



Effect of age of seedlings and weed management under SRI on yield of rice

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ABSTRACT

Planting of 10 or 15 days old seedlings did not differ significantly on grain yield of rice. Among weed management practices SRI method of planting with four times cono-weeding at 10 days interval starting from 10 days after transplanting recorded significantly higher grain yield (6003 kg/ha) and was found effective in weed control. However, pre-emergence application of butachlor + one hand weeding at 20 DAT was equally effective alternative weed control in SRI method of cultivation.

Key words: Age of seedlings, B:C ratio, Butachlor, Cono-weeding, Grain yield, SRI

Rice (*Oryza sativa* L.) is a one of the important staple food crops for more than half of the world's population. In India, rice is grown in an area of 44.3 m ha and record production of 103.4 m t was estimated in 2011-12. Demand for rice is growing every year and it is estimated that by 2025 the requirement would be 130 million tones. To sustain present food self sufficiency and to meet future food demands, India has to increase its rice productivity by three per cent per annum (Thiyagarajan and Selvaraju 2011). In India, manual method of transplanting is the most dominant and traditional method of crop establishment in irrigated low land rice, which not only consume more water but also causes wastage of water resulting in degradation of land. Water resource limitations, shortage of labor during peak period of transplanting and escalating labor wages make transplanting more expensive which invariably leads to delay in transplanting and results in reduction of yield and profit (Gangwar *et al.* 2008). To mitigate this problem many methods of cultivation have been developed, one among them is System of Rice intensification (SRI). System of rice intensification is an emerging water saving technology which can help the farmers to overcome the present water crisis. The SRI is considered as a system rather than a technology as it involves the holistic management to give ideal growing condition to rice plant. Besides, it enhances soil health with reduction in input use such as seeds, water, labor *etc.* (Gujja and Thiyagarajan 2009). Age of seedling and weed management practices plays an important role under limited water situation in SRI production system. In SRI, planting of too young seedling (8-10 days) is difficult. Further, weeds are incorporated and controlled through cono-weeding in SRI is very drudgeries and a

person has to walk longdistance for cono-weeding in rice. In order to standardize the seedling age and economize the cono-weeding operations, the study was under taken to study the effect of age of seedlings and weed management methods under SRI for enhancing grain yield.

MATERIALS AND METHODS

Field experiments were conducted during summer seasons of 2010 and 2011 at ZARS, V.C. Farm, Mandya, Karnataka to standardize the seedling age and economize the cono weeding operation for enhancing grain yield. The soil of the experiment site was red sandy loam, slightly acidic in nature (pH 6.05), medium in available soil nitrogen (274.60 kg/ha), phosphorus (27.2 kg/ha) and potassium (174.30 kg/ha). Treatment consisted two age of seedlings (A₁: 10 days old seedlings and A₂: 15 days old seedlings) and three weed management practices (W₁: 2 times cono weeder at 10 and 20 DAT, W₂: 4 times cono weeder at 10, 20, 30 and 40 DAT and W₃ by pre-emergence herbicide butachlor 1.5 kg/ha 5 DAT followed 1 hand weeding at 20 DAT) were laid out in a factorial RCBD with three replications. Under SRI method of rice cultivation, 10 and 15 days old seedlings raised from rice mat nursery were transplanted with a spacing of 25x25 cm in both the seasons. Farm yard manure was applied 10 t/ha uniformly, incorporated and leveled. Recommended dose of fertilizers (125:62.5:62.5 and 100-50-50 kg NPK/ha for summer and *Kharif* seasons, respectively) were applied as per the treatments indicated in the plan. Nitrogenous fertilizer was applied in three splits *viz.*, 50% nitrogen at basal and 25 % N each at active tillering and panicle initiation stage. The entire dose of phosphorus was applied as basal and potassium was applied in two splits *viz.*, 50% at basal and remaining 50% was supplied at panicle initiation stage. Weeding was done with cono-weeding at 10 days interval start-

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ing from 10 days after transplanting. Pre-emergence herbicide butachlor was sprayed at 3 DAP using knapsack sprayer with a spray volume of 500 l/ha. Irrigation management i.e. alternate wetting and drying and timely plant protection measures were adopted to raise the crop. Observations on weed dry weight, yield components and productivity of rice were recorded. Data recorded were analyzed statistically as per the procedure prescribed for Factorial RCBD (Gomez and Gomez 1984).

RESULTS AND DISCUSSION

Weed flora

The dominating weed flora observed in the experimental field were *Cynodon dactylon*, *Dactyloctenium aegyptium* and *Chloris barbata* among the grasses, *Alternanthera pungens*, *Portulaca oleracea*, *Cleome chelidoni*, *Eclipta alba*, *Anagallis arvensis*, *Spergula arvensis*, *Melilotus indica* and *Tridax procumbens* among the broad leaved weeds and *Cyprus* sp. among sedges.

Effect of age of seedling on grain yield

Pooled data of the experimental results revealed that age of seedling did not differ significantly on yield of rice. However, planting 15 days old seedlings produced higher grain yield (5696 kg/ha) than planting 10 days old seedling. Higher grain yield might be attributed to greater root development and activity, more flourishing capacity of the seedlings at early transplanting stage and higher number of panicles and panicle weight were consequently improved the grain yield

Effect of weed management practices on dry weight of weeds, yield and yield attributes

Dry weight of weeds recorded during crop growth stages did not differ significantly between the age of

seedling planted at 10 and 15 day old. However, lower dry weight of weeds recorded with the seedlings planted in 10 days old (13.37g) than 15 days old (13.43 g). Weed management practices had significant effect on yield and yield attributes of SRI (Table 2). Weed control through cono-weeding at 10, 20, 30 and 40 days after transplanting recorded significantly lower weed dry weight (8.70 g) which resulted higher grain yield (6003 kg/ha) followed by application of pre-emergence herbicide butachlor 1.5 kg/ha at 5 DAT followed 1 hand weeding at 20 DAT (day weight grain yield was recorded 11.7 g and 5653 kg/ha respectively) and found significantly superior over other treatments. This might be due to effective control of weeds which in turn significantly increased the number of panicles/m² and panicle weight (g) consequently improved the grain yield. Control of weeds by herbicides during early stages of rice resulted in lower competition to the crop for moisture, nutrients and sunlight that influenced the crop to grow better as evidenced in increased yield attributes and yield (Singh *et al.* 2005). The interaction effect between age of seedlings and weed management practices were found significant during both the season of the study.

Economics

In SRI method of rice cultivation, planting of 15 days old seedlings obtained higher net returns and B:C ratio (₹ 37960/ha and 1:46, respectively) than planting 10 days old seedlings. Among weed management practices cono-weeding at 10, 20, 30 and 40 days after transplanting recorded higher B:C ratio (1.50) as compared to pre-emergence herbicide butachlor 1.5 kg/ha at 5 DAT followed by 1 hand weeding at 20 DAT and 2 times cono weeder at 10 and 20 DAT (1.20).

Table 1. Influence of age of seedling and weed management practices on yield and yield components of SRI

Treatment	Grain yield (kg/ha)			Panicle no./m ²			Panicle weight (g)		
	2010	2011	Mean	2010	2011	Mean	2010	2011	Mean
<i>Age of seedling</i>									
A ₁ : 10 days old	4485	6570	5528	357	450	404	3.43	3.38	3.41
A ₂ : 15 days old	4787	6604	5696	370	460	415	3.47	3.52	3.50
LSD (P=0.05)	NS	NS		NS	NS		NS	NS	
<i>Weed management practices</i>									
W ₁ : 2 times conoweeder at 10 and 20 DAT	4134	6224	5179	343	434	389	3.36	3.26	3.31
W ₂ : 4 times conoweeder at 10, 20, 30 and 40 DAT	5114	6891	6003	380	470	425	3.49	3.60	3.55
W ₃ : Pre-emergence herbicide butachlor 1.5 kg/ha 5 DAT followed 1 hand weeding at 20 DAT	4661	6645	5653	368	471	420	3.50	3.49	3.49
LSD (P=0.05)	598.0	459.2	528.6	21.0	30.5	25.8	NS	NS	

Table 2. Weed dry weight and economics of SRI cultivation as influenced by age of seedling and weed management practices

Treatment	Weed dry weight (g/m ²)	Cost of cultivation (x10 ³ ₹/ha)	Gross returns (x10 ³ ₹/ha)	Net returns (x10 ³ ₹/ha)
<i>Age of seedling</i>				
A ₁ : 10 days old	13.37	26.00	61.98	35.98
A ₂ : 15 days old	13.43	26.00	63.96	37.96
LSD (P=0.05)	NS			
<i>Weed management practices</i>				
W ₁ : 2 times cono weeder at 10 and 20 DAT	19.80	26.50	58.28	31.78
W ₂ : 4 times cono weeder at 10, 20, 30 and 40 DAT	08.70	27.00	67.53	40.53
W ₃ : Pre-emergence herbicide Butachlor 1.5 kg/ha 5 DAT followed 1 hand weeding at 20 DAT	11.70	28.00	63.33	35.33
LSD (P=0.05)	1.53			

Based on the above study it can be concluded that in SRI, planting 10 or 15 days old seedling was desirable for realizing higher productivity in place of too young seedlings (8-10 days old seedlings) and four time cono-weeding at 10 days interval after transplanting was found most effective in weed control.

REFERENCES

Gangwar KS, Gill MS, Tomar OK and Pandey DK. 2008. Effect of crop establishment methods on growth, productivity and soil fertility of rice (*Oryza sativa*) - based cropping systems. *Indian Journal of Agronomy* **53**:102-106.

Gomez KA and Gomez AA. 2010. *Statistical Procedures for Agricultural Research*. (2nd Ed.). Wiley India Pvt Ltd., India.

Gujja B and Thiyagarajan TM. 2009. Indian food security? The System of Rice Intensification. *Gate Keeper Series* **143**: 4-5.

Singh VP, Singh Govindra, Singh RK, Singh SP, Kumar A, Dhyani VC, Kumar M and Sharma G. 2005. Effect of herbicides alone and in combination on direct-seeded rice. *Indian Journal of Weed Science* **37**: 197-201