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Correlation Coefficient and Path Analysis in Coriander

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Abstract- The field experiment was carried out during *Rabi* season of the year 2011-2012 on the experimental field of Department of Horticulture, Dr. PDKV, Akola, Maharashtra (India). The study was undertaken on twenty four genotypes of coriander using Randomized Block Design with three replications. This study revealed that number of umbels per plant (0.25) and test weight (0.31) was associated significantly and positively with seed yield per plant. The perusal of path coefficient analysis shown days to 50% flowering (2.08) had highest direct effect on seed yield followed by number of seed per umbel (1.01), number of secondary branches (0.52), number of umbel per plant (0.49), test weight (0.28), plant height (0.23), leaf area (0.11) and chlorophyll content (0.11). Therefore, greater emphasis should be given on these characters while selecting for higher yield and related traits.

Index Terms- Coriander, correlation coefficient, path analysis and yield.

I. INTRODUCTION

Coriander (*Coriandrum sativum* L.) is an important seed spices crop of family Apiaceae (Umbelliferae) and possess 2n=22 chromosomes with cross-pollination as mode of reproduction. Western Europe and Asia are considered to be the centre of origin of this crop (Gal, *et al.,* 2010). In India it is mainly grown in Rajasthan, Madhya Pradesh, Andhra Pradesh and Tamil Nadu. In India coriander is cultivated in an area of about 107.54 thousand ha. with a production of about 385.33 thousand million tonnes (Anonyms, 2010).

Coriander is an annual herbaceous plant extensively grown in India. Its name has been derived from Greek world "Koris" means bed-bug, because of unpleasant, fetid bug like odour of the green unripened 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). Relationships of different traits with yield, among different traits 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 complex inheritance, which is subjected to environmental fluctuations, requiring indirect selection of simply highly heritable traits for its improvement (Thakur and Saini, 1995). Deb and Khaleque (2009) stated that knowledge about the association and interaction of different traits with yield greatly helps the breeder in selection work with more precession and accuracy. 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 have been used in breeding studies in different aromatic plants (Gurubuz, 2001). Hence, correlation studies and path analysis provide detailed information to identify important characters to be considered in improvement programme through selection.

The present research work was undertaken to investigate the relative importance of direct and indirect influences of the component traits toward seed yield; and identify the important traits to be considered in coriander improvement programmes.

II. MATERIALS AND METHODS

The present investigation was conducted at Main Garden, Department of Horticulture, Dr . Panjabrao Deshmukh Krishi Vidyapeeth. Akola during rabi 2011-2012. The experimental material comprised of twenty four diverse genotypes (RCr-20, RCr-41, RCr-435, RCr-436, RCr-684, GCr-1, GCr-2, Co-1, Co-2, Co-3, Co-4, JD-1, NRCSS-ACr-1, Azad Dhania-1, Rajendra Swathi, Swathi, Sudha, Sindhu, Sadhana, Pant Haritma, Hissar Sugandh, Hissar Anand, Hissar Surbhi and Akola Local) collected from the National Research Center of Seed spices Ajmer, Rajasthan and Department of Horticulture, Dr. Panjabrao Deshmukh Krishi Vidyapeeth. Akola, Maharashtra. The experiment was laid out in a randomized block design with three replications. The seeds of different genotypes were sown on 24 October at Main Garden, Department of Horticulture, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola. The recommended dose of manures and fertilizer were applied at the time of field preparation. Akola is situated in subtropical region between 22° 42' N latitude and 77° 02' longitudes at an altitude of 307.42' above the mean sea level. Row to row and plant to plant spacing were maintained at 30 cm and 10 cm respectively. All the agronomic package of practices was adapted to grow a healthy crop. In each replication five plants randomly selected were marked for observation. Observations were recorded for twelve characters viz., plant height (cm), number of primary branches per plant, number of secondary branches per plant, leaf area (cm^2), days to 50 percent flowering, days to harvesting, number of umbels per plant, number of umbellets per umbel, number of seeds per umbel, test weight (g), chlorophyll content (mg/g) and seed yield per plant (g).

The analysis of variance for testing the variation among treatments was carried out as per the method suggested by Panse and Sukhatm, (1989). The genotypic and phenotypic correlation coefficients were calculated as per methods given by Al-Jibouri *et al.* (1958). Path analysis based on genotypic correlations was performed according to Dewey & Lu (1959).

III. RESULTS AND DISCUSSION

Analysis of variance revealed significant differences among genotypes for all traits studied indicating presence of significant variability in the materials

Yield of a crop is the result of interaction of a number of inter-related characters. Therefore, selection should be based on these component characters after assessing their correlation with seed yield per plot. Character association revealed the mutual relationship between two characters, and it is important parameters for taking a decision regarding the nature of 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. Significant correlation of character suggested that these are much scope for direct and indirect selection for further improvement. In general, the estimate of genotypic correlation coefficient was higher than corresponding phenotypic ones, thereby, suggesting strong inherent association among the characters studied. In the present investigation, seed yield per plant was positively significant correlated with number of umbel per plant (0.25) and test weight (0.311) at genotypic and phenotypic level. Therefore, these characters should be considered while making selection for yield improvement in coriander. There finding are in line with Sanker and Khader (1991).

Plant height showed positive and significant correlations with number of primary branches, number of secondary branches, leaf area, days to 50% flowering, number of umbel per plant, number of umbllete per umbel, number of seed per umbel, days to harvesting and chlorophyll content at both genotypic and phenotypic content. These findings are in agreement with Bhandari and Gupta (1993). Number of umbels per plant showed positive and significant correlations with plant height, number of primary branches, number of secondary branches, leaf area, days to 50% flowering, number of umbllete per umbel, number of seed per umbel, days to harvesting and chlorophyll content at both genotypic and phenotypic content. Similar findings were also noted by Meena *et. al.* (2010), Singh *et. al.* (2006), Agrihotri *et. al.* (1997) and Vedamuthu *et. al.* (1989).

Test weight showed positive and significant correlation with seed yield per plant. Similar result also reported by Sanjeev *et. al.* (1990)

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. Partitioning of correlation coefficient into direct and indirect effects provide information about the nature and magnitude of effects of other characters on seed yield. The result of the present investigation on path coefficient analysis as presented in Table 2 revealed that days to 50% flowering (2.08) had highest direct effect on seed yield followed by number of seed per umbel (1.01), number of secondary branches (0.52), number of umbel per plant (0.49), test weight (0.28), plant height (0.23), leaf area (0.11) and chlorophyll content (0.11). These indicate that seed yield could be improved by making selection on the basis these characters. These findings are in agreement with that Datta *et.al. (*2006), Kumar (1997), Vedamuthu *et. al.* (1989) and Choudhary (1987) for secondary branches per plant; Jain *et. al.* (2003), Srivastava *et. al.* (2000) and Kumar (1997) for number of umbel per plant and Srivastava *et. al.* (2000) for number of seed per umbel.

Path coefficient analysis indicated that utility of the character like days to 50% flowering which showed highest positive direct effects on seed yield per plot. These are major yield contributing traits for enhancing the yield of coriander.

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Table 1. The genotypic and phenotypic (in parenthesis) correlation coefficient among 12 quantitative traits in coriander.

Characters		Plant height (cm)	Primary branches/ plant	Secondary Branches/ plant	Leaf area	Days to 50% flowering	No. of umbels/ plant	No. of umballete/ umbel	No. of seed/ umbel	Test weight (g)	Days to harvesting	Chlorophyll content	Correlation with seed yield/ plant (g)
Plant height (cm)	rg	**1.00**	0.67	0.51	0.70	0.64	0.25	0.49	0.48	-0.42	0.66	0.56	-0.33
	rp	**(1.00)**	0.60**	0.50**	0.69**	0.62**	0.25 *	0.47**	0.47 **	-0.42 **	0.65 **	0.55 **	-0.33**
Primary branches/ plant	rg		**1.00**	0.91	0.78	0.62	0.48	0.51	0.69	-0.56	0.63	0.47	-0.22
	rp		**(1.00)**	0.83 **	0.69 **	0.54**	0.41**	0.46**	0.60 **	-0.50**	0.56 **	0.41 **	-0.20
Secondary branches/ plant	rg			**1.00**	0.65	0.70	0.49	0.62	0.65	-0.55	0.67	0.41	-0.21
	rp			**(1.00)**	0.63 **	0.67**	0.48**	0.60**	0.63**	-0.54**	0.66 **	0.40 **	-0.21
Leaf area (cm^2)	rg				**1.00**	0.69	0.59	0.50	0.53	-0.36	0.68	0.56	-0.08
	rp				**(1.00)**	0.66 **	0.58**	0.48**	0.51 **	-0.36 **	0.66 **	0.55 **	-0.08
Days to 50% flowering	rg					**1.00**	0.55	0.65	0.45	-0.57	0.96	0.60	-0.27
	rp					**(1.00)**	0.53**	0.58**	0.43 **	-0.55 **	0.92 **	0.58 **	-0.24 *
No of umbels per plant	rg						**1.00**	0.52	0.61	-0.36	0.53	0.43	0.25
	rp						**(1.00)**	0.50**	0.60**	-0.35 **	0.52 **	0.42 **	0.25 *
No. of umballate/umbel	rg							**1.00**	0.68	-0.45	0.53	0.31	-0.10
	rp							**(1.00)**	0.64 **	-0.43**	0.50 **	0.31 **	-0.10
No. of seed per umbel	rg								**1.00**	-0.61	0.44	0.43	0.11
	rp								**(1.00)**	-0.61 **	0.44 **	0.43**	0.12
Test weight (g)	rg									**1.00**	-0.60	-0.35	0.31
	rp									**(1.00)**	-0.59**	-0.35**	0.311**
Days to harvesting	rg										**1.00**	0.65	-0.40
	rp										**(1.00)**	0.64 **	-0.39**
Chlorophyll content	rg											**1.00**	-0.05
	rp											**(1.00)**	-0.05
Seed yield per plant (g)	rg												**1.00**
	rp												**(1.00)**

*, **Significant at 5 and 1 % levels, rg= genotypic correlation; rp = phenotypic correlation

Table 2. Direct (diagonal) and indirect effect of different traits contributing to yield in coriander

Characters	Plant height (cm)	Primary branches/ plant	Secondary Branches/ plant	Leaf area (cm^2)	Days to 50 % flowe	No of umbels / plant	No. of umballete /umbel	No. of seed/umbel	Test weight (g)	Days to harvesting	Chlorophyll	Correlation seed yield/ plant
Plant height (cm)	0.233	0.158	0.121	0.164	0.150	0.059	0.115	0.112	-0.099	0.155	0.131	-0.337
Primary branches/ plant	-0.668	-0.988	-0.901	-0.772	-0.614	-0.477	-0.506	-0.685	0.556	-0.629	-0.466	-0.228
Secondary branches/ plant	0.271	0.477	0.523	0.344	0.368	0.260	0.329	0.342	-0.292	0.354	0.215	-0.217
Leaf area (cm^2)	0.083	0.093	0.078	0.119	0.083	0.071	0.060	0.063	-0.043	0.081	0.066	-0.087
Days to 50 % flower	1.808	1.744	1.975	1.959	2.804	1.552	1.829	1.275	-1.607	2.692	1.707	-0.271
No of umbels/ plant	0.124	0.236	0.244	0.293	0.271	0.490	0.258	0.300	-0.178	0.264	0.211	0.255
No. of umballate/umbel	-0.584	-0.604	-0.743	-0.601	-0.770	-0.622	-1.180	-0.809	0.531	-0.626	-0.375	-0.107
No. of seed/ umbel	0.490	0.706	0.666	0.540	0.463	0.625	0.699	1.019	-0.628	0.458	0.443	0.119
Test weight (g)	-0.119	-0.158	-0.157	-0.103	-0.160	-0.102	-0.126	-0.172	0.280	-0.168	-0.099	0.316
Days to harvesting	-2.039	-1.945	-2.069	-2.093	-2.935	-1.650	-1.622	-1.373	1.836	-3.056	-2.002	-0.401
Chlorophyll	0.061	0.051	0.045	0.061	0.067	0.047	0.035	0.047	-0.039	0.07	0.110	-0.057

Residual effect = 0.236; Bold figures in main diagonal indicate direct effect