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Research Article

IMPACT OF INTEGRATED NUTRIENT MANAGEMENT ON GROWTH AND YIELD ATTRIBUTES OF RICE (*Oriza sativa*) cv. PUSA SUGANDHA-1

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Abstract: The field experiment was conducted at Research Farm, of faculty of Agriculture and Allied Industries, Rama University, Mandhana, Kanpur, U.P. during the *Kharif* season of 2019-20. The treatments comprised of 7 nutrient management T_1 (100% N through Vermicompost) T_2 (75% N through Vermicompost) T_3 (100% NPK through fertilizers), T_4 (Farmers practice N: 60, P: 30 through fertilizers + 3 tonne FYM/ha) T_5 (50% N through Vermicompost + 50% NPK through fertilizers), T_6 (75% N through Vermicompost 25% NPK through fertilizers) and T_7 Absolute control. Various periodical observations were recorded on growth parameters, yield attributing characters, and yields under different treatments. Different yield attributing characters viz. effective tillers/panicle, length of panicle, total grains/panicle, sound grains/panicle, chaffy grains/panicle were found significantly higher in T_1 treatments. The poor growth of plants under absolute control plots was observed due to more interspecies competition for utilization of available native nutrients from the soil which leads to a lesser number of effective tillers and sound grains per panicle. On the contrary chaffyness of the grains was maximum under control as compared to the rest of the organic nutrient management. Performance of Inorganic nutrient management in rice, plant height, number of effective tillers/hill, panicle length, grains per panicle and 1000 grain weight significantly higher with the application of 100% NPK through fertilizers at par with the substitution of 50% N through vermicompost + 50% NPK through fertilizers.

Keywords: *Vermicompost, Nutrient management, Tillers*

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Introduction

Indian agriculture has a serious concern about national food security including stagnation or decline in production and productivity growth rates of major crops, deterioration of soil fertility, low diversity of production systems, and increasing production costs, leaving agriculture as economically non-viable enterprises. It is due to this problem that the sustainable and eco- friendly agriculture, *viz*., organic farming became louder [1]. The impact of increased fertilizer use on crop production has been large and significant [2].

In recent years there has been an adverse effect of continuous and indiscriminate use of inorganic fertilizers on the deterioration of soil formation, soil health, and environmental pollution. Use of high analysis fertilizer in imbalance and indiscriminate manner had developed many problems of soil organic matter, increase in salinity, sodicity, soil pollutants and hazards of pests and diseases [3].

Rice is a dominant component of the Indian food security system as it is consumed as a major staple food. Organic nutrient management methods combine scientific knowledge of ecology and modern technology with habitual farming practices based on naturally occurring biological processes. Management has been considered as one of the best options for protecting the organic nutrient and sustaining soil health and productivity and is gaining a lot of importance in present-day agriculture.

INM approach is flexible and minimizes the use of chemicals but maximizes use of efficiency and improves the soil health. Change in cropping sequence with respect to the availability of resources the integrated approach of nutrient supply through inorganic and organic (FYM) has become very much promising in building soil health and quality of produce.

Using a judicious combination of chemical and organics for achieving enhanced and sustainable production by adopting integrated nutrient supply is imperative. At present scented rice varieties are mostly grown by the farmers under inorganic nutrient management but in order to produce better quality grain without deteriorating soil health and eliminating environmental pollution, the use of organic nutrients would be beneficial.

Material and Methods

The present investigation was conducted at Agricultural Research Farm, Faculty of Agriculture and Allied Industries, Rama University, Mandhana, Kanpur, U.P. during *kharif* season of 2019-20. The treatments were randomized in each replication separately as shown in the plan of layout. The details of the treatments and symbols used are as under. T_1 (100% N through vermicompost), T_2 (75% N through vermicompost), T_3 (100 % NPK through fertilizers), T_4 (Farmers practice N: 60, P:30 through fertilizers + 3 tonne FYM/ha), T_5 (50 % N though vermicompost + 50% NPK through fertilizers), T_6(75% N through vermicompost + 25% NPK through fertilizers), T_7 (Absolute control). Rice was grown by transplanting young seedlings. Two nursery beds of dimension 10.0 m x 1.0 m were prepared manually. These nursery beds were raised to a height of 5 cm by spreading the loose soils on the bed taken from both sides in length dimension of nursery bed. A 30 cm wide and 10 cm deep channel was prepared by digging the soil on both sides of the nursery bed. Then healthy seeds of rice variety were sown in nursery beds at the rate of 30 kg/ha on 21 June 2019. After this, seeds were covered with fine soil and vermicompost.

Table-1 *Effective tillers/hill of rice as influenced by nutrient management*

Treatment No.	Treatment	Effective tiller/hill
T_1	100% N though Vermicompost	8.44
T_2	75% N though Vermicompost	8.22
T_3	100 % NPK though fertilizers	9.89
T_4	Farmers practice N:60, P:30 though fertilizer + 3 tonne FYM/ha	7.33
T_5	50 % N though Vermicompost + 50 % NPK though fertilizers	9.44
T_6	75% N though Vermicompost + 25 % NPK though fertilizer	9.22
T_7	Absolute control	4.89
SEm±		0.21
CD at 5%		0.64

Table-2 *Length of panicle (cm) of rice as influenced by nutrient management*

Treatment No.	Treatment	Length of panicle (cm)
T_1	100% N though Vermicompost	26.94
T_2	75% N though Vermicompost	26.37
T_3	100 % NPK though fertilizers	30.04
T_4	Farmers practice N:60, P:30 though fertilizer + 3 tonne FYM/ha	25.69
T_5	50 % N though Vermicompost + 50 % NPK though fertilizers	28.46
T_6	75% N though Vermicompost + 25 % NPK though fertilizer	28.12
T_7	Absolute control	24.13
SEm±		0.65
CD at 5%		1.96

Table-3 *Number of grains/panicle of rice as influenced by nutrient management*

Treatment No.	Treatment	Grains/panicle
T_1	100% N though Vermicompost	71
T_2	75% N though Vermicompost	70.33
T_3	100 % NPK though fertilizers	73
T_4	Farmers practice N:60, P:30 though fertilizer + 3 tonne FYM/ha	70
T_5	50 % N though Vermicompost + 50 % NPK though fertilizers	72.33
T_6	75% N though Vermicompost + 25 % NPK though fertilizer	71.33
T_7	Absolute control	63.33
SEm±		0.94
CD at 5%		2.82

Table-4 *Filled grains/panicle of rice as influenced by nutrient management*

Treatment No.	Treatment	Filled grains/panicle
T_1	100% N though Vermicompost	59.67
T_2	75% N though Vermicompost	58.67
T_3	100 % NPK though fertilizers	63.33
T_4	Farmers practice N:60, P:30 though fertilizer + 3 tonne FYM/ha	58.33
T_5	50 % N though Vermicompost + 50 % NPK though fertilizers	62.33
T_6	75% N though Vermicompost + 25 % NPK though fertilizer	60.67
T_7	Absolute control	50.33
SEm±		1.41
CD at 5%		4.41

Table-5 *Unfilled grains/panicle of rice as influenced by nutrient management*

Treatment No.	Treatment	Unfilled grains/panicle
T_1	100% N though Vermicompost	11.33
T_2	75% N though Vermicompost	11.67
T_3	100 % NPK though fertilizers	9.67
T_4	Farmers practice N:60, P:30 though fertilizer + 3 tonne FYM/ha	12
T_5	50 % N though Vermicompost + 50 % NPK though fertilizers	10
T_6	75% N though Vermicompost + 25 % NPK though fertilizer	10.67
T_7	Absolute control	13
SEm±		0.25
CD at 5%		0.78

Table-6 *Sterility percentage of rice as influenced by nutrient management*

Treatment No.	Treatment	Sterility percentage
T_1	100% N though Vermicompost	15.98
T_2	75% N though Vermicompost	16.62
T_3	100 % NPK though fertilizers	13.2
T_4	Farmers practice N:60, P:30 though fertilizer + 3 tonne FYM/ha	17.18
T_5	50 % N though Vermicompost + 50 % NPK though fertilizers	13.84
T_6	75% N though Vermicompost + 25 % NPK though fertilizer	15.02
T_7	Absolute control	20.49
SEm±		0.36
CD at 5%		1.12

Table-7 *Grain yield (kg/ha) of rice as influence by nutrient management*

Treatment No.	Treatment	Grain yield (kg/ha)
T_1	100% N though Vermicompost	2898
T_2	75% N though Vermicompost	2506
T_3	100 % NPK though fertilizers	3233
T_4	Farmers practice N:60, P:30 though fertilizer + 3 tonne FYM/ha	1632
T_5	50 % N though Vermicompost + 50 % NPK though fertilizers	3110
T_6	75% N though Vermicompost + 25 % NPK though fertilizer	3045
T_7	Absolute control	1106
SEm±		66.36
CD at 5%		206.76

Table-8 *Straw yield (kg/ha) of rice as influenced by nutrient management*

Treatment No.	Treatment	Straw yield (kg/ha)
T_1	100% N though Vermicompost	5020
T_2	75% N though Vermicompost	4699
T_3	100 % NPK though fertilizers	5411
T_4	Farmers practice N:60, P:30 though fertilizer + 3 tonne FYM/ha	3436
T_5	50 % N though Vermicompost + 50 % NPK though fertilizers	5272
T_6	75% N though Vermicompost + 25 % NPK though fertilizer	5229
T_7	Absolute control	2544
SEm±		115.69
CD at 5%		360

Observations were recorded Number effective tillers/hill, Panicle length, Number grains/panicle, Number filled and chaffy grains/panicle, Sterility percentage, Test weight, Biological yield, Grain yield, Straw yield, Harvest index.

Result and Discussion

These results are concisely described in this chapter along with data in concerning tables. The data recorded on number of effective tillers/hill are given in [Table-1]. In T_3 100% NPK through fertilizers resulted in appreciably highest effective tillers (9.89/hill) and at par with T_5 followed by T_6 over rest of the nutrient management. Similar findings were also reported by Mhaskar *et al*. (2005) [4], Budhar and Mani (2010) [5], Hossaen *et al*. (2011) [6], and Hammad *et al*. (2011) [7]. Result presented in [Table-2] indicated that the panicle length was minimum (24.13 cm) under control and it was increased with the addition of nutrient management. Among the treatments T_3 100% NPK through fertilizers registered longer panicle length (30.04 cm) than that of T_5 (28.46 cm). These findings are in close conformity with the results of Manjunath *et al*. (2012) [8] and Shanmugam and Veeraputhran (2000) [9]. The data showed in [Table-3] the significant variations in terms of grains/panicle were also observed due to nutrient management. The number of grains/panicle was found minimum (63.33) under absolute control and maximum under T_3 100% NPK through fertilizers resulted in appreciably more number of grains/panicle (73.00). These findings are in close conformity with the results of Manjunath *et al*. (2012) and Shanmugam and Veeraputhran (2000). Data presented in [Table-4]. It is exhibited significant variations in the number of filled grains/panicle. Significantly a greater number of filled grains/panicle were noted with the application of T_3 100% NPK through fertilizer (63.33). These findings are in close conformity with the results of Manjunath *et al.* (2012) and Shanmugam and Veeraputhran (2000). In [Table-5] lowest number of unfilled grains/panicle was found (9.67) with T_3 in comparison to T_4 and T_7. These findings are in close conformity with the results of Manjunath *et al*. (2012) and Shanmugam and Veeraputhran (2000). The sterility percent noted under each treatment are presented in [Table-6].

Nutrients was not applied (T_7) had appreciably more sterility per cent (20.49) over rest of the nutrient management treatments. The sterility was least (13.20) under T_3 100% NPK through fertilizers in comparison to rest of the nutrient management treatments. It is also clear from the data that there was significant difference in grain yield due to different nutrient management given in [Table-7]. These results collaborated with the findings of Murali and Setty (2001). The yield was appreciably more under T_3 100% NPK through fertilizer (3,233kg/ha) and at par with T_5 in comparison to rest of the nutrient management. The results further indicate that addition of T_3 100% NPK through fertilizers resulted marked influenced on straw yield presented in [Table-8] and produced higher straw yield (5411 kg/ha) over rest of the treatments.

Similar results were obtained by Jing *et al*. (2009) [10], Kumar and Prasad (2010), Kumari *et al*. (2010) [11], Pooniya & Shivay (2011) [12] and Soni *et al*. (2012) [13].

Application of research: Study of nutrient management on growth and yield attributes of rice

Research Category: Nutrient Management

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Cultivar / Variety / Breed name: Rice (*Oriza sativa*) cv. Pusa Sugandha-1

Conflict of Interest: None declared

Ethical approval: This article does not contain any studies with human participants or animals performed by any of the authors.
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