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Performance of various rice varieties under different method of crop establishment

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Abstract

The present investigation on conducted during *Kharif* season of 2006 with 32 genotypes of rice at Research Farm of Indira Gandhi Krishi Vishwavidyalaya, Raipur (Chhattisgarh). On the basis of overall performance, the genotypes Poonima, Danteshwari, R-1033-968-2-1 and R-1248-1489-2-822-1 performed better for the entire attributes viz. yield, number of tillers, and biomass under SRI method of rice cultivation. The hybrid variety IRH-5 performed better under traditional method with continuous water level.

Keywords: Genotype, rice, SRI, yield

Introduction

Rice stands first among all food grain crops of the world and is the staple food of more than half of world's population. In India also rice is the major crop in terms of area, production and consumption. In general, rice is grown under diverse environmental conditions from a wide range of latitude and altitudes. It is also grown under all the 3 rice growing environments like uplands, lowlands and midlands.

When compared to other crops, the water requirement for rice crop is very high. It is often believed that standing water of at least 5 cm depth is needed for rice crop right from transplanting to flowering and grain filling stages. With increasing water crisis in many parts of the world including India, newer technologies are being developed with minimum water use for rice cultivation.

The system of rice intensification called, in short, SRI is one of such alternatives. The system is capable of saving irrigation water up to 50 to 60 per cent as compared to traditional practices and also increases yield. The SRI was first developed by Herri de Lunlqnie in 1980 in Madagascar and hence it is also known as "Madagascar method" by people of other countries. It is a technique of increasing productivity by changing management of plant, soil water and nutrients; it involves single young seedlings planted widely on aerated soil and most importantly keeping rice field moist but not flooded. the experiment was conducted with 32 rice genotypes cultivated under both SRI and traditional methods of rice cultivation with the objective to evaluate the performance of SRI (system of rice intensification) and traditional method of rice cultivation.

Materials and Methods

The experiment was conducted at demonstrations farm, Indira Gandhi Krishi Vishwavidyalaya, Raipur situated in South- Eastern part of Chhattisgarh. During the Kharif season of 2006 a total of 1099.9 mm was received as against the normal value of 1140 mm at IGKV, Raipur (C.G). Table 1 Name of different genotypes used during study period. Thirty two genotypes of paddy were sown on two different dates i.e. 16th and 25th July, 2006 under traditional and SRI methods. All the recommended package of practices was carried out for the successful cultivation of paddy. The daily meteorological observations along with the plant height, grain and straw yield of paddy were recorded.

Table 1: Name of different genotypes used during study period.

S. No	Genotypes	S. No	Genotypes	S. No	Genotypes	S. No	Genotypes
1	Poornima	9	R-1162-1667-1-1	17	R-1248-1489-2-822-1	25	R-1250-1557-895-1
2	Danteshwari	10	R-1102-2795-3-1	18	IR-36	26	Madhuri
3	R-1033-968-2-1	11	R-1217-536-1-259-1	19	R-1072-360-1-1	27	R-1033-2559-1-1
4	R-1099-2596-1-1	12	Chandrasahini	20	R-1218-509-2-452-1	28	Karma masuri
5	R-1013-2297-1-1	13	MTU-1010	21	IR-64	29	Indira Sugandhit
6	R-1182-167-2-1	14	R-979-67-2-44-1	22	R-548-89-6	30	R-1055-1629-4-1
7	Shamleshwari	15	RDG-1	23	R-703-1-52-1-1	31	Mahamaya
8	R-1037-649-1-1	16	IRH-5	24	R-1124-91-2-73-1	32	Kranti

Results and Discussion

The performance of different rice genotypes under SRI as well as traditional method of cultivation was examined by both yield and yield attributing characters.

The important yield attributing characters that were examined are number of tillers, crop height as well as biomass production. The performance of these varieties under both methods of cultivation were examined by computing the student 't' value which shows the difference between the yield attributes under both methods of cultivation is significant or not. If the difference between the SRI and traditional method of cultivation is positive it is indicated as positively significant and vice-versa. The results of yield for the 32 rice genotypes along with positive and negative significant are shown in Table 2.

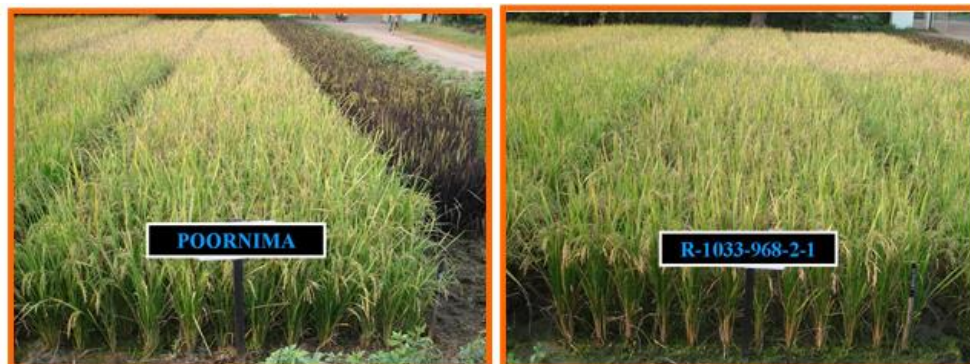
It is observed from the results that there is significant difference in yield between the two methods of cultivation in respect of 32 genotypes. Two genotypes namely IR-1102-2795-3-1 and Mahamaya has no significant indicated that these two varieties response is equally well under both the method of cultivation with good management. Out of 30 genotypes, nine genotypes show negatively significant yield indicating that the performance is better under only traditional method of cultivation. The rest of varieties show positively significant difference indicating that they performed better under SRI method of cultivation. The different genotypes suitable for SRI and traditional method of cultivation are given in Table 3 and so show in plate 1

Table 2: Student 't' test values the SRI and Traditional methods of rice cultivation on yield

Varieties	Calculated 't' value	Significance	Mean Yield (kg ^{ha} ⁻¹)		Varieties	Calculated 't' value	Significance	Mean Yield (kg ^{ha} ⁻¹)	
			SRI	TM				SRI	TM
Poornima	3.839	+S*	24.17	22.43	R-1248-1489-2-22-1	10.47	+S*	56.20	43.73
Danteshwari	2.541	-S	22.12	23.41	IR-36	3.83	+S*	25.81	21.54
R-1033-968-2-1	44.901	+S*	48.97	34.48	R-1072-360-1-1	9.269	+S*	42.96	31.62
R-1099-2596-1-1	12.017	+S*	35.03	27.82	R-1218-509-2-452-1	2.103	+S	51.34	47.71
R-1013-2297-1-1	3.731	+S*	39.99	37.88	IR-64	3.397	+S*	43.50	39.76
R-1182-167-2-1	22.76	+S*	43.79	30.73	R-548-89-6	7.012	+S*	45.71	39.01
Shamleshwari	2.178	+S	25.04	23.45	R-703-1-52-1-1	14.159	+S*	45.87	34.21
R-1037-649-1-1	8.119	+S*	39.31	29.99	R-1124-91-2-73-1	25.218	+S*	64.37	38.29
R-1162-1667-1-1	6.356	+S*	43.55	37.44	R-1250-1557-895-1	6.889	+S*	46.13	37.32
R-1102-2795-3-1	2.014	NS	43.46	41.62	Madhuri	7.466	+S*	29.07	17.92
R-1217-536-1-259-1	3.17	+S*	46.52	41.56	R-1033-2559-1-1	5.149	-S*	35.03	40.41
Chandrasahini	2.651	-S	27.14	30.14	Karma Masuri	12.435	-S*	32.30	53.19
MTU-1010	3.027	-S*	34.75	39.79	Indira Sugandhit	9.412	-S*	12.29	27.65
R-979-67-2-44-1	2.809	-S	52.07	56.32	R-1055-1629-4-1	6.211	-S*	50.03	39.66
RDG-1	6.415	+S*	33.80	25.21	Mahamaya	1.345	NS	45.9	44.09
IRH-5	2.793	-S	39.26	42.84	Kranti	2.362	+S	37.89	33.38

Table 3: Rice genotypes performed superior in the two methods of cultivations from yield point of view

SRI	Traditional
Poornima, R-1033-968-2-1, R-1099-2596-1-1, R-1013-2297-1-1, R-1182-167-2-1, Shamleshwari, R-1037-649-1-1, R-1162-1667-1-1, R-1217-536-1-259-1, RDG-1, R-1248-1489-2-822-1, IR-36, R-1072-360-1-1, R-1218-509-2-452-1, IR-64, R-548-89-6, R-703-1-52-1-1, R-1124-91-2-73-1, R-1250-1557-895-1, Madhuri, Kranti	Danteshwari, Chandrasahini, MTU-1010, R-979-67-2-44-1, IRH-5, R-1033-2559-1-1, Karma Masuri, Indira Sugandhit, R-1055-1629-4-1

**Plate 1:** Rice Genotype Suitable Under Sri Method

Out of 32 genotypes, 21 genotypes showed higher grain yield under SRI method of cultivation. This might be due to the fact that yield is a function of growth characters and yield attributes. The grain is the result of growth and yield attributing character of crops. Similar findings was reported by (Sharma and Gupta, 2006) [10] and (Manjappa *et al.*, 2006) [5].

Out of these 18 varieties under SRI method, 5 genotypes under traditional method performed highly significantly superior to other varieties in the same group.

The above results are similar to the findings of Hossain *et al.* (2001) [3]; Francis & Lakandhan (2005); Reddy *et al.* (2006) [6]; Rao *et al.* (2006); Goswami and Dutta (2006) [2]; Kumar *et al.* (2006) [9]; Chaudhary *et al.* (2006) and Singh *et al.* (2006) [7-9].

Out of 32 genotypes, 11 genotypes showed significantly higher effective tiller under SRI method of cultivation. There was significant reduction in production of tillers with the advancement of age of seedling and water management practices. The increase in effective tillers hill⁻¹ might be also due to the application of nitrogen at maximum tillering and panicle initiation stage. Similar finding was also reported by Islam *et al.* (2005) [4]; Singh *et al.* and Singh *et al.* (2006) [7-9].

Among the 32 genotypes, 16 genotypes showed higher plant height in SRI method. This might be due to adequate space in between the plants allowed lesser competition and facilities nutrient in take including micro nutrient from a wider soil area. Similar finding were also reported by Reddy *et al.* (2006) [6].

Out of 31 genotypes, 11 genotypes gave significantly higher biomass in traditional method of cultivation while 20 genotypes gave significantly higher biomass under SRI method of cultivation.

SRI method provided sufficient space for high nutrient absorption and maintains aeration, radiation and thermal activities, which increased said plant character finally more biomass accumulation. A similar result was also reported by Reddy *et al.* (2006) [6]. The similar result was found similar to the findings of Hossain *et al.* (2001) [3]; Manjappa *et al.* (2006) [5]; Chaudhary *et al.* (2006) and Singh *et al.* (2006) [7-9].

Overall performance

For assessing the overall performance of the genotypes in both the methods of cultivation the significance in yield and the other attributes are examined on pooled basis. The performance is shown in table 4.

Four genotypes namely Poornima, Danteshwari and R-1033-968-2-1, and R-1248-1489-2-822-1 showed significantly superior performance for all the four attributes and looked better under SRI method of cultivation. Interestingly the hybrid variety recently released from IGKV (IRH-5) also performed better under traditional method with continuous water level. If yield, number of tillers as well as biomass is considered as better attributes to examine the performance of any genotypes, the genotypes Poornima, Danteshwari, R-1033-968-2-1, R-1248-1489-2-822-1, R-1099-25-96-1-1, R-1030-22-97-1-1, R-1250-1557-895-1, SHAMLESHWARI, RDG-1, IR-36, Madhuri, R-1182-167-2-1, and R-1162-1667-1-1 showed better performance under SRI method of cultivation. If only yield and biomass are considered to be better attributes for assessing genotypes, then the genotypes namely, SHAMLESHWARI, RDG-1, IR-36 and Madhuri performed better under SRI method of cultivation.

The above findings are in accordance to the findings of Zheng *et al.* (2004) [11] for grain yield, biomass and maximum number of tillers per hill and Krishna *et al.* (2006) [9] for overall performance.

Table 4: Overall performance of the genotypes with significantly higher values in SRI method of cultivation

S. No.	Attributes	Genotypes
01.	All	Poornima, Danteshwari and R-1033-968-2-1 and R-1248-1489-2-822-1
02.	YTH	R-1072-360-1-1
03.	YTB	R-1099-25-96-1-1, R-1030-22-97-1-1 and R-1250-1557-895-1
04.	YB	Shamleshwari, RDG-1, IR-36, Madhuri
05.	YT	Kranti
06.	YH	R-1217-536-1-259-1, R-1218-509-2-452-1, IR-64, R-548-89-6, R-703-1-52-1-1 and R-1124-91-2-73-1
07.	YHB	R-1182-167-2-1, R-1162-1667-1-1
08.	Y	R-1037-649-1-1
09.	THB	Indira Sugandhit
10.	TB	Mahamaya
11.	B	R-1055-1629-4-1
12.	H	Chandrahini, R-979-67-2-44-1
13.	T	MTU-1010

Y- Yield, T- Tiller, H- Height, B- Biomass

Conclusions

It is inferred that there is a significant difference in yield between the two methods of cultivation in respect of 32 genotypes.

The genotypes Poornima, R-1033-968-2-1, R-1099-2596-1-1, R-1013-2297-1-1, R-1182-167-2-1, SHAMLESHWARI, R-1037-649-1-1, R-1162-1667-1-1, R-1217-536-1-259-1, RDG-1, R-1248-1489-2-822-1, IR-36, R-1072-360-1-1, R-1218-509-2-452-1, IR-64, R-548-89-6, R-703-1-52-1-1, R-1124-91-2-73-1, R-1250-1557-895-1, Madhuri and Kranti showed positively significant difference and perform well under SRI Method.

11 genotypes exhibited superiority in tillering under SRI method namely Poornima, Danteshwari, R-1099-2596-1-1, R-

1013-2297-1-1, MTU-1010, R-1248-1489-2-822-1, R-1072-360-1-1, R-1250-1557-895-1, Indira Sugandhit, Mahamaya, Kranti.

16 genotypes namely Poornima, Danteshwari, R-1033-968-2-1, R-1182-167-2-1, R-1162-1667-1-1, R-1217-536-1-259-1, CHANDRAHSINI, R-979-67-2-44-1, R-1248-1489-2-822-1, R-1072-360-1-1, R-1218-509-2-452-1, IR-64, R-548-89-6, R-703-1-52-1-1, R-1124-91-2-73-1 and Indira Sugandhit showed significantly higher values under SRI method.

20 genotypes namely Poornima, Danteshwari, R-1033-968-2-1, R-1099-2596-1-1, R-1013-2297-1-1, R-1182-167-2-1, SHAMLESHWARI, R-1162-1667-1-1, RDG-1, R-1248-1489-2-822-1, IR-36, R-1250-1557-895-1, Madhuri, Indira

Sugandhit, R-1055-1629-4-1, Mahamaya produced significantly higher bio-mass under SRI method.

The four genotypes viz. Poornima, Danteshwari, R-1033-968-2-1 and R-1248-1489-2-822-1 showed significantly superior performance in all the four attributes i.e. yield, tillering, plant height and plant bio-mass and hence these genotypes are best suited under SRI method of cultivation. Interestingly, the hybrid variety released by IGKV, i.e. IRH-5 performed better under traditional method that is with continuous water level in keeping the field wet and dry. If yield, tiller as well as biomass are considered as better attributes for examining the performance of any genotype namely Poornima, Danteshwari, R-1033-968-2-1, R-1248-1489-2-822-1, R-1099-25-96-1-1, R-1030-22-97-1-1, R-1250-1557-895-1, SHAMLESHWARI, RDG-1, IR-36, Madhuri, R-1182-167-2-1, and R-1162-1667-1-1 seems better under SRI method of cultivation.

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