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Influence of Irrigation Schedule and Weed Management Practices on Growth and Yield of Fenugreek (*Trigonella foenum-graecum* L.)

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ABSTRACT

Application of oxadiazon was most effective for the control of all weeds, which resulted in 96% weed control efficiency and 196% higher mean seed yield over weedy check. The maximum WUE (59.2 kg ha^{-1}) and net return (Rs. 23763 ha^{-1}) were obtained under this treatment. The interaction effect of irrigation schedule and weed management practices was not significant.

INTRODUCTION

Fenugreek commonly known as methi is one of the important seed spices in India cultivated on 50,000 hectares producing 60,000 tonnes of seeds annually. Fenugreek is raised as a **rabi** season crop and grown in all types of soil under irrigated conditions but does best on loamy soils. Water is a scare commodity, which if used judiciously alongwith suitable agrotechniques at critical plant growth stages would substantially increase both plant growth and yield. With the introduction of high yielding varieties coupled with increased use of fertilizers and irrigation weed problems have increased manifolds. Application of irrigation in proper amount and in proper time will go a long way in arresting the problem created by weeds. Uncontrolled weeds can reduce fenugreek seed yield upto 91% (Mali and Suwalka, 1987). The use of herbicides is one way to eliminate crop weed competition easily. The efficacy of herbicides also depends upon soil moisture. Keeping this view in mind, the present experiment was planned to study the effect of irrigation schedule based on critical growth stages and weed management practices on yield of fenugreek.

MATERIALS AND METHODS

A field experiment was conducted during winter seasons of 2002-03 and 2003-04 at Agronomy Farm, Anand Agricultural University, Anand. The soil was sandy loam in texture, low in organic carbon, available nitrogen and phosphorus and rich in available potassium with pH 7.8. The treatments consisted of three irrigation schedules and six weed management practices. The experiment was laid out in split plot design with allocation of irrigation schedule in main plots and weed management practices in sub-plots. The treatments were replicated thrice. Pendimethalin, fluchloralin and oxadiazon were applied at 0.75, 1.0 and 0.5 kg ha^{-1}, respectively each as pre-emergence two days after sowing (DAS) in 500 l ha^{-1} of water. Fenugreek variety GF-1 was sown by drilling on November 7, 2002 and November 10, 2003, respectively at row spacing of 30 cm at 25 kg seed ha^{-1} and fertilized with 20 : 40 kg NP ha^{-1} as basal only.

RESULTS AND DISCUSSION

Effect on Weeds

The major weeds observed in the experimental field were *Chenopodium album* (32.1%), *Chenopodium murale* (10.6%), *Melilotus indica* (18.8%), *Cyprus rotundus* (8.0%) and *Asphodelus tenuifolius* (14.0%). Other weeds with low density (16.5%) were *Eragrotis major, Dactyloctenium aegyptium, Eleusine indica, Phyllanthus niruri* and *Portulaca oleracea*. Weed

density at 20 DAS was not influenced by different irrigation schedules. Irrigations at seedling, branching, flowering and pod formation stages and irrigations at seedling, branching, flowering, pod formation and pod development stages contributed significantly lower total weed count at 40 DAS during first year of study only. Similar effects were observed on dry weight of weeds at harvest. Oxadiazon at 0.5 kg ha^{-1} caused lower weed density and weed dry weight than other herbicides (Table 1).

Effect on Crop

Thousand-seed weight was significantly higher when irrigation was applied at all five critical growth stages of crop. Weed management practices significantly affected the yield attributes of fenugreek. Maximum values of all the yield attributes were recorded under oxadiazon application and the minimum under weedy check condition. Reduced crop-weed competition due to oxadiazon created a favourable condition for better crop growth and development.

Seed and haulm yields of fenugreek were affected by irrigation schedules. Significantly higher seed and haulm yields were recorded when irrigations were done at seedling, branching, flowering, pod formation and pod development stages. All weed control treatments produced significantly more seed and haulm yields than weedy check (Table 2). Oxadiazon at 0.5 kg ha^{-1} was most

Table 1. Effect of treatments on weeds in fenugreek

Treatment	Weed density (No. m^{-2})				Dry weight of weeds at harvest (kg ha^{-1})	
	20 DAS		40 DAS			
	2001-02	2002-03	2001-02	2002-03	2001-02	2002-03
Irrigation schedules						
Irrigation at seedling, branching and pod formation stages	1.94 (174)	2.03 (195)	1.61 (120)	1.66 (122)	2.65 (1086)	2.57 (1100)
Irrigation at seedling, branching, flowering and pod formation stages	2.01 (169)	2.05 (195)	1.48 (107)	1.59 (102)	2.51 (217)	2.48 (671)
Irrigation at seedling, branching, flowering, pod formation and pod development stages	1.89 (175)	2.07 (188)	1.49 (92)	1.62 (104)	2.51 (506)	2.49 (555)
LSD (P=0.05)	NS	NS	0.025	NS	0.054	0.063
Weed management practices						
Weedy	2.58 (382)	2.63 (434)	2.53 (361)	2.65 (458)	3.45 (3025)	3.48 (3352)
Hand weeding at 20 & 40 DAS	2.12 (133)	2.19 (165)	0.86 (10)	1.14 (15)	2.16 (129)	2.08 (123)
Hand weeding at 20 DAS & interculturing at 40 DAS	2.28 (205)	2.30 (209)	1.76 (62)	1.67 (48)	2.31 (206)	2.23 (177)
Pendimethalin	2.40 (254)	2.44 (279)	1.42 (39)	1.35 (24)	2.76 (586)	2.69 (511)
Fluchloralin	1.76 (59)	1.76 (59)	1.94 (92)	1.90 (79)	2.59 (399)	2.58 (386)
Oxadiazon	0.54 (5)	0.98 (11)	0.66 (6)	1.02 (11)	2.05 (116)	2.01 (105)
LSD (P=0.05)	0.002	0.105	0.036	NS	0.002	0.089

Weed density and weed dry weight values are subjected to square root transformation.
Values in parentheses are original.
NS–Not Significant.

Table 2. Effect of treatments on yield, WUE and economics of fenugreek

Treatment	1000-seed weight (g)		Seed yield (kg ha^{-1})		Haulm yield (kg ha^{-1})		Water use efficiency (kg ha^{-1})	Net return (Rs. ha^{-1})
	2001-02	2002-03	2001-02	2002-03	2001-02	2002-03		
Irrigation schedules								
Irrigation at seedling, branching and pod formation stages	3.7	3.9	1457	1470	2203	2176	52.3	14850
Irrigation at seedling, branching, flowering and pod formation stages	4.3	4.0	1561	1537	2373	2291	45.6	16732
Irrigation at seedling, branching, flowering, pod formation and pod development stages	5.8	5.0	1658	1625	2526	2431	41.0	18017
LSD (P=0.05)	0.48	0.12	63	55	96	115	-	-
Weed management practices								
Weedy	2.4	2.4	698	664	1061	1702	20.0	4578
Hand weeding at 20 & 40 DAS	4.7	3.9	1843	1808	2801	2522	53.7	2061
Hand weeding at 20 DAS & interculturing at 40 DAS	3.9	4.0	1657	1662	2519	2427	48.8	18284
Pendimethalin	3.3	5.3	1844	1829	2809	2499	54.0	21378
Fluchloralin	5.6	3.8	1280	1285	1956	2133	37.7	12797
Oxadiazon	7.5	6.3	2012	2013	3059	2513	59.2	23763
LSD (P=0.05)	0.66	0.17	64	78	135	162	-	-

effective in reducing crop-weed competition and producing higher seed yield. The highest seed yield due to herbicides in fenugreek was also reported by Dungarwal *et al.* (2002).

The interaction effects between irrigation schedules and weed management practices were non-significant.

The highest value of WUE (52.3 kg ha^{-1}) was obtained when irrigations were done at seedling, branching and pod formation stages. Similarly, it was found to be maximum (59.2 kg ha^{-1}) under the application of oxadiazon at 0.5 kg ha^{-1} as pre-emergence. This might be due to minimum transpiration loss of water through weeds, which were effectively controlled by this treatment. In terms of monetary return, irrigations at seedling, branching, flowering, pod formation and pod development stages recorded the highest net return (Rs. 18017 ha^{-1}), while in case of weed management practices, maximum net return was obtained with oxadiazon at 0.5 kg ha^{-1} (Rs. 23763 ha^{-1}) followed by pendimethalin at 0.75 kg ha^{-1} (Rs. 21378 ha^{-1}).

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