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Relative Efficacy and Economics of Integrated Weed Management in Blackgram under Semi-humid Climate of Punjab

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The main constraint in pulse production is the weed growth which inflicts heavy losses on the crop yield by competing for essential growth factors like nutrients, space, light, moisture and also affects the crop by sheltering insects, pests and diseases. The traditional practice of manual hoeing has become expensive and inadequate. However, chemical and integrated weed management have attracted the research workers' because of their easy availability with quick weed control and economical feasibility over the traditional method.

The experiment was conducted at the Students' Farm, Khalsa College, Amritsar on a sandy loam soil low in organic carbon and available nitrogen and medium in available phosphorus and potassium during summer *(zaid)* of 2001. Fifteen treatments replicated four times were laid out in randomized block design (Table 1). Blackgram variety Mash 218 was sown on 25 March 2000. The treatments consisted of three herbicides (alachlor, pendimethalin and fluchloralin) at three different doses, one manual hoeing 25 days after sowing (DAS) alone and integrated with the herbicides alongwith weed-free and weedy check (Table 1). Alachlor and pendimethalin were applied just after sowing as pre-emergence, while fluchloralin was applied just before sowing as pre-plant incorporation. Economic analysis of various treatments was carried out on cost and return basis.

The major weeds in the experimental field were *Amaranthus viridis, Medicago denticulata, Trianthema monogyna, Lapidium sativum, Cynodon dactylon* and *Cyperus rotundus*. The relative density of narrow and broad leaf weeds was 78.8 and 21.2%, respectively, under weedy conditions.

Weed density and dry weight were decreased, whereas seed and straw yields were increased with increase in dose of herbicides (Table 1). All the treatments significantly reduced the density and dry weight of weeds compared to weedy check. However, weed density and weed dry weight in integrated weed management treatments were at par with that of one hoeing done 25 DAS and lower than herbicides alone.

Weedy check resulted in 45.2% yield loss attributed to the crop-weed competition. Alachlor at 1.0 kg ha^{-1} had yield loss of 29.6%, whereas fluchloralin at 1.5 kg ha^{-1} caused yield loss of 1.7%. Alachlor at 1.0 kg ha^{-1}+one hoeing had weed index of 21.4% and fluchloralin at 0.5 kg ha^{-1}+ one hoeing recorded 6.4%. Fluchloralin at 1.5 kg ha^{-1} (1241 kg ha^{-1}) and pendimethalin at 2.0 kg ha^{-1} produced seed yield at par with weed-free and fluchloralin at 0.5 kg ha^{-1} or pendimethalin at 1.0 kg ha^{-1} both supplemented with one hoeing 25 DAS.

Although weed-free plot had the highest yield increase as well as gross returns but it produced lowest economic returns and B : C ratio, because weed-free conditions did not commensurate with the added costs of labour due to maximum number of manual hoeing i. e. four. Fluchloralin at 0.5 kg ha^{-1} alone or supplemented with one hoeing was the most effective and economical weed control treatment with the highest B : C ratio followed by fluchloralin at 1.0 and 1.5 kg ha^{-1}, respectively.

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Table 1. Integrated weed management influence on weed, crop and economics in blackgram

Treatment	Dose (kg ha^{-1})	Weed density 30 DAS (No. m^{-2})	Weed dry weight 30 DAS (g m^{-2})	Seed yield (kg ha^{-1})	Straw yield (kg ha^{-1})	Cost of treatment (Rs. ha^{-1})	Cost of cultivation (Rs. ha^{-1})	Gross returns (Rs. ha^{-1})	Net returns (Rs. ha^{-1})	Benefit : cost ratio
Alachlor	1.0	36	2.9	869	2410	700	6411	17380	10969	2.71
Alachlor	1.5	33	2.3	961	2856	1050	6774	19220	12446	2.84
Alachlor	2.0	28	2.0	999	3102	1400	7136	19980	12844	2.80
Pendimethalin	1.0	34	1.6	1072	3087	1320	7053	21440	14387	3.04
Pendimethalin	1.5	28	1.5	1113	3433	1980	7736	22260	14524	2.88
Pendimethalin	2.0	21	1.4	1221	3491	2640	8419	24420	16001	2.90
Fluchloralin	0.5	34	1.6	1079	3106	500	6204	21580	15376	3.48
Fluchloralin	1.0	26	1.4	1123	3439	1000	6722	22460	15738	3.34
Fluchloralin	1.5	21	1.4	1241	3493	1500	7239	24820	17581	3.43
Alachlor fb hoeing 25 DAS	1.0	14	0.5	973	2882	2300	8067	19460	11393	2.41
Pendimethalin fb hoeing 25 DAS	1.0	14	0.5	1130	3413	2920	8708	22600	13892	2.60
Fluchloralin fb hoeing 25 DAS	0.5	14	0.4	1161	3491	2100	7860	23220	15360	3.00
Hoeing 25 DAS	-	15	0.4	910	3144	1600	7343	18200	10857	2.48
Weed-free	-	0	0	1263	3619	6400	12310	25260	12950	2.05
Weedy	-	47	3.8	692	1951	-	5686	13840	8154	2.43
LSD (P=0.05)	-	2	0.2	180	188	-	-	-	-	-

DAS–Days after sowing, fb–followed by.

Rate of alachlor, pendimethalin and fluchloralin Rs. 350, 400 and 450 litre^{-1}, respectively, while cost of spray Rs. 100, one daily worker paid Rs. 80 day^{-1}, mash grain cost Rs. 2000 q^{-1}.