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Full Length Research Paper

Standardization of date of sowing and stage of pinching on fenugreek yield and quality parameters

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A field experiment entitled "Standardization of Date of Sowing and Stage of Pinching on Fenugreek (*Trigonella foenum- graecum* L.) Yield and Quality Parameters" was conducted during kharif 2015 at College of Horticulture, Mandsaur. The experiment consists of 4 different dates of sowing and 3 stages of pinching at different intervals. These treatments were evaluated under split plot design with three replications. Among various dates of sowing D_2 (10th October) treatment exhibited significantly higher number of pods plant^{-1}, length of pod (cm), weight of pod (mg), number of seeds pod^{-1}, weight of seeds pod $^{-1}$ (mg), thousand of seed weight (g), seed yield (q ha^{-1}), straw yield (q ha^{-1}), biological yield (q ha^{-1}), harvest index (%), SPAD value, germination percentage of seeds, seedling vigour index, and protein (%) comparison to D_1, D_3 and D_4. Among the various Pinching stages, P_3 exhibited maximum number of pods plant^{-1}, length of pod (cm), weight of pod (mg), number of seeds pod^{-1}, weight of seeds pod $^{-1}$ (mg), thousand seed weight (g), seed yield (q ha^{-1}), straw yield (q ha^{-1}), biological yield (q ha^{-1}), harvest index (%), germination percentage, seedling vigour index and protein (%) in comparison to other pinching stages. On the basis of one year research it could be concluded that the yield and quality of fenugreek crop can be increased by sowing on 10th October with the pinching at 35 DAS.

Keywords: Fenugreek, flowering, date of sowing, pinching, yield, quality.

INTRODUCTION

Fenugreek (*Trigonella foenum-graecum* L.), commonly called as 'Greek hay' and also called as 'methi' in Hindi, belonging to the family Fabaceae and is a commercially important annual spice crop grown almost in every part of the country. It is used as condiment, leafy vegetable, seed, green fodder and green manure crop. It is rich in proteins, iron, calcium, vitamin A, B_2 and C. Besides, it also contains gum (22.06%), trigonellin (0.13-0.35%), diosgenin (1.0 g). Seeds have strong aroma and are bitter in taste. It reduces blood cholesterol and blood sugar levels. It adds flavor and also act as a nutritive food.

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The value added products of fenugreek such as fenugreek powder and oleoresins are exported. In spite of great utility and importance as spice, leafy vegetable, medicinal and cosmetic value, a little attention has been paid to evolve suitable package of practices for profitable cultivation of fenugreek. Among the various cultural practices, proper time of sowing is a prerequisite (Nandre *et al.,* 2011), climatic factors such as temperature, duration of bright sunshine and relative humidity differs with sowing time of the crop, which ultimately influence the yield of fenugreek and also sowing date is a very important parameter in crop production. The optimum sowing date paves the way for better-use of time, light, temperature, precipitation and other factors (Moosavi, 2014). Slight variation in the temperature may cause

complete crop failure or low yield and productivity. It is therefore essential to adjust the sowing time such a way to provide optimum soil and atmospheric temperature required for better growth and development of the crop. Cutting management or pinching practice greatly influences the growth and yield attributes in fenugreek (Baboo, 1997). Cutting of herbage at early stages of growth induces uniformity in growth, flowering and seed setting in fenugreek. Apical bud pinching helps in altering the source– sink relationship by curbing the vegetative growth and hastening reproductive phase. It also helps in production of side shoots or branches thus resulting in increased photosynthetic activity and accumulation of more photosynthates ultimately resulting in increased seed size and yield (Lakshmi *et al*., 2015).

MATERIALS AND METHODS

The investigation was conducted during September 2015 to March 2016 at the Department of Plantation, Spices, Medicinal and Aromatic Crops, K.N.K. College of Horticulture, Mandsaur, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya Gwalior (M.P.). The experiment consists of 4 different dates of sowing and 3 stages of pinching at different intervals and treatments were evaluated under split plot design with three replications and 36 plots. The main plot treatments comprised of sowing dates 25th September (D_1), 10th October (D_2), 25th October (D_3) and 9th November (D_4) and sub plot treatments are comprised of pinching stages No pinching (P_1), Pinching 25 DAS (P_2), Pinching 35 DAS (P_3). The soil of the experimental field was light black loamy texture, with low in availability of nitrogen, low in phosphorus and high in potassium status with the P^H of 6.5. Seeds were sown in the field with the spacing of 30x10 cm apart at a seed rate of 15 Kg/ha and watered immediately. The crop is provided with Phosphorous, potassium and nitrogen in the form of DAP, Murate of potash and urea at the rate of **40:50:40** NPK kg/ha respectively. Standard intercultural practices were carried out as and when required. The crop was irrigated at an interval of 7-10 days. Data was recorded for various yield and quality parameters like number of pods plant^{-1}, length of pod (cm)**,** weight of pod (mg), number of seeds pod^{-1}**,** weight of seeds pod $^{-1}$ (mg), thousand seed weight (g), seed yield (q ha^{-1}), straw yield (q ha^{-1}), biological yield (q ha^{-1}), harvest index (%), SPAD value, germination percentage of seeds, seedling vigour index, and protein (%) and statistically analyzed using the method of variance as described by Pansey and Sukhatme (1985) at 5% level of significance.

RESULT AND DISCUSSION

Effect of sowing time and pinching stage on yield parameters

It is evident from the tabulated data that the reproductive growth was significantly affected by different sowing dates and pinching stages.

From the Table 1 and Table 2 it is clear that 10th October sown crop recorded greater number of pods per plant, pod length, weight of pod, number of seeds per pod and weight of seeds per pod. This might be due to better vegetative growth. Improvement in overall growth i.e. plant height and number of branches per plant with the early date of sowing coupled with increased net photosynthesis towards reproduction structure, on the other, might have increased the yield attributes like number of pods, pod length, weight of pod, number of seeds per pod and weight of seeds per pod.

Among pinching treatments, pinching 35 DAS recorded maximum number of pods per plant, pod length, weight of pod, number of seeds per pod and weight of seeds per pod. This might be due to fact that maximum number of branches which inturn has resulted in maximum number of pods per plant, pod length, weight of pod, number of seeds per pod and weight of seeds per pod. The results are in line with Vasudevan *et al.* (2008) Krishnaveni *et al*. (2014) in fenugreek.

It can be seen from the Table 3 and Table 4 that 10th October sown crop recorded higher thousand seed weight, seed yield, straw yield, biological yield and harvest index in comparison to other sowing dates. This variation might be attributed due to better vegetative growth in terms of more number of branches per plant, 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.

Among pinching treatments pinching 35 DAS recorded thousand seed weight, highest thousand seed weight, seed yield, straw yield, biological yield and harvest index. This might be due to maximum translocation of assimilates in P_3 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 recorded in P_3 (Pinched at 35 DAS) (Guha *et al*., 2013) in coriander.

Effect of sowing time and pinching stage on quality parameters

In the present study 10th October sown crop recorded maximum chlorophyll content in leaves and protein content in seeds of fenugreek (Table 5). This might be due to better plant growth due to favourable climatic conditions prevailing during the period and more photosynthetic activity has resulted in better seed filling resulting in the quality seeds in terms of higher protein content. The results are in line with Khoja (2004) in coriander and Babaleshwar, (2014) in kasuri methi. Among pinching treatments pinching 35 DAS recorded maximum chlorophyll and protein this might be due to attributed mainly because the pinching of plants prolongs

Table 1. Effect of sowing dates and stage of pinching on number of pods per plant, pod length (cm) and number of seeds per pod.

Treatments	No. of pods per plant	pod length (cm)	No. of seeds per pod
25th September	53.6	10.63	15.48
10th October	75.9	11.72	16.88
25th October	56.7	10.92	15.77
9th November	37.4	10.28	15.46
S.Em. ±	1.23	0.176	0.200
C.D. at 5%	4.28	0.611	0.693
No pinching	52.1	10.51	14.95
Pinching 25 DAS	57.1	10.92	16.23
Pinching 35 DAS	58.5	11.24	16.52
S.Em. ±	1.43	0.185	0.150
C.D. at 5%	4.29	0.555	0.451

Table 2. Effect of sowing dates and stage of pinching on weight of pod (mg) and weight of seeds per pod (mg) .

Treatments	weight of pod (mg)	weight of seeds per pod (mg)
25th September	345.55	296.66
10th October	661.55	435.55
25th October	640.11	371.11
9th November	256.66	175.55
S.Em. ±	9.019	8.917
C.D. at 5%	31.212	30.859
No pinching	414.58	293.33
Pinching 25 DAS	485.66	324.16
Pinching 35 DAS	527.66	341.66
S.Em. ±	11.708	12.643
C.D. at 5%	0.451	37.906

Table 3. Effect of sowing dates and stage of pinching on 1000 seed weight (g) and seed yield (qha^{-1}).

Treatments	1000 seed weight (g)	Seed yield (qha^{-1})
25th September	19.14	14.00
10th October	20.20	18.55
25th October	19.62	16.02
9th November	16.82	11.68
S.Em. ±	0.128	0.490
C.D. at 5%	0.443	1.697
No pinching	18.24	13.38
Pinching 25 DAS	19.07	14.73
Pinching 35 DAS	19.52	17.08
S.Em. ±	0.111	0.559
C.D. at 5%	0.335	1.678

the vegetative growth which is very well evidenced from the delayed flowering in the plants pinched at 35 DAS. As the vegetative growth was extended the photosynthetic activity was also maximum in plants pinched at 35 DAS as compared to plants pinched at 25 DAS and no pinching. Thus pinching improves the translocation of photosynthates from source to sink increasing the chlorophyll content in leaf tissue inturn resulted in the significant increase in crude protein content (Table 5) due to pinching at 35 DAS. These results may be attributed due to increased nitrogen concentration in seed which is an integral part of protein.

It can also be seen from the Table 5 that 10th October sown recorded maximum germination % and seedling vigour index of fenugreek seeds. Among pinching treatments pinching at 35 DAS recorded maximum

Table 4. Effect of sowing dates and stage of pinching on straw yield (qh^{-1}) and biological yield (qh^{-1}) and harvest index (%).

Treatments	Straw yield (qha^{-1}) (qha^{-1})	Biological yield	Harvest index (%)
25th September	43.08	57.10	24.31
10th October	44.48	63.03	29.31
25th October	44.02	60.04	26.57
9th November	41.97	53.66	21.73
S.Em. ±	0.192	0.499	0.683
C.D. at 5%	0.665	1.728	2.365
No pinching	42.60	55.99	23.76
Pinching 25 DAS	43.40	58.13	25.04
Pinching 35 DAS	44.16	61.25	27.63
S.Em. ±	0.348	0.579	0.778
C.D. at 5%	1.045	1.737	2.333

Table 5. Effect of sowing dates and stage of pinching on chlorophyll content (SPAD value), Germination%, Seedling vigour index and protein content (%).

Treatment	Chlorophyll (SPAD Value)	Germination (%)	Seedling vigour index	Protein (%)
25th September	54.79	91.00	2297.27	16.97
10th October	59.43	97.33	2334.33	18.63
25th October	59.39	93.67	2190.63	17.41
9th November	55.33	73.66	1660.72	15.92
S.Em. ±	0.400	0.747	31.890	0.339
C.D. at 5%	1.387	2.585	110.355	1.176
No pinching	56.60	80.00	1926.12	15.94
Pinching 25 DAS	56.99	91.00	2127.87	17.49
Pinching 35 DAS	58.11	95.75	2308.21	18.27
S.Em. ±	0.393	0.58	30.99	0.305
C.D. at 5%	1.178	1.76	92.93	0.915

germination % and seedling vigour index. It might be due to pinching of apical bud greatly influenced the seed quality. The better performance of pinched plants was because of more number of branches, increase in photosynthetic area leading to higher photosynthetic rate, accumulation of more photosynthates resulting into better seed development which ultimately caused better seed germination and seedling vigour index. Similar results were reported by Phor and Mangal (1991) in palak and Sajjan *et al.* (2002) in okra while, increased vigour index with apical pinching was also reported by Venkata Reddy *et al.* (1997) in okra.

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