Effect of age of seedlings under different system of rice intensification(SRI)

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To assure food security in the rice-consuming countries of the world, those countries will have to produce 50% more rice with improved quality to meet consumers' demand by 2025. This additional rice will have to be produced on less land with less water, less labour, and fewer chemicals. Rice (*Oryza sativa L.*) is an important crop of Tungabhadra project area and is cultivated over an area of 0.1 m ha. Timely planting and use of appropriate aged seedlings for transplanting are important non cash inputs for realizing the higher productivity in rice (Pattar *et al.*, 2001).

Transplanting younger seedlings, preferably 8-15 days old before the plants enter their fourth phyllochron of growth, planting the seedlings singly rather than in clumps of 3-6 plants, and keeping the paddy soil moist but not continuously saturated during the plants' vegetative growth phase is good. Transplanting of less than 15 days old seedlings was found better. Further farmers are very often to use 35 to 50 days old seedlings in place of recommended 25 to 30 days old seedlings and such information under TBP situations is not available (Balasubramanian *et al.*, 1977). It is important to select suitable age of rice seedlings which contributes towards increased rice production and resolve the problem posed by higher temperature and water depth inflicting seedling mortality. This has resulted in low population per unit area just after transplanting as well as causing huge economic losses**.** In a study, Patra, Sonowal and Biswas (2008) reported that for every 20days delay in transplanting *khgarif* rice in *Terai* region of West Bengal resulted in 3q.ha^{-1}yield loss. Hence, the present investigation was carried out to study the influence of age of seedlings under different system of rice intensification.

A field experiment was carried out during the *Kharif,* 2005 at Agricultural Research Station Siruguppa, Karnataka. The soil was deep black clay in texture, neutral in pH (8.22) and low in electrical conductivity (0.28 ds/m). It was low in available nitrogen (265 kg ha^{-1}), high in available phosphorus (30.5 kg ha^{-1}) and medium in available potassium content (365 kg ha^{-1}). There were 15 treatment combinations comprising of three methods of planting (M_1- Normal method, M_2- Recommended SRI method, M_3- Modified SRI method)as main treatments and five age of seedlings (9, 12, 15, 18 and 21 days) as sub treatments and were laid out in split plot design with three replications. The gross plot size was 4 m x 3 m. IET-16933 was used as test variety. The spacing followed was 20 cm x 10 cm (M_1), 25 cm x 25 cm (M_2 and M_3). The crop received a fertilizer dose of 150:75:75 kg NPK ha^{-1}. Full dose of P_2O_5 and K_2O and 50 per cent of nitrogen was applied at the time of transplanting and remaining 50 per cent of nitrogen was applied in two equal splits at 30 and 55 days after transplanting. All the recommended cultivation practices were followed. The crop was harvested after attaining physiological maturity.

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Methods of planting had significant influence on the grain yield of rice (Table 2). Modified SRI method recorded significantly higher grain yield (6342 kg ha^{-1}) which was 24.23 per cent higher over the normal method. The better performance of rice under modified SRI method may be due to higher number of panicles per hill (61.52), panicle length (20.83 cm), number of grains per panicle (167.25) and test weight (20.83). These results are in agreement with the findings of Norman (2002) who reported that by changing the management practices, there was increase in the grain yield under SRI method due to higher number of tillers, number of grains per panicle and panicle length. These findings are in conformity with Adrainaivo and Jolei (2002). Significantly lower sterility per cent was recorded in modified SRI method and which resulted in higher grain yield. Straw yield also followed same trend as that of grain yield. Modified SRI and recommended SRI method recorded significantly higher straw yield of paddy than normal method. The increase in straws yield of paddy in modified SRI method over the recommended and normal methods was by 1.23 and 15.53 per cent, respectively. The higher straw yield under modified SRI method was due to higher dry matter production and accumulation in stem.

The grain yield of rice was significantly influenced by age of seedlings (Table 2). Planting of 9 days (6071 kg ha^{-1}) or 12 days (6018 kg ha^{-1}) old seedlings gave significantly higher grain yield than 15 (5792 kg ha^{-1}), 18 (5771 kg ha^{-1}) and 21 days (5721 kg ha^{-1}) old seedlings. This was because of the higher number of panicle per hill (48.93 and 48.17under planting of 9 days and 12 days old seedlings, respectively), panicle length (21.07 and 21.24 17under planting of 9 days and 12 days old seedlings, respectively), number of grains per panicle (159.33 and 158.13 17under planting of 9 days and 12 days old seedlings, respectively) and test weight (20.74 and 20.58 g 17under planting of 9 days and 12 days old seedlings, respectively) and further transplanting younger seedlings i.e. less than 15 days old seedlings had higher tillering capacity and more vigour which inturn helped in extracting nutrients from soil. Similar findings were reported by Thiyagarajan *et al*., 2002. From this study, it could be concluded that, modified SRI method with planting of 9 or 12 days old seedlings was found to be optimum in TBP area for enhancing rice production.

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Table 1. Influence of methods of planting and age of seedlings on yield components

	Total number of panicles per hill						Panicle length (cm)						Number of grains per panicle						Test weight /1000 grain weight (g)					
	S_1	S_2	S_3	S_4	S_5	Mean	S_1	S_2	S_3	S_4	S_5	Mean	S_1	S_2	S_3	S_4	S_5	Mean	S_1	S_2	S_3	S_4	S_5	Mean
M_1	19.3	19.1	17.5	17.3	17.6	**18.1**	19.5	19.7	18.7	18.2	18.5	**18.9**	129.6	129.5	121.2	120.5	122.4	**124.6**	19.9	19.8	19.2	19.3	19.2	**19.4**
M_2	63.1	62.3	59.7	59.5	59.0	**60.7**	21.8	22.1	21.2	22.1	20.8	**21.6**	172.5	173.6	155.2	158.7	158.3	**163.7**	21.0	20.8	20.3	20.27	20.1	**20.5**
M_3	64.3	63.1	60.1	60.2	59.8	**61.5**	21.8	21.9	20.9	20.3	20.8	**21.1**	175.8	171.2	167.6	161.3	160.2	**167.2**	21.2	21.1	20.6	20.6	20.5	**20.8**
Mean	**48.93**	**48.17**	**45.79**	**45.70**	**45.50**		**21.07**	**21.24**	**20.29**	**20.23**	**20.08**		**159.33**	**158.13**	**148.04**	**146.87**	**146.99**		**20.74**	**20.58**	**20.07**	**20.08**	**19.93**	

	SEm(±)	LSD(0.05)	SEm(±)	LSD(0.05)	SEm(±)	LSD(0.05)	SEm(±)	LSD(0.05)
Main treatments (M)	0.56	2.22	0.31	0.21	0.87	3.44	0.09	0.36
Sub treatments (s)	0.81	2.38	0.23	0.68	1.31	3.83	0.05	0.14
S at same M	1.41	NS	0.40	NS	2.27	NS	0.08	NS
M at same or different S	1.38	NS	0.47	NS	2.21	NS	0.12	NS

M_1 – Normal method (Application of RDF through inorganics with FYM @ 10 t ha^{-1} and transplanting at 20 cm x 10 cm spacing)
M_2 – Recommended SRI (Application of RDN through organics and transplanting at 25 cm x 25 cm spacing)
M_3 – Modified SRI (Application of RDF through inorganics with FYM @ 10 t ha^{-1} and transplanting at 25 cm x 25 cm spacing)

DAT – Days after transplanting **NS**-Non significant

S_1 – 9 Days old seedlings
S_2 – 12 Days old seedlings
S_3 – 15 Days old seedlings
S_4 – 18 Days old seedlings
S_5 – 21 Days old seedlings

Table 2. Grain yield and straw yield as influenced by methods of planting and age of seedlings

Treatments	Grain yield (kg ha^{-1})						Straw yield (kg ha^{-1})					
	S_1	**S_2**	**S_3**	**S_4**	**S_5**	**Mean**	**S_1**	**S_2**	**S_3**	**S_4**	**S_5**	**Mean**
M_1	5397	5327	4997	4910	4893	**5105**	6433	6263	5990	5950	5903	**6108**
M_2	6377	6313	6153	6143	6080	**6213**	7240	7216	7093	7100	7073	**7144**
M_3	6440	6416	6226	6260	6370	**6342**	7383	7327	7143	7140	7173	**7233**
Mean	**6071**	**6018**	**5792**	**5771**	**5781**		**7019**	**6935**	**6742**	**6730**	**6716**	

	SEm(±)	LSD(0.05)	SEm(±)	LSD(0.05)
Main treatments (M)	3.9	15.3	5.1	20.2
Sub treatments (s)	5.2	15.2	5.4	15.9
S at same M	9.0	NS	9.4	NS
M at same or different S	8.9	NS	9.9	NS

M_1 – Normal method (Application of RDF through inorganics with FYM @ 10 t ha^{-1} and transplanting at 20 cm x 10 cm spacing)
M_2 – Recommended SRI (Application of RDN through organics and transplanting at 25 cm x 25 cm spacing)
M_3 – Modified SRI (Application of RDF through inorganics with FYM @ 10 t ha^{-1} and transplanting at 25 cm x 25 cm spacing)

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