

Response of ajwain (*Trachyspermum ammi* L.) genotypes for growth and yield

S.S.Meena*, Y.K.Sharma, M.D.Meena, S.N. Saxena, Shyam Sundar Meena, N. Choudhary,
R.D. Meena, G.K.Tripathi and P.K. Agrawal

ICAR- National Research Centre on Seed Spices, Tabiji, Ajmer- 305206, Rajasthan, India

Abstract

Ajwain (*Trachyspermum ammi* L.) also known as Bishop's weed is an annual herbaceous plant belonging to family Apiaceae bearing grayish brown fruits. The major ajwain producing countries are India, Persia, Iran, Egypt, Afghanistan, Pakistan and North Africa. Thirteen ajwain genotypes were evaluated for various plant growths, seed yield attributing traits and essential oil content during 2016-17 to 2018-2019 at six (Hissar, Guntur, Jobner, Jagudan & Faizabad) AICRP centres including ICAR-NRCSS, Ajmer, India. The significant differences were obtained for all the parameters studied. Plant height ranged from 118.8-121.1 cm, number of primary branches 18.0-18.8, umbels plant⁻¹ 265.6-298.8, umbellate umbel⁻¹ 24.0-27.4 and seeds umbellate⁻¹ 19.0-19.5. On the basis of mean seed yield (1652.45 kg ha⁻¹) of three years (2016-17 to 2018-2019) at ICAR-NRCSS, Ajmer, the maximum seed yield was recorded as 1652.45 kg ha⁻¹ in AA-73, followed by IA-1(1406.91 kg ha⁻¹) showing an increase of 88.06 & 57.03 % higher seed yield over Ajmer Ajwain -2 and Ajmer Ajwain -1 (checks), respectively. Seeds of AA-73 contains 9.15% total oil and 6.38% essential oil which is higher (39.26 and 17.27% respectively) as compared to Ajmer Ajwain-2, national check.

Key words: Ajwain, essential oil, genotypes, growth parameters, seed yield.

Introduction

Ajwain (*Trachyspermum ammi* L.) is also known as carom seed is an annual herbaceous plant belonging to family Apiaceae. It originated in the eastern Mediterranean, possibly Egypt, and spread up to India from the Near East. It is an annual herbaceous plant bearing small egg shaped grayish brown fruits/seeds. The roots are diuretic in nature and the seeds are brownish, gray, hot, pungent, stomachic, appetizer and possess excellent aphrodisiac, carminative, laxative and diuretic properties. It is used in pickles, biscuits, confectionery and beverages. An important use of ajwain seeds in medicine as a remedy for indigestion. The seeds contain 2–4.4% brown coloured oil known as ajwain oil. The major constituent of this oil are thymol (36.5- 41.1), p-cymene (20.9-27.2) and g-terpinene (25.9 35.7%). Its specific gravity and odour resembles the volatile oil, which is used as gastrointestinal ailments, lack of appetite and bronchial problems. The oil exhibits anti inflammatory, fungicidal, antihelmentic, antioxidant activity, analgesic antimicrobial, anti-spasmodic and anti-aggregatory effects on humans. Thymol is used in tooth paste and perfumery. It is also used in the preparation of lotions and ointment. It inhibits the bacterial resistant microbial pathogens and is useful as a plant based fourth generation herbal antibiotic formulation. Ajwain is highly esteemed as a remedial

agent for flatulence, flatulent colic, atonic dyspepsia, diarrhoea - in short, as a digestive aid and also as an antiseptic. The most common Indian name is ajwain and is known with various local names such as omum in Tamil and vamu in Telgu. The major Ajwain producing countries are India, Persia, Iran, Egypt, Afghanistan, Pakistan and North Africa. In India it is produced mainly in Rajasthan, Andhra Pradesh, Telangana, Gujarat, Madhya Pradesh, Bihar, Uttar Pradesh, Tamil Nadu and West Bengal. In Rajasthan it mostly grown in Chitorghar, Pratapgarh, Jhalawar, Udaipur, Bundi, Kota, and Banswara districts which are categories under Central Plateau and Hills Region. In Gujarat, Patan, Bharuch, Banaskantha, Mehasana, Jamanagar, Ahemdabad, Amreli are the major growing districts. During 2019-20, 27920 MT of ajwain seed was produced from 37810 hectare in India with a current productivity of 738.43 kg ha⁻¹. India exports ajwain to Dubai, Yeman, Malaysia, Indonesia, Singapur, Pakistan, Saudi Arabia, UAE and USA.

The importance of ajwain based on its medicinal value and export potential as spices was recognized long back but it remained neglected for a long time from scientific attention for its improvement in its productivity as well as its quality (Meena *et al.*, 2015). The success of any breeding methodology for improving morphological characters depends primarily on the existence of high

degree of genetic variability and its efficient utilization. Although many improved varieties of ajwain have been developed and released in the country but still there is ample scope for improved variety across the country. There is need for crop improvement other by traditional or advanced methods of breeding to increase the adaptability and productivity of the crop. The objectives of the present study was to evaluate the performance of thirteen genotypes of ajwain with two check Ajmer Ajwain-1 and Ajmer Ajwain-2 received from various parts of the country under AICRP on Seed Spices for growth, yield parameters and quality for different state of country.

Materials and Methods

Thirteen ajwain genotypes along with two checks Ajmer Ajwain-1 and Ajmer Ajwain-2 were evaluated in randomized block design (RBD) with three replications during 2016-17 to 2018-2019 at six (Hissar, Guntur, Jobner, Jagudan & Faizabad) AICRP centres. Each entry was sown in plots of size 4×2.5 m at 50 cm and 20 cm distance between rows and plants, respectively. Timely management practices were followed to grow a good crop. All the recommended agronomic practices were adopted for raising a good crop. Data were recorded on plant height, number of branches, umbels

plant⁻¹, umbellets umbel⁻¹, seeds umbel⁻¹, seed yield and essential oil content. The data were pooled for all the three years and statistically analyzed for different characters as suggested by Panse and Sukhatme, 1985.

Results and Discussion

The pooled data on growth characters of the different genotypes are presented in Table -1. The significant differences were obtained for all the parameters. The plant height among different genotypes was recorded from 107.11 to 121.07 cm with maximum for LS-14-8 which significantly excelled all the other cultivars except JA-187 (121.04 cm) and AA-73 (119.69 cm). The number of secondary branches plant⁻¹ ranged from 156.33 to 244.44 being maximum in AA-73. The significant variation among the varieties might be due to genetic characters. In respect of umbels plant⁻¹, the variety AA-73 was significantly superior to all the other genotypes. The maximum number of umbellates umbel⁻¹ and seeds umbellate⁻¹ were recorded for the variety AA-73 followed by IA-1 and HAJ-18. On the basis of mean seed yield over three years the maximum seed yield was recorded in AA-73(1652.45 kg ha⁻¹) which statistically out yielded all other cultivars followed by IA-1 (1406.91 kg ha⁻¹) (Table-2). The seed yield mainly depends on number of umbels plant⁻¹ and seeds umbellate⁻¹. In

Table 1. Performance of ajwain genotypes for growth and yield attributes pooled data three years (2016-17 to 2018-19)

Genotypes	Plant Hight (cm)	No. of secondary branches plant ⁻¹	No. of umbels plant ⁻¹	No. of umbellates umbel ⁻¹	No. of seeds umbellate ⁻¹	Test weight (g)	Seed yield (kg ha ⁻¹)
AA-2(C)	107.11	156.33	235.60	17.00	20.02	1.29	878.69
JA-187	121.04	194.78	229.13	17.00	23.22	0.89	1213.78
JA-219	115.47	216.00	223.12	18.11	22.07	0.92	1029.05
IA-1	109.73	222.02	222.40	18.69	23.47	0.98	1406.91
HAJ-18	108.67	219.09	238.58	18.11	23.73	0.92	1303.50
HAJ-7	114.44	223.05	239.25	17.18	22.69	0.87	1220.78
AA-1(C)	120.33	207.76	233.42	17.07	22.58	1.31	1052.33
LS-14-3	112.07	189.98	204.80	16.42	23.15	1.05	823.91
LS-14-8	121.07	207.22	240.77	16.84	22.43	0.98	1141.37
ND-11	119.20	202.53	222.95	17.24	20.51	1.21	1156.05
ND-10	117.25	213.65	217.55	17.72	18.86	1.15	1146.96
AA-73	119.69	244.44	282.32	19.43	25.64	1.30	1652.45
AA-6	116.94	159.56	231.20	16.53	22.82	1.27	1216.69
C.D. 5%	6.85	9.10	21.67	1.47	1.81	0.31	149.13
SEm±	2.33	3.10	7.38	0.50	0.62	0.11	50.79
C.V. %	3.49	2.63	5.5	4.97	4.754	16.90	7.50

Table 2. Performance of ajwain genotypes for the seed yield (Pooled)

S.No.	Genotypes	Seed yield (kg ha ⁻¹)	% increase over check AA-2	% increase over check AA-1
1.	AA-2(NC)	878.69	0.00	-16.50
2.	JA-187	1213.78	38.14	15.34
3.	JA-219	1029.05	17.11	-2.21
4.	IA-1	1406.91	60.11	33.69
5.	HAJ-18	1303.50	48.35	23.87
6.	HAJ-7	1220.78	38.93	16.01
7.	AA-1(NC)	1052.33	19.76	0.00
8.	LS-14-3	823.91	-6.23	-21.71
9.	LS-14-8	1141.37	29.89	8.46
10.	ND-11	1156.05	31.57	9.86
11.	ND-10	1146.96	30.53	8.99
12.	AA-73	1652.45	88.06	57.03
13.	AA-6	1216.69	38.47	15.62
	C.D.at 5%	149.13		
	SEm±	50.79		
	C.V.%	7.50		

Table 3. Ancillary data of ajwain genotypes AA-73 at Ajmer in CVT during 2016-17 to 2018-19 (pooled)

Characters	AA-73		AA-1 (NC)	AA-2 (NC)
	Range	Mean		
Plant height (cm)	118.8-121.1	119.6	120.3	107.1
No. of primary branches plant ⁻¹	18.0-18.8	18.4	16.4	13.2
No. of secondary branches plant ⁻¹	243.4-245.4	244.4	207.7	156.3
Days to 50% flowering	90-94	92.0	95.0	93.0
Days to 75% maturity	165-170	168.0	170.0	169.0
No. umbels per plant	265.6-298.8	282.3	233.4	235.6
No. of umbellates umbel ⁻¹	24.0-27.4	25.6	22.5	20.0
No. of seeds umbellate ⁻¹	19.0-19.5	19.4	17.0	17.0
Seed yield (kg ha ⁻¹)	1540.6-1754.6	1652.4	1052.3	878.6

Table 4. Quality attributes of ajwain genotypes AA-73 tested at NRCSS, Ajmer during 2017-18

Name of Entry	Total Oil (%)	Essential Oil (%)
AA-73	9.15	6.38
Ajmer Ajwain-1 (NC)	8.55	6.30
Ajmer Ajwain-2 (NC)	6.57	5.44
% higher than AA-1	7.01	1.27
% higher than AA-2	39.26	17.27

variety AA-73, these yield attributing characters were superior to others. The maximum seed yield was recorded as 1652.45 kg ha⁻¹ in AA-73 followed by IA-1 (1406.91 kg ha⁻¹) showing an increase of 88.06 & 57.03% higher seed yield over Ajmer Ajwain -2 and Ajmer Ajwain -1 (checks), respectively. Seeds of AA-73 contains 9.15% total oil and 6.38% essential oil which is higher (39.26 and 17.27% respectively) as compared to Ajmer Ajwain-2, national check. These results are akin to findings of Krishnamoorthy and Madalageri (2002), Meena *et al.* (2013), Sharma *et al.* (2015) and Singh and Choudhary (2008). On the basis of these results variety AA-73 has been identified for National release during XXX Workshop of AICRP on Spices held at TNU, Coimbatore.

Acknowledgement

The authors gratefully acknowledge the support provided by Director, ICAR- National Research Centre on Seed Spices, Ajmer and Project Coordinator, AICRP on Spices, Calicut (Kerala).

REFERENCES

- Krishnamoorthy, V. and Madalageri, M.B. 2002. Variability and correlation studies ajwain (*Trachyspermum ammi* L.). *J. Med. and Aromatic Pl Sci.*, 24: 364-370.
- Meena, S.K., Singh, B. and Meena. A. K. 2013. Variability in fennel (*Foeniculum vulgare* Mill.) for yield and yield attributes. *IRJGBT.*, 5: 117-124.
- Meena, S.S, Solanki, R.K., Kakani, R.K. and Kumari, S. 2015. Genetic variability studies in ajwain (*Trachyspermum ammi* L.) germplasm. *J. Spice and Aromatic Crops*, 24(2):119-123.
- Panse, V.G. and Sukhatme, P.V. 1985. *Statistical Methods for Agricultural Workers*, ICAR, New Delhi.
- Sharma, L.K., Meena, R.S. and Panwar, A. 2015. Genetic variability on yield and its yield attributing characters in fennel (*Foeniculum vulgare* Mill.). *Int. J. Seed Spices.*, 5: 95-97.
- Singh, D. and Choudhary, S.P. 2008. Evaluation of ajwain (*Trachyspermum ammi* L.) genotypes suitable for semi arid regions. *J Spices aromatic Crop.*, 17: 167-171

Received : April 2021; Revised : May 2021;
Accepted : June 2021.