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PERFORMANCE OF DIFFERENT RICE HYBRIDS IN GIRD ZONE OF MADHYA PRADESH INDIA

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ABSTRACT

Hybrid rice practically has been a feasible and readily adopted genetic option to increase the rice production in climate changing situation in India. Keeping above consideration in view the six hybrid rice varieties were taken under testing for evaluation of their bio efficiency. The two years field experiment was conducted at instructional farm of Krishi Vigyan Kendra, Baroda, Sheopur during *Kharif* seasons of 2020 and 2021. Soil of experimental filed was clay loam had pH 7.8, organic carbon 0.72, available N 252.8 kg/ha, available P 27.2 kg/ha, and available K 185.6 kg/ha. Six hybrids of rice *viz.* Adv 801 +, Adv 807+, PAC 8744+, MAHYCO 5629, US 312, Arize 6444 and one local control Pusa 1612 were planted for comparing their performance. In experimental plots, it is observed that growth, yield attributing traits (numbers of tillers/m^2, filled grains/panicle, panicle length and test weight) and grain yield varied significantly with different hybrids of rice. All the hybrids taken under study produced significantly higher yield over rice variety Pusa 1121. Among hybrids, Adv 801+ yielded highest which was at par with US 312 and PAC 8744 + and significantly higher over MAHYCO 5629, Arize 6444 and Adv 807+. Based on findings, it can be concluded that rice hybrid Adv 801+, US 312 and PAC 8749 + were found to be promising for gird zone of Madhya Pradesh with respect to yield and other attributes. Hybrid Adv 807 + yielded excellent in short duration of 100-105 days.
Keywords **:** Rice, Hybrids, Short duration, Yield.

Introduction

Rice is the most consumed cereal grain in the world, constituting the dietary staple food for more than half of human population of the planet. Nearly 90 per cent of the world's rice is produced and consumed in Asia (Van Nguyen and Ferrero, 2006). Rice grain is termed as the global grain. The crop occupies largest area in India followed by China and Indonesia, whereas China has the highest production, but Australia has the highest productivity. It is the agricultural commodity with the third highest worldwide production, after sugarcane and maize (FAOSTAT, 2018). India has an area over 47 million ha and production of 132 million tones with productivity of 4.2 t/ha (IPADFASUSDA, 2023). Even than rice self-sufficiency in India is precarious. The country's population of more than a billion is growing at 1.8% per year, outpacing the 1.4% annual growth rate of rice production. India's population is expected to be 1.5 billion by the year 2030 and 138 million tons of rice will be required by 2030.This implies rice production need to grow by 17 per cent from the current level of 118 million tons in 2020 to reach 138 million tons by 2030.With the current level of productivity, total area under rice would be 52 million hectares covering almost 38 per cent of the total cropped land. The requirement of land under rice can be a major constraint to the growing need of crop diversification for both economic security of the farmers and nutritional security for larger population. Therefore, there is a strong need to increase rice production by enhancing productivity levels of rice without area expansion. Platueing trend in the yield of HYV's, declining and degrading natural resources like land and water and acute shortage of labour make the task of increasing rice production quite challenging.

The current situation necessitates looking for some innovative technologies to boost rice production. Encourage by success of hybrid rice technology in enhancing the rice production and productivity in China, the Indian Council of Agricultural Research (ICAR) initiated a program for development and large scale adoption of hybrid rice in the country. Hybrid rice technology is likely to play a key role in increasing the rice production.

Promising rice hybrids were identified for increasing rice production. Most of the released hybrids mature within 110 to 135 days with yield potential of 6.0 – 7.5 t/ha. On an average, hybrids give 20-40 per cent higher grain yield over the control. Hybrid rice practically has been a feasible and readily adopted genetic option to increase the rice production in India. Keeping above consideration in view the six hybrid rice varieties of different companies were taken under testing for evaluation of their bio efficiency.

Materials and Methods

Two year filed experiment was conducted with rice at instructional farm of Krishi Vigyan Kendra, Baroda, Sheopur during *Kharif* seasons of 2020 and 2021. Soil of experimental filed was clay loam had pH 7.8, Organic carbon 0.72, available N 252.8 kg/ha, available P 27.2 kg/ha, and available K 185.6 kg/ha. Six hybrids of rice viz. Adv 801 +, Adv 807+, PAL 8744+, MAHYCO 5629, US 312, Arize 6444 and one local control Pusa 1612 were planted for comparing their performance. 21 days old seedlings (2/hill) were transplanted in well puddle filed. All plots of experiment were flooded with 5-10 cm standing water until the flowering stage. Weed control and plant protection measure were taken as per recommendation. The experiment was conducted in a randomized block design with seven replications of $20m^2$plots. N, P and K were applied at the rate of 120, 60 and 40 kg/ha through Ursa, SSP and MOP. Half dose of N and full dose of P & K were applied as Basel dose at the time of transplanting. Remaining N was applied in two equal splits at 20 DAT and 40 DAT as topdressing. Data on plant height (cm) at harvest, days to 50% flowering, number of effective tillers per meter square, length of panicle (cm), Number of filled grains per panicle, test weight (g) and grain yield (kg/ha) were recorded and analyzed statistically following the analysis of variance procedure as described by Gomez and Gomez (1984).

Results and Discussion

Various growth and yield attributing characters like plant height, days to 50 per cent flowering, Number of effective tillers/m^2, Length of panicle (cm), Number of filled grain/panicle and Test weight (g) were studied. Though the plant height is genetically controlled character, it is being influenced by environmental conditions and management practices. Plant height is a very important trait in the selection of high yielding rice variety (Sabouri *et al*., 2008). In this study, the highest plant height was recorded in PAC 8744+ (136.8 cm during I year and 135.67 during II year) which was significantly higher over rice hybrid ADV 801+, MAHYCO 5629, US 312 and ADV 807+. The lowest plant height was noticed in rice hybrid ADV 807+ (99.40 cm during I year and 99.33 during II year). The data regarding days required to 50 per cent flowering showed significant difference. Maximun days to 50 per cent flowering (95.67 days during I year and 95 days during II year) were taken by check Pusa 1121 (inbreed line), which was significantly higher over all rice hybrids under study. Among hybrids, maximum days to 50 per cent flowering (88.67days during I year and 90 days during II year) were noticed in US 312, which at par with Arize 6444 and PAC 8744+ and significantly higher over ADV 801+, MAHYCO 5629 and ADV 807+. Minimum days to 50 per cent flowering (67.67 days during I year and 68 days during II year) were recorded in ADV 807+. This type of variability might be due to the genetic makeup of the exotic lines under specific environmental conditions (Ahmad *et al*., 2014).

Number of effective tillers per square meter is very important yield attribute. The data for the number of effective tillers per square meters showed that the hybrid PAC 8744 + has highest number of effective tillers per square meter (459.33 tillers per square meter during I year and 447 during II year) during both year of study, while minimum number of effective tillers per square meter (342 tillers per square meter during I year and 334.33 tillers per square meter during II year) were recorded in MAHYCO 5629. The panicle length is also very important trait regarding paddy yield. Panicle length varied significantly with different genotypes during both the year of study. In case of panicle length, the highest panicle length was recorded in hybrid US 312 (29.87 cm during I year and 29.93 cm during II year) which was at par with hybrids Adv 801+, Arize 6444, PAC 8744 + and check Pusa 1121 and significantly higher over MAHYCO 5629 and Adv 807 +. Minimum value for panicle length among hybrids was recorded in hybrid Adv 807+ (21.60 cm during I year and 21.67 during II year). The variation in panicle length in different hybrids was also reported by Riaz *et al*. (2017). In rice, the number of fertile grain per panicle is one of the important yield attributing traits having positive direct effect on rice yield (Shrestha *et al*., 2021). All the hybrids taken

under study found significantly superior over check Pusa 1612 for filled grains per panicle during both the year of study. Highest number of filled grains per panicle were recorded in US 312 (279 grains per panicle during I year and 275.33 during II year). Among the hybrids, the minimum number of fertile filled grains per panicle were recorded in ADV 807+ (21.6 grains per panicle during I year and 21.67 during II year). For the better varietal development, it was recommended that number of grains per panicle is a direct economic trait (Xio *et al*., 1996). Similarly, thousand grain weight (Test weight) is also an important component that contributes towards increase in yield (Akram *et al*., 2007). The thousand grain weight in the hybrids ranged from 21.33 gm to 25.67 gm. Grain of hybrid Adv 801+ found to be bold with highest test weight (25.67 gm) during both the year of study, which was at par with Arize 6444, Adv 807 + and MAHYCO 5629 and significantly higher over US -312, PAC 8744+ and check Pusa 1121. Among hybrids tested in this study, US 312 produced fine grains with test weight 21.67 gm during I year and 21.33 gm during II year. Low value of test weight is an indication towards grain fineness. In case of check variety, Pusa 1121, it is basmati, produced finest grain with lowest thousand grain weight (21.33 gm during I year and 21.0 gm during II year).

The data on yield revealed that all six hybrids produced significantly higher grain yield than the check variety (Table-1) during both the year of study. This increase in yield over check ranged from 42.47-80.80 per cent. On an average, ADV 801+ produced the highest yield (7950 kg per hectare during I year and 7838.67 kg per hectare during II year) during both the year of study, which was at par with US-312 and PAC 8744 and significantly higher over MAHYCO 5629, Arize 6444, Adv 807+ and check variety Pusa 1121. Among hybrids tested in this study, ADV 807+ yielded minimum (6197.00 kg per hectare during I year and 6176.67 kg per hectare during II year) during both the year of study. The yield advantage of rice hybrids over inbred varieties has already been reported by several researchers (Akram *et al*., 2021, Chamling and Basu 2014, Riaz *et al*., 2017, Shrstha *et al*., 2021, Virmani 1986, Young and Virmani 1990, Peng and Virmani, 1991). Yield increase in hybrids seems due to hetrosis in number of grains per panicle and thousand grain weight (Virmani *et al*., 1982)

Conclusion

Based on above findings, it can be concluded that rice hybrid Adv 801+, US-312 and PAC 8749+ were found to be promising for grid zone of Madhya Pradesh with respect to yield and other attributes. Hybrid Adv 807+ yielded excellent in short duration of 100-105 days.

Table: Growth, yield attributes and yield of rice hybrids

Rice hybrid	Plant height (cm		Days to 50% flowing		No. of effective tillers		Panicle length (cm)		Field grains/ panicle		1000 grains wt (g)		Yield (Kg/ha)	
	I year	II year	I year	II year	I year	II year	I year	II year	I year	II year	I year	II year	I year	II year
Adv 801+	128.27	127.33	83	84.33	434	423.67	29.13	29.60	247.67	247.33	25.67	25.67	7950	7838.67
MAHYCO 5629	110.23	109.67	73.67	74.33	342	334.33	26	26.13	237	240	24.93	25	6265.50	6341.00
US 312	130.13	128.67	88.67	90	412	403	29.87	29.93	279	275.33	21.67	21.33	7569.17	7557.00
Arize 6444	135.47	134.33	88	89	454	449.33	28.73	28.73	213.67	215.67	25.67	25.33	6285.33	6347.67
Pusa 1121	133.27	132.33	95.67	95	412	406	28.73	29.07	192.67	189.33	21.33	21.00	4397.67.	4387.33
PAC 8744+	136.8	135.67	88.33	87.67	459.33	447	28.53	28.87	242.33	240.67	24.33	24.33	7143.00	7172.33
Adv 807+	99.40	99.33	67.67	68	358	363	21.60	21.67	229.33	232.33	25.33	25	6197.00	6176.67
SEM ±	2.3	1.89	0.99	0.97	39.12	34.95	0.79	0.70	6.47	5.41	0.32	0.36	445.38	361.56
CD at 5%	6.5	5.33	2.79	2.76	110.65	98.85	2.23	1.99	18.29	15.29	0.92	1.01	1259.64	1022.65

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