



Short Note

Comparative Performance of Different Weed Management Practices in System of Rice Intensification

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A field study was conducted at Agricultural Research Station, Kampasagar, Andhra Pradesh during *kharif* 2008-09 to evaluate the best weed management practice in System of Rice Intensification. The experiment was laid out in randomized block design with eight weed management treatments (T₁- Pre emergence application of butachlor @ 1.5 kg a.i ha⁻¹, T₂-cono weeding (CW) thrice at 15 days interval, T₃ – T₁+T₂, T₄ - T₁+ hand weeding (HW) at 20 and 40 days after planting (DAP), T₅ - T₂ + HW at 20 and 40 DAP, T₆ - T₃+ HW at 20 and 40 DAP, T₇- un weeded check and T₈- weed free). Weed density and weed dry matter were higher in un weeded check followed by Butachlor application and cono weeding alone practices. Integrated weed management practice of butachlor @ 1.5 kg a.i ha⁻¹ combined with cono weeding thrice at 15 days interval and hand weeding at 20 and 40 DAP recorded significantly higher yield attributes and grain yield than the weedy check, butachlor @ 1.5 kg a.i ha⁻¹ alone and cono weeding thrice at 15 days interval alone practices. Combination of weed management practices, integrated weed management practices and weed free check were comparable with each other with respect to grain yield and yield attributes.

Key words: Butachlor, cono weeding, hand weeding, integrated weed management, system of rice intensification

In India, rice is the most important staple food for over two thirds of the population. It is a means of livelihood for millions of rural households and it plays a vital role in our national food security, hence the slogan "Rice is Life" is most appropriate. In India, rice occupies an area of 42.3 million ha with an annual production of 87.0 million tonnes and a productivity of little more than 3 tonnes ha⁻¹. Rice is being grown extensively in the state of Andhra Pradesh in 4.0 million ha with an annual production of 17.8 million tones.

System of Rice Intensification (SRI) is worth studying as alternative to the conventional system of rice cultivation especially in situation of limited resource availability (Irrigation with ground water). Successful crop production under SRI method depends upon the effective weed management practice. In SRI method mechanical weed control by cono weeder is in vogue. Presently farmers are controlling weeds in SRI method of cultivation mechanically by using of cono weeder. In heavy soils running cono weeder in between rows is a hard task and moreover labourers are reluctant to operate this equipment because of requirement of more energy for operating this equipment. In this context, the chemical and cultural method of weed management has to be evaluated under system of rice intensification. Keeping this in view, the present experiment was designed and proposed for evaluation.

Materials and Methods

A field experiment was conducted during *kharif* 2008-09 at Agricultural Research Station, Kampasagar, Andhra Pradesh, India. The soil of the experimental site was sandy clay loam with pH 7.6. The nutrient status was medium in available N (282 kg N ha⁻¹) and available phosphorous (22.5 kg P₂O₅ ha⁻¹) and high in available potassium (305 kg K₂O ha⁻¹). The experiment was carried out in a randomized block design with eight weed management treatments (T₁- Pre emergence application of butachlor @ 1.5 kg a.i ha⁻¹, T₂- cono weeding (CW) thrice at 15 days interval, T₃ – Pre emergence application of butachlor @ 1.5 kg a.i ha⁻¹ + cono weeding (CW) thrice at 15 days interval, T₄ - pre emergence application of butachlor @ 1.5 kg a.i ha⁻¹+ hand weeding (HW) at 20 and 40 days after planting (DAP), T₅ - cono weeding (CW) thrice at 15 days interval + HW at 20 and 40 DAP, T₆ - T₃+ HW at 20 and 40 DAP, T₇- un weeded check and T₈- weed free) and replicated thrice.

Long duration rice variety BPT 5204 @ 5 kg seed ha⁻¹ was sown in raised beds of puddled field on 31st July 2008. 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 centimeter to cover the seeds. The beds were irrigated with a rose can daily in the morning and evening. Before lifting the

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seedlings, nursery beds were thoroughly irrigated. After lifting, seedlings were immediately transplanted in the main field. The main field was prepared by ploughing twice followed by thorough puddling. The farm yard manure @ 15 t ha⁻¹ was applied during first puddling in the main field. The fertilizers of N, P₂O₅ and K₂O were applied at 120:60:40 NPK kg ha⁻¹. The entire phosphorous and half of the recommended potassium were applied as basal dose during transplanting and another half of recommended potassium was applied during panicle initiation stage. Nitrogen was applied in 3 equal splits at transplanting, active tillering and panicle initiation stages.

Seedlings of 12 days old were transplanted in the main field in square pattern with a spacing of 25 x 25 cm with single seedling per hill. Field was irrigated just enough to saturate the soil with moisture. Subsequent irrigation was given as the soil starts forming fine cracks throughout vegetative phase. From flowering to 10-12 days before

harvesting, a thin film of water was maintained continuously by frequent irrigation. During cono weeding, standing water was maintained to facilitate for easy movement of conoweeder. Weed management was done as per the treatments. Cono weeder was run at 15 DAP for thrice at 15 days interval.

The observations on yield attributes like panicle number m⁻², panicle length, panicle weight, filled and unfilled grains per panicle and 1000 grain weight and grain yield were recorded at harvest. Weed density and weed dry matter were recorded and weed control efficiency was worked out.

Results and Discussion

Weed flora

The major weed flora observed in experimental plot were *Echinochloa colona* L. *Cynodon dactylon* Pers *Dactyloctenium aegyptium* Beauv, *Cyperus rotundus* L., (Monocots); *Eclipta alba* Hassk, *Trianthema portulacastrum* L., *Amaranthus viridis* L. (Dicots).

Table 1. Influence of weed management practices under System of Rice Intensification on weed dry matter and weed count at flowering stage.

Treatment	Weed dry matter (g/m ²)	Weed count (No./m ²)	Weed Control Efficiency (%)
T ₁ - Butachlor application @ 1.5 kg a.i ha ⁻¹	45	30	25.0
T ₂ - Cono weeding at 15 days interval	32	27	46.6
T ₃ - T ₁ +T ₂	20	21	66.6
T ₄ - T ₁ + Hand weeding at 20 and 40 DAP	14	16	76.6
T ₅ - T ₂ + Hand weeding at 20 and 40 DAP	12	14	80.0
T ₆ - T ₃ + Hand weeding at 20 and 40 DAP	10	12	83.3
T ₇ - un weeded check	60	72	-
T ₈ - weed free	0	0	100
S.Em±(P=0.05)	5	3	
C.D. (P=0.05)	11	8	

Weed density, weed dry matter and weed control efficiency

Weed density and weed dry matter at flowering stage were significantly lower under integrated weed management practice of butachlor @ 1.5 kg a.i ha⁻¹ combined with cono weeding thrice at 15 days interval and hand weeding at 20 and 40 DAP (Table 1) and it was comparable with hand weeding at 20 and 40 DAP combined either with butachlor @ 1.5 kg a.i ha⁻¹ or cono weeding thrice at 15 days interval and butachlor @ 1.5 kg a.i ha⁻¹ + cono weeding thrice at 15 days interval.

Weed control efficiency was higher under integrated weed management practice of butachlor @ 1.5 kg a.i ha⁻¹ combined with cono weeding thrice at 15 days interval and hand weeding at 20 and 40 DAP (83.3%) followed by cono weeding thrice at 15 days interval + hand weeding at 20 and 40 DAP (80%) and butachlor @ 1.5 kg a.i ha⁻¹ + hand weeding at 20 and 40 DAP (76.6%). The lowest weed control efficiency was recorded with butachlor @ 1.5 kg a.i ha⁻¹ alone (25%).

Yield attributes

Panicle number, filled grains, panicle length and 1000 grain weight were significantly higher in integrated weed management practice of butachlor @ 1.5 kg a.i ha⁻¹ combined with cono weeding thrice at 15 days interval and hand weeding at 20 and 40 DAP than the weedy check, butachlor @ 1.5 kg a.i ha⁻¹ alone and cono weeding thrice at 15 days interval (Table 2). Panicle number recorded in hand weeding at 20 and 40 DAP combined either with butachlor @ 1.5 kg a.i ha⁻¹ or cono weeding thrice at 15 days interval and weed free practices were comparable with each other and significantly higher than the butachlor @ 1.5 kg a.i ha⁻¹ and un weeded check.

Filled grain per panicle recorded under conoweeding thrice at 15 days interval combined either with hand weeding at 20 and 40 DAP or butachlor @ 1.5 kg a.i ha⁻¹ and weed free were on par with integrated weed management practice of butachlor @ 1.5 kg a.i ha⁻¹ combined with cono weeding thrice at 15 days interval and hand weeding

Table 2. Influence of different weed management practices under System of Rice Intensification on yield attributes, grain yield and economics of rice.

Treatment	Panicle/ m ₂	Filled grains/ panicle	Unfilled grains/ panicle	Panicle length (cm)	Test weight (g)	Grain yield (kg/ha)	Gross returns (Rs.)	Cost of cultivation	B.C ratio
T ₁ – Butachlor application @ 1.5 kg a.i ha ⁻¹	300	105	25	20.0	13.90	4100	41000	28700	1.4
T ₂ - Cono weeding at 15 days interval	330	119	14	21.9	13.95	5400	54000	29000	1.8
T ₃ – T ₁ +T ₂	380	131	20	22.5	14.25	6200	62000	29700	2.0
T ₄ – T ₁ + Hand weeding at 20 and 40 DAP	435	120	16	22.9	14.50	6800	68000	29700	2.2
T ₅ –T ₂ + Hand weeding at 20 and 40 DAP	452	139	14	23.8	14.65	7000	70000	30000	2.3
T ₆ – T ₃ + Hand weeding at 20 and 40 DAP	460	144	10	23.9	14.75	7050	70500	30700	2.3
T ₇ – No weeding	253	95	22	20.5	13.85	3200	32000	28000	1.1
T ₈ – weed free	445	128	13	23.6	14.70	7000	70000	30000	2.3
S.E m± (P=0.05)	30	10	3.0	0.8	0.07	288			
C.D(P=0.05)	64	22	7	1.8	0.15	616			

at 20 and 40 DAP and significantly higher than the butachlor @ 1.5 kg a.i ha⁻¹ and un weeded check.

Panicle length observed in pre emergence application of butachlor @ 1.5 kg a.i ha⁻¹ + cono weeding (CW) thrice at 15 days interval or hand weeding at 20 and 40 DAP, cono weeding (CW) thrice at 15 days interval + HW at 20 and 40 DAP and weed free check were comparable with each other and significantly higher than the butachlor @ 1.5 kg a.i ha⁻¹ and weedy check. Integrated weed management practice of butachlor @ 1.5 kg a.i ha⁻¹ combined with cono weeding thrice at 15 days interval and hand weeding at 20 and 40 DAP resulted significantly higher 1000 grain weight than the butachlor @ 1.5 kg a.i ha⁻¹, cono weeding thrice at 15 days interval and butachlor @ 1.5 kg a.i ha⁻¹ combined either with cono weeding thrice at 15 days interval or hand weeding at 20 and 40 DAP. It is comparable with hand weeding at 20 and 40 DAP combined with conoweeding thrice at 15 days interval and weed free check. Integration of weed management practice helps in better control of weed growth, there by less competition for resources which leads to good crop growth and yield attributes than the single weed management practice.

Grain yield

Integrated weed management practice of butachlor @ 1.5 kg a.i ha⁻¹ combined with cono weeding thrice at 15 days interval and hand weeding at 20 and 40 DAP resulted in higher yield attributes due to broad spectrum control of weeds cum reduced weed dry weight which to more nutrient uptake, exposure to sunlight and weed free condition at the early stages of crop growth. The weed free condition at critical stages of crop might have favoured increased panicle number and length, filled grains and 1000 grain weight due to increased availability of nutrients with less competition. Which ultimately resulted higher grain yield.

Grain yield was significantly higher in integrated weed management practice than the butachlor @ 1.5 kg a.i ha⁻¹, conoweeding thrice at 15 days interval and unweeded check (Table 2). The grain yield recorded in weed free check and hand weeding at 20 and 40 DAP combined either with butachlor @ 1.5 kg a.i ha⁻¹ or cono weeding thrice at 15 days interval were on par with integrated weed management practice. The same results were confirmed by Subramanian *et al.* (2006), Kavitha *et al.* (2010) and Latif *et al.* (2005).

Higher gross returns and B.C ratio were registered in butachlor @ 1.5 kg a.i ha⁻¹ combined with cono weeding thrice at 15 days interval and hand weeding at 20 and 40 DAP. In cono weeding (CW) thrice at 15 days interval + HW at 20 and 40 DAP and weed free check were registered similar gross returns and B.C ratio with that of integrated weed management practice.

Conclusion

It could be concluded that butachlor @ 1.5 kg a.i ha⁻¹ combined with cono weeding thrice at 15 days interval and hand weeding at 20 and 40 DAP resulted in higher grain yield, gross returns and B.C ratio. in system of rice intensification.

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