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Effect of Nitrogen, Phosphorous, Potassium (NPK) Levels and Spacing on Growth and Yield of Rice (*Oryza sativa* L.)

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A B S T R A C T

The field experiment was conducted in *Khairf* 2022 at the Crop Research Farm of the Department of Agronomy, SHUATS, Prayagraj (U.P.). A sandy loam texture, a pH of 7.1 that was directly neutral, a low quantity of organic carbon (0.36%), and poor availability of the nutrients n, p, and k (171.48 kg ha^{-1}, 15.2 kg ha^{-1}, and 232.5 kg ha^{-1} respectively) were every feature of the soil in the experimental plot. Over the course of a one-year trial, nine treatments including a control were evaluated. Each was reproduced three times. The findings proved that application of NPK 120:60:60 $Kgha^{-1}$ + 25 × 10 cm was recorded significantly higher plant height (105.00 cm), Number of tillers/plant (18.90), Plant dry weight (38.99 g/plant), Panicles/hills (14.00), grains/Panicle (195.00), Test weight (18.32g), Panicle length (30.11), Grain yield (5.96 t ha^{-1}), Straw yield (11.12 t ha^{-1}), Harvest index (44.67%).

Introduction

The major cereal food crop in the world and the main source of energy for more than half the population is rice. Poaceae and Poaceae are the genera to which rice belongs. Only two of the species — *Oryza sativa* and *O. glaberrima* — are grown in cultivation. The prince of cereals, rice (*Oryza sativa* L.), is the most significant food crop not only in India but also globally. For a typical human diet, rice is a great source of both carbohydrates and protein. More than two thirds of the world's population eats it as a daily staple. For Indians, the phrase "rice is life" is most relevant. Since millions of rural Indians depend on this crop for their livelihoods and the country's overall food security. It can be grown in a range of environments, including those below sea level (Kerala), at elevations of around 2000 m (Himalayan region), and between 80 degrees and 320 metres north of the equator (Kashmir). The hybrid is superior to the parent according to heterosis. In Pakistan, phosphate deficiency is common in most soils, making phosphate fertiliser application essential for agricultural development. Flowering and seed production are stimulated by phosphorus. The

weight of 1000 grains has a direct bearing on its insufficiency. Potassium (K+) is essential for the biochemical processes that occur in plants, including the activation of several enzymes, enhancement of protein, carbohydrate, and fat concentrations, and development of drought, frost, storage, insect, and disease resistance. Due to the crucial role that it performs. The efficacy of other nutrients has been decreased as a result of the large depletion of soil K reserves brought on by increased cultivation intensity and the development of high-yielding, fertilizer responsive plants. In order to boost wheat production, fertilizer technology that uses NPK in the right combinations is required.

The number of fertile shoots is significantly influenced by different row spacing. 25 to 30 cm is a typical row spacing. Plants produce substantially more seeds per head than with spraying because of the larger spacing. This is probably due to the fact that plants compete less with one another for light, nutrients, and growth and development-related space the more widely spaced the rows are is not. Higher yields arise from greater photosynthesis occurring at the source before being transferred to the sink (Garbe *et al*., 2013). As a result, there may be fierce competition for nutrients, light, and space, which would explain why closer spacing produced fewer seeds per spike. related to weed and rice inter- and intra-specific competition (Mohaddesi *et al.,* 2011). Dakshina Murthy (2015) Though the gross returns, net returns and rupee per rupee invested were increased progressively with incremental doses of N, the increase was statistically measurable. Paiman *et al.*, (2021) revealed that the application of NPK Mutiara fertilizer can increase the production of dry grain weight per hectare. Nutrient uptake to the source and ultimately to greater grain yield (Zhimomi, 2021).

Materials and Methods

At the Department of Agronomy, SHUATS, Prayagraj (U.P.), Crop Research Farm, the field experiment was conducted out during *Khairf* 2022. Nine treatments, including a control, were tested in the experiment, and each was replicated, thrice T1:NPK60:20:20Kgha^{-1}+20×10cm,
T2:NPK60:20:20Kgha^{-1}+25×10cm,
T3:NPK60:20:20Kgha^{-1}+30×10cm,
T4:NPK90:40:40Kgha^{-1}+20×10cm,
T5:NPK90:40:40Kgha^{-1}+25×10cm,
T6:NPK90:40:40Kgha^{-1}+30×10cm,
T7:NPK120:60:60Kgha^{-1}+20×10cm,
T8:NPK120:60:60kgha^{-1}+25×10cm,
T9:NPK120:60:60Kgha^{-1}+30×10cm, T10:Control are used . The results showed that application of NPK 120:60:60 Kg ha^{-1} + 25 × 10 cm.

Results and Discussion

Pre - harvest Parameters

Despite a numerical increase in plant height being seen in a dose-dependent way, the analysis of the data reveals that the treatment of various amounts of nitrogen, phosphorus, and potassium had no appreciable impact on plant height as measured at (i.e., 60 DAS). When NPK 120:60:60 Kg ha^{-1}+ 25 10 cm was treated, the highest plant height was measured at 60 DAS (61.70 cm), whereas the lowest plant height was measured with the treatment Control (52.00 cm), and NPK 120:60:60 Kg ha $^{-1}$ + 30 10 cm (59.40 cm) was statistically equivalent to Treatment T8., there was a significant difference among the treatments.

The application of NPK 120:60:60kg ha^{-1} + 25 10 cm resulted in the largest number of tillers per plant (14.30), whereas the treatment Control resulted in the lowest number (10.00), and NPK 120:60:60kg ha^{-1} + 30 10 cm (14.00) was statistically equivalent to Treatment T8.

Although there was a substantial variance between the treatments at 60 DAS, Treatment T8 and NPK 120:60:60 kg ha^{-1} + 30 10 cm (19.36 gram) were statistically equal. The highest plant dry weight (19.43 gm) was recorded with the application of NPK 120:60:60 kg ha^{-1}+ 25 10 cm, and the lowest plant dry weight (17.00 gm) was recorded with the treatment Control.

Table.1 Influence of levels of Nitrogen, Phosphorous, Potassium (NPK) on growth and Yield attributes and their combination on growth and yield of Rice at 60 DAS.

Treatments	Plant Height	Number of tillers/plants	Dry weight	Number of panicles/hills	Number of grains/panicles	Test weight(g)	Grain yield(t ha^{-1})	Straw yield(t ha^{-1})
T1	55.80	10.20	18.06	10.00	175.00	13.30	3.60	**5.60**
T2	54.80	11.60	17.90	11.00	182.00	14.00	3.80	**5.69**
T3	54.00	11.90	17.86	10.00	171.00	14.19	2.71	**5.49**
T4	57.60	12.50	18.78	8.00	180.00	16.08	3.83	**7.64**
T5	57.20	12.80	18.35	11.00	181.00	16.43	4.39	**7.14**
T6	56.60	13.20	18.17	10.00	183.00	15.16	3.10	**6.23**
T7	59.40	13.50	19.36	13.00	192.00	17.04	5.65	**10.57**
T8	61.70	14.30	19.43	14.00	195.00	18.32	5.96	**11.12**
T9	58.10	14.00	18.78	11.00	187.00	18.00	4.30	**8.33**
T10 (Control)	52.00	10.00	17.00	13.00	189.00	17.78	5.47	**10.08**
F– Test	S	S	S	S	S	S	S	**S**
S.Em(+)	0.97	0.17	0.31	0.15	2.25	0.17	0.05	**154.0**
CD(p=0.05)	**2.89**	**0.52**	**0.92**	**0.46**	**6.70**	**0.51**	**0.17**	**457.6**

Post - harvest Parameters

Significantly, the highest number of panicles/hills (14.00), highest number of grains/hills (195.00), and highest test weight (18.32) were all reported with the application of NPK 120:60:60 kg ha^{-1} + 25 10 cm. Significantly, the treatment of applying NPK 120:60:60 kg ha^{-1}+ 25 10 cm resulted in the highest grain production (5.96 t ha^{-1}) and straw yield (18.80 t ha^{-1}) of all the treatments**.**

The largest plant is 15 x 20 cm tall (101.36 cm), while the smallest is 15 x 15 cm tall (98.07 cm). The most transplanted plants per strain were found in hills with three plants, followed by hills with two and one seedlings. For flag leaf areas, which Pokerel (2018) found to not significantly correlate with distance, similar results were seen.

The number of sprouts significantly improved between 6 and 8 weeks of therapy, but not significantly. The treatment intervals of 30 x 30 and 15 x 15, 25 x 25 and 15 x 15, and 15 x 15 and 20 x 20 all showed substantial change at week 8. Significant improvements were seen at week 12 for all treatments, with the exception of 20 x 20 and 25 x 25.

Differences between 15x15 and 30x30, 15x15 and 25x25, and 30x30 and 20x20 became apparent at week 14 (Melie Feyem, 2021). Again in 2018. At a distance of 20 x 20 cm, the number of packing particles was found to be highest, averaging 89.4.

The number of packed kernels per panicle that were seen to be at their peak was three seedlings/hills (87.57), which is statistically more than one seedling/hill (77.11).

This outcome demonstrated that the spikelet fertility rate peaked in in 20 x 20cm spacing (81.29) which is statistically superior than others two spacing. It is concluded that application of NPK (120:60:60 kg/ha) and spacing of 25 × 10 cm (Treatment 8) in Rice was recorded higher growth and yield as compared to other treatments.

References

Dakshina Murthy K. M., A. Upendra Rao, D. Vijay and T. V. Sridhar (2015) Effect of levels of nitrogen, phosphorus and potassium on performance of rice; Indian Journal of Agricultural Research., 49 (1): 83-87. https://doi.org/10.5958/0976-058X.2015.00012.8

Garbe A A, Mahmoud B A, Adamu Y, Ibrahim U (2013) Effect of variety, seed rate and row spacing on the growth and yield of rice in Bauchi, Nigeria. African J Food Agric Nut Dev 13(4):8155–8166. https://doi.org/10.4314/AJFAND.V13I4

Melie Feyem Marie-Noel, Bell Martin Joseph *et al.*, (2021) Effect of Plant Spacing on the Growth and Yield of Rainfed Rice (*Oryza sativa*) in the Bimodal Rain Forest Zone of Cameroon, Vol. 7, Issue. 2: 48-59. https://doi.org/10.32861/jac.72.48.59

Mohaddesi A, Abbasian A, Bakhshipour S, Aminpanah H (2011) Effect of different levels of nitrogen and plant spacing on yield, yield com-ponents and physiological indices in high yield rice. Amer-EurJAgric Environ 10:893–900.

Paiman, Ardiyanta, C. Tri Kusumastuti, Sri Gunawan and Fani Ardiani (2021). Maximizing the Rice Yield (*Oryza sativa* L.) using NPK Fertilizer, The Open Agriculture Journal:1874-3315/21 https://doi.org/10.2174/1874331502115010033

Pokharel, L P Amgain, B Sapkota, A Khanal, T B Gurung (2018). Effect of Spacing and Number of Seedling Hill-1 on Grain Yield andother Agronomic Traits of Hybrid Rice (U.S. 312) on Late Transplantation. JOJ Material Sci. 2018; 5(1): 555652. https://doi.org/10.19080/JOJMS.2018.04.555652

Zhimomi T., L. Tzudir, P. R. K. Reddy and Shivani Kumari (2021) Effect of Spacing and Age of Seedling on Yield of Rice under System of Rice Intensification; *Int.J.Curr.Microbiol.App.Sci* 10(02): 763-769. https://doi.org/10.20546/ijcmas.2021.1002.091

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