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Agronomic evaluation of rice (*Oryza sativa* L.) hybrids under agro climatic condition of Prayagraj, (U.P.)

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Abstract
A field experiment was conducted during *kharif* season of 2019 at the Crop Research Farm, Department of Agronomy, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences , Prayagraj (U.P.) to agronomic evaluate of rice (*Oryza sativa* L.) hybrids under agro-climatic conditions of Prayagraj U.P. The experiment is comprised of Randomized Block Design and was conducted to find the performance of 10 hybrids. In the experiment it was revealed that variety KHR-17 performed better than other varieties *i.e.* Tillers m^{-2} (349.33 no.) Panicle length (31.51 cm), grain yield per plant (35.50 g), test weight (27.11 g) grain yield (8.09 t ha^{-1}), straw yield (19.46 t ha^{-1})and B:C ratio (1.86) were found to be significantly higher than other varieties respectively.

Keywords: Hybrid rice, varietal response, yield, *Oryza sativa* L.

Introduction
Rice (*Oryza sativa* L.) is considering a staple food for more than half of the global population. About 55 per cent of the rice area is irrigated that accounts 75 per cent of the rice production in the world**.** More than 90% of the world's rice is grown and consumed in Asia, where 60% of the calories are consumed by 3 billion Asians (Khush, 2005) [4] Globally it is cultivated in an area of 153.51 m ha with an annual production of about 650.19 million tones and an average productivity of 2.96 t ha (FAO, 2015) [1]

Rice being a crop having high water requirement there is a need to search for alternative methods to reduce water requirement of rice without reduction in yield. Establishment techniques, plant density, nutrient requirement and management, water management etc., need to be standardized to achieve the reported yield potential of rice under different duration in various environments. Method of establishment is one of the cultural practices, which influences the rice crop through its effect on growth and development (Gopi *et al*., 2006 and Khan, M., *et al* 2018) [2, 9]. There is an urgent need to adopt some innovative technologies to break the yield ceiling in rice. Among the available technological options to enhance rice production and productivity, hybrid rice is the most practically feasible and readily adoptable technology. Hybrid rice offers a wide opportunity to augment rice productivity in India. Hybrid rice gives about (15-20%) more yield than high yielding commercial varieties (Virmani, 1994 and Mishra *et al*., 2003). 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. Moreover, hybrid rice normally have a yield advantage of 20 - 30% over non hybrid rice cultivars (Lin and Yuan, 1980; Shen, 1980). Heterosis indicates the superiority of hybrid over its parents. Heterosis refers to the phenomenon in which the F1 hybrid obtained by crossing of two genetically dissimilar individuals shows the increased or decreased vigor over the better or mid-parent value. Being strictly self-pollinated crop, rice requires the use of a male sterility system to develop commercial rice hybrid parental lines. Male sterility produces unfertile pollen, so that rice spikelets are incapable of setting seeds through self-pollination. A male sterile line is used as a female parent and grown side by side with a pollen parent in an isolated plot to produce a bulk quantity of hybrid seed ensuing from cross pollination with the adjoining fertile pollen parent (Li *et al*., 2007).

Materials and Methods

The experiment was carried out during *kharif* season of 2019 at Crop Research Farm, Department of Agronomy, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (U.P.) which is located at 250 24' 42" N latitude, 810 50' 56" E longitude and 98 m altitude above the mean sea level. The soil of the experiment at site was sandy loam with a pH (7.8), available N (142.5 kg ha^{-1}) P_2O_5 (11.2 kg ha^{-1}) and K_2O (232.5 kg ha^{-1}). The experiment was laid in Randomized block design with three replications the performance of twenty two varieties with check variety. The recommended dose was fertilizer 120:60:60 kg N, P_2O_5 and K_2O ha^{-1} basal dose of fertilizer was applied just before last puddling on, half dose of nitrogen and full dose of phosphorus and potassium followed by two topdressings of 1/4th dose of nitrogen on 23 DAT & 50 DAT. Number of tillers was counted from five random plants per hills of panicle, Panicle length (cm) was observed at the time of harvest randomly from five tagged hills and their averages were recorded.

The ten panicles were counted separately which were obtained randomly from five tagged hills and their averages of filled grain were recorded. One thousand grains were randomly counted from panicles obtained from each plot and weighed and recorded as test weight (g) at 14% moisture. Five plants were selected randomly from each plot to analyze the various yield observations such as number of tillers hill-1, number of grains spike-1. Moreover, grains from harvest area (1.0 m^2) were dried in sun, cleaned and weighed separately from each plot for calculating the grain yield in tones ha^{-1}. Straw from harvest area (1.0 m^2) was dried in sun, bundled, tagged and weighed separately from each plot for calculating the straw yield in tones $hectare^{-1}$. Economics was calculated on the basis of prevailing market prices. The data subjected to be statistical analysis.

Results and Discussions

Yields attributes and yield of rice

During the period of investigation the maximum number of tillers m^{-2} (349.33) and panicle length $plant^{-1}$ (31.51 cm) was recorded under variety KHR-17. The significant differences in panicle length among the hybrid rice varieties could be attributed to their genetic make-up. The result confirms the findings of Yadav *et al*. (2004). The significant and highest grain yield $plant^{-1}$ (35.50 g) was found in treatment T_6. Further, this reported by Ranjitha *et al*. (2013) [5]. The data showed the maximum test weight (27.11 g) was observed in variety KHR-17 . This could be due to the adoption of 20 x 15 cm spacing for rice transplanting resulted in heavier filled and healthy grain in variety (KHR-17). Similar results have been also reported by Haque *et al*. (2015). The data revealed that the significant and highest grain yield (8.09 t ha^{-1}) and straw yield (19.46 t ha^{-1}) was found in treatment T_6. In general biological yield per plant had highly significant positive correlation with plant height, days to maturity, filled grain per panicle and total number of grains per panicle. Grain yield per plant had highly significant positive correlation with plant height, panicle length, 1000 grain weight, harvest index, grain yield per plot, grain yield per square meter and with grain yield ha^{-1} and B:C ratio. These results confirm the findings of Tripathi (2013, Jabeen, Z. 2018) [6, 10].

Table 1: Effect of different hybrid verities on yield attributes and yield of hybrid rice under agro-climatic condition of Prayagraj, U.P

Rice Hybrids	Tillers/m^2 (No.)	Panicle length (cm)	Test weight (g)	Yield/hill(g)	Grain yield(t/ha)	Net returns (₹/ha)	B:CRatio
KHR-12	324.66	27.38	21.20	25.00	7.13	77942.81	1.51
KHR-13	331.33	29.16	21.48	25.66	7.19	79152.81	1.54
KHR-14	332.66	29.13	23.41	27.00	7.34	81814.81	1.59
KHR-15	343.00	29.40	24.38	27.36	7.68	87925.31	1.71
KHR-16	348.66	30.93	25.30	34.50	7.90	91918.31	1.79
KHR-17	349.33	31.51	27.11	35.50	8.09	95487.81	1.86
KHR-18	346.66	28.75	22.36	25.83	6.96	74857.31	1.45
KHR-19	323.33	27.18	21.07	25.00	6.99	75522.81	1.47
KHR-20	299.00	25.85	20.46	23.67	6.70	70138.31	1.36
KHR-21	298.33	24.85	20.45	22.50	6.19	60942.31	1.18
SEm(±)	2.95	0.62	0.34	0.85	0.18		
CD(P=0.05)	8.84	8.87	1.01	2.55	0.48		

Conclusion

It may be concluded that variety KHR-17 was found to be the best for obtaining higher yield attributes, yield (8.09 t ha-1), panicle length (31.51 cm), net return (95487.81) and benefit cost ratio (1.86) 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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