

## EVALUATION OF RICE GENOTYPES FOR BIO CHEMICAL AND YIELD AND YIELD CONTRIBUTING CHARACTERS

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### ABSTRACT

An investigation was carried out during *kharif* season of 2019-2020 at research farm of ARS Sakoli in Randomized Block Design (RBD) with twelve treatments (twelve rice cultivars viz., CR Dhan 311, CR Dhan 310, CR Dhan 201, Indira Arobiec, Samleshwari, Rajeshwari, Indira Barani Dhan, MTU-1010, N-22, PKV Ganesh, Vandana, Sahbhagi Dhan) replicated thrice. Cultivar PKV Ganesh recorded higher total number of grains panicle<sup>-1</sup>, spikelet fertility, number of panicles m<sup>-2</sup> and grain yield kg ha<sup>-1</sup> over check Sahbhagi Dhan and other cultivars under study.

(Key words: Rice, chemical, yield and yield contributing characters)

### INTRODUCTION

Rice (*Oryza sativa* L.) is the seed of the monocot plants. It can be a short, medium or long grain size. It is cultivated in 116 countries globally by 144 million farm families in around 160 million ha producing 480 million tons milled rice (Singh, 2018). The total area under rice cultivation in India was 44.6 million hectares producing 108.08 million tons with the productivity of 2.47 t ha<sup>-1</sup> in 2016. The total area under rice in Maharashtra state is 15.57 lakh hectare with an annual rice production of 36.54 lakh tons (52.95 lakh tons rough rice) and the average productivity is 2.35 t ha<sup>-1</sup> (3.4 t ha<sup>-1</sup> rough rice) (Anonymous, 2016a). Eastern Vidarbha zone is the major rice producing area of Maharashtra. Nearly 8.16 lakh hectare area of Vidarbha (contributes 52.41 % of the state area) was under rice crop with the production of 24.39 lakh tons rough rice (16.83 lakh tons milled rice) (Anonymous, 2016a)

Direct seeding of rice refers to the process of establishing a rice crop from seeds sown in the field rather than by transplanting seedlings from the nursery. Day by day there is less rainfall, uneven distribution of rains, dry spell during the month of July- August and from second fortnight of September in Vidarbha region. Sometimes farmers use 40 to 50 days old rice seedling for transplanting which later on suffers heavily due to disease pest infestation also. Rice crop suffer due to water stress at flowering and grain filling stage which resulted into low yields. To overcome this problem now farmers are slowly shifting to rice crop cultivation by direct seeding. Different rice cultivars growing in India for direct seeding condition in many states have different morphological and yield traits. Different rice

cultivars showed differences in yield under direct seeding condition. Considering the above facts present investigation was under taken on different varieties of rice under direct seeded condition.

### MATERIALS AND METHODS

A field experiment was conducted at research farm, ARS, Sakoli, during 2019-20 in RBD with three replications and twelve treatments (cultivars CR Dhan 311, CR Dhan 310, CR Dhan 201, Indira Arobiec, Samleshwari, Rajeshwari, Indira Barani Dhan, MTU-1010, N-22, PKV Ganesh, Vandana, Sahbhagi Dhan). Observations on total chlorophyll content were recorded at 60 and 90 DAS. Total number of grains panicle<sup>-1</sup>, spikelet fertility, weight of grains panicle<sup>-1</sup>, number of panicles m<sup>-2</sup>, 1000 grain weight, grain type, harvest index and grain yield in kg ha<sup>-1</sup> were recorded at harvest. Data were statistically analysed as per method suggested by Panse and Sukhatme (1967).

### RESULTS AND DISCUSSION

#### Total chlorophyll content

The data pertaining to total chlorophyll content of rice cultivars are presented in Table 1 indicated that mean total chlorophyll content of rice cultivars at 60 DAS was 5.95 mg g<sup>-1</sup>. Six rice cultivars recorded significantly higher total chlorophyll content than check Sahbhagi Dhan (4.65 mg g<sup>-1</sup>). Significantly highest total chlorophyll content was recorded in Samleshwari (7.68 mg g<sup>-1</sup>) followed by Indira Arobiec (7.49 mg g<sup>-1</sup>) and CR Dhan 201 (7.12 mg g<sup>-1</sup>). However, lowest total chlorophyll content was recorded in CR Dhan

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311 (4.3 mg g<sup>-1</sup>). Rice cultivars viz., Rajeshwari (5.73 mg g<sup>-1</sup>), MTU 1010 (5.53 mg g<sup>-1</sup>), PKV Ganesh (5.43 mg g<sup>-1</sup>), Vandana (4.32 mg g<sup>-1</sup>) and CR Dhan 311 (4.3 mg g<sup>-1</sup>) were found at par with the check Sahbhagi Dhan.

The data pertaining to total chlorophyll content of rice cultivars are presented in Table 1 indicated that mean total chlorophyll content of rice cultivars at 90 DAS was (3.76 mg g<sup>-1</sup>). Significantly highest total chlorophyll content was recorded in CR Dhan 201 (4.83 mg g<sup>-1</sup>) as compared to check Sahbhagi Dhan (3.61 mg g<sup>-1</sup>). However, lowest total chlorophyll content was recorded in N-22 (2.86 mg g<sup>-1</sup>). While, rest of all cultivars except CR Dhan 201 were found at par with the check Sahbhagi Dhan.

Total chlorophyll content (mg g<sup>-1</sup>) of fresh leaves was higher at 60 DAS and declined at 90 DAS due to yellowing of leaves at later stage. Swain *et al.* (2017) reported mean of 2.03 mg g<sup>-1</sup> total chlorophyll content of rice varieties and range of 1.6 to 2.5 mg g<sup>-1</sup> at later stage. The present results obtained at 60 DAS are also supported by Vanisri *et al.* (2017). They reported the range of total chlorophyll mg g<sup>-1</sup> from 3.42 in Tulsi to 6.56 mg g<sup>-1</sup> in Rasi amongst 21 rice cultivars studied.

#### **Total number of grains panicle<sup>-1</sup>**

The data pertaining to total number of grains panicle<sup>-1</sup> of rice cultivars are presented in Table 1 indicated that mean total number of grains panicle<sup>-1</sup> of rice cultivars were 118.42. Significant differences were found in respect to total number of grains panicle<sup>-1</sup> of rice cultivars. Significantly highest total number of grains panicle<sup>-1</sup> were recorded in PKV Ganesh (155) followed by Rajeshwari (149) as compared to check Sahbhagi Dhan (123). Significantly less total number of grains panicle<sup>-1</sup> were recorded in rice cultivars Vandana (63) followed by N-22 (72). However, rest of rice cultivars showed at par total number of grains panicle<sup>-1</sup> with Sahbhagi Dhan.

In present investigation total number of grains panicle<sup>-1</sup> of rice cultivars were ranged from 63 to 155 under direct seeded condition in low land area. High yielding rice cultivars PKV Ganesh (155), Rajeshwari (149) showed higher number of grains panicle<sup>-1</sup>. Present results are supported by Swain *et al.* (2017). They reported the range of number of grains panicle<sup>-1</sup> from 72.7 to 107.4. Likewise Adigbo *et al.* (2018) screened 19 upland rice cultivars in inundated soil and reported range of number of grains panicle<sup>-1</sup> from 41 to 88.

#### **Spikelet fertility**

The data pertaining to spikelet fertility of rice cultivars are given in Table 1 indicated that mean spikelet fertility of rice cultivars was 89.24 %. Numerically higher spikelet fertility was recorded in Indira Arobic (95.68 %) followed by Indira Barani Dhan (93.16 %), Samleshwari (91.66%), PKV Ganesh (91.61%) and others as compared to check Sahbhagi Dhan (85.36 %) which recorded lowest to spikelet fertility. All the rice cultivars exhibited at par spikelet fertility (%) with the check Sahbhagi Dhan.

In present investigation spikelet fertility of rice cultivars ranged from 85.36 to 95.68%. The present results are supported by Swain *et al.* (2017), who reported more than 84% spikelet fertility in rice cultivars. Malarvizhi *et al.* (2010) also reported range from 86.2 to 93.35% of spikelet fertility in different rice cultivars and hybrids studied.

#### **Weight of grains panicle<sup>-1</sup>**

The data pertaining to weight of grains panicle<sup>-1</sup> of rice cultivars are presented in Table 1 indicated that mean weight of grains panicle<sup>-1</sup> of rice cultivars was 2.46 g. Significantly highest weight of grains panicle<sup>-1</sup> was recorded in Rajeshwari (3.65 g) followed by MTU-1010 (3.16 g) and Indira Aerobic (3.06 g) as compared to check Sahbhagi Dhan (2.2 g), while significantly lowest weight of grains panicle<sup>-1</sup> was recorded in rice cultivar Vandana (1.9 g). Rest of all rice cultivars were exhibited at par weight of grains panicle<sup>-1</sup> with the check Sahbhagi Dhan.

In present study weight of grains panicle<sup>-1</sup> of rice cultivars was ranged from 1.9 g to 3.65 g. Top yielding rice cultivar Rajeshwari had 3.65 g weight of grains panicle<sup>-1</sup>. Results are supported by Efisue *et al.* (2014). They studied 26 rice cultivars and reported mean weight of grains panicle<sup>-1</sup> of 2.80 and range from 1.73 to 4.17g.

#### **Number of panicles m<sup>-2</sup>**

The data pertaining to number of panicles m<sup>-2</sup> of rice cultivars are presented in Table 1 that mean number of panicles m<sup>-2</sup> of rice cultivars were 319.58. Significantly highest number of panicles m<sup>-2</sup> were recorded in PKV Ganesh (445) followed by Vandana (395), Indira Aerobic (335), CR Dhan 310 (330), N-22 (330) and CR Dhan 201 (325) as compared to check Sahbhagi Dhan (245). Lowest number of panicles m<sup>-2</sup> were recorded in rice cultivars Sahbhagi Dhan (245) and Indira Barani Dhan (245). Rest of all rice cultivars were exhibited at par number of panicles m<sup>-2</sup> with the check Sahbhagi Dhan.

In present study number of panicles m<sup>-2</sup> were ranged from 245 to 445 and highest was recorded in second high yielding rice cultivar PKV Ganesh. Presents results are supported by Ali *et al.* (2007). They reported 141 to 327 panicles m<sup>-2</sup>.

#### **1000 grain weight**

The data in respect to 1000 grain weight (g) of rice cultivars are presented in Table 1 indicated that mean 1000 grain weight of rice cultivars was 23.77 g. Significant difference was observed among the rice cultivars. Significantly highest 1000 grain weight was recorded in Rajeshwari (32.4 g) as compared to check Sahbhagi Dhan (25.6 g). Whereas, significantly lowest 1000 grain weight was recorded in rice cultivar PKV Ganesh (15.6 g) followed by CR Dhan 310 (17.2 g) and CR Dhan 311 (20.4 g). Rest of the rice cultivars were at par with check Sahbhagi Dhan (25.6 g).

In present investigation 1000 grain weight (g) of rice cultivars was ranged from 15.6 g in second high yielding rice cultivar PKV Ganesh to 32.4 g in top high yielding rice

**Table 1. Evaluation of rice genotypes for total chlorophyll content ( $\text{mg g}^{-1}$ ), number of grains panicle<sup>-1</sup>(g), spikelet fertility (%), weight of grains panicle<sup>-1</sup>(g), number of panicles m<sup>-2</sup>, panicle length (cm), 1000 grain weight (g), grain type, Harvest Index(%) and Grain yield kg ha<sup>-1</sup>**

Genotypes	Chlorophyll content ( $\text{mg g}^{-1}$ )		Number of grains panicle <sup>-1</sup>	Spikelete fertility (%)	Weight of grains panicle <sup>-1</sup> (g)	Number of panicles m <sup>-2</sup>	Panicle length (cm)	1000 grain weight (g)	Grain type	Harvest index (%)	Grain yield (kg ha <sup>-1</sup> )
	60 DAS	90 DAS									
CR Dhan 311	4.30	3.67	121.0	87.60	2.40	285.0	24.6	20.4	MS	29.6	4946.0
CR Dhan 310	6.53	3.92	110.0	87.27	2.20	330.0	25.8	17.2	SB	29.0	3733.0
CR Dhan 201	7.12	4.83	130.0	88.46	2.05	325.0	25.8	26.0	LB	34.0	4720.0
Indira Arobic	7.49	4.32	139.0	95.68	3.06	335.0	20.8	22.4	MS	39.6	5740.0
Samleshwari	7.68	2.98	120.0	91.66	2.45	305.0	25.6	26.4	MS	36.3	5793.0
Rajeshwari	5.73	3.31	149.0	86.57	3.65	305.0	33.4	32.4	LB	36.6	6446.0
Indira Barani Dhan	6.45	4.20	117.0	93.16	1.96	245.0	23.4	23.6	LS	52.18	3456.0
MTU-1010	5.53	3.85	122.0	89.34	3.16	290.0	26.2	28.4	LS	34.6	4680.0
N-22	6.13	2.68	72.0	90.27	1.63	330.0	17.6	22.4	MS	37.95	2533.0
PKV Ganesh	5.43	3.79	155.0	91.61	2.80	445.0	22.7	15.6	SS	31.0	6066.0
Vandana	4.32	3.79	63.0	87.30	1.90	395.0	21.6	24.8	LS	35.53	2413.0
SahabagiDhan (check)	4.65	3.61	123.0	85.36	2.20	245.0	27.0	25.6	LB	50.95	3660.0
SE (m) $\pm$	0.38	0.25	7.93	5.66	0.16	21.51	1.56	1.52	-	2.29	308.13
CD at 5%	1.12	0.74	23.26	16.59	0.48	63.08	4.65	4.44	-	6.70	903.71

cultivar Rajeshwari. The present results are supported by Padhiary *et al.* (2017). They reported range of 1000 grain weight (g) of rice cultivars from 18.20 to 24.58 in high yielded Varsadhan.

### Grain type

The data in respect to grain type of rice cultivars are presented in Table 1. Different rice cultivars found to be different grain types. High yielding rice cultivar Rajeshwari showed long bold (LB) grain type. CR Dhan 201 and check Sahbhagi Dhan are also having long bold (LB) grain type. Second high yielding rice cultivar PKV Ganesh has short slender (SS) grain type. Four rice cultivars *viz.*, CR Dhan 311, Indira Arobiec, Samleshwari and N-22 were shown medium slender (MS) grain type. Whereas, Indira Barani Dhan, MTU 1010 and Vandana showed long slender (LS) grain type.

### Harvest index

The data in respect to harvest index (%) of rice cultivars are presented in Table 1 indicated that mean harvest index of rice cultivars was 37.28 %. Numerically higher harvest index was recorded in Indira Barani Dhan (52.18 %) as compared to check Sahbhagi Dhan (50.95 %). Whereas, significantly lower harvest index was recorded in rest of the rice cultivars as compared to check Sahbhagi Dhan (50.95 %). However, significantly lowest harvest index was recorded in CR Dhan 310 (29 %)

In present investigation harvest index (%) of rice cultivars was ranged from 29 to 52.18%. The present results are supported by Padhiary *et al.* (2017). They reported range of harvest index (%) from 27.76 to 36.97.

### Grain yield kg ha<sup>-1</sup>

The data in respect to grain yield kg ha<sup>-1</sup> of rice cultivars are presented in Table 1 indicated that mean grain yield of rice cultivars was 4515.5 kg ha<sup>-1</sup>. Grain yield differences were statistically significant. Grain yield ranged from 2413 to 6446 kg ha<sup>-1</sup>. Seven rice cultivars recorded significantly higher grain yield kg ha<sup>-1</sup> as compared to check Sahbhagi Dhan (3660 kg). Significantly highest grain yield ha<sup>-1</sup> was recorded in Rajeshwari (6446 kg). Other rice cultivars recorded significantly higher grain yield ha<sup>-1</sup> were PKV Ganesh (6066 kg) which stood second followed by Samleshwari (5793 kg), Indira Arobiec (5740 kg), CR Dhan 311 (4946 kg), CR Dhan 201 (4720 kg) and MTU 1010 (4680 kg). However, significantly lower grain yield ha<sup>-1</sup> was recorded in Vandana (2413 kg) followed by N-22 (2533 kg), while rest of the rice cultivars were at par with check Sahbhagi Dhan (3660 kg).

In present investigation grain yield ranged from

2413 to 6446 kg ha<sup>-1</sup>. The results obtained in present study are supported by Ali *et al.* (2007), Swain *et al.* (2017), Ali *et al.* (2007) reported range of grain yield from 2490 to 5140 kg ha<sup>-1</sup> when screened 15 rice varieties suitable for direct seeding in Punjab. Swain *et al.* (2017) reported grain yield of rice cultivars ranged from 2810 to 4700 kg ha<sup>-1</sup>. They observed that higher 1000 grain weight rice variety was high yielded as it was also observed in present study in case of Rajeshwari (6446 kg). Purane *et al.* (2020) studied on performance of rice genotypes for morpho-physiological parameters and yield in summer season on seven rice genotypes at 30, 60 and 90 DAT and reported range of grain yield plot<sup>-1</sup> from 3.52 to 2.94 kg and highest grain yield plot<sup>-1</sup> was observed in genotype PKV-Ganesh (3.52 kg)

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