Indian Journal of Weed Science **53**(3): 310–312, 2021

Print ISSN 0253-8040 Online ISSN 0974-8164

Integrated weed management in mustard

Hillel M Chishi*, Khekashi Zhimo, Muyoniu Khiamn, Anilo Zhimomi

Department of Agriculture (Agronomy), Himgiri Zee University, Dehradun, Uttarakhand 248197, India

Email: hillelchishihillel@gmail.com

Article information

DOI: 10.5958/0974-8164.2021.00058.7

Type of article: Research note

Received : 4 May 2021
Revised : 8 September 2021
Accepted : 10 September 2021

KEYWORDS

Clodinafop, Hand weeding, Herbicides, Integrated weed management, Pendimethalin, Mustard

ABSTRACT

A field experiment was conducted in the experimental farm of Department of Agriculture, Himgiri Zee University, Dehradun, Uttarakhand, India during winter season (*Rabi*) 2018-19. The experiment was conducted in randomized block design (RBD) with 7 treatments, *viz.* pre-emergence application (PE) of pendimethalin 750 g/ha, pendimethalin 750 g/ha PE followed by (*fb*) one hand weeding (HW) at 30 days after seeding (DAS), post-emergence application of (PoE) clodinafop 60 g/ha, clodinafop 60 g/ha (PoE) *fb* one hand weeding (HW) 60 days after seeding (DAS), hand weeding twice at 30 and 60 DAS, weed free and weedy check. All the weed control treatments significantly reduced the weed density and biomass. Hand weeding twice at 30 and 60 DAS recorded highest weed control efficiency and minimum weed index. The integrated weed management treatment including pendimethalin 750 g/ha PE *fb* 1 HW was superior than other treatments in recording highest plant height, plant population, dry matter, seed/siliqua, siliqua/plant, length of siliqua, seed weight, seed, stover and biological yield of Indian mustard.

Edible oil crops have an important role in agriculture and industrial economy of India. Despite leading producer of vegetable oil in the world, India has dubious distinction of largest producer, consumer and importer of edible oil in the world. For India, the attainment of self-sufficiency in edible oil is possible if the production potential of our annual edible oilseed crops is harnessed through improved technologies of managing nutrients and weeds. In India, mustard occupies an area of 6.8 mha with production of 9.1 million tonnes and average yield of 1.34 t/ha (GOI 2020). Rajasthan is the largest rapeseed and mustard producing state with 4.22 m tonnes followed by Haryana with 1.15 m tonnes and Uttar Pradesh with 0.96 m tonnes (GOI 2020).

Mustard (*Brassica juncea* (L.) Czern.) belongs to Cruciferae or Brassicaceae family. Mustard is one of the major Rabi oilseed crops of India. It is also known as Rai or Laha. India is one of the largest producer of mustard in the world. The oil content in mustard seeds varies from 37-49 % (Bhowmik *et al. 2014)*. The seed and oil are used as condiment in the preparation of pickles and for flavouring curries and vegetables. Among numerous constraints of mustard production technology, weed infestation is one of the major causes of low productivity (Singh *et al.* 2013*)*. Competition by weeds at initial stages is a major limiting factor to its productivity. Approximately, 15-30% yield reduction is caused by weeds in mustard crop (Mishra *et al.* 2016). Weed control in Indian mustard needs due attention as this crop is grown in poor soils with poor management practices. Manual weeding at 3-4 weeks after sowing is the most common practice to control weeds in Indian mustard. But increasing wages and scarcity of labour compel to search for other alternatives. The pre-emergence application of pendimethalin was found effective in managing weeds (Mukherjee 2014, Rao and Chauhan 2015) and hence is most common herbicidal weed control measure recommended in Indian mustard. In the situations where weeds are not controlled completely by pre-emergence herbicides, the post-emergence herbicides or other non-chemical method will be helpful in managing weeds and increasing mustard production. Therefore, it is imperative to find out an alternative weed management strategy for achieving season long weed control in Indian mustard. therefore, the present study was conducted to identify effective weed control method for season long weed management in Indian mustard.

A field experiment was conducted during winter season (*Rabi*) 2018-19 at the experimental field, Himgiri Zee University, Dehradun (Uttarakhand). The soil of experimental site was sandy loam in texture,

alkaline in reaction, (pH 8.27) and low in available N (165.30 kg/ha), medium in available P (24.88 kg/ha) and available K (164.43 kg/ha). The experiment was conducted in randomized block design (RBD) with 7 treatments *i.e*. pre-emergence application (PE) of pendimethalin 750 g/ha, pendimethalin 750 g/ha PE followed by (*fb*) one hand weeding (HW) at 30 days after seeding (DAS), post-emergence application of (PoE) of clodinafop 60 g/ha, clodinafop 60 g/ha PoE *fb* one hand weeding (HW) at 60 days after seeding (DAS), hand weeding twice at 30 and 60 DAS, weed free and weedy check. Mustard variety '*Pusa Bahar*' was sown at row spacing of 30 cm apart on 11 October 2018 using 6 kg/ha. A uniform dose of 60 kg N/ha, 40 kg P/ha and 40 kg K/ha was applied through Urea, DAP and MOP respectively. The recommended cultural practices and plant protection measures were followed to raise the healthy crop. The post-emergence herbicide was applied on 30 DAS. Weeding was done manually in weed free check plots with help of hand tool '*Khurpi*', as required. Species wise number of weeds (weed density) was recorded at random in each plot by using quadrat of 50 x 50 cm size. The herbicides were sprayed with the help of hand operated knapsack sprayer. The mustard yield was estimated by using standard procedures. Economics of the treatment was computed based on the prevalent market prices.

Effect on weeds

The weed flora in the experimental field consisted of mixed population of broad-leaved weeds, *viz*. *Chenopodium album* and *Fumaria parviflora*; grassy weed, *viz. Cynodon dactylon* and sedge, *viz. Cyperus rotundus*, as reported in mustard by Sharma and Jain (2002) and Bazaya *et al.* (2004). The field was dominated with broad-leaved weeds at all the crop growth stages. All weed control treatments significantly reduced weed density than the weedy check. Among the integrated weed management treatments, pendimethalin 750 g/ha PE *fb* one HW was effective against grassy, broad-leaved and sedge weeds. Lowest weed density and biomass, weed index and highest weed control efficiency was recorded with hand weeding twice at 30 and 60 DAS. The integrated weed management treatment involving pendimethalin 750 g/ha PE *fb* one HW at 30 DAS (**Table 1**.) also recorded the lowest weed density and biomass, weed index and highest weed control efficiency as reported earlier by Sharma *et al.* (2001) and Sharma and Thakur (2001).

Effect on mustard

Significantly taller plants were recorded with hand weeding twice at 30 and 60 DAS. Among the herbicide-based treatments taller plants were observed with pendimethalin 750 g/ha PE *fb* one HW due to the effective control of weeds that created favourable environment for the growth of mustard. The highest seed, straw yield of mustard was recorded under the weed free conditions (**Table 2)**. Among the weed management treatments tested, hand weeding twice at 30 and 60 DAS was most effective in achieving significantly higher mustard seed and straw yield (1.55 and 3.16 t/ha) and it was at par with pendimethalin 750 g/ha PE *fb* one HW. This could be attributed to decreased crop-weed competition at the critical stages due to these treatments, which facilitated better growth and development resulting in better response of yield attributing characters, *viz*. seed/siliqua, length of siliqua and test weight resulting in higher seed yield (**Table 2)** as reported by Bamboriya *et al.* (2016). Weedy check had the lowest yield due to higher weed density and biomass. The test weight was not affected significantly due to different weed control treatments as it is directly related with yield in the same manner. The seed yield of mustard linearly decreased as the weed biomass increased.

Table 1. Effect of various weed control treatments on weed density and biomass, weed control efficiency (WCE), weed index, mustard plant height, seeds/ siliqua, length of siliqua and test weight at mustard harvest

Treatment	Weed density (no./m^2)	Weed biomass (g/m^2)	WCE (%)	Weed index (%)	Plant height (cm)	Seed / siliqua	Length of siliqua (cm)	Test weight (g)
Pendimethalin 750 g/ha pre-emergence application (PE)	3.74 (4.60)	2.36 (4.60)	40.09	17.48	126.06	10.33	4.96	3.53
Pendimethalin 750 g/ha PE *fb* one hand weeding at 30 DAS	2.92 (4.16)	2.27 (4.16)	45.71	9.11	155.63	12.00	5.13	3.53
Clodinafop 60 g/ha post-emergence application (PoE)	4.58 (6.46)	2.73 (6.46)	15.60	26.99	108.93	10.33	4.73	3.40
Clodinafop 60 g/ ha PoE *fb* one hand weeding 60 DAS	4.28 (5.56)	2.56 (5.56)	25.43	20.91	114.86	10.33	4.90	3.53
Hand weeding twice at 30 and 60 DAS	2.68 (3.06)	2.01 (3.06)	60.31	5.16	180.16	12.66	5.36	3.53
Weed free	1.00 (0.00)	1.00 (0.00)	100.00	0.00	186.33	14.33	5.70	3.56
Weedy check	5.03 (7.66)	2.94 (7.66)	0.00	33.69	90.80	9.66	4.16	3.43
LSD (p=0.05)	0.68	0.15	8.99	0.17	6.50	0.98	0.20	NS

Table 2. Effect of different weed management treatments on economics, seed yield and straw yield of mustard cultivation

Treatment	Gross return ($x10^3$ `/ha)	Cost of cultivation ($x10^3$ `/ha)	Net return ($x10^3$ `/ha)	Seed yield (t/ha)	Straw yield (t/ha)	B:C ratio
Pendimethalin 750 g/ha pre-emergence application (PE)	56.60	25.08	31.52	1.35	2.78	1.25
Pendimethalin 750 g/ha PE *fb* one hand weeding at 30 DAS	62.34	29.58	32.76	1.48	2.98	1.10
Clodinafop 60 g/ha post-emergence application (PoE)	50.08	24.55	25.53	1.19	2.35	1.03
Clodinafop 60 g/ ha PoE *fb* one hand weeding 60 DAS	54.25	28.75	25.50	1.29	2.57	0.88
Hand weeding twice at 30 and 60 DAS	65.06	33.30	31.75	1.55	3.16	0.95
Weed free	68.60	37.80	30.80	1.63	3.39	0.81
Weedy check	45.49	24.30	21.18	1.08	2.20	0.87
LSD (p=0.05)				0.03	0.04	

Economics

The viability of any practice depends on its economic feasibility. A better treatment in terms of weed control if not fetched good return may not be acceptable to the farmers. Among all the weed control treatments tested, the highest cost of cultivation and gross return was observed with weed free followed by hand weeding twice at 30 and 60 DAS (**Table 2**). However, highest net return was obtained with pendimethalin 750 g/ha PE *fb* hand weeding at 30 DAS which might be attributed to higher seed yield of mustard because of better weed control and the low cost of cultivation due to herbicide use when compared to hand weeding twice and weed free. Thus, the integrated weed management treatment comprising of pendimethalin 750 g/ha PE *fb* one HW at 30 DAS may be used for effective weed management and higher yield of mustard with higher net income.

REFERENCES

GOI. 2020. *Agricultural Statistics at a Glance*. 2019. Government of India (GOI), Ministry of Agriculture and Farmers Welfare, Department of Agriculture, Cooperation and Farmers Welfare, Directorate of Economics and Statistics, New Delhi, India. 315 p. 2001.

Bazaya BR, Kachroo D. and Jat RK. 2004. Integrated weed management in mustard (*Brassica juncea*). *Indian Journal of Weed Science* **36**: 290–292.

Bhowmik B, Mitra B and Bhadra K. 2014. Diversity of insect pollinators and their effect on the crop yield of *Brassica juncea L.*, NPJ-93, from Southern West Bengal. *International Journal of Recent Scientist Research* **5**(6): 1207–1213.

Bamboriya SD, Kaushik MK, Bamboriya SD and Tiwari RC. 2016. Weed dynamics and weed control efficiency under different weed management practices for increased productivity of mustard. *Indian Journal of Weed Science* **48**(4): 458–459

Mukherjee D. 2014. Influence of weed and fertilizer management on yield and nutrient uptake in mustard. *Indian Journal of Weed Science* **46**(3): 251–255.

Rao AN and Chauhan BS. 2015. Weeds and weed management in India - A Review. pp. 87–118. In: *Proceedings of Weed Science in the Asian Pacific Region*. Indian Society of Weed Science, Hyderabad, India.

Sharma OL and Jain NK. 2002. Effect of herbicides on weed dynamics and seed yield of Indian mustard (*Brassica juncea*). *Indian Magazine of Agricultural Sciences* **72**: 322–324.

Sharma V and Thakur DR. 2001. Evaluation of herbicides for weed control in gobhi-sarson under rainfed mid-hill situation of Himachal Pradesh. *Indian Journal of Weed Science* **33**: 5–8.

Singh RK, Singh RP and Singh MK. 2013. Weed management in rapeseed-mustard – A review. *Agricultural Reviews* **34**: 36–49.

Mishra JS, Rao AN, Singh VP and Rakesh K. 2016. Weed management in major field crops. Chapter 9. pp.1–21. In: *Advances in Weed Management*, Indian Society of Agronomy, New Delhi, India.