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Influence of Weed Management Practices and Biochar on Weed Dynamics of Fenugreek (*Trigonella foenum-graecum* L.)

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ABSTRACT

A field experiment was conducted at Instructional farm, Rajasthan College of Agriculture, MPUAT, Udaipur (Rajasthan) during *rabi* season 2021-22 and 2022-23 to study the influence of weed management practices and biochar on weed dynamics of fenugreek. The experiment consists of eight weed management treatments and three biochar levels thereby involving 24 treatment combinations replicated thrice in factorial randomized block design. The pooled results revealed that pre-emergence application of oxyfluorfen 120 g ha^{-1} recorded significantly lowest density and dry matter of narrow-leaved, broad-leaved and total weeds and highest weed control efficiency (78.28%).

Key words: *Fenugreek, Oxyfluorfen, Weed control efficiency, Weed density.*

Introduction

Fenugreek (*Trigonella foenum graecum* L.) is most valuable seed spices crop primarily grown in arid and semi-arid regions of India during the *rabi* season. India occupies a prime position among the fenugreek growing countries of the world with 1.45 lakh ha area with a production of 2.29 metric tonnes. Among the states, Rajasthan, Madhya Pradesh and Gujarat are the major fenugreek producing states. Among the states, Rajasthan is the largest fenugreek growing state and occupies 0.67 lakh ha area with an annual production of 0.87 metric tonnes (Directorate of Economics and Statistics, 2023).

The average yield of fenugreek is significantly lower than its potential, which may be due to many factors. Among these, weed infestation are considered as a major constraint. Weeds have been identified as a serious problem since they create biotic stress in realizing the genetic yield potential of this valuable crop. Weeds reduce grain yield of this crop up to an extent of 63.72 per cent (Malunjkar *et al.*, 2022). The most intense competition from weeds occurs within the first 25-30 days after sowing; leading to a severe decline in seed yield of fenugreek (Tripathi and Singh, 1993). Manual weeding at right stage is difficult because of labor-intensive, time-consuming and expensive in nature. Under such conditions, use of herbicide with suitable dose remains the pertinent choice for controlling the weeds. In present study oxadiargyl, oxyfluorfen and imazethapyr have been taken for testing at different doses for control of diversified weed flora. Keeping the above fact, the study was undertaken to evaluate the effect of weed management practices and biochar on weed dynamics of fenugreek in Southern

Rajasthan.

Materials and Methods

A field experiment was carried out at Instructional Farm, Rajasthan College of Agriculture, MPUAT, Udaipur (Rajasthan) during *rabi* season 2021-22 and 2022-23. The experiment comprised of eight weed management treatments *viz*., oxadiargyl 100 g ha^{-1} PE, oxadiargyl 120 g ha^{-1} PE, oxyfluorfen 100 g ha^{-1} PE, oxyfluorfen 120 g ha^{-1} PE, imazethapyr 70 g ha^{-1} PE, imazethapyr 100 g ha^{-1} PE, weed-free and weedy check and three biochar levels *viz*., control, biochar 1 t ha^{-1} and biochar 2 t ha^{-1}, thereby involving 24 treatment combinations replicated thrice in factorial randomized block design. Fenugreek variety PRM 45 was sown at 30 cm row-to-row spacing using 25 kg seed ha^{-1}. All the recommended improved practices were followed in this experiment including fertilizers and plant protection measures. All the herbicides were applied as per treatment by using knapsack sprayer fitted with a flat fan nozzle using 500 litres of water $hectare^{-1}$. Density of weed at 30 DAS was recorded m^{-2} with the help of 0.25 m^{-2} quadrate. In each treatment weeds were counted and the mean data were converted to per square metre and subjected to square root transformation $\sqrt{X} + 0.5$ to normalize their distribution (Gomez and Gomez, 1984). The weeds were dried at 65 ºC temperature in oven till a constant weight was obtained which was expressed as weed dry matter. Weed control efficiency of each treatment was computed by using the following formula given by Mani *et al*. (1968).

$$\text{WCE (\%)} = \frac{x - y}{x} \times 100$$

Where,
WCE = Weed control efficiency,
X= Weed dry matter in weedy check
y = Weed dry mater in treated plot

Results

Effect of herbicide on weed

The experiment field of fenugreek was infested with *Chenopodium album*, *Chenopodium murale*, *Fumeria parviflora*, *Malva parviflora*, *Melilotus indica*, *Convolvulus arvensis* and *Phalaris minor* weeds during *rabi* season. The experimental plot dominated by broad-leaved weeds followed by narrow-leaved weeds. The density and dry matter of weeds under present study was significantly reduced due to various weed management treatments compared to weedy check. Among herbicidal treatments, pre-emergence application of oxyfluorfen 120 g ha^{-1} recorded lower weed density (2.28, 6.34 and 6.70 m^{-2}, respectively) and dry matter (0.72, 9.18 and 9.90 g m^{-2}, respectively) of narrow-leaved, broad-leaved and total weeds which was significantly superior over other treatments and weed check. However, the next order of superiority was recorded under pre-emergence application of oxyfluorfen 100 g ha^{-1} and oxadiargyl 120 g ha^{-1}. Maximum weed control efficiency was observed with application of oxyfluorfen 120 g ha^{-1} PE over other herbicidal treatment in fenugreek. Application of biochar to fenugreek crop did not produce any significant effect on density and dry matter of both the category of weeds.

Discussion

The lowest density and dry matter of weeds in fenugreek recorded under pre-emergence application of oxyfluorfen 120 g ha^{-1}. This might be due to the fact that this treatment checked early growth of weeds right from their germination (as it was soil applied) and late emerging weeds were effectively controlled by residual effect of herbicide and smothering effect of fenugreek (due to better growth at earlier stage because of weed free condition) on weeds. Hence, crop could remain weed free for comparatively longer duration in general and during critical period of crop-weed competition. The higher weed control efficiency was recorded under oxyfluorfen was mainly because of the fact that it is a broad spectrum herbicide and its persistence and prolonged activity in the soil. The results so obtained are in close conformity with finding of Patel *et al.* (2018), Malunjkar *et al.* (2022) and Choudhary *et al.* (2022).

Conclusion

Based on the findings of present study, it can be concluded that pre-emergence application of oxyfluorfen at 120 g ha^{-1} was superior in curbing weed density, reducing weed dry matter and higher weed control efficiency in fenugreek crop under Southern Rajasthan condition.

Table 1. Influence of weed management practices and biochar on weed density, weed dry matter and weed control efficiency of fenugreek at 30 DAS (Pooled data of two years)

Treatments	Weed density (No. m^{-2})			Weed dry matter (g m^{-2})			Weed control efficiency (%)		
	Narrow-leaved weeds	Broad-leaved weeds	Total weeds	Narrow-leaved weeds	Broad-leaved weeds	Total weeds	Narrow-leaved weeds	Broad-leaved weeds	Total weeds
Weed management									
Weedy check	4.78 (22.40)	13.53 (182.56)	14.33 (204.96)	1.46	31.07	32.52	0.00	0.00	0.00
Oxadiargyl 100 g ha^{-1} PE	2.63 (6.42)	7.74 (59.38)	8.14 (65.80)	1.02	12.84	13.87	71.29	67.42	67.84
Oxadiargyl 120 g ha^{-1} PE	2.36 (5.09)	6.92 (47.42)	7.28 (52.51)	0.83	10.40	11.23	77.24	73.99	74.34
Oxyfluorfen 100 g ha^{-1} PE	2.30 (4.78)	6.82 (46.08)	7.16 (50.86)	0.81	10.01	10.82	78.64	74.72	75.15
Oxyfluorfen 120 g ha^{-1} PE	2.28 (4.69)	6.34 (39.76)	6.70 (44.46)	0.72	9.18	9.90	79.01	78.19	78.28
Imazethapyr 70 g ha^{-1} PE	3.15 (9.46)	8.94 (79.49)	9.46 (88.95)	1.21	15.10	16.31	57.67	56.39	56.53
Imazethapyr 100 g ha^{-1} PE	2.68 (6.71)	7.87 (61.43)	8.28 (68.14)	1.06	13.22	14.28	70.01	66.32	66.72
Weed-free	0.71 (0.00)	0.71 (0.00)	0.71 (0.00)	0.00	0.00	0.00	100.00	100.00	100.00
SEm±	0.02	0.06	0. 06	0.01	0.16	0.17			
CD (P=0.05)	0.06	0.16	0.16	0.04	0.45	0.47			
Level of biochar									
Control	2.63 (7.52)	7.41 (65.32)	7.81 (72.84)	0.90	12.86	13.76			
Biochar 1 t ha^{-1}	2.60 (7.35)	7.30 (63.54)	7.70 (70.89)	0.88	12.60	13.47			
Biochar 2 t ha^{-1}	2.61 (7.46)	7.37 (64.70)	7.77 (72.16)	0.89	12.73	13.62			
SEm±	0.01	0.03	0.04	0.01	0.10	0.10			
CD (P=0.05)	NS	NS	NS	NS	NS	NS			

Values are $\sqrt{x + 0.5}$ transformed and actual values are in parentheses

Conflict of Interest- None

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