Available online at www.ijpab.com

DOI: http://dx.doi.org/10.18782/2320-7051.5187

ISSN: 2320 – 7051

Int. J. Pure App. Biosci. **5 (6):** 784-788 (2017)

Research Article

International Journal of Pure & Applied Bioscience

OPEN ACCESS

Influence of SRI (System of Rice Intensification) Method of Cultivation on Seed Quality Parameters of Rice (*Oryza sativa* L.)

G. Kumar[1*], L. V. Subba Rao[2], R. Mahendra Kumar[3] and K. Keshavulu[4]

[1,4]Department of Seed Science and Technology, College of Agriculture,
Professor Jayashankar Telangana State Agriculture University, Rajendranagar, Hyderabad – 500030, India
[2]Crop Improvement Section, [3] Department of Agronomy, Directorate of Rice Research, Rajendranagar, Hyderabad – 500030, India
*Corresponding Author E-mail: kumar.golle15@gmail.com

Received: 10.07.2017 | Revised: 18.08.2017 | Accepted: 21.08.2017

ABSTRACT

An investigation to Influence of SRI (System of Rice Intensification) method of cultivation on seed quality parameters of rice (Oryza sativa L.) was conducted at Directorate of Rice Research farm, ICRISAT campus, Patancheru, Hyderabad during Kharif 2013, while laboratory studies were carried out at Directorate of Rice Research, Rajendranagar, Hyderabad. The field experiment was laid out in split plot design with three replications with two methods of cultivation, System of Rice Intensification (SRI) and Conventional Transplanting (CT) as main treatments and fifteen varieties of different groups as sub treatments. Except seed germination all other seed quality parameters viz., seedling length (root length and shoot length, separately), seedling dry weight (161.11 mg) and vigour index recorded significantly higher values in SRI method compared to Conventional Transplanting (CT). Akshayadhan recorded significantly higher seed quality parameters such as root length (23.38 cm), shoot length (10.05 cm), seedling length (33.43 cm) and vigour index II (19045.00).

Key words: *System of Rice Intensification (SRI), Seedling length, Seedling dry weight, Seed vigour indices.*

INTRODUCTION

System of Rice Intensification cultivation (SRI) is visualized as one of the water saving rice cultivation. It is reported that the rice yields obtained in this method are similar or higher to the yields obtained under conventional system with reduced (30-40%) water. SRI cultivation method offers to minimize water consumption for rice cultivation and to increase the productivity[5]. India is the second most populous nation and the largest producer of rice next to china in the world. Increased and sustained production of rice is essential for food security in India. Good quality and healthy seed is a basic and critical input for the sustained agriculture production.

Cite this article: Kumar, G., Subba Rao, L.V., Kumar, R.M. and Keshavulu, K., Influence of SRI (System of Rice Intensification) Method of Cultivation on Seed Quality Parameters of Rice (*Oryza sativa* L.), *Int. J. Pure App. Biosci.* **5(6):** 784-788 (2017). doi: http://dx.doi.org/10.18782/2320-7051.5187

Successful agriculture depends on the quality of seeds used for sowing. The establishment of the seedling depends upon the vigour of the seed, demanding each and every seed readily germinate and produce vigourous seedlings. System of rice intensification, developed in Madagascar in the 1980s, is a system approach to increase rice productivity with less external and inexpensive inputs. By adopting this system of cultivation we could save water, protect soil productivity, save environment by checking methane gas from water submerged paddy cultivation practices, bring down the input cost, besides increasing the production for providing food to the growing population. In this context, need to identify which cultivars respond well for SRI or conventional method. Keeping these views in mind, a study was undertaken to Influence of SRI method of cultivation on seed quality parameters of rice (*Oryza sativa* L.).

MATERIALS AND METHODS

The study was carried out at Directorate of Rice Research farm, ICRISAT campus, Patancheru, Hyderabad during *kharif* 2013, while laboratory studies were carried out at Directorate of Rice Research, Rajendranagar, Hyderabad. The field experiment was laid out in split - plot design with three replications with two methods of cultivation, System of Rice Intensification (SRI) and Conventional transplanting (CT) as main treatments and fifteen varieties of different groups as sub treatments *viz*., Tulasi, Ravi, Varadhan (early duration), Triguna, Jaya, Akshayadhan (medium duration), Swarnadhan, Phalguna, Dhanrasi (late duration), DRRH 3, PA 6444, US 382 (hybrids), Kasturi, Sugandhamathi and Vasumahti (scented). Seeds soaked in water for 12 hours followed by incubation in moist gunny cloth bag for 24 hours. The sprouted seeds were broadcasted uniformly on the nursery beds and covered with thin layer (1 cm) of soil and FYM mixture in 1:1 proportion. The beds were irrigated with a rose can daily in the morning and evening without flooding. Before lifting the seedlings, nursery beds were thoroughly irrigated. After lifting, seedlings were immediately transplanted in the main field with gentle placement but not with harsh pushing, which may revert root direction to cause transplanting trauma. Main field was prepared by ploughing with tractor-drawn mould board plough followed by harrowing and puddling. Seedlings of twelve days old were transplanted in the main field in square pattern, spacing at 25 cm x 25 cm with single seedlings per hill. Alternate wetting and drying was practiced throughout the vegetative phase. From panicle initiation to flowering, thin film of water was maintained continuously by frequent irrigation. The water can be drained after 70 per cent of the grains in the panicle get hardened. During the entire crop growth period weeding with rotary weeder was done three times at the interval of fifteen days in both the directions. The weeds around the plants were removed manually and trampled in the field. Separate land preparation and cultural practices were followed conventional transplanting method. The seeds obtained from all the treatments were tested for laboratory germination (between-paper method) as per the procedures of ISTA[2]. The first and final count were recorded and expressed in percentage. After final germination count, ten normal seedlings were selected at random in each replication for recording seedling length in centimeters and same seedlings were oven dried at $85^{0} \pm 1^{0}$C for 24 hours and weighed (mg) for seedling dry weight. Seed vigour index I and seed vigour index II were calculated by multiplying germination percent with seedling length and seedling dry weight, respectively[1] and expressed in number.

RESULTS AND DISCUSSION

The results of influence of SRI (System of Rice Intensification) method of cultivation on seed quality parameters are presented in table 1 and 2. In both the methods of cultivation, initial count of germination was significantly higher in SRI (91.07 %) compared to CT (87.53 %). Significant differences were also observed among all the varieties. The variety US 382 recorded the highest initial count of germination (94.67%), which was on par with

PA 6444, DRRH 3, Varadhan, Jaya, Akshayadhan and Triguna. The lowest initial count of germination was recorded by variety Kasturi (83.17%). Interaction effect between methods of cultivation and varieties was found to be non - significant for initial count of germination. However, during initial count of germination (5th day), methods of cultivation effect proved to be significant but this effect was terminated by the end of germination period (14 days). In both the methods of cultivation, final count of germination exhibited no significant difference. Significant differences were observed among all the varieties. Variety US 382 recorded the higher final count of germination (98.67%), which was on par with PA 6444, DRRH 3 and Varadhan. The lowest final count of germination was recorded by variety Kasturi (89.83%). Interaction effect between methods of cultivation and varieties were found to be non - significant in the final count of germination per cent. These results are in conformity with the findings of Nandisha and Mahadevappa[6], Udaykumar[8] and Singh *et al.*[7] who reported that higher germination was recorded in SRI method in of cultivation.

In both the methods of cultivation, root length was significantly higher in SRI (21.45cm) compared to CT (19.32 cm). Significant differences were observed among all the varieties. The variety Akshayadhan recorded the highest root length (23.38 cm), which was on par with PA 6444 (23.19 cm), US 382 (22.87 cm), and DRRH 3 (22.46 cm), while the lowest root length was recorded by variety Kasturi (17.72 cm). Interaction effect between methods of cultivation and varieties were found to be non - significant in root length. In both the methods of cultivation, shoot length was significantly higher in SRI (9.96 cm) compared to CT (9.23 cm). Significant differences were also observed among all the varieties. Variety Akshayadhan recorded the higher shoot length (10.05 cm), which was on par with PA 6444 (9.98 cm), US 382 (9.93 cm), DRRH 3 (9.50 cm), Ravi (9.36 cm), Varadhan (9.73 cm) and Jaya (9.72 cm). The lowest shoot length was recorded by variety Kasturi (8.70 cm). Interaction effect between methods of cultivation and varieties were found to be non - significant in shoot length. In the present investigation, the root length and shoot length higher in SRI compared to conventional transplanting (CT). These results are in agreement with the observations of Nandisha and Mahadevappa[6]. In both the methods of cultivation, seedling length was significantly higher in SRI (31.40 cm) compared to CT (28.55 cm). Significant differences were also observed among all the varieties. Variety Akshayadhan recorded the highest seedling length (33.43 cm), which was on par with PA 6444 (37.17 cm), US 382 (32.80 cm) and DRRH 3 (33.17 cm). The lowest seedling length was recorded by variety Sugandhamathi (26.42 cm). Interaction effect between methods of cultivation and varieties were found to be non - significant. In the present investigation, the seedling length was higher in SRI compare to conventional transplanting. Similar findings were also observed by Kanaka Durga[3].In both the methods of cultivation, seedlings dry weight was significantly higher in SRI (161.11 mg) compared to CT (154.89 mg). Significant differences were also observed among all the varieties. Variety Akshayadhan recorded the highest seedlings dry weight (196.67 mg), which was significantly superior to all other varieties and was followed by PA 6444, US 382, DRRH 3, Varadhan, Ravi, Jaya, Phalguna, Swarnadhan, Triguna, Vasumathi, Kasturi, Dhanrasi and Tulasi. The lowest seedlings dry weight was recorded by variety Sugandhamathi (138.33 mg). Interaction effect between methods of cultivation and varieties were found to be non - significant. Seedling dry weight higher in SRI compared to CT. These results are in agreement with the observations of Kanaka Durga[3].In both the methods of cultivation, seed vigour index I was significantly higher in SRI (3005.82) compare to CT (2698.06). Significant differences were also observed among all the varieties. Variety PA 6444 recorded the higher seed vigour index I (3262.11), which was on par with Akshayadhan, US 382 and DRRH

3.The lowest seed vigour index I was recorded by variety Sugandhamathi (2404.38). Interaction effect between methods of cultivation and varieties were found to be non - significant. The SRI method produced seeds have better quality than CT. The better filling of seeds and higher test weight, which indicates the better food reserves in the seeds produced with these methods, might have resulted in better quality parameter. These results are in agreement with the observations of Nandisha and Mahadevappa[6], Udaykumar[8], Krishna *et al*.[4] and Kanaka Durga[3].In both the methods of cultivation, seed vigour index II was significantly higher in SRI (15430.22) compare to CT (14636.44). Significant differences were also observed among all the varieties. Variety Akshayadhan recorded the higher seed vigour index II (19045.00), which was significantly superior to all other varieties and was followed by US 382 (17433.33), PA 6444 (17373.33), DRRH 3 (16331.67), Varadhan (15926.67), Ravi (15015), Jaya (14828.33), Phalguna (14390), Swarnadhan (14235), Triguna (14125), Dhanrasi (13990), Vasumathi (13670), Tulasi (13368.33), and Kasturi (13175). The lowest seedling vigour index II was recorded by variety Sugandhamathi (12593.33). Interaction effect between methods of cultivation and varieties were found to be non - significant. The vigour index was significantly higher with SRI. The better seed quality produced under SRI may be due to higher test weight values. These results are in conformity with the findings of Nandisha and Mahadevappa[6], Udaykumar[8], Krishna *et al*.[4], Kanaka Durga[3] and Singh *et al*[7].

Table 1: Influence of SRI and conventional transplanting methods on germination per cent (initial and final count), root length and shoot length in rice varieties

Variety	Initial count (5th day)			Final count (14th day)			Root length(cm)			Shoot length(cm)		
	SRI	CT	Mean	SRI	CT	Mean	SRI	CT	Mean	SRI	CT	Mean
Tulasi	89.00	82.33	85.67	93.67	90.67	92.17	20.60	18.15	19.37	9.82	9.16	9.49
Ravi	90.67	88.33	89.50	95.33	94.33	94.83	21.82	19.23	20.52	10.22	9.36	9.79
Varadhan	93.67	91.33	92.50	98.00	97.00	97.50	22.86	20.77	21.82	10.02	9.44	9.73
Triguna	91.00	89.00	90.00	94.67	93.67	94.17	19.87	18.08	18.98	9.53	9.05	9.29
Jaya	92.33	90.00	91.17	96.00	95.33	95.67	20.65	19.12	19.88	10.12	9.31	9.72
Akshayadhan	92.00	89.67	90.83	97.67	96.00	96.83	24.37	22.40	23.38	10.43	9.68	10.05
Swarnadhan	89.67	83.33	86.50	95.00	92.67	93.83	20.37	18.33	19.35	10.00	9.20	9.60
Phalguna	90.33	87.33	88.83	95.67	94.00	94.83	20.63	18.35	19.49	10.09	9.25	9.67
Dhanrasi	90.00	87.00	88.50	97.33	95.67	96.50	19.88	18.12	19.00	9.74	9.08	9.41
DRRH 3	94.00	92.33	93.17	98.33	97.67	98.00	23.85	21.07	22.46	10.26	9.50	9.88
PA 6444	94.33	93.33	93.83	98.67	98.00	98.33	24.19	22.18	23.19	10.33	9.63	9.98
US 382	95.00	94.33	94.67	99.00	98.33	98.67	24.10	21.64	22.87	10.31	9.55	9.93
Kasturi	86.00	80.33	83.17	90.33	89.33	89.83	19.75	18.08	18.92	9.73	9.00	9.36
Sugandhamathi	88.67	81.33	85.00	91.33	90.67	91.00	19.08	16.36	17.72	9.13	8.27	8.70
Vasumathi	89.33	83.00	86.17	92.67	91.67	92.17	19.67	17.98	18.83	9.63	8.94	9.29
Mean	91.07	87.53	89.30	95.58	94.33	94.96	21.45	19.32	20.38	9.96	9.23	9.60
For comparing means of	SEm±	CD at 5%		SEm±	CD at 5%		SEm±	CD at 5%		SEm±	CD at 5%	
Methods (M)	0.47	2.87		0.37	NS		0.09	0.53		0.07	0.42	
Varieties (V)	1.68	4.75		0.55	1.56		0.39	1.11		0.12	0.35	
M ×V	2.34	NS		0.84	NS		0.54	NS		0.18	NS	
V ×M	1.83	NS		1.44	NS		0.33	NS		0.26	NS	

SRI - System of Rice Intensification CT – Conventional transplanting

Table 2: Influence of SRI and conventional transplanting methods on germination (%), seedling length (cm), seedling dry weight (mg), seed vigour index I and seed vigour index II in rice varieties

Variety	Germination (%)			Seedling length(cm)			Seedling dry weight (mg)			Vigour index I			Vigour index II		
	SRI	CT	Mean	SRI	CT	Mean	SRI	CT	Mean	SRI	CT	Mean	SRI	CT	Mean
Tulasi	93.67	90.67	92.17	30.42	27.30	28.86	150.00	140.00	145.00	2848.90	2474.48	2661.69	14050.00	12686.67	13368.33
Ravi	95.33	94.33	94.83	32.04	28.59	30.31	160.00	156.67	158.33	3053.17	2696.64	2874.91	15253.33	14776.67	15015.00
Varadhan	98.00	97.00	97.50	32.89	30.21	31.55	166.67	160.00	163.33	3224.27	2930.33	3077.30	16333.33	15520.00	15926.67
Triguna	94.67	93.67	94.17	29.40	27.13	28.26	150.00	150.00	150.00	2782.53	2541.98	2662.26	14206.67	14043.33	14125.00
Jaya	96.00	95.33	95.67	30.77	28.43	29.60	156.67	153.33	155.00	2953.50	2710.25	2831.87	15043.33	14613.33	14828.33
Akshayadhan	97.67	96.00	96.83	34.80	32.08	33.43	200.00	193.33	196.67	3398.87	3079.99	3239.43	19523.33	18566.67	19045.00
Swarnadhan	95.00	92.67	93.83	30.37	27.53	28.95	153.33	150.00	151.67	2886.04	2550.82	2718.43	14570.00	13900.00	14235.00
Phalguna	95.67	94.00	94.83	30.72	27.60	29.16	153.33	150.00	151.67	2938.61	2595.04	2766.83	14670.00	14110.00	14390.00
Dhanrasi	97.33	95.67	96.50	29.62	27.20	28.41	146.67	143.33	145.00	2882.87	2601.17	2742.02	14273.33	13706.67	13990.00
DRRH 3	98.33	97.67	98.00	34.11	30.57	32.34	170.00	163.33	166.67	3354.39	2984.95	3169.67	16716.67	15946.67	16331.67
PA 6444	98.67	98.00	98.33	34.53	31.81	33.17	183.33	170.00	176.67	3406.67	3117.54	3262.11	18086.67	16660.00	17373.33
US 382	99.00	98.33	98.67	34.41	31.19	32.80	186.67	166.67	176.67	3406.59	3067.13	3236.86	18480.00	16386.67	17433.33
Kasturi	90.33	89.33	89.83	29.48	27.08	28.28	146.67	146.67	146.67	2661.38	2419.20	2540.29	13246.67	13103.33	13175.00
Sugandhamathi	91.33	90.67	91.00	28.21	24.63	26.42	143.33	133.33	138.33	2574.79	2233.97	2404.38	13100.00	12086.67	12593.33
Vasumathi	92.67	91.67	92.17	29.30	26.92	28.11	150.00	146.67	148.33	2714.67	2467.47	2591.07	13900.00	13440.00	13670.00
Mean	95.58	94.33	94.96	31.40	28.55	29.97	161.11	154.89	158.00	3005.82	2698.06	2851.94	15430.22	14636.44	15033.30

For comparing means of	SEm±	CD at 5%	SEm±	CD at 5%	SEm±	CD at 5%	SEm±	CD at 5%	SEm±	CD at 5%
Methods (M)	0.37	NS	0.07	0.46	0.31	1.94	6.64	40.93	46.14	284.67
Varieties (V)	0.55	1.56	0.39	1.10	2.97	8.42	37.38	105.93	291.16	825.04
M ×V	0.84	NS	0.54	NS	4.07	NS	51.50	NS	400.47	NS
V ×M	1.44	NS	0.28	NS	1.22	NS	25.70	NS	178.71	NS

SRI - System of Rice Intensification CT- Conventional transplanting

CONCLUSION

On the basis of the above study we concluded that the seed quality parameters (except germination) were significantly higher in SRI method of cultivation compared to conventional transplanting (CT). Akshayadhan (early duration) recorded significantly higher seed quality parameters such as root length (cm), shoot length (cm), seedling length (cm) and vigour index II, while vigour index I was significantly higher in hybrids.

REFERENCES

1. Abul-Baki, A.A and Anderson, J.D. Vigour determination in soyabean seed by multiple criteria. *Crop Science*.**13:** 630 – 633 (1973).
2. Anonymous. International rates for seed testing. *Seed Science and Technology*. (Supplement). **29:** 1-335 (1996).
3. Kanaka Durga, K. 2012. Influence of seedling age and spacing on productivity and quality traits of rice under System of Rice Intensification. *Madras Agricultural Journal*. **99 (4 -6):** 301-304 (2012).
4. Krishna, A., Biradarpatil, N.K and Channappagoudar, B.B. Influence of System of Rice Intensification (SRI) cultivation on seed yield and quality. *Karnataka Journal of Agricultural Sciences.* **22(3):** 369-372 (2008a).
5. Laulanie, H. and Le systeme de rigiculture intensive malagache. *Tropicultura* (Brussels). **11:** 104-114 (1993).
6. Nandisha, B.S and Mahadevappa, M. 1984. Influence of mother plant and nutrition and spacing in planting value of rice seeds. *Seed Research*. **12(2):** 52-32 (1984).
7. Singh, R.K., Singh, A.N., Ram, H., Rajendra Prasad, S and Chauhan, R.K. Response of basmati (*Oryza sativa* L.) rice varieties to System of Rice Intensification (SRI) and conventional methods of rice cultivation. *Annals of Agricultural Research*. **34(1):** 50-56 (2013).
8. Udaykumar. Studies on System of Rice Intensification (SRI) for seed yield and seed quality. *M.Sc(Ag.) Thesis.* Acharya N.G. Ranga Agricultural University, Hyderabad, India (2005).