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Evaluation of suitable rice genotype suitable under sri and traditional methods of cultivation

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Abstract
The investigation was 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 Poornima, 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. 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. 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.

Keywords: Rice genotype, in SRI method, growth parameters and yield

Introduction
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. The major climatic factors affecting growth and yield include solar radiation, temperature and rainfall. The rainfall is particularly important in rainfed rice cultivation.
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.
It is hypothesized that all the genotypes may not perform well under SRI method and only a few genotypes are suitable for SRI method of cultivation. The reason for such hypothesis is that the changes in micro-climate due to changes in crop geometry and also due to field hydrological conditions are responsible for the difference in genotype x environment interaction. The environment means that it may either be thermal or light or radiation regimes. In view of the above hypothesis, the experiment was conducted with 32 rice genotypes cultivated under both SRI and traditional methods of rice cultivation with the objective to evaluate rice genotypes suitable under SRI and Traditional Methods of 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). Thirty two genotypes of paddy were sown on two different dates i.e. 16th and 25th July, 2006 under traditional and SRI methods, respectively in split plot design with three replication. 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

Results and Discussion

1. Yield

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 1.

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 2

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) [4]; 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].

2. Tiller

Out of 32 varieties, 11 varieties showed superiority in tillering in SRI method of cultivation while 5 varieties showed significant tillering under traditional method of cultivation, 16 genotypes gave no significant difference in tiller number in both the methods of cultivation (table 1). In fact it is always felt that SRI method of cultivation gives better tillering as compared to traditional method of rice cultivation. However, the result showed that it is a genotype specific reaction. Some genotypes give significantly higher number of tillers in traditional method of cultivation. The genotypes which give significantly higher tiller number in each method of cultivation are given in table 2.

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) [8].

3 Plant height

Plant height is a genetic character but sometimes environmental factors also influence the plant height due to some physical and biological stresses. The significantly higher values in the two methods of rice cultivation based on the 't' test values are shown in table 1. As in the earlier case, plant height had also showed significant difference between the two methods of cultivation. Out of 32 varieties, 16 varieties showed significantly higher values of plant height in SRI method of rice cultivation as compared to traditional method of cultivation. Only 4 genotypes showed significant difference of height in traditional method of cultivation as compared to SRI method of cultivation. The rest of the 10 varieties have no significant difference between the two methods of cultivation. The genotypes which showed significant difference under SRI and traditional methods of cultivation are given in table 2.

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].

The main reason of these results is that the plant gets maximum height and radiation due to wider spacing, resulting higher photosynthesis and food material synthesis. During vegetative growth gets deposited in leaves and other plant parts leading to enlargement and development of meristmatic tissues at growing point. This caused faster growth of the growing points, ultimately in the plant height. But at the reproductive stage, food material manufactured during photosynthesis gets partitioned for the development of sink, leading to slow increase of plant height at this stage.

Radiation and thermal use efficiencies are responsible for enlargement and development of meristmatic tissue at growing points, which caused faster growth of growing part, ultimately plant height. The above findings are in agreement with the finding of Reddy *et al.* (2006) [6].

4. Biomass Production

In fact biomass production is also a positive indicator for better performance of genotypes. The significant genotypes which give significantly higher biomass in both the methods of cultivation is given in table 1.

It is interesting to note from the table 1 that the only one genotype (R-1124-912-73-1) gave no significant difference in the biomass production, but the other genotype showed significant difference in biomass production in SRI method of cultivation or in traditional method of cultivation. The varieties given significant difference under the two different methods of cultivation as given in table 2.

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) [9].

Table 1: Student't' test values and their significance between the SRI and Traditional methods of rice cultivation

S.no	Genotypes	SRI				Traditional methods			
		Tiller	Yield	Plant ht.	Biomass	Tiller	Yield	Plant ht.	Biomass
1	Poornima	14.6	24.17	80.3	256	8.8	22.43	74.5	231
2	Danteshwari	14.5	22.12	83.5	312.6	11.5	23.41	76.1	200.6
3	R-1033-968-2-1	13.4	48.97	84.8	425.8	11.9	34.48	77.5	337.4
4	R-1099-2596-1-1	12.4	35.03	84.3	498.4	8.5	27.82	85.7	296.4
5	R-1013-2297-1-1	14.5	39.99	86.4	538.3	10.5	37.88	86.6	336.6
6	R-1182-167-2-1	17.8	43.79	104.6	602.4	15.5	30.73	90.4	641
7	Shamleshwari	12.6	25.04	98.4	633.6	13.6	23.45	96.2	484.2
8	R-1037-649-1-1	12.4	39.31	99.1	302.4	15.5	29.99	96.1	672.6
9	R-1162-1667-1-1	12.7	43.55	98.3	572.3	16.8	37.44	89.5	496.2
10	R-1102-2795-3-1	11.8	43.46	87	430.4	17	41.62	90.3	664
11	R-1217-536-1-259-1	10.7	46.52	116.8	466.9	15.3	41.56	106	689.2
12	Chandrahsini	9.3	27.14	107.8	448.2	10.4	30.14	97.6	606.2
13	MTU-1010	14.7	34.75	110.2	493.6	11.5	39.79	114.5	539.2
14	R-979-67-2-44-1	9.5	52.07	118.5	491.2	9.6	56.32	106.5	611
15	RDG-1	9.5	33.8	68.8	568.7	9.5	25.21	86.7	358
16	IRH-5	10.4	39.26	126.9	468.2	9.5	42.84	116.1	584.8
17	R-1248-1489-2-822-1	11.5	56.2	96.3	499.7	9	43.73	86.8	458.8
18	IR-36	12.4	25.81	64.6	390.4	11.8	21.54	71.1	232.8
19	R-1072-360-1-1	15.3	42.96	101	600.5	9.5	31.62	93.3	530.8
20	R-1218-509-2-452-1	13.6	51.34	119.4	544.5	14.7	47.71	109.6	770.6
21	IR-64	17	43.5	114.2	608	15.5	39.76	102.1	655.2
22	R-548-89-6	8.5	45.71	120.9	471.2	15.3	39.01	110.3	957
23	R-703-1-52-1-1	13.6	45.87	119.1	720.2	14.5	34.21	107.3	806.6
24	R-1124-91-2-73-1	11.4	64.37	123	617.6	11.9	38.29	110.7	615.2
25	R-1250-1557-895-1	13.6	46.13	120.1	664.6	11.5	37.32	113.4	629.6
26	Madhuri	11.8	29.07	93.9	476	12.4	17.92	102.5	674.8
27	R-1033-2559-1-1	15.5	35.03	98	536.7	17.8	40.41	98.6	717
28	Karma Masuri	17.1	32.3	105	548.3	14.4	53.19	101.1	675.6
29	Indira Sugandhit	19.4	12.29	108	562.7	15.5	27.65	118.4	1017.8
30	R-1055-1629-4-1	10.5	50.03	110.9	454.6	9.5	39.66	123.5	540.4
31	Mahamaya	14.7	45.9	111.8	602.7	10.7	44.09	119.6	575.8
32	Kranti	11.5	37.89	113.1	455.5	14.4	33.38	115.7	800

* Highly significant at 1% level

(- ve sign) means- TM value more than SRI value, (+ ve sign) means- SRI value more than TM value

Table 2: Genotypes with significantly higher growth & yield characters under SRI and Traditional methods

Characters	SRI	Traditional Method
Plant height	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, Indira sugandhit	RDG-1, IR-36, R-1250-1557-895-1, Madhuri, R-1055-1629-4-1, Mahamaya
Tiller	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	R-1037-649-1-1, R-1162-1667-1-1, R-1102-2795-3-1, R-1217-536-1-259-1, R-548-89-6
Biomass	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	R-1037-649-1-1, R-1102-2795-3-1, R-1217-536-1-259-1, Chandrahsini, MTU-1010, R-979-67-2-44-1, IRH-5, R-1072-360-1-1, R-1218-509-2-452-1, IR-64, R-548-89-6, R-703-1-52-1-1, R-1033-2559-1-1, Karma Masuri, Kranti
Yield	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, Chandrahsini, MTU-1010, R-979-67-2-44-1, IRH-5, R-1033-2559-1-1, Karma Masuri, Indira Sugandhit, R-1055-1629-4-1

Conclusion

The experiment it is inferred that there is a significant difference in yield between the two methods of cultivation in respect of 32 genotypes. Genotype IR-1102-2795-3-1 and Mahamaya responded equally well for both the methods i.e. SRI and traditional method of rice cultivation under good management. The genotypes Danteshwari, Chandrahsini, MTU-1010, R-979-67-2-44-1, IRH-5, R-1033-2559-1-1, KARMA MASURI, Indira Sugandhit and R-1055-1629-4-1 revealed negative significant which shows that they perform better under traditional method, whereas the rest of 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.

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 recently 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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