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Performance of potential fenugreek genotypes for seed yield and its attributing traits in Northern dry zone of Karnataka

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Abstract

The present investigation was undertaken for two consecutive years during *Rabi* season of 2019-20 and 2020-21 in the Department of Plantation, Spices, Medicinal and Aromatic Crops, Kittur Rani Channamma College of Horticulture, Arabhavi, to identify high yielding fenugreek genotypes suitable for Northern dry zone of Karnataka. According to pooled data, all the 32 genotypes which were selected for the experiment varied significantly with respect to growth, yield and yield attributing characters. Among the 32 genotypes evaluated, the highest plant height was recorded in DFC 16 (84.59 cm). Maximum number of branches per plant was observed in Pusa Early Bunching (17.16). Ajmeer Methi 3 recorded maximum plant spread at E-W and N-S direction (27.38 & 27.20 cm). Minimum days to 50 % flowering (38.49) and days to maturity (96.24), maximum number of pods per plant (57.07), pod length (12.57 cm), number of seeds per pod (15.89), seed yield (9.08 g/plant, 0.97 kg/plot & 30.82 q/ha) were recorded in Pusa Early Bunching. The genotypes such as, Pusa Early Bunching, Ajmeer Methi 3, DFC 20, DFC 8 and DFC 27 were found promising for seed yield.

Keywords: Fenugreek, evaluation, genotype, seed yield, pusa early bunching

Introduction

Fenugreek is the largest grown spice in India produced for its seeds, tender shoots and fresh leaves. It belongs to the family Fabaceae and is generally known as 'Methi' in Hindi and 'Menthya' in Kannada. This small-seeded diploid annual legume plant is self-pollinated with chromosome number $2n=16$ (Darlington and Wylie, 1955) [5]. The species name '*foenum-graecum*' means 'greek hay,' implying its use as a forage crop in the past. It is also known as "ox horn" or "goat horn" because the pods extending in opposite directions from the nodes of the stem base resemble ox or goat horns (Lust, 1986) [12]. It is a native of South Eastern Europe and West Asia and is extensively grown in India, Argentina, Bulgaria, Egypt, France, Morocco, Spain, Turkey, China, Pakistan and Lebanon. The cultivation of this crop is confined to areas with moderate or low rainfall and a cool growing season without extreme temperatures. China, India, Canada, Turkey, Northern and Southern Africa, Australia and Southern Europe are the largest producers of fenugreek (Ahmad *et al.*, 2016) [2]. India is the world's top producing country and currently is responsible for more than 68 per cent of world production. During 2019-20, fenugreek was grown in 126.30 thousand hectares area with a production of 182.17 thousand tonnes and productivity of 1071.33 kg per hectare. Fenugreek is one of India's most important exports, with a volume of 14756.67 tonnes and a value of 15469 lakhs (Anon., 2020) [3].

The low productivity of fenugreek in India is mainly due to non availability of suitable high yielding varieties for various agro climatic regions and poor crop husbandry (Kurubetta *et al.*, 2018) [10]. Fenugreek cultivar performs differently under different agro-climatic conditions and various cultivars of same species grown even in same environment often have yield differences because, yield and quality of crop are very complex characteristics depending on certain biological alignments between environment and heredity. The characteristics of a cultivar as well as combination of traits differ according to climate condition of the localities (Jhajhra *et al.*, 2017) [8]. Before recommendation of any variety suitable for the region, it is pertinent to evaluate varieties giving emphasis on the aspect of genotypic suitability and yield (Latye *et al.*, 2016) [11]. Considering all above the mentioned facts, an experiment on varietal performance of fenugreek genotypes was undertaken so as to ascertain and recommend the

genotypes best suited for Northern dry zone of Karnataka.

Material and methods

The present investigation was carried out for two consecutive years during *Rabi* season of 2019-20 and 2020-21 in the Department of Plantation, Spices, Medicinal and Aromatic Crops, Kittur Rani Channamma College of Horticulture, Arabhavi, University of Horticultural Sciences, Bagalkot situated in Northern dry zone (Zone No. 3; Region-2) of Karnataka at 16°15' N latitude and 74°45' E longitude, at an altitude of 612 m above mean sea level. The experiment was laid out in Randomised Block Design with thirty two genotypes in three replications. Fenugreek germplasm comprising of thirty-two accessions collected from different regions formed the experimental material.

The experimental site was brought to fine tilth by ploughing deeply with tractor drawn reversible double mouldboard plough. Then the plots of 1.6 m width and 2.4 m length were laid out and separated by bunds of 1 m width as per the plan making provision for irrigation channels. The recommended dose of fertilizer mixture was applied by broadcasting uniformly in rows to individual plots and mixed thoroughly in to the soil. The seeds were treated with Ridomil Mz at the rate of 2 g per kg seeds to control damping off disease incidence and sown at a spacing of 30 x 10 cm. The plots were irrigated immediately after the completion of sowing. Thinning of excess seedlings and gap filling was done twenty days after sowing. The plots were kept free from weeds by regular weeding. The crop was irrigated at an interval of eight to ten days. The crop was harvested after attaining complete maturity. Seeds were separated by hand threshing.

Observations on growth parameters including plant height (cm), number of branches, plant spread (E-W & N-S) (cm) were recorded on five randomly selected plants avoiding the border row plants in each replication of different treatments at harvest. For days to 50 per cent flowering, the days were counted from date of sowing to the day on which 50 per cent of plants in each experimental plot flowered. For days to maturity, number of days were counted from flowering to maturity of pods. Number of pods per plant, pod length (cm), number of seeds per pod and seed yield per plant (g) were recorded at the time of harvest. The seed yield per plot (kg) was computed by summing up all the harvested pods of each treatment. Then seed yield per hectare (q) was calculated on the basis of seed yield per plot.

Fisher method of analysis of variance as given by Panse and Sukhatme (1967) [14] was applied for analysis and interpretation of data. The level of significance used in 'F' test was at P = 0.05 and critical difference (CD) values were worked out wherever 'F' test was significant.

Results and Discussion

The statistics suggest a highly significant variation among the growth parameters (Table 1). According to pooled data, statistically high plant height was recorded in DFC 16 (84.59 cm), which was on par with CO 1 (82.30 cm), whereas lowest plant height was noticed in DFC 27 (61.15 cm). Different responses to plant height might be due to genetic characteristic of genotypes and adaptability to a particular environment which in some way influenced the morphological expression through the activity of endogenous hormonal level and apical dominance. These findings confirm the results obtained by Aggrwal *et al.* (2013) [11] Chowdhury *et al.* (2014) [4], Singh *et al.* (2015) [18] and Jhajhra *et al.* (2017)

[8] in fenugreek. The maximum number of branches was recorded in Pusa Early Bunching (17.16) and it was statistically on par with Ajmeer Methi 3 (16.64). At the same time, the minimum number of branches was observed in Sirsi Local (8.96). The genotype Ajmeer Methi 3 (27.38 cm) had shown the highest plant spread (E-W), which was on par with Pusa Early Bunching (26.49 cm), whereas lowest was noticed Sirsi Local (16.97 cm). The highest plant spread (N-S) was recorded in Ajmeer Methi 3 (27.20 cm), which was at parity with Pusa Early Bunching (26.14 cm). In comparison, lower plant spread (N-S) was in Belagavi Local (11.70 cm). The wide variation in growth parameters of all the cultivars might be due to their genetic makeup, which indirectly govern the morphology of plant. These results are in conformity with the findings of Aggarwal *et al.* (2013) [11], Datta and Chaudhari (2005) [6] and Latye *et al.* (2016) [11].

The genotypes showed marked differences with respect to days to 50 % flowering. Among the genotypes evaluated, the genotype Pusa Early Bunching was the earliest to achieve the 50 per cent flowering stage with minimum of 38.49 days and which was on par with DFC 8 (40.52 days) and DFC 27 (41.24 days). Whereas, significantly maximum days to 50 % flowering was taken by Belagavi Local (50.84 days). The possible reason of early flowering in certain genotypes indicated adaptability of these genotypes in a particular environment, better and efficient utilization of nutrients in a relatively hostile environment which might have resulted in early termination of vegetative phase and initiation of reproductive stage as compared to genotypes which took longer time to flowering. Similar results have also been reported by Pushpa *et al.* (2010) [15] Singh *et al.* (2015) [18], Jhajhra *et al.* (2017) [8] and Jyothi and Hegde (2018) [9] in fenugreek. The number of days taken to maturity varied significantly among the genotypes. Pusa Early Bunching (96.24 days) took significantly the minimum number of days to pod maturity followed by DFC 8 (99.05 days) and Ajmeer Methi 3 (99.96 days). Whereas, significantly the maximum days to maturity was taken by Sirsi Local (111.82 days) (Table 2). Rao (2001) [16] evaluated diverse fenugreek genotypes in Krishna-Godavari zone of Andhra Pradesh and reported significant variation in flowering and maturity.

Pusa Early Bunching (57.07) produced the highest number of pods per plant which was on par with Ajmeer Methi 3 (56.20), while minimum number of pods per plant was noticed in Sirsi Local (23.79). Such increase in number of pods per plant might be due to the higher growth parameters like plant spread and number of branches, contribution of increased plant spread towards increased seed yield might be mainly through the production of more number of primary and secondary branches which in turn, resulted in more number of pods, as bearing area available on the plant was more. The results of the study were in harmony with the work of Jain *et al.* (2014) [7], Verma (2002) [19] and Jyothi and Hegde (2018) [9].

Significant differences in pod length and number of seeds per pod were also noticed among the genotypes evaluated. Among all the genotypes Pusa Early Bunching registered the highest pod length (12.57 cm) and number of seeds per pod (15.89) which were on par with Ajmeer Methi 3 (12.34 cm & 15.78, respectively). The higher number of seeds per pod may be due to the higher pod length which will result in higher seed yield. The results are in conformity with the findings of Malik and Tehlan (2009) [13].

Significantly highest seed yield (9.08 g/plant, 0.97 kg/plot &

30.82 q/ha) was recorded in Pusa Early Bunching followed by Ajmeer Methi 3, DFC 20, DFC 8 and DFC 27, while minimum was registered in Sirsi Local (4.35 g/plant, 0.46 kg/plot & 14.47 q/ha) (Table 3). The variation in yield characters might be due to differences in response of different fenugreek varieties to agro-climatic conditions and different

vegetative characters of cultivars might cause the significant difference. Similar results under different set of climatic conditions as influenced by the cultivars of fenugreek were reported by Sharma and Sastry (2008) [17], Pushpa *et al.* (2010) [15], Singh *et al.* (2015) [18] and Jain *et al.* (2014) [7].

Table 1: *Per se* performance of fenugreek genotypes for growth parameters

Sl. No.	Treatments	Plant height (cm)	Number of branches	Plant spread (E-W) (cm)	Plant spread (N-S) (cm)
1	DFC 4	64.94	10.25	19.74	14.33
2	DFC 5	67.50	11.78	21.63	16.60
3	DFC 6	69.05	10.36	19.83	18.78
4	DFC 8	62.41	14.58	25.42	23.43
5	DFC 9	67.92	10.63	21.01	17.78
6	DFC 10	71.12	10.86	20.62	14.55
7	DFC 14	68.22	11.06	21.80	16.80
8	DFC 15	67.24	9.92	19.58	15.47
9	DFC 16	84.59	11.28	21.79	16.53
10	DFC 17	66.61	12.62	24.09	19.16
11	DFC 18	71.89	11.12	21.92	16.17
12	DFC 19	70.35	10.27	20.29	16.50
13	DFC 20	64.43	14.38	24.79	24.45
14	DFC 21	67.90	11.17	20.70	14.89
15	DFC 24	76.46	10.90	20.69	14.66
16	DFC 25	67.13	10.90	21.02	16.64
17	DFC 27	61.15	12.70	23.46	24.11
18	DFC 28	64.80	11.72	22.08	18.92
19	DFC 29	66.87	11.63	21.87	19.38
20	Ajmeer Methi 1	67.11	12.49	23.06	21.27
21	Ajmeer Methi 2	70.46	11.98	23.65	19.97
22	Ajmeer Methi 3	64.42	16.64	27.38	27.20
23	Ajmeer Methi 4	70.55	11.83	23.39	18.77
24	Lam M 2	67.07	12.17	23.72	19.90
25	Pusa Early Bunching	64.72	17.16	26.49	26.14
26	Gujarat Methi 2	66.94	11.79	23.24	17.42
27	CO 1	82.30	10.04	19.76	17.20
28	CO 2	67.41	11.52	22.75	17.34
29	Arabhavi Local	77.79	12.42	24.51	18.28
30	Kushtagi Local	66.57	10.22	19.85	13.82
31	Belagavi Local	76.01	10.42	19.74	11.70
32	Sirsi Local	70.75	8.96	16.97	11.74
	Mean	69.15	11.74	22.09	18.12
	S.Em±	1.19	0.38	0.65	0.85
	CD (0.05)	3.36	1.09	1.83	2.39

Table 2: *Per se* performance of fenugreek genotypes for reproductive and yield parameters

Sl. No.	Treatments	Days to 50% flowering	Days to pod maturity	Number of pods/ plant	Pod length (cm)	Number of seeds/ pod
1	DFC 4	43.42	104.39	33.37	8.92	10.48
2	DFC 5	41.88	101.39	32.81	8.75	9.88
3	DFC 6	41.65	102.47	37.64	9.37	11.39
4	DFC 8	40.52	99.05	49.67	11.82	14.99
5	DFC 9	44.47	105.99	36.15	9.37	11.22
6	DFC 10	43.48	104.20	40.36	9.95	11.51
7	DFC 14	42.93	102.84	41.87	9.43	11.78
8	DFC 15	42.44	102.37	39.99	9.67	12.12
9	DFC 16	42.48	102.56	37.79	9.46	11.23
10	DFC 17	42.23	102.21	35.45	8.75	10.62
11	DFC 18	43.79	104.70	32.71	8.55	10.26
12	DFC 19	42.50	102.56	40.19	10.09	11.81
13	DFC 20	42.12	100.32	49.88	11.97	15.18
14	DFC 21	45.72	108.12	37.31	9.12	11.07
15	DFC 24	47.54	110.17	30.29	7.88	9.54
16	DFC 25	44.92	106.77	39.22	9.79	12.11
17	DFC 27	41.24	100.50	46.55	11.33	14.34
18	DFC 28	46.33	109.09	40.41	9.51	12.10
19	DFC 29	43.59	104.37	36.64	9.31	11.54

20	Ajmeer Methi 1	43.99	105.06	40.02	9.84	12.18
21	Ajmeer Methi 2	43.26	103.40	39.92	9.94	12.37
22	Ajmeer Methi 3	43.95	99.96	56.20	12.34	15.78
23	Ajmeer Methi 4	47.92	110.38	37.66	9.75	11.90
24	Lam M 2	44.53	105.69	41.85	9.47	12.02
25	Pusa Early Bunching	38.49	96.24	57.07	12.57	15.89
26	Gujarat Methi 2	43.21	103.78	33.24	9.34	10.43
27	CO 1	44.02	105.33	36.66	9.50	11.46
28	CO 2	44.62	105.79	35.20	9.12	10.49
29	Arabhavi Local	42.54	102.84	31.91	9.12	10.35
30	Kushtagi Local	45.03	106.95	33.95	8.90	10.59
31	Belagavi Local	45.58	108.40	26.67	8.00	9.30
32	Sirsi Local	50.84	111.82	23.79	8.02	9.26
	Mean	43.79	104.37	38.51	9.65	11.72
	S.Em±	0.54	0.92	0.80	0.25	0.31
	CD (0.05)	1.53	2.60	2.25	0.71	0.87

Table 3: Per se performance of fenugreek genotypes for yield parameters

Sl. No.	Treatments	Seed yield (g/plant)	Seed yield (kg/ plot)	Seed yield (q/ha)
1	DFC 4	5.25	0.56	17.84
2	DFC 5	5.27	0.55	17.59
3	DFC 6	6.14	0.65	20.51
4	DFC 8	7.89	0.85	26.85
5	DFC 9	5.77	0.62	19.54
6	DFC 10	6.63	0.70	22.10
7	DFC 14	6.96	0.73	23.16
8	DFC 15	6.58	0.69	22.00
9	DFC 16	6.18	0.65	20.59
10	DFC 17	5.84	0.61	19.47
11	DFC 18	5.34	0.56	17.77
12	DFC 19	6.57	0.69	21.97
13	DFC 20	8.13	0.88	27.79
14	DFC 21	6.16	0.65	20.57
15	DFC 24	4.83	0.51	16.08
16	DFC 25	6.38	0.67	21.27
17	DFC 27	7.77	0.82	25.87
18	DFC 28	6.63	0.70	22.14
19	DFC 29	5.96	0.63	19.85
20	Ajmeer Methi 1	6.55	0.69	21.88
21	Ajmeer Methi 2	6.56	0.69	21.89
22	Ajmeer Methi 3	8.28	0.91	28.92
23	Ajmeer Methi 4	6.15	0.65	20.55
24	Lam M 2	6.69	0.70	22.35
25	Pusa Early Bunching	9.08	0.97	30.82
26	Gujarat Methi 2	5.47	0.57	18.24
27	CO 1	6.05	0.64	20.18
28	CO 2	5.82	0.61	19.28
29	Arabhavi Local	5.19	0.54	17.29
30	Kushtagi Local	5.61	0.59	18.71
31	Belagavi Local	4.47	0.47	14.88
32	Sirsi Local	4.35	0.46	14.47
	Mean	6.27	0.66	21.01
	S.Em±	0.19	0.03	0.85
	CD (0.05)	0.54	0.08	2.40

Conclusion

From the study it can be concluded that the cultivation of genotypes Pusa Early Bunching, Ajmeer Methi 3, DFC 20, DFC 8 and DFC 27 may be suitable and more economical for Northern dry zone of Karnataka. These high yielding varieties can be proposed for multi-location trials for their yield stability and further exploited in various breeding programmes for their yield potential.

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