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Rajnandini Vaishnav
M.Sc, Department of Agronomy, Indira Gandhi Krishi Vishwavidyalaya Raipur, Raj Mohini Devi College of Agriculture and Research Station, Ambikapur, Sarguja, Chhattisgarh, India

RS Sidar
Professor, Department of Agronomy, Indira Gandhi Krishi Vishwavidyalaya Raipur, RMD College of Agriculture and Research Station Ambikapur Sarguja, Chhattisgarh India

ON Verma
Senior Scientist Department of Genetics and Plant Breeding, Indira Gandhi Krishi Vishwavidyalaya Raipur, S.K. College of Agriculture and Research Station Kawardha, Chhattisgarh India

CK Chandrakar
Senior Scientist Department of Agronomy, Indira Gandhi Krishi Vishwavidyalaya Raipur, S.K. College of Agriculture and Research Station Kawardha, Chhattisgarh India

Corresponding Author
Rajnandini Vaishnav
M.Sc, Department of Agronomy, Indira Gandhi Krishi Vishwavidyalaya Raipur, Raj Mohini Devi College of Agriculture and Research Station, Ambikapur, Sarguja, Chhattisgarh, India

Performance of rice (*Oryza sativa*) varieties in Kabirdham district of Chhattisgarh

Rajnandini Vaishnav, RS Sidar, ON Verma and CK Chandrakar

Abstract
A field experiment was conducted to evaluate the performance of seven rice varieties collected from IGKV Raipur namely, Chandrahasni, Swarna, zinc Rice, Protezinc, DRR dhan 48, Madhuraj 55 and Rajeshwari. The experiment was laid out in a Randomized Block Design with three replications. Observation was recorded on 30 DAT, 60 DAT, 90 DAT and at harvest on parameters like, Growth parameters viz. Plant height, Number of tillers/plant, Number of leaves/plant, LAI, CGR and RGR. Yield parameters viz. Number of panicles/m^2, Panicle length, Number of grains/panicle and Test weight. Grain yield, Straw yield and Harvest index was also recorded. Result obtained as the plant height at harvest was tallest of Madhuraj 55 (114.1 cm), maximum no. of tillers/plant was produced by Rajeshwari rice variety (19.8), maximum number of leaves/plant was produced highest by Rajeshwari (44.0) and maximum LAI, CGR and RGR was registered by Rajeshwari variety (4.74, 9.54 and 0.060 respectively). All the yield parameters were recorded maximum by Rajeshwari rice variety followed by Swarna and the poorest yield attributing characteristics was registered by Protezinc. Grain yield, straw yield and harvest index was comparatively higher in Rajeshwari (65.6 q/ha, 86.4 q/ha and 43.2% respectively) followed by Swarna rice variety (61.1 q/ha, 85.0 q/ha and 41% respectively).

Keywords: Growth parameters, yield parameters

Introduction
Rice (*Oryza sativa* L.) is one of the most widely consumed crop within the cereals which suffice the extreme needs of the calorie in this coming neoteric world and has a major impact on livelihood and economics of billion of people. Although India stand second among all rice producing countries with the production of 118.43 million tons and uses 43.78 million hectare of land for rice cultivation (Anonymous, 2020) [1]. There is a wide spread concern for the population growth and in that case increment in food demands and meeting the food requirements of the growing population for global food security, poses a huge challenge. According to forecasts the global production will need to increase by over 40% by 2040 to meet the need of the growing universal population.
Chhattisgarh state is being acknowledged as "Rice bowl of India" and approximately 82% population of the state is dependent on agriculture for their livelihood. Present data reveals that about 3.61 million hectares of land is under rice cultivation with 6.7 million tons of production. Over 23,000 rice varieties have been recorded in this arena. Varieties play a major role in upgrading the yield by improving the input use efficiency. Variety hold different physiological and morphological features that contribute towards yield. Different varieties have different morphological and yield component that is mainly influenced by their genetic makeup and outer environment. The varieties often perform different in different environments due to genotype environment interaction.

Material and Methods
A field experiment was conducted at S.K. College of Agriculture and Research station Kawardha (C.G.) during *Kharif* 2021. The experiment field has geographical situation of 22^0 0' N latitude and 81^0 13' E longitude, having savanna climate and agro-climatic zone is "Plains of Chhattisgarh". It has savanna climate with yearly temperature of 30.13 °C. The experiment was laid out in a Randomized Block Design (RBD) with three replications. The selected field was firstly divided into three equal blocks and each block was further divided into seven unit plots. The size of each unit plot was 20 m^2 (4 m x 5 m). The total number of plot was twenty one. All blocks were separated by 1.0 m buffer-zone. In this research work seven rice varieties were included *viz.* Chandrahasni, Swarna, Zinco Rice, Protezinc, DRR dhan 48, Madhuraj 55

and Rajeshwari. Twenty one days old seedlings were transplanted on 27 July 2021 maintaining 16 cm hill to hill and 17 cm line it line distance. The experimental field was uniformly fertilized with urea, MOP and DAP. Two hand weeding were done at 25 DAT and at 41 DAT. Irrigation was also performed during crop growth period. Data on yield parameters at final harvest. All the collected data were analyzed following the Analysis of Variance (ANOVA) and differences between means adjudged b

Results and Discussion

Number of panicles/m^2

Varieties showed significant difference in relation to numbers of panicle/m^2. Among all the varieties, rice variety Rajeshwari produced significantly higher number of panicles/m^2 (222.7), which was at par with the variety Swarna (216.3) and variety Chandrahasini (212.3). The lowest number of panicles/m^2 was produced with variety Protezinc (184.0), which was at par with Madhuraj-55 (187.7) remaining all the varieties were intermediate and at par with each other. Genetic make-up of the variety which is essentially influenced by heredity is foremost probable reason for the difference in the production of number of panicle/m^2. The results corroborates with the findings of Patel *et al.* (2010) who reviewed that the number of panicle/m^2 was varied with variety.

Panicle length

Significant difference was recorded among different rice varieties for panicle length. Among the different tested varieties, Rajeshwari was recorded to have the longest length of panicle (26.0 cm) followed by Swarna (25.8 cm) and Chandrahasini (25.0). Above mentioned three varieties were at par. The shortest panicle length was noted by Protezinc (21.9 cm). The length of panicle is controlled by genetic nature of the variety. As the panicle escalated per hill, the length of the panicle may be enlarged. The findings are in correlation with the findings of Baishya *et al.* (2015) [2] who reported that the panicle length influenced by variety.

Number of grains/panicle

Variety Rajeshwari (140.1) was recorded to have the highest number of grains/panicle which was statistically identical with Swarna (134.5). The lowest number of grains/panicle was noted with the variety Protezinc (110.8) which was statistically similar with Madhuraj 55 (113.8). Varietal variations related to number of grains/panicle is a result of differences in genetic constituents of different rice varieties.

Test weight

From the data presented below, it is very clear that all the test rice varieties differ greatly in 1000 grain weight value. The test weight values ranges from 20.0 g to 25.6 g. The heaviest 1000 grain weight was recorded by Rajeshwari (25.6 g), followed by Swarna (25.2 g) and Chandrahasini (25.2 g). On the other hand lowest value for 1000 grain weight was recorded for Protezinc (20.0 g). The findings are similar with the reports of Setiawati *et al.* (2020) [5] who also recorded different test weight due to varietal difference.

Show Treatments Number of panicles/m2 Panicle length (cm) Number of grains/panicle and its Test weight (g)

S. No.	Treatments	Number of panicles/m^2	Panicle length (cm)	Number of grains/panicle	Test weight (g)
T_1	Chandrahasni	212.3	25.0	125.6	25.2
T_2	Swarna	216.3	25.8	134.5	25.2
T_3	ZincoRice	191.7	22.7	115.6	22.4
T_4	Protezinc	184.0	21.9	110.8	20.0
T_5	DRR ddhan 48	193.7	23.9	120.8	24.1
T_6	Madhuraj 55	187.7	22.6	113.8	20.9
T_7	Rajeshwari	222.7	26.0	140.1	25.6
SEm±		3.38	0.40	2.79	0.24
CD (P=0.05)		10.54	1.25	8.70	0.75

Grain yield, straw yield and biological yield

Grain yield

Among all the tested rice varieties, Rajeshwari (65.6 q/ha) variety was able to produce significantly higher grain yield followed by Swarna (61.1). On the other hand, minimum yield was recorded by variety Protezinc (45.8). Remaining all varieties yielded in between this range. Higher grain yield is determined by physiological process results into a high net accumulation of photosynthates and their partitioning. The higher yield in Rajeshwari are supposed to be contributed by various growth and yield parameters, like more number of leaves/hill during different growth stages and a higher count of effective tillers/m^2, that result into formations of more photosynthetic produce. The higher value of test weight is one of the main factors for enhancement of the grain yield in the variety.

Straw yield

All the variety showed significant difference in terms of straw yield. The bulkiest straw yield was recorded by variety Rajeshwari (86.4 q/ha) which was on the same plane with variety Swarna (85.0 q/ha). The lowest weight of straw yield was recorded by variety Protezinc (72.3 q/ha) which was comparable with variety Madhuraj 55 (75.6 q/ha).The straw yield of remaining tested varieties ranged between 86.4 q/ha and 72.3 q/ha and among the biofortified rice varieties highest straw yield was registered by DRR dhan 48 (78.5) followed by Zincorice (78.1 q/ha) The variable straw yield of the tested rice varieties might be due to difference in their count of tillers/hill. The result was supported by Roy *et al.* (2014) [4].

Harvest index

Harvest index (HI) is an important character owning physiological importance and as it reflects translocation on alternatively dry matter partitioning of a given genotype the economics parts. All the varieties flaunted a significant variable results related to harvest index. Data concerning to harvest index of all the varieties is presented in Table which is directly connected to grain yield and straw yield. However, among all the varieties, highest value of HI was noted for Rajeshwari (43.2). The next two varieties were at par with each other i.e. Swarna (41.8) and Chandrahasini (41.3). The lowest value of HI was calculated for variety Protezinc (38.8) and was comparable with Madhuraj 55 (39.8).

Shows Treatments Grain yield (q/ha) Straw yield (q/ha) and its Harvest index (%)

S. No.	Treatments	Grain yield (q/ha)	Straw yield (q/ha)	Harvest index (%)
T_1	Chandrahasni	56.7	80.6	41.3
T_2	Swarna	61.1	85.0	41.8
T_3	ZincoRice	52.9	78.1	40.4
T_4	Protezinc	45.8	72.3	38.8
T_5	DRR ddhan 48	53.8	78.5	40.7
T_6	Madhuraj 55	49.9	75.6	39.8
T_7	Rajeshwari	65.6	86.4	43.2
SEm±		1.26	1.37	0.66
CD (P=0.05)		3.91	4.28	2.06

Conclusions

Among the rice varieties evaluated, Rajeshwari dominated to all, in terms of grain yield (65,607 q/ha), straw yield (86,383 q/ha) and Harvest index (43.16%) followed by variety Swarna with grain yield (61.1 q/ha), straw yield (84.969 q/ha) and Harvest index (41.80%). The maximum grain yield production was mainly due to superiority in number of tillers/hill, number of panicle/m^2, number of grain/panicle and test weight.

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