

Effect of irrigation and phosphorus on seed yield and its attributes of fenugreek (*Trigonella foenum-graecum*)

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ABSTRACT

An experiment was conducted during the winter (*rabi*) seasons of 1987-88 and 1988-89 to study the effect of 4 levels each of irrigation and phosphorus on yield of fenugreek (*Trigonella foenum-graecum* L.). Seed, straw and biological yields along with all growth and yield parameters were maximum with irrigation at an irrigation water depth : cumulative pan evaporation (IW : CPE) ratio of 1. Phosphorus @ 40 kg/ha significantly increased the seed yield and growth and yield-attributing characters. Interaction effect of irrigation and phosphorus was significant. The maximum seed yield was recorded when crop was irrigated at an IW : CPE ratio of 1 with 60 kg P/ha.

The yield of fenugreek (*Trigonella foenum-graecum* L.) is very low in India and very little work on irrigation and phosphatic fertilization has been done. Therefore the present experiment was conducted to find out their effects on the fenugreek.

MATERIALS AND METHODS

The field experiment with fenugreek variety 'Prabha' was conducted at Jobner, during the winter (*rabi*) seasons of 1987-88 and 1988-89. The soil was loamy sand, low in N, medium in P and rich in available K. The 0.30 cm soil layer had field capacity 11.5 and 12.5%, permanent wilting point 3.15 and 3.25% and bulk density 1.44 and 1.53 mg/m³ respectively for 1987-88 and 1988-89. Treatment consisting of 4 levels each of irrigation [0.4, 0.6, 0.8 and irrigation

water depth : cumulative pan evaporation (IW : CPE) ratio of 1] and fertilizer (0, 20, 40 and 60 kg P₂O₅/ha) in split-plot design, had irrigation in main plots and phosphatic fertilizer in subplots with 3 replications. Crop was sown in rows at 30 cm apart on 15 November and 28 October in 1987-88 and 1988-89 respectively. A uniform dose of 30 kg N/ha along with P as per treatment was applied at sowing time through urea and single superphosphate respectively. Irrigations given were 3, 4, 6 and 7 during 1987-88 and 3, 4, 7 and 8 during 1988-89 when applied at 0.4, 0.6, 0.8 and 1.0 IW : CPE ratio respectively. Measured quality (45 mm) of water was applied at each irrigation. There was 63.0 and 25.2 mm rainfall during 1987-88 and 1988-89 respectively in the crop season.

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Table 1. Effect of irrigation and phosphorus on growth, yield attributes, yield and water-use efficiency on fenugreek (Pooled data of 1987-88 and 1988-89)

Treatment	Plant height (cm)	Branches/plant	Pods/plant	Seeds/pod	Pod length (cm)	Test weight (g)	Seed yield (q/ha)	Straw yield (q/ha)	Biological yield (q/ha)	Harvest index (%)	WUE (kg seed/ha-mm)
<i>Irrigation (IW : CPE ratio)</i>											
0.4	33.7	4.5	19.3	14.8	9.0	9.37	6.69	13.74	19.93	32.63	3.73
0.6	33.7	5.4	22.2	15.9	9.6	10.54	8.77	17.29	26.06	33.56	3.90
0.8	44.4	6.0	27.0	16.5	9.9	12.38	11.84	20.71	32.55	36.02	3.52
1.0	51.3	6.4	28.3	16.6	10.1	13.44	12.86	22.80	36.14	35.17	3.38
CD (P = 0.05)	2.6	0.3	1.8	0.7	0.4	0.53	1.08	0.95	1.31	1.11	0.13
<i>P₂O₅ (kg/ha)</i>											
0	40.8	5.4	20.7	15.7	9.5	10.98	8.83	17.61	26.44	33.12	3.14
20	42.4	5.6	24.5	16.0	9.6	11.43	10.17	18.81	28.97	34.77	3.60
40	42.6	5.7	25.8	16.2	9.7	11.73	10.78	19.40	30.18	35.15	3.83
60	41.7	5.7	25.4	16.0	9.7	11.60	10.39	19.23	29.62	34.33	3.69
CD (P = 0.05)	NS	NS	1.5	NS	NS	0.35	0.45	0.95	1.09	1.26	0.34

IW : CPE, Irrigation water depth: cumulative pan evaporation
WUE, Water-use efficiency

RESULTS AND DISCUSSION

Effect of irrigation

Plant height, branches/plant and test weight were increased significantly up to irrigation at an IW : CPE ratio of 1.0, whereas pods/plant increased up to 0.8 and pod length and seeds/pod up to of 0.6. (Table 1). Seven irrigations at an IW : CPE ratio of 0.8 significantly increased the seed, straw and biological yields over the lower frequency of irrigation. The differential behavior for seed and straw yields might be due to higher water requirement of the crop coupled with low water-retention capacity of the loamy sand soil. The findings are in agreement with the findings of Pareek (1983), Bhati (1986) and Bhati (1989). The water-use efficiency increased significantly up to an IW : CPE ratio of 0.6, than it declined significantly as IW : CPE ratio increased from 0.6 to 1.0.

Effect of phosphorus

Application of P @ of 20 kg/ha increased pods/plant, test weight, straw yield, harvest index and water-use efficiency from the control (Table 1). However, seed and biological yields increased significantly up to 40 kg P_2O_5 /ha. Phosphorus did not affect the plant height, seeds/pod and pod length. Dasora (1980), Rathore and Manohar (1989) and Bhati (1989) also reported corroborative results.

Interaction effect

The effect of interaction between irrigation levels and phosphorus was observed on test weight and biological yield during 1987-88 and in pooled analysis on seed yield (Table 2). There was no significant increase in test weight and biological yield with P over the control when irrigation supply limited up to 3 irrigations at an IW : CPE ratio of 0.4, but with 4-7

Table 2. Interaction effect of irrigation and phosphorus on 1,000-grain weight and biological yield (q/ha) and seed yield (q/ha)* of fenugreek

Treatment	1,000-seed weight (g)			Biological yield (q/ha)			Seed yield (q/ha)		
	P ₀	P ₂₀	P ₄₀	P ₀	P ₂₀	P ₄₀	P ₀	P ₂₀	P ₄₀
<i>Irrigation (IW : CPE ratio)</i>									
0.4	9.48	9.54	9.73	9.45	20.88	22.65	19.78	6.39	7.07
0.6	10.58	11.67	11.96	11.27	25.79	29.08	27.75	8.14	9.27
0.8	12.60	13.83	13.60	13.47	31.83	37.49	36.73	9.98	11.84
1.0	13.60	13.95	14.27	14.35	36.41	40.20	43.86	10.81	12.29
CD (P = 0.05)	0.39				2.21			0.76	

IW : CPE, Irrigation water depth : cumulative pan evaporation

* Pooled data

irrigations resulted in significant increase only with 20 kg/ha over the control. Fenugreek-seed yield during 1988-89 was also affected due to irrigation and levels of P with increase in irrigation number (at 0.8 and 1.0 IW : CPE ratios). The seed yield increased significantly with P up to 40 kg/ha, but in lower frequencies (at 0.4 and 0.6 IW : CPE ratio) the response to P was only up to 20 kg/ha.

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