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Weed Management in Moth bean (*Vigna aconitifolia*) in Arid Region of Rajasthan

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Abstract: Field experiments were conducted at the Central Arid Zone Research Institute, Jodhpur, during three consecutive *kharif* seasons (1998 to 2000) to find out economical and effective weed management practices in moth bean. The results revealed that one hand weeding at 30 days after sowing was very effective in reducing population and dry weight of weeds and also gave maximum weed control efficiency (72%). Application of fluchloralin at 0.75 and 1.00 kg ha^{-1} was relatively more effective in controlling weeds and increasing the seed yield of moth bean. The maximum net returns were obtained with the application of fluchloralin at 0.75 kg ha^{-1}, but the maximum B:C ratio (1.23) was recorded with pre-plant incorporation of fluchloralin at 0.50 kg ha^{-1}.

Key words: Moth bean, weed management, fluchloralin, B:C ratio.

Moth bean (*Vigna aconitifolia*) is an important legume crop of arid zone of Rajasthan. It occupies about 1.1 m ha area with total seed production of 0.29 m tones. Thus the productivity (266 kg ha^{-1}) of this crop in the region is low. Severe weed infestation is the major constraint and may reduce the yield by 75% (Singh and Singh, 1979). Conventional methods used for managing weeds in moth bean fields are time consuming, cumbersome and costly. Moreover, acute shortage of labor at critical time makes manual weeding operation impossible. Keeping this in view, an experiment was conducted to find out economical and effective weed management practices in moth bean.

Material and Methods

A field experiment was conducted at the Central Arid Zone Research Institute, Jodhpur, during three consecutive kharif seasons (1998 to 2000) on a loamy sand soil (85% sand, 8.1% silt and 5.5% clay) having pH 8.1, organic carbon 0.22%, total nitrogen 0.03%, available phosphorus 16 kg ha^{-1} and available potassium 225 kg ha^{-1}. The region is characterized by a monsoon climate with the wet season occurring from the end of June to September. About 95% of the average annual precipitation of 360 mm is received during this period. Total rainfall during the crop growth period was 214.4, 296 and 284.3 mm in respective years. In season I, II and III there were 15, 10 and 11 rainy days, respectively.

Six treatments comprizing of hand weeding at 30 days after sowing (DAS), 0.50, 0.75 and 1.00 kg fluchloralin ha^{-1} as pre-plant soil incorporation (PPI), weedy check and weed free check were replicated four times in a randomized block design. In weed free plots, weeds were removed at 20, 35 and 50 DAS. Fluchloralin was applied one day before crop sowing.

Table 1. Effect of weed management on species-wise weed dry weight (g) and weed control efficiency (mean of 3 years)

Treatments	*A. blitum*	*D. muricata*	*H. sublatum*	*C. rotundus*	*G. lotoides*	*T. terrestris*	*C. biflorus*	*P. niruri*	*C. dactylon*	Total population	Total dry wt. (g)	WCE (%)
Weedy check	33.5	24.0	15.0	8.4	6.5	6.8	3.6	4.5	3.0	153	105.3	0.0
One HW at 30 DAS	11.2	6.5	4.1	3.2	2.4	–	–	–	–	52	29.4	72.0
Fluchloralin 0.50 kg ha^{-1}	24.5	10.0	8.2	8.4	4.5	4.1	3.4	–	3.0	95	54.1	14.2
Fluchloralin 0.75 kg ha^{-1}	17.2	12.0	7.5	3.8	3.0	–	1.9	–	–	70	45.4	59.9
Fluchloralin 1.00 kg ha^{-1}	14.2	11.5	4.0	2.0	2.5	3.0	–	–	–	58	37.2	64.7
Weed free check	–	1.4	–	–	–	–	–	1.0	–	7	2.4	97.7
CD (0.05)	–	–	–	–	–	–	–	–	–	25	31.6	–

Table 2. Yield and yield attributes of moth bean as influenced by weed management practices

Treatments	Seed yield (kg ha^{-1})	Branches $plant^{-1}$	Pods $plant^{-1}$	Seeds pod^{-1}	100 seed weight (g)
Weedy check	221.1	5.2	21	4.1	2.1
HW at 30 DAS	304.5	7.8	34	4.8	2.6
Fluchloralin 0.50 kg ha^{-1}	292.3	6.0	26	4.1	2.3
Fluchloralin 0.75 kg ha^{-1}	301.5	7.2	31	4.6	2.4
Fluchloralin 1.00 kg ha^{-1}	302.5	7.6	33	4.8	2.5
Weed free check	325.9	8.2	36	5.1	2.4
CD (P = 0.05)	25	1.7	6.1	0.8	NS

Moth bean cv. CZM 79 was sown in rows 45 cm apart with plant to plant spacing of 15 cm on July 20, 29 and 16 during 1998, 1999 and 2000, respectively.

Data on density and dry matter accumulation of weeds were recorded at harvest. Yield attributes such as number of pods per plant, number of seeds per pod and seed yield were recorded at a harvest.

Results and Discussion

Effects on weeds

Weed flora of the experimental field consisted of *Amaranthus blitum, Digera muricata, Heliotropium sublatum, Tribulus terrestris, Cyperus rotundus, Cenchrus biflorus, Phyllanthus niruri, Glinus lotoides* and *Cynodon dactylon.*

A. blitum and *D. muricata* constituted about 55 to 60% biomass of total weed flora. *H. sublatum* and *C. rotundus* were dominating among rest of the weed species. The total weed population as well as dry matter production were significantly reduced by weedy management practices as compared to weed check (Table 1). The population and dry matter of weeds recorded under fluchloralin treatments were comparable with one hand weeding given at 30 DAS. The reduction in weeds due to fluchloralin application was observed in moth bean (Henry and Singh, 1985), mung bean (Balyan *et al.,* 1988) and blackgram (Singh *et al.,* 1992). The highest weed control efficiency was however, recorded with weed free check followed by one hand weeding (72%), fluchloralin 1.0 kg ha^{-1} (64.8%), 0.75 kg ha^{-1} (56.9%) and 0.50 kg ha^{-1} (45.2%).

Effects on crop

A significant increase in branches $plant^{-1}$ and pods $plant^{-1}$ was recorded due to different weed management practices except fluchloralin at 0.50 kg ha^{-1}, which remained at par with that of weedy check (Table 2). All yield attributes were maximum in weed free check. Effect of weed control treatments on 100-seed weight was not significant (Table 2).

The maximum seed yield was recorded in weed free check and it was 47.4% higher than weedy check. Seed yield obtained with one hand weeding and fluchloralin application were however, at par with that of weed free check. The lowest seed yield (221.1 kg ha^{-1}) was obtained under weedy check.

Table 3. Economics of weed management practices (mean of three years)

Treatments	Additional yield over weedy check (kg ha^{-1})	Additional returns over weedy check (Rs ha^{-1})	Cost of weed control (Rs ha^{-1})	Net returns over weedy check (Rs ha^{-1})	B:C ratio
One HW at 30 DAS	83.40	1501	1200	301	0.25
Fluchloralin 0.50 kg ha^{-1}	71.20	1282	575	706	1.23
Fluchloralin 0.75 kg ha^{-1}	80.40	1447	737	710	0.96
Fluchloralin 1.00 kg ha^{-1}	81.40	1465	900	656	0.63
Weed free check	104.80	1886	1680	206	0.12

Economics

Pre-plant incorporation of fluchloralin gave higher net returns and B:C ratio compared to weed free check, one hand weeding and weedy check. Pre-plant incorporation of fluchloralin at 0.50 and 0.75 kg ha^{-1} had almost similar returns, but B:C ratio (1.23) was higher with the application of fluchloralin at 0.50 kg ha^{-1}, which was highest among all the weed control treatments (Table 3). Additional returns over weedy check were higher with one hand weeding and weed free check, but net returns reduced due to higher cost of weed control. Whereas, net returns and B:C ratio were higher under all levels of fluchloralin application due to low cost of weed control with fluchloralin.

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