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Effect of weed management strategy on weed flora and yield of Indian mustard

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Abstract

A field Experiment was carried out at the Agronomy Research Farm, A.N.D.U.A & T., Kumarganj, Ayodhya during rabi season in 2017-18 and 2018-19 to study the effect of weed management strategy on weed flora and yield of Indian mustard. The experiment was laid out in randomized block design with three replication. Twelve weed control treatments were tested in the experiment. Manual hand weeding at 20 and 40 DAs (T₁₁) recorded significantly reduced density of weed with WCE (74.74 and 88.44%), which was similar to T₁₀, T₉, T₅, and T₆ treatments over other herbicide treatments. It resulted significantly increase growth parameters viz. Plant height, number of branch plant⁻¹, Dry matter accumulation and grain and straw yield of mustard crop.

Keywords: Grain yield, growth, herbicide, mustard and weed

Introduction

Indian mustard (*Brassica juncea* L.) belongs to family *Brassicaceae*. It is known to Greeks, Romans, Indians and Chinese 2000 years ago. Genus *Brassica* comprises of five cultivated species viz., *Brassica juncea* (Indian mustard), *Brassica campestris* (Toria), *Brassica nigra* (Banarasi rye), *Brassica napus* (Gobhi sarson) and *Brassica carinata* (Abyssinian mustard) predominantly grown in China, India, Canada, Pakistan, USSR and Europe. It is the third major oilseed crop of India, ranking after groundnut and soybean, with around 23 per cent share of total oilseed production (Rajak *et al.*, 2011). Oilseeds are main source of energy in the diet of Indians. Though, our country has become self-reliant with respect to food grains but still lagging behind in the production of oilseeds. Its green tender plants are used for preparing vegetable commonly called as "Sarson Ka Saag". India is one of the important among the 3rd leading oilseed producing countries of the world after Canada and China. Mustard is the second most important edible oil seed crop after groundnut in India. In India, it is cultivated on 5.98 and 6.23 m ha with 8.43 and 9.34 mt production and 1410 and 1499 kg ha⁻¹ productivity. However, in Uttar Pradesh state contributed major part of during the year 2017-18 and 2018-19, the area of rapeseed-mustard was 0.68 and 0.75 mha. with the production of 0.95 and 1.12 mt and productivity of 1392 and 1483 kg ha⁻¹ productivity. Thus, it has major share in area (11.36 and 12.08%) and production (11.21 and 11.96%) of mustard in our country. But the Rajasthan had the highest area (2.21 and 2.37 mha) and production (3.54 and 4.08 mt) and productivity of (1602 and 1720 kg ha⁻¹) as compared to Gujarat having the highest area (0.22 and 0.20 mha) and production (0.40 and 0.34 mt) and productivity of 1808 and 1745 kg ha⁻¹ (Anonymous 2018-19).

Productivity is low causes various factor viz. weeds, Moisture, nutrient. Weed is a major problem of the mustard crop, which competes at initial stage to crop for moisture, light, space and nutrient. It causes loss of seed yield up to 35-60% or even more depending upon the weed density, type of weed flora and duration of infestations. By the use of hand weeding and new herbicides we can judge the best weed management practices for particular crop. It control is a preferred practice causes sparse and costly labour as well as lesser feasibility of mechanical or manual weeding. In order to optimize the weed control efficacy and minimize the application costs, use of pre-and post emergence herbicides, as well as herbicide mixtures, has become the alternative. This strategy also represents an important tool to avoid problems related to herbicide resistance.

Considering above fact, the present experiment was planned to assess the relative bio-efficacy of pre and post emergence herbicide for broad spectrum weed control.

Material Methods

The present experiment was carried out during *rabi* season 2017-18 and 2018-19 at Agronomy Research Farm in Acharya Narendra Deva University of Agriculture & Technology, Kumarganj, Ayodhya. The soil was silty loam in texture having low organic carbon 0.33 and 0.34% and available nitrogen ($137.00 \text{ kg ha}^{-1}$) and medium in available phosphorus (15.35 kg ha^{-1}) and high in potassium ($249.25 \text{ kg ha}^{-1}$). Twelve weed management practices, *i.e.* T₁-Pendimethalin (PE) @ 1000 g ha^{-1} , T₂-Isoproturon (POE) @ 1000 g ha^{-1} at 20 DAS, T₃-Pendimethalin (PE) @ 1000 g ha^{-1} + Hand weeding at 40 DAS, T₄-Isoproturon (POE) @ 1000 g ha^{-1} + Hand weeding at 40 DAS, T₅-Pendimethalin (PE) @ 1000 g ha^{-1} + Paddy straw mulch @ 5 t ha^{-1} at 2-3 DAS, T₆-Isoproturon (POE) @ 1000 g ha^{-1} + Paddy straw mulch @ 5 t ha^{-1} at 2-3 DAS, T₇-Metribuzin (PE) @ 175 g ha^{-1} , T₈-Metribuzin (PE) @ 175 g ha^{-1} + Hand weeding at 40 DAS, T₉-Metribuzin (PE) @ 175 g ha^{-1} + Paddy straw mulch @ 5 t ha^{-1} at 2-3 DAS, T₁₀-Paddy straw mulch @ 10 t ha^{-1} at 2-3 DAS, T₁₁-Hand weeding at 20 and 40 DAS and T₁₂-Weedy check were studied in randomized block design with three replications. The mustard variety cv. 'NDR-8501' was sown manually keeping the row distance of 45 cm and plant distance of 15 cm with the seed rate of 5 kg/ha for the period of 2nd week of October during both the years of experiment. The recommended dose of fertilizer like Nitrogen (80 kg ha^{-1}), Phosphorus (40 kg ha^{-1}), Potash (20 kg ha^{-1}) and Sulphur (20 kg ha^{-1}) was applied under experimental field. However, half dose of nitrogen through Urea and full dose of Phosphorus by single super phosphate respectively were applied as basal. Remaining quantity of nitrogen was applied in two equal split. The herbicides were applied using knapsack sprayer fitted with flat fan nozzle with spray volume of 500 l/ha. The other package of practices was adopted to raise the crop as per the recommendations. After sowing, a light irrigation was given flowering and pod formation. The crop was harvested 21st March and 10th March during 2017-18 and 2018-19, respectively. The observations on number of weeds and dry matter of weeds were taken from randomly selected four spots by using 0.5 m^2 iron quadrat from net plot area. The weed data were subjected to square root transformation before analysis. Weed control efficiency was also calculated on the basis of dry matter production by weeds. Data on growth and yield were determined at harvest. The data were statistically analyzed by using statistical procedures and comparisons were made at 5% level of significance.

Result and Discussion

Effect on weed

Different weed management practices significantly reduced the weed density of weed at 60 DAS stage. The lowest density was recorded with the two hand weeding at 20 and 40 DAS (T₁₁) which was statistically at par with T₁₀, T₉ and T₅ as compare to remaining the weed management treatment during both the investigation years. Minimum density of weed recorded under Metribuzin (PE) @ 175 g ha^{-1} + Paddy straw mulch @ 5 t ha^{-1} at 2-3DAS (T₉) was mainly due to chemical herbicide and manual weeding, Since the herbicides are plant killer, their use at appropriate dose and time make them selective to kill certain plant species leaving selected crop

plants unaffected. Many weeds appear to be less sensitive to declining leaf water potential than those of the crop. For example, weeds with more extensive root system and better physical tolerance to drought can quickly exhaust the soil moisture and make crop to suffer greatly for want of soil water. Many researchers have reported lower weed population in mustard and similar crops with the use of herbicides (Yadav *et al.* 2004).

The weed control efficiency (WCE %) was concerned, it was also affected due to various weed control treatments (Table - 1). The higher WCE was recorded in two hand weeding at 20 and 40 DAS (74.74%) T₁₁ treatment, followed by paddy straw mulch @ 10 t ha^{-1} at 2-3 DAS (74.31) T₁₀ treatment over the weedy check (0.00) plots. Overall the treatments two hand weeding 20 and 40 DAS was found more effective to control of weeds which resulted in higher WCE than other treatments. These findings are in close conformity with those reported by (Patel *et al.* 2013). As it is well known fact that the weed population (WP) is directly correlated with WCE, if a particular treatment showed the highest WCE means weeds have been controlled effectively. Thus, there was an inverse relationship between WCE and WP. Two hand weeding at 20 and 40 DAS recorded the lowest values of weed population (2.95) fb paddy straw mulch @ 10 t ha^{-1} at 2-3DAS (3.00) T₁₀ treatment. However, the highest seed yield was recorded with two hand weeding at 20 and 40 DAS and the lowest with weedy check plot.

Effect on growth

Weed management a practice was significantly affected on plant height, number of branch plant⁻¹, dry matter accumulation at maturity stages. However, tallest plant height number of branch and dry matter accumulation was recorded with hand weeding at 20 and 40 DAS (167.89), (20.05) and (40.95) T₁₁ treatment and followed by paddy straw mulch @ 10 t ha^{-1} 2-3 DAS (165.09), (19.63) and (39.96) T₁₀ treatment which was statistically at par with T₉, T₅ and T₆, treatments over other treatments. Higher plant height with T₁₁ was mainly owing to lower weed density which was critical period of crop life cycle. Therefore, no more competition between crop and weed was observed for moisture, nutrients, space and light. This resulted in vigorous crop. Integrated weed management increased the uptake of nutrients by crop or weeds contributed to higher vegetative growth. On the other hand, reduction in uptake of nutrients by crop in weedy check and lower synthesis of growth regulators caused reduction in the vegetative growth of crop (Kumar *et al.* 2012). Similar trend was also found of number of branch plant⁻¹, dry matter accumulation and days taken to harvest time.

Effect on yield

Yield is the ultimate resultant of the bio-physiological process which coordinated interplay of growth characters and yield attributes. Seed and stover yields were influenced significantly by applying various weed management practices. Application of herbicides had significant effect on seed and stover yield. The highest grain and stover yield of mustard was also recorded under two hand weeding at 20 and 40. It was found statistically at par with T₁₀, T₉, T₅ and T₆ treatment. Significantly lowest seed and stover yields were found under weedy check plot. Similar results were also reported by Deepak *et al.* (2019). The highest harvest index was also reported under hand weeding at 20 and 40 DAS during both the years. The harvest index speaks the conversion efficiency

of non-seed portion by turning up nutrient uptake as well as utilization.

Thus, it is concluded that the weed management practices two hand weeding at 20 and 40 DAS was significantly reduced weed density and biomass which was highly effective on weed, and produced maximum grain and straw yield.

Conclusion

It can be concluded from the investigation that hand weeding twice at 20 and 40 DAS was found to be effective where laborers are easily available. In case of non-availability of laborers, Metribuzin (PE) @ 175 g ha⁻¹ + Paddy straw mulch @ 5 t ha⁻¹ at 2-3DAS (pre-emergence) was found economically viable for weed control with higher grain yield and net profit.

Table 1: Effect of various weed management practices on weed population (m⁻²) and weed control efficiency (%) (Pool data of two year 2017-18 and 2018-19)

Treatments	W.P. 60 DAS	WCE (%)
T ₁ -Pendimethalin (PE) @ 1000 g ha ⁻¹	5.50	52.91
T ₂ -Isoproturon (POE) @ 100 g ha ⁻¹ at 20DAS	5.90	49.48
T ₃ -Pendimethalin (PE) @ 1000 g ha ⁻¹ + Hand weeding at 40DAS	4.35	62.75
T ₄ -Isoproturon (POE) @ 100 g ha ⁻¹ + Hand weeding at 40DAS	4.50	61.47
T ₅ -Pendimethalin (PE) @ 1000 g ha ⁻¹ + Paddy straw mulch @ 5 t ha ⁻¹ at 2-3DAS	3.50	70.03
T ₆ -Isoproturon (POE) @ 100 g ha ⁻¹ + Paddy straw mulch @ 5 t ha ⁻¹ at 2-3DASok	4.15	64.46
T ₇ -Metribuzin (PE) @ 175 g ha ⁻¹	4.90	58.04
T ₈ -Metribuzin (PE) @ 175 g ha ⁻¹ + Hand weeding at 40DAS	4.20	64.04
T ₉ -Metribuzin (PE) @ 175 g ha ⁻¹ + Paddy straw mulch @ 5 t ha ⁻¹ at 2-3DAS	3.10	73.45
T ₁₀ -Paddy straw mulch @ 10 t ha ⁻¹ at 2-3DAS	3.00	74.31
T ₁₁ -Hand weeding at 20 and 40DAS	2.95	74.74
T ₁₂ -Weedy check	11.68	0.00
SEM±	0.26	-
CD (P=0.05)	0.77	-

Table 2: Effect of different weed management practices on plant height, No of branch and dry matter accumulation of mustard (Pool data of two years 2017-18 and 2018-19)

Treatments	Plant height	Number of branches plant ⁻¹	Dry matter accumulation
T ₁ -Pendimethalin (PE) @ 1000 g ha ⁻¹	140.18	16.84	32.71
T ₂ -Isoproturon (POE) @ 100 g ha ⁻¹ at 20DAS	135.29	16.33	31.43
T ₃ -Pendimethalin (PE) @ 1000 g ha ⁻¹ + Hand weeding at 40DAS	143.88	17.35	35.62
T ₄ -Isoproturon (POE) @ 100 g ha ⁻¹ + Hand weeding at 40DAS	142.37	17.14	34.70
T ₅ -Pendimethalin (PE) @ 1000 g ha ⁻¹ + Paddy straw mulch @ 5 t ha ⁻¹ at 2-3DAS	157.98	18.83	39.15
T ₆ -Isoproturon (POE) @ 100 g ha ⁻¹ + Paddy straw mulch @ 5 t ha ⁻¹ at 2-3DAS	155.46	18.64	38.46
T ₇ -Metribuzin (PE) @ 175 g ha ⁻¹	141.28	17.03	33.60
T ₈ -Metribuzin (PE) @ 175 g ha ⁻¹ + Hand weeding at 40DAS	146.49	17.54	36.45
T ₉ -Metribuzin (PE) @ 175 g ha ⁻¹ + Paddy straw mulch @ 5 t ha ⁻¹ at 2-3DAS	160.87	19.24	39.64
T ₁₀ -Paddy straw mulch @ 10 t ha ⁻¹ at 2-3DAS	165.09	19.63	39.96
T ₁₁ -Hand weeding at 20 and 40DAS	167.89	20.05	40.95
T ₁₂ -Weedy check	120.48	14.63	26.14
SEM±	6.33	0.85	0.86
CD (P=0.05)	18.57	2.49	2.54

Table 3: Effect of different weed management practices on seed yield (q ha⁻¹), straw yield (q ha⁻¹), and harvest index (%) of mustard (Pool data of two year 2017-18 and 2018-19).

Treatments	Seed yield (q ha-1)	Stover yield (q ha-1)	Harvest index (%)
T ₁ -Pendimethalin (PE) @ 1000 g ha ⁻¹	15.97	43.74	26.74
T ₂ -Isoproturon (POE) @ 100 g ha ⁻¹ at 20DAS	14.72	40.54	26.63
T ₃ -Pendimethalin (PE) @ 1000 g ha ⁻¹ + Hand weeding at 40DAS	16.53	44.59	27.04
T ₄ -Isoproturon (POE) @ 100 g ha ⁻¹ + Hand weeding at 40DAS	16.34	44.72	26.76
T ₅ -Pendimethalin (PE) @ 1000 g ha ⁻¹ + Paddy straw mulch @ 5 t ha ⁻¹ at 2-3DAS	18.15	49.04	27.01
T ₆ -Isoproturon (POE) @ 100 g ha ⁻¹ + Paddy straw mulch @ 5 t ha ⁻¹ at 2-3DAS	18.08	48.08	27.32
T ₇ -Metribuzin (PE) @ 175 g ha ⁻¹	16.24	45.09	26.47
T ₈ -Metribuzin (PE) @ 175 g ha ⁻¹ + Hand weeding at 40DAS	16.33	45.32	26.48
T ₉ -Metribuzin (PE) @ 175 g ha ⁻¹ + Paddy straw mulch @ 5 t ha ⁻¹ at 2-3DAS	18.56	50.03	27.07
T ₁₀ -Paddy straw mulch @ 10 t ha ⁻¹ at 2-3DAS	19.73	52.60	27.27
T ₁₁ -Hand weeding at 20 and 40DAS	20.31	53.64	27.46
T ₁₂ -Weedy check	13.03	36.07	26.53
SEM±	0.77	2.20	-
CD (P=0.05)	2.28	6.47	-

Reference

1. Anonymous. Annual report Ministry of Agriculture, 2018-19.
2. Kumar S, Kumar A, Rana SS, Chander N, Angiras NN. Integrated weed management in mustard. *Indian Journal of Weed Science*. 2012; 44(3):139-143.
3. Pandey D, Singh G, Kumar R, Rao A, Kumar M, Kumar A. Effect of weed management practices on growth and yield of Indian mustard. *Journal of Pharmacognosy and Phytochemistry*. 2019; 8(4):3379-3383.
4. Patel HB, Patel GN, Ali S, Patel DM, Patel NH. Effect of integrated weed management on growth, yield and weed parameters in mustard. *Crop Research*. (0970-4884) 2013; 46(1-3):109-114.
5. Rajak DR, Patel HA, Chaudhari KN, Patel N.K, Panigrahy S, Parihar JS. Spatial temporal sowing pattern of rapeseed-mustard crop in India. *International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences*, -8/W20, 38, 2011.