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Assessment of Ajwain (*Trachyspermum ammi* L.) Genotypes for Reproductive and Yield attributes under Eastern Dry Zone of Karnataka

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ABSTRACT: Fourteen ajwain genotypes were evaluated at College of Horticulture, Bengaluru, Karnataka, India, from October 2019 to April 2020 in-order to identify suitable ajwain genotype for Eastern dry zone of Karnataka. The experiment was laid out in randomised complete block design and Fisher's method of data analysis was used. Evident differences among ajwain genotypes in days to first flowering, 50 % flowering, days to maturity, number of umbels per plant, number of umbellet and seeds per umbel, seed yield per plant, per plot and per hectare, harvest index and test weight confirms the presence of variability among them. The genotype AA-93 registered minimum number of days to first flower appearance (53.00 days), days to 50 per cent flowering (65.00 days) and days for umbel formation (78.67 days). The maximum and minimum number of umbels per plant was registered in the genotype GA-1 (207.20) and Lam Sel-1 (99.33), respectively. The number of umbellet per umbel was maximum in the genotype AA-1 (20.00), and minimum in Lam Sel-1 (11.33). The genotype AA-93 registered minimum days to seed maturity (136.67 days). The genotype GA-1 exhibited maximum number of seeds per umbel (415.73) and was minimum in Lam Sel-1 (177.33). The maximum and minimum seed yield per hectare was recorded in the genotype GA-1 (13.37 q/ha) and Lam Sel-1 (4.06 q/ha), respectively. Maximum test weight was recorded in the genotype DAC-6 (1.15 g per 1000 seeds). From the experiment it is evident that, the genotype GA-1 performed well under Eastern dry zone of Karnataka compared to other genotypes.

Keywords: Ajwain, variability, genotypes, pharmacological activities, essential oil.

INTRODUCTION

Ajwain (*Trachyspermum ammi* L., 2n=18) also known as Carom seed or Carom Ajowan or Bishop's weed, is one of the important seed spice belonging to the family Apiaceae and is native to Egypt. It is dispersed in many parts of India, Iran, Afghanistan, *etc*. In India, it occupies an area of 34,500 ha with the production of 27,940 tonnes and it is mainly cultivated in Rajasthan (15,430 ha area and 10,540 tonnes production), Gujarat (5,320 ha and 5,050 tonnes), Telangana, Madhya Pradesh, Andhra Pradesh, Uttar Pradesh, Uttaranchal, Haryana, Punjab, Maharashtra and to a small extent in Karnataka (Anon., 2018). It is also gaining cropping area under West Bengal and Bihar (Mohsenzadeh *et al*., 2012). The length of growing season of ajwain in Karnataka is short compared to that prevailing in Rajasthan (Solemani *et al*., 2011). The major ajwain importing countries are Yemen, Dubai, Malaysia, Pakistan, Saudi Arabia, Indonesia, Singapore, UAE and USA (Ravindrababu *et al*., 2012).

Ajwain seeds possesses various pharmacological activities like anti-fungal, anti-oxidant, antimicrobial, cytotoxic, hypolipidemic, anti-hypertensive, anti-spasmodic, broncho-dilating actions, anti-lithiasis, diuretic, abortifacient, anti-tussive, nematicidal, anthelmintic, anti-filarial, antiplatelet-aggregatory and hepatoprotective activity. Thus, seeds are used for the treatment of abdominal pains, piles, bronchial problems, asthma, lack of appetite, abdominal tumors,diarrhea, dysentery, atonic dyspepsia, cholera, colic skin diseases, hysteria, flatulence, indigestion, galactagogue, amenorrhea (Dubey and Kashyap, 2015). Ajwain seeds contain an essential oil, which consists thymol (50 %), γ-terpinene (3.83%) and cymene (3.37%). It has a strong anti-spasmodic, fungicidal and germicidal effect (Bhatt *et al*., 2018). The other major use of ajwain in flavoring of foods (Muvel *et al*., 2015). As the crop is

gaining importance in the southern states, an effort was made to identify suitable ajwain genotype during the *rabi* season under Eastern dry zone of Karnataka.

MATERIAL AND METHODS

A field experiment was conducted at the Department of Plantation, Spices, Medicinal and Aromatic crops, College of Horticulture, UHS campus, GKVK, Bengaluru, Karnataka, India, during *rabi* season of October 2019 to April 2020. Experimental site is located at an elevation of 930 meters above MSL with 12°58′ North latitude and 77°35′ East longitude which comes under Eastern Dry Zone of Karnataka. Experimental material consisted of fourteen ajwain genotypes (Table 1) which were evaluated in randomised complete block design with three replications. The seed were sown in plots of size 2.7 m × 1.4 m (3.78 m^2) with a spacing of 45 cm × 20 cm accommodating 42 plants. Complete production practices were followed to raise an healthy crop. Five representative plants in each plot were tagged to record the observations. The data recorded on various parameters during the course of investigation were subjected to Fisher's method of analysis of variance through statistical design RCBD. Data interpretation was carried out according to Panse and Sukhatme (1957).

Table 1: Source of ajwain genotypes used in the experiment.

Name of the genotype	Source	Salient features
DAC-1	HRS, Devihosur, Haveri	—
DAC-2	HRS, Devihosur, Haveri	—
DAC-3	HRS, Devihosur, Haveri	—
DAC-4	HRS, Devihosur, Haveri	—
DAC-5	HRS, Devihosur, Haveri	—
DAC-6	HRS, Devihosur, Haveri	—
DAC-7	HRS, Devihosur, Haveri	—
DAC-8	HRS, Devihosur, Haveri	—
AA-1	NRCSS, Ajmer, Rajasthan	Suitable for both irrigated and rainfed conditions
AA-2	NRCSS, Ajmer, Rajasthan	Resistant to powdery mildew
AA-93	NRCSS, Ajmer, Rajasthan	Early maturing, lodging resistant
GA-1	GAU, Gujarat	Matures in 175 days
Lam Sel-1	HRS, Lam, Guntur	Erect type
Lam Ajwain-2	HRS, Lam, Guntur	Spreading type

DAC: Devihosur Ajwain collection AA: Ajmer Ajwain GA: Gujarat Ajwain

RESULTS AND DISCUSSION

Significant differences among ajwain genotypes with respect to yield and yield attributes revealed the existence of variability among the genotypes (Table 2). The genotype AA-93, took less number of days to first flower appearance, 50 % flowering, umbel formation and days to maturity (53.00, 65.00, 78.67 and 136.67 days, respectively), while, Lam Ajwain-2 took maximum days to first flowering, 50 % flowering and umbel formation (89.00, 96.33 and 109.67 days, respectively) and maximum days to seed maturity was observed in Lam Sel-1 (168.33 days). This confirms that, AA-93 genotype is an early maturing type. The variations in days to first flower appearance and 50 per cent flowering was attributed to the genetic constitution of the genotype combined with environmental interaction. The quick growth and accumulation of more amount of carbohydrates have resulted in early flowering. However, the variations in days taken for umbel formation is due to variations in days to first flower appearance, days to 50 per cent flowering, faster growth and interaction of a particular genotype with the environment. The reports by Meena *et al*., (2014); Meena *et al*. (2017) in ajwain genotypes, Moniruzzaman *et al*., (2013); Phurailatpam *et al*., (2016); Hongal *et al*., (2018) in coriander genotypes, Haq *et al*., (2015) in black cumin genotypes and Telugu *et al*., (2019) in fennel genotypes provides support to the present findings.

Table 2: Mean performance of various ajwain genotypes for yield and yield attributes under Eastern dry of Karnataka.

Genotypes	Days to first flowering	Days to 50 % flowering	Days for umbel formation	No. of umbels per plant	No. of umbellets per umbel	No. of seeds per umbel	Seed yield per plant (g)	Seed yield per plot (g)	Seed yield per hectare (q)	Harvest index (%)	Test weight (g)
DAC-1	75.33	83.33	96.67	144.60	13.67	292.40	10.70	434.60	11.44	17.06	1.04
DAC-2	73.33	80.33	96.67	126.93	13.33	268.00	9.43	388.70	10.23	14.63	1.08
DAC-3	84.67	92.33	96.00	120.80	12.33	219.13	5.53	209.13	5.51	15.14	0.84
DAC-4	84.00	90.67	102.00	131.20	12.67	228.47	6.03	209.93	5.53	14.82	0.76
DAC-5	71.33	79.00	94.67	130.00	13.33	235.27	7.74	225.77	5.94	14.38	0.98
DAC-6	70.67	80.67	93.33	170.93	15.00	296.93	10.64	432.43	11.38	16.85	1.15
DAC-7	88.33	94.67	105.67	109.00	13.33	207.93	6.50	221.40	5.82	16.32	0.96
DAC-8	72.67	81.33	95.67	189.87	19.67	367.53	12.41	504.90	13.29	19.97	0.97
AA-1	70.33	80.00	95.67	194.87	20.00	406.93	12.31	476.67	12.55	18.94	0.94
AA-2	76.33	84.00	97.67	185.40	15.00	323.40	11.15	454.03	11.94	17.87	0.73
AA-93	53.00	65.00	78.67	138.93	13.67	298.87	10.81	449.67	11.83	18.33	0.62
GA-1	68.67	80.33	91.33	207.20	14.33	415.73	13.37	507.90	13.37	19.89	0.91
Lam Sel-1	81.67	90.00	99.67	99.33	11.33	177.33	5.02	154.60	4.06	14.83	0.78
Lam Ajwain-2	89.00	96.33	109.67	101.60	11.67	183.20	5.32	181.67	4.79	15.44	0.67
Mean	75.67	84.14	96.67	146.48	14.24	280.08	9.07	346.53	9.12	16.75	0.89
S.Em ±	1.19	1.52	2.03	4.13	0.42	8.08	0.40	16.83	0.44	4.55	0.05
CD @ 5 %	3.57	4.57	6.08	12.38	1.24	24.24	1.22	50.50	1.32	3.83	0.14

The number of umbels per plant was maximum in GA-1 (207.20) followed by AA-1 (194.87), DAC-8 (189.87) and AA-2 (185.40) while, minimum number of umbels was recorded in Lam Sel-1 (99.33). The maximum number of umbellet (20.00) was produced by AA-1, while, minimum was registered in Lam Sel-1 (11.33). The genotype GA-1 produced maximum number of seeds per umbel (415.73) followed by AA-1 (406.93) and DAC-8 (367.53) while, Lam Sel-1 produced minimum number of seeds per umbel (177.33). The variation is due to genetic makeup and response of specific genotype to the environmental factors. However, the production of better number of primary and secondary branches have resulted in production of better number of umbels per plant and umbellet per umbel and better seed set is attributed to better pollination and fertilization. Results reported by Singh *et al.* (2003) in fennel genotypes, Meena *et al*., (2017) in ajwain genotypes, Moniruzzaman *et al*. (2013); Phurailatpam *et al*. (2016); Hongal *et al*., (2018) in coriander genotypes and Telugu *et al*. (2019) in fennel genotypes provides support to the present findings.

The maximum seed yield per plant, per plot and per hectare was registered in GA-1 (13.37 g plant^{-1}, 507.90 g plot^{-1} and 13.37 q ha^{-1}) followed by DAC-8 (12.41 g plant^{-1}, 504.90 g plot^{-1} and 13.29 q ha^{-1}) while, minimum yield was observed in Lam Sel-1 (5.02 g plant^{-1}, 154.60 g plot^{-1} and 4.06 q ha^{-1}). Maximum test weight was recorded in DAC-6 (1.15 g) followed by DAC-2 (1.08) and DAC-1 (1.04) and minimum was registered in AA-93 (0.62 g). Maximum harvest index was recorded in DAC-8 (19.97 %) followed by GA-1 (19.89 %) and AA-1 (18.94 %), and minimum was recorded in DAC-5 (14.38 %). Seed yield is a complex biometric trait and considerable variations in seed yield are attributed to genetic character and response of a genotype to agro-climatic conditions. Increase in seed yield among ajwain genotypes could be attributed to better growth and yield parameters which positively correlated to yield. Seed size is a typical genetic character but variations in test weight is due to the differences in accumulation of dry matter and photosynthates in seeds. Corresponding findings were reported by Sarada *et al.* (2009); Meena *et al*. (2014) in ajwain genotypes, Moniruzzaman *et al*. (2013); Phurailatpam *et al*. (2016); Hongal *et al*., (2018) in coriander genotypes and Telugu *et al*. (2019) in fennel genotypes.

CONCLUSION

Among different ajwain genotypes, GA-1, DAC-8, AA-1, AA-2 and AA-93 genotypes were found promising with respect to days to first flowering, 50% flowering, days to maturity, number of umbels per plant, number of umbellet and seeds per umbel, seed yield per plant, per plot and per hectare, harvest index and test weight. The genotype GA-1 was found to be more prominent.

FUTURE SCOPE

Identified promising genotypes may be subjected to multi location trials within the zone and studies on sowing date or time for explaining the varietal diversity under Eastern dry zone of Karnataka can be taken up.

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