

Nutrient depletion by weeds, yield and economics of drum seeded rice influenced by weed management

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ABSTRACT

Study revealed that drum seeding + green manure method of seedling establishment and pre-emergence application of pretilachlor + safener at the rate of 0.45 kg/ha on 5 days after sowing (DAS) *fb* hand weeding (HW) at 45 DAS registered lowest weed density, weed biomass, highest weed control efficiency (WCE), zero per cent weed index (WI), lowest depletion of NPK nutrient by weeds and highest grain yield of crop and B: C ratio.

Key words : Drum seeded rice, Weed management, Grain yield, Economics, Nutrient depletion by weeds

Expansion in the irrigated area, introduction of early maturing rice cultivars, availability of drum seeders, availability of selective herbicides for weed management together with increasing transplanting cost and declining profitability of transplanted rice production system have encouraged rice farmers to shift from transplanting to direct seeding (Balasubramanian and Krishnarajan 2001). The drum seeders have brought out many advantages like cost reduction, faster growth and establishment, easiness in inter-culture, lesser seed rate and higher yield compared to broadcasting (Tamil Selvan and Budhar 2001). There is vast possibility of intercropping green manures during early stage of rice crop with less interference on rice growth which suppresses weeds better than sole rice cropping (Gracy Mathew *et al.* 1991). In hand weeding, it is difficult to differentiate and remove the grassy weeds especially *Echinochloa colona* and *E. crusgalli* due to phenotypical similarities between weeds and rice seedlings in the early stages. The present study was taken up to study the effect of weed management practices on drum seeded rice.

A field experiment was conducted at Tamil Nadu Agricultural University, Coimbatore during *rabi* (August to January) season of 2004-2005 to study the effect of weed management practices in drum seeded rice under lowland ecosystem. The soil of experimental field was clay loam with pH of 8.1 and organic carbon 0.67%, available nitrogen 235 kg/ha, phosphorus 18 kg/ha and potassium 525 kg/ha. Rice cultivar 'Co43' was chosen for the study. The experiment was laid out in split/plot design in three replication with different seeding methods (drum seeding; drum seeding + green manure; broadcasting) in main plots and weed management practices (cyhalofop-butyl at 15 DAS *fb* hand weeding at 45 DAS; pretilachlor + safener at 5 DAS *fb* hand weeding at 45 DAS; hand weeding twice at 20 and 45 DAS; unweeded check) in sub

plots. The sole rice was sown at a row spacing of 25 cm, while rice and dhaincha (*Sesbania aculeata*) seeds were sown in alternate rows of 12.5 cm apart. The dual cropped dhaincha was incorporated on 35 DAS by using "cono weeder". Pretilachlor + safener was applied at the rate of 0.45 kg/ha and cyhalofop-butyl was applied at the rate of 60 g/ha. The data on weed count and weed dry matter were transformed by using square root transformation.

Effect on weed and crop yield

Dual cropping of *Sesbania* (dhaincha) with drum seeded rice reduced total weed density and weed biomass as compared to other method of seeding (Table 1). This might be due to dual cropping of green manure as smother intercrop in rice to reduce weed growth as earlier reported by Ravisankar (2002). Among the weed management practices, pretilachlor + safener at 5 DAS *fb* hand weeding at 45 DAS registered significantly lowest total weed density and weed biomass. This might be due to effective control of weed seed germination in the early stages of crop growth by pretilachlor + safener. This is in line with the findings of Subramanian (2003).

The pretilachlor + safener at 5 DAS *fb* hand weeding at 45 DAS recorded highest weed control efficiency of 67.1% and it was comparable with cyhalofop-butyl at 15 DAS *fb* hand weeding at 45 DAS and hand weeding twice at 20 and 45 DAS treatments. Pretilachlor plus safener along with hand weeding at 45 DAS effectively checked weed growth, density, weed dry weight and higher weed control efficiency (Raju *et al.* 2001). The dual cropping of dhaincha in drum seeded rice recorded higher grain yield (4286 kg/ha) than broadcasting. Among the weed management practices, the pretilachlor + safener at 5 DAS *fb* hand weeding at 45 DAS recorded higher grain yield (5155 kg/ha) than other treatments. Similar observations were also made by Gogoi *et al.* (2000).

Table 1. Effect of weed management practices on weed and grain yield of drum seeded rice

Treatments	Total weed density at 40 DAS (no./m ²)	Weed biomass at 40DAS (g/m ²)	WCE (%) at 40 DAS	Weed index (%)	Grain yield (kg/ha)
Seeding methods					
Drum seeding	7.8 (65.6)	7.2 (54.4)	-	-	4099
Drum seeding + green manure	7.4 (55.7)	6.6 (46.2)	-	-	4286
Broadcasting	7.9 (65.0)	7.3 (55.6)	-	-	3842
LSD (P = 0.05)	0.3	0.2			201
Weed management					
Cyhalofop-butyl on 15 DAS <i>fb</i> 1 HW 45 DAS	6.9 (50.9)	6.3 (38.9)	60.4	10.20	4629
Pretilachlor+safener on 5 DAS <i>fb</i> 1 HW 45 DAS	6.6 (42.6)	5.7 (32.3)	67.1	0.00	5155
HW twice 20 and 45 DAS	6.9 (47.5)	6.2 (38.8)	60.5	8.92	4695
Unweeded check	10.4 (107.4)	9.9 (98.2)	-	64.64	1823
LSD (P = 0.05)	0.3	0.4			205

Figures in the parenthesis denotes original values, DAS-Days after sowing, HW-Hand weeding, WCE-Weed control efficiency

Nutrient depletion by weeds

The drum seeding alone and drum seeding + green manure showed a comparable N removal by weeds at 40, 60 DAS and maturity stages (Table 2). At these stages, in the drum seeding + green manure method of seeding, the weeds removed lesser N than broadcasting. The reduction ranged as 21.6, 12.2 and 21.5% at 40, 60 DAS and maturity stages, respectively. The dual cropping of dhaincha with drum seeded rice resulted in reduced weed density and dry weight hence lesser N removal. Similar results were also reported by Umapathi (1998). The drum seeding + green manure recorded lesser P and K removal by weeds, the reduction being 16.7% for P and 10.8% for K relative to broadcasting.

Due to the better weed control, N removal by weeds was lower in pretilachlor + safener compared to other treatments. Shetty and Gill (1974) observed that the rate of decrease in N removal was proportional to the decrease in weed dry matter. Removal of P and K by weeds at maturity was also lesser under pretilachlor + safener. Better weed control efficiency as a result of lower weed dry matter had restricted the nutrient depletion by weeds observed by Gracy Mathew and Alexander (1995).

Economics

The drum seeding + green manure method of seeding recorded higher gross return (Rs. 31,480/ha), net return (Rs 14,469/ha) and B: C ratio (1.81) and it was comparable with drum seeding alone (Table 3). Significant

Table 2. Effect of weed management practices on depletion of nutrients by weeds in drum seeded rice

Treatments	Nitrogen (kg/ha)			Phosphorus (Kg/ha)	Potassium (kg/ha)
	40 DAS	60 DAS	At maturity	At maturity	At maturity
Seeding methods					
Drum seeding	3.47	3.20	4.37	0.34	6.97
Drum seeding + green manure	3.31	3.17	4.42	0.35	6.78
Broadcasting	4.22	3.61	5.63	0.42	7.60
LSD (P = 0.05)	0.28	0.19	0.75	0.06	0.36
Weed management					
Cyhalofop - butyl on 15 DAS <i>fb</i> 1 HW 45 DAS	2.58	2.82	4.11	0.28	5.40
Pretilachlor + safener on 5 DAS <i>fb</i> 1 HW 45 DAS	1.80	1.93	2.40	0.22	4.42
HW twice 20 and 45 DAS	2.35	2.66	3.71	0.25	5.23
Unweeded check	7.96	8.20	9.01	0.73	13.41
LSD (P = 0.05)	0.54	0.54	1.25	0.09	0.59

DAS-Days after sowing; HW-Hand Weeding

Table 3. Effect of weed management practices on economics of drum seeded rice

Treatments	Gross return (Rs)	Net return (Rs)	B: C
Seeding methods			
Drum seeding	30127	13655	1.79
Drum seeding + green manure	31480	14469	1.81
Broadcasting	28246	11711	1.67
Weed management			
Cyhalofop - butyl on 15 DAS <i>fb</i> 1HW 45 DAS	34102	16340	1.92
Pretilachlor + safener on 5 DAS <i>fb</i> 1HW 45 DAS	37711	20346	2.17
HW twice 20 and 45 DAS	34512	16610	1.93
Unweeded check	13478	4551	0.99

DAS-Days after sowing: HW-Hand Weeding

improvement in grain and straw yield could have contributed to the higher gross and net return and B: C ratio. The present investigation clearly illustrates that higher economic return and profitability could be achieved by growing dhaincha as dual crop and incorporating it mechanically. With regard to weed management treatments, pretilachlor + safener at 5 DAS + hand weeding at 45 DAS recorded higher gross return (Rs 37,711/ha), net return (Rs 20,346/ha) and B: C ratio (2.17) than other treatments. The significant improvement in grain yield of pretilachlor + safener treatment had led to higher net return and B:C ratio. Unweeded check recorded a loss of Rs.551/ha attributable to severe yield reduction.

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