Indian Journal of Weed Science 41(1&2) : 106-108, 2009 **Short communication**

Integrated weed management in upland rice under eastern and south eastern coastal plain zone of Orissa

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ABSTRACT

Field experiments conducted consecutively for four years (2002-2005) during *kharif* at OUAT Research Farm in upland condition revealed that recommended practice (butachlor 1.0 kg/ha + HW at 25 DAS) produced significantly higher grain and straw yield of 3767 and 4980 kg/ha, respectively. The same treatment also registered higher net return of Rs. 8070/ha with B:C ratio of 1.55. Population of grasses, broad leaf and sedges were lowest at 60 DAS where recommended practice (butachlor 1.0 kg/ha along with one hand weeding at 25 DAS) was followed. Weed control efficiency was found to be maximum (86.2%) in farmer's practice (HW at 25 and 45 DAS) at 60 DAS.

Key words : Integrated weed management, Upland rice, Butachlor

Direct seeding of rice is becoming popular to conserve the soil and water. But, direct seeded rice offers severe infestation of weeds which is difficult to control (De Dutta 1986). Economic factor and development of rice production technology are the major drivers that have led to the adoption of direct seeding rice establishment in place of transplanting in Asia (Pandey and Velasko 2002). Manual weeding is expensive, laborious and time consuming and is difficult to control weeds in early stages of direct seeded rice. Application of pre-emergence herbicides has been found effective in early stage, but second flush of weeds after 25 to 30 days after sowing becomes problematic. Hence, integrated weed management practices are the only alternative. Inclusion of cowpea as inter crop suppresses the weed growth initially, which is the critical period for crop weed competition. Since, information are lacking with respect to integrated weed management practices for direct seeded rice grown under coastal ecosystem of Orissa, the present study was carried out to evaluate the use of herbicide alone or in combination with other management practices.

A field experiment was conducted at Research Farm, Bhubaneswar (Orissa) consecutively for four years (2002 to 2005) during *kharif* season. The soil of the experimental site was sandy loam in texture with pH of 5.4. The soil was low in available N (218 kg/ha), medium in available P (15.4 kg/ha) and K (156.8 kg/ha). The experiment was laid out with seven treatments *viz.,* inter cropping with cowpea (fodder) harvested at 35 DAS followed by mechanical weeding at 45 DAS, inter cropping of cowpea + application of butachlor 1.0 kg/ha at 5 DAS followed by incorporation of cowpea at 35 DAS and mechanical weeding at 45 DAS, application of pretilachlor 0.75 kg/ha + safner at 5 DAS, mechanical weeding at 25 and 45 DAS, farmers' practice *i.e.* hand weeding at 25 DAS, and unweeded control in randomized block design with three replication. Rice variety *Khandagiri* was sown in rows 15 cm apart and fertilized uniformly with 60:30:30 kg N, P_2O_5 and K_2O. Full dose of P_2O_5 and K_2O along with half dose of N were applied as basal and the remaining N was top dressed in two equal splits at 25 and 50 DAS. The weed control practices were imposed as per schedules of treatment. Intercropping of cowpea was done by skipping fourth row of rice. The rice crop was sown during first week of July and harvested during first week of November in all the years of investigations. Plant protection measures and irrigations were provided as and when required. The required quantities of herbicides were applied with manually operated Knapsack sprayer using a spray volume of 500 liters water/ha. Weed counts were made randomly at two places with the help of 0.25 m^2 quadrates at 60 DAS and at maturity of crop. Yield attributes of rice were recorded at harvest of the crop. Weed control efficiency (WCE) % was calculated using the following formula.

$$\text{WCE (\%)} = \frac{\text{Weed biomass in control plot-weed biomass in treated plot}}{\text{Weed biomass in control plot}} \text{ X } 100$$

The floristic composition in weedy check plots of experimental field was consisted with *Digitaria ciliaris, Cynodon dactylon, Echinochloa colona* and *Eleusine indica* among grasses. *Ageratum conyzoides, Cleome viscose* and *Chrozoffera rottleri* among broad leaf weed and *Cyperus rotundus* among the sedges. Other weeds observed in low density were *Panicum repens, Dactyloctenium aegypticum, Ludwigia parviflora,*

Table1. Effect of weed management practices on density of major weed species (no./m^2) at 60 DAS in direct seeded rice (2002 to 2005)

Treatments	Grasses						Broadleaf					Sedges			Total weeds
	Dci	Cd	Ech	Ele	Pan	Total	Age	Cle	Chro	Lud	Total	Cr	Ci	Total	
T_1 Intercropping cowpea (fodder) harvested at 35 DAS *fb* mechanical weeding at 45 DAS	5.2	5.4	4.7	4.4	3.7	23.4	4.6	3.9	3.6	4.0	16.1	2.9	1.8	4.7	43.9
T_2 Intercropping cowpea and butachlor 1.0 kg/ha (5 DAS) *fb* incorporationof cowpea (35 DAS) *fb* mechanical weeding (45 DAS)	4.9	5.1	4.0	4.0	3.1	21.1	4.4	3.8	3.7	4.1	16.0	2.6	1.7	4.3	41.4
T_3 Pretilachlor 0.75 kg/ha + safener	5.9	6.4	5.3	5.0	4.3	26.9	5.9	5.2	4.8	5.7	21.6	3.6	2.6	5.8	54.3
T_4 Mechanical weeding at 25 and 45 DAS	5.0	5.2	3.9	3.8	3.5	21.4	4.5	3.8	3.7	4.3	16.3	2.8	1.7	4.5	42.2
Farmers practice (HW at 25 and 45 DAS)	4.1	4.3	3.3	3.2	2.7	17.6	3.8	2.7	2.6	3.5	12.6	2.4	1.6	4.0	34.2
T_5 Recommended practie (Butachlor 1.0 kg/ha + HW at 25 DAS)	5.1	5.2	4.5	4.2	3.8	22.8	4.9	4.0	3.8	4.3	17.0	3.1	1.7	4.8	44.6
T_6 Unweeded control	35.6	37.2	27.2	26.9	12.5	139.4	21.8	18.1	17.4	19.0	76.3	19.3	13.3	32.6	248.3

Dci = *Digitaria ciliaris*, Cd = *Cynodon dactylon*, Ech = *Echinochloa colona*, Ele = *Eleusine indica*, Pan = *Panicum repens* Age = *Ageratum conyzoides*, Cle = *Cleome viscosa*, Chro = *Chrozoffera rottleri*, Lud = *Ludwigia parviflora* Cr = *Cyperus rotundus*, Ci = *Cyperus iria,* DAS : Days after sowing

Table 2. Effect of integrated weed management on yield and its attributes, economics, weed biomass and weed control efficiency (WCE) of direct seeded rice (pooled data 2002 to 2005)

Treatments	Panicles no./m^2	No. of grains/ panicle	1000 grain weight (g)	Yield(kg/ha)		Net monetary return (Rs/ha)	B:C ratio	WCE (%)	
				Grain	Straw			60 DAS	At harvest
T_1 Intercropping cowpea (fodder) harvested at 35 DAS*fb* mechanical weeding at 45 DAS	295	133.5	20.73	2792	3685	*5030	1.27	82.3	74.4
T_2 Intercropping cowpea and butachlor 1.0 kg/ha (5 DAS)*fb*incorporationof cowpea (35 DAS)*fb* mechanical weeding (45 DAS)	315	135.3	22.32	3030	3910	1930	1.11	83.3	77.1
T_3 Pretilachlor 0.75 kg/ha + safener	330	138.5	22.65	3284	4335	5820	1.40	78.1	73.1
T_4 Mechanical weeding at 25 and 45 DAS	340	140.8	23.08	3324	4140	5650	1.38	83.0	73.7
T_5 Farmers practice (HW at 25 and 45 DAS)	358	143.7	23.34	3657	4860	4375	1.23	86.2	74.6
T_6 Recommended practice (Butachlor 1.0 kg/ha + HW at 25 DAS)	378	145.5	23.85	3767	4980	8070	1.55	82.0	75.8
T_7 Unweeded control	275	129.7	21.40	1596	2140	-2450	0.75	-	-
LSD (P=0.05)	10	3.7	0.88	339	76	-	-	-	-

*Mean yield of fodder cowpea 6 t/ha (sale price @ Rs 800/t) has been considered for calculation of net return and B:C ratio, DAS : Days after sowing, HW-Hand weeding

Sporobolus diander, Alternanthera sessilis, Eclipta alba, Paspalum scrobiculatum and *Cyperus iria.*

Based on the mean data on population of different weeds at 60 DAS and harvest stages, the population of grasses was more irrespective of treatments (Table 1). Broad leaf weeds and sedges occupied second and third position, respectively with respect to weed density/m^2. Unweeded control led to record higher weed density/m^2 at 60 DAS (248.3) as well as at maturity (341.7) of rice (Fig. 1). Farmers' practice (HW at 25 and 45 DAS) had registered significantly the lowest density of grasses, broad leaf weeds, sedges individually as well as total weeds at 60 DAS. But, their population were minimum with intercropping cowpea + butachlor 1.0 kg/ha (5 DAS) *fb* incorporation of cowpea at 35 DAS and mechanical weeding at 45 DAS due to smothering action of cowpea and killing of weeds.

Weed control efficiency was maximum (86.2%) with farmers' practice (HW at 25 and 45 DAS) at 60 DAS (Table 2) mainly due to effective control of weeds at early stages of crop growth. But intercropping with cowpea + butachlor 1.0 kg/ha (5 DAS) *fb* incorporation of cowpea at

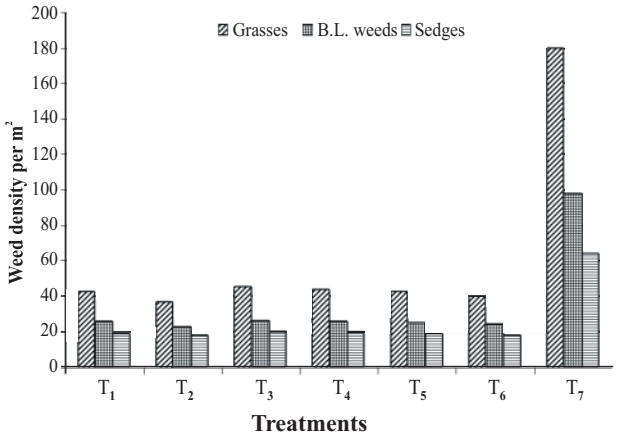

Fig 1. Effect of integrated weed management on weed density at maturity in direct seeded rice

35 DAS + mechanical weeding at 45 DAS registered the highest WCE (77.1%) at harvest because of weed control from initial stage to advanced stage of crop growth

Pooled grain and straw yield significantly increased with all treatments receiving weed control means over unwedded cheek (Table 2). Recommended practice (butachlor 1.0 kg/ha + HW at 25 DAS) recorded the highest grain yield of 3767 kg/ha and was at par with farmers' practice of HW at 25 and 45 DAS (3657 kg/ha), which was attributed to more numbers of panicles/m^2 (378), more 1000 grain weight (23.85g) and more number of grains/panicle (145.5). Similar findings were also reported by Singh and Tripathi (2006). Pre-emergence application of butachlor 1.0 kg/ha along with one hand weeding at 25 DAS has resulted in increased growth and yield attributing characters (Table 2) which was ultimately reflected in increased grain yield mainly due to timely and effective control of weeds during initial stages of crop growth (Ram *et al*. 2004, Mukharjee and Singh 2005) .The treatments of cowpea intercropping recorded significantly lower grain yield due to less number of plant population because of imposition of 3:1 rice cowpea row ratio (Annon 2006).

Pre emergence application of butachlor 1.0 kg/ha + HW at 25 DAS registered the highest B:C ratio of 1.55 followed by pretilachlor 0.75 kg/ha + safener (1.40) and mechanical weedings at 25 and 45 DAS (1.38) which was due to less cost incurred for weeding during initial period of crop growth and higher yield. Farmers' practice of hand weddings at 25 and 45 DAS recorded lower B:C ratio (1.23) because of higher cost incurred for manual weeding twice. Intercropping cowpea harvested as fodder at 35 DAS registered higher B:C ratio (1.27) as compared with intercropping cowpea incorporated at 35 DAS (1.11) due to additional return from fodder cowpea.

Pre emergence application of butachlor 1.0 kg/ha along with one hand weeding at 25 DAS was found to be the most effective and economical method of weed management in direct seeded upland rice providing efficient control of initial flushes of weeds with higher returns.

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