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Ajmer Dill 2: An Indian dill type variety for cultivation in Semi-Arid Parts of India

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Abstract

Dill has been used in ayurvedic medicines since ancient times and it is a popular herb widely used as a spice and also yields essential oil. It is an aromatic and annual herb of apiaceae family. Dill can be grown under irrigated condition and rainfed condition. The trial was conducted under irrigated condition to test the performance of dill entries for seed yield. European type dill AD-01-43(E) showed higher plant height (134 cm) as compared to Indian type dill AD – 2 (90 cm). AD-2 recorded early (132 days) seed maturity as compared to European type dill. The variety tested at ICAR-NRCSS Ajmer for yield performance. Ajmer Dill -2 recorded higher (1466 kg ha⁻¹) seed yield as compared to local variety (1207 kg ha⁻¹) which was 21% higher. Indian dill AD-2 recorded lowest percent disease incidence (PDI) 5.2% (Tolerant) as compared to other tested entries. The proposed variety AD- 2 recorded higher (15.3 q ha⁻¹) seed yield than check variety (9.64 q ha⁻¹) at farmers fields and was further released as Ajmer Dill -2.

Keywords: *Anethum sowa*, ayurvedic uses, variety, dillapiole, yield

Introduction

Indian Dill (*Anethum sowa* Roxb.) is a winter crop belonging to the family Apiaceae. It is predominantly found in the subtropical and temperate regions of Asia, particularly in India, Bangladesh, and Pakistan, and is also cultivated in some European countries. It is extensively grown in the Indian states of Punjab, Madhya Pradesh, Uttar Pradesh, Gujarat, J & K, and Rajasthan (Meena *et al.*, 2013). In semi-arid parts of India, it is grown during the winter season. The flowers are pale yellow with the compound umbels. The mature seeds are dark brown to dark yellow, dorsally compact and 4 mm long, 2-3 mm broad and 1 mm thick with straight to slightly curved with a longitudinally ridged surface (Saleh-E-In *et al.*, 2006; Jana and Shekhawat, 2010). The plant's leaves, seeds, and entire plant are widely used as a spice for flavoring food and in culinary preparations (Saleh-E-In and Choi, 2021). Like other spice crops, dill also having

antioxidant property and traditionally, it has been employed as a medicinal herb for treating indigestion, hiccups, insomnia, stomach pain, menstrual disorders, flatulence, and more (Choudhary *et al.*, 2017; Meena *et al.*, 2022). The essential oils derived from the whole plant and seeds hold significant economic value for medicinal products, cosmetics, and food preparation (Saleh-E-In *et al.*, 2006). There are various volatile components of dill seeds and herb; carvone being the predominant odorant of dill seeds and α -phellandrene, limonene, dill ether, and myristicin are the most important odorants of dill herbs. Other compounds isolated from seeds are coumarins, flavonoids, phenolic acids and steroids. The primary distinction between the two lies in the composition of their essential oils, with *A. sowa* containing higher levels of dillapiole compared to *A. graveolens* (Malhotra and Vashishtha, 2007). The dill crop is mostly grown on marginal and sub-marginal lands, where input use depends on the resource and management capacity on a field scale with local varieties. Through competition for resources like nutrients, water, light, and space, among other interactions, weeds have been shown to promote and modify the physiology of both pathogens and host plants (Meena *et al.*, 2017). Consequently, its full yield potential is not realized under arid to semi-arid agro-climatic conditions. The essential oil of *A. sowa* seeds has been documented for its antimicrobial, insecticidal, and synergistic properties (Aggarwal *et al.*, 2002). The productivity of dill (sowa) in India is quite low (480 kg ha^{-1}) as against the potential of 1800 kg ha^{-1} (Malhotra *et al.*, 2017). Hence, variety Ajmer Dill- 2 an Indian dill type variety has been developed for higher yield and increased productivity.

Selection procedure

The ICAR-National Research Center on Seed Spices (NRCSS), Ajmer has succeeded in development of first ever high yielding variety Ajmer Dill -2 (NRCSS AD-2) of dill with high dillapiole content, for arid and semi-arid agro-climate. 'NRCSS AD 2 (Sel. AD-01-6) has been developed through mass selection based on progeny performance from Nagaur Local. The selection AD-01-6 was identified by the XVII All India Co-ordinated Research Project on Spices as NRCSS AD- 2 and released by State Varietal Release Committees of

Rajasthan vide notification No. 3-43/ 2014-SD-IV dated 1.1.16. The 31st Subcommittee meeting has approved the release of this variety for cultivation in the state and Ministry of Agriculture and Farmers Welfare, India accepted for notification of this variety in 24th Central Variety Release and Notification Committee meeting held on 22 September, 2016 (Malhotra *et al.*, 2017). This variety has been registered at ICAR- NBPGR with IC 620541. Plants of this variety grow to the average height of 90 cm and bears on an average 121 umbels plant⁻¹ and 26 umbellates umbel⁻¹. It is an early variety takes about 79 days to flowering and 132 days to reach seed maturity.

Yield performance evaluation

Dill can be grown under irrigated conditions and rainfed conditions. The trial was conducted under irrigation condition. The data was collected for ancillary characters and presented in Table 1 revealed that there was significant variation for days to 50% flowering European type recorded delayed in 50% flowering as compared to Indian types dill. Primary branched was recorded 6 in Indian typed while highest (121) number of umbels per plant was recorded in line AD-01-6 (I). The number of umbellate/ umbel and number of seeds per umbellate was higher in European type dill as compared to Indian type dill. Generally, European type dill showed higher plant height (134 and 138 cm respectively) as compared to Indian type dill (90, 82 and 86 cm respectively) which was recorded in these lines. Early (132 days) seed maturity was recorded in AD-01-6 (I) as compared to European type dill. Test weight was higher in AD-01-6 (I) as compared to tested entries. Volatile oil was also higher (3.2%) than that of other Indian types entries. Its distinctive flavor gives the essential oil a marketable value. It is a colorless or pale-yellow liquid. More dillapiole (36.0%) and less carvone (19.5%) are reported to be present in Indian dill seeds (Malhotra *et al.*, 2017).

The variety tested at ICAR-NRCSS Ajmer from 2000-2001 to 2002-2003 for yield performance. Mean data presented in Table 2 revealed that the Ajmer Dill -2 recorded a higher seed yield of 1466 kg/ha as compared to 1207 kg ha^{-1} in local variety which was 21% higher and statistically significant. While this line was recorded at par yield (1474 kg ha^{-1}) with AD-01-43(E).

Table 1: Ancillary observations of dill varieties (Mean of 2000-01 to 2002-03)

S.No	Characters	AD-01-43(E)	AD-01-44(E)	AD-01-6 (I)	AD-01-32 (I)	Local Variety Nagaur (I) (check)
1.	Days to 50% flowering	90	93	79	82	74
2.	Primary branches /plant(Nos.)	10	8	6	6	6
3.	No. of umbels / plant	24	18	121	82	63
4.	No. of umbellate / umbel	58	50	26	18	18
5.	No. of seeds / umbellate	48	41	22	16	15
6.	Plant height (cm)	134	138	90	82	86
7.	Days to maturity	142	144	132	136	128
8.	100 seed weight (g)	4.10	3.32	4.35	3.67	3.92
9.	Volatile oil(%)	3.5	3.4	3.2	2.8	2.6

I: Indian dill, E: European dill

Table 2 : Yield Performance of dill in varietal evaluation trial during three years(2000-01 to 2002-03)

Year	Location	AD-01-43(E)	AD-01-44(E)	AD-01-6 (I) (Ajmer Dill -2)	AD-01-32 (I)	Local Variety Nagaur (I) (Check)
2000-01	NRCSS ,Ajmer	1482	1402	1485	1386	1185
2001-02	NRCSS ,Ajmer	1506	1318	1492	1387	1225
2002-03	NRCSS ,Ajmer	1434	1268	1421	1223	1211
	Mean	1474	1329	1466	1332	1207
% higher than the check Variety Nagaur (I)				21		
% higher than the check Variety Nagaur AD-01-32 (E)				10.06		

Table 3: Reaction to major diseases and insect pests (mean of 2000-01 to 2002-03)

S. NO	Entry	Powdery mildew PDI (%)	Aphids
1.	AD-01-6 (I) (Ajmer Dill -2)	5.2(Tolerant)	Aphid attack was observed Indiscriminately in all of the selections and was controllable by spraying insecticides
2.	AD-01-32(I)	7.6 (Tolerant)	
3.	AD-01-43(E)	28.2(Susceptible)	
4.	AD-01-44(E)	26.4(Susceptible)	
5.	Local variety Nagauri (I) check	9.4(Tolerant)	

Table 4 : Yield performance of dill in station trials used as a check during (2010-11 to 2014-15) at ICAR-NRCSS, Ajmer

Year	Location	AD-01 (E)	AD-01-6 (I) (Ajmer Dill -2)
2010-11	NRCSS, Ajmer	1979.0	1966.0
2011-12	NRCSS, Ajmer	1025.0	975.0
2012-13	NRCSS, Ajmer	1641.0	1836.0
2014-15	NRCSS, Ajmer	1895.55	1736.0
	Mean	1635.14	1628.42

Table 5: Performance of AD-2 (Proposed variety) in demonstrations

S.No	Name and address of farmer	Area (ha)	Date of sowing	Date of harvesting	Yield (q ha ⁻¹)	
					AD-2	LOCAL
1	Sh.Bheru Lal S/o Shri Mega Ram Jamurear , Armod	0.2	28.10.14	4.4.2015	15.8	9.2
2	Sh.Jiya Ram S/o Sh. Manag Ram fatehgarh, Armod	0.2	26.10.14	5.4.2015	15.5	10.4
3	Sh. Narayan S/o Sh. Limba Ram, Jamurear, Armod	0.2	29.10.14	2.4.2015	16.3	9.8
4	Sh. Devi Ram S/o Sh. Bheru Ram, Jamurear, Armod	0.2	26.10.14	1.4.2015	14.0	9.5
5	Sh. Ashok S/o Sh. Bhera Ram , Jamurear, Armod	0.2	29.10.14	8.4.2015	14.9	9.3
Average yield (q ha⁻¹)					15.3	9.64
Per cent higher yield of AD-2 than local						58.71



Fig. 1: Plant and seeds of Ajmer Dill -2 (AD-2)

Disease reaction of tested entries also recorded. Table 3 revealed that the best performing Indian dill AD-01-6(I) recorded lowest percent disease incidence 5.2% (Tolerant) as compared to other tested entries.

After testing with local check variety, these two lines (AD-01 (E) and Ajmer Dill- 2) were tested under station trials from 2010-11 to 2014-15. The mean performance of both lines presented in Table 4 revealed that both lines recorded average seed yield (1635.14 and 1628.42 kg ha⁻¹ respectively) which was statistically non-significant to each other.

The best performing Indian type dill entry AD-01-6 (I), was further proposed and released as Ajmer Dill-2. Ajmer Dill-2 was tested at farmer's fields for yield performance under irrigated conditions. Based on the data presented in Table 5, proposed variety AD- 2 produced about 37% higher seed yield (15.3 q ha⁻¹) compared with the test variety (9.64 q ha⁻¹) at farmer's field. Figure 1 depicts the appearance of leaves and seeds of Indian type dill variety Ajmer Dill -2.

Conclusions

The developed variety of dill Ajmer Dill-2 is Indian type and having higher seed yield (15.3 q ha⁻¹) and higher dillapiole content in essential oil. Breeder and truthfully labelled seed of this variety is available at ICAR-NRCSS, Ajmer-305 206, Rajasthan for commercial cultivation.

Conflicts of Interest : The authors declare no conflicts of interest.

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