SHORT COMMUNICATION Oryza Vol. 52 No.2, 2015 (153-155)

Effect of nutrient management practices, spacing and age of seedling on rice yield under system of rice intensification

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ABSTRACT

The result of experiment conducted on three nutrient management practices , two age of seedlings and three spacings on System of Rice Intensification revealed no significant difference in different nutrient management practices on grain yield of rice under System of rice intensification, however Integrated source of nutrient i.e 50%RD+ FYM10 tha^{-1} resulted in maximum grain yield of rice as compared to organic source i.e FYM 20 t ha^{-1} and Recommended dose of fertilizer. Planting of 15 days old seedling produced significantly higher yield than 10 days old seedling. Spacing of 20x20cm.produced significantly higher yield than 25x25cm. spacing in an iron toxic soil .

Key words: *Rice, SRI, Organic, integrated source of nutrient, spacing, age of seedling*

System of Rice Intensification (SRI) has become a noble approach to increase rice production which saves water and other inputs (Satyanarayan *et al.*, 2007). Iron toxicity in coastal tracts of Odisha is a problem in cultivation of rice. About 0.70 million ha of land in Odisha is rich in hydrated oxides of iron and aluminium. The medium and lowlands suffer from iron toxicity due to lateral movement of soluble iron from upper ridges (Agronica, 2005). Under such situation several modern approaches like cultivation of aerobic rice varieties, use of organic sources of nutrients, raised bed planting and alternate drying and wetting have been advocated to fight against iron toxicity. Age of the seedling, planting in wider spacing and nutrient management practices are the key inputs which play major role in enhancing yield of rice under SRI method. Singh *et al* (2008) has advocated reduction of fertilizer dose to 25% on application of FYM 10 tha^{-1} and 50% on10 t ha^{-1} FYM + biofertilizes for getting maximum yield of paddy in trials conducted over five years. Hussain *et al* (2012) reported that 14 and 21 days old seedlings resulted in significantly higher growth, yield attributes and yield of rice. Increase in grain yield of rice to the tune of 19.5% with 25cm x 25cm spacing over 30cm x 30cm under SRI method was reported by Singh *et al* (2012). Considering all the advantages of SRI, an attempt was made to standardize the nutrient management practices, age of seedling and spacing of rice in iron toxic soil under SRI method of cultivation.

Field experiment was conducted during wet season of 2010 at the Central Farm, Regional Research and Technology Transfer Station (OUAT), Bhubaneswar. The soil of the experimental site was Sandy loam in texture, acidic in reaction (pH=5.8), moderate in organic carbon content (0.6%),low in available nitrogen (120 kg ha^{-1}), available P(12.0 kg ha^{-1}) and medium in available K (245 kg ha^{-1}) and high in iron content (89.5 kg ha^{-1}). The experiment was laid out in a split- plot design keeping three nutrient management practices in the main plots *viz* recommended dose (RD) *i.e*. 60-30-30 N- P_2O_5- K_2O kg ha^{-1}, 50% RD+FYM 10 t ha^{-1} and FYM 20 t ha^{-1}; four combination of two age of seedlings *viz*.10 days and 15 days and two spacing *viz.* 20 x 20cm and 25x25cm in sub plots with three replications. CR Dhan-10 (Satya Krishna), a medium duration rice variety was as a test crop in the experiment. Nursery bed was prepared on raised bed with well decomposed FYM

on 24th August. Single seedling was transplanted on 2nd and 7th September as per age of treatment following specification of SRI. Interculture was given after 20, 30 and 40 days of transplanting by using weeder keeping thin film of standing water at the time of weeding. The harvesting of the crop was done on 15th December and 17th December as per the treatment. The data on yield attributing characters recorded from five random plants at the time of harvest along with grain and straw yield have been analyzed as per procedure given by Nageswara Rao(1980) and have been presented Table 1.

The different nutrient management practices exhibited no significant effect on the yield attributing characters like plant height, total number of tillers per hill, panicles number per hill except number of grains per panicle. However, application of integrated source of nutrients *i.e* 50% RD + FYM 10 t ha $^{-1}$ resulted in higher number of panicles per plant (12.1) and grain per panicle than application of organic source *i.e* FYM 20 t ha^{-1} and chemical source of nutrient *i.e* recommended dose of fertilizer. Organic source of nutrient (FYM 20 t ha^{-1}) resulted in increase in growth characters like plant height and number of tillers per plant followed by application of 50% RD+FYM10 t ha^{-1} and RD in decreasing order.

Transplanting 15 days old seedlings produced significantly more no of tillers per hill (12.7), panicles per hill (10.6) and grains per panicle (126) as compared to transplanting 10 days old seedling under SRI technique. Transplanting of 10 days old seedling recorded significantly higher plant height than transplanting older seedling of 15 days.

Transplanting at wider spacing of 25cm x 25cm recorded significantly higher number of tillers per hill (13.6), panicles per hill (10.6) and grains per panicle (141.5) as compared to that planted at closer spacing of 20cm x 20cm. whereas, Closer spacing of 20 cmx20 cm resulted in significant increase in plant height than wider spacing.

There was no significant difference among the sources of nutrient on grain yield under SRI method. However, integrated source of nutrient (of 50% RD + FYM 10 t ha^{-1}) produced higher grain yield (4.09 t ha^{-1}) due to higher number of panicles per plant and grains per panicle than nutrient source through organic source (3.93 t ha $^{-1}$) and chemical source (3.45 t ha^{-1}) .This was in agreement with findings of Singh *et al* (2008). Application of FYM 20 t ha^{-1} recorded significantly maximum straw yield (5.67 t ha^{-1}) followed by 50% RD+FYM 10 t ha^{-1} and recommended dose of fertilizer, due to higher values of plant height and number of tillers per plant in former treatment.

Table 1. Effect of nutrient management practices, spacing and age of seedlings on yield and yield attributing characters of rice under SRI method cultivation

Particulars	Plant height (cm)	Total tillers hill^{-1}	Panicles hill^{-1}	Grains panicle^{-1}	Grain yield ha^{-1}	Straw yield tha^{-1}	Harvest index %
Nutrient Management							
RD (60-30-30N P_2O_5 K_2O kgha^{-1})	99.1	10.5	8.0	117.0	3.45	4.68	42.4
50% RD + FYM 10tha^{-1}	103.1	12.5	12.1	142.1	4.09	5.19	44.1
FYM 20 t ha^{-1}	118.6	14.8	10.4	141.1	3.93	5.67	40.9
SEm($_+$)	7.23	1.7	1.6	1.16	0.34	0.14	-
CD (P < 0.05)	NS	NS	NS	3.22	NS	0.39	-
Age Seedling							
10 days	108.3	11.5	9.8	126.0	3.63	4.71	41.3
15 days	105.2	12.7	10.6	140.5	4.02	5.16	46.1
SEm($_+$)	1.42	0.56	0.34	6.56	0.65	0.24	-
CD (P < 0.05)	2.99	1.18	0.72	13.80	1.36	0.52	-
Spacing							
20cm x 20cm	112.7	11.6	9.5	125.2	4.11	5.98	40.73
25cm x 25cm	101.1	13.6	10.6	141.5	3.53	5.67	38.40
SEm($_+$)	5.14	0.85	0.44	6.75	0.65	0.17	-
CD (P < 0.05)	10.8	1.8	0.92	14.2	1.36	0.36	-

Transplanting of 15 days old seedling produced significantly maximum grain yield (4.02 t ha^{-1}) which was 10.74% higher than 10 days old seedling (3.63 t ha^{-1}). It was in agreement with findings of Hussain *et al* (2012).The straw yield was also maximum with 15 days old seedling (5.16 t ha^{-1}) as compared to 10 days old seedling (4.71t ha^{-1}) due to significantly higher number of tillers per plant. The spacing of 20cm x 20 cm produced substantially higher grain yield (4.11t ha^{-1}) to the tune of 16.4% than wider spacing of 25cm x 25cm (3.53 t ha^{-1}) due to increase in plant population to the tune of 50%, compensating higher values of yield attributes in latter case. Similar findings were also reported by Singh *et al* (2012). The straw yield was also maximum with closer spacing than wider spacing due to the same reason.

It is concluded that application of 50% inorganic and 50% organic source of fertilizer with seedling age of 15 days and at 20 cm x 20 cm spacing is more appropriate than recommended practice of SRI for iron toxic soils of Odisha.

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