Akkenapally Sruthi
M.Sc. Scholar, Department of
Agronomy, SHUATS, Prayagraj,
Uttar Pradesh, India

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

Shruti Grace George
Ph.D., Scholar, Department of
Agronomy, SHUATS, Prayagraj,
Uttar Pradesh, India

Vivek Pundhir
Associate Professor and Head,
Department of Agronomy,
Narain College, Shikohabad
District-Firozabad, Uttar
Pradesh, India

Evaluation of rice (*Oryza sativa* L.) hybrids on growth, yield and economics under agro-climatic conditions of Prayagraj, U.P.

Akkenapally Sruthi, Vikram Singh, Shruti Grace George and Vivek Pundhir

Abstract
A field experiment was conducted during kharif season of 2021 at Crop Research Farm, Department of Agronomy, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology & Sciences, Prayagraj, Uttar Pradesh, India on soil with sandy loam in texture to study the "Evaluation of Rice (*Oryza sativa* L.) Hybrids on Growth, Yield and Economics under Agro-climatic Conditions of Prayagraj, U.P.". The experiment consists of Twenty-two Rice hybrids *viz.*, UR-23, UR-24, UR-25, UR-26, UR-27, UR-28, UR-29, UR-30, UR-31, UR-32, UR-33, UR-34, UR-35, UR-36, UR-37, UR-38, UR-39, UR-40, UR-41, UR-42, UR-43, UR-44. The experiment was laid out in Randomized Block Design (RBD) with Twenty-two rice hybrids replicated Thrice. 50% of recommended dose of nitrogen and full dose of phosphorus and potassium was applied as basal application just before last puddling and remaining 50% of nitrogen was applied in two top dressings at 30 DAT and 58 DAT. Znso$_4$ was broadcasted before puddling. The study revealed that, among different Hybrids UR-38 produced significantly higher plant height (122.57 cm), number of tillers per hill (No.) (15.07), plant dry weight per hill (55.91 g), panicle length per hill (29.00 cm), number of filled grains per panicle (No.) (256.17), grain yield (6.85 t/ha) and straw yield (12.77 t/ha). The hybrid UR-37 recorded significantly minimum number of days to 50% flowering (45.67 days) and the hybrid UR-34 recorded significantly minimum days to maturity (84.67 DAT). Hybrid UR-38 also fetched highest gross returns (176172.00 INR/ha), net returns (122126.00 INR/ha) and benefit cost ratio (2.25) when compared to other hybrids.

Keywords: Rice hybrids, yield attributes, growth attributes

Introduction
Rice (*Oryza sativa* L.) is considered as one of the most important staple cereals in the world and it is the main source of carbohydrates for nearly one half of the world population. However, 90% of rice is produced and consumed in Asia. It contributes 43% of gross cropped area of the country, 46% of total cereal production and second in rice production after China (Yadav *et al*., 2010) [8]. The genetic classification of rice plant belongs to genus *Oryza* of family Gramineae (Poaceae). The genus includes 24 species of which 22 are wild and 2 are cultivated species. *Oryza sativa* L. and *Oryza glaberimma* are cultivated. All species are cultivated in Asia, America and Europe continents. India has 44.2 million ha area with average productivity of 2.3 tonnes/ha and production of million tonnes (Directorate of economics and statistics, 2016-2017). In Uttar Pradesh 5.9 million ha with an average productivity of 2447 kg/ha and production of 14.63 million tonnes (Agriculture statistics, 2016). Globally, rice is now cultivated on 159 million hectares with annual production of around 748 million tonnes and average productivity of 4.68 tonnes/ha. It is estimated that 5000 litres of water is needed to produce 1 kg rice (Bouman *et al*., 2009)

Hybrid rice was planted in area of 1.3 million hectares and additional rice production of 1.5 to 2.5 million tonnes was recorded through this technology. More than 80% of total hybrid rice area is in Eastern India states like Uttar Pradesh, Jharkhand, Bihar and Chhattisgarh. Hybrid rice cultivars possessed a prominent role in enhancing the production and quality of rice which is used for various purposes. Hybrid rice cultivation is economically viable if management level is above 60%. Hybrids are short duration with resistance to major pests and diseases, non-lodging, they adapt better to stress and different climatic conditions and has longer shelf life.

Corresponding Author:
Akkenapally Sruthi
M.Sc. Scholar, Department of
Agronomy, SHUATS, Prayagraj,
Uttar Pradesh, India

Materials and Methods

A field experiment was conducted during *kharif* season of 2021 at Crop Research Farm, Department of Agronomy, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology & Sciences, Prayagraj, U.P, India. The soil of the experimental plot was sandy loam in texture, nearly neutral in soil reaction (pH 7.8), medium in organic carbon (0.35%), medium in available Nitrogen (243.0 kg/ha), low in available Phosphorous (20.10 kg/ha) and medium in available Potash (105.0 kg/ha). The treatments consist of Twenty-two Rice hybrids *viz.,* UR-23, UR-24, UR-25, UR-26, UR-27, UR-28, UR-29, UR-30, UR-31, UR-32, UR-33, UR-34, UR-35, UR-36, UR-37, UR-38, UR-39, UR-40, UR-41, UR-42, UR-43, UR-44. The experiment was laid out in Randomized Block Design (RBD) with Twenty-two hybrids replicated Thrice. The experiment comprising of Twenty-two hybrids, *viz.,* T_1: UR-23, T_2:UR-24, T_3: UR-25, T_4: UR-26, T_5: UR-27, T_6: UR-28, T_7: UR-29,T_8:UR-30,T_9: UR-31, T_{10}: UR-32,T_{11}: UR-33, T_{12}: UR-34, T_{13}: UR-35, T_{14}: UR-36, T_{15}: UR-37, T_{16}: UR-38, T_{17}: UR-39,T_{18}: UR-40,T_{19}: UR-41, T_{20}:UR-42, T_{21}: UR-43, T_{22}: UR-44 observation regarding growth and yield attributes was recorded during the field experiment.

Table 1: Evaluation of Rice Hybrids on Growth Attributes under Agro-climatic Conditions of Prayagraj, Uttar Pradesh

Hybrids	Plant height (cm)	Number of tillers/hill (No.)	Plant dry weight/hill (g)
UR-23	105.62	11.33	48.65
UR-24	114.34	10.47	49.38
UR-25	113.25	13.00	47.67
UR-26	104.52	10.27	50.21
UR-27	110.34	13.33	49.63
UR-28	113.78	12.07	49.36
UR-29	105.21	12.09	50.76
UR-30	118.29	10.40	52.74
UR-31	117.77	14.20	49.21
UR-32	116.63	13.82	51.43
UR 33	116.60	13.33	48.43
UR 34	120.37	13.87	46.91
UR 35	107.58	11.00	53.33
UR 36	119.84	12.27	51.73
UR 37	117.63	10.33	48.78
UR38	122.57	15.07	55.91
UR39	107.04	13.07	49.91
UR40	115.96	14.40	48.10
UR41	107.04	13.20	46.67
UR42	112.63	10.87	47.83
UR43	109.26	11.43	50.87
UR44	110.43	13.01	49.61
F-test	S	S	S
S.Em±	1.65	0.43	1.30
CD (P = 0.05)	5.01	1.29	3.93

Table 2: Evaluation of Rice Hybrids on Yield Attributes under Agro-climatic Conditions of Prayagraj, Uttar Pradesh

Hybrids	Panicle length(cm)	Filled grain/panicle (No.)	Grain yield(t/ha)	Straw yield(t/ha)
UR-23	27.54	219.50	5.44	11.03
UR-24	28.33	208.17	4.49	10.23
UR-25	28.41	251.00	5.16	11.26
UR-26	24.33	176.33	5.43	10.9
UR-27	26.67	236.17	5.51	9.83
UR-28	28.00	225.00	5.49	11.07
UR-29	28.33	183.00	6.14	10.76
UR-30	24.67	191.33	4.25	10.03
UR-31	24.67	185.17	5.45	9.93
UR-32	21.33	244.50	5.56	11.03
UR 33	22.45	201.76	5.65	10.13
UR 34	25.68	217.43	6.34	12.26
UR 35	22.34	165.87	5.25	11.33
UR 36	23.59	158.34	5.36	10.9
UR 37	27.41	194.56	5.56	9.83
UR38	29.00	256.17	6.85	12.77
UR39	22.56	245.00	5.32	10.76
UR40	20.33	156.00	6.31	10.03
UR41	26.67	180.33	5.35	9.62
UR42	24.89	156.17	5.09	11.03
UR43	22.56	223.50	5.25	11.13
UR44	27.45	233.24	5.07	11.23
F-test	S	S	S	S
S.Em±	0.34	7.67	0.17	0.37
CD (P=0.05)	0.89	21.56	0.51	1.14

Result and Discussion
Growth
The recorded and analyses data pertaining to growth parameters indicates that significant higher plant height (122.57 cm), number of tillers per hill (No.) (15.07), plant dry weight per hill (55.91 g) was recorded in rice hybrid UR-38.

The differential growth with respect to plant height, number of tillers per hill and plant dry weight among the hybrids may be attributed to differences in genetic characterization of the individual, including rapid growth rates, tallness or shortness of species. Similar findings were recorded by Chamely *et al.* (2015) [1], Sharma *et al.* and Reddy *et al*. (2018).

Yield and yield attributes
Yield attributes such as Panicle length (cm), Number of filled Grains/Panicle (No.), Grain yield (t/ha) and Straw yield (t/ha) are recorded highest in hybrid UR-38. The Hybrid UR-38 was recorded with higher yield attributes *viz*. panicle length per hill (29.00 cm), number of filled grains per panicle (No.) (256.17), grain yield (6.85 t/ha) and straw yield (12.77 t/ha)

Increases in yield attributes such as Panicle length (cm), Number of filled Grains/Panicle (No.), Grain yield (t/ha) and Straw yield (t/ha) have resulted in an increase in seed production as a result of different genetic makeup. Similar findings were recorded by Meena *et al*. (2016) [4] and Khan *et al.* (2018) [3].

Conclusion
Based on the findings of this field experiment it is concluded that among all rice hybrids, UR-38 was found the most suitable rice hybrid to be recommended as it was found more adaptive, productive and profitable when compared to other hybrids under agro-climatic conditions of Prayagraj, U.P.

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