Original Research Article

EVALUATION OF RICE (*Oryza sativa*) HYBRIDS 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 using the rice hybrid cultivars: R-24, R-40, R-48, R-52, R-77, R-107, R-111, R-120, R-127, R-145. The field experiment results 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) and yield attributes as Number Tillers/m^2 (338.65), Panicle length (29.60 cm), Grain yield (5.16 t/ha) and Straw yield (13.31 t/ha). Also maximum gross return (₹116264 /ha), net return (₹67218/ha), and benefit cost ratio (1.37). Therefore, the rice hybrid R-48 would be able recommended to farmers after further trails.

Keywords: *Rice, Hybrid, Growth, Yield, Kharif, Summer, Uttar Pradesh*

1. INTRODUCTION

The rice plant belongs to the genus *Oryza* L., of family Poaceae (Graminae). The *Oryza* genus contains four species complexes: *O. sativa* L., *O. officinalis* Wall., O. *ridley* Hook. *f*., and the species *O. granulata* Nees & Arn. ex G. Watt There are three *Oryza sativa* types: Indica, Japonica and Javanica. The Indica rice type (*O. sativa* subsp. *indica* Shig. Kato) is grown throughout the tropical and sub-tropical region, The Indica rice is grown in around 90% of world rice area. The Japonica rice type (*O. sativa* subsp. *japonica* Shig. Kato) is grown throughout the temperate zone. The Javanica rice type is the name given to *O. sativa* subsp. *japonica* growing mainly in the part of Indonesia.

(IRRI, Africa Rice and CIAT, 2010) stated that 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 It 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 42.2 million hectares with a production of 110.9 million tons, while China produces 187.45 million tons of rice on the area of 33.1 million hectares. 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).**

It is estimated that the rice production must increase by 114 million tons by 2035, but farmers must achieveit under significant threats from climate change (**Suzanne et al., 2012)** , 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 thegreatest 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.), India, which is located at 25^0 28' 42" N latitude, 81^0 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. Theclimate of the region is semi-arid subtropical. The experimental field had a sandy loam texture??, pH……?? a level of organic carbon (0.87%), available Nitrogen (225 kg/ha), Phosphorus (41.8 kg/ha) and Potassium (261.2 kg/ha).

The experiment (270 m^2) was conducted in Randomized block design consisting of 10 hybrids (R-24, R-40, R-48, R-52, R-77, R- 107, R-111, R-120, R-127, R-145) with three replications and was allocated randomly in each replication.

To reduce crop-weed competition one hand weeding was carried out at 35 days after sowing (DAS). 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 recorded were analyzed statistically by using appropriate analysis of variance adopting Gomez and Gomez (1984).

3. RESULT AND DISSCUSSION

3.1Growth parameters

3.1.1 Plant height (cm)

At 100 DAS the significantly and higher plant height was observed in **R- 107** (111.25 cm) (Table 1). However, R-40 (110.73 cm) and R-127 (110.28 cm) were statistically at par with R-107. Genetic makeup of the variety is a huge contributing factor which have also been reported by **Haque et 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 favourable weather condition associated. Bahure et al. (2019) found the higher growing degree days and hydrothermal units are gained by these hybrids.

3.1.2 Numbers of tillers/hill

At 100 DAT the highest number of tillers was observed in R-48 (14.50) (Table 1). However, R-127 (14.30), R-40 (13.30), andR-24 (13.17) were statistically at par with R-48. A comparative study of the performance of rice hybrids exhibited that R-48 recorded significantly higher tillers/hill. The significant differences could 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).

3.1.3 Plant dry weight (g)

At 100 DAT the highest dry weight was observed in R-48 (38.43 g/plant) (Table 1). However, R-107 (37.44 g/plant), were statistically at par with R-48. 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 in 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 Bozorgi et al. (2011).

4.1 3.2 Yield parameters

4.1.1 3.2.1 Number of Tillers/meter^2

The highest value was observed in R-48 (338.65 tillers/m2), (Table 2). However, R-40 (320.63 tillers/m2) and R-120 (323.74 tillers/m2) were statistically at par with R-48. The high tillering capacity is the probable reason for high yielding varieties. 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.

3.2.2 Panicle Length

In Table 2 is shown the recorded significantly higher in panicle length (29.60 cm) in R-48. However, R-107 (29.12 cm) and R-40 (28.23cm) were statistically at par with R-48. The nitrogen level exert a significantly favorable effect on panicle length on rice hybrids.. The significant differences in panicle length amongthe rice hybrids could also be attributed to their genetic make-up. Results confirm the findings of Rahman et al. (2013).

3.2.3 Grain yield (t/ha)

The data (Table 2) showed the significantly highest grain yield 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 nutrients. The hybrids of short duration have the potential to give the maximum grain yield respect to the rest of the varieties .The other reason of the highyield of R-48 is due to the better growth parameters (tillers/hill, plant dry weight) resulting to produce higher grain yield. Similar findings were reported by Ranjitha et al. (2013).

3.2.4 Straw yield (t/ha)

The data in Table 2, showed the significantly highest straw yield in R- 48 (13.31 t/ha). However,

R- 145 (12.25 t/ha) was statistically at par with R-48. According to the findings by Padmavathi (1997), it shows that the capability of rice hybrids to utilize more nitrogen is expressed on better growth with beneficial effect on nutrient uptake and physiological metabolism increasing the straw yield.

3.3 Economics

The result showed (Table 3) that 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 rice hybrids.

4. CONCLUSION

The concluded experiment showed that the rice hybrid R-48 was found to be the best for obtaining maximum grain yield. It also fetched the maximum gross return, net return and Benefit cost 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. The rice hybrid R-48 can be recommended to farmers after further trails.

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Table 1. Field evaluation of growth attributes of Rice Hybrids at 100 days after sowing.

S. No	Hybrids	Growth parameters at 100 DAS		
		Plant Height (cm)	Tillers/hill (No.)	Dry weight (g)
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	3398
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 yield attributes of Rice Hybrids at 100 days after sowing.

S. No.	Hybrids	Growth Parameter at 100 DAS			
		No. 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