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Performance of System of Rice Intensification (SRI) under Different Planting Geometry and Age of Seedlings

Key words : Crop Geometry, Grain yield ,Seedling age, SRI

System of Rice Intensification (SRI) developed in Madagascar by Fr. Henri de Laulanie in association with Non-Governmental Organization, Association Tefy Saina is spreading to many countries. Rice cultivation under SRI can save water, protect soil productivity, save environment by checking methane gas, bring down the input cost, besides increasing the production for providing food to the growing population (Krishna *et al*., 2008). The SRI has its own methodologies *viz.,* transplanting younger seedlings (8-12 days old) singly at shallow depth by adoption of wider spacing (25 x 25 cm), to keep soil moist, inter row weeding using rotary weeder and use of organics. Uphoff (2006) cautioned that SRI is not a readymade recepie, but a system to be modified to suit the local ecological system. Research studies on crop geometry and seedling age in SRI are highly inconsistent (Reddy *et al*., 2006, Krishna *et al*., 2006, Natarajan *et al*., 2008) warranting the need for studying the two aspects in a particular agro ecosystem before advocating to farmers. In this context, the field investigation was conducted.

The field experiments were conducted during *rabi* season of 2005-2006 and 2006-07 on clay loam soils at Regional Agricultural Research Station, Warangal under tank irrigation. The soil had a pH of 7.8, low in organic carbon (0.36%) available nitrogen (284 kg ha^{-1}) and medium in phosphorus (14 Kg ha^{-1}) and potassium (268 Kg ha^{-1}). The treatments consisted of three planting geometries at 20 x 20 cm, 25 x 25 cm and 30 x 30 cm and three seedling ages of 10, 15 and 20 days old. The experiment was designed in RBD (factorial) with three replications. The variety used was WGL-20471 (Erramallelu) of 120-125 days duration. The plot size was 6 m x 4 m. A uniform dose of 60 kg P_2O_5 ha^{-1} and 30 kg K_2O $ha^{-1}$was applied basally. The nitrogenous fertilizer 120 kg ha^{-1} was applied in three equal splits at basal, maximum tillering and panicle initiation stages respectively. Rice seeds were soaked for 24 hours in water and then incubated in moist gunny bag for another 24 hours and pre germinated seeds were broadcasted uniformly on nursery beds. After broadcasting the seed, 1:1 soil-FYM mixture was spread in a thin layer of one cm. Nursery sowings were done at different dates to get respective aged seedlings (10,15 and 20 days) for transplanting on the same day. The nursery beds were irrigated regularly. On the day of transplanting seedlings were lifted carefully along with soil and transplanted immediately in the main field with gentle placement but not with harsh pushing. The crop was transplanted on 18th and 31st January in first and second year respectively. All the agronomic package of practices for SRI were followed and crop was kept free from pest and diseases.

Planting geometry and seedling ages in SRI

The pooled results of influence of spacing and seedling age on yield attributes and grain yield are presented in one way table as the interactions were found to be not significant.

Number of tillers and panicles per hill varied significantly due to crop geometry. Profused tillers (30.4 $hill^{-1}$) and panicles (26.4 $hill^{-1}$) were noticed under wider spacing (30 x 30 cm). Number of panicles per plant reduced significantly with 25 x 25 cm (18.9) and 20 x 20 cm (15.4). Wider planting might have facilitated better utilization of the resources resulting in more number of tillers and panicles (Reddy, 2002) on unit area basis (m^{-2}) both the tillers and panicles were significantly higher with closer spacing. On an average, 20 x 20 cm spacing gave significantly higher tiller number by 27.1 and 31.1% and panicles by 28.0 and 33.2% compared with those of 25 x 25 cm and 30 x 30 cm respectively. The increase in yield attributes was due to greater number of 25 hills m^{-2} than 16 and 11.11 hills m^{-2} in closer spacing over 25 cm x 25 cm and 30 cm x 30 cm respectively. The results were endorsed by Reddy *et al*. (2006).

Panicle length was significantly not influenced by different spacings. Significantly higher 1000 grain weight (18.2 g) was recorded with 30 cm x 30 cm over other two spacings. Significantly higher grain yield (6872 kg ha^{-1}) was noticed with a spacing of 20 cm x 20 cm compared to 25 cm x 25 cm

Table 1. Yield attributes and yield as influenced by spacing and seedling ages in SRI during *Rabi* (Pooled data)

Treatment	Tillers hill^{-1}	Tillers m^{-2}	Panicles hill^{-1}	Panicles m^{-2}	Panicle length (cm)	Filled grains Panicle^{-1}	1000 grain weight (g)	Grain yield (kg ha^{-1})	Straw yield (kg ha^{-1})
Spacing (cm)									
20 x 20	18.4	459	15.4	389	23.0	119.5	17.3	6872	7494
25 x 25	22.2	361	18.9	304	23.6	133.2	17.6	6226	6984
30 x 30	30.4	350	26.4	292	23.5	139.8	18.2	6044	6712
SEm±	1.3	11	0.7	9	0.3	5.0	0.02	125	134
CD (P=0.05)	3.8	35	2.0	28	NS	15.0	0.5	375	403
Seedling ages (days)									
10	23.7	399	20.8	337	23.1	131.3	17.5	6557	7289
15	24.7	397	20.7	336	23.7	127.8	17.6	6398	7112
20	22.6	374	19.1	313	23.3	133.4	18.0	6189	6794
SEm±	1.3	11	0.7	9	0.3	5.0	0.02	125	134
CD (P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS
Spacing x seedling age									
SEm ±	2.2	20	1.2	16	0.5	9.0	0.3	216	231
CD (P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS

(6226 kg ha^{-1}) and 30 cm x 30 cm (6044 kg ha^{-1}) straw yields also followed the similar trend. The optimum level of plant population with better yield parameters might have resulted in higher grain yield with 20 cm x 20 cm spacing. These finding are in contrast to the results of Zhang *et al*. (2004) and Krishna *et al*. (2008).

No significant differences were observed for yield attributes, grain and straw yields due to age of seedlings. However, grain yield produced with 10 days old seedlings was higher (6872 kg ha^{-1}) over 15 days (6226 kg ha^{-1}) and 20 days old seedlings (6044 kg ha^{-1}). Earlier Krishna *et al*. (2008) recorded significantly higher grain yield with either 8 or 12 day seedling over 16 and 25 days, where as Jeyanthi and Subbalaksmi (2008) indicated that 3-4 leaf stage or endosperm detachment from the seedling to be considered rather than counting seedling days in SRI

Higher rice grain yield can be realized by adopting a planting geometry of 20 cm x 20 cm, with either 10, 15 or 20 day seedling transplanting in SRI during *rabi* season in Erramallelu rice variety.

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