Original Research Article

"Influence of organic nutrient sources on growth and yield of rice varieties (*Oryza sativa* L.) and yield validation using SPSS model"

ABSTRACT

A field experiment was conducted during Kharif 2022 at Crop Research Farm, Department of Agronomy, SHUATS, Prayagraj (U.P) to determine the "**Influence of organic nutrient sources on growth and yield of rice varities and Yield Validation Using SPSS Model"**.The treatments consisted of organic nutrient sources and rice varities. [Panchagavya 6%+Vermicompost 10t/ha,Panchagavya 3%+Vermicompost 5t/ha]. and the rice varities [RNR-15048,BPT-5204,NDR-359]. whose effect is observed in paddy. The results observed that the treatment with application of NDR-359 + vermicompost 5t/ha + panchagavya 3% recorded higher plant height, number of tillers/plant, plant dry weight, CGR,RGR and yield parameter number of panicles, number of grains/panicles, number of grains ,test weight, grin yield, stover yield and harvest index.

Keywords: organic nutreints; varities; growth; yield.

Introduction

Rice is derived from a cereal grass called Oryza Sativa, a genus in the family of Gramineae, One of the most important cereal crops in the world, it produces 35–60% of the total calories, or about each of all calories consumed by humans, and feeds half the world's population (**Tayefe *et al.,* 2014**). Nowadays, Asia accounts for more than 90% of rice production production and consumption. Nearly two billion people in Asia depend on rice approximately 60–70% of their energy requirements (**Sridhar *et al.*, 2019**). India has the largest area (43.50 m ha) among the countries which grow crops and is the second-largest producer (163.51 MT), behind China (203.14 MT), with an average productivity of 3.76 t/ha. Over 44 million hectares of land in India are used for rice production, and 109.70 million tonnes were generated just between 2016 and 2017. With a 5.98 million ha area, Uttar Pradesh produces 14.64 million tonnes of rice at a productivity of 2.447 t/ha (GOI, 2016). In hopes of achieving national food security, India must grow an additional 1.7 million tonnes of rice each year (**Dass and Chandra, 2013**). 2019 **(Singh *et al.*,**) With such a growth rate of 3 MT per year, India should produce an additional 50 MT of rice in order to satisfy 1523 million people by 2023.

In Asia, rice is a major source of calories, especially for the poor, which eat from 50 to 80 percent of the daily calories from it. In Asia, where it is a staple of culture and tradition, and over 90% of the world's rice is grown and eaten. While it is true that rice is not a tropical plant, it is believed to belong with moist, humid areas. China (32.7%), India (26.0%), Thailand (5.3%), Myanmar (4.8%), the Philippines (2.8%), Brazil (2.0%), and Japan (1.9%) are the top 10 suppliers of rice in the world (**Anonymus, 2012**). To name a few other uses, the 85% of the rice is also used in cerelac, snack foods, brewed beverages, flour, oil, syrup, and religious rituals.

Ayurveda uses the term "panchagavya" to describe a fermented product formed from five components obtained from cows, including milk, urine, dung, and bile.clarified butter and curd**.** In India, the contribution of foliar panchagavya to the production of numerous plantation crops has received considerable attention **(Selvaraj, 2003).**Often used for horticultural and agricultural crops, Panchagavya is a well-known foliar nutrition made by organic producers in Tamil Nadu **(Swaminathan *et al*., 2007).** The goal of the current study was to test the hypothesis that foliar panchagavya administration will have on various physiological parameters, yield.

Panchagavya, an organic product has potential to play the role in promoting immunity growth and providing immunity in plant system. The use of organic liquid such as panchagavya results in higher growth, yield and quality of crops. Different species of insect pests were reported to be associated with spinach in different areas of the country. Usually, the management of the pests is insecticides oriented but the problems associated with synthetic chemicals Viz., development of pest resistance objectionable pesticides residue and higher cost etc, has necessitated development of new control methods. Several plants and its products are known to be potential resources. (**Choudhary *et al.*,2014**). **Beaulah *et al*.,** (2002) concluded that the beneficial microorganisms

from panchagavya and their presence in the rhizospheres environment of the root zone influence the plant growth and crop yield.

Vermicompost has been considered as a soil additive to reduce the use of mineral fertilizers because it provides required nutrient amounts, increases cation exchange capacity and improves water holding capacity (**Tejada and Gonzaler, 2009**). Vermicompost not only increases yield of rice but can also substitute chemical fertilizer to some extent (**Sharma *et al.,* 2008; Guera, 2010**).

Vermicomposting is an effective biological process for conversion of organic wastes into a stable end product, where in microbial activity plays an essential role. Earthworms are mainly responsible for fragmentation and conditioning of the substrate, increasing surface area for microbial activity and significantly altering biological activity of the process (**Domynguez 2004**) Vermicompost is homogenous, with desirable aesthetics and possess plant growth hormones and high levels of soil enzymes, while enhancing microbial population and tending to hold more nutrients over longer periods without adverse impacts on the environment. In India, about 320 million tonnes of agricultural wastes are generated annually. The vermicompost is a rich source of beneficial microorganisms and nutrients (**Pant 2008**). Increase in crop yield, soil nutrients status and nutrients uptake was reported due to application of vermicompost.

MATERIALS AND METHODS:

The experiment was conducted during Kharif season of 2022 at Crop Research Farm, Department of Agronomy, SHUATS, Prayagraj (U.P). The soil of the field constituting a part of central gangetic alluvium is neutral and deep. The soil of the experimental field was sandy loam in texture, nearly neutral in soil reaction (pH 7.4),low level of organic carbon (0.51%), available N (78.9 kg/ha), available P (32.88 kg/ha) and available K (385.10 kg/ha). Nutrient sources were Panchagavya and vermicompost to fulfilled with Nitrogen, Phosphous, Potassium respectively. The treatment were RNR -15048,panchagavya - 6% + RNR-15048,3 - vermicompost – (5t/ha) + panchagavya – 3% + RNR -15048, 4 - vermicompost - (10t/ha) + BPT – 5204, 5 - panchagavya - 6% + BPT – 5204, 6 - vermicompost – (5t/ha) + panchagavya – 3% +BPT – 5204. 7 - vermicompost – (10t/ha) + NDR – 359. 8 - panchagavya - 6% + NDR – 359. 9 - vermicompost – (5t/ha) + panchagavya – 3% + NDR – 359+ Vermicompost 10t/ha + Panchagavya 6%. The experiment was laid out in Randomized Block Design, with 10 treatments replicated thrice.The observations were recorded for plant height, plant dry weight, Crop growth rate ($g/m^2/day$), Relative growth rate (g/g/day), Number of earhead, Number of seed, Number of fingers/plant, test weight (g), seed yield (t/ha), strover yield (t/ha) and harvest index (%). The collected data was subjected to statistical analysis by analysis of variance (ANOVA)was used statically to examine these variables using SPSS (Statistical Product and Service Solutions). The correlation coefficient has been obtained from the sum of weather parameters and the sum product of various weather parameters. The dependant variable (yield) and the independent variables (time, sum, and sum products for various meteorological conditions) were regressed many times. The regression formula was used to create the regression equation.

3. RESULTS AND DISSCUSSION

Growth parameters

Plant height :

The data revealed that significant and higher plant height (112.6 cm) was observed in treatment T_9 [NDR-359 + Vermicompost(5t/ha) + Panchagavya 3%], and there was no statiscally at par value.

Increased plant height of crops with vermicompost application had also been reported by **Thanunathan *et al*., (2001).**

Number of Tillers/plant :

The data revealed that treatment T_9 [NDR-359 + Vermicompost(5t/ha) + Panchagavya 3%] recorded significant and maximum number of tillers/hill (12.7) and there was no statiscally at par value.

An increase in the number of productive tillers could be attributed to the improvement in soil physical and chemical properties and better availability of nutrients by the addition of fertilizer,vermicompost.Similar findings were also reported by **Kamakar *et al*., (2010)** and **Murgan** and **Murugaianyan (2013)** to increase the numbers of effective tillers.

Plant dry weight (g):

Results revealed that treatment T_9 [NDR-359 + Vermicompost(5t/ha) + Panchagavya 3%] recorded siginificantly higher plant dry weight (52.3 g).which was superior to all the treatment and treatment T_7 with the application of [NDR-359 + Vermicompost(10t/ha)].

Higher Dry matter accumulation is because of the better nutrient availability which increased plant height and produced more number of shoots Organic manure (FYM) and inorganic fertilizers combindly influenced the growth attributes. Treatment combination of (RDF 100% + FYM 5t/ha) +P_2-6% showed the highest growth characteristics because of the correct application of 100% recommended dose of fertilizers with FYM combined with the application of Panchagavya 6%which imparts immunity to the crop against pests and diseases.. The lowest growth is recorded in the treatment combination of (RDF 50% + FYM 5t/ha) +P_1- 3% because of the less application of recommended dose of fertilizer which indirectly reduces the availability of nutrients to the crop. The favorable effect of integrated nutrient management through both inorganic fertilizers and organic manures on higher crop growth and yield was also reported by **Kumaretal.(2008).**

Crop Growth Rate (g/m^2/day):

The data recorded that during 80-100DAS that treatment T_9 [ZnO (900 ppm)+ Boron (0.5%)] was highest crop growth rate (26.44 g/m^2/day). which was superior to all the treatment and treatment T_7 with the application of [BPT-5204 + Panchagavya 6%]

Releative Growth Rate (g/g/day):

The data revealed that during 80-100,treatment T_8 [NDR-359 + Panchagavya 6%], and there was no statiscally at par value.

Yield parameter:

Number of effective tillers/hill:

The data showed that treatment T_9 [NDR-359 + Vermicompost(5t/ha) + Panchagavya 3%] recorded significantly number of effective tillers/hill (12.7) and there was no statiscally at par value.

The number of panicle (Productive tillers) per hill, panicle length, Total number of grains and number of filled grains per panicle and thousand grains weight were recorded at harvest from the ten randomly tagged plants in each plot (**Hemalatha *et al*., 2000**).

Number of panicle/hill:

The data showed that treatment T_9 [NDR-359 + Vermicompost(5t/ha) + Panchagavya 3%] recorded significantly higher number of panicle/hill (7.6) and there were no stastically at par value.

Number of grain/panicle :

The data recorded that significant and higher number of grains/panicle (114.7), and there were no stastically at par value.

Test weight (g):

Significant and maximum test weight (21.8) was recorded in treatment T_9[NDR-359 + Vermicompost(5t/ha) + Panchagavya 3%]. However, treatment T_7 [NDR-359 + Panchagavya 6%] was stastically at par with the treatment T_9 [NDR-359 + Vermicompost(5t/ha) + Panchagavya 3%].

Grain yield(t/ha):

Significant and higher grain yield (5.64 t/ha) was obtained in treatment T_9 [NDR-359 + Vermicompost(5t/ha) + Panchagavya 3%], and there were no stastically at par value.

Stover yield (t/ha):

Significant and higher stover yield (7.34 t/ha) was obtained in treatment T_9 [NDR-359 + Vermicompost(5t/ha) + Panchagavya 3%], and there were no stastically at par value.

Harvest index (%):

Significant and higher harvest index (41.63 %) was obtained in treatment T_9 [NDR-359 + Vermicompost(5t/ha) + Panchagavya 3%], which was superior to all the treatment and treatment T_6 with the application of [BPT-5204 + Vermicompost (5 t/ha)+ Panchagavya 3%], T_3 application of RNR-15048+Vermicompost(5t/ha) + Panchagavya 3%.

The higher increase in the yield has been reported to be associated with the release of macro and micro nutrients during the course of microbial decomposition. Organic matter also functions as source of energy for soil micro flora which brings about the transformation of other nutrients held in soil or applied through other means, in a form that is readily utilized by growing plants which helped in increase of seed yield. The results were in accordance with **Jadhav et al. (2011)**. The seed yield increased due to the application of panchagavya might be due to it contains smaller amounts of plant growth regulators like IAA, GA and it also contains many nutrients and the foliar application helped plant to utilize all these nutrients efficiently and helped in increase in yield attributes which eventually helped in increase in seed yield. The results were found to be similar with **Vimalendran and Wahab (2013).**

This positive effect might be dueto the fact that nitrogen is well known for its role in development and growth of plant and in various vitally important metabolic processes in the plant, the positive results of vermicompost application helped in increase of plant growth which led to higher yield attributes. The similarfindings were found by **Singh *et al*., (2017).**

The maximum grain and straw yield was due to marked improvement in dry matter accumulation, yield attributes and greater nutrient content and their uptake by rice crop. These findings are in direct conformity with that of **Barik *et al*., (2008).**

Table 1. Influences of Organic nutrient sources and growth attributes of rice varieties.

		100 DAT			80-100 DAT	
Sl No	**Treatment**	**Plant height (cm)**	**Number of tillers/hill**	**Dry weight**	**CGR ($g/m^2/day$)**	**RGR (g/g/day)**
1	RNR-15048 + Vermicompost 10(t/ha)	**108.5**	**10.8**	**50.0**	**25.93**	**0.012**
2	RNR-15048 + Panchagavya 6%	**107.4**	**10.4**	**49.3**	**25.65**	**0.012**
3	RNR-15048+Vermicompost(5t/ha) + Panchagavya 3%	**111.2**	**11.8**	**51.1**	**24.22**	**0.011**
4	BPT-5204 + Vermicompost 10(t/ha)	**107.9**	**10.5**	**49.7**	**25.89**	**0.012**
5	BPT-5204 + Panchagavya 6%	**105.2**	**10.3**	**49.5**	**26.44**	**0.012**
6	BPT-5204 + Vermicompost(5t/ha) + Panchagavya 3%	**110.5**	**11.5**	**50.7**	**26.20**	**0.011**
7	NDR-359 + Vermicompost 10(t/ha)	**111.8**	**12.1**	**51.9**	**25.47**	**0.011**
8	NDR-359 + Panchagavya 6%	**109.7**	**11.2**	**50.6**	**26.44**	**0.013**
9	NDR-359 + Vermicompost(5t/ha) + Panchagavya 3%	**112.6**	**12.7**	**52.3**	**22.78**	**0.009**
	F test	**S**	**S**	**S**	**S**	**S**
	SEm(±)	**0.20**	**0.13**	**0.12**	**0.47**	**0.0003**
	CD (P=0.05)	**0.61**	**0.39**	**0.37**	**1.41**	**0.009**

Table 2. Influences of Organic nutrient sources and yield attributes of rice varieties

SL. NO	TREATMENTS	NO. Of effective tillers/hill	No.of grains/panicle	No.of panicles/ hill	Test weight (g)	Grain yield (t/ha)	Stover yield (t/ha)	Harvest index(%)
1	RNR-15048 + Vermicompost 10(t/ha)	10.8	105.0	6.7	16.2	4.40	6.40	39.84
2	RNR-15048 + Panchagavya 6%	10.4	111.0	7.2	14.7	3.99	5.90	40.15
3	RNR-15048+Vermicompost(5t/ha) + Panchagavya 3%	11.8	104.7	7.4	18.3	4.94	6.93	41.55
4	BPT-5204 + Vermicompost 10(t/ha)	10.5	110.7	6.9	15.9	4.15	6.18	40.19
5	BPT-5204 + Panchagavya 6%	10.3	101.3	7.3	15.1	3.82	5.70	40.27
6	BPT-5204 + Vermicompost(5t/ha) + Panchagavya 3%	11.5	104.3	7.4	17.4	4.77	6.84	40.97
7	NDR-359 + Vermicompost 10(t/ha)	12.1	105.3	6.6	21.3	5.14	7.10	37.86
8	NDR-359 + Panchagavya 6%	11.2	98.0	7.1	19.7	4.67	6.56	41.60
9	NDR-359 + Vermicompost(5t/ha) + Panchagavya 3%	12.7	114.7	7.6	21.8	5.64	7.34	41.63
	F test	S	S	S	S	S	S	S
	SEm(±)	0.13	1.24	0.08	0.21	0.09	0.07	0.51
	CD (P=0.05)	0.39	3.70	0.24	0.63	0.26	0.20	1.23

CONCLUSION

Based on the above findings it can be concuded that application of NDR-359 Vermicompost 5 (t/ha) and Panchagavya 3%, has performed better in growth parameters and yield attributes of rice varities RNR-15048 and also proven profitable. Since the findings are based on one season, further trails are needed to confirm the results.

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