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ISSN: 0975-928X

Volume: 10

Number:1

EJPB (2019) 10(1):224-229

DOI: 10.5958/0975-928X.2019.00026.7

https://ejplantbreeding.org

Electronic Journal of Plant Breeding, 10 (1): 224 – 229 (Mar 2019) DOI: 10.5958/0975-928X.2019.00026.7
ISSN 0975-928X

Research Article

Character association and path analysis for yield traits in coriander (*Coriandrum sativum* L.)

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(Received: 01 Jun 2018; Revised: 12 Mar 2019; Accepted: 13 Mar 2019)

Abstract
The field experiment was carried out during *Rabi* season of the year 2016 - 2017 at Department of Plantation, Spices, Medicinal and Aromatic crops, College of Horticulture, UHS campus, GKVK, Bengaluru. Sixteen coriander (*Coriandrum sativum* L.) varieties were evaluated to estimate the association of seed yield with other traits. Seed yield per plant exhibited positive and significant correlation with plant height, number of primary branches per plant, dry weight of plant, number of umbels per plant, number of umbellets per umbel, number of seeds per umbellet, test weight and harvest index. The perusal of path analysis revealed that, number of primary branches per plant had a highest positive direct effect on seed yield per plant followed by number of umbellets per umbel. Therefore emphasis could be given for characters associated with yield while selecting for higher yield in coriander.

Key words
Coriandrum sativum, Correlation, path analysis, RCBD, Umbellets, seed yield

Introduction

Coriander (*Coriandrum sativum* L.) (2n = 22) is an important seed spice crop belongs to family Apiaceae (Umbelliferae). Mediterranean region is its center of origin. Coriander is an annual herbaceous cross pollinated crop. Its name has been derived from Greek word “Koris” means bed-bug, because of unpleasant, fetid bug like odour of the green unripen fruits (Meena *et. al*., 2010).When initiating a breeding programme with any crop having genetic variation, it is important to gather information on the traits of agronomic importance in order to select and breed better varieties (Dubley and Moll, 1969). Relationship of different traits with yield and their direct and indirect effects on one another provides basis for a successful breeding programme (Ali *et. al.*, 2003). Yield being a quantitative trait has a complex inheritance, which is subjected to environmental fluctuations, requires indirect selection of highly heritable traits for its improvement (Thakur and Saini, 1995). The intensity and direction of association of the different traits with yield were estimated with genotypic and phenotypic coefficient of correlation (Mode and Robinson, 1959). The exact picture of the relative importance of direct and indirect influences of the component characters towards seed yield is determined by path analysis (Bhatt, 1973).

Correlation and path analysis establishes the extent of association between yield and its component and also bring out the relative importance of their direct and indirect effects and thus, gives a clear understanding of their association with yield. Keeping this in view, the present investigation was done to know the association among characters and path analysis in coriander.

Material and Methods

The present investigation was carried out at Department of Plantation, Spices, Medicinal and Aromatic crops, College of Horticulture, UHS Campus, GKVK, Bengaluru, located at an altitude of 930 m above MSL at $12^{o}58^{1}$ North Latitude and $77^{o}35^{1}$ East Longitude lying in the Eastern Dry Zone (zone-5) of Karnataka. The experimental material comprised of sixteen coriander varieties (RCr-684, RCr-728, RCr-446, RCr-20, RCr-436, RCr-41, RCr-480, RCr-475, RCr-435, ACr-1, GCo-1, GCo-2, CO-1, CO-2, CO-3 and CO (Cr)-4) and were evaluated in Randomized Complete Block Design with three replications during *rabi* 2016-2017. Sowing was done on November, 6^{th} 2016 at a spacing of 30 × 10 cm (shallow depth of 1-1.5cm) and seeds germinated in 10 days. All the recommended cultural practices were followed to raise a good crop (Fig1-2).

Five plants in each variety in each replication were selected randomly for recording observations for plant characters and yield attributes. The observations recorded on plant height (cm.), plant spread (cm^2), days to first flowering, days to 50% flowering, number of primary branches, number of secondary branches, number of umbels per plant, number of umbellets per umbel, number of seeds per umbellet, fresh and dry weight of plant (g.), test weight (g.), harvest index (%), days to seed maturity and seed yield per plant (g.) Data was analyzed for different parameters by method suggested by Panse and Sukathme (1967). Both genotypic and phenotypic coefficients of correlation between two characters were determined by using the variance and covariance components as suggested by Al-Jibouri *et al.* (1958).

Result and Discussion

Yield of any crop is the result of interaction of a number of inter-related characters. Therefore, selection should be based on association of different characters with the yield. Character association reveals the mutual relationship between two characters and it is important for indirect selection to be followed for improvement in the crop under study. The phenotypic and genotypic correlation among the yield and yield components in coriander are presented in Table 1. The genotypic coefficient of correlation in general was high in magnitude than the phenotypic correlation coefficients indicating a strong inherent association among various characters. In the present investigation, seed yield per plant had positive and highly significant correlation with the traits such as plant height, number of primary branches, dry weight of plant, number of umbels per plant, number of umbellets per umbel, number of seeds per umbellet, test weight and harvest index at both genotypic and phenotypic levels. It indicated that selection of these highly associated traits with seed yield per plant will indirectly help in selecting the plants or varieties with high yield. Similar results have been obtained by Vedamuthu and Rajan (1990) and Vijayalatha and Chezhiyan (2002) in coriander.

In this study, for estimation of direct and indirect effects of component traits was carried out by taking seed yield per plant separately, with a set of nine characters, which were contributing towards seed yield per plant. The perusal data presented in Table 2. revealed that, number of primary branches per plant and number of umbellets per umbel had a highest positive direct effect on seed yield per plant followed by number of umbels per plant and harvest index indicating direct selection based on these traits will be rewarding in crop improvement. Whereas, characters like plant height, days to fifty per cent flowering, number of seeds per umbellet and test weight showed negative direct effect on seed yield per plant. Number of seeds per umbellet had significant positive correlation on seed yield per plant, but its direct effect on seed yield per plant was negative and hence direct selection for this trait was not effective. So, it can be selected through positive indirect effect particularly days to fifty per cent flowering. These results are in accordance with the findings of Vedamuthu and Rajan (1990), Bhavani Shanker and Abdul Khader (1991), Vijayalatha and Cheriyan (2002), Dhirendra Singh *et al*. (2006), Meena *et al*. (2010) and Palanikumar and Rajamani (2012) in coriander. From our study it is concluded that number of primary branches per plant, number of umbellets per umbel, number of umbels per plant and harvest index should be given more emphasis in the selection aimed at improving seed yield per plant in coriander.

Acknowledgement

This research was supported and funded by the All India Coordinated Research Project on seed spices, Indian Institute of Spice Research-Calicut. The authors are thank full to all the scientists of different institutions for providing the seed material in time for conducting the research.

References

Al-jibouri, H. A., Miller, P. A. and ROBINSON, H. F., 1958, Genotypic and environmental variances and co-variances in an upland cotton cross of interspecific origin. *Agron. J.*, **50** (1): 633-636.

Ali, S.A, Mishra, A.K, Yadav, L.N and Maurya, K.N 2003. Variability and correlation studies in coriander (*Coriandrum sativum* L.). *Int. J. Tropical Agri.*, **11** (1): 40-42.

Bhatt, G.M. 1973. Significance of path coefficient analysis in determining the nature of character association. *Euphytica*. **22** (1): 338-343.

Bhavani Shanker, K. and Abdul Khader, M. D. 1991, Correlation studies and path analysis of yield and yield components in coriander (*Coriandrum sativum* L.). *South Indian Hort*., **39** (6): 384-386.

Dhirendra singh, Jain, U.K, Rajput, S.S, Khandelwal, V and Shiva, K.N 2006. Genetic variation for seed yield and its components and their association in coriander (*Coriandrum sativum*) germplasm. *J. Spices Arom. Crops.*, **15** (1): 25-29.

 DOI: 10.5958/0975-928X.2019.00026.7

Dubley, J.W and Moll, R.H 1969. Interpretation and use of estimates of heritability and genetic variances in plant breeding. *Crop Sci. J*., **9** (1): 257-262.

Meena, M.L, Vikas Kumar, Sanjay Kumar, Yadav Y.C and Adesh Kumar 2010. Genetic variability, heritability, genetic advance, correlation coefficient and path analysis in coriander. *Indian J. Hort*., **67** (1): 242-246.

Mode, C.J and Rhobinson, H.F 1959. Pleotorpism and genetic divergence and covariance. Biometrics. **15** (1): 518-537.

Palanikumar, M, Rajamani, K and Muthaiah, A.R 2012. Path coefficient analysis in coriander (*Coriandrum sativum* L.) genotypes for fresh biomass yield under different seasons. *Crop Res*., **44** (1-2): 222-226.

Panse, V.C and Sukhatme, P.V 1967. Statistical Methods for Agricultural Research Workers. **2nd** Editions, ICAR, New Delhi, p.381.

Thakur, S.R and Saini, J.P 1995. Variation, association and path analysis in finger millet (*Eleusinecoracana*) under aerial moisture stress condition. *J. Agric. Sci*., **65** (1): 54-57.

Vedamuthu, G.B and Rajan, F.S 1990. Yield components in coriander (*Coriandrum sativum* L.). *South Indian Hort*., **37** (5): 287-290.

Vijayalatha, K.R and Chezhiyan, N 2002. Correlation and path analysis studies in coriander (*Coriandrum sativum* L.). *South Indian Hort*., **52** (1-6): 248-251.

Electronic Journal of Plant Breeding, 10 (1): 224 – 229 (Mar 2019) DOI: 10.5958/0975-928X.2019.00026.7
ISSN 0975-928X

Table 1. Estimates of genotypic and phenotypic correlation coefficient among fourteen different characters in coriander

	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13	X14
X2 G	0.609**	1.00												
P	0.579**													
X3 G	0.258	0.424*	1.00											
P	0.222	0.368*												
X4 G	0.208	0.479**	0.890**	1.00										
P	0.196	0.375*	0.812*											
X5 G	0.321	0.009	0.333	0.251	1.00									
P	0.284	0.027	0.267	0.180										
X6 G	0.320	-0.037	0.658**	0.415*	0.503**	1.00								
P	0.291	-0.026	0.547**	0.352*	0.493**									
X7 G	-0.928**	-0.626**	-0.329	-0.229	-0.416*	-0.547**	1.00							
P	-0.780**	-0.479**	-0.312	-0.292	-0.313	-0.477**								
X8 G	-0.797**	-0.568**	-0.353*	-0.246	-0.256	-0.543**	0.998**	1.00						
P	-0.742**	-0.486**	-0.313	-0.215	-0.253	-0.488**	0.904**							
X9 G	0.312	0.138	0.629**	0.511**	0.216	0.704**	-0.472**	-0.417*	1.00					
P	0.289	0.091	0.541**	0.348	0.154	0.583**	-0.397*	-0.413*						
X10 G	0.495**	0.327	0.931**	0.741**	0.373*	0.867**	-0.704**	-0.609**	0.825**	1.00				
P	0.423*	0.261	0.816**	0.549**	0.285	0.648**	-0.484**	-0.541**	0.714**					
X11 G	0.145	0.136	0.967**	0.839**	0.514**	0.881**	-0.428*	-0.503**	0.569**	0.872**	1.00			
P	0.092	0.068	0.721**	0.423*	0.311	0.566**	-0.263	-0.376*	0.532**	0.754**				
X12 G	0.210	0.426*	0.892**	0.828**	0.330	0.313	-0.109	-0.143	0.257	0.631**	0.657**	1.00		
P	0.199	0.398*	0.770**	0.684**	0.303	0.323	-0.149	-0.114	0.192	0.513**	0.520**			
X13 G	0.280	0.525**	0.846**	0.586**	0.023	0.570**	-0.459**	-0.541**	0.608**	0.859**	0.812**	0.544**	1.00	
P	0.255	0.488**	0.766**	0.474**	-0.006	0.494**	-0.460**	-0.509**	0.594**	0.739**	0.679**	0.471**		
X14 G	0.202	0.090	0.468**	0.061	0.132	0.757**	-0.585**	-0.587**	0.745**	0.895**	0.610**	0.158	0.668**	1.00
P	0.167	0.068	0.333	0.059	0.051	0.495**	-0.288	-0.289	0.534**	0.491**	0.317	0.077	0.458**	
X15 G	**0.461****	**0.075**	**0.589****	**0.410***	**0.150**	**0.765****	**-0.651****	**-0.580****	**0.906****	**0.902****	**0.704****	**0.314**	**0.665****	**0.849****
P	**0.413***	**0.070**	**0.525****	**0.265**	**0.157**	**0.689****	**-0.478****	**-0.542****	**0.845****	**0.727****	**0.516****	**0.237**	**0.595****	**0.588****

*Significant at 5 per cent level and **Significant at 1 per cent level
G=Genotypic correlation coefficient, P= Phenotypic correlation coefficient

X1: Plant height at harvest (cm.)
X2: Plant spread (cm^2)
X3: Number of primary branches per plant
X4: Number of secondary branches per plant
X5: Fresh weight of plant (g.)
X6: Dry weight of plant (g.)
X7: Days to first flowering
X8: Days to fifty per cent flowering
X9: Number of umbels per plant
X10: Number of umbellets per umbel
X11: Number of seeds per umbellet
X12: Days to seed maturity
X13: Test weight (g.)
X14: Harvest index (%)
X15: Seed yield per plant (g.)

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Table 2. Direct and indirect effect of different characters on seed yield of coriander

Characters	X1	X2	X3	X4	X5	X6	X7	X8	X9	rG
X1	**-0.090**	-0.023	0.072	-0.028	-0.045	-0.013	-0.019	-0.025	-0.018	**0.461****
X2	0.231	**0.893**	-0.315	0.562	0.832	0.863	0.796	0.756	0.418	**0.589****
X3	0.209	0.092	**-0.262**	0.109	0.159	0.132	0.037	0.142	0.154	**-0.580****
X4	0.080	0.161	-0.107	**0.256**	0.211	0.146	0.066	0.156	0.191	**0.906****
X5	0.243	0.457	-0.299	0.405	**0.491**	0.428	0.310	0.422	0.440	**0.902****
X6	-0.056	-0.372	0.193	-0.219	-0.335	**-0.384**	-0.252	-0.312	-0.234	**0.704****
X7	-0.096	-0.408	0.065	-0.118	-0.289	-0.301	**-0.458**	-0.249	-0.072	**0.314**
X8	-0.103	-0.313	0.200	-0.225	-0.318	-0.301	-0.201	**-0.370**	-0.247	**0.665****
X9	0.044	0.102	-0.128	0.162	0.195	0.133	0.034	0.145	**0.218**	**0.849****

Residual effect = **0.4031** Diagonal values are direct effects, Above and below diagonal values are indirect effects.

X1: Plant height (cm.)
X2: Number of primary branches
X3: Days to fifty per cent flowering
X4: Number of umbels per plant
X5: Number of umbellets per umbel
X6: Number of seeds per umbellet
X7: Days to seed maturity
X8: Test weight (g.)
X9: Harvest index (%)
rG: Correlation values for seed yield per plant (g.)

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Fig. 1. General view of the experimental field at full flowering stage

Fig. 2. Phenotypic Variation among the varieties for plant height and flowering

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