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Lenin
M.Sc. Scholar, Department of Agronomy, Naini Agricultural institute, SHUATS, Prayagraj Uttar Pradesh, India

Vikram Singh
Associate Professor, Department of Agronomy, Naini Agricultural institute, SHUATS, Prayagraj Uttar Pradesh, India

Amit Kumar
Ph.D. Scholar, Department of Agronomy, Naini Agricultural institute, SHUATS, Prayagraj Uttar Pradesh, India

Corresponding Author:
Lenin
M.Sc. Scholar, Department of Agronomy, Naini Agricultural institute, SHUATS, Prayagraj Uttar Pradesh, India

Response on growth and yield of private sector rice (*Oryza sativa* L.) genotypes under agro-climatic zone of Prayagraj (U.P.)

Lenin, Vikram Singh and Amit Kumar

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Abstract
A field experiment was conducted during *Kharif* season of 2023 at Crop Research Farm (CRF), Department of Agronomy, SHUATS, Prayagraj (U.P) to investigate the "Evaluation of Private Sector Rice (*Oryza sativa* L.) Genotypes under Agro-climatic zone of Prayagraj U.P". The soil of the experimental plot was sandy loam in texture, nearly neutral in soil reaction (pH 7.1), organic carbon (0.75%), available N (269.96 kg/ha), available P (33.10 kg/ha), and available K (336 kg/ha). The treatments consist of 10 hybrids. The experiment was laid out in Randomized Block Design with ten treatments replicated thrice. The significantly highest Plant height (65.11 cm), No. of tiller/hill (9.96), Dry weight (28.71 g/plant), Test weight (23.86g), Grain yield/hill (30.67g), Seed yield (7 t/ha) and Harvest Index (43.10%) were significantly higher in Hybrid UR-160. Hybrid UR- 160 also fetched maximum gross return (INR 181477.10 /ha), net return (INR 127431.10 /ha) and B: C ratio (2.36).

Keywords: Hybrid rice, Hybrids, yield, growth, economics

Introduction
Rice (*Oryza sativa* L.) is one of the most important staple cereals in the world and one of the main source of carbohydrates for nearly one half of world's population. More than 90% of the rice is produced and consumed in Asia, where it a staple for the region's 560 million hungry people. 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) [9] India's land frontier appears to have reached its extensive margin of exploitation-for the past three decades the net sown area has been stagnating at around 142 million hectares (India, MoAFW 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 tones (Agriculture Statistics 2016). Rice is the most crucial cereal food crop of India, which occupies about 24% of gross cropped area of the country. The UN/FAO forecasts that global food production will need to increase by over 40% by 2030 and 70% by 2050. For increasing the yield and productivity various strategies includes, conventional hybridization and selection procedures, ideotype breeding, hybrid breeding, wide hybridization and genetic engineering. Among the available genetic options to increase the productivity, adoption of hybrid rice breeding technology is one of the practically feasible and sustainable approaches. Hybrid rice accounts for more than half of the area under the crop and has contributed significantly to yield and output growth even after, relocation of land to other agriculture and non-agriculture uses. Growing of hybrid rice is a complex process and especially agronomic management of hybrid rice differs considerable from that of conventional varieties. Although the technology is still new, many rice- producing countries have expressed their interest in applying it to improve food security. During the year 2010, hybrid rice was planted in an area of 1.7 mha and 1.5 to 2.5 mt was added to rice production in India through this technology.

Materials and Methods
A field experiment was conducted at Crop Research Farm, Department of Agronomy, SHUATS, Prayagraj (U.P) during *Kharif*, 2023. The soil of the experimental plot was sandy loam in

texture, nearly neutral in soil reaction (pH 7.2), organic carbon (0.48%), available N (108 kg/ha), available P (22.5 kg/ha), and available K (280 kg/ha). The experiment was laid out in Randomized Block Design with 10 hybrids each replicated thrice. The observations were recorded on different growth parameters at harvest *viz*. plant height(cm), plant dry weight, test weight, seed yield, stover yield and harvest index were analyzed statistically to test their significance and the experiment findings have been summarized in the light of scientific reasoning and have been discussed below under the following heading: -

Results and Discussion

A. Growth Attributes: At 100 DAT the significantly tallest plant height was observed in UR-160 (65.11 cm). However, UR-185 (61.89 cm), UR-200 (62.28 cm), UR-205 (62.82 cm) and UR-215(62.19 cm) were statistically at par with UR-160.Genetic makeup of the variety is a huge contributing factor which have also been reported by Haque *et al*. (2015) [4]. Increase in plant height may also be due to synchronized availability of all the essential plant nutrients especially nitrogen for a longer period during growth stages (Singh *et al*., 2019) [8]. The result conformed with Deshpande and Devasenpathy, 2011. At 100 DAT the highest number of tillers was observed in UR-160 (9.96). However, UR-140 (9.24), UR-150 (9.48), UR-170 (9.20), UR-175 (9.82), UR-185 (9.72), UR-195 (9.24) and UR-200 (9.46) were statistically at par withNUR-160.The significant differences could due to the variation in genetic make-up of the high yielding varieties that might be influenced by heredity. It could also be due to good nutrient. This was consistent with findings. At 100 DAT the highest dry weight was observed in UR-160 (28.71 g/plant). However, UR-205 (27.47 g/plant) and UR-215 (27.46 g/plant) were statistically at par with UR-160.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) [2].

Yield attributes: UR-160 recorded significantly higher panicle length/hill (27.92 cm). However, UR-150 (25.42 cm), UR- 170 (26.02 cm), UR-175 (26.60 cm), UR-185(27.66 cm), UR-200(27.28 cm),UR-205(27.41 cm), and UR-215 (27.47 cm) were statistically at par with UR-160. The highest significant number of filled grains/panicle (108.38) was recorded under the hybrid UR-160. However, UR-140 (104.74), UR-150 (106.96), UR-175 (104.00) and UR-215 (100.54) were statistically at par with UR-160.The probable reason might be that hybrid rice produces long roots and broad leaves that enable them to take up more nutrients and produce more grains. It is suited to existing climatic condition of the place especially during the grain-filling stage of the panicle development. Similar results have also been reported by Bhuiyan *et al*. (2014) [1]. The data showed the highest grain yield/hill was observed in UR-160 (30.67 g/hill). However, UR-140 (28.72 g/hill), UR-170 (28.40 g/hill), UR-175 (29.17 g/hill) and UR-200 (29.01 g/hill) were statistically at par with UR- 160.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 data showed the significantly highest grain yield was observed in UR-160 (5.00 t/ha). However, UR-150 (4.27 t/ha), and UR-195 (4.39 t/ha) were statistically at par with UR-160.Grain yield per plant had highly significant positive correlation with tillers/hill, panicle length, harvest index, grain yield per plot, grain yield /meter2 and with grain yield/hectare. These results confirm the findings of Rahman *et al*. (2013) [7]. Significantly highest straw yield was observed in UR-160 (9.06 t/ha). However, UR-140 (7.61 t/ha), UR-170 (7.49 t/ha), UR-185 (8.70 t/ha), UR-195 (8.41 t/ha), UR-200 (8.20 t/ha),UR-215 (8.17 t/ha) were statistically at par with UR-160. According to the findings by Padmavathi, 1997 [6] supports 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. The data showed the harvest index was observed significantly higher in UR-160 (43.10%). Harvest index reflects the physiological capacity of a crop variety to mobilize and translocate the photosynthates to the sink. (Marri *et al*., 2005) [5] found that harvest index negatively correlated with plant height, but positively correlated with grain number/panicle, grain number/plant, percentage spikelet fertility and yield/plant in rice.

Table 1: Field evaluation of hybrid rice on growth parameters of rice hybrid

Hybrids	Plant height (cm)	Tillers/hill (No.)	Dry weight (,;plant)
Rice Hybrid UR-140	60.52	9.24	^{2}5.38
Rice Hybrid UR-150	61.00	9.4S	24.57
Rice Hybrid UR-160	65.11	9.96	28.71
Rice Hybrid UR-170	60.53	9.20	26.15
Rice Hybrid UR-175	55.26	9.S2	25.66
Rice Hybrid UR-185	61.89	9.72	26.53
Rice Hybrid UR-195	60.28	9.24	25.51
Rice Hybrid UR-200	62.28	9.46	25.61
Rice Hybrid UR-205	62.82	8.12	27.47
Rice Hybrid UR-215	62.19	8.66	27.46
F-test	S	S	S
S.Em±	1.60	0.33	0.83
CD (P=0.05)	4.76	0.89	2.48

Table 2: Field evaluation of rice hybrids on yield attributes and yield

Hybrids	Panicle length (CM)	Filled grains (No.)	Grain yield/hill (g/hill)	Grain Yield	Straw yield (t/ha)	Harvest Index (t/ha)
Rice Hybrid UR-140	25.27	104.74	28.72	3.28	7.61	32.44
Rice Hybrid UR-150	25.42	106.96	24.48	4.27	7.18	34.41
Rice Hybrid UR-160	27.92	108.38	30.67	5.00	9.06	43.10
Rice Hybrid UR-170	26.02	95.68	28.4	3.74	7.49	35.40
Rice Hybrid UR-175	26.60	104.00	29.17	3.58	5.15	32.52
Rice Hybrid UR-185	27.66	101	22.87	3.07	8.70	30.28
Rice Hybrid UR-195	24.28	97.37	25.19	4.39	8.41	33.91
Rice Hybrid UR-200	27.28	97.13	29.01	3.74	8.20	31.98
Rice Hybrid UR-205	27.41	97.06	21.24	3.00	7.92	29.49
Rice Hybrid UR-215	27.47	100.54	24.98	3.27	8.17	30.05
F-test	S	S	S	S	S	S
SEm±	0.79	2.87	1.25	0.35	0.91	1.43
CD (P=0.05)	2.35	8.5	2.47	1.05	1.72	3.51

Conclusion

On the basis of *Kharif* season experimentation, it can be concluded that hybrid UR-160 was found to be best for obtaining higher growth, yield and economic renumeration. Since the finding are based on the research done in one season. Further trials are needed to confirm more precise results.

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