



ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; 12(3): 3214-3216
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www.thepharmajournal.com

Received: 01-12-2022

Accepted: 03-02-2023

AR Bramhane

Department of Agricultural
Botany, Dr. Panjabrao
Deshmukh Krishi Vidyapeeth,
Akola, Maharashtra, India

DT Deshmukh

Associate Director of Research,
Dr. Panjabrao Deshmukh Krishi
Vidyapeeth, Akola,
Maharashtra, India

SM Ghawade

Junior Breeder Cum
Horticulturist, Dr. Panjabrao
Deshmukh Krishi Vidyapeeth,
Akola, Maharashtra, India

DS Phad

Assistant Vegetable Breeder
Chilli and Vegetable Research
Unit, Dr. Panjabrao Deshmukh
Krishi Vidyapeeth, Akola,
Maharashtra, India

Corresponding Author:

AR Bramhane

Department of Agricultural
Botany, Dr. Panjabrao
Deshmukh Krishi Vidyapeeth,
Akola, Maharashtra, India

Correlation and path analysis studies in Ajwain (*Trachyspermum ammi* L. Sprague)

AR Bramhane, DT Deshmukh, SM Ghawade and DS Phad

Abstract

Fifteen genotypes of Ajwain were evaluated for correlation and path analysis studies in randomized block design with three replications. Seed yield per plant was associated positively and significantly with plant height at maturity, number of primary branches per plant, number of umbels per plant, number of umbellates per umbel and test weight. The genotypic path coefficient analysis indicated that days to first flowering, number of umbels per plant, number of umbellates per umbel and test weight had positive direct effect on seed yield per plant. The path coefficient analysis indicated that days to 50 percent flowering, days to maturity, plant height at maturity and number of primary branches per plant had negative direct effect on seed yield per plant.

Keywords: Correlation, path analysis, Ajwain, *Trachyspermum ammi*

Introduction

Ajwain (*Trachyspermum ammi* L. Sprague) is an annual herb in the family of Apiaceae. Ajwain is a highly valued medicinally important seed spice. It is one of the most important and economical medicinal plants with a number of chromosomes $2n = 18$, that can be found in arid and semi-arid regions of Iran for agriculture in conditions of water scarcity. It is also known as "Bishop Weed". The minute grayish brown seeds or fruits of Ajwain are oval in shape. The flowers are protandrous and cross pollination occurs through insect. It is a native of Egypt and is cultivated in Iraq, Iran, Afghanistan, Pakistan, and India. In India, it is cultivated in Gujarat, Rajasthan, Madhya Pradesh, Uttar Pradesh, Maharashtra, Bihar and West Bengal. The total area and production of ajwain in India (2020) are about 37810 ha and 27920 T, respectively (NRC Seed Spices Ajmer, 2020) [2]. The fruit possesses stimulant, antispasmodic and carminative properties and is used traditionally as an important remedial agent for flatulence, atonic dyspepsia, diarrhoea, abdominal tumours, abdominal pains, piles, bronchial problems, lack of appetite, galactagogue, asthma and amenorrhoea.

Materials and Methods

The experimental material comprises of fifteen genotypes of Ajwain viz., AKAJ-18-02-21, AKAJ-18-03-21, AKAJ-18-04-21, AKAJ-18-05-21, AKAJ-18-07-21, AKAJ-18-08-21, AKAJ-18-09-21, AKAJ-18-10-21, AKAJ-18-11-21, AKAJ-18-12-21, AKAJ-18-13-21 and AKAJ-18-14-21 were collected from Chilli and Vegetable Research Unit, Dr. PDKV, Akola and 3 checks namely, AA-19-01, AA-2 and AA-93 were collected from NRCSS, Tabji, Ajmer, Rajasthan. The experiment was conducted in Randomized Block Design at Chilli and Vegetable Research Unit, Dr. PDKV, Akola (Maharashtra) during *Rabi* season 2020-2021. Each genotype was sown in three replication with plot size 3 x 3 m² and spacing 60 cm x 45 cm. The observation were recorded on five randomly selected plants of each genotype in each replication for nine characters viz., days to first flowering, days to 50 percent flowering, days to maturity, Plant height at maturity, Number of primary branches per plant, number of umbels per plant, number of umbellates per umbel, test weight and seed yield per plant. However, days to first flowering, days to 50 percent flowering and days to maturity were recorded on plot basis.

Analysis of variance was done as per the methodology suggested by Panse & Sukhatme (1985) [6]. The genotypic correlation coefficients were calculated as per method suggested by Johnson *et al.*, 1955 [5]. Path analysis based on genotypic correlation was performed according to Dewey and Lu (1959) [4].

Results and Discussion

Analysis of variance (Table 1.) revealed significant differences among the genotypes for all the traits studied indicating presence of variability in the material.

In present findings significant positive genotypic correlation of seed yield per plant (Table 2.) was observed with plant height at maturity, number of primary branches per plant, number of umbels per plant, number of umbellates per umbel and test weight. Thus, these characters emerged as most important associate of seed yield per plant in Ajwain. It showed that the above mentioned characters must be included in selection criteria for improvement of seed yield in Ajwain. This resembles to the finding of Subramaniam *et al.* (2018)

[10], Rawat *et al.* (2020) [7] and Chaitanya *et al.* (2021) [3].

The result of present investigation on path coefficient analysis as presented in Table 3 revealed that days to first flowering, number of umbels per plant, number of umbellates per umbel and test weight showed positive direct effect on seed yield per plant. This resembles to the finding of, Singh *et al.* (2019) [8], Rawat *et al.* (2020) [7] and Chaitanya *et al.* (2021) [3] in ajwain. The path coefficient analysis revealed that days to 50 percent flowering, days to maturity, plant height at maturity and number of primary branches per plant, showed negative direct effect on seed yield per plant. These similar results were reported in ajwain by Subramaniam *et al.* (2018) [10], Rawat *et al.* (2020) [7] and Singh *et al.* (2021) [9].

Table 1: Analysis of variance for the nine characters in Ajwain

Source	Degrees of freedom	Mean sum of squares								
		Days to first flowering (Days)	Days to 50 percent flowering (days)	Days to maturity (days)	Plant height at maturity (cm)	Number of primary branches per plant	Number of umbels per plant	Number of umbellates per umbel	Test weight (g)	Seed yield per plant (g)
Replications	2	2.4670	3.80	4.20	0.150	0.1130	6.4010	0.0810	0.0010	0.0390
Treatments	14	239.476**	249.676**	148.229**	431.249**	3.101**	860.338**	9.007**	0.077**	4.501**
Error	28	7.443	9.205	6.2	3.372	0.063	3.917	0.085	0.001	0.172

* - significant at 5% level of significance.

** - significant at 1% level of significance.

Table 2: Genotypic correlation coefficient among the nine characters in Ajwain

Characters	Days to first flowering (Days)	Days to 50 percent flowering (Days)	Days to maturity (Days)	Plant height at maturity (cm)	Number of primary branches per plant	Number of umbels per plant	Number of umbellates per umbel	Test weight (g)	Seed yield per plant (g)
Days to first flowering (Days)	1.000	0.992**	0.948**	-0.271	-0.054	-0.292	0.148	-0.415*	-0.273
Days to 50 percent flowering (Days)		1.000	0.939**	-0.334*	-0.132	-0.377*	0.124	-0.466*	-0.355*
Days to maturity (Days)			1.000	-0.267	-0.189	-0.344*	0.010	-0.427*	-0.326*
Plant height at maturity (cm)				1.000	0.735**	0.901**	0.252	0.871**	0.915**
Number of primary branches per plant					1.000	0.879**	0.488**	0.677**	0.856**
Number of umbels per plant						1.000	0.298*	0.803**	0.966**
Number of umbellates per umbel							1.000	0.207	0.421*
Test weight (g)								1.000	0.886**
Seed yield per plant (g)									1.000

* - significant at 5% level of significance.

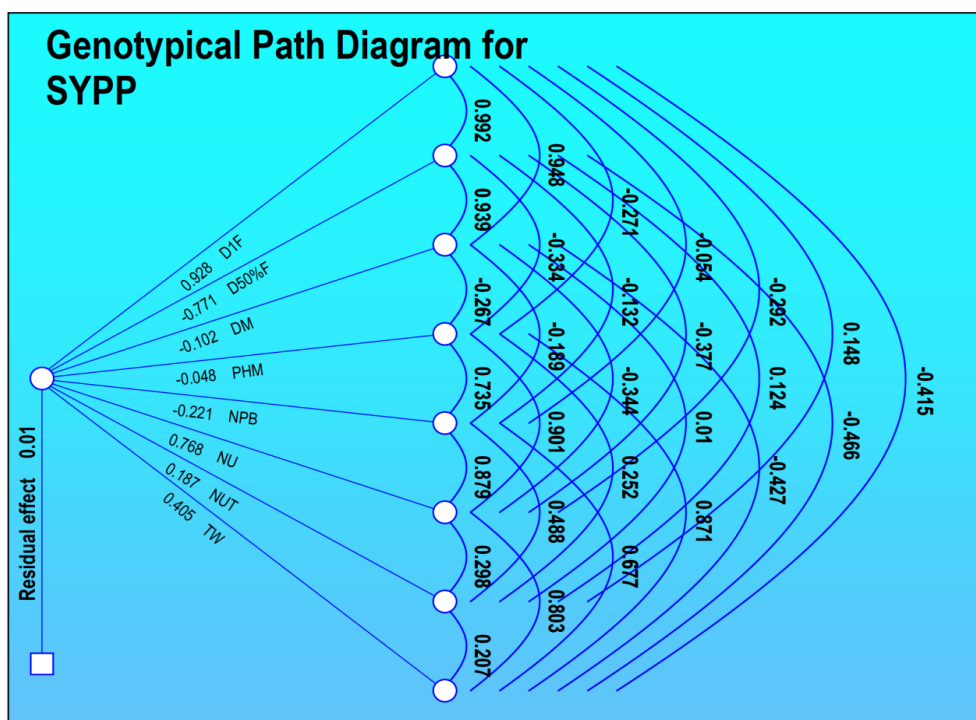
** - significant at 1% level of significance.

Table 3: Genotypic path coefficient analysis showing direct (diagonal and bold) and indirect effects of different characters on seed yield in Ajwain

Characters	Days to first flowering (Days)	Days to 50 percent flowering (Days)	Days to maturity (Days)	Plant height at maturity (cm)	Number of primary branches per plant	Number of umbels per plant	Number of umbellates per umbel	Test weight (g)	Seed yield per plant (g)
Days to first flowering (Days)	0.928	0.921	0.880	-0.252	-0.050	-0.271	0.137	-0.386	-0.273
Days to 50 percent flowering (Days)	-0.765	-0.771	-0.724	0.258	0.102	0.290	-0.095	0.359	-0.355*
Days to maturity (Days)	-0.097	-0.096	-0.102	0.027	0.019	0.035	-0.001	0.044	-0.326*
Plant height at maturity (cm)	0.013	0.016	0.013	-0.048	-0.035	-0.043	-0.012	-0.042	0.915**
Number of primary branches per plant	0.012	0.029	0.042	-0.163	-0.221	-0.195	-0.108	-0.150	0.856**
Number of umbels per plant	-0.225	-0.290	-0.264	0.692	0.675	0.768	0.229	0.617	0.966**
Number of umbellates per umbel	0.028	0.023	0.002	0.047	0.091	0.056	0.187	0.039	0.421*
Test weight (g)	-0.168	-0.189	-0.173	0.353	0.274	0.326	0.084	0.405	0.886**
Seed yield per plant (g)	-0.273	-0.355*	-0.326*	0.915**	0.856**	0.966**	0.421*	0.886**	1.000
Partial R ²	-0.254	0.274	0.033	-0.044	-0.190	0.742	0.079	0.359	

* - significant at 5% level of significance.

** - significant at 1% level of significance.



D1F: Days to first flowering
 NU: Number of umbels per plant
 D50% F: days to 50 percent flowering
 NUT: Number of umbellates per plant
 DM: Days to maturity
 TW: Test weight
 PHM: Plant height at maturity
 SYPP: Seed yield per plant
 NPB: Number of primary branches per plant

Fig 1: Genotypic path diagram for seed yield per plant in Ajwain

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