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Path coefficient analysis of seed yield in coriander (*Coriandrum sativum* L.).

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Abstract

Path analysis evaluation of 45 genotypes of coriander (*Coriandrum sativum* L.) at Mandsaur (Madhya Pradesh) indicated that seeds umbel-1 had the highest positive direct effect on seed yield per plant at phenotypic as well as genotypic level. At both genotypic and phenotypic level, the highest positive indirect effect on seed yield was exerted by test weight via seeds umbel^{-1} followed by umbellet umbel^{-1} via seeds umbel^{-1}. While the highest negative indirect effect on seed yield was imposed by days to 50 percent flowering via seeds umbel^{-1} followed by oil percent in seeds via seeds umbel^{-1}. So path coefficient analysis revealed that seeds umbel^{-1}, test weight, umbellet umbel^{-1} and early flowering were the most important characters for selection in coriander genotypes.

Key words: coriander,direct effect, indirect effect, Path coefficient, seed yield.

Introduction

Coriander (*Coriandrum sativum* L.) is an annual herbaceous plant belongs to the family Apiaceae. It is a native of Mediterranean region and cross pollinated diploid species, possesses 2n = 22 chromosomes. In India, coriander is cultivated in about 543.00 thousand hectare with annual production of about 524.0 thousand MT, (Anon., 2013). The major coriander growing states are Rajasthan, Madhya Pradesh, Andhra Pradesh, Gujarat, Bihar, Uttar Pradesh and with scattered pockets in Tamil Nadu, Orissa, Karnataka and Haryana (Singh *et al*. 2013). Coriander has several potential health benefits like cholesterol-lowering, anticancer effect, anti-hypertensive, antioxidant activity, digestive stimulant and many more. This potential can further be explored and exploited to develop new formulations and coriander can be used as a complete and promising functional food (Chawla and Thakur,2013).

Crop yield is influenced by several genetic factors interacting with the environment and therefore, study of characters which are less affected by the environment, is required to construct suitable selection indices for crop improvement. The adequacy of genotypes is determined by the amount of genetic variability present in the germplasm and limited information is available in coriander on this aspect. Furthermore, information on association among different morphological characters and with seed yield is necessary for identification of suitable selection criteria for producing high yielding varieties. In the present investigation, 45 genotypes of coriander were used to evaluate the germplasm on the basis of *per se* performance, correlation and path coefficient analysis. Path analysis facilitates the partitioning of correlation coefficient in the direct and indirect effects on yield and any other attributes. The information is expected to form the basis of designing breeding strategies to improve the yield potential of coriander.

Materials and methods

The experimental material comprised forty five diverse genotypes (UD-7, MD Local-1,UD-176, UD-7, MDLocal-2, UD-208, UD-13, MDLocal-3, UD-475, UD-19, MDLocal-4, UD-562, UD-21, MD Local-5, UD-563, UD-22, MD Local-6, UD-565, UD-31, MD Local-7, UD-663, UD-33, MD Local-8, UD-706, UD-36, MD Local-9, UD-737, UD-44, MD Local-10, UD-794, UD-56, MD Local-11, UD-801, UD-86, MD Local-12, Rcr-20, UD-104, MD Local-13, Rcr-436, UD-109, Ajmer cr-1, Rcr-684, UD-112, MD Local-14 and Rcr-728) and were sown during *rabi*, 2013-14 under the randomized block design with three replications at Horticultural Farm, Department of Plantation, Spices, Medicinal and Aromatic Crops, College of Horticulture, Mandsaur (M.P.), India. Row to row and plant to plant spacing were maintained at 30 cm and 10 cm, respectively. All the agronomic package of practices was

adopted to grow a healthy crop. In each replication five plants were randomly selected and marked for observation. Observations were recorded for ten characters viz., plant height (cm), number of branches plant^{-1}, days to 50 percent flowering, umbels plant^{-1}, umbellet umbel^{-1}, seeds umbel^{-1}, test weight (g), oil content in seeds (%), chlorophyll content in leaves (SPAD value) and seed yield plant^{-1}(g). The recorded data were analyzed for path coefficient as suggested by Dewey and Lu (1959).

Results and discussion

The genotypic correlation coefficient between different character pairs was generally similar in sign and nature to the corresponding phenotypic coefficient in the experiment. However, genotypic correlation was higher in magnitude than the corresponding phenotypic correlation(Table No.1). Seeds umbel^{-1} established maximum positive correlation with seed yield plant^{-1}followed by test weight while days to 50 percent flowering had maximum negative correlation with seed yield plant^{-1} bothat genotypic and phenotypic level. Similar results have been reported bySingh *et al.* (2006) and Meena *et al.* (2010).

Yield is the sum total of the several component characters which directly or indirectly contributed to it.The information derived from the correlation studies indicated only mutual association among the characters. Whereas, path coefficient analysis helps in understanding the magnitude of direct and indirect contribution of each character on the dependent characters like seed yield.Partioning of correlation coefficient in to direct and indirect effects provide information about the nature and magnitude of effects of other characters on seed yield.

Path analysis indicated that seeds umbel^{-1} had the highest positive direct effect on seed yield per plant at phenotypic as well as genotypic level (Table 2 & 3). At both genotypic and phenotypic level, the highest positive indirect effect on seed yield was exerted by test weight via seeds umbel^{-1} followed by umbellet umbel^{-1} via seeds umbel^{-1}. While the highest negative indirect effect on seed yield was imposed by days to 50 percent flowering via seeds umbel^{-1} followed by oil percent in seeds via seeds umbel^{-1}(Table 2 & 3). So path coefficient analysis revealed that seeds umbel^{-1}, test weight and umbellet umbel^{-1} were the most important characters for selection in coriander genotypes. These findings are in line with those Bhandari and Gupta (1991), Singh *et al*. (2005) and Singh *et al*. (2006).

Table 1.Genotypic & Phenotypic correlation coefficient of yield and its component character of coriander

Characters		No. of branches plant^{-1}	Days to 50% flowering	umbels plant^{-1}	Umbellet umbel^{-1}	Seeds umbel^{-1}	Test wt. (g)	Oil (%) in seeds	Chlorophyll Content (SPAD value)	Seed yield plant^{-1} (g)
Plant height (cm)	G	0.389*	0.778**	0.320	-0.376*	-0.170	-0.533**	0.224	0.190	-0.170
	P	0.315	0.691**	0.297	-0.183	-0.150	-0.444**	0.181	0.176	-0.137
No. of branches plant^{-1}	G		0.509**	0.722**	0.128	0.059	-0.241	-0.202	0.187	0.062
	P		0.411*	0.595**	0.055	0.045	-0.186	-0.141	0.137	0.056
Days to 50% flowering	G			0.389*	-0.179	-0.417*	-0.618**	0.212	0.124	-0.421*
	P			0.368*	-0.105	-0.394*	-0.561**	0.191	0.116	-0.383*
Umbels plant^{-1}	G				0.250	0.179	-0.344*	-0.220	0.095	0.188
	P				0.144	0.174	-0.318	-0.202	0.083	0.170
Umbellet umbel^{-1}	G					0.247	0.320	-0.258	-0.165	0.254
	P					0.180	0.203	-0.140	-0.142	0.170
Seeds umbel^{-1}	G						0.344*	-0.295	-0.121	0.969**
	P						0.303	-0.265	-0.114	0.945**
Test wt. (g)	G							-0.172	-0.156	0.341*
	P							-0.139	-0.122	0.320
Oil (%) in seeds	G								0.048	-0.284
	P								0.026	-0.281
Chlorophyll Content (SPAD value)	G									-0.127
	P									-0.112

** 1% level of significance * 5% level of significance

Table 2.Genotypic path coefficient analysis showing the direct and indirect effect on seed yield of Coriander

Character	Plant height (cm)	No. of branches plant^{-1}	Days to 50% flowering	umbels plant^{-1}	Umbellet umbel^{-1}	Seeds umbel^{-1}	Test wt. (g)	Oil (%) in seeds	Chlorophyll Content (SPAD value)	Correlation with seed yield plant^{-1}
Plant height (cm)	-0.010	0.001	0.004	0.000	-0.002	-0.177	0.009	0.005	-0.001	-0.170
No. of branches plant^{-1}	-0.004	0.002	0.003	0.000	0.001	0.061	0.004	-0.005	-0.001	0.062
Days to 50% flowering	-0.008	0.001	0.005	0.000	-0.001	-0.434	0.010	0.005	0.000	-0.421*
Umbels plant^{-1}	-0.003	0.002	0.002	0.000	0.001	0.186	0.006	-0.005	0.000	0.188
Umbellet umbel^{-1}	0.004	0.000	-0.001	0.000	0.004	0.257	-0.005	-0.006	0.001	0.254
Seeds umbel^{-1}	0.002	0.000	-0.002	0.000	0.001	1.009	-0.006	-0.007	0.000	0.969**
Test wt. (g)	0.005	-0.001	-0.003	0.000	0.001	0.358	-0.016	-0.004	0.001	0.341*
Oil (%) in seeds	-0.002	0.000	0.001	0.000	-0.001	-0.307	0.003	0.024	0.000	-0.284
Chlorophyll Content (SPAD value)	-0.002	0.000	0.001	0.000	-0.001	-0.125	0.003	0.001	-0.004	-0.127

Residual effect= -0.0591

Table 3. Phenotypic path coefficient analysis showing the direct and indirect effect on seed yield of Coriander

Character	Plant height (cm)	No. of branches plant^{-1}	Days to 50% flowering	umbels plant^{-1}	Umbellet umbel^{-1}	Seeds umbel^{-1}	Test wt. (g)	Oil (%) in seeds	Chlorophyll Content (SPAD value)	Correlation with seed yield plant^{-1}
Plant height (cm)	0.035	0.004	-0.016	0.004	0.002	-0.138	-0.021	-0.005	-0.001	-0.137
No. of branches plant^{-1}	0.011	0.012	-0.009	0.007	0.000	0.041	-0.009	0.004	-0.001	0.056
Days to 50% flowering	0.024	0.005	-0.023	0.004	0.001	-0.362	-0.027	-0.006	-0.001	-0.383*
Umbels plant^{-1}	0.010	0.007	-0.008	0.012	-0.001	0.159	-0.015	0.006	-0.001	0.170
Umbellet umbel^{-1}	-0.006	0.001	0.002	0.002	-0.009	0.165	0.010	0.004	0.001	0.170
Seeds umbel^{-1}	-0.005	0.001	0.009	0.002	-0.002	0.917	0.014	0.008	0.001	0.945**
Test wt. (g)	-0.016	-0.002	0.013	-0.004	-0.002	0.278	0.048	0.004	0.001	0.320
Oil (%) in seeds	0.006	-0.002	-0.004	-0.002	0.001	-0.243	-0.007	-0.030	0.000	-0.281
Chlorophyll Content (SPAD value)	0.006	0.002	-0.003	0.001	0.001	-0.105	-0.006	-0.001	-0.008	-0.112

Residual effect= 0.1031

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