Effect of Age of Seedlings and Weed Management Practices on Certain Growth Parameters of Rice under System of Rice Intensification (SRI)

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Abstract

During Thaladi and Kuruvai seasons in 2009 to 2010, two field experiments were carried out at Annamalai University Experimental Farm in a factorial randomized block design with three replications. The treatments were formed by combination of two age of seedlings and four weed management practices that were tested on SRI crop. All the treatments and their combinations significantly influenced the growth aspects. Conoweeding four times adopted in 15 days old rice seedlings ranked first and resulted in increased plant height, LAI, tillers m^{-2} and DMP over unweeded control. The next best was butachlor application @ 1.5 kg a.i. ha^{-1} + hand weeding and both were comparable.

Key Words: System of rice intensification, age of seedlings, weed management.

Rice is a staple food for more than half of the global population and it is a predominant crop in lowland ecosystem. Tamil Nadu is one of the important rice growing states in India wherein rice is cultivated on 1.93 m ha with a production of 5.18 m t and the productivity is 2.68 t ha^{-1} which is very low when compared to world average of 4.25 t ha^{-1} .

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Rice contributes 20 to 25 per cent of agricultural GDP in India and its production has to be necessarily increased in India to meet the growing population and that too with reduced available irrigation water. System of Rice Intensification (SRI) is one of the ways to solve the water crisis in rice cultivation and to increase the rice yield three to four times as compared to conventional farmer's cultivation (Uphoff, 2002).

Materials and Methods

To evaluate the effect of age of seedlings and weed management practices on certain growth parameters of rice under SRI, two field experiments were conducted at Annamalai University Experimental Farm which is located at 11°24' North latitude, 79°44' East longitude and at an altitude of 5.79 m above mean sea level. The experimental soil is clay loam in texture with a pH of 8.4. The soil is low in available nitrogen (227 kg ha^{-1}), medium in available (17 kg ha^{-1}) phosphorus and in available potassium high (346 kg ha^{-1}). The experiments were conducted during Thaladi (August 2009 to January 2010) and Kuruvai seasons (June 2010 to September 2010) with Co 43 and ADT 43 cultivars, respectively. The experiments were conducted in a

factorial randomized block design with treatments formed by combination of two age of seedling (M_1 – 10 days old seedlings and M_2 - 15 days old seedlings) and four weed management practices (S_1 – conoweeding two times at 10 and 20 DAT, S_2 – conoweeding four times at 10, 20, 30 and 40 DAT, S_3 – pre-emergence application of butachlor @ 1.5 kg a.i. ha^{-1} on 3 DAT + hand weeding on 35 DAT and S_4 – unweeded control). Butachlor was applied to respective plots by mixing it with sand @ 50 kg ha^{-1}. Standard package of practices were adopted for both the crops. Plant height, number of tillers m^{-2} and crop dry matter production were recorded at harvest. Leaf area index (LAI) was computed at active tillering stage by using the formula suggested by Yoshida *et al*. (1976).

Results and Discussion

Age of Seedlings

Significant influence of age of seedlings was observed during both the seasons. Transplanting of 15 days old seedlings resulted in the tallest plants (Table 1), more number of tillers m^{-2} (Table 2) higher LAI (Table 3), and higher dry matter production (DMP) (Table 4) in both the seasons compared to 10 days old seedlings. This observation was confirmed by the earlier findings of Tao *et al*. (2002).

Weed management practices

All the weed management practices exerted significant influence on growth parameters of rice. Within the weed management practices, conoweeding four times increased the plant height (23.85 and 21.25 cm) (Table 1), LAI (2.27 and 3.11) (Table 2), tillers m^{-2} (181.62 and 170.79) (Table 3) and DMP (6.49 and 6.18 t ha^{-1}) (Table 4) over unweeded control in Thaladi and Kuruvai seasons, respectively and was on par with butachlor application @ 1.5 kg a.i. ha^{-1} + hand weeding on 35 DAT. Least growth parameters were registered in unweeded control in both the seasons.

Interaction effect

The interaction between the age of seedlings and weed management practices was marked on the growth parameters during both the seasons. Transplanting of 15 days old seedlings coupled with conoweeding four times resulted in taller plants (116.2 and 109.0 cm), the higher number of tillers m^{-2} (459.6 and 434.3), LAI (6.43 and 5.64), and DMP (14.65 and 14.20 t ha^{-1}) in Thaladi and Kuruvai seasons, respectively. However, it was comparable with butachlor application @ 1.5 kg a.i. ha^{-1} + hand weeding on 35 DAT. The least growth parameters were observed in unweeded control. All the weed management practices exerted similar effect when they practiced in 10 days old seedlings. The increased growth parameters in 15 days old seedlings plus conoweeding four times might be due to lesser competition from weeds, vigour of seedlings, wider spacing, presence of thin film of water, improved respiration of roots, root development, absence of mutual shading and increased uptake of nutrients (Uphoff, 2001; Thiyagarajan *et al*., 2002; Natesan *et al*., 2008).

It may be concluded that in SRI, transplanting of 15 days old seedlings coupled with conoweeding four times at 10, 20, 30 and 40 DAT favourably increased the growth parameter which ultimately reflected in higher yield.

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Table 1: Plant height (cm) at harvest stage

Age of seedlings (M) / Weed management practices (S)	Thaladi crop Co-43			Kuruvai crop ADT-43		
	M_1	M_2	Mean	M_1	M_2	Mean
S_1	102.0	105.2	103.6	96.3	100.2	98.2
S_2	112.5	116.2	114.4	105.50	109.0	107.3
S_3	110.7	114.4	112.5	103.8	107.3	105.5
S_4	88.5	92.5	90.5	83.9	88.1	86.0
Mean	103.4	107.1	105.3	97.4	101.1	99.3
	M	S	M x S	M	S	M x S
SEd±	0.79	0.84	1.67	0.74	0.80	1.60
CD (p=0.05)	**1.71**	**1.81**	**3.61**	**1.61**	**1.73**	**3.46**

Table 2: Number of tillers m^{-2} at maximum tillering stage

Age of seedlings (M) / Weed management practices (S)	Thaladi crop Co-43			Kuruvai crop ADT-43		
	M_1	M_2	Mean	M_1	M_2	Mean
S_1	372	396	384	352	375	364
S_2	436	460	448	412	434	423

S_3	420	443	431	397	419	408
S_4	251	281	266	241	264	252
Mean	370	395	382	351	373	362
	M	S	M x S	M	S	M x S
SEd±	5.71	7.68	10.84	5.09	7.03	10.09
CD (p=0.05)	**12.27**	**16.51**	**23.31**	**10.94**	**15.11**	**21.90**

Table 3: Leaf area index at maximum tillering stage

	Thaladi crop Co-43			**Kuruvai crop ADT-43**		
Age of seedlings (M) / Weed management practices (S)	**M_1**	**M_2**	**Mean**	**M_1**	**M_2**	**Mean**
S_1	4.66	5.22	4.94	3.99	4.39	4.19
S_2	5.89	6.43	6.16	5.12	5.64	5.38
S_3	5.58	6.12	5.85	4.82	5.34	5.08
S_4	3.57	4.21	3.89	2.02	2.53	2.27
Mean	4.92	5.49	5.20	3.98	4.47	4.23
	M	S	M x S	M	S	M x S
SEd±	0.10	0.14	0.20	0.09	0.14	0.19
CD (p=0.05)	**0.22**	**0.31**	**0.44**	**0.21**	**0.30**	**0.42**

Table 4: Crop dry matter production (t ha^{-1}) at harvest stage

	Thaladi crop Co-43			**Kuruvai crop ADT-43**		
Age of seedlings (M) / Weed management practices (S)	**M_1**	**M_2**	**Mean**	**M_1**	**M_2**	**Mean**
S_1	9.53	10.57	10.05	9.33	10.28	9.80
S_2	12.53	14.65	13.59	12.00	14.20	13.10
S_3	11.37	13.49	12.43	11.05	13.25	12.15
S_4	6.11	8.10	7.10	6.05	7.80	6.92
Mean	9.88	11.70	10.79	9.60	11.38	10.49
	M	S	M x S	M	S	M x S
SEd±	0.40	0.52	0.90	0.28	0.43	0.80
CD (p=0.05)	**0.89**	**1.16**	**1.96**	**0.64**	**0.95**	**1.73**