Original Research Article

Effect of Integrated Nutrient Management and Panchagavya spray on growth and yield of Rice (*Oryza sativa* L.)

Abstract

A field experiment entitled "Effect of Integrated Nutrient Management and Panchgavya spray on growth and yield of Rice (*Oryza sativa* L.) was conducted during *Kharif* 2021 at Crop Research Farm, Department of Agronomy, SHUATS, Prayagraj (U.P). The soil of experimental plot was sandy loam in texture, nearly neutral in soil reaction (pH 7.8), low in organic carbon (0.35%), available N (243 kg/ha), available P (20.10 kg/ha) and available K (105 kg/ha). The experiment was laid out in Randomized Block Design, with nine treatments consists of *viz*., 1 : (RDF 50% + FYM 5t/ha) +P_1 -3%, 2 : (RDF 50% + FYM 5t/ha) +P_2 - 6%, 3 : (RDF 50% + FYM 5t/ha) +P_2 - 9%, 4: (RDF 75% +FYM 5t/ha) + P_1 - 3%, 5 : (RDF 75% + FYM 5t/ha) + P_2 -6%, 6 : (RDF75% + FYM 5t/ha) + P_3- 9%, 7 : (RDF 100% +FYM 5t/ha) + P_1 -3%, 8 : (RDF 100% + FYM 5t/ha) +P_2-6%, 9 : (RDF 100% + FYM 5t/ha) + P_3 - 9% and were replicated thrice. Results obtained that there was significant increase in yield attributes *viz*., grain yield (6.28 t/ha) were recorded with the application of (RDF 100% + FYM 5t/ha) +P_2-6%. The maximum Gross return (169650.00 INR/ha), Net return (115561.00 INR/ha) and B:C ratio (2.14) is recorded in treatment with (RDF 100% + FYM 5t/ha) +P_2-6%. Therefore, it is concluded that the application of (RDF 100% + FYM 5t/ha) +P_2-6% was more productive and economically feasible.

Keywords: Rice, integrated nutrient management, FYM, panchagavya, Economics

INTRODUCTION

Rice**,** (*Oryza sativa*), edible starchy cereal grain and the grass plant (family Poaceae) by which it is produced. Roughly one-half of the world population, including virtually all of East and Southeast Asia, is wholly dependent upon rice as a staple food; 95 percent of the world's rice crop is eaten by humans.

As a cereal grain, domesticated rice is the most widely consumed staple food for over half of the world's human population especially in Asia and Africa. It is the agricultural commodity with the third-highest worldwide production, after sugarcane and maize. Since sizable portions of sugarcane and maize crops are used for purposes other than human consumption, rice is the most important food crop with regard to human nutrition and caloric intake, providing more than one-fifth of the calories consumed worldwide by humans. There are many varieties of rice and culinary preferences tend to vary regionally.

Total production of Rice during 2019-2020 is estimated at record 117.94 million tonnes. It is higher by 8.17 million tonnes than the five years average production of 109.77 million tonnes. In the 2020/2021 crop year, China produced over 148 million metric tons of milled rice, a higher volume than any other country, India came in second place with 122 metric tonnes of milled rice in that year. The highest productivity is 6710 kg/ha in china followed by Vietnam. In India West Bengal is the largest producer of rice. The area of Rice in India in the year 2022/2021 id about 45,400 thousand hectare and in the year 2021/2022 the area increased to about 47,000 thousand hectares. In India West Bengal is the largest producer of rice. Two crops of rice are raised in a year in this state. Rice is regarded as the master crop of coastal India and in few regions of eastern India.

Integrated Nutrient Management aims to use nutrients in a more rational way (yield-targeted, site-and soil specific); understanding the interrelation of different nutrients; use combinations of mineral and organic fertilizers; provide nutrients on a cropping-system/rotation basis; and use on-farm and off-farm waste through recycling. Nutrient cycling is an important component of Conservation Agriculture, in which minimum soil disturbance, intercropping, crop rotations and a permanent soil cover minimize the need for chemical fertilizers. Healthy crops are also less susceptible to pests, thus contributing to crop protection (IPM). A better application of nutrients will reduce runoff, and by this benefits the overall ecosystem, including marine areas

. Its need in modern agriculture has arisen due to: (i) high price of chemical fertilizers; (ii) imbalance in the ratio of NPK consumption; (iii) imbalance between consumption and domestic production; (iv) deterioration of soil health; (v) consumption of non-renewable energy sources by inorganic fertilizers; (vi) pollution hazards of chemical fertilizers; (viii) loss of chemical productivity; (viii) deterioration in soil physical properties; (ix) deterioration in biological activity; (x) additive effect of organic and mineral fertilizers; (xi) organic materials as a source of secondary

micronutrients; (xii) interaction benefit crops; and reduction in crop productivity **(Yaduvanshi and Gupta, 1983**). INM aims to improve soil health and sustain high level of productivity and production **(Prasad *et al*. 1995). Singh and Kumar (2014**) reported increased yield and nutrient use efficiency in rice with organics. Organic supply of nutrients at the peak period of absorption also provide micro nutrients and modify soil-physical behavior as well as increase the efficiency of applied nutrients **(Pandey *et al*. 2007**). The combined use of organic and

Production efficiencies are gained through nutrient management practices that promote combined use of mineral, organic and biological resources in a reasoned way to balance efficient use of limited/finite resources and ensure ecosystem sustainability against nutrient mining and degradation of soil and water resources.

Panchagavya is an organic product having the potential to play the role of promoting growth and providing immunity in plant system. Panchagavya consists of nine products viz. cow dung, cow urine, milk, curd, jaggery, ghee, banana, Tender coconut and water. When suitably mixed and used, these have miraculous effects. It has micro nutrients like nitrogen, phosphorus and potassium which are the major nutrients required for the growth of plants. Panchagavya also contains many vitamins, amino acids. It also contain Gibberllins and auxins which regulate the growth of plants. Panchagavya also contains microorganisms like Psuedomonas, Azotobacter, phospho bacteria which are considered to be beneficial for rice crop. Panchagavya has the capacity to restore the yield efficiency level. It can be easily prepared at the field level without any special techniques. Panchagavya, an organic source of nutrition, is an indigenous material which is used widely for agricultural and horticultural crops. Panchagavya had positive influence on beneficial microorganisms present in the soil and influence the crop growth and yield. Panchagavya is now gaining attention as an efficient organic growth promoter.

MATERIALS AND METHODS

This experiment was carried out during *Kharif* 2021 at Crop Research Farm, Department of Agronomy, NAI, SHUATS, Prayagraj, (U.P.) which is located at 25.28^{o}N latitude, 81.54^{o}E longitude and 98 m altitude above the mean sea level. This area is situated on the right side of the river Yamuna by the side of Prayagraj, Rewa road, about 5 km away from Prayagraj city. The soil of

experimental plot was sandy loam in texture, nearly neutral in soil reaction (pH 7.8), low in organic carbon (0.35%), available N (243 kg/ha), available P (20.10 kg/ha) and available K (105 kg/ha). The experiment was laid out in Randomized Block Design, with nine treatments consists of *viz*., 1 : (RDF 50% + FYM 5t/ha) +P_1 -3%, 2 : (RDF 50% + FYM 5t/ha) +P_2 - 6%, 3 : (RDF 50% + FYM 5t/ha) +P_2 - 9%, 4 : (RDF 75% +FYM 5t/ha) + P_1 - 3%, 5 : (RDF 75% + FYM 5t/ha) + P_2 - 6%, 6 : (RDF75% + FYM 5t/ha) + P_3- 9%, 7 : (RDF 100% +FYM 5t/ha) + P_1 -3%, 8 : (RDF 100% + FYM 5t/ha) +P_2-6%, 9 : (RDF 100% + FYM 5t/ha) + P_3 - 9% and were replicated thrice. Rice variety Shiats dhan 3 was taken as test crop. The crop matures in about 130-138 days. The yield potential of the crop is 6.5 t/ha. The main field was prepared by ploughing with the help of cultivator. The main field was puddled by tractor drawn puddler and later it was leveled by planker. The 21 days old seedlings were transplanted to the main field. The transplanting was done at a spacing of 20 × 10 cmAll the nutrients such as (N, P_2O_5, K_2O) were applied to the soil in form of urea, DAP and MOP respectively. The 100 % recommended dose of fertilizer is 120:60:60. FYM is incorporated into the soil after puddling and before transplanting of seedling at a recommended rate of 5 t/ha. Panchagavya spray of 3%, 6%, 9% is sprayed to the crop at an interval of 15, 30 and 45 days after transplanting. The growth parameters were recorded at periodical intervals of 20,40,60,80 DAT and at harvest stage from the randomly selected five plants in each treatment. Statistically analysis was done and mean compared at 5% probability level of significant results.

RESULTS AND DISCUSSION

Effect of Integrated Nutrient Management and Panchagavya spray on Economics of Rice

Effect of Integrated nutrient management and Panchagavya spray on yield and economics of Rice are presented in Table 1. Maximum Grain yield (6.28 t/ha), Gross returns (169650.00 INR/ha), Net returns (115561.00 INR/ha) and Benefit cost ratio (2.14) was obtained with the treatment combination of (RDF 100% + FYM 5t/ha) +P_2-6%. However the treatment combination of (RDF 100% +FYM 5t/ha) + P_1-3% were statistically at par with (RDF 100% + FYM 5t/ha) +P_2-6% with the Grain yield of (5.28 t/ha). Maximum gross returns is obtained because of the high grain yield which in turn because of the incorporation of the FYM and application of 100% recommended dose

of the fertilizer. Maximum net returns is obtained because of the high gross returns. Grain yield of Rice was significantly influenced by integrated nutrient management as well as application of inorganic fertilizer. The cost of cultivation increased with the increased application of inorganic fertilizers. The advantages of organics such as FYM and Panchagavya applied to the crop and to the soil have improved the soil health, which are not calculated in terms of money. Application of Panchagavya provides resistance to the crop against pests and diseases instead of use of chemical pesticides and reduces the cost of cultivation which in turn increases the gross returns. The higher yield with sufficient quantity of organics is due to its nature of providing balanced supply of all the essential nutrients, which balances with crop needs, uptake and thus result in significantly higher grain yield over other higher doses of the same organic source (**Ghosh, 2007).**

Table 1 Effect of Integrated Nutrient Management and Panchagavya spray on yield and economics of Rice

Treatment combinations	Grain yield (t/ha)	Cost of cultivation (INR/ha)	Gross returns (INR/ha)	Net returns (INR/ha)	B:C Ratio
1 : (RDF 50% + FYM 5t/ha) +P_1 -3%	4.35	50794	117450	66656	1.31
2 : (RDF 50% + FYM 5t/ha) +P_2 - 6%	5.13	50994	138600	87606	1.72
3 : (RDF 50% + FYM 5t/ha) +P_2 - 9%	4.97	51219	134100	82881	1.62
4 : (RDF 75% +FYM 5t/ha) + P_1 -3%	4.95	52341	133650	81309	1.55
5 : (RDF 75% + FYM 5t/ha) + P_2 -6%	5.60	52541	151200	98659	1.88
6 : (RDF75% + FYM 5t/ha) + P_3- 9%	4.90	52766	132300	79534	1.51
7 : (RDF 100% +FYM 5t/ha) + P_1 -3%	**5.80**	53889	156600	102711	1.91
8 : (RDF 100% + FYM 5t/ha) +P_2 - 6%	**6.28**	54089	**169650**	**115561**	**2.14**
9 : (RDF 100% + FYM 5t/ha) + P_3 -9%	5.20	54314	140400	86086	1.58

CONCLUSION

From the above experiment it is concluded that transplanting of Rice with the application of (RDF 100% + FYM 5t/ha) +P_2-6% has found to be more productive and remunerative. Therefore, it is recommended for farmers for receiving higher yield and economic benefits of Rice.

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