The Ecoscan 10(3&4): 359-363, 2016 (Supplement on Rice)
AN INTERNATIONAL QUARTERLY JOURNAL OF ENVIRONMENTAL SCIENCES

# INFLUENCE OF SYSTEM OF RICE INTENSIFICATION (SRI) ON GROWTH, YIELD AND QUALITY PARAMETERS OF RICE (*ORYZA SATIVA* L.)

**G. KUMAR*, L. V. SUBBA RAO[2], R. MAHENDRA KUMAR[3] AND K. KESHAVULU[1]**
[1]Department of Seed Science and Technology, College of Agriculture,
Professor Jayashankar Telangana State Agricultural University, Rajendranagar, Hyderabad - 500 030, INDIA
[2]Crop Improvement Section,
[3]Department of Agronomy,
Directorate of Rice Research, Rajendranagar, Hyderabad -500 030, INDIA
e-mail: kumar.golle15@gmail.com

**ABSTRACT**

The studies on influence of System of Rice Intensification (SRI) on growth, yield and quality parameters of rice (*Oryza Sativa* L.) was conducted at Directorate of Rice Research farm, ICRISAT campus, Patancheru, Hyderabad during *Kharif* 2013 using fifteen rice varieties of different groups. Plant height (115.78 cm), number of effective tillers per $m^2$ (304.63) and seed yield per ha (5851.71 kg $ha^{-1}$) were found to be higher under SRI method of cultivation compared to conventional transplanting (CT) method. Days to 50% flowering recorded an average 5 - 6 days earlier flowering in SRI method compared to conventional transplanting method. Among all the varieties, US 382 recorded the significantly higher seed yield per ha (7340.33 kg $ha^{-1}$) under SRI method. Except seed germination all other seed quality parameters *viz.*, seedling length and vigour index I (31.40 cm) (3005.82), respectively recorded significantly higher values in SRI method.

**KEY WORDS**
System of Rice Intensification
Conventional Transplanting
Growth
Yield, Seed quality

**Received : 17.07.2016**
**Revised : 13.08.2016**
**Accepted : 08.10.2016**

***Corresponding author**

## INTRODUCTION

Rice (*Oryza sativa* L.) is one of the important staple food crop feeding more than a third of the world's population and grow on 11% of the world's cultivated area (Khush, 1993). More than 90 % of the world's rice is produced and consumed in Asia. India is the largest producer of rice next to China in the world. In India, rice is produced in an area of 43.97 million hectare with a production of 104.32 million tonnes and productivity is 2372 kg $ha^{-1}$ (Anon., 2014). The rice productivity is less than 2 tonnes per hectare in most of the states (Dash, 2009). Importance of rice production is increasing day by day because of rising population. The additional rice will have to be produced with SRI method. 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 (Laulanie, 1993). Good quality and healthy seed is a basic and critical input for the sustained agriculture production. 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 under SRI method of cultivation (Krishna *et al*., 2008b).

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 (Satyanarayana *et al*., 2007). Higher grain yields of rice have been reported when rice is grown by SRI method as compared to the conventional transplanting (Thakur *et al*., 2010). Further, there was a differential response of different duration cultivars for SRI cultivation. Identification of suitable cultivars which responds well for SRI and maximise the yields is the paramount importance. Keeping the above views in mind, a study was undertaken on influence of System of Rice Intensification (SRI) on growth, yield and quality parameters of rice (*Oryza Sativa* L.).

## MATERIALS AND METHODS

Field experiment 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 rice varieties of different groups as sub treatments *viz*., Tulasi, Ravi, Varadhan, Triguna, Jaya, Akshayadhan, Swarnadhan, Phalguna, Dhanrasi, DRRH 3, PA 6444, US 382, Kasturi, Sugandhamathi and Vasuma. The sprouted seeds were broadcasted uniformly at the rate of 5 kg $ha^{-1}$ 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. Nursery beds were thoroughly irrigated before transferring the seedlings to the main field. Marker was used to lay out the plot into wider spacing *i.e.,* 25 cm x 25 cm row to row and plant to plant. Twelve days old young seedlings having only two leaves were transplanted in the main field with no standing water. At each hill, only one seedling was transplanted. Alternate wetting and drying was practiced throughout the vegetative phase. From panicle initiation to flowering, thin film of water was maintained like that of normal method. The water can be drained after 70 per cent of the grains in the panicle get hardened. The rotary weeder was employed 3 times at 15 days interval during the crop growth period. The weeds around the plants were removed manually and trampled in the field. Separate land preparation and cultural practices were followed conventional transplanting method.

In these study observations on plant height, days to 50% flowering, number of effective tillers $m^{-2}$ and seed yield $ha^{-1}$ were recorded on three randomly selected plants. Pure seed fractions of freshly harvested seeds were used to assess the seed quality parameters such as germination per cent, seedling length and vigour index I. Seed vigour index I was calculated by multiplying germination per cent with seedling length (cm) (Abdul - Baki and Anderson, 1973). The experimental data recorded on various parameters were analyzed statistically following the analysis of variance procedure described by Gomez and Gomez (1984).

## RESULTS AND DISCUSSION

Data for growth and yield parameters of rice are presented in Table 1 and 2, respectively. Plant height was recorded significantly higher in SRI method (115.78 cm) compared to CT method (96.97 cm) at harvest. Significant differences were also observed among all the varieties. Triguna recorded the highest plant height (126.57 cm) at harvest. The lowest plant height was observed in Tulasi (94.83 cm) at harvest. Interaction effects were found to be non - significant at harvest. The plant height was more in SRI method of cultivation due to increased availability of space among the plants due to the planting of single seedling per hill at wider spacing which have ensured for maximum utilization of light and nutrients. These results were also conformity with the findings of Krupakar Reddy (2004), Kavitha *et al*. (2010), Sri Rajitha (2011), Sridevi and Chellamuthu (2012), Singh *et al*. (2013) and Dwivedi *et al*. (2015).

Days to 50% flowering was significantly higher in conventional transplanting (100 days) compared to SRI (95 days). Significant differences were also observed among all the varieties. Dhanrasi which is long duration variety took more days for 50% flowering (111.50 days) followed by Phalguna (107.50 days). The variety Tulasi had early 50% flowering (81.67 days) among all varieties in the study. The interaction effect between the methods of cultivation and varieties were indicated significant difference. Among all the varieties, Dhanrasi variety

**Table 1: Plant height (cm) at harvest and days to 50% flowering of various rice varieties as influenced by SRI and Conventional transplanting methods**

| Varieties | Plant height at harvest | | | Days to 50% flowering | | |
|---|---|---|---|---|---|---|
| | SRI | CT | Mean | SRI | CT | Mean |
| Tulasi | 106.55 | 83.12 | 94.83 | 79.67 | 83.67 | 81.67 |
| Ravi | 119.80 | 98.21 | 109.00 | 86.33 | 91.33 | 88.83 |
| Varadhan | 119.97 | 100.20 | 110.09 | 86.00 | 91.00 | 88.50 |
| Triguna | 131.79 | 121.35 | 126.57 | 86.67 | 93.00 | 89.83 |
| Jaya | 109.87 | 94.33 | 102.10 | 91.33 | 99.67 | 95.50 |
| Akshayadhan | 118.98 | 95.45 | 107.21 | 93.33 | 98.00 | 95.67 |
| Swarnadhan | 115.30 | 94.60 | 104.95 | 101.67 | 109.00 | 105.33 |
| Phalguna | 109.80 | 93.70 | 101.75 | 102.00 | 113.00 | 107.50 |
| Dhanrasi | 116.59 | 94.66 | 105.63 | 109.00 | 114.00 | 111.50 |
| DRRH 3 | 120.35 | 100.89 | 110.62 | 97.67 | 102.67 | 100.17 |
| PA 6444 | 120.41 | 100.33 | 110.37 | 100.67 | 102.00 | 101.33 |
| US 382 | 123.18 | 108.17 | 115.68 | 95.00 | 101.67 | 98.33 |
| Kasturi | 107.22 | 87.95 | 97.58 | 96.67 | 100.67 | 98.67 |
| Sugandhamathi | 109.71 | 93.64 | 101.67 | 99.67 | 102.33 | 101.00 |
| Vasumathi | 107.14 | 87.96 | 97.55 | 100.00 | 104.00 | 102.00 |
| Mean | 115.78 | 96.97 | 106.37 | 95.04 | 100.40 | 97.72 |
| For comparingmeans of | SEm ± | | CD at 5% | SEm ± | | CD at 5% |
| Methods (M) | 1.20 | | 7.39 | 0.40 | | 2.49 |
| Varieties (V) | 2.26 | | 6.39 | 0.71 | | 2.01 |
| M × V | 3.31 | | NS | 1.05 | | 3.50 |
| V× M | 4.64 | | NS | 1.56 | | 3.34 |

SRI - System of Rice Intensification: CT - Conventional transplanting

**Table 2: Number of effective tillers $m^{-2}$ and seed yield (kg $ha^{-1}$) of various rice varieties as influenced by SRI and Conventional transplanting methods**

| Varieties | Number of effective tillers $m^{-2}$ | | | Seed yield (kg $ha^{-1}$) | | |
|---|---|---|---|---|---|---|
| | SRI | CT | Mean | SRI | CT | Mean |
| Tulasi | 286.67 | 233.00 | 259.83 | 4833.33 | 4600.00 | 4716.67 |
| Ravi | 294.00 | 234.00 | 264.00 | 5392.00 | 5054.44 | 5223.22 |
| Varadhan | 329.33 | 269.99 | 299.66 | 6105.00 | 5780.00 | 5942.50 |
| Triguna | 297.00 | 234.57 | 265.79 | 6080.73 | 5122.44 | 5601.59 |
| Jaya | 298.27 | 235.67 | 266.97 | 6001.07 | 5076.67 | 5538.87 |
| Akshayadhan | 316.33 | 243.87 | 280.10 | 6017.40 | 5761.33 | 5889.37 |
| Swarnadhan | 287.72 | 233.44 | 260.58 | 5281.60 | 5022.22 | 5151.91 |
| Phalguna | 299.00 | 238.87 | 268.93 | 5867.63 | 5093.33 | 5480.48 |
| Dhanrasi | 301.33 | 241.40 | 271.37 | 6094.40 | 5246.67 | 5670.53 |
| DRRH 3 | 349.67 | 271.67 | 310.67 | 6900.00 | 5866.67 | 6383.33 |
| PA 6444 | 364.79 | 272.33 | 318.56 | 7303.47 | 5966.67 | 6635.07 |
| US 382 | 365.00 | 273.33 | 319.17 | 7340.33 | 6191.11 | 6765.72 |
| Kasturi | 238.33 | 223.33 | 230.83 | 4602.87 | 4330.89 | 4466.88 |
| Sugandhamathi | 270.00 | 229.51 | 249.75 | 4767.47 | 4500.00 | 4633.73 |
| Vasumathi | 271.99 | 231.97 | 251.98 | 5188.33 | 4939.00 | 5063.67 |
| Mean | 304.63 | 244.97 | 274.55 | 5851.71 | 5236.76 | 5544.24 |
| For comparing means of | | SEm ± | CD at 5% | SEm ± | | CD at 5% |
| Methods (M) | | 2.37 | 14.65 | 45.37 | | 279.92 |
| Varieties (V) | | 5.74 | 16.26 | 113.92 | | 322.80 |
| M × V | | 8.19 | 25.51 | 162.12 | | 501.75 |
| V × M | | 9.20 | 25.28 | 175.73 | | 498.60 |

SRI - System of Rice Intensification; CT - Conventional transplanting

**Table 3: Vigour index I (Germination% × seedling length) of various rice varieties as influenced by SRI and Conventional transplanting methods**

| Varieties | Germination (%) | | | Seedling length(cm) | | | Vigour index I | | |
|---|---|---|---|---|---|---|---|---|---|
| | SRI | CT | Mean | SRI | CT | Mean | SRI | CT | Mean |
| Tulasi | 93.67 | 90.67 | 92.17 | 30.42 | 27.30 | 28.86 | 2848.90 | 2474.48 | 2661.69 |
| Ravi | 95.33 | 94.33 | 94.83 | 32.04 | 28.59 | 30.31 | 3053.17 | 2696.64 | 2874.91 |
| Varadhan | 98.00 | 97.00 | 97.50 | 32.89 | 30.21 | 31.55 | 3224.27 | 2930.33 | 3077.30 |
| Triguna | 94.67 | 93.67 | 94.17 | 29.40 | 27.13 | 28.26 | 2782.53 | 2541.98 | 2662.26 |
| Jaya | 96.00 | 95.33 | 95.67 | 30.77 | 28.43 | 29.60 | 2953.50 | 2710.25 | 2831.87 |
| Akshayadhan | 97.67 | 96.00 | 96.83 | 34.80 | 32.08 | 33.43 | 3398.87 | 3079.99 | 3239.43 |
| Swarnadhan | 95.00 | 92.67 | 93.83 | 30.37 | 27.53 | 28.95 | 2886.04 | 2550.82 | 2718.43 |
| Phalguna | 95.67 | 94.00 | 94.83 | 30.72 | 27.60 | 29.16 | 2938.61 | 2595.04 | 2766.83 |
| Dhanrasi | 97.33 | 95.67 | 96.50 | 29.62 | 27.20 | 28.41 | 2882.87 | 2601.17 | 2742.02 |
| DRRH 3 | 98.33 | 97.67 | 98.00 | 34.11 | 30.57 | 32.34 | 3354.39 | 2984.95 | 3169.67 |
| PA 6444 | 98.67 | 98.00 | 98.33 | 34.53 | 31.81 | 33.17 | 3406.67 | 3117.54 | 3262.11 |
| US 382 | 99.00 | 98.33 | 98.67 | 34.41 | 31.19 | 32.80 | 3406.59 | 3067.13 | 3236.86 |
| Kasturi | 90.33 | 89.33 | 89.83 | 29.48 | 27.08 | 28.28 | 2661.38 | 2419.20 | 2540.29 |
| Sugandhamathi | 91.33 | 90.67 | 91.00 | 28.21 | 24.63 | 26.42 | 2574.79 | 2233.97 | 2404.38 |
| Vasumathi | 92.67 | 91.67 | 92.17 | 29.30 | 26.92 | 28.11 | 2714.67 | 2467.47 | 2591.07 |
| Mean | 95.58 | 94.33 | 94.96 | 31.40 | 28.55 | 29.97 | 3005.82 | 2698.06 | 2851.94 |
| For comparing means of | SEm ± | | CD at 5% | SEm ± | | CD at 5% | SEm ± | | CD at 5% |
| Methods (M) | 0.37 | | NS | 0.07 | | 0.46 | 6.64 | | 40.93 |
| Varieties (V) | 0.55 | | 1.56 | 0.39 | | 1.10 | 37.38 | | 105.93 |
| M × V | 0.84 | | NS | 0.54 | | NS | 51.50 | | NS |
| V × M | 1.44 | | NS | 0.28 | | NS | 25.70 | | NS |

SRI - System of Rice Intensification; CT - Conventional transplanting

took more days to 50 per cent flowering under CT (114.00 days). Tulasi recorded lesser days to 50 per cent flowering under SRI (79.67 days). Days to 50% flowering was on an average 5 to 6 days earlier in SRI compared to CT in all the varieties. It might be due to the young seedlings were transplanted along with intact soil, thus making the plants to establish quickly and grow at faster rate in SRI method. Similar observations were also found by Laulanie (1993), Krupakar Reddy (2004), Uday kumar (2005) and Krishna *et al*. (2008b).

Number of effective tillers $m^{-2}$ was recorded significantly higher in SRI (304.63) method compared to CT (244.97). Significant differences were also observed among all the varieties. The hybrid US 382 recorded the highest number of effective tillers $m^{-2}$ (319.17), which was on par with PA 6444 and DRRH 3. The lowest number of effective tillers $m^{-2}$ was observed in Kasturi (230.83). Interaction effect between methods of cultivation

and varieties SRI and CT showed significant interaction with all the varieties in number of effective tillers $m^{-2}$. Among all the varieties US 382 recorded highest number of effective tillers $m^{-2}$ in SRI (365.00). The lowest number of effective tillers $m^{-2}$ was produced by variety Kasturi under CT (223.33). In SRI method, increase in the effective tillers $m^{-2}$ might be due to the better spacing provided to the plants by planting in square method. This might have facilitated better utilization of resources by the plants converting majority of the tillers in to effective tillers. Similar results were reported by Gani *et al*. (2002), Sarath and Thilak (2004), Udaykumar (2005), Prabhakar setty *et al*. (2007), Krishna and Biradarpatil (2009), Singh *et al*. (2012), Gopalakrishnan *et al*. (2013) and Thawait *et al*. (2014).

In both the methods of cultivation, seed yield $ha^{-1}$ was significantly higher in SRI (5851.71 kg $ha^{-1}$) compared to CT (5236.76 kg $ha^{-1}$). Significant differences were also observed among all the varieties. Variety US 382 recorded the higher seed yield (6765.72 kg $ha^{-1}$), which was on par with PA 6444. The lowest seed yield was recorded by variety Kasturi (4466.88 kg $ha^{-1}$). Interaction effect between methods of cultivation and varieties SRI and CT showed significant interaction with all the varieties in the production of seed yield $ha^{-1}$. Among all the varieties US 382 recorded highest seed yield under SRI (7340.33 kg $ha^{-1}$), while the lowest seed yield was recorded by variety Kasturi under CT (4330.89 kg $ha^{-1}$). Seed yield was recorded higher in SRI method; it might be due to planting young seedlings, favourable soils conditions were incorporate with rotary weedings provides better aeration, more spacing and less competition to grown rice plants took up more macronutrients than did the roots of conventionally managed plants, which was reflected in the higher SRI yields. Similar results were reported by Nissanka and Bandara (2004), Udaykumar (2005), Subba Rao *et al*.(2007), Kavitha *et al*. (2010), Mohanty and Mohanty (2010), Barison and Uphoff (2011), Kanaka Durga (2012), Sridevi and Chellamuthu (2012), Thakur *et al*. (2013), Dwivedi *et al*. (2015) and Shivkanth *et al*. (2016).

**Quality parameters**

Data for quality parameters of rice are presented in Table 3. In both the methods of cultivation, germination per cent exhibited no significant difference. Significant differences were observed among all the varieties. Variety US 382 recorded the higher seed germination (98.67%), which was on par with PA 6444, DRRH 3 and Varadhan. The lowest germination was recorded by variety Kasturi (89.83%). Interaction effect between methods of cultivation and varieties were found to be non **-** significant in the germination per cent. However, SRI method recorded higher germination due to higher test weight values. These results are in conformity with the results of Nandisha and Mahadevappa (1984), Udaykumar (2005) and Singh *et al*. (2013).

Seedling length was significantly higher in SRI (31.40 cm) compare 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, US 382 and DRR 3. 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 CT. This may be due to under wider spacing to better filling of seed. Similar findings were also observed by Kanaka Durga (2012). 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. It might be due to better filling of seeds and higher test weight, which indicates the better food reserves in the seeds produced with SRI method, might have resulted in better quality parameter. These results are in agreement with the observations of Nandisha and Mahadevappa (1984), Udaykumar (2005), Krishna *et al*. (2008a) and Kanaka Durga (2012).

On the basis of the above study it can be concluded that seed yield $ha^{-1}$ higher in SRI method of cultivation compared conventional transplanting. Hybrids recorded higher seed yield $ha^{-1}$ under SRI cultivation than other varieties. These methods of rice cultivation help in increasing the production as well as produce the quality seed.

## REFERENCES

**Abul-Baki, A. A. and Anderson, J. D. 1973.** Vigour determination in soybean seed by multiple criteria. *Crop Science*.**13:** 630-633.

**Anonymous. 2014.** Agricultural statistics at a glance. *Directorate of Economics and Statistics*, New Delhi. p. 86.

**Barison, J. and Uphoff, N. 2011.** Rice yield and its relation to root growth and nutrient-use efficiency under SRI and conventional cultivation: an evaluation in Madagascar. *Paddy Water Environment*. **9:** 65-78.

**Dash, M. C. 2009.** Bio resources as a tool for food security, and sustainable development for rural livelihood in India. In the context of industrial development and environmental protection: an overview. *The Ecoscan*. **3(3&4):** 201-208.

**Dwivedi, S. K., Meshram, M. R., Ashok Pal and Kanvar, P. C. 2015.** Effect of planting geometry and seedling density on growth and yield of scented rice under SRI based cultivation practices. *The Bioscan*. **10(1):** 455-458.

**Gani, A., Rahman, A., Dahono., Rustam and Hengsdijk, H. 2002.** Synopsis of water management experiments in Indonesia. In: *Water Wise Rice Production* - IRRI, Philippines. pp. 29-37.

**Gomez, K. A. and Gomez, A. A. 1984.** Statistical procedure for Agriculture Research. 2nd ed. *John Willey and Sons*, New York. p. 680.

**Gopalakrishnanan, S., Mahendra kumar, R., Pagidi Humayaun., Sriniva, V., Ratna Kumari, B., Vijayabharathi, R., Amit Singh., Surekha, K., Padmavathi, Ch., Somashekar, N., Raghuveer Rao, P., Latha, P. C., Subbha Rao, L. V., Babu, V. R., Viraktamath, B. C., Vinod goud, V., Loganandhan, N., Biksham Gujja and Om Rupela. 2013.** Assessment of different methods of rice (*Oryza sativa* L.) cultivation affecting growth parameters, soil chemical, biological and microbiological properties, water saving and grain yield in rice-rice system. In *Paddy and Water Environment. Summaries at 21st International Congress in Agronomy,* 23 November 1998, New Delhi, India. pp. 454-455.

**Kanaka Durga, K. 2012.** Influence of seedling age and spacing on

productivity and quality traits of rice under System of Rice Intensification. *Madras Agricultural J.* **99(4-6):** 301-304.

**Kavitha, M. P., Ganesaraja, V., Paulpandi, V. K. and Bala Subramanian, R. 2010.** Effect of age of seedlings, weed management practices and humic acid application on system of rice intensification. *Indian Journal of Agricultural Research*. **44(4):** 294-299.

**Krishna, A. and Biradarpatil, N. K. 2009.** Influence of seedling age and spacing on seed yield and quality of short duration rice under System of Rice Intensification cultivation. *Karnataka J. Agricultural Science*. **22(1):** 53-55.

**Krishna, A., Biradarpatil, N. K. and Channappagoudar, B. B. 2008a.** Influence of System of Rice Intensification (SRI) cultivation on seed yield and quality. *Karnataka J. Agricultural Sciences*. **22(3):** 369-372.

**Krishna, A., Biradarpatil, N. K., Manjappa, K. and Channappagoudar, B. B. 2008b.** Evaluation of System of Rice Intensification cultivation, seedling age and spacing on seed yield and quality in Samba Masuhri (BPT-5204) rice. *Karnataka J. Agricultural Sciences*. **21(1):** 20-25.

**Krupakar Reddy, G. 2004**. Varietal performance and spatial requirement of rice under System of Rice Intensification during *Kharif* season. *M.Sc. (Ag.) Thesis*, Acharya N. G. Ranga Agricultural University, Hyderabad, India.

**Kush, G. S. 1993**. Breading rice for sustainable agricultural systems. Proceedings from *International Crop Science Congress*. Ames, IA, 14-22 July, 1992. pp. 89-199.

**Laulanie, H. 1993.** Le systeme de rigiculture intensive malagache. *Tropicultura* (Brussels). **11:** 104-114.

**Mohanty, D. K. and Mohanty, M. K. 2010.** Assessment of yield using cono weeder in SRI method of paddy cultivation. Available on line at www.indianjournals.com.

**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.

**Nissanka, S. P. and Bandara, T. 2004.** Comparison of productivity of System of Rice Intensification and conventional rice farming systems in the dry zone of Sri Lanka. In *4th International Crop Science Congress,* 26 September- 01 October, 2004, Brisbane, Australia.

**Prabhakara Setty, T. K., Bandi, A. G., Satnam Singh and Sanjay, M. T. 2007.** Influence of Integrated Nutrient Management on growth and yield of hybrid rice under System of Rice Intensification (SRI) and aerobic method of cultivation. In *SRI India 2007 Second National Symposium on 'System of Rice Intensification (SRI) in India - Progress and Prospects'*. Papers and Extended Summaries, 3-5 October, Agartala, Tripura, India. 82-84.

**Sarath, P. N. and Thilak, B. 2004.** Comparison of productivity of System of Rice Intensification and conventional rice farming system in the dry-zone region of Sri Lanka. In *4th International Crop Science Congress*, 26 September-01 October, 2004, Brisbane, Austrila. In: http://www.regional.org.au.

**Satyanarayana, A., Thinyagarajan, T. M. and Uphoff, N. 2007.** Opportunities for water saving with higher yield from the System of Rice Intensification. *Irrigation Science.* **25:** 99-115.

**Shivkanth. S., Joanna. B. and Tapan. R. 2016.** Effect of yield, quality attributes and cost of rice (*Oryza sativa* L.) variety under System of Rice Intensification (SRI) organic and conventional methods of rice cultivation. *International J. Scientific and Research Publications*. **6(6):** www.ijsrp.org.

**Singh, R. K., Singh, A. N., Ram, H., Rajendra Prasad, S. and Chauhan, R. K. 2013.** 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.

**Singh, Y. V., Singh, K. K. and Sharma, S. K. 2012.** Influence of crop nutrition and rice varieties under two systems of cultivation on grain quality, yield and water use. *Rice Science.* **19(4):** (www. ricescience. org/file up /pdf/2012-0022.Pdf).

**Sridevi, V. and Chellamuthu, V. 2012.** Influence of System of Rice Intensification on growth, yield and nutrient uptake of rice (*Oryza sativa* L.). *Madras Agricultural J.* **99(4-6):** 305-307.

**Sri Ranjitha. 2011.** Performance of Rice (*Oryza sativa* L.) cultivars and hybrids under different nutrient management practices in SRI. *M.Sc. (Ag.) Thesis*. Acharya N G Ranga Agricultural University, Hyderabad, India.

**Subba Rao, L. V., Mahender Kumar, R., Chaitanya, U., Padmavathi, Ch., Surekha, K., Latha, P.C., Prasad, M. S., Ravindra Babu, V., Prasad, J. S., Rupela, O. P., Vinod Goud., Shobha Rani, N. and Viraktamath, B. C. 2007.** Quality Seed Production through System of Rice Intensification. In *SRI India 2007 Second National Symposium on 'System of Rice Intensification (SRI) in India-Progress and Prospects'*. Papers and Extended Summaries, 3-5 October 2007, Agartala, Tripura, India. pp. 112-114.

**Thakur, A. K., Sreelatha Rath and Krishna Gopal Mandal. 2013.** Differential response of system of rice intensification (SRI) and conventional flooded rice management methods to application of nitrogen fertilizer. *Plant and soil*. pp. 221-227.

**Thakur, A. K., Uphoff, N. and Antony, E. 2010.** An assessment of physiological effects of System of Rice Intensification (SRI) practices compared with recommended rice cultivation practices in India. *Experimental Agriculture*. **46(1):** 77-98.

**Thawait. D., Patel, A. K., Kar, S., Sharma, M. K. and Meshram, M. R. 2014**. Performance of transplanted scented rice (*Oryza sativa* L.) under SRI based cultivation practices; a sustainable method for crop production. *The Bioscan*. **9(2):** 539-542.

**Udaykumar. 2005.** 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).