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Evaluation of rice (*Oryza sativa* L.) hybrids under Agro-climatic conditions of Prayagraj

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Abstract
For the growing population and increased urbanization there is a need of the best hybrids that obtain highest yields and also effectively utilize the available land, which will be possible through better breeding programmes, best agronomic practices and their peculiar agro-climatic conditions for which an experiment was conducted during *Kharif* season of 2020 at Crop Research Farm, Department of Agronomy, SHUATS, Prayagraj (UP) to study the "Evaluation of Rice Hybrids under Agro-climatic conditions of Prayagraj". The experiment was laid out in Randomized Block Design consisting of 15 Rice hybrids each replicated thrice. The different Rice hybrids were allocated randomly in each replication. The result revealed that hybrid (KR-15) was found to be best for obtaining Maximum plant height (113.04 cm), more number of tillers/hill (16.93), more number of tillers/m2 (439.00), maximum dry weight (47.07g), maximum panicle length (29.47 cm), more number of filled grains/panicle (135.62), maximum test weight (23.00 g), maximum grain yield/hill (22.93 g), maximum grain yield (9.47 t/ha), maximum stover yield (31.33 t/ha), maximum biological weight (23.04 t/ha), maxim harvest index (46.23%). Highest gross return (1,89,400.00 INR/ha), net return (1,28,843.00 INR/ha) and B:C ratio (2:13) was also recorded hybrid (KR-15) respectively.

Keywords: Rice hybrids, agro-climatic conditions, yield

Introduction
Rice (*Oryza sativa* L.) is one of the most important staple cereal crops in the world and the genetic classification of rice crop belongs to the genus Oryza of family *Gramineae* (*Poaceae*). The genus includes 24 species of which 22 are wild and two are cultivated species. *Oryza sativa* L. and *Oryza glaberimma* are cultivated. The nutrient content of rice are 80% carbohydrates, 7-8% protein and it is one of the main sources of carbohydrates for nearly one half of the world population. However, more than 90% of the rice is produced and consumed in Asia, where it is a staple for a majority of the population, including 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 as shown by Yadav *et al*. (2010) [12].

The present status of hybrids rice India, the major challenges and future outlook for this innovative technology. Since the population is increasing hence there is an urgent need to provide high yield rice varieties but yield was already stagnated hence hybrid rice break the yield barriers which give 15-20% higher yield. So, rice hybrids received from IIRR (DRR) Hyderabad to asses yield potential along with good quality. Therefore, Present study has been conducted to assess the actual spreading of these newer hybrids in terms of area with simultaneous reduction in the area under older hybrids for rice crop and the increase in the average yield/ha. This will help the government to draw a plan for augmenting the spread of the superior newer hybrids in place of the age-old hybrids. Rice requirement by the year 2020 is estimated to be around 122 million tons as against the present production of about 100 million tons, thus leaving a gap of about 22 million tons rice. Present production level needs to be increased up to 140 million tons by 2025 which can be achieved only by increasing the rice production by over 2 million tons per year incoming decade Anonymous 2005.

Materials and Methods
This experiment was carried out during *kharif* 2020 at Crop Research Farm, Department of Agronomy, Naini Agriculture Institute, Sam Higginbottom University of Agriculture Technology and Sciences (SHUATS), Prayagraj, (U.P.) which is located in at 25.28˚N

latitude, 81.54˚E longitude and 98 m altitude above the mean sea level. Organic carbon (0.35%), available nitrogen (243 kg/ha), phosphorus (20.10 kg ha) and potassium (105.00 kg ha). The climate of the region is semi-arid subtropical.

Experimental design

The experiment was conducted in Randomized block design consisting of 15 hybrids i.e., from KR-11 to KR-25 with 3 replications and was allocated randomly in each replication.

Results and Discussion

The research part was divided into growth attributes and the yield attributes. In the growth attributes plant height, tillers per square meter (in number), are taken. Plant height is not a yield component especially in grain crops but it indicates of various essential plant nutrients on plant metabolism. At 90 DAT the highest plant height was observed in KR-15 (113.04 cm) which was significantly superior over rest of rice hybrids except KR -16 (111.48 cm), KR-19 (110.12 cm) and KR-21 (105.45 cm) which are statistically at par with treatment KR-15 (113.04 cm) as shown in (Table 1) respectively. The reason for highest 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 Bahure *et al*. (2019) [2]. The hybrid KR-115 although has the highest yield which is a negative character but it is tolerant to Lodging which is biggest asset in the paddy hybrids. The results showed (Table.1) that tillers/m2 was much influenced under various hybrids at 90 DAT the highest tillers/m2 was observed in KR-15 (439.00) which was significantly superior over rest of the rice hybrids except KR-11, KR-13, KR-14, KR-19, KR-20, KR-22, KR-23, KR-24 and KR-25 which are statistically at par with treatment KR-15 (439.00 tillers/m2). In the present study the tillers/m2 was higher in KR-15 which will be the highest yielding one according to the reason that high yielding hybrids had high tillering capacity as reported by (Yadav *et al*., 2004) [11].

The second division of the research will be about the yield and yield contributing characters, which covers the characters like panicle length (cm), filled grains per panicle, unfilled grains per panicle, grain yield per hectare (tons), straw yield per hectare (tons). During the period of investigation as in the data showed (Table 1) the maximum panicle length/hill (31.97 cm) was recorded for the hybrid KR-15. Hybrid KR-21 (29.37 cm), KR-24 (29.17 cm) was found significantly superior over all Rice hybrids. The nitrogen level exerted significant effect on panicle length in hybrid rice. Thus, in this study hybrid (KR-15) 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 which was already shown by Vivek *et al.* (2004) [10]. And the long panicle also indicates more grain number which is a biggest yield attribute for the paddy crop. The results confirm the findings of Rahman *et al.* (2013) [7]. The results showed (Table.1) that filled grains/panicle was much influenced under various hybrids at harvest. The highest significant number of filled grains/panicle (135.62) was recorded under the hybrid KR-15 was found to be significantly superior over other rice hybrids except KR-17 (124.69), KR-21 (125.63) and KR-24 (131.22). The favourable reason might be that the hybrid rice produces long roots and broad leaves that enable them to take up more nutrients and produces more grains. KR- 15 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 Fernandez (2002) [4]. The results showed (Table.1) that the lowest unfilled grains (no.) panicle (28.93) was recorded under the hybrid KR-22, the hybrid KR-18 (66.40) was found to be highest unfilled grains (No.) panicle, is unsuited 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) [3]. During the period of investigation, the data showed (Table.2) the highest grain yield t/ha was observed in KR- 15 (9.47 t/ha) which was significantly superior over rest of the rice hybrids except KR-16, KR-21 and KR-24 (which are statistically at par with KR-15 (9.47 t/ha). The increased yield attributes will be due to the highest number of tillers, long panicle and also highest number of filled grains per panicle, which ultimately resulted in increased grain yield. These results in the conformity with the work done by Vishwakarma (2015). The data showed (Table. 2) the highest straw yield/ha was observed in KR-15 (13.57 t/ha) which was significantly superior over rest of the rice hybrids except KR-16, KR-17 and KR-21 which are statistically at par with KR-15. According to the findings by (Padmavathi, 1997) [6] 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. The data revealed that the significant and highest grain yield (9.47 t/ha) and straw yield (13.57 t/ha) was found in treatment T14. In general, biological yield per plant had highly significant positive correlation with grain yield per plant. These results were shown by Tripathi (2013) [8].

Table 1: Evaluation of rice hybrids on Growth Attributes *viz*., plant height, Tillers/m2 and Yield Attributes *viz*., panicle length, filled grains per panicle, unfilled grains per panicle, grain yield per hectare, straw yield per hectare

Rice hybrids	Plant height (cm)	Tillers/ m2 (No.)	Panicle length (cm)	Filled grains/ Panicle (No.)	Un-Filled grains/ Panicle (No.)	Grain yield (t/ha)	Straw yield (t/ha)	Harvest Index (%)
KR-11	96.58	386.33	23.87	103.09	51.40	7.73	11.83	39.53
KR -12	91.88	295.00	23.97	83.02	34.73	5.63	9.74	36.68
KR-13	91.13	391.67	25.60	84.51	37.67	5.63	9.73	36.81
KR-14	92.35	361.38	27.57	89.65	51.33	6.52	10.62	38.02
KR-15	113.04	439.00	31.97	135.62	56.73	9.47	13.57	41.12
KR-16	111.48	330.00	27.10	107.34	59.73	8.75	12.85	40.50
KR-17	100.70	283.58	25.60	124.69	49.27	8.43	12.53	40.13
KR-18	82.85	295.35	25.10	92.68	66.40	5.78	9.88	37.05
KR-19	110.12	383.45	27.97	110.72	48.87	8.29	12.39	40.11
KR-20	97.53	420.00	25.17	99.26	42.80	7.81	11.91	39.05
KR-21	105.45	350.42	29.37	125.63	49.00	8.69	12.79	40.46

KR-22	100.26	380.00	23.97	76.16	28.93	5.31	9.41	36.14
KR-23	101.39	412.25	23.87	111.07	36.80	7.19	11.29	38.81
KR-24	97.71	417.39	29.17	131.22	46.40	9.44	13.54	41.09
KR-25	99.81	388.00	25.53	100.24	51.80	8.05	12.15	39.83
S.Em(±)	3.60	28.58	1.18	6.36	8.92	0.31	0.36	0.93
CD (P=0.05)	10.45	82.79	3.42	18.44	-	0.92	1.06	2.70

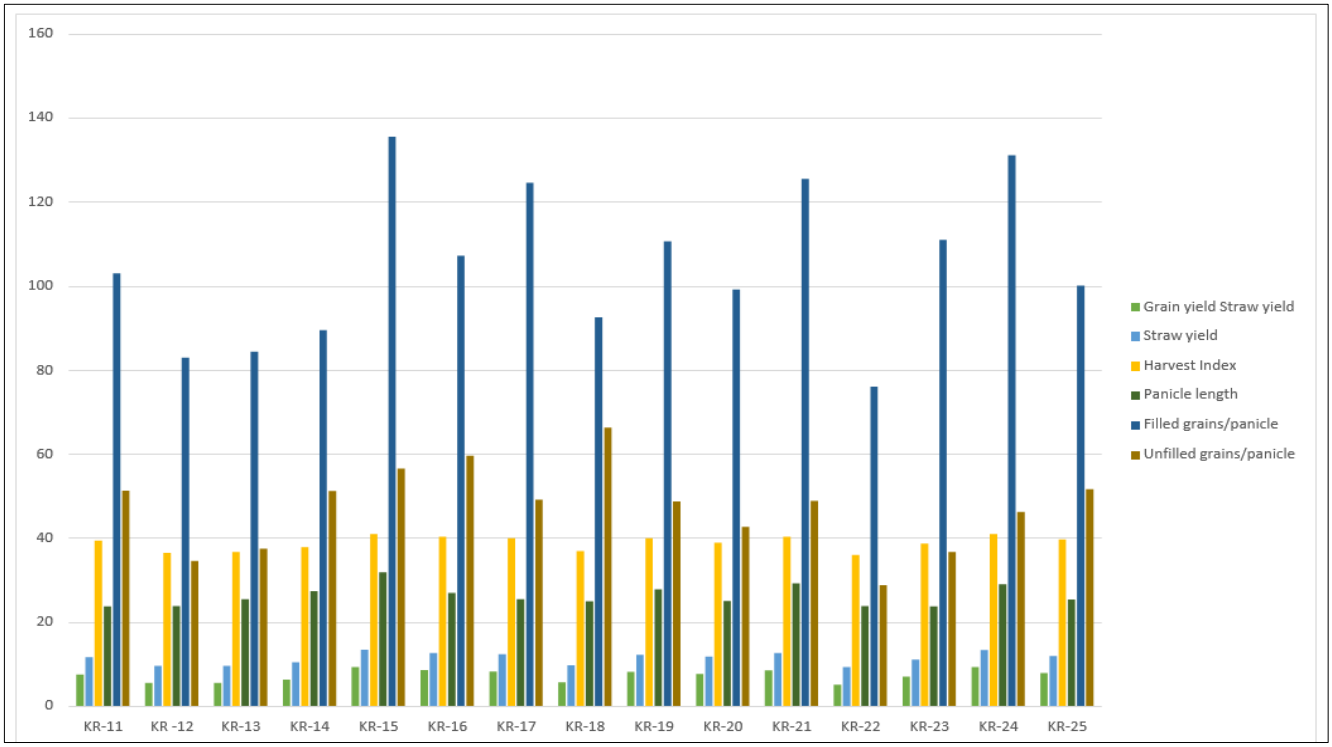

Fig 1: Evaluation of rice hybrids on Growth Attributes Yield Attributes *viz*., panicle length, filled grains per panicle, unfilled grains per panicle, grain yield per hectare, straw yield per hectare

Conclusion

It is to be concluded that variety KR-15 was found to be best for obtaining higher yield (9.47 t/ha), panicle length (31.97 cm), net return (128843) and benefit cost ratio (2.13) in hybrid rice. Since the finding is based on the research done in one season further trials are needed to confirm the results.

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