

Comparative efficiency of herbicides in controlling *Asphodelus tenuifolius* and other weeds in Indian mustard (*Brassica juncea*)

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ABSTRACT

A study was carried out during the winter season of 1995-96 and 1996-97 to determine the most effective method of weed in Indian mustard [*Brassica juncea* (L.) Czernj. & Cosson]. Two hand-weedings at 20 and 40 days after sowing being statistically at par with metribuzin 0.175 kg (pre-emergence) and isoproturon 0.75 kg/ha (pre-plant incorporation) reduced weed dry-matter significantly, increased the yield attributes and grain yield over herbicidal schedules and fetched maximum net profit.

Key words : Indian mustard, Weed control, Grain yield, Herbicides

Agro-climatic conditions of northern Madhya Pradesh are so favourable for Indian mustard production that its maximum potential could be achieved if weeds are managed timely. *Asphodelus tenuifolius* Cav. is one of the most problematic weeds that quickly germinates and regenerates and hence competes with the crop in the initial stages of crop growth. In general, weeds resulted in reduction of Indian mustard yield up to 30-35%. Weeds removal by manual method is costly and cumbersome. Therefore in the present study an attempt was made to evaluate different herbicides at variable doses for the control of weed in Indian mustard.

MATERIALS AND METHODS

A field experiment was carried out during the winter (*rabi*) season of 1995-96 and

1996-97 at Morena, on sandy-loam soil having low available N (201 kg/ha), medium P (23.0 kg/ha) and high K (307 kg/ha), with pH 7.5. Twelve treatments comprising cultural and chemical weed-control methods (Table 1) were tested in randomized block design with 3 replications. The pre-planting and pre-emergence herbicides were sprayed @ 600 litres/ha one day before and after sowing. Sowing of 'Pusa Bold' variety was done on 20 October 1995 and 3 November 1996 with a row spacing of 30 cm using 5 kg seed/ha. A basal dose of 40 kg N, 40 kg P₂O₅ and 20 kg K₂O/ha was applied at sowing and remaining 40 kg N/ha was applied after first irrigation given at flower-initiation stage. The crop was harvested in the first week of March in both years. Weed density of *Asphodelus* and other weeds was counted in 1m² at 2 places from each plot

Table 1. Weed parameters as influenced by weed-control method in Indian mustard

Treatment	Herbicide (kg/ha)	Weed population (No./m ²)				Weed dry matter (g/m ²)		Weed control efficiency (%)	
		<i>Asphodelus</i>		Other weeds		Y ₁	Y ₂	Y ₁	Y ₂
		Y ₁	Y ₂	Y ₁	Y ₂			Y ₁	Y ₂
Weedy check		107.6	92.3	214.0	190.3	20.9	18.8	0	0
Metolachlor (P.E)	1.00	52.0	57.3	28.0	46.6	04.6	05.6	77.9	71.1
Oxyfluorfen (P.P.)	0.15	38.6	42.6	24.6	41.3	03.0	04.6	85.5	75.6
Pendimethalin (P.E.)	1.0	34.0	39.6	21.3	31.0	2.6	3.4	87.5	81.6
Isoproturon(P.P.)	0.75	07.3	10.6	7.6	11.0	1.0	1.4	94.9	92.5
Isoproturon(P.E.)	0.75	10.3	16.6	9.0	19.0	1.5	3.0	92.8	83.9
Fluchloralin (P.P.)	1.00	11.6	21.0	8.6	13.0	1.6	3.9	92.3	84.4
Metribuzin(P.E.)	0.140	12.3	20.6	9.6	14.6	1.7	2.8	91.7	85.5
Metribuzin (P.P.)	0.175	06.3	10.3	4.6	10.6	0.8	1.2	96.0	93.2
Metribuzin (P.E.)	0.219	04.6	8.3	4.0	11.6	0.6	1.0	96.8	94.5
Hand-weeding at 25 days		08.6	14.3	9.6	12.3	1.4	1.2	93.3	93.5
Hand-weeding at 20 and 40 days		03.3	4.3	2.0	3.3	0.2	0.3	98.8	98.0
CD (P = 0.05)		08.9	9.5	9.3	9.5	1.1	0.9		

Y₁, 1995-96; Y₂, 1996-97

Table 2. Effect of weed-management practices on seed yield, yield attributes and economic return of Indian mustard

Treatment	Seed yield (q/ha)			Branches/plant		Pod weight/plant		1,000-grain weight (g)		Gross return (Rs/ha)		Net return (Rs/ha)		Benefit : cost ratio	
	Y ₁	Y ₂	Pooled	Y ₁	Y ₂	Y ₁	Y ₂	Y ₁	Y ₂	Y ₁	Y ₂	Y ₁	Y ₂	Y ₁	Y ₂
Weedy check	8.4	8.7	08.5	3.3	3.1	14.0	14.6	3.0	3.3	10,537	10,912	6,230	6,305	2.4	2.3
Metolachlor (P.E)	11.5	11.1	11.3	4.0	3.6	15.3	16.0	3.6	4.0	14,425	13,975	9,348	8,598	2.8	2.5
Oxyfluorfen (P.P.)	14.6	13.5	14.0	4.6	3.8	16.6	16.3	4.0	4.0	18,250	16,912	13,173	11,535	3.5	3.1
Pendimethalin (P.E.)	15.0	14.1	14.5	4.7	3.9	17.6	17.6	4.0	4.3	18,800	17,662	13,593	12,155	3.6	3.2
Isoproturon (P.P.)	19.2	18.8	19.0	5.1	4.8	18.6	19.0	4.6	5.0	24,012	23,512	19,231	18,433	5.0	4.6
Isoproturon (P.E.)	17.6	17.6	17.6	7.5	3.9	18.0	17.6	4.3	4.3	22,075	22,037	17,296	16,958	4.6	4.3
Fluchloralin (P.P.)	16.6	15.6	16.1	7.3	3.9	17.6	17.0	4.0	4.0	20,825	19,575	15,518	13,968	3.9	3.4
Metribuzin (P.E.)	16.2	17.4	16.8	6.5	3.8	17.3	17.3	4.0	4.3	20,337	21,850	15,631	16,844	4.3	4.3
Metribuzin (P.P.)	19.3	18.9	19.1	6.4	4.9	19.6	19.6	5.3	4.6	24,225	23,687	19,382	18,545	5.0	4.6
Metribuzin (P.E.)	15.1	18.1	16.1	8.0	4.8	16.0	16.0	3.6	4.3	18,875	22,687	13,892	17,354	3.7	4.2
Hand-weeding at 25 days	16.5	15.6	16.1	4.8	4.0	17.0	16.0	4.0	4.3	21,937	19,575	17,060	14,398	4.4	3.7
Hand-weeding at 20 and 40 days	20.9	19.7	20.3	8.3	5.1	21.6	20.6	6.0	5.6	26,212	24,687	20,765	18,940	4.8	4.2
CD (P = 0.05)	2.6	0.5	01.0	1.2	0.5	4.6	2.1	1.1	1.3						

Y₁, 1995-96; Y₂, 1996-97

Rates of herbicides: Metolachlor Rs 550/litre, oxyfluorfen Rs 1,450/litre, pendimethalin Rs 450/litre, isoproturon Rs 400/kg, fluchloralin Rs 800/litre, metribuzin Rs 1,100/kg

Labour charges, Rs 50/day

and weed dry weight from the same area was recorded at flower-initiation stage of the weeds.

RESULTS AND DISCUSSION

The major weeds were *Asphodelus tenuifolius* (49.9%), *Convolvulus arvensis* L. (14.6%), *Anagallis arvensis* L. (11.6%), *Chenopodium album* L. (9.3%), *Avena fatua* L. (8.3%) and *Euphorbia hirta* (6.3%).

Weed

All manual + herbicidal treatments reduced the weed population significantly compared to unweeded check (Table 1). Hand-weeding twice (20 and 40 days after sowing) proved most effective in controlling all types of weeds. But was statistically at par with pre-emergence application of metribuzin either @ 0.219 or 0.175 kg/ha and pre-plant application of isoproturon @ 0.75 kg ai/ha in controlling weeds, particularly of *Asphodelus tenuifolius* (the predominant weed). However, during the first year 1 hand-weeding at 25 days and fluchloralin 1.0 kg/ha (pre-planting) were also at par with hand-weeding twice. Application of metolachlor and pendimethalin as pre-emergence and oxyfluorfen as pre-plant did not show much promising results in reduction of weed infestation. The results confirm the findings of Singh *et al.* (1989). The highest average weed-control efficiency (98.4%) was observed under 2 hand-weedings.

Dry-matter accumulation by weed was minimum under 2 hand-weedings (Table 1) and was statistically at par with pre-emergence application of metribuzin @ 0.219 kg ai/ha. The highest weed dry matter was recorded under weedy check.

Crop

There was significant differences in branches/plant, pod weight/plant (g) and 1,000-weed weight (g) due to weed-control

treatments (Table 2). Two hand-weeding at 20 and 40 days gave highest values of yield-attributing characters. Among the herbicides, isoproturon, fluchloralin and metribuzin proved at par with 2 hand-weeding in either of the year, but recorded significantly higher values than metalachlor, oxyfluorfen and pendimethalin.

The weed-control treatments showed significant increase in grain yield (Table 2). Two hand-weedings at 20 and 40 days recorded the highest yield, which was at par with metribuzin @ 0.175 kg/ha (pre-emergence) and isoproturon @ 0.75 kg/ha (pre-plant) and significantly superior to rest of the treatments. Averaged over 2 years, uncontrolled weeds reduced yield by 57%. This confirms the findings of Tomar and Namdeo (1991) and Singh *et al.* (1989). Pre-emergence application of metribuzin @ 0.175 kg/ha resulted in significantly higher average yield over rest of the herbicides and 1 hand-weeding, but on a par with pre-plant application of isoproturon @ 0.75 kg/ha, which on an average showed 123 and 121% increase in grain yield over the control respectively. The results pertaining to isoproturon confirm those of Yadav *et al.* (1997). Due to poor frequency and growth under these treatments, weeds were unable to compete with the crop plants and resulted in better expression of yield components and thus gave higher yield.

Economis of different weed-management practices revealed that the highest net realization was obtained under 2 hand-weedings at 20 and 40 days, followed by metribuzin 0.175 kg ai/ha (pre-emergence) and isoproturon 0.75 kg ai/ha (pre-plant). The unweeded control was found economically poor. Highest average benefit : cost ratio of 4.8 was observed with isoproturon (pre-plant) and metribuzin @ 0.715 kg/ha (pre-emergence).

Thus when labour is limited, metribuzin

@ 0.175 kg ai/ha as pre-emergence or isoproturon @ 0.75 kg ai/ha as pre-plant may be used for effective control of weed in Indian mustard.

REFERENCES

- Singh, S.J., Sinha, K.K. and Mishra, S.S. 1989. Effect of herbicides on Indian mustard (*Brassica juncea*) in calcareous soil. *Indian Journal of Agronomy* 34 (4): 494-495.
- Tomar, Suresh S. and Namdeo, K.N. 1991. Studies on chemical weed control in mustard. *Indian Journal of Agronomy* 36 (1): 118-120.
- Yadav, R.P., Yadav, K.S., Shrivastava, U.K. and Sharma, Rakesh K. 1997. Efficiency of isoproturon for weed control in Indian mustard (*Brassica juncea*). *Indian Journal of Agronomy* 42 (1): 176-78.