

Evaluation of Rice under Agro-climatic Zones of Prayagraj

ABSTRACT

A field experiment was conducted at Crop Research Farm, Naini Agriculture Institute, Department of Agronomy, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj during *Kharif*, 2022 on sandy loamy soil. The experiment was laid out in Randomized Block Design, Replicated thrice, consisting of ten treatments *i.e.*, R-24, R-40, R-48, R-52, R-77, R-107, R-111, R-120, R-127, R-145. The field experiment result revealed that R-48 has significantly increased the growth parameters *viz.*, Plant height (111.25 cm), Number of tillers (14.50), Plant dry weight (38.43 g/plant), Tillers/m² (338.65), Panicle length (29.60 cm), Grain yield (5.16 t/ha) and Straw yield (13.31 t/ha). Maximum gross return (₹116264 /ha), net return (₹67218/ha), and B:C ratio (1.37) was also recorded in R-48.

Keywords: *Hybrid, Rice, Growth, Yield, Kharif, U.P.*

1. Introduction:

“Rice (*Oryza sativa* L.) Rice is one of the major staple cereals with more than 3.5 billion people depending on rice for more than 20 % of their daily calorie intake (IRRI, Africa Rice and CIAT 2010). is the most crucial cereal food crop of India, which occupies about 24% of gross cropped area of the country. It contributes 42% of total food grain production and 45% of total cereal production of the country. China and India are major rice growing countries in the world. **Krishnakumar *et al.***, (2005) have reported that in India, rice is cultivated on an area of 42.2 million ha with a production of 110.9 million tons of rice, while China produces 187.45 million tons of rice on the area of 33.1 million ha. India has a long history of rice cultivation and stands first in rice area and second in rice production, after China (**Yadav *et al.***, 2010).

The genetic classification of rice plant belongs to the genus *Oryza* of family *Graminae* (*Poaceae*). The *Oryza* genus is divided into four species complexes: *O. sativa*, *O. officinalis*, *O. ridley* and *O. granulata*. *Indica* are grown throughout the tropical and sub-tropical region, *Indica* rice are grown in around 90% of world rice area and Japonica varieties are grown throughout the temperate zone and *Javanica* are grown mainly in the part of Indonesia lines.

India is major rice growing country in world with an area of 43.79 million hectares, having production 112.91 million tonnes and productivity of 2.572 t/ha (**Directorate of Economics and Statistics 2017-2018**). In Uttar Pradesh 5.9 million ha and production 13.27 million tonnes with an average productivity of 2447 kg/ha and production of 14.63 million tonnes (**Agriculture Statistics 2016**). It is estimated that the rice production must increase by 114 million tons by 2035, but farmers must achieve it under significant threats from climate change (Suzanne et al. 2012) coupled with decreasing amount of available agricultural land, labour, and water for agriculture and increased costs of all inputs. Increasing global food production with minimal adverse impact on resources and the environment is the greatest challenge for food security (Ladha et al. 2015)

2. MATERIALS AND METHODS:

This experiment was carried out during kharif season 2022 at Crop Research Farm, Department of Agronomy, Naini Agriculture Institute, Sam Higginbottom University of Agriculture Technology and Sciences, Prayagraj, (U.P.) which is located at 25° 28' 42" N latitude, 81° 50' 56" 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. Organic carbon (0.87%), available Nitrogen (225 kg/ha), Phosphorus (41.8 kg/ha) and Potassium (261.2 kg/ha). The climate of the region is semi-arid subtropical. To reduce crop-weed competition one hand weeding was carried out at 35 days after sowing. Two irrigations were provided at 40 days interval. The observations pertaining to growth attributes were recorded using standard procedure at 20 days intervals, and presented at 100 DAS. Yield parameters were observed on the day of harvest, 23rd November, 2022. All the attributes were recorded and analyzed statistically by using appropriate analysis of Variance adopting Gomez and Gomez (1984).

3. Experimental design

The experiment was conducted in Randomized block design consisting of 10 hybrids *i.e.*, from R-24 to R-145 with 3 replications and was allocated randomly in each replication.

4. RESULT AND DISSCUSSION:

4.1 Growth parameters

4.1.1 Plant height (cm)

At 100 DAS the significantly and higher plant height was observed in R- 48(111.25 cm). However, R-24 (108.34 cm) R-77(108.24 cm) and R-127 (110.28 cm) were statistically at par with R-305. Genetic makeup of the variety is a huge contributing factor which have also been reported by Haqueet al. (2015). Increase in plant height may be due to synchronized availability of essential

plants nutrients to the crop especially nitrogen for a longer period during its growth stages. The result conformed with Deshpande and Devasenpathy, 2011. Also, reason for maximum plant height might be due to more favorable weather condition associated and was criticized by the higher growing degree days and hydrothermal units gained in these hybrids was found by Bahureet al. (2019)

4.1.2 Numbers of tillers/hill

At 100 DAT the highest number of tillers was observed in R-48 (14.50). However, R-24 (13.17) and R-40 (13.30) were statistically at par with R-305. The significant differences could be due to the variation in genetic make-up of the high yielding varieties that might be influenced by heredity. A comparative study of the performance of rice hybrids exhibited that R-305 recorded significantly higher tillers/hill. The significant differences could be due to the variation in genetic make-up of the high yielding varieties that might be influenced by heredity. This was consistent with Chowdhery et al. (1993).

4.1.3 Plant dry Weight (g/plant)

At 100 DAT the highest dry weight was observed in R-48 (38.43 g/plant). However, R-107 (37.44 g/plant), were statistically at par with R-305. The probable reason for maximum dry matter accumulation depends upon the photosynthesis and respiration rate, which finally increases the plant growth with respect to increased plant height, leaf area and tillers/hill etc. Thus, the treatment which attained maximum growth, also accumulated higher dry matter similar result have also been reported by Kumar (2016). The other reason of high dry matter accumulation might be due to the significant increase in morphological parameters which responsible for the photosynthetic capacity of the plant thereby increasing the straw yield. The result conformed with Bozorgiet al.(2011)

4.2 Yield parameters:

4.2.1 Number of Tillers/meter²

The highest tillers/m² was observed in R-48 (338.65 tillers/m²). However, R-40 (320.63 tillers/m²), R-120 (323.74 tillers/m²) was statistically at par with R-48. The probable reason for high yielding varieties have high tillering capacity. Similar findings are also reported by Yadav et al. (2004). Wang et al. (2016) reported that the unequal distribution of photo- synthetically active radiation (PAR) was the source of heterogeneity in individual tiller yields, in that early emerging superior tillers pre-empted the uppermost light source, and shaded the late emerging tillers under limited light conditions.

4.2.2 Panicle Length

R-305 recorded significantly higher panicle length/hill (29.60 cm). However, R-40 (28.23cm), R-107 (29.12 cm) and R-111(27.59 cm) were statistically at par with R- 48. The nitrogen level exerted

significant effect of on panicle length in hybrid rice. Thus, in the study had significantly produced the longest panicle among the hybrids under experiment. The significant differences in panicle length among the hybrid rice varieties could be attributed to their genetic make-up. The results confirm the findings of Rahman et al. (2013).

4.2.3 Grain yield (t/ha)

The data showed the significantly highest grain yield was observed in R-48 (5.16 t/ha). However, R-40 (4.73 t/ha) and R-77 (4.85 t/ha) were statistically at par with R-48. The higher grain yield/hill under variety might be due to the optimum utilization of nutrient. The hybrids of short duration high yielding have the potential to give the maximum grain yield then rest of the varieties. The other reason of the high yield of variety is due to the better growth attribute resulting to produce higher grain yield. Similar findings were reported by Ranjitha et al. (2013)

4.2.4 Straw yield (t/ha)

The data showed the significantly highest straw yield was observed in R-48 (13.31 t/ha). However, R-145 (12.25) were statistically at par with R-48. According to the findings by Padmavathi, 1997 it shows that the capability of hybrid rice to utilize more nitrogen through the expression of better growth brought by the beneficial effect on nutrient uptake and physiological growth increase the straw yield.

Economics:

The result showed that [Table 3] the maximum gross return (116264 INR/ha), net return (67218 INR/ha) and B:C ratio (1.37) was recorded in R-48 as compared to other Hybrids.

5. CONCLUSION:

The concluded experiment showed that hybrid R-48 was found to be best for obtaining maximum grain yield. It also fetched the maximum gross return, net return and B:C ratio as compared to other hybrids. Since the findings are based on the research done in one season. Further trials are needed to conform more precise results. Hence hybrid R-48 can be recommended to farmers after further trails.

Table 1. Field evaluation of different varieties on growth attributes of Rice Hybrids.

S. No	Hybrids	Growth parameters		
		Plant Height (cm)	Tillers/hill (No.)	Dry weight (g/plant)
1.	R-24	108.34	13.17	33.36
2.	R-40	110.73	13.30	32.69
3.	R-48	104.97	14.50	38.43
4.	R-52	103.68	10.97	33.98
5.	R-77	108.24	12.34	33.76
6.	R-107	111.25	10.43	37.44
7.	R-111	107.30	11.70	35.45
8.	R-120	104.20	10.50	34.57
9.	R-127	110.28	14.30	35.21
10.	R-145	103.20	11.97	32.93
	F-test	S	S	S
	SEm±	1.35	0.47	0.78
	CD (p=0.05)	4.01	1.39	2.34

Table 2. Field evaluation of different varieties on yield attributes of Rice Hybrids.

S. No.	Hybrids	Growth Parameter			
		Tillers/m ²	Panicle length (cm)	Grain yield (t/ha)	Straw yield (t/ha)
1.	R-24	273.81	25.28	3.14	9.46
2.	R-40	320.63	28.23	4.73	10.59
3.	R-48	338.65	29.60	5.16	13.31
4.	R-52	280.22	24.99	3.66	8.83
5.	R-77	254.22	26.29	4.85	10.17
6.	R-107	307.43	29.12	3.47	8.34
7.	R-111	308.88	27.59	3.64	9.84
8.	R-120	323.74	25.43	2.43	7.10
9.	R-127	246.36	23.20	3.37	9.98
10.	R-145	255.43	20.20	2.90	12.25
	F-test	S	S	S	S
	SEm±	9.89	0.76	0.19	0.53
	CD (p=0.05)	29.40	2.27	0.59	1.58

Table 3. Field evaluation of different varieties on Economics of Rice Hybrids

S. No.	Hybrids	Economics			
		Cost of cultivation (INR/ha)	Gross return (INR/ha)	Net return (INR/ha)	B:C ratio
1	R-24	49046	71444	22398	0.45
2	R-40	49046	106081	57035	1.16
3	R-48	49046	116264	67218	1.37
4	R-52	49046	82,222	33176	0.67
5	R-77	49046	108343	59297	1.20
6	R-107	49046	77941	28895	0.58
7	R-111	49046	82196	33150	0.67
8	R-120	49046	55085	6039	0.12
9	R-127	49046	68463	19418	0.39
10	R-145	49046	107250	58204	1.18

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