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RESEARCH NOTE

Influence of weed management practices on growth and yield attributes of mustard

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ABSTRACT

A field experiment was conducted on sandy loam soils to identify alternate weed management treatments to economically manage weeds and improve mustard growth and yield of mustard. Among tested weed management treatments, higher growth parameters, higher yield attributes (number of siliquae/plants and seeds/siliquae) and yield of mustard were observed under inter-cultivation and hand weeding twice at 15 and 30 days after seeding (DAS) which was at par with pre-emergence application (PE) of oxadiargyl 0.09 kg/ha *fb* inter-cultivation at 30 DAS.

Keywords: Hand weeding, Inter-cultivation, Oxadiargyl, Mustard, Weed management

Mustard (*Brassica juncea* (L.) Czern.) is the second most important oilseed crop in India, after groundnut, among the seven edible oilseeds. The seed is used as condiment. The leaves of young mustard plants are used as green vegetables, as it supplies sulphur and minerals in the diet. Mustard oil cake is used as feed and manure. Its green stem and leaves are a good source of green fodder for cattle. Weeds are the major biotic stress in mustard production. Weed competition in mustard is more serious during early stages (4-6 weeks), because crop growth in winter (*Rabi*) season remains slow (Mishra *et al.* 2016). However, during later stages, it grows vigorously and suppresses weeds growth. The critical period of crop -weed competition in mustard is 15-40 days and weeds cause about 24% of yield loss if they are not controlled during the critical period (Yadav *et al*. 2014). In mustard, traditionally weeds are managed by hand weeding. But, increasing wages, scarcity of labour at peak periods and high labour cost necessitates the need to identify other alternative weed management methods which are technically feasible and economically viable (Rao and Chauhan 2015). Hence, the present experiment was carried out to study the influence of weed management practices on crop growth and yield of mustard.

A field experiment was conducted during *Rabi* 2020-21 at Rajendranagar, Hyderabad on a sandy loam soil available nitrogen (223 kg/ha), available phosphorus (30.87 kg/ha) and potassium (375.72 kg/ha). Mustard variety '*NRCHB-101*' was sown with seed rate of 4 kg/ha manually at row spacing of 40 cm. Later, the crop was resorted to thinning and plant to plant spacing was maintained at 10 cm. The experiment was laid out in randomised block design with twelve treatments, *viz*. pre-emergence application (PE) of pendimethalin 1.0 kg/ha followed by (*fb*) post-emergence application (PoE) of quizalofop-ethyl 0.05 kg/ha, oxadiargyl 0.09 kg/ha PE *fb* quizalofop-ethyl 0.05 kg/ha PoE, oxyfluorfen 0.1 kg/ha PE *fb* quizalofop-ethyl 0.05 kg/ha PoE, pendimethalin 1.0 kg/ha PE *fb* straw mulch 5 t/ha, oxadiargyl 0.09 kg/ha PE *fb* straw mulch 5 t/ha, oxyfluorfen 0.1 kg/ha PE *fb* straw mulch 5 t/ha, pendimethalin 1.0 kg/ha PE *fb* inter-cultivation at 30 DAS, oxadiargyl 0.09 kg/ha PE *fb* inter-cultivation at 30 DAS, oxyfluorfen 0.1 kg/ha PE *fb* inter-cultivation at 30 DAS, inter-cultivation and hand weeding at 15 and 30 DAS (weed free), inter-cultivation at 15 and 30 DAS and unweeded control with three replications. Pre-emergence herbicides were applied within 24 hours after sowing. Post-emergence herbicide was sprayed at 2-3 leaf stage of weeds. Straw mulch was applied on 15 DAS. Inter-cultivation was done with push hoe at 15 and 30 DAS. Hand weeding was done at 15 and 30 DAS. The observations were recorded, using standard procedures, on crop growth parameters *i.e.*, plant height and dry matter production, yield attributes *i.e.*, number of siliqua/plants, length of siliqua, seeds/siliquae and 1000-seed weight. For dry matter production, samples were dried in hot air oven at 65 ±

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5°C.The data on weed density and biomass for all the categories were computed using square root $(\sqrt{x+1})$ transformation.

Effect on weeds

Significantly lower weed density and biomass were observed under inter-cultivation and hand weeding twice at 15 and 30 DAS and it was at par with oxadiargyl 0.09 kg/ha PE *fb* inter-cultivation at 30 DAS. It was on par with oxyfluorfen 0.1 kg/ha PE *fb* inter-cultivation at 30 DAS and pendimethalin 1.0 kg/ha PE *fb* inter-cultivation at 30 DAS. Lower total weed density was recorded with treatments might be due to their effective control of weeds at critical period of weed competition (Chandolia *et al.* 2010, Mishra 2012).

Effect on mustard growth

Maximum mustard plant height and dry matter production was noticed under inter-cultivation and hand weeding twice at 15 and 30 DAS and it was at par with oxadiargyl 0.09 kg/ha PE *fb* inter-cultivation at 30 DAS. It was at par with oxyfluorfen 0.1 kg/ha PE *fb* inter-cultivation at 30 DAS and pendimethalin 1.0 kg/ha PE *fb* inter-cultivation at 30 DAS. Efficient utilization of resources by the crop due to less weed competition in those treatments resulted in higher mustard plant height that led to higher photosynthates accumulation and higher dry matter production (Bazaya *et al*. 2004, Kaur *et al.* 2013, Das 2016).

Effect on mustard yield attributes and yield

The mustard yield attributes like number of siliquae/plant and number of seeds/siliquae were significantly influenced by different weed management practices. However, length of siliquae and 1000-seed weight not influenced by weed management practices. Higher number of siliquae/ plant and number of seeds/siliquae were recorded under inter-cultivation and hand weeding at 15 and 30 DAS and it was statistically on par with oxadiargyl 0.09 kg/ha *fb* inter-cultivation at 30 DAS. Oxyfluorfen 0.1 kg/ha PE *fb* inter-cultivation at 30 DAS and pendimethalin 1.0 kg/ha PE *fb* inter-

Table 1. Weed and crop growth as influenced by weed management treatments in mustard

Treatment	Total weed density (no./m^2)	Weed biomass (g/m^2)	Mustard plant height (cm)	Mustard dry matter production (kg/ha)
Pendimethalin 1.0 kg/ha PE *fb* quizalofop-ethyl 0.05 kg/ha PoE	5.83 (32.97)	3.51(11.29)	131.88	3563.1
Oxadiargyl 0.09 kg/ha PE *fb* quizalofop-ethyl 0.05 kg/ha PoE	5.68 (31.14)	3.38 (10.43)	132.93	3658.6
Oxyfluorfen 0.1 kg/ha PE *fb* quizalofop-ethyl 0.05 kg/ha PoE	5.78 (32.39)	3.45 (10.88)	132.54	3591.9
Pendimethalin 1.0 kg/ha PE *fb* straw mulch 5 t/ha	5.26 (26.70)	3.08 (8.48)	140.42	4025.1
Oxadiargyl 0.09 kg/ha PE *fb* straw mulch 5 t/ha	5.12 (25.20)	2.98 (7.89)	140.85	4071.9
Oxyfluorfen 0.1 kg/ha PE *fb* straw mulch 5 t/ha	5.21 (26.15)	3.03 (8.18)	140.68	4052.2
Pendimethalin 1.0 kg/ha PE *fb* inter-cultivation at 30 DAS	4.32 (17.66)	2.58 (5.66)	148.89	4458.1
Oxadiargyl 0.09 kg/ha PE *fb* inter-cultivation at 30 DAS	3.85 (13.81)	2.29 (4.24)	150.92	4588.9
Oxyfluorfen 0.1 kg/ha PE *fb* inter-cultivation at 30 DAS	4.22 (16.82)	2.53 (5.38)	149.03	4546.9
Inter-cultivation and hand weeding at 15 DAS and 30 DAS (weed free)	3.34 (10.16)	2.01 (3.05)	158.17	4861.9
Inter-cultivation at 15 and 30 DAS	5.34 (27.48)	3.17 (9.03)	139.72	3976.6
Unweeded control	11.68(135.53)	7.70 (58.30)	129.32	3173.4
LSD (p=0.05)	0.53	0.35	7.8	281.7

Note: Weed data was subjected to square root $(\sqrt{x+1})$ transformation and original values are shown in parenthesis, DAS = days after sowing; PE = pre-emergence; PoE = post-emergence

Table 2. Yield attributes and yield as influenced by weed management treatments in mustard

Treatment	No. of siliquae /plant	Length of siliquae (cm)	No. of seeds/ siliquae	Test weight (g)	Seed yield (kg/ha)
Pendimethalin 1.0 kg/ha PE *fb* quizalofop-ethyl 0.05 kg/ha PoE	84.29	5.30	11.90	3.54	895
Oxadiargyl 0.09 kg/ha PE *fb* quizalofop-ethyl 0.05 kg/ha PoE	86.10	5.40	12.15	3.56	917
Oxyfluorfen 0.1 kg/ha PE *fb* quizalofop-ethyl 0.05 kg/ha PoE	85.98	5.30	11.96	3.55	908
Pendimethalin 1.0 kg/ha PE *fb* straw mulch 5 t/ha	90.81	5.60	13.69	3.56	1084
Oxadiargyl 0.09 kg/ha PE *fb* straw mulch 5 t/ha	91.02	5.70	13.98	3.57	1104
Oxyfluorfen 0.1 kg/ha PE *fb* straw mulch 5 t/ha	90.90	5.60	13.95	3.56	1092
Pendimethalin 1.0 kg/ha PE *fb* inter-cultivation at 30 DAS	96.33	5.80	16.45	3.58	1267
Oxadiargyl 0.09 kg/ha PE *fb* inter-cultivation at 30 DAS	98.37	5.90	16.96	3.59	1349
Oxyfluorfen 0.1 kg/ha PE *fb* inter-cultivation at 30 DAS	96.49	5.90	16.53	3.59	1320
Inter-cultivation and hand weeding at 15 DAS and 30 DAS (weed free)	100.50	6.00	17.50	3.60	1483
Inter-cultivation at 15 and 30 DAS	90.70	5.53	13.53	3.54	1070
Unweeded control	78.52	5.10	9.98	3.43	641
LSD (p=0.05)	2.30	NS	0.6	NS	140.0

*DAS: days after sowing; PE: pre-emergence application; PoE: post-emergence application

Table 3. Economics as influenced by tested weed management treatments in mustard

Treatment	Cost of cultivation (₹/ha)	Gross returns (₹/ha)	Net returns (₹/ha)	B:C ratio
Pendimethalin 1.0 kg/ha PE *fb* quizalofop-ethyl 0.05 kg/ha PoE	21041	42201	21160	2.01
Oxadiargyl 0.09 kg/ha PE *fb* quizalofop-ethyl 0.05 kg/ha PoE	21421	43246	21825	2.02
Oxyfluorfen 0.1 kg/ha PE *fb* quizalofop-ethyl 0.05 kg/ha PoE	21055	42856	21801	2.04
Pendimethalin 1.0 kg/ha PE *fb* straw mulch 5 t/ha	24531	50875	26344	2.07
Oxadiargyl 0.09 kg/ha PE *fb* straw mulch 5 t/ha	24681	51820	27139	2.10
Oxyfluorfen 0.1 kg/ha PE *fb* straw mulch 5 t/ha	24305	51234	26929	2.11
Pendimethalin 1.0 kg/ha PE *fb* inter-cultivation at 30 DAS	21181	59163	37982	2.79
Oxadiargyl 0.09 kg/ha PE *fb* inter-cultivation at 30 DAS	21231	62874	41643	2.96
Oxyfluorfen 0.1 kg/ha PE *fb* inter-cultivation at 30 DAS	21125	61555	40430	2.91
Inter-cultivation and hand weeding at 15 DAS and 30 DAS (weed free)	25981	68933	42952	2.65
Inter-cultivation at 15 and 30 DAS	23531	50162	26631	2.13
Unweeded control	19531	28806	11275	1.47
LSD (p=0.05)		6353	2507	

*DAS = days after sowing; PE = pre-emergence application; PoE = post-emergence application

cultivation at 30 DAS, which were at par with oxadiargyl 0.09 kg/ha *fb* inter-cultivation at 30 DAS. The effective weed management treatments provided weed free environment during crop growth resulting in higher number of siliquae/ plant and number of seeds/siliquae (Kour *et al.* 2013). Similarly, higher mustard seed yield was recorded under inter-cultivation and hand weeding at 15 and 30 DAS and it was statistically at par with oxadiargyl 0.09 kg/ha *fb* inter-cultivation at 30 DAS. These results are in conformity with the findings of Mishra (2012), Kumar *et al.* (2013) and Yadav *et al.* (2017).

Effect on economics

The maximum gross and net returns were recorded with inter-cultivation and hand weeding twice at 15 and 30 DAS followed by oxadiargyl 0.09 kg/ha PE *fb* intercultivation at 30 DAS, oxyfluorfen 0.1 kg/ha PE *fb* inter-cultivation at 30 DAS, pendimethalin 1.0 kg/ha PE *fb* inter-cultivation at 30 DAS (**Table 3**). But higher B:C ratio was recorded with oxadiargyl 0.09 kg/ha PE *fb* inter-cultivation at 30 DAS because of higher cost of cultivation of hand weeding (Degra *et al.* 2006, Kalita *et al.* 2017).

Conclusion

It was inferred that, inter-cultivation and hand weeding at 15 and 30 DAS and oxadiargyl 0.09 kg/ha PE *fb* inter-cultivation at 30 DAS may be used in mustard for economically managing weeds and attain higher mustard growth and yield.

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