Biological Forum – An International Journal **14(4): 757-761(2022)**

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

Variation for Qualitative Traits in Ajwain (*Trachyspermum ammi* L.) Germplasm

Gayathri T.[1*], Giridhar K.[2], Tanuja Priya B.[3], Paratpara Rao M.[4] and Vijaya Lakshmi T.[5]

[1]P.G. Scholar, Department of Plantation, Spices, Medicinal and Aromatic Crops, College of Horticulture, Dr. YSR Horticultural University, Venkataramannagudem, West Godavari (Andhra Pradesh), India.
[2]Principal Scientist and Head (Horticulture), Horticultural Research Station, Dr. YSR Horticultural University, Lam, Guntur (Andhra Pradesh), India.
[3]Senior Scientist (Horticulture), Horticultural Research Station, Dr. YSR Horticultural University, Lam, Guntur (Andhra Pradesh), India.
[4]Associate Professor, Department of Genetics and Plant Breeding, College of Horticulture, Dr. YSR Horticultural University, Venkataramannagudem, West Godavari (Andhra Pradesh), India.
[5]Senior Scientist (Plant Pathology), Horticultural Research Station, Dr. YSR Horticultural University, Lam, Guntur (Andhra Pradesh), India.

(Corresponding author: Gayathri T.)*
(Received 11 September 2022, Accepted 27 October, 2022)
(Published by Research Trend, Website: www.researchtrend.net)

ABSTRACT: The current study examined variation in ten qualitative traits of ajwain (*Trachyspermum ammi* L.) germplasm lines, including vegetative, floral, and seed shattering habit. Growth habit, foliage at full grown stage, stem waxiness, nature of branch emergence, angle of primary branch, leaf: density of feathering are among the vegetative characters, while stigma colour, gynoecium carpel colour, and umbel compactness are among the floral characters. Under an Olympus trinocular microscope, the floral characters stigma colour and gynoecium carpel colour were examined. All of the traits studied showed variation among genotypes, which could be attributed to genotypic variation.

Keywords: Ajwain, Introduction, Qualitative traits, Germplasm.

INTRODUCTION

Ajwain (*Trachyspermum ammi* L.) is a seed spice crop that belongs to the Apiaceae family and has chromosome number 2n = 2x = 18. It is also known as false lovage seeds, bishop's weed, carum, ajowan and ajowan. It is primarily grown for seed, herb and volatile oil. Ajwain is a Mediterranean native that is primarily grown in eastern India, Egypt, Persia, Afghanistan, Pakistan and Iran. It has medicinal value, particularly for treating digestive system disorders and aphrodisiac, laxative, carminative and indigestion. Additionally, it is used to treat cholera, diarrhoea, gastric and urinary issues. Seeds have a small amount (2-4%) of yellow to brownish volatile oil. Thymol (50%) is the main component of ajwain oil and is a powerful germicide, antispasmodic and fungicide. Humans benefit from the oil's fungicidal, antimicrobial and anti-aggregatory properties. Thymol can also be found in toothpaste and perfume. It contains 8.9% moisture, 15.4% protein, 18.1% fat (ether extract), 11.9 percent fibre, 38.6% carbohydrates and 7.1% minerals in addition to volatile oil (Dashora, 2005). Appropriate identification and characterization of plant material is critical for successful plant resource conservation and long-term agricultural use. Crop species genotype descriptors are required for varietal identity, determining varietal purity, distinguishing new genotypes from existing varieties and documenting genetic resources (Deswal *et al.*, 2017). Keeping the preceding aspects in mind, this experiment was planned and carried out at Horticultural Research Station, Lam, Guntur, during 2021-22, with the goal of studying the variation among ajwain germplasm for various qualitative traits.

MATERIALS AND METHODS

The experiment was carried out at the Horticultural Research Station, Lam, Guntur, which is located in the Krishna-Godavari Agro-climatic Zone of Andhra Pradesh, India, at an altitude of 31.5 metres above mean sea level, 16° 18° N latitude, 80° 29° E longitude and about 8 km away from the Guntur town. Vertisols (black cotton soil) with a pH of 8.4, an EC of 0.16 mmhos cm^{-1} and a good moisture-retentive capacity make up the soil at the experimental site. NPK contents ranged from 200 to 250, 70 to 90 and 800-850 $kgha^{-1}$, respectively.

35 germplasm lines were sown using an augmented block design that consisted of five augmented blocks, each with seven entries and four check varieties. By visually observing five plants from each row, the observations for ten qualitative traits, including growth habit, foliage at full-grown stage, stem waxiness, nature of branch emergence, angle of primary branch, leaf: density of feathering, colour of stigma, gynoecium

carpel colour, umbel compactness and seed-shattering habit, were made.

1. Growth habit: Plant growth habit was visually recorded at 50% flowering, and germplasm lines were classified as erect or spreading.

2. Foliage at full grown stage: Foliage at full grown stage was recorded based on visual observations at 60 days after sowing, and genotypes were classified as dense or sparse.

3. Nature of branch emergence: The nature of branch emergence was visually recorded at 50% flowering, and the genotypes were divided into two groups: from the base of the plant and above the base of the plant.

4. Angle of primary branch: The angle of the primary branch was measured at 50% flowering and genotypes were classified as narrow angled (<45˚) or broad angled (>45˚).

5. Stem waxiness: The plants were visually evaluated after flowering for the presence or absence of waxiness on the stem and the classification was made accordingly.

6. Leaf: Density of feathering: Density of feathering of leaf is recorded visually at the time of appearance of main umbel and genotypes were grouped under two categories i.e., dense and sparse.

7. Colour of stigma: The colour of the stigma was observed under a microscope and classified as white and light green.

8. Gynoecium (carpel colour): The colour of gynoecium carpels was observed under a microscope and classified as light yellow, light green, and dark green.

9. Umbel compactness: The main umbel compactness was visually recorded at maturity, and the genotypes were classified into three categories: loose, medium compact, and compact.

10. Seed shattering habit: Seed shattering habit was observed visually during harvest, and genotypes were classified into three categories: low shattering, medium shattering, and high shattering.

RESULTS AND DISCUSSION

The variation among 39 germplasm lines of ajwain, including checks, was examined using a diverse range of qualitative traits, including growth habit, foliage at full-grown stage, stem waxiness, nature of branch emergence, angle of primary branch, leaf: density of feathering, colour of stigma, colour of gynoecium carpel, umbel compactness and seed shattering habit. Twenty-four of the genotypes under study showed spreading growth habits, while fifteen of the genotypes showed erect growth habits (Plate 1.). Several studies, including Devebarta (2011) in fenugreek, Amit (2012) in coriander, Meena (2012) in ajwain and Chitra (2017) in coriander reported the variation in growth habits (Table 1).

Foliage at the full-grown stage was studied in all 39 ajwain genotypes and classified into two types: dense and sparse. At full growth, seventeen genotypes had dense foliage, while the remaining 22 genotypes had sparse foliage (Table 2). Except AA-3, AA-57, AA-61 and GA-1, which were non-waxy types, the majority of germplasm lines tested showed stem waxiness (Plate 2). Meena (2012) reported similar findings in Ajwain (Table 3). Eleven germplasm lines, including AA-3, AA-36, AA-56, AA-61, AA-67, LTA-26, LTA-40, LTA-41, LTA-51, GA-1 and LA-2, showed branch emergence above the base of the plant (Plate 3), while the other twenty-eight lines showed branch emergence from the base of the plant (Table 4). Among the germplasm tested, sixteen genotypes had a narrow angle (45°) between the primary branch and the main stem, while the remaining 23 genotypes had a broad angle (>45°) between the primary branch and the main stem (Table 5). Eighteen of the germplasm lines tested for leaf feathering density have dense feathering, while the other twenty-one lines have sparse feathering (Table 6, Plate 4).

The stigma varied in colour from pale green to white. With the exception of AA-10, AA-12, AA-22, AA-21, AA-29, AA-36, AA-37, AA-41, AA-52, AA-69, LTA-42, LTA-43, LTA-45 and LTA-47, the majority of the germplasm lines under study exhibited a pale green stigma (Table 7, Plate 5). Twelve genotypes exhibited a light-yellow carpel colour, twenty exhibited a light green carpel colour and seven showed a dark green carpel colour (Table 8, Plate 6). The majority of the genotypes studied for umbel compactness have medium umbel compactness. The genotypes AA-10, S-11-6, AA-37, AA-41, AA-57, JA-189, AA-63, LTA-26, LTA-42, LTA-47, LTA-51 and LA-2 have loose umbels, whereas AA-29, AA-67, LTA-24, LTA-25, LTA-43, LTA-45 and GA-1 have tight umbels (Plate 7). Meena (2012) discovered a similar variation in umbel compactness in ajwain (Table 9). Among the genotypes under study for seed shattering habits, seventeen genotypes exhibited low seed shattering habits. Sixteen genotypes were found to have a medium shattering habit. However, the genotypes AA-10, AA-12, AA-36, AA-48, LTA-25 and LTA-40 exhibited high seed shattering. Similar findings were reported by Meena (2012) in Ajwain (Table 10).

Table 1: Categorization of ajwain germplasm based on growth habit.

Category	Number of entries	Germplasm
Erect	15	AA-10, AA-12, AA-26, AA-29, AA-30, AA-37, AA-4, AA-63, LTA-24, LTA-41, LTA-43, AA-2, GA-1, LS-1, LA-2
Spreading	24	S-11-6, AA-22, AA-21, AA-3, AA-36, AA-41, AA-48, AA-52, AA-56, AA-57, JA-189, AA-61, AA-67, AA-69, AA-68, LTA-25, LTA-26, LTA-39, LTA-40, LTA-42, LTA-44, LTA-45, LTA-47, LTA-51

Table 2: Categorization of ajwain germplasm based on foliage at full grown stage.

Category	Number of entries	Germplasm
Dense	17	AA-10, S-11-6, AA-21, AA-26, AA-30, AA-41, AA-52, AA-69, LTA-39, LTA-40, LTA-41, LTA-42, LTA-43, LTA-44, LTA-51, AA-2, LA-2
Sparse	22	AA-12, AA-22, AA-29, AA-3, AA-36, AA-37, AA-4, AA-48, AA-56, AA-57, JA-189, AA-61, AA-63, AA-67, AA-68, LTA-24, LTA-25, LTA-26, LTA-45, LTA-47, GA-1, LA-1

Table 3: Categorization of ajwain germplasm based on stem waxiness.

Category	Number of entries	Germplasm
Present	35	AA-10, AA-12, S-11-6, AA-22, AA-21, AA-26, AA-29, AA-30, AA-36, AA-37, AA-4, AA-41, AA-48, AA-52, AA-56, JA-189, AA-63, AA-67, AA-69, AA-68, LTA-24, LTA-25, LTA-26, LTA-39, LTA-40, LTA-41, LTA-42, LTA-43, LTA-44, LTA-45, LTA-47, LTA-51, AA-2, LS-1, LA-2
Absent	4	AA-3, AA-57, AA-61, GA-1

Table 4: Categorization of ajwain germplasm based on nature of branch emergence.

Category	Number of entries	Germplasm
From base	28	AA-10, AA-12, S-11-6, AA-22, AA-21, AA-26, AA-29, AA-30, AA-37, AA-4, AA-41, AA-48, AA-52, AA-57, JA-189, AA-63, AA-69, AA-68, LTA-24, LTA-25, LTA-39, LTA-42, LTA-43, LTA-44, LTA-45, LTA-47, AA-2, LS-1.
Above base	11	AA-3, AA-36, AA-56, AA-61, AA-67, LTA-26, LTA-40, LTA-41, LTA-51, GA-1, LA-2

Table 5: Categorization of ajwain germplasm based on angle of primary branch.

Category	Number of entries	Germplasm
Narrow angle (<45°)	16	AA-12, AA-2, AA-30, AA-36, AA-4, AA-41, AA-61, AA-63, AA-67, AA-68, LTA-24, LTA-25, LTA-41, LTA-42, LTA-43, LS-1
Broad angle (>45°)	23	AA-10, S-11-6, AA-21, AA-26, AA-29, AA-3, AA-37, AA-48, AA-52, AA-56, AA-57, JA-189, AA-69, LTA-26, LTA-39, LTA-40, LTA-44, LTA-45, LTA-47, LTA-51, AA-2, GA-1, LA-2

Table 6: Categorization of ajwain germplasm based on leaf: density of feathering.

Category	Number of entries	Germplasm
Dense	18	AA-10, AA-12, S-11-6, AA-29, AA-30, AA-41, AA-52, AA-57, AA-63, AA-67, AA-68, LTA-41, LTA-43, LTA-45, LTA-51, AA-2, LS-1, LA-2
Sparse	21	AA-2, AA-21, AA-26, AA-3, AA-36, AA-37, AA-4, AA-48, AA-56, JA-189, AA-61, AA-69, LTA-24, LTA-25, LTA-26, LTA-39, LTA-40, LTA-42, LTA-44, LTA-47, GA-1

Table 7: Categorization of ajwain germplasm based on colour of stigma.

Category	Number of entries	Germplasm
Light green	25	S-11-6, AA-26, AA-3, AA-30, AA-4, AA-48, AA-56, AA-57, JA-189, AA-61, AA-63, AA-67, AA-68, LTA-24, LTA-25, LTA-26, LTA-39, LTA-40, LTA-41, LTA-44, LTA-51, AA-2, GA-1, LS-1, LA-2
White	14	AA-10, AA-12, AA-22, AA-21, AA-29, AA-36, AA-37, AA-41, AA-52, AA-69, LTA-42, LTA-43, LTA-45, LTA-47

Table 8: Categorization of ajwain germplasm based on gynoecium carpel colour.

Category	Number of entries	Germplasm
Light green	19	AA-12, AA-22, AA-29, AA-30, AA-36, AA-37, AA-4, AA-41, AA-48, AA-52, AA-57, JA-189, AA-67, AA-68, LTA-24, LTA-25, LTA-39, LTA-40, LTA-42, LTA-47
Dark green	7	S-11-6, AA-56, AA-63, LTA-26, LTA-51, GA-1, LA-2
Light yellow	13	AA-10, AA-21, AA-26, AA-3, AA-61, AA-69, LTA-41, LTA-43, LTA-44, LTA-45, AA-2, LS-1

Table 9: Categorization of ajwain germplasm based on umbel compactness.

Category	Number of entries	Germplasm
Loose	12	AA-10, S-11-6, AA-37, AA-41, AA-57, JA-189, AA-63, LTA-26, LTA-42, LTA-47, LTA-51, LA-2
Medium compact	20	AA-12, AA-22, AA-21, AA-26, AA-3, AA-30, AA-36, AA-4, AA-48, AA-52, AA-56, AA-61, AA-69, AA-68, LTA-39, LTA-40, LTA-41, LTA-44, AA-2, LS-1
High Compact	7	AA-29, AA-67, LTA-24, LTA-25, LTA-43, LTA-45, GA-1

Table 10: Categorization of ajwain germplasm based on seed shattering habit.

Category	Number of entries	Germplasm
Low	17	AA-29, AA-30, AA-4, JA-189, AA-61, AA-63, AA-68, LTA-26, LTA-39, LTA-42, LTA-44, LTA-47, LTA-51, AA-2, GA-1, LS-1, LA-2
Medium	16	S-11-6, AA-22, AA-21, AA-26, AA-3, AA-37, AA-41, AA-52, AA-56, AA-57, AA-67, AA-69, LTA-24, LTA-41, LTA-43, LTA-45
High	6	AA-10, AA-12, AA-36, AA-48, LTA-25, LTA-40

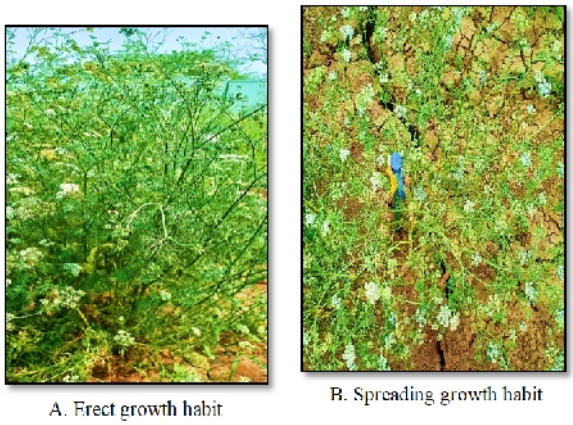

Plate 1. Growth habit.

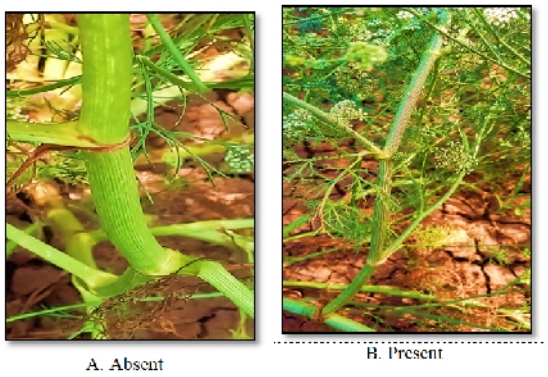

Plate 2. Stem waxiness.

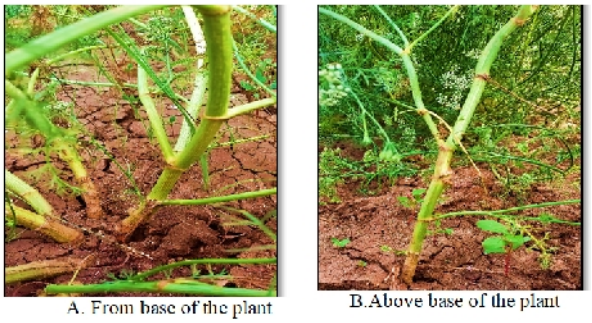

Plate 3. Nature of branch emergence.

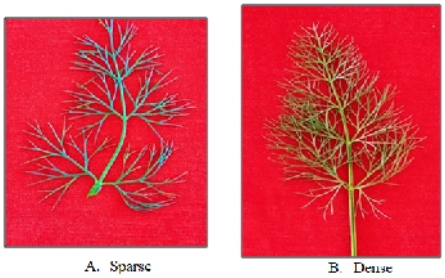

Plate 4. Leaf: density of feathering.

Plate 5. Colour of Stigma.

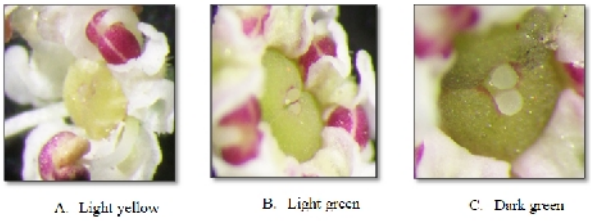

Plate 6. Gynoecium carpel colour.

Plate 7. Umbel compactness.

CONCLUSION

It was revealed that there was variation in the qualitative traits studied across different germplasm lines. This variation could be due to genetic variations.

FUTURE SCOPE

It is mentioned that the current findings, which are based on a one-year investigation are simply indicative. Therefore, it is advised that this experiment be conducted once more to verify the accuracy of the previous finding. The findings of this study can be applied to various breeding techniques to enhance ajwain genetics and the study can be expanded to separate the existing ajwain germplasm for registration without any legal concerns linked to Intellectual issues of plant variety protection.

REFERENCES

Amit, M. (2012). Characterization of coriander genotypes. *M. Sc. Thesis*. Department of Vegetable Sciences. C.C.S.H.A.U. Hisar.

Chitra, R. (2017). Variability for qualitative and quantitative characters in coriander (*Coriandrum sativum* L.) genotypes. *International Journal of Seed Spices*, *7*(2), 8-13.

Deswal, S., Malik, T. P. and Tehlan, S. K. (2017). Characterization of fennel (*Foeniculum vulgare* L.) Genotypes on the Basis of Seed Characteristics. *International Journal of Current Microbiology and Applied Sciences*, *6*(10), 3671-3677.

Dashora, L. K. (2005). Advances in production technology of ajwain. A course manual for winter school on Advances in seed spices production at NRCSS. *Ajmer during September*, *22*, 172-174.

Devebarta (2011). Characterization of fenugreek germplasms by field and laboratory techniques. M. Sc. Thesis. Department of Vegetable Sciences. C.C.S.H.A.U. Hisar.

Meena, K. K. (2012). Performance of Ajwain (*Trachyspermum ammi* L.) Germplasm under Udaipur Agro-climatic Conditions. *M. Sc. Thesis*, MPUAT, Udaipur.

How to cite this article: Gayathri T., Giridhar K., Tanuja Priya B., Paratpara Rao M. and Vijaya Lakshmi T. (2022). Variation for Qualitative Traits in Ajwain (*Trachyspermum ammi* L.) Germplasm. *Biological Forum – An International Journal*, *14*(4): 757-761.