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Screening of Fennel (*Anethum graveolens* L.) genotypes for growth and seed yield attributing traits

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Abstract

Fennel (*Anethum graveolens* L.) belongs to seed spice crops. The research experiment on Evaluation of fennel (*Anethum graveolens* L.) genotypes for growth and seed yield attributing characters was conducted at Horticultural Research & Extension Centre, Devihosur, Haveri, University of Horticultural Sciences, Bagalkot, Karnataka during Rabi season (2022-23) to know the different fennel genotypes performance for growth and seed yield attributing characters. Among the different genotypes of the fennel viz., DFnC-1, DFnC -2, DFnC -3, DFnC -4, DFnC -5, DFnC-6, DFnC-7, DFnC-8, DFnC-9, DFnC-10, DFnC-11, DFnC-12, DFnC-13 & four varieties namely C-1, C-2, C-3 and C-4 differed significantly during 2022-23. The results revealed that the genotype DFnC-12, recorded significantly the highest plant height (178 cm) at harvest stage, primary branches (5.90 No./plant), secondary branch (20.90 No./plant), umbels (18.60 No./plant), number of umbellets (54.00 No./umbel), No. of seeds (42.30/umbel), seed yield (845 g/plot) and seed yield per ha (2113 kg/ha) at harvest stage and which was followed by the genotype DFnC -2. While, the lowest plant height (146.00 cm), number of primary and secondary branches (3.90 & 14.40 No./plant, respectively), umbels (11.10/plant), umbellets (36.10/plant), No. of seeds (32.50/umbel), seed yield per plot (501 g) & seed yield per ha (1253 kg/ha) was recorded by C-3.

Keywords: Fennel, genotypes, height of the plant, umbel, umbellets, seed yield per hectare

Introduction

Fennel (*Foeniculum vulgare* Mill.), a member of the Apiaceae family, originates from the Mediterranean region and Europe. Its seeds are commonly used as a spice, and both the seeds and their essential oil serve as flavouring agents in a variety of food products, including bakery items, pickles, confectioneries, and dairy products. In addition to its culinary uses, fennel is valued for its medicinal properties. It is traditionally used to treat conditions such as digestive disorders, constipation, dysentery, diarrhea, and colic pain. It also plays a role in managing ailments related to the respiratory system and internal organs like the spleen and kidneys. Despite its recognized importance in traditional medicine and its potential in the spice export market, fennel has not received adequate scientific focus for improving yield and quality traits (Choudhary *et al.*, 2017) [2]. Improvement in crop characteristics through breeding largely depends on the presence of sufficient genetic variability and its proper utilization. Although several improved fennel varieties have been released in India, there is still a lack of region-specific varieties for Central India, particularly Madhya Pradesh. Thus, there remains a strong need to enhance fennel productivity and adaptability through both conventional and modern breeding approaches. The present investigation was carried out to assess the performance of seventeen fennel genotypes along with four standard checks (C-1, C-2, C-3, and C-4) obtained from different regions of the country under the All India Coordinated Research Project (AICRP) on Seed Spices.

Materials and Methods

A field experiment was carried out during the Rabi season of 2022–23 at the Horticultural Research and Extension Centre, Devihosur, Haveri, under the University of Horticultural Sciences, Bagalkot, Karnataka, to evaluate the performance of different fennel genotypes for

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growth and seed yield. The research station is situated in the Northern Transitional Agro-climatic Zone (Zone 8) at 14°47' N latitude and 75°21' E longitude, with an altitude of 563 m above mean sea level. The soil of the experimental site is medium-depth black soil, and the area receives an average annual rainfall of about 750 mm. The major crops of this centre include chilli and seed spices.

The experiment consisted of seventeen fennel genotypes collected from Devihosur, namely DFnC-1 to DFnC-13, along with four check varieties (C-1, C-2, C-3, and C-4). Seeds were sown at a spacing of 60 × 30 cm. The trial was laid out in a Randomized Block Design (RBD) with a single factor and replicated twice. All recommended agronomic practices were followed under limited irrigation conditions to obtain quality seed production. Since fennel is a cross-pollinated crop with a high tendency for outcrossing, an isolation distance of 200 m was maintained from other fennel fields to prevent genetic contamination. Rouging was carried out at different crop growth stages, including vegetative, flowering, and seed maturity stages, to ensure genetic purity. Observations were recorded on five randomly selected plants from each genotype in every replication. The parameters studied included plant height, number of primary and secondary branches, number of umbels per plant, number of umbellets per umbel, number of seeds per umbel, seed yield per plant, and seed yield per hectare. The net plot yield was used to calculate yield per hectare. All recorded data were subjected to appropriate statistical analysis.

Results and Discussion

The results obtained from the present investigation on performance of different genotypes of fennel differed significantly with respect to growth and seed yield attributing characters during 2022-23 as presented in table.1 & 2. The analysis of variance was calculated for all growth and seed yield parameters of different genotypes of fennel and mean of different parameters were presented and results were revealed that, the significant maximum plant height (178 cm) at harvest stage, primary branches (5.90 No./plant), secondary branch (20.90 No./plant), umbels (18.60 No./plant), number of umbellets (54.00 No./umbel), No. of seeds (42.30/umbel), seed yield (845 g/plot) and seed yield per ha (2113 kg/ha) at harvest stage was recorded with genotype DFnC-12. However, which was followed by the genotype the DFnC-2. While, the lowest plant height (146.00 cm), number of primary and secondary branches (3.90 & 14.40 No./plant, respectively), umbels (11.10/plant), umbellets (36.10/plant), No. of seeds (32.50/umbel), seed yield per plot (501 g) & seed yield per ha (1253 kg/ha) was recorded by the genotype C-3 (table.1&2). The observed variation in growth and yield traits among the genotypes may be attributed to differences in their genetic potential as well as their ability to adapt to specific seasonal conditions, location, and management practices. The morphological variability recorded among the genotypes is likely governed by their inherent genetic makeup.

Similar observations have been reported by Malhotra and Vashistha (2007) [7] in dill and Balai *et al.* (2011) [1] in coriander. The present findings are also in agreement with the reports of Selvarajan and Chezhiyan (2001) [10], Hellal *et al.* (2011) [5], and Kushbhu Kumari *et al.* Enhanced crop growth, particularly in terms of the number of branches per plant, may be due to the combined effect of genetic potential and proper crop management practices, as also indicated by Kumar *et al.* (2002). Comparable results have been documented by Solanki *et al.* (2014) [12] and Raut *et al.* (2020) [9] in dill, as well as by Jyothi

al. (2017) [6] & Dhakad *et al.*, (2017) [3] in Coriander. And genotypes were highly significant for all the characters indicating that the presence of genetic diversity in the material Sengupta *et al.*, (2014) [11] Ghanshyam *et al.*, (2015) [4] and Mamatha *et al.*, (2017) [8] reported the same findings in thirteen genotypes of fennel evaluated at Vegetable Research Farm, Department of Horticulture, JNKVV, Jabalpur.

Table 1: Evaluation of Fennel Genotypes for growth attributes during 2022-23

Genotypes	Plant height (cm)	Primary branches (No./plant)	Secondary branch (No./plant)	Umbels (No./plant)	Umbellets (No./plant)
DFnC-1	166	4.8	19.1	16.7	50.6
DFnC-2	171	5.7	19.4	17.4	52.3
DFnC-3	154	4.6	17.1	14.6	49.6
DFnC-4	157	4.9	17.8	13.6	45.1
DFnC-5	159	4.6	16.1	13.3	47.7
DFnC-6	154	4.4	16.1	14.7	50.7
DFnC-7	163	4.7	17.2	12.2	49.4
DFnC-8	173	5.0	14.4	15.2	48.1
DFnC-9	169	4.9	17.4	13.1	46.3
DFnC-10	173	4.5	16.4	14.6	50.1
DFnC-11	168	4.6	16.9	15.6	44.4
DFnC-12	178	5.9	20.9	18.6	54.0
DFnC-13	166	4.3	14.7	12.5	44.3
C-1	161	4.2	14.2	13.5	46.1
C-2	152	5.6	17.1	15.6	44.8
C-3	146	3.9	14.4	11.1	36.1
C-4	152	4.7	21.1	14.1	45.9
Mean	162.5	4.8	17.1	14.5	47.4
SEM	25	0.55	0.65	1.01	1.15
CD@5%	75	1.65	1.95	3.03	3.45
CV%	5.25	4.25	5.56	8.25	6.25

C-1: GF-12 C-2:RF-145 C-3:AF-1 C-4:AF-2

Table 2: Evaluation of Fennel Genotypes for Seed Yield during 2022-23

Genotypes	Number of seeds/ Umbel	Seed Yield (Plot yield/g)	Seed Yield (Kg/ha)
DFnC-1	38.4	512	1280
DFnC-2	39.8	810	2025
DFnC-3	33.8	735	1838
DFnC-4	34.2	613	1533
DFnC-5	38.0	605	1513
DFnC-6	35.0	665	1663
DFnC-7	39.8	615	1538
DFnC-8	39.8	725	1813
DFnC-9	35.8	645	1613
DFnC-10	32.2	701	1753
DFnC-11	34.9	740	1850
DFnC-12	42.3	845	2113
DFnC-13	32.0	805	2013
C-1	35.3	545	1363
C-2	39.1	685	1713
C-3	32.5	501	1253
C-4	35.8	703	1758
Mean	36.4	673	1684
SEM	1.03	31.3	50.15
CD@5%	3.09	93.9	150.45
CV%	9.15	4.65	7.25

Conclusion

Among the evaluated fennel genotypes, DFnC-12 exhibited superior performance, particularly with respect to growth parameters and seed yield. Hence, this genotype may be

considered a promising candidate for inclusion in future crop improvement and breeding programmes.

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