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ISSN: 0974-4908
Res. Environ. Life Sci.
9(9) 1076-1078 (2016)

Effect of sowing dates and stage of pinching on growth, seed yield and quality of Fenugreek (*Trigonella foenum – graecum* L.)

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(Received: December 12, 2015; Revised received: May 27, 2016; Accepted: June 07, 2016)

Abstract: A study was conducted to standardize the optimum date of sowing and pinching level in fenugreek during 2014-15. The experiment consisted 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) which were assessed in all possible combinations for growth, yield and quality parameters. Among the different sowing dates, D_2 (15th October) and among different stage of pinching, P_2 (Pinching at 35 DAS) recorded maximum plant spread, number of branches per plant, dry matter production of leaves, stem, pods, seeds, total dry matter production, 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, 1000 seed weight, total chlorophyll content in leaves and protein content in seeds. Whereas, maximum plant height was recorded in 1st November sown crop and in the non pinched plants. While, lower values for these parameters were observed in D_1 (1st October) and P_1 (Pinching at 25 DAS).

Key words: Fenugreek, Dates of sowing, Pinching, Growth, Yield

Introduction

Fenugreek (*Trigonella foenum – graecum* L.), commonly called as 'Greek hay' and also called as 'methi' in Hindi, occupies a prime position among the seed spices grown in India. It is an annual herb native to South-East Europe and West Asia belongs to the family fabaceae. The plant is erect or spreading, growing up to a height of 30-60 cm. Seeds are rich in protein (6.3%), fat (9.5%), carbohydrates (42.3%), diosgenin (1.0 g). Fenugreek also possess anti-diabetic, anti-fertility, anticancer, anti-microbial, anti-parasitic effects (Al-Habori and Raman, 2004). Among the various cultural practices, proper time of sowing is a prerequisite and among several seed production approaches, apical bud pinching is one which is practiced to enhance flower bearing branches by curbing vegetative growth which ultimately reflects on the seed yield and quality of crop (Vasudevan *et al*., 2008). However, among various constraints in cultivation of this crop non availability of adequate quantity of good quality seeds is considered to be a major factor. There is a need to standardize various agronomic techniques to improve seed yield in fenugreek under hill zone. Hence, an attempt was made in this study to increase both seed yield and quality in fenugreek.

Materials 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 Randomized Complete Block Design (FRCBD) with three replications. Size of each plot was 2.5 m x 1.2 m. The experiment consisted of five dates of sowing (1st October, 15th October, 1st November, 15th November and 1st December) and three stages of pinching (Pinching at 25 DAS, Pinching at 35 DAS and No pinching. The seeds were sown at the rate of 12-15 kg/ha. Seeds were sown at 15 days intervals starting from 1st October to 1st December, 2014 at a spacing of 30x10 cm. The apical buds were removed by pinching manually without causing damage to the plant parts as per the treatments. The chlorophyll content in fresh and fully matured leaves was estimated by using Dimethyl Sulfoxide (DMS) as suggested by Sadasivum and Manickam (2005). The protein content in seeds was estimated by multiplying the nitrogen content of the seeds by 6.25 and expressed in per cent. The other cultural practices like irrigation, weeding and plant protection operation were carried out as and when required.

Results and Discussion

The data presented in Table 1 revealed that all the growth parameters were significantly influenced by different sowing dates and stage of pinching. Increased plant height (42.31 cm), leaf area (4.557 cm^2), leaf area index (0.019) and leaf area duration (0.432 days) were recorded in the 1st November sown crop than the crop sown on other dates. This might be due to the fact that mean temperature requirement of fenugreek closely coincided with the prevailing temperature in the month of November, which is evident from the increased leaf area, leaf area index and leaf area duration

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

Treatments	Plant ht. (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)
Dates of sowing (D)											
D_1 : 1st October	23.91	3.989	0.013	0.376	4.15	22.81	0.071	0.182	0.333	0.333	0.492
D_2 : 15th October	34.58	4.276	0.016	0.390	10.90	45.26	0.132	0.901	0.508	0.508	1.636
D_3 : 1st November	42.31	4.557	0.019	0.432	9.08	36.36	0.122	0.434	0.394	0.394	1.197
D_4 : 15th November	27.61	4.400	0.018	0.420	7.97	31.97	0.093	0.257	0.033	0.033	0.702
D_5 : 1st December	30.03	4.278	0.017	0.404	6.60	28.84	0.102	0.281	0.100	0.100	0.943
SEm±	0.48	0.117	0.002	0.007	0.19	1.10	0.003	0.034	0.333	0.333	0.043
CD @ 5 %	1.45	0.342	0.005	0.020	0.58	3.27	0.009	0.130	0.508	0.508	0.130
Stage of Pinching (P)											
P_1 : Pinching 25 DAS	29.54	4.168	0.012	0.396	7.14	30.99	0.102	0.333	0.262	0.207	0.886
P_2 : Pinching 35 DAS	31.34	4.371	0.017	0.416	8.45	35.66	0.110	0.508	0.281	0.220	1.122
P_3 : No pinching (Control)	34.19	4.300	0.016	0.406	7.64	32.48	0.108	0.394	0.264	0.211	0.981
SEm±	0.38	0.091	0.002	0.005	0.15	0.84	0.001	0.033	0.002	0.002	0.040
CD @ 5 %	1.13	0.263	0.005	0.015	0.45	2.53	0.005	0.100	0.006	0.007	0.106

*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 seed yield and quality of fenugreek (*Trigonella foenum – graecum* L.)

Treatments	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 (%)	Total chlorophyll content of leaves (mg/g)	Protein content of seeds (%)
Dates of sowing (D)											
D_1 : 1st October	23.91	3.989	0.013	0.376	4.15	22.81	0.071	0.182	0.333	2.62	2.79
D_2 : 15th October	34.58	4.276	0.016	0.390	10.90	45.26	0.132	0.901	0.508	3.15	4.79
D_3 : 1st November	42.31	4.557	0.019	0.432	9.08	36.36	0.122	0.434	0.394	3.05	3.78
D_4 : 15th November	27.61	4.400	0.018	0.420	7.97	31.97	0.093	0.257	0.033	2.96	2.95
D_5 : 1st December	30.03	4.278	0.017	0.404	6.60	28.84	0.102	0.281	0.100	2.80	3.32
SEm±	0.48	0.117	0.002	0.007	0.19	1.10	0.003	0.034	0.333	0.03	0.08
CD @ 5 %	1.45	0.342	0.005	0.020	0.58	3.27	0.009	0.130	0.508	0.08	0.23
Stage of Pinching (P)											
P_1 : Pinching 25 DAS	29.54	4.168	0.012	0.396	7.14	30.99	0.102	0.333	0.262	2.86	3.39
P_2 : Pinching 35 DAS	31.34	4.371	0.017	0.416	8.45	35.66	0.110	0.508	0.281	2.98	3.71
P_3 : No pinching (Control)	34.19	4.300	0.016	0.406	7.64	32.48	0.108	0.394	0.264	2.90	3.48
SEm±	0.38	0.091	0.002	0.005	0.15	0.84	0.001	0.033	0.002	0.02	0.06
CD @ 5 %	1.13	0.263	0.005	0.015	0.45	2.53	0.005	0.100	0.006	0.06	0.17

of the crop (Ayub *et al*., 2008). With respect to pinching treatments, the maximum plant height (34.19 cm) was recorded in the non-pinched plants, whereas, the maximum leaf area (4.371 cm^2), leaf area index (0.017) and leaf area duration (0.416 days) were recorded in the plants pinched at 35 DAS. Significantly maximum number of branches per plant (10.90), plant spread (45.26 cm^2), dry matter production of leaves (0.132 g), stem (0.901 g), pods (0.305 g), seeds (0.247 g) and total dry matter production (1.636 g) were registered in the crop sown on 15th October while minimum were recorded in 1st October sown crop. This might be due to temperature mediated effect which has led to better utilization of light and moisture inturn resulted in maximum accumulation of dry matter (Khoja, 2004). Pinching also had a significant effect on number of branches per plant, plant spread, dry matter production of leaves, stem, pods, seeds and total dry matter production. Pinching the plants at 35 DAS registered maximum number of branches per plant (8.45), plant spread (35.66 cm^2), dry matter production of leaves (0.110 g), stem (0.508 g), pods (0.281 g), seeds (0.220 g) and total dry matter production (1.122 g) as compared to no pinching. Decrease in plant height and increase in number of branches with pinching could be due to pinching of apical bud which curbs the vertical growth. Thus because of translocation of photosynthates to leaf axils the axillary branches increased. Activation of lateral dormant buds by arresting the terminal growth through pinching of apical bud would have facilitated the significant increase in number of branches per plant and maximum dry matter accumulation (Jabbar *et al.,* 2007, Vasudevan *et al.,* 2008, Baloch and Zubair, 2010 and Krishnaveni *et al.,* 2014).

The data presented in Table 2 revealed that maximum number of pods per plant (12.40), pod length (10.13 cm) and fresh

weight of pod (0.30 g) were noticed in the crop sown on 15th October, whereas 1st October sowing noticed minimum pod values. Similarly, maximum number of seeds per pod (13.04), weight of seeds per pod (0.24 g) and thousand seed weight (20.58 g) were registered in D_2 (15th October), whereas minimum values for these pod and seed characters were noticed in 1st October sown crop. The seed yield (3.04 g/plant and 1015.09 kg /ha) and harvest index (27.43 %) was maximum in D_2 (15th October). This might be due to better vegetative growth in terms of more number of branches per plant, higher dry matter accumulation, more number of pods per plant and seeds per pod due to better photosynthetic efficiency and translocation of photosynthates from source to sink. Further, maximum seed yield resulted in maximizing the harvest index. The maximum seed weight was because of better reproductive growth and seed filling period which significantly increased the harvest index (Ayub *et al.,* 2008, Azadi *et al.,* 2013 and Selim *et al.,* 2013). With respect to sowing dates, pinching also registered significant difference for various yield parameters. The number of pods per plant (9.29), pod length (9.25 cm), fresh weight of pod (0.28 g), number of seeds per pod (11.61g), weight of seeds per pod (0.21 g) and 1000 seed weight (18.94 g) were maximum in the plants pinched at 35 DAS (P_2), while P_1 (Pinching at 25 DAS) recorded minimum number of pods per plant (7.85), pod length (8.79 cm), fresh weight of pod (0.26 g), number of seeds per pod (11.10), weight of seeds per pod (0.209 g)and 1000 seed weight (17.67 g). These results were attributed mainly because of maximum number of branches which inturn has resulted in maximum number of pods per plant, pod length, fresh weight of pod and 1000 seed weight in P_2 as compared to P_1. Beneficial effect noticed with pinchingperhaps could be related to effective synthesis and translocation of photosynthates from source to sink which is evident with higher seed weight (Baloch and Zubair, 2010, Olfati and Malakouti, 2013 and Krishnaveni *et al.,* 2014). Seed yield per plant and seed yield per hectare also differed significantly due to pinching. The maximum seed yield (2.07 g/plant and 694.79 kg/ha) was obtained in P_2 (Pinched at 35 DAS) while, minimum was noticed in the plants pinched at 25 DAS (1.68 g/plant and 563.30 kg/ha) and no pinching (1.91 g/plant and 642.39 kg/ha). Maximum translocation of assimilates in P_2 has resulted in maximum number of seeds per pod and weight of seeds per pod which in turn increased the seed yield. This increasing trend of number of seeds and weight of seeds per pod has resulted in maximum harvest index. Thus the maximum harvest index (23.90 per cent) was recorded in P_2 (Pinched at 35 DAS) while minimum (21.26 %) in P_1 (Jabbar *et al.,* 2007, Baloch and Zubair, 2010 and Olfati and Malakouti, 2013). Maximum chlorophyll content in leaves was noticed in the 15th October sown crop (3.15 mg/g fresh weight).This might be due to better plant growth, favourable climatic conditions prevailing during the period (Khoja, 2004). The chlorophyll content was also differed significantly with respect to pinching. The plants pinched at 35 DAS registered maximum chlorophyll (2.98 mg/g fresh weight) as compared to non-pinched plants.The highest protein content in seed (4.79 %) was recorded in the 15th October sown crop because more photosynthetic activity had resulted in better seed filling resulting in the quality seeds in terms of higher protein content. The plants pinched at 35 DAS recorded maximum protein content (3.71 %) as presented in table 2 (Babaleshwar, 2014). These results were attributed mainly to pinching of plants which prolongs the vegetative growth. As the vegetative growth was extended the photosynthetic activity was also maximum in P_2 as compared to P_1 and no pinching. Thus pinching improved the translocation of photosynthates from source to sink resulting in increased chlorophyll content in leaf tissue in turn resulted in the significant increase in crude protein content (Table 2) due to pinching at 35 DAS.

Growth, productivity and quality of any crop is influenced by several factors, such as environmental factors, genetic constitution and agronomic practices. Under hill zone of Karnataka 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 up the productivity. Thus it can be concluded that sowing of fenugreek on 15th October and pinching at 35 DAS was found to be best by recording maximum growth, seed yield and quality in fenugreek.

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