Indian Journal of Agronomy **62** (2): 233–235 (June 2017)

Research Communication

Productivity and profitability of Indian mustard (*Brassica juncea*) as influenced by weed- management practices under irrigated condition

SUMITRA DEVI BAMBORIYA[1], M.K. KAUSHIK[2], SHANTI DEVI BAMBORIYA[3] DINESH JAJORIYA[4] AND ANITA KUMAWAT[5]

Maharana Pratap University of Agriculture and Technology, Udaipur, Rajasthan 313 001

Received : September 2016; Revised accepted : April 217

ABSTRACT

A field experiment was conducted during the winter (*rabi*) season of 2014–15 at Udaipur, Rajasthan, to find out suitable weed-management practices for Indian mustard [*Brassica juncea* (L.) Czernj. & Cosson]. Of the 10 treatments, after weed-free check, 2 hand-weedings at 20 and 40 days after sowing (DAS) recorded the highest growth parameters, viz. dry-matter accumulation at harvest (40 g/plant), plant height (170 cm), branches/plant (23); and yield attributes, viz. siliquae/plant (297.0), seeds/siliqua (15.5) and 1,000-seed weight (4.89 g) resulted in the highest seed (1.95 t/ha) and straw yield (5.57 t/ha). However, the highest net returns (₹56.3 × 10^3/ha) and benefit : cost ratio (2.69) were recorded with fluazifop-p-butyl 0.055 kg/ha at 10 DAS + 1 hoeing at 40 DAS being at par with fenoxaprop-p-ethyl 0.075 kg/ha at 10 DAS + 1 hoeing at 40 DAS. For getting more yield and profit, weed-management in Indian mustard should be done through application of fluazifop-p-butyl 0.055 kg/ha as post-emergence 10 days after sowing followed by 1 hoeing 40 DAS.

Key words : Economics, Herbicides, Indian mustard, Post-emergence, Productivity, Weed

India is one of the four major players in the global oilseeds/vegetable oils scenario, being one of the important oilseed grower, producer, importer, and exporter. (De and Sinha, 2011). Rapeseed–mustard is the key oilseed crop that can help in addressing the challenge of demand - supply gap of edible oil in India. This crop accounts for nearly one-third of the oil produced in India, making it the country's key edible oilseed crop (Kumar and Chauhan, 2005). Despite the high quality of oil and meal and also its wide adaptability for varied agro-climatic conditions, the area, production and yield of rapeseed–mustard in India have been fluctuating due to various biotic and abiotic stresses coupled with India's domestic price support programme. Weeds are major impediment to Indian mustard production through their ability to compete for resources and their impact on product quality and are major factors which causing yield reduction to the tune of 10–58% (Banga and Yadav, 2001). Manual weeding is effective but, it is cumbersome, time-consuming and uneconomical. Many weeds though initially controlled to some extent by sole application of pre-emergence or early post-emergence herbicides but might have re-emerged later to compete with crop plants causing significant yield reductions. With this background, the present study was undertaken to find out the best weed management practice for getting higher productivity, quality and economic benefits from Indian mustard.

A field experiment was conducted during the winter season (*rabi*) of 2014–15 at the Instructional Farm, Rajasthan College of Agriculture, MPUAT, Udaipur (Rajasthan), to evaluate effect of weed management on productivity and profitability of Indian mustard. The soil was clay loam in texture, having slight alkaline reaction (pH 7.9), medium in available nitrogen (281.4 kg/ha), phosphorus (24.5 kg/ha) and potassium (238.1 kg/ha) and high in available sulphur (34.23 kg/ha). The experiment comprises 10 treatments, which included weedy check, 1 hand-weeding at 20 DAS, 2 hand-weedings at 20 and 40 DAS, fenoxaprop-p-ethyl 0.075 kg/ha at 10 DAS, fluazifop-p-butyl 0.055 kg/ha at 10 DAS, quizalofop-p-ethyl 0.050 kg/ha at 30 DAS, fenoxaprop-p-ethyl 0.075 kg/ha at 10 DAS + 1 hoeing at 40 DAS, fluazifop-p-butyl 0.055 kg/ha at 10 DAS + 1 hoeing at 40 DAS, isoproturon

Based on a part of M.Sc. thesis of the first author submitted to Maharana Pratap University of Agriculture and Technology, Udaipur, Rajasthan 313 001 in 2016 (Unpublished)

[1]Corresponding author's Email: sumisaani@gmail.com

[1]M.Sc. Student, [2]Professor, [4]Assistant Professor, Division of Agronomy, MPUAT, Udaipur, Rajasthan 313 001, [3,5]Ph.D. Scholar, Division of Agronomy, ICAR-Indian Agricultural Research Institute, New Delhi 110 012

1.25 kg/ha at 30 DAS and weed-free check. The experiment was laid out in randomized block design and replicated 4 times. Indian mustard variety 'Pusa Jai Kisan' was sown at 40 cm × 10 cm row and plant-to-plant spacing on 1 November, 2014 with a seed rate of 3 kg/ha. The one-third dose of nitrogen and full dose of phosphorus was applied as per treatments at sowing time and two-thirds nitrogen was top-dressed in 2 equal splits– at first and second irrigation respectively. The crop was harvested at full physiological maturity, sun-dried for a week and threshed manually. All the biometrical observation on crop and weeds were observed as per the standard practices. Economics of treatments was computed on the basis of prevailing market price of inputs and outputs in Indian rupees under each treatment. Statistical analysis of the data was done as per the standard analysis of variance technique for the experimental design.

The results showed that plant growth parameters, viz. plant height, dry-matter accumulation and branches/plant, were significantly increased in weed-management treatments compared to weedy check (Table 1). Yield attributes like number of siliquae/plant, seeds/siliqua and test weight, were significantly higher with hand-weeding done at 20 and 40 DAS compared to all the other treatments. Manual weeding is most effective to create competition free environment with efficient control of weeds, so it had the highest positive effect on plant growth parameters and yield attributes. The results confirm the findings of Chauhan *et al*. (2005) and Mankar (2015). After weed-free treatment, the highest seed, straw and oil yield of Indian mustard were recorded under 2 hand-weedings at 20 and 40 DAS which was at par with fluazifop-p-butyl 0.055 kg/ha at10 DAS + hoeing at 40 DAS and fenoxaprop-p-ethyl 0.075 kg/ha at10 DAS + hoeing at 40 DAS (Table 2). Alone post-emergence application of fluazifop-p-butyl at 0.055 kg/ha and fenoxaprop-p-ethyl at 0.075 kg/ha revealed yield superiority to the control, but still not competent enough to achieve the targeted yield potential. This is because many weeds though initially controlled to some extent by sole application of post-emergence herbicides but might have reemerged later to compete with crop plants causing significant yield reduction. Improvement in yield was noticed with integrated approach in comparison to individual post-emergence herbicide application. The lowest grain yield of Indian mustard was recorded in weedy check. The higher grain yield under 2 hand-weedings was mainly owing to proper growth and development of Indian mustard because of poor crop-weed competition, i.e. less weed population and biomass. Implication of any of the weed-management practice resulted in better monetary returns when compared with weedy check. Unweeded control resulted in the lowest net returns and benefit cost ratio (Table 2). Fluazifop-p-butyl @ 0.055 kg/ha at 10 DAS + 1 hoeing at 40 DAS resulted in the highest net returns and benefit: cost ratio. Two hand-weedings at 20 and 40 DAS significantly improved the yield of Indian mustard, but the profit margin gets reduced due to higher wages of human labour incurred.

The results of present study indicated that integrated weed management through application of fluazifop-p-butyl @ 0.055 kg/ha as post-emergence at 10 DAS after sowing followed by 1 hoeing at 40 DAS was found to be the

Table 1. Effect of weed management on growth parameters and yield attributes of irrigated Indian mustard

Treatment	Dry-matter accumulation (g/plant)				Plant height (cm)	Branches/ plant	Siliquae/ plant	Seeds/ siliqua	1,000-seed weight (g)
	30 DAS	60 DAS	90 DAS	At harvest					
Weedy check	1.19	10.47	17.71	21.13	126.2	16.0	212.5	13.08	4.83
One hand-weeding at 20 DAS	1.91	15.53	26.00	32.00	160.0	21.0	256.3	14.13	5.56
Two hand-weedings at 20 and 40 DAS	1.94	22.53	34.41	40.38	170.0	23.0	297.0	15.55	5.97
Fenoxaprop-p-ethyl 0.075 kg/ha at 10 DAS	1.52	13.68	24.75	29.80	152.5	19.5	246.7	13.95	5.38
Fluazifop-p-butyl 0.055 kg/ha at 10 DAS	1.58	15.47	25.16	30.72	153.3	19.7	250.0	13.95	5.39
Quizalofop-p-ethyl 0.050 kg/ha at 30 DAS	1.18	14.00	25.75	32.31	158.0	19.5	254.0	14.06	5.61
Fenoxaprop-p-ethyl 0.075 kg/ha at 10 DAS + 1 hoeing at 40 DAS	1.53	20.46	31.08	36.85	168.0	22.0	278.7	14.68	5.73
Fluazifop-p-butyl 0.055 kg/ha at 10 DAS + one hoeing at 40 DAS	1.56	20.74	31.39	37.19	168.3	22.0	279.2	14.75	5.74
Isoproturon 1.25 kg/ha at 30 DAS	1.19	13.75	24.50	29.00	151.5	19.0	235.7	13.96	5.24
Weed free check	2.20	25.24	36.47	41.14	173.7	25.0	299.7	15.58	6.03
SEm±	0.08	0.88	1.21	1.39	4.70	0.93	7.48	0.27	0.11
CD (P=0.05)	0.24	2.56	3.52	4.04	13.65	2.70	21.71	0.79	0.32

Table 2. Effect of weed management on productivity, quality traits and economics of irrigated Indian mustard

Treatment	Yield (t/ha)		Quality parameters		Cost of cultivation (× 10^3 ₹/ha)	Net returns (× 10^3 ₹/ha)	Benefit: cost ratio
	Seed	Straw	Oil content (%)	Oil yield (kg/ha)			
Weedy check	1.17	3.94	39.2	457.4	17.8	30.6	1.71
One hand-weeding at 20 DAS	1.65	4.89	40.0	662.5	21.6	45.9	2.12
Two hand-weedings at 20 and 40 DAS	1.95	5.57	39.9	781.8	25.0	54.3	2.17
Fenoxaprop-p-ethyl 0.075 kg/ha at 10 DAS	1.49	4.69	40.0	596.6	19.7	41.5	2.10
Fluazifop-p-butyl 0.055 kg/ha at 10 DAS	1.50	4.70	39.5	592.8	18.7	42.9	2.29
Quizalofop-p-ethyl 0.050 kg/ha at 30 DAS	1.52	4.8	39.7	603.4	19.7	42.8	2.17
Fenoxaprop-p-ethyl 0.075 kg/ha at 10 DAS + 1 hoeing at 40 DAS	1.91	5.21	39.9	763.5	22.0	55.2	2.51
Fluazifop-p-butyl 0.055 kg/ha at 10 DAS + 1 hoeing at 40 DAS	1.91	5.22	40.1	766.9	20.9	56.3	2.69
Isoproturon 1.25 kg/ha at 30 DAS	1.39	4.56	39.3	545.3	19.2	38.2	1.99
Weed free check	1.98	5.78	39.8	784.9	29.2	51.3	1.76
SEm±	0.063	0.16	0.47	25.4	-	2.21	0.11
CD (P=0.05)	0.18	0.46	NS	73.7	-	6.42	0.31

practically feasible and economically best strategy in reducing the weed infestation and achieving better yield under irrigated conditions in mustard growing areas of India.

REFERENCES

Banga, R.S., Yadav, A. and Bisht, R. 2004. Integrated weed management in Indian mustard. *Indian Journal of Weed Science* **36**: 224–226.

Chauhan, Y.S., Bhargava, M.K. and Jain, V.K. 2005. Weed management in Indian mustard. *Indian Journal of Agronomy* **50**: 149–151.

De, B. and Sinha, A.C. 2011. *Integrated Nutrient Management in Rapeseed: An Integrated Approach for Enhancing the Growth and Yield of Rapeseed* (*Brassica campestris* var yellow sarson). Lambert Academic Publishing, pp. 1–6.

Kumar, A. and Chauhan, J.S. 2005. Status and future thrust areas of rapeseed–mustard research in India. *Indian Journal of Agricultural Sciences* **75**: 621–635.

Mankar, D.D. 2015. Study on effective weed management in Indian mustard (*Brassica juncea* L.). *Journal of Oilseed Brassica* **6**: 279–288.