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Interaction Effects of Different Sowing Dates and Stage of Pinching on Growth, Yield and Economics of Fenugreek (*Trigonella foenum – graecum* L.)

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ABSTRACT

The study was conducted to find out the optimum date of sowing and pinching level in fenugreek in open field condition at College of Horticulture, Mudigere, UAHS, Shivamogga during 2014-15. The experiment consisted of five dates of sowing (1st October, 15th October, 1st November, 15th November and 1st December) and three stage of pinching (Pinching at 25 DAS, Pinching at 35 DAS and No pinching) which were assessed in all possible combinations for growth and yield.Among the different treatment combinations D_2P_2 (Sowing on 15th October and Pinching at 35 DAS) recorded maximum plant spread, number of branches per plant, dry matter production of leaves (DMPL), dry matter production of stem (DMPS), dry matter production of pods (DMPP), dry matter production of seeds (DMPS), total dry matter production (TDMP), number of pods per plant, length of pod, fresh weight of pod, number of seeds per pod, weight of seeds per pod, seed yield, harvest index and 1000 seed weight. Whereas, maximum plant height was recorded in D_3P_3 (Sowing on 1st November and no pinching).While, lower values for these parameters were observed in D_1P_1 (Sowing on 1stOctober and Pinching at 25 DAS).

Key words: *Fenugreek, Dates of sowing, Pinching, Growth, Yield, Economics.*

INTRODUCTION

Fenugreek *Trigonella foenum - graecum* L. is one of the important winter seasonleguminous crops and it is one of the major seed spices grown in India, which apart from being used for its greens and seeds as condiment. It is commonly known as *methi*, belongs to family Leguminosae and a native of South-Eastern Europeand Western Asia with chromosome number 2n = 16. India occupies an important position among the fenugreek growing countries of the world but, the seed yield obtained under Indian condition is very low (1,093 kg/ha) as compared to Morocco (2,000 kg/ha), which is the major competitor in the world market. The plant is erect or spreading, growing up to a height of 30-90 cm.

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Indian Ayurvedic and Traditional Chinese Medicines has recognized it as a galactogogue or lactation stimulant in women after child birth as well as for its ability to treat wounds and sore muscles[16]. Seed in powder or germinated form exhibits anti-diabetic properties[6]. There is a need to standardize various agronomic techniques to improve seed yield in fenugreek. Date of sowing is an important agronomic factor affecting productivity of the crop owing to changes in environmental conditions to which phonological stages of crop are exposed and among the various cultural practices, proper time of sowing is a prerequisite[11]. The optimum sowing date paves the way for better-use of time, light, temperature, precipitation and other factors. Pinching is done to affect canopy structure and is normally accomplished by removing the growing tip. Cutting management or pinching practice greatly influences the growth and yield attributes in fenugreek[3]. It has direct relationship with plant form and subsequent potential for yield increment too[10]. Several attempts have been made in cultivation of fenugreek in the past to increase the productivity and quality, out of which optimum date of sowing and pinching plays an important role to boost the productivity. There is a need to increase both seed yield and quality in fenugreek.

MATERIAL AND METHODS

A field experiment was conducted at college of Horticulture, Mudigere during the period from October 2014 to March 2015.The experiment was designed to study the effect of sowing dates and stage of pinching on growth and yield of fenugreek (*Trigonella foenum - graecum* L.). The experiment was laid out in Factorial Randomised Complete Block Design (FRCBD) with three replications. Size of each plot was 2.5 m x 1.2 m. The experiment consists of five dates of sowing (1st October, 15th October, 1st November, 15th November and 1st December) and three levels of pinching (Pinching at 25 DAS, Pinching at 35 DAS and No pinching). FYM and fertilizers were applied as per the recommendations. Seeds were soaked overnight and they were treated with Captan 2g/kg seeds. Later they were shade dried for half an hour. The seeds were used with the seed rate of 12 – 15 kg/ha and 2-3 seeds were sown per hole. Seeds were sown at 15 days' intervals starting from 1stOctober to 1stDecember, 2014 at a spacing of 30x10 cm. The apical buds were removed by pinching manually without causing damage to the plant parts as per treatments. The other cultural practices like irrigation, weeding, and plant protection operation were carried out as and when required. The observations were recorded on growth and yield parameters.

RESULTS AND DISCUSSION

Growth parameters

The data present in table 1 revealed that all the growth parameters were significantly influence by the interaction effects of different sowing dates and stage of pinching.

The treatment combination D_3P_3 (Sowing on 1st November and no pinching) recorded significantly maximum plant height (48.24 cm) while, D_1P_1 (Sowing on 1st October and pinching at 25 DAS) registered minimum plant height (21.24 cm). This may be due to prevailing temperature in the month of November. Further because of no pinching plants continued its growth and resulted in maximum height. Similar results were also observed by Israel[7] in coriander, Vasudevan *et al.*[17], Nandre *et al.*[11], in fenugreek and Krishnaveni *et al.*[9], in fenugreek. With respect to number of branches per plant and plant spread. Among the treatment combination, D_2P_2 (Sowing on 15th October and pinching at 35 DAS) recorded significantly higher number of branches per plant (12.06) and plant spread (51.62 cm^2). Under this combination, the plants had adequate opportunity for photosynthesis, resulting in increasing the number of branches and plant spread due to pinching of apical bud. The results are in agreement with Ayub *et al.*[1], in fennel, Israel[7] and Guha *et al.*[5], in coriander, Vasudevan *et al.*[17], and Krishnaveni *et al.*[9], in fenugreek.

Whereas, the maximum leaf area (5.056 cm^2), leaf area index (0.019) and leaf area duration of the crop (0.446 days) was observed in the treatment combination D_3P_2. Crop sown on 1st November enjoyed a favourable environmental condition at the crop growth stage which is evident from the increased leaf area, leaf area index and leaf area duration of the crop and pinching has resulted in the increase of the leaf parameters because of more photosynthetic activity. The results are in line with Ayub *et al.*[1], in fennel and Singh *et al.*[15], in mustard. The treatment combination D_2P_2 (Sowing on 15th October and pinching at 35 DAS) recorded maximum dry matter of leaves (0.143 g), stem (1.196 g), pods (0.326 g), seeds (0.266 g) and total dry matter production (2.00 g). This might be due to temperature mediated effect which has lead to better utilization of light and moisture in turn resulted in maximum accumulation of dry matter. Further, pinching the plants restrict the vertical growth and results in maximum plant spread and accumulation of photosynthates in the plant parts which has resulted in maximum dry matter production. Similar results were also given by Israel[7] in coriander, Jabbar *et al.*[8], in okra and Krishnaveni *et al.*[9], in fenugreek.

Yield parameters and economics

The interaction effects of different sowing dates and stage of pinching showed a significant influence on yield parameters and economics of fenugreek (Table 2).

The interaction effect of sowing on different dates and pinching at different intervals recorded significant difference for various yield parameters. The treatment combination D_2P_2 (Sowing on 15th October and pinching at 35 DAS) recorded maximum number of pods per plant (13.80), pod length (10.34 cm), fresh weight of pod (0.31 g), number of seeds per pod (13.60), weight of seeds per pod (0.25 g) and 1000 seed weight (21.09 g). The results are in agreement with Ayub *et al.*[1], Azadi[2] and Selim *et al.*[14], in fennel. This may be because of maximum number of branches, more number of pods per plant, better vegetative growth and accumulation of more photosynthates which in turn has resulted in better seed and pod parameters. Interaction between dates of sowing and pinching resulted significant difference for seed yield and harvest index also. Among the treatment combinations D_2P_2 (Sowing on 15th October and pinching at 35 DAS) recorded maximum seed yield (3.44 g/plant and 1148.11 kg /ha) and harvest index (29.16 per cent) while, D_1P_1 (Sowing on 1st October and pinching at 25 DAS) recorded minimum values for seed yield (0.93 g/plant and 312.21 kg/ha) and harvest index (12.52 per cent). The maximum seed yield can be attributed to more number of branches per plant, pods per plant and seeds per pod. The maximum seed weight was because of better reproductive growth and seed filling period which significantly increased the harvest index. Further maximum translocation of assimilates in pinched plants resulted in maximum number of seeds per pod and weight of seeds per pod which in turn increased the seed yield. Similar results were also observed by Sajjan[13] and Jabbar *et al.*[8], in okra, Ayub *et al.*[1], in fennel, Baloch and Zubair[4] in chick pea, Azadi[2] in lentil, Guha *et al.*[5], in coriander and Olfati and Malakouti[12] in faba bean.

Benefit cost ratio is an important and ultimate factor which decides the optimum levels of input to be used for maximization of production and returns of any crop. In the present study, the benefit cost ratio of fenugreek was worked out for sowing on different dates with different stage of pinching. Cost economics of fenugreek was also significantly influenced by sowing on different dates and pinching at different stages. The maximum gross return (91,848.80 Rupees/ha), net return (66,436.80 Rupees/ha) and cost benefit ratio (2.62) was recorded in treatment combination D_2P_2 (Sowing on 15th October and pinching at 35 DAS) and the minimum gross return (24,976.80Rupees/ha), net return (-435.2 Rupees/ha) and cost benefit ratio (-0.017) was recorded in the treatment combination D_1P_1 (Sowing on 1st October and Pinching at 25 DAS). This might be due to better seed yield and least incidence of pest and diseases in the treatment combination which resulted in higher returns.

Table 1. Effect of different sowing dates and stage of pinching on various growth parameters of fenugreek (*Trigonella foenum – graecum* L.).

Treatment combination	Plant height (cm)	Leaf Area (cm^2)	Leaf Area Index (LAI)	Leaf Area Duration (Days)	No. of branches	Plant spread (cm^2)	*DMPL (g)	*DMPS (g)	*DMPP (g)	*DMPS (g)	*TDMP (g)
D_1P_1	21.24	3.700	0.012	0.370	3.36	21.41	0.066	0.170	0.213	0.186	0.470
D_1P_2	23.78	4.033	0.015	0.380	4.96	24.65	0.086	0.193	0.230	0.193	0.529
D_1P_3	26.71	4.233	0.016	0.380	4.13	22.35	0.072	0.183	0.226	0.193	0.486
D_2P_1	26.24	4.167	0.013	0.386	10.00	41.11	0.130	0.585	0.296	0.233	1.380
D_2P_2	28.05	4.133	0.016	0.390	12.06	51.62	0.143	1.196	0.326	0.266	2.000
D_2P_3	28.54	4.527	0.018	0.393	10.63	43.04	0.133	0.916	0.303	0.243	1.530
D_3P_1	38.38	4.400	0.014	0.423	8.73	34.70	0.118	0.380	0.283	0.226	1.086
D_3P_2	40.30	5.056	0.019	0.446	9.66	38.38	0.123	0.506	0.303	0.236	1.293
D_3P_3	48.24	4.527	0.018	0.426	8.86	35.98	0.123	0.413	0.286	0.230	1.213
D_4P_1	32.54	4.440	0.017	0.416	7.60	31.01	0.083	0.223	0.243	0.206	0.593
D_4P_2	34.46	4.427	0.016	0.420	8.30	33.29	0.093	0.296	0.263	0.206	0.786
D_4P_3	36.73	4.333	0.017	0.423	8.03	31.61	0.093	0.253	0.256	0.206	0.724
D_5P_1	29.26	4.133	0.013	0.396	6.00	26.72	0.104	0.306	0.273	0.203	0.893
D_5P_2	30.06	4.353	0.013	0.406	7.26	30.38	0.116	0.330	0.283	0.220	0.990
D_5P_3	30.75	4.347	0.013	0.410	6.53	29.41	0.109	0.206	0.276	0.218	0.946
SEm±	0.90	0.203	0.003	0.006	0.37	1.91	0.004	0.081	0.005	0.004	0.081
CD at 5 %	2.65	0.591	0.010	0.018	1.01	5.66	0.012	0.234	0.016	0.011	0.239

DMPL- Dry Matter Production of Leaves; DMPS- Dry Matter Production of stem; DMPP- Dry Matter Production of Pods;TDMP-Total Dry Matter Production

Table 2: Effect of different sowing dates and stage of pinching on yield parameters and economics of fenugreek (*Trigonella foenum – graecum* L.)

Treatment combination	No. of pods/plant	Pod length (cm)	Fresh wt. of pod (g)	No. of seeds/pod	Wt. of seeds/pod (g/pod)	1000 seed wt. (g)	Seed yield (g /plant)	Seed yield (kg /ha)	Harvest Index (%)	B:C
D_1P_1	5.10	6.90	0.22	9.83	0.18	12.79	0.93	312.21	12.52	-0.017
D_1P_2	5.86	7.87	0.25	10.16	0.19	16.64	1.14	382.75	19.18	0.21
D_1P_3	5.23	7.16	0.23	10.00	0.19	14.37	1.03	346.36	16.49	0.15
D_2P_1	11.06	9.88	0.29	12.53	0.22	20.20	2.54	845.94	25.86	1.67
D_2P_2	13.80	10.34	0.31	13.60	0.25	21.09	3.44	1148.11	29.16	2.62
D_2P_3	12.33	10.16	0.30	13.00	0.24	20.43	3.16	1051.21	27.26	2.49
D_3P_1	9.73	9.56	0.28	11.60	0.22	19.36	2.16	716.34	24.52	1.22
D_3P_2	10.93	9.70	0.29	12.13	0.22	19.77	2.51	837.00	25.29	1.58
D_3P_3	10.66	9.64	0.29	11.93	0.22	19.56	2.35	784.85	24.80	1.55
D_4P_1	7.16	9.15	0.27	11.13	0.20	17.50	1.52	526.96	22.98	0.63
D_4P_2	8.90	9.47	0.28	11.43	0.21	18.15	1.88	622.11	23.78	0.92
D_4P_3	8.40	9.32	0.27	11.20	0.21	17.64	1.75	579.38	23.50	0.88
D_5P_1	6.20	8.49	0.25	10.43	0.19	18.50	1.24	513.18	20.41	0.58
D_5P_2	6.96	8.90	0.27	10.73	0.20	19.03	1.37	564.98	22.10	0.74
D_5P_3	6.66	8.74	0.26	10.53	0.19	18.87	1.28	541.16	21.29	0.76
SEm±	0.312	0.140	0.005	0.221	0.005	0.503	0.08	25.35	0.43	
CD at 5 %	0.919	0.406	0.016	0.651	0.012	1.456	0.21	74.49	1.24	

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