Indian Journal of Weed Science 41(3&4) : 157-159, 2009

Impact of Sesbania brown manuring on weeds and performance of direct seeded rice.

V.C. Dhyani, V. Pratap Singh, S.P. Singh, Abnish Kumar and Neeta Tripathi
Govind Ballabh Pant University of Agriculture & Technology, Pantnagar (Uttarakhand)
E-mail : dhyanivipin1@rediffmail.com

ABSTRACT

A field experiment with ten treatments in randomized block design was conducted at Pantnagar in the year 2005-06 and 2006-07 to evaluate effect of Sesbania brown manuring on rice weeds and its yield. Rice shoot dry weight was related to weed dry weight at 28 days of crop stage. There was not significant difference in all those treatment where pendimethalin was applied with respect to weed dry weight and rice shoot weight. Row seeding resulted in lesser weed dry weight and higher rice shoot dry weight, however, treatment difference was insignificant. Weed dry weight continued to increase up to 84 days stage and then it declined at harvest in the weedy plot. At 56 DAS and subsequent stages dry weight was less in all those treatments where hand weeding was done at 30 DAS than those treatments where it was not done.

Key words : Brown manuring, Sesbania, Weeds, Direct seeded rice.

Rice production systems are undergoing various types of changes and one such change has been the shift from transplanting to direct seeding. Due to high rate, scarcity of water and labour and at the same time the availability of advanced technologies of integrated weed management, direct seeding is cost effective, can save water and allows early sowing of wheat. In dry seeded rice with alternate drying and wetting, crop is subjected to greater weed competition than transplanted rice. Therefore major challenge for the farmers is effective weed management. Integrated weed management involving herbicides, cultural and biological control seems to be the best strategy because weeds are subjected to multiple attacks. Intercropping of green manure crops may have dual advantage of adding biomass to soil and also by smothering the weeds as it is fast growing species. Rice may be successfully intercropped with legumes, such as *Crotalaria juncea, Vigna sinensis, Glycine max* and *Sesbania rostrata* (Sattar and biswas 1991). Sesbania being an aquatic plant can also be grown together with rice to suppress weeds (Torres *et al.* 1995). Experiments conducted in India showed that rainfed lowland rice intercropped with any of the above-mentioned crops' yields as much as rice treated with the herbicide butachlor (Angady and Umapathy 1997). Intercropping has been also reported to smother weed stand composed of *Echinochloa colona, Panicum* spp. *Ischaemum rugosum*, *Cyanotis* spp. and *Eclipta prostrata* besides report loss in yield (Hussain *et al.* 1991). In view of above, co-culture (brown manuring) was tested at GBPUA & T, Pantnagar to evaluate its effect on weeds and on the performance of direct seeded rice.

MATERIALS AND METHODS

A field experiment was conducted during 2005-06 and 2006-07 on the silty clay loam soil of Crop Research Centre of Govind Ballabh Pant University of Agriculture & Technology. The soil of the experimental plot was high in organic carbon (0.7%) low in available N (168 kg/ha), medium in available P (22.5 kg/ha) and high in available K (470 kg/ha). Ten treatments were tested in the randomized block design, replicated three times comprising of seeding methods (broadcasting and line sowing), herbicides (pendimethalin 1.0 kg/ha, 2,4-D 0.3 and 0.5 kg/ha). Two treatments comprising of weedy and weed free were also kept for comparison. Pendimethalin was sprayed just 2 days after sowing and 2, 4-D was sprayed to kill the plant at 25 days after sowing. In one treatment, application of 2, 4-D was delayed up to 35 days after sowing to see the effect of 2, 4-D on the crop at that stage. Hand weeding was done at 30 days after sowing. Rice cv *Narendra-359* was sown on 18.06.2005 and 27.06.2006. The row distance in the rice crop was taken as 20 cm and one row of Sesbania was sown in between two rows of rice in those plots where it had to be inter-cropped. All other package of practices was followed as per recommendations.

RESULTS AND DISCUSSION

The weed flora observed in the rice field comprised of *Echinochloa crusgalli*, *E. clolona*, *Leptochloa chinensis*, *Commelina diffusa*, *Eragrostis japonica*, *Cyperus rotundus*, *C. iria, Fimbristylis miliacea* and *Caesulia axillaris*.

Rice shoot dry weight was related to weed dry weight at 28 days of crop stage. There was no significant

Table 1 Weed dry weight (g/m^2) and rice shoot dry weight (g/m^2) as influenced by various treatments at 28, 56 and 84 DAS (pooled data of two years)

Treatments	28 DAS		56 DAS		84 DAS	
	Total weeds	Rice	Total weeds	Rice	Total weeds	Rice
T_1= Sesbania (BC) + pendimethalin +2,4-D (0.5kg) 25 DAS+HW	29.8	119.0	6.8	320.0	12.7	926.3
T_2= Sesbania (RS)+ pendimethalin +2,4-D (0.5 kg) 25 DAS+HW	23.6	116.6	7.0	324.8	14.5	995.2
T_3= Sesbania (BC)+2,4-D(0.5 kg) 25 DAS+HW	218.3	80.7	8.5	230.9	17.7	488.3
T_4= Sesbania (RS)+2,4-D(0.5 kg) 25 DAS+HW	153.0	118.5	14.7	246.4	14.7	646.6
T_5= pendimethalin+HW(weed free)	0.0	141.5	0.0	407.1	0.6	966.7
T_6=Weedy	404.8	88.9	533.5	144.0	885.9	194.9
T_7= Sesbania (RS)+ pendimethalin+2,4-D (0.3kg) 25 DAS+HW	16.6	117.5	6.8	301.1	16.6	907.0
T_8= Sesbania at 75% seed rate(RS)+2,4-D (0.5 kg) 25 DAS+HW	144.7	120.4	9.4	356.3	24.4	929.1
T_9= Sesbania (RS) + pendimethalin+2,4-D (0.5 kg) 35 DAS	28.7	88.5	39.7	235.9	96.6	707.1
T_{10}=0 Sesbania (RS) + pendimethalin+2,4-D (0.5 kg) 25 DAS	32.9	125.8	94.1	315.7	150.7	846.0
LSD (P=0.05)	15.1	16.7	14.3	27.4	29.2	97.8

BC. - Broad casting, RS - Row sowing, DAS - Days after sowing, HW- Hand weeding

Table 2 Yield attributing characters, grain yield and straw yield as influenced by various treatments (pooled data of two years)

Treat ments	Panicle/m^2	Grain no. /panicle	1000 grain wt. (g)	Grain yield (t/ha)	Straw yield (t/ha)
T_1= Sesbania (BC) + pendimethalin +2,4-D (0.5kg) 25 DAS+HW	240	145	27.5	5.31	7.37
T_2= Sesbania (RS)+ pendimethalin+2,4-D (0.5 kg) 25 DAS+HW	237	140	25.9	5.41	6.49
T_3= Sesbania (BC)+2,4-D(0.5 kg) 25 DAS+HW	231	117	25.5	4.21	5.99
T_4= Sesbania (RS)+2,4-D(0.5 kg) 25 DAS+HW	225	128	26.6	4.63	6.03
T_5= pendimethalin+HW(weed free)	255	146	26.9	5.93	7.34
T_6=Weedy	50	110	25.2	0.62	0.97
T_7= Sesbania (RS)+ pendimethalin+2, 4-D (0.3kg) 25 DAS+HW	242	146	27.1	6.01	7.97
T_8= Sesbania at 75% seed rate(RS)+2,4-D (0.5 kg) 25 DAS+HW	221	135	26.4	5.30	7.82
T_9= Sesbania (RS)+ pendimethalin+2,4-D (0.5 kg) 35 DAS	211	126	25.6	3.65	5.54
T_{10}=0 Sesbania (RS) + pendimethalin+2,4-D (0.5 kg) 25 DAS	207	131	27.8	4.40	5.75
LSD (P=0.05)	18.9	9.0	2.4	1.60	1.00

BC. - Broad casting, RS - Row sowing, DAS - Days after sowing, HW- Hand weeding

difference in all those treatment where pendimethalin was applied with respect to weed dry weight and rice shoot weight. Row seeding resulted in lesser weed dry weight and higher rice shoot dry weight, however, treatment difference was insignificant (Table 1).

In all those treatments where pendimethalin was not applied resulted in higher weed dry weight and lower shoot dry weight at 28 days stage. It was because of better control of rice weeds by pendimethalin. Weed free treatment produced significantly highest rice shoot dry weight. There was significant reduction in weed dry weight due to combined effect of both intercropped as well as broadcasting and application of 2, 4-D at 0.5 kg/ha at 25 DAS compared to weedy plot.

Weed dry weight continued to increase up to 84 days stage and then it declined at harvest in the weedy plot (Table 2). At 56 DAS and subsequent stages, dry weight was less in all those treatments where hand weeding was done at 30 DAS than those treatments where it was not done. Weed dry weight was even lesser in those plots where pendimethalin was applied. At 28 days stage, weed dry weight was less in those plots where weed was killed at 35 DAS (T_9) than at 25 DAS (T_{10}) however it was not significantly different. Rice shoot dry weight on the other hand was significantly different between those two treatments. At 56 days, weed dry weight was significantly lesser and rice shoot dry weight was significantly higher in treatment where was knockdown by 2, 4-D at 35 days stage compared to treatment where it was knockdown at 25 days (T_{10}). Same trend was also observed at 84 days stage as well. It might be due to mutual competition between, rice crop and weeds as was able to exert completion on weeds over longer period of time in terms of various inputs. At 84 days stage all the treatment where pendimethalin was applied and 2, 4-D was knock downed at 25 days stage resulted in statistically at par weed dry weight and rice shoot dry weight. Intercropping and broadcasting was statistically at par in terms of weed dry weight.

All the treatments produced higher number of panicle/m^2 at the time of harvest than weedy check, however highest panicle/m^2 were obtained in the weedy free situation. Weed free and all those treatment where pendimthalin + 2, 4-D + hand weeding was done were statistically at par and superior to all other treatments in terms of panicle/m^2. Higher weed infestation at the initial days i.e. 28 DAS due to non application of pendimethalin was the reason behind this. Panicles were higher (although not significant) in T_7 where instead of 0.5 kg/ha only 0.3kg/ha 2, 4-D was applied. This may indicate that there may be some phyto toxicity caused by early application of 2, 4-D. 2, 4-D application was delayed in T_9, produced lesser panicles compared to T_{10} even after lesser weed infestation. It showed that delayed 2, 4-D application to kill Sesbania had negative effect on plant growth because rice and Sesbania had to compete for resources. Similar trend was observed for grain number/panicle. One thousand (1000) grain weight remained unaffected by treatments. It was lowest under weedy situation. Highest grain yield was obtained in T_7 where Sesbania was row seeded with direct seeded rice and 2, 4-D was applied at 0.3 kg/ha to kill during first year and during second year it was weed free which resulted in maximum yield. Slightly higher yield in Sesbania brown manuring (T_7) may be due to some additional nitrogen added in the field through green biomass than weed free during first year. Sharma *et al*, (2008) also reported higher grain yield in the Sesbania co culture compared to direct seeded rice. Treatment difference was non significant in all those treatments where pendimethalin was applied as pre emergence herbicide. Higher grain yield in weed free and T_7 may be attributed to higher number of panicle at the time of maturity. 2,4-D applied at 0.5 kg/ha may be phytotoxic to rice plant resulted slightly lower tiller count and thus lower grain yield.

Thus it can be concluded that broadcasting was at par to intercropping in reducing weed dry weight as well as producing grain yield of rice. There was no substitute to pre emergence herbicide application in direct seeded rice. Application of 2, 4-D at 0.5 kg/ha had some setback on crop. Also there is need to critically analyze yield penalty in rice due to broadcasting and inter cropping of Sesbania.

REFERENCES

Sattar SA and Biswas JC. 1991. Intercropping a green manure with direct seeded rice. *International Rice Research Newsletter* **16** (1): 23

Angady VV and Umapathy PN. 1997. Integrated weed management through smother intercrops in rainfed lowland rice. *International Rice Notes* **22**(1): 47-48.

Torres RO, Pareek RP, Ladha JK and Garrity DP. 1995. Stem nodulating legumes as relay cropped or intercropped green manures for lowland rice. *Field Crops Research* **42**: 39-47.

Sharma DP, Sharma SK, Joshi PK, Singh Samar and Singh G. 2008. *Resource conservation technologies in the reclaimed soils*. Central Soil Salinity Research Institute, Karnal Technical Bulletin 1.