^{-1}). Highest obtained with recommended dose of chemical fertilizer was due to batter growth and yield attribute recorded which in turn, resulted in increase of rice yield compared to added level of N in organic farm. Lal *et al* (2013) [9]. The increased in grain and straw yield supplied the nutrient combination with organic, green manure, biofertilizer and inorganic fertilizer. Application of 50 and 75% RDF+50 and 25% N-Organic manure and biofertilizer is combination of treatment T_5, T_6, T_7, T_8, T_9, T_{10}, T_{11}, and T_{12} significantly produced an increase in productivity in rice (Khairnar and Thakur (2011). The favorable effect of integrated nutrient management through both inorganic fertilizer and organic manure on higher grain and straw yield was also reported by Kumar *et al.* (2008) [6]. The result indicate that green manure with N fixing tree leaves left marked residual effect and therefore improved productivity level due to cumulative effect. This may be due to fact that slowly released nutrient through green manure and applied inorganic fertilizer N helped in produce more grain yield of rice.

Soil properties

The results revealed that Improved soil physical conditions reflected by lower bulk density of soil, when applied organic and inorganic sources of nutrients continuously. Integration of organic sources with inorganic fertilizer were found more effective as compared to single application in building up fertility and improving physical status of soil.

The buildup of neutral soil pH and EC were recorded under INM modules as compared to sole inorganic fertilizer treatment (T_2) whereas, maximum reduction in pH was observed with the application of T_{12} (50 % RDF + 50% N-FYM+ Green manure + BGA). However, differences in pH and EC were found non-significant. The higher availability of nutrient N, P, K, S and Zn in soil after harvest were recorded under all the INM modules as compared to inorganic fertilizer application treatments. Whereas the maximum availability of N, P, K, S and Zn were estimated under the treatment having T_{12}-50% RDF+ 50% RDF with FYM, Green manure and BGA which was closely followed by T_{11}, T_{10} Jackson (1973) [8]. Better crop growth was observed with FYM, green manure and BGA treated plots might be due to the improvement of physical and chemical properties of the soil and providing good soil environment to plant and enhance root growth leading to accumulation of more organic residues in the soil while its increase with the treatment combination is ascribed to direct incorporation of organic matter through organics. These results closely corroborate with the findings of Prasad and Singhania (1989) and Datta *et al.* (2008). On the basis of present investigation, it can be concluded that the T_8 -75% RDF with inorganic fertilizer +25% N through organics (FYM, Green manure, BGA) found most effective in increasing the growth, yield and quality of rice and also helped in maintaining soil health for sustainable rice production.

Table 1: Effect of integrated nutrient management on Grain and straw Yield pH, EC and OC % in soil after harvest of rice crop.

Treatments	Grain yield (tha^{-1})	Straw yield (tha^{-1})	pH	EC (dSm^{-1})	OC (g kg^{-1})
T_1– Control	22.93	38.14	8.51	0.325	3.75
T_2 - 100% RDF	61.13	79.785	8.46	0.315	4.15
T_3 - 75% RDF	51.88	68.09	8.45	0.315	4.10
T_4 - 50% RDF	41.20	55.875	8.44	0.305	4.00
T_5 - 75% RDF + 25% N-FYM	55.66	74.905	8.43	0.295	4.35
T_6 - 75% RDF +25% N-GM	57.39	76.775	8.43	0.29	4.45
T_7 - 75% RDF +25% N-FYM + GM	59.33	78.615	8.41	0.285	4.6
T_8 - 75% RDF + 25% N-FYM + GM + BGA	60.46	79.255	8.40	0.275	4.85
T_9 - 50% RDF + 50% N-FYM	53.57	72.68	8.41	0.285	4.65
T_{10}- 50% RDF + 50% N-GM	54.99	74.275	8.39	0.275	4.75
T_{11}- 50% RDF + 50% N-FYM+GM	57.06	75.835	8.37	0.27	5.05
T_{12}- 50%RDF + 50% N-FYM + GM + BGA	58.65	77.66	8.36	0.26	5.35
SEm□	2.43	3.05	-	-	-
C.D. at 5%	7.155	8.945	-	-	-

Table 2: Effect of integrated nutrient management on available N, P, K, S and Zn in soil after harvest of rice crop

Treatments	Nitrogen (kg ha^{-1})	Phosphorus (kg ha^{-1})	Potash (kg ha^{-1})	Sulpher (kg ha^{-1})	Zinc (ppm)
T_1– Control	172.21	9.85	221.47	9.90	0.88
T_2 - 100% RDF	231.76	15.89	274.42	14.38	1.20
T_3 - 75% RDF	212.09	14.09	264.88	12.21	1.01
T_4 - 50% RDF	195.21	13.67	255.33	11.60	0.99
T_5 - 75% RDF + 25% N-FYM	215.45	14.67	269.50	14.14	1.14
T_6 - 75% RDF +25% N-GM	218.56	15.04	272.90	14.32	1.18
T_7 - 75% RDF +25% N-FYM + GM	225.79	15.75	274.42	14.89	1.19
T_8 - 75% RDF + 25% N-FYM + GM + BGA	229.56	15.90	275.18	15.12	1.22
T_9 - 50% RDF + 50% N-FYM	226.26	15.03	271.89	13.28	1.11
T_{10}- 50% RDF + 50% N-GM	231.59	15.70	273.60	14.46	1.16
T_{11}- 50% RDF + 50% N-FYM+GM	236.53	16.25	275.45	14.81	1.21
T_{12}- 50%RDF + 50% N-FYM + GM + BGA	239.55	16.84	277.48	15.09	1.23
SEm□	5.65	0.52	4.95	0.25	0.045
C.D. at 5%	16.55	1.53	14.50	0.74	0.135

Conclusion

Soil fertility status significantly increased with the application of organic and inorganic combination RDF +FYM+GM+BGA integrated treatment from initial to final stage of the soil. Applications of organic sources with inorganic sources were found more effective in building up soil fertility status as compared to inorganic fertilizer alone. These findings indicated that application of integrated use of recommended fertilizer dose along with manure can successfully maintain and improve soil fertility. Use of different organic amendment viz. RDF+BGA+GM+FYM in a cumulative manner met the nutrient requirement of rice. These amendment result in better yield and Physical, Chamical and biological properties of soil.

References

1. Anonymous. Economics survey of India, Economic Division Ministry of Finance, Government, of India, New Delhi, 2014, 45-55.
2. Krishna Kumar S, Saravanan A, Ramesh K, Natarajan SK, Veerabadran V, Mani S. Organic forming: Impact on rice (*Oryza sativa* L.) Productivity and soil health: Asian J of Plant Sci. 2005; 4(5):510-512.
3. Sahu R, Kauraw DL, Thakur R. Impact of integrated resources management on production and nutrients uptake by rice crop. Journal of Soils and Crops. 2009; 19(2):205-209.
4. Koushal S, Sharma AK, Singh A. Yield performance, economics and soil fertility through direct and residual effects of organic and inorganic sources of nitrogen as substitute to chemical fertilizer in rice-wheat cropping system. Research Journal of Agricultural Science. 2011; 43(3):189-193.
5. Selvi D, Santhy P, Dhakshinamoorthy M, Maheswari M. Microbial papulation and biomass in rhizophere as influenced by continuous intensive cultivation and fertilization in an inceptisol. J Indian Sco. Soil Sci. 2004; 52(3):254-257.
6. Jgdish Kumar, Yadav MP. Effect of conjunctive use of organic inorganic and bio-fertilizer on growth and yield attributes, yield and nutrient uptake in hybrid rice (*Oryza sativa* L.). Research on crop. 2008; 9(3):511-113.
7. Dutta M, Chauhan BS. Effect of nutrient management practice on the performance of upland rice in a newly developed terraced land. *Indian Agriculture*. 2010; 54(2):13-21.
8. Jackson ML. Soil chemical analysis, prentice Hall of India, Pvt. Ltd, New Delhi, 1973.
9. Lal B, Sharma GD, Gautam P, Rana R. Effect of integrated nutrient management and spacing on growth parameters, nutrient content and productivity of rice under system of rice intensification. International journal of research in biosciences. 2013; 2(3):53-59.