

Weed management in *Brassica* species

HARPHOOL SINGH¹, B.P. SINGH AND HANUMAN PRASAD²

Department of Agronomy, Chaudhary Charan Singh Haryana Agricultural University,
Hisar 125 004

Received : September 2000

ABSTRACT

A field study on weed management in *Brassica* species was carried out during 1995–96 and 1996–97. The *Brassica* species did not influence the weed intensity and their dry matter in any season of the experiment but weed-management treatments decreased the weed population and dry weight and consequently increased the weed-control efficiency, yield attributes, seed yield and mean net returns over weedy check. During both years the maximum seed yield (1,705 and 1,945 kg/ha) was recorded in weed-free, followed by 2 manual weedings at 25 and 45 days after sowing (1,593 and 1,792 kg/ha) which was found most effective in controlling the weeds compared with other treatments. Among the herbicides, pre-emergence application of pendimethalin @ 1.0 kg a.i./ha recorded higher seed yield and found best substitute of repeated manual weeding where the labour costs are too high.

Key words : *Brassica* spp., Weed, Herbicide

Amongst the winter oilseeds, rapeseed-mustard group of crops occupy largest hectareage in Haryana, Punjab, Rajasthan and Uttar Pradesh. Among various environmental and other constraints responsible for low productivity, management of weeds is of paramount importance. On an average, 25% seed yield is reduced by weeds due to competition for moisture and nutrients (Singh, 1995).

Weed-management studies have been carried out in traditional *Brassica* in the past. But with the introduction of non-traditional *Brassica* species, viz. Ethiopian mustard (*Brassica carinata* A. Braun), the

present investigation was carried out to find out the effect of weed-management methods on weeds and performance of *Brassica* species.

MATERIALS AND METHODS

An experiment was conducted at Research farm of CCS Haryana Agricultural University, Hisar, during 1995–96 and 1996–97. The soil of the experimental field was sandy loam in texture, low in organic carbon and available nitrogen, medium in available phosphorus, rich in potassium and slightly alkaline in reaction. Recommended doses of fertilizer nutrients (80 kg N and 30

Present address : ¹ARS, Fatehpur - Shekhawati, Rajasthan; ²KVK, Abusar, Jhunjhunu, Rajasthan

kg P_2O_5 /ha) were applied to the crop. Half of the nitrogen and whole of phosphatic fertilizer were added at sowing and the remaining half dose of N was applied at the first irrigation.

The experiment was laid out in split-plot design with 3 replications. The main-plot treatments comprised 3 *Brassica* species / cultivars and the subplots treatments comprised 7 weed-management treatments (Tables 1, 2). Seed was sown with *pura* method at a row spacing of 30 cm on 24 November in 1995 and on 14 November in 1996. The herbicides were sprayed with a knapsack sprayer using an equivalent of 700 litres/ha water.

Weed density (No./m²) and their dry weight (g/m²) were recorded at 60 and 80 days after sowing by random quadrat and dried in oven at 60°C.

RESULTS AND DISCUSSION

Effect on weeds

Weed flora: The dominant weeds were *Melilotus indica* All., *Chenopodium album* L., *Anagallis arvensis* Lam, *Fumaria parviflora* Lam., *Vicia sativa* L., *Lathyrus aphaca* L., *Melilotus alba*, *Coronopus didymus*, *Cynodon dactylon* (L.) Pers. and *Cirsium arvense* (L.) Scop. in decreasing order.

Weed density and dry - matter accumulation : *Brassica* species, in spite of their different growth habits, did not influence the weed population and dry weight (Table 1). While the weed-management methods significantly reduced the intensity of weeds and dry matter. Two manual weeding at 25 and 45 days were found most effective in reducing the

intensity and dry-matter accumulation of weeds over other methods of the weed control at 60 and 80 days of crop during both the years. Two manual weeding caused effective and timely control of weeds and did not allow the weeds to regenerate, and therefore, maximum weed-control efficiency and lower dry-matter accumulation by weeds recorded. Such findings were also reported by Singh *et al.* (1993) and Pradhan (1993).

Effect on crop

Yield attributes: The significant differences were observed in yield attributes among different species and cultivars of the same species (Table 2). *Brassica carinata* cv. 'HC 2' recorded significantly higher siliquae/plant than *Brassica juncea* during both the years. While *Brassica juncea* cultivar 'R H 30' was significantly superior to *Brassica carinata* with respect to siliqua index and 1,000-seed weight during both the years, but it was on a par with *Brassica juncea* cv. 'Laxmi'.

Weed-management treatments improved the siliquae/plant, siliqua index and test weight over control. The maximum value of yield-attributing characters recorded in weed free, followed by 2 hand-weedings at 25 and 45 days and pendimethalin @ 1.0 kg a.i./ha during both the years. Two manual weeding at 25 and 45 days showed effective weed control than 1 manual weeding at 25 days. Such an effect had reflected in better vegetative and reproductive development of crop. Among herbicides, higher values of yield-attributing characters were recorded with pendimethalin than with

Table 1. Effect of weed management and *Brassica* species on weed intensity, dry-matter accumulation and weed-control efficiency

Treatment	Intensity (weeds/m ²)				Dry matter accumulation (g/m ²)				Weed-control efficiency (%)	
	60 days*		80 days*		60 days*		80 days*			
	1995-96	1996-97	1995-96	1996-97	1995-96	1996-97	1995-96	1996-97		
<i>Brassica</i> species										
<i>Brassica juncea</i> cv. 'RH 30'	5.63 (37.67)	5.77 (39.48)	5.66 (37.95)	5.86 (40.67)	29.0	31.4	35.7	36.3		
<i>Brassica juncea</i> cv. 'Laxmi'	5.59 (36.78)	5.72 (38.43)	5.77 (38.81)	5.86 (40.50)	29.1	30.6	32.7	36.4		
<i>Brassica juncea</i> cv. 'HC 2'	5.70 (38.84)	5.77 (39.57)	6.11 (43.00)	5.92 (41.64)	30.0	31.5	37.3	37.5		
CD (P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS		
<i>Weed-management level</i>										
Isoproturon @ 0.5 kg a.i./ha (PE)	6.28 (39.44)	6.44 (41.49)	6.33 (40.12)	6.58 (43.67)	30.5	32.3	40.8	38.7	49.5	54.3
Pendimethalin @ 1.0 kg/ha (pre)	6.45 (41.44)	6.63 (43.40)	6.67 (44.10)	6.82 (46.11)	32.5	34.4	37.7	41.1	53.7	51.5
Trifluralin @ 1.0 kg a.i./ha (ppi)	7.32 (53.11)	7.32 (53.11)	7.16 (50.78)	7.30 (52.78)	40.1	42.1	45.1	47.4	44.6	44.0
1 manual weeding at 25 days*	5.33 (28.00)	5.50 (29.78)	5.58 (29.56)	5.64 (31.33)	20.2	24.0	26.6	28.3	67.3	66.6
2 manual weedings at 25 and 45 days	4.02 (15.78)	4.19 (17.11)	4.96 (24.78)	4.37 (18.67)	13.0	14.1	14.9	16.9	81.7	80.0
Weed-free	0.71 (0.00)	0.71 (0.00)	0.71 (0.00)	0.71 (0.00)	0.0	0.0	0.0	0.0	100.0	100.0
Weedy check	9.33 (86.56)	9.47 (89.22)	9.52 (90.11)	9.74 (94.00)	69.1	71.2	81.4	84.7		
CD (P=0.05)	0.83	0.62	0.46	0.44	3.8	4.7	5.6	5.9		

Data in parentheses are original values; *days, days after sowing

Table 2. Effect of weed management and *Brassica* species on yield attributes, seed yield and economics

Treatment	Siliquae/ plant		Siliqua index		Seeds/ siliqua		1,000-seed weight (g)		Seed yield (kg/ha)		Mean net returns (Rs/ha)	
	1995- 96	1996- 97	1995- 96	1996- 97	1995- 96	1996- 97	1995- 96	1996- 97	1995- 96	1996- 97	Pooled	
<i>Brassica</i> species												
<i>Brassica juncea</i> cv. 'RH 30'	135.3	155.9	43.0	43.9	10.6	11.0	5.14	5.23	1,339	1,712	1,526	8,192
<i>Brassica juncea</i> cv. 'Laxmi'	127.7	151.5	42.3	43.1	9.8	10.7	4.76	4.83	1,343	1,556	1,449	7,448
<i>Brassica juncea</i> cv. 'HC 2'	149.9	170.7	30.1	30.4	9.7	10.3	3.66	3.63	1,191	1,293	1,242	5,420
CD (P=0.05)	10.5	12.6	2.5	3.1	NS	NS	0.32	0.43	47	120	60	
<i>Weed-management level</i>												
Isoproturon @ 0.5 kg a.i./ha (PE)	121.5	151.1	36.7	36.8	9.2	9.8	4.28	4.30	884	1,175	1,030	4,236
Pendimethalin @ 1.0 kg/ha (pre)	146.9	166.6	39.3	40.3	10.2	10.8	4.67	4.82	1,495	1,672	1,583	9,112
Trifluralin @ 1.0 kg a.i./ha (ppi)	133.3	154.9	38.2	38.9	10.2	10.8	4.50	4.53	1,257	1,482	1,370	6,667
One manual weeding at 25 DAS	142.8	163.7	38.5	39.7	10.1	10.7	4.37	4.31	1,415	1,553	1,484	8,242
2 manual weeding at 25 and 45 days	153.3	170.1	40.3	41.1	40.7	10.8	4.80	4.83	1,593	1,792	1,693	9,302
Weed-free	153.6	181.6	40.7	41.3	11.0	11.1	4.90	4.97	1,705	1,945	1,825	8,611
Weedy check	111.9	127.7	35.3	35.8	8.9	10.7	4.13	4.17	687	1,024	855	2,973
CD (P=0.05)	10.5	24.7	3.0	3.5	NS	NS	0.38	0.48	87	100	51	

other herbicides. Isoproturon although provided good control of weeds, it caused temporary crop injury which resulted in reduced plant growth and yield attributes. The similar results were also recorded by Singh *et al.* (1992) and Rajput *et al.* (1993).

Seed yield

Brassica juncea gave significantly higher seed yield and net returns over *Brassica carinata* (Table 2). The *Brassica juncea* cv. 'RH 30' was also significantly superior to 'Laxmi' for seed yield. The pooled analysis indicates that *Brassica juncea* 'RH 30' and 'Laxmi' increased seed yield by 22.86 and 16.66% respectively, over *Brassica carinata* 'HC 2'. The higher grain yield was probably owing to higher number of siliqua, siliqua index and 1,000-grain weight which consequently increased the seed yield in *Brassica juncea* cultivars compared with *Brassica carinata*. Such results were also reported by Saran and Giri (1987). All the weed-control methods significantly increased the seed yield over weedy check. The increase in grain yield with weed-control methods is believed to be an indirect expression of reduction in weed-crop competition which significantly helped in increasing yield components and grain yield of the crop. Singh *et al.* (1992) and Chauhan *et al.* (1993) also observed in increase in yield attributes and seed yield of Indian mustard through weed-control methods. The maximum mean net returns (Rs 9,302/ha) were recorded under 2 manual weeding treatment while among the herbicides pendimethalin @ 1.0 kg a.i./ha recorded maximum mean net returns.

In *Brassica* species 2 manual weeding at 25 and 45 days proved easiest and most

efficient method of weed management. Among the herbicides, pre-emergence application of pendimethalin @ 1.0 kg/ha was found best substitute for repeated manual weeding where the labour costs are too high.

REFERENCES

- Chauhan, D.R., Balyan, R.S., Kadian, V.S. and Dhankar, R.S. 1993. Integrated weed management studies in raya (*Brassica juncea* L. Czern and Coss). (In) *Proceedings of International Symposium*, organized by Indian Society of Weed Science, held at Hisar, India during 18–20 November, vol.3, pp. 114–116.
- Pradhan, A.C. 1993. Integrated weed management in mustard (*Brassica juncea* L. Czern and Coss) in tarai tract of eastern India. (In) *Proceedings of International Symposium*, organized by Indian Society of Weed Science, held at Hisar, India during 18–20 November, vol.3, pp. 114–116.
- Rajput, R.L., Gautam, D.S. and Verma, O.P. 1993. Studies on cultural and chemical weed control in mustard. *Research Journal, Gujarat Agricultural University* 18 (2) : 1–5.
- Saran, G. and Giri, G. 1987. Influence of dates of sowing on *Brassica* species under semi-arid rainfed conditions of north-west India. *Journal of Agricultural Science, Cambridge* 108 : 561–566.
- Singh, B.P. 1995. Problem and prospects of oilseed based cropping system. Convention Manual, *Recent Advances in Agronomy*, AAREM?, Chaudhary Charan Singh Haryana Agricultural University, Hisar, pp. 171–178.
- Singh, S., Malik, R.K. and Balyan, R.S. 1992. Weed management studies in raya (*Brassica juncea* L.) *Haryana Journal of Agronomy* 8(1) : 16–18.
- Singh, J., Singh, H.B. and Gangasaran. 1993. Studies on the weed management and nitrogen fertilization in mustard (*Brassica juncea* L.) var. Varuna. (In) *Proceedings of International Symposium*, organized by the Indian Society of Weed Science, held during 18–20 November, vol. 3, pp. 94–97.