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Short communication

Economic feasibility of weed management practices in fenugreek

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ABSTRACT

A field experiment on economic feasibility of weed management practices in fenugreek was conducted during *rabi* season of 2007-08 and 2008-09 at National Research Centre on Seed Spices, Ajmer (Rajasthan) for finding suitable method of weed control. The experiment was laid in randomised block design with three replications. Results revealed that besides weed free treatment significantly higher plant height, number of branches per plant, number of nodules per plant, dry weight of nodules per plant and dry matter accumulation per plant at (60 DAS, 90 DAS and at harvest) were recorded with the pre-emergence application of oxadiargyl @ 75 g/ha + 1 hand weeding at 45 days after sowing (DAS) but pre-emergence application of pendimethalin @ 1 kg/ha + 1 hand weeding at 45 DAS was at par with it. Similarly, yield attributes like number of pods per plant, length of pod, pod weight, number of seeds per pod and test weight as well as seed and straw yields of fenugreek were higher with pre-emergence (PE) application of oxadiargyl @ 75 g/ha + 1 hand weeding at 45 DAS. Besides weed-free treatment, the lowest dry weight of weed at harvest, weed index and the highest weed control efficiency was obtained under pre-emergence application of oxadiargyl @ 75 g/ha + 1 hand weeding at 45 DAS. The highest gross and net returns were obtained in weed free treatment followed by pre-emergence application of oxadiargyl @ 75 g /ha + 1 hand weeding at 45 days after sowing but highest B : C ratio (4.38) was recorded with pre-emergence application of oxadiargyl @ 75 g/ha + 1 hand weeding at 45 DAS.

Key words: Fenugreek, weed management, weed index, herbicides, seed yield, economics.

Fenugreek (*Trigonella foenum-graecum* L.) locally known as *methi* is an important multipurpose winter season seed spice crop. It is mainly grown in Rajasthan, Gujarat, Madhya Pradesh, Maharashtra, Haryana, Punjab, Bihar and Andhra Pradesh. The seeds of fenugreek are used as a condiment and seasoning agent for garnishing and flavourings dishes. Fenugreek seed contains 40-45 per cent carbohydrate, mainly high in lysine and tryptophan, 5-10 per cent fixed oil (lipids), pyridine-type alkaloids, trigonelline (0.2-0.36%), choline (0.5%), gentiamine and carpaines, the falvanoids apigein, luteolin, orientin, quercetin, vitexin and isovitexin; free amino acids, such as 4-hydroxy isoleucine (0.09%), calcium and iron; saponins (0.6-1.7%), cholesterol and sitostera, vitamins A, B_1, C and nicotinic acid and 0.015 per cent volatile oils (Bruneton, 2; Budavari, 1; Newall *et al.*, 9). Weed is an important factor responsible for loss in crop production. Simultaneous emergence and rapid growth of weed leads to severe weed crop competition for light, moisture, space and nutrients. Precise information on weed management in fenugreek is essential and inevitable for getting healthy growth of plants. Initially it being a slow growing seed spice hence more prone to crop weed competition therefore, fenugreek's field should be kept weed-free at initial stage of crop establishment. Manual weeding is commonly employed practice but availability of labour itself is a problem, besides its high cost. Therefore, it is essential to find out an appropriate and economical method of weed control to keep fenugreek fields weed-free at the critical stages of crop-weed competition. Initial slow growth of fenugreek leads to severe weed crop competition and reduces growth as well as yield as high as 91.4 per cent (Mali and Suwalka, 5). Besides, other practices of weed management, pre-emergence application of herbicides may lead to cost effective control of the weeds right from the start, which otherwise may not be possible by manual weeding. Keeping in view the above mentioned facts, present study was carried out to evaluate economic feasibility of weed management practices in fenugreek.

The experiment on effect of weed management practices on growth, yield attributes, seed yield and economics of fenugreek as well as weed indices was conducted on research farm of NRCSS, Ajmer (Rajasthan). Nine weed control treatments consisting of weedy check, hand weeding at 45 DAS, pendimethalin (PE) @ 1 kg/ha, oxadiargyl (PE) 75 g/ha, fluchloralin(PE) 1 kg/ha , pendimethalin (PE) @ 1 kg/ha + 1 hand weeding at 45 DAS, oxadiargyl (PE) 75 g + 1 hand weeding at 45 DAS , fluchloralin 1 kg/ha (PE) + 1 hand weeding at 45 DAS and weed-free treatment were laid out in a randomised block design

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with three replications during *rabi* season of 2007-08 and 2008-09. The soil of the experimental field was sandy loam sand having low organic matter (0.23%), available nitrogen (178.65 kg/ha), phosphorus (12.0 kg/ha) and sufficient available potassium (165 kg/ ha), slightly alkaline with pH (8.04) and EC (0.076 dS/m). The fenugreek variety Ajmer Methi-1 (AM-1) was sown on 15th October during both the years on the same site at 30 cm row to row and 10 cm plant to plant spacing with seed rate of 20 kg/ha. Irrigation was applied immediately after sowing. All other standard cultural practices were followed during whole cropping season. Pre-emergence application of oxadiargyl, pendimethalin and fluchloralin were applied with the help of a knapsack sprayer fitted with flat fan nozzle with a spray volume of 600 l per ha. In manual control treatments, weeds were uprooted and removed at 45 DAS as per treatments. In weed free plots, the weeds were removed manually after every seven days for ensuring complete weed-free conditions. After uprooting of weeds, they were sun-dried completely till reached to constant weight and finally the dry weight was recorded for each treatment and expressed as q/ha. Weed control efficiency and weed index were calculated by the formulae suggested by Kondap and Upadhyaya (4), and Gill and Kumar (3).The response of all the weed management treatments observed consistently uniform during both the years. Hence, statistical analysis was done on pooled data of both the years as per the procedure prescribed by Panse and Sukhatme (11).

Besides, weed-free treatment, the lowest dry weight of weed (3.97 q/ha) and weed index (7.6%) at harvest and highest weed control index (95.48%) was recorded with pre-emergence application of oxadiargyl 75 g + 1 hand weeding at 45 DAS. The higher weed control efficiency, lower weed index and dry weight of weed under pre-emergence application of oxadiargyl 75 g + 1 hand weeding at 45 DAS was due to effective control of weeds from the field and weeds those escaped from herbicidal control were removed by hand weeding at 45 DAS. The combined effect of herbicide and hand weeding at 45 DAS resulted in remarkably less dry weight of weeds (Table 1).These findings are akin to reports of Patel *et al.* (10), and Mehriya *et al.* (6).

Besides, weed free treatments, the highest plant height, number of branches/plant and dry matter accumulation/plant at harvest as well as number of nodules and dry weight of nodules per plant and at all the growth stages were recorded with the pre-emergence application of oxadiargyl 75 g/ha + 1 hand weeding at 45 DAS being at par with pre-emergence application of pendimethalin @ 1 kg/ha + 1 hand weeding at 45 DAS (Tables 1 & 2). The lowest values of all these parameters were recorded under weedy check .Weeds were effectively controlled under these treatment, hence there was no severe competition by weeds for moisture and nutrients which created congenial conditions for better absorption of water and nutrients which maintained higher water potential in leaf and plant resulting in higher plant height, number of branches/ plant, dry matter accumulation/ plant. These results corroborate with those reported by Rathore *et al.* (12), Patel *et al.* (10), Mehriya *et al.* (6), and Mehta *et al.* (8).

Yield attributes as well as seed and straw yield were significantly influenced with the application of different weed control treatments. Results revealed that besides weed free treatments the highest yield attributes like number of pods/ plant (49.77), length of pod (13.20 cm), pod weight (609.10 mg), number of seeds/ pod (17.42) and test weight (20.41 g) as well as seed yield (20.81 q/ha) and straw yield (32.78 q/ ha) were recorded with the pre-emergence application of oxadiargyl 75 g + 1 hand weeding at 45 DAS, however it was at par with pre-emergence application of pendimethalin @ 1 kg/ha + 1 hand weeding at 45 DAS. The lowest values of yield attributes and yield were recorded in weedy check (Table 3). It might be due to complete removal of weeds throughout the crop growth period with pre-emergence application of oxadiargyl 75 g/ha along with removal of weed by hand weeding, which have resulted in maintaining high soil fertility status by way of removing less plant nutrients through weeds which created favourable effect on yield attributes. While, increase in the yield attributes under pre-emergence application of oxadiargyl 75 g/ha + 1 hand weeding at 45 DAS might be due to effective control of weeds like *Chenopodium album* and *C. murale* resulting in lesser competition of weeds, which ultimately resulted in the better utilization of nutrients and moisture available in the soil by the crop The results are in accordance with those of Rathore *et al.* (12), Patel *et al.* (10), Mehriya *et al.* (6), and Meena and Mehta (7).

Gross return, net return and B:C ratio were significantly influenced with the application of different weed control treatments. The highest gross return of Rs. 89,689/ha was obtained in weed-free treatment followed by pre-emergence application of oxadiargyl @ 75 g /ha + hand weeding at 45 DAS (Rs. 83,244/ha) however the highest net return (Rs. 67,774/ha) and B:C ratio (4.38) was recorded with the application of oxadiargyl @ 75 g/ha (PE) + 1 hand weeding at 45 DAS. Hence, it is inferred from the investigation that the pre-emergence application of oxadiargyl @ 75 g/ha + 1 hand weeding at 45 DAS is the best economically feasible weed control treatment ultimately leads to higher yields. Yadav *et*

Table 1. Effect of weed management practices on dry weight of weed, weed control efficiency, weed index, plant height, number of branches per plant, dry matter accumulation /plant at harvest (pooled data of two years).

Treatment	Dry wt. of weed at harvest (q/ha)	Weed control index (%)	Weed index (%)	Plant height (cm)	Branches / plant	Dry matter accumulation/ plant (g)
Weedy check	92.58	0.00	56.92	74.97	6.03	9.48
Hand weeding at 45 DAS	12.21	86.38	33.52	78.43	6.10	9.79
Pendimethalin 1 kg /ha (PE)	7.39	91.57	21.98	79.43	7.03	13.30
Oxadiargyl 75 g /ha (PE)	5.14	94.28	21.31	85.23	7.06	13.90
Fluchloralin 1 kg /ha (PE)	10.09	88.57	28.56	76.18	6.77	12.36
Pendimethalin 1 kg/ha (PE) + 1 Hand weeding at 45 DAS	6.03	93.08	9.66	81.83	7.16	15.02
Oxadiargyl 75 g /ha (PE) + 1 Hand weeding at 45 DAS	3.97	95.48	7.16	85.70	7.17	15.45
Fluchloralin 1 kg /ha (PE) + 1 Hand weeding at 45 DAS	8.99	89.97	17.42	79.70	6.83	14.86
Weed-free	0.00	100	0.00	87.70	7.30	16.56
CD (P = 0.05)	3.831	4.063	7.90	2.79	0.953	1.78

Table 2. Effect of weed management practices on number of nodules, dry weight of nodules per plant and dry matter accumulation per plant at different growth stages in fenugreek (pooled data of two years).

Treatment	No. of nodules/plant		Dry weight of nodules / plant (mg)	
	40 DAS	60 DAS	40 DAS	60 DAS
Weed check (control)	4.85	9.85	9.83	19.81
Hand weeding at 45 DAS	5.84	12.14	11.87	24.30
Pendimethalin 1 kg/ha (PE)	6.25	13.43	12.88	26.78
Oxadiargyl 75 g/ha (PE)	6.87	14.26	13.81	28.56
Fluchloralin 1 kg/ha (PE)	6.03	13.25	12.25	26.15
Pendimethalin 1 kg/ha (PE) + 1 Hand weeding at 45 DAS	8.35	17.55	16.83	35.08
Oxadiargyl 75 g/ha (PE) + 1 Hand weeding at 45 DAS	8.70	18.14	17.65	36.34
Fluchloralin 1 kg/ha (PE) + 1 hand weeding at 45 DAS	7.42	15.70	14.15	31.45
Weed-free	8.90	18.95	17.92	37.14
CD (P = 0.05)	0.70	2.03	1.94	4.05

*a*l. (14) reported that application of oxadiargyl 50 g/ha produced higher seed yield of cumin statistically at par with pendimethalin at 1.0 kg/ha.

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Table 3. Effect of weed management practices on yield attributes, yield, gross return, net return and BCR of fenugreek (pooled data of two years).

Treatment	No. of pods/plant	Pod length (cm)	Pod weight (mg)	No. of seeds/pod	Test weight (g)	Seed yield (q/ha)	Straw yield (q/ha)	Gross return (Rs./ha)	Net return (Rs./ha)	B:C ratio
Weedy check (control)	21.90	12.03	556.5	15.77	17.98	9.66	16.44	38640	26040	2.07
Hand weeding at 45 DAS	37.23	12.37	566.7	15.90	18.66	14.89	24.22	59556	44956	3.08
Pendimethalin 1 kg/ha (PE)	47.50	13.07	603.1	16.63	19.06	17.50	32.33	70000	54988	3.66
Oxadiargyl 75 g/ha (PE)	47.70	13.17	606.3	16.77	19.42	17.65	32.31	70600	57130	4.24
Fluchloralin 1 kg/ha (PE)	38.50	12.77	599.6	16.30	18.95	16.00	28.72	64000	50009	3.57
Pendimethalin 1 kg/ha (PE) + 1 Hand weeding at 45 DAS	49.37	13.17	608.7	17.20	19.76	20.26	32.22	81022	64010	3.76
Oxadiargyl 75 g/ha (PE) + 1 Hand weeding at 45 DAS	49.77	13.20	609.1	17.42	20.41	20.81	32.78	83244	67774	4.38
Fluchloralin 1 kg/ha (PE) + 1 Hand weeding at 45 DAS	42.10	12.90	603.1	16.50	19.01	18.50	32.78	74000	58009	3.63
Weed free	51.37	13.60	610.6	17.43	21.7	22.42	35.00	89689	72589	4.24
CD (P = 0.05)	1.12	0.66	59.28	1.15	1.34	1.80	3.94	-	-	-

Selling price of fenugreek seed Rs. 4,000/q

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