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Correlation and Path Coefficient Studies in Ajwain for Yield and Yield Attributing Traits

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A B S T R A C T

Twenty five 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 days to first flowering, days to 50 % flowering, days to maturity, plant height at maturity, number of primary branches per plant, number of umbels per plant and test weight. The perusal of path coefficient analysis shown days to first flowering (4.207) had highest direct effect on seed yield per plant followed by diameter of main umbel (3.324), test weight (2.152), number of seeds per umbel (1.736), plant height at maturity (1.236), number of umbellate per umbel (0.967) and days to maturity (0.747). Therefore, in ajwain breeding programme greater emphasis should be given on these characters while selection.

Introduction

Ajwain (*Trachyspermum ammi* L. Sprague; 2n=18), belongs to the family Apiaceae, a highly valued medicinally important seed spices. It is native of Egypt and is cultivated in Iraq, Iran, Afghanistan and India. It is also known as Bishop's weed and Carum in English and cultivated mainly for its seed, herb and volatile oil. It has medicinal value specially for curing indigestion, stomach pain and elements concerning digestive system. It is also used in cholera, diarrhea, gastric and urinary trouble. Seed contains volatile oil (2-4 %) that is yellow brownish in colour used in many *ayurvedic* medicines and industries. In India, it is grown in Gujarat, Rajasthan, Madhya Pradesh, Bihar, Punjab, Tamil Nadu, West Bengal, Andhra Pradesh and Uttar Pradesh. In India, 19000 m t of Ajwain was produced from 27000 ha area with the productivity of 703.70 kg/ha (Anonymous

2014). In Maharashtra, its cultivation is mostly confined to vidharbha region. The production of ajwain in vidviarbha region is about 1208.9 mt in the area of 907 ha giving productivity of 1.33 mt/ha (Joint Director of Agriculture, Amravati and Nagpur, Department of Agriculture, Maharashtra, 2016). Ajwain's flowers are protandrous in nature and cross pollination occurs through insects (Malhotra and Vijay, 2004).

Materials and Methods

The experimental material comprises of twenty five genotypes of ajwain, out of which 22 germplasm line *viz*., IC-255982, IC-570334, IC-334479, IC-394916, IC-570286, IC-348021, IC-572861, IC-544645, IC-571652, IC-255983, IC-430895, IC-571675, IC-334410, IC-570331, IC-530565, IC-339813, IC-571642, IC-339846, IC-530562, IC-430882, IC-530563, IC-02 were collected from NBPGR, New Delhi 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 2017-2018. Each genotype was sown in three replication with plot size 3 x 1.8 m^2 and spacing 60 x 60 cm. The observation were recorded on five randomly selected plants of each genotype in each replication for thirteen characters *viz.*, Plant height at maturity, Number of primary branches per plant, length of first internode, number of umbels per plant, number of umbellate per umbel, number of seeds per umbel, number of seeds per umbellate, diameter of main umbel, seed yield per plant and test weight. However, days to first flowering, days to 50 % flowering and days to maturity were recorded on plot basis.

Analysis of variance was done as per the methodology suggested by Panse & Sukhatme (1988). The genotypic and phenotypic correlation coefficients were calculated as per method suggested by Johnson *et al.,* 1955. Path analysis based on genotypic correlation was performed according to Dewey and Lu (1959).

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.

The characters days to first flowering, days to 50 % flowering, days to maturity, plant height at maturity, plant height at maturity, number of primary branches per plant, number of umbels per plant and test weight were found in positive association with seed yield per plant and also in positive association among themselves. This resembles to the finding of Sharma *et al.,* (2015) and Shivaprasad *et al.,* (2017). Thus indicating the scope for the direct selection for further improvement.

Partitioning of correlation coefficient into direct and indirect effect provide information about the nature and magnitude of effects of other characters on seed yield. The result of present investigation on path coefficient analysis as presented in Table 3 revealed that days to first flowering (4.207) had highest direct effect on seed yield per plant followed by diameter of main umbel (3.324), test weight (2.152), number of seeds per umbel (1.736), plant height at maturity (1.236), number of umbellate per umbel (0.967) and days to maturity (0.747).

Plant height at maturity had positive and indirect effect on seed yield via days to first flowering (1.269), days to maturity (0.471) and test weight (0.335).

Table.1 Analysis of variance for the thirteen characters in ajwain

Source	Df	Mean sum of square for various characters						
		Days to first flowering	Days to 50% flowering	Days to maturity	Plant height at maturity (cm)	Number of primary branches per plant	Length of first internode (cm)	Number of umbels per plant
		1	2	3	4	5	6	7
Replication	2	20.333	75.293	16.333	10.816	2.189	0.017	60.829
Genotypes	24	640.858**	387.972**	145.142**	474.568**	8.148**	1.556**	2192.828**
Error	48	7.403	39.682	83.889	30.495	0.672	0.040	39.855

Source	df	Mean sum of square for various characters					
		Number of umbellate per umbel	Number of seeds per umbel	Number of seeds per umbellate	Diameter of main umbel (cm)	Test weight (g)	Seed yield per plant (g)
		8	9	10	11	12	13
Replication	2	0.218	46.844	2.360	0.004	0.006	0.184
Genotypes	24	11.307**	33944.74**	139.527**	0.613**	0.233**	16.058**
Error	48	1.105	903.011	6.923	0.162	0.004	0.299

Significant at 5% level - *
Significant at 1 % level - **

Table.2 Genetic correlation coefficient among the thirteen characters in ajwain

Characters	DF	D50%F	DM	PH	NPB	LI	NU	NUT	NSU	NSUT	DMU	TW	SYPP
DF	1.000	0.931**	0.992**	0.105	0.726**	-0.788**	-0.116	-0.694**	-0.555**	-0.760**	-0.574**	0.452**	0.228*
D50%F		1.000	0.921**	0.190	0.969**	-0.894**	0.024	-0.743**	-0.468**	-0.782**	-0.580**	0.603**	0.403**
DM			1.000	0.631**	0.976**	-0.987**	0.447**	-0.651**	-0.446**	-0.908**	-0.816**	0.232*	0.424**
PH				1.000	0.412**	-0.093	0.568**	0.005	0.027	-0.038	-0.426**	0.156	0.300**
NPB					1.000	-0.764**	0.358**	-0.567**	-0.268*	-0.725**	-0.522**	0.640**	0.525**
LI						1.000	-0.075	0.628**	0.464**	0.800**	0.683**	-0.489**	-0.295**
NU							1.000	0.091	0.382**	-0.097	-0.169	0.142	0.334**
NUT								1.000	0.565**	0.779**	0.404**	-0.508**	-0.060
NSU									1.000	0.526**	0.262*	-0.196	0.090
NSUT										1.000	0.669**	-0.564**	-0.138
DMU											1.000	-0.384**	0.061
TW												1.000	0.537**
SYPP													1.000

DF : Days to first flowering
D50%F : Days to 50% flowering
DM : Days to maturity
PH : Plant height at maturity
NPB : Number of primary branches per plant
LI : Length of first internode
NU : Number of umbels per plant
NUT : Number of umbellate per umbel
NSU : Number of seeds per umbel
NSUT : Number of seeds per umbellate
DMU : Diameter of main umbel
TW : Test weight
SYPP : Seed yield per plant

Table.3 Direct (diagonal) and Indirect effect of different traits contributing to yield in ajwain

	DF	D50%F	DM	PH	NPB	LI	NU	NUT	NSU	NSUT	DMU	TW	Correlation with SYPP
DF	**4.207**	-0.787	0.847	0.373	-3.197	0.564	-0.001	-0.631	-1.021	1.351	-2.363	0.896	0.228*
D50%F	4.182	**-0.792**	0.687	0.235	-3.716	0.582	-0.002	-0.719	-0.812	1.386	-1.928	1.298	0.403**
DM	4.773	-0.729	**0.747**	0.780	-3.745	0.643	-0.036	-0.630	-0.774	1.609	-2.712	0.500	0.424**
PH	1.269	-0.151	0.471	**1.236**	-1.581	0.061	-0.045	0.005	0.047	0.068	-1.414	0.335	0.300**
NPB	3.506	-0.767	0.729	0.509	**-3.836**	0.497	-0.028	-0.549	-0.465	1.286	-1.735	1.377	0.525**
LI	-3.646	0.708	-0.737	-0.115	2.929	**-0.651**	0.006	0.607	0.806	-1.419	2.269	-1.052	-0.295**
NU	0.055	-0.019	0.334	0.702	-1.374	0.049	**-0.079**	0.088	0.663	0.171	-0.562	0.307	0.334**
NUT	-2.745	0.589	-0.486	0.006	2.176	-0.409	-0.007	**0.967**	0.981	-1.380	1.342	-1.093	-0.060NS
NSU	-2.475	0.370	-0.333	0.034	1.027	-0.302	-0.030	0.547	**1.736**	-0.932	0.869	-0.422	0.090NS
NSUT	-3.206	0.620	-0.678	-0.047	2.782	-0.521	0.008	0.753	0.913	**-1.773**	2.223	-1.213	-0.138NS
DMU	-2.991	0.459	-0.609	-0.526	2.002	-0.444	0.013	0.391	0.454	-1.186	**3.324**	-0.826	0.061NS
TW	1.751	-0.478	0.173	0.192	-2.453	0.318	-0.011	-0.491	-0.340	0.999	-1.276	**2.152**	0.537**

Residual effect (R) = -0.22361

Also the character test weight showed high positive and indirect effect on seed yield via days to first flowering (1.751), number of seeds per umbellate (0.999) and length of internode (0.318), plant height at maturity (0.192) and days to maturity (0.173). This resembles to the finding of Ghanshyam *et al.*, (2014) and Shivaprasada *et al.*, (2015). Thus the present investigation revealed the importance of plant height at maturity and test weight character on the basis of correlation and path analysis for yield improvement in ajwain.

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