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Research Note

Association and path co-efficient analysis among leaf yield and it's component in coriander (*Coriandrum sativum* L.) genotypes

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Abstract
An investigation was carried out in Horticultural College and Research Institute, Tamil Nadu Agricultural University, Coimbatore during 2015- 2016 *rabi* season for evaluation of Coriander (*Coriandrum sativum* L.) genotypes for growth, leaf yield and quality. The experiment was laid out in the Randomized Block Design with 30 genotypes and replicated thrice. The study revealed that the relationship of characters implied that plant weight showed a significant positive association with the number of shoots per plant and leaf weight. Maximum significant positive genotypic and the phenotypic correlation coefficient was significantly recorded for leaf weight and stem weight with the number of shoots per plant respectively. Path analysis investigation on plant weight revealed that the leaf weight and the number of shoots per plant recorded very high positive direct effect on plant weight. But for the traits, stem weight, plant height and the number of leaves registered negative direct effect.
The residual effect was observed to be high. Therefore, greater emphasis should be given on these characters while selecting for higher leaf yield and related traits.

Keywords
Coriander, Correlation Coefficient, Path analysis and Leaf Yield, Residual effect

Coriander (*Coriandrum sativum* L.) belongs to the family Apiaceae (Umbelliferae) which is mainly cultivated for its seed throughout the year (Mhemdi *et al.,* 2011). It is also known as Cilantro or Dhania, Chinese Parsely, Mexican Parsely and Japanese Parsely. It is native of Mediterranean region. It is one of the earliest known spices by mankind grown for its leaves, seeds, essential oil and oleoresin. The green leaves are consumed as fresh herbs, in salads and as garnishes due to its attractive green colour and aroma (Norman 1990; Kamat *et al.,* 2003). India is the largest producer, consumer and exporter of coriander with a greater share in the world export market. In India, coriander is grown in an area of 4,47,000 hectares with the production of 3,14,000 metric tonnes of seeds and the productivity of 700 kg per hectare (NHB, 2014). In India, Rajasthan is the major producer (60%) of coriander followed by Madhya Pradesh, Andhra Pradesh, Karnataka, Tamil Nadu and Orissa. In Tamil Nadu, the area under coriander is 9,590 hectares with a production of 4,100 metric tonnes (NHB, 2014). Thoothukudi district ranks first in area (3,975 ha) followed by Sivagangai and Ramanathapuram. It is also grown either under rainfed or irrigated condition in Tirunelveli, Trichy, Cuddalore, Perambalur, Virudhunagar, Coimbatore, Salem and Dharmapuri districts (Agro Marketing Intelligence and Business Promotion Centre of TNAU, 2014). Coriander leaves are consumed as fresh herbs, in salads and as garnishes due to its attractive green colour and aroma. It is very rich in various nutrients and vitamins, such as protein, fat, fiber, carbohydrates, water, vitamin C, calcium, phosphorus, iron, thiamine, riboflavin and oxalic acid (Peter, 2004). It is also a very valuable herb as it strengthens the stomach and promotes digestion, increases secretion and discharge of urine and

reduces fever. Even though, many improved varieties are available in coriander as a seed-spice, very little work has been done in improving of coriander for leaf purpose. For leaf purpose, coriander is grown all around the year. Presently, some local varieties like Kalmi K5, Mohini-25 and Green Cross are available in the market and they are low yielders (Chaulagain *et al.,* 2011). There is a great scope for varietal improvement in coriander to increase in leaf yield potential. The cultivars with a high leaf yield were also very much limited (Choubey *et al.,* 1991). Knowledge regarding association and path coefficient analysis between yield and its components traits are important in determining the component characters that could be used as selection parameters for effective improvement of the crop. Hence, the present study was conducted.

The trials were laid out at the College orchard, Tamil Nadu Agricultural University, Coimbatore during 2015 - 16. The orchard is located at 11^0 N latitude, 77^0E longitude and at an altitude of 426.26 m above MSL. The material used in the study comprised of 30 genotypes of leafy coriander obtained from the various centres of AICRP on Spices. The details of genotypes are given in **Table 1.**

The experiment was laid out in a randomized block design with 30 genotypes with two replications during Rabi 2015 (November –December) in the open field condition. Each genotype was raised in flatbeds of 3 m. x 3 m. Thirty grams of seeds per bed was sown in lines with a spacing of 15 x 15 cm. The recommended packages of practices were followed (Crop production guide, TNAU, 2014). Five randomly selected plants in each genotype per replication were tagged for recording observations on plant characters viz., plant height (cm), the number of shoots per plant, the number of leaves per plant, leaf weight per plant (g), stem weight per plant (g) and whole plant weight (g). The analysis of variance for testing the variation among treatments was carried out as per the method suggested by Panse and Sukhatme (1957). Phenotypic and genotypic correlation coefficients (Johnson *et al*., 1955) and path coefficient analysis (Dewey and Lu, 1959) were determined. The genotypic correlation significance was estimated by Pearson correlations method.

Correlation coefficients between plant weight and its component traits were calculated to bring out the nature and the extent of association of yield (plant weight) with its components and inter-association among its components are presented in **Table 2.** In this study, the

Table 1. Source of collection of coriander genotypes

S.No.	Genotypes	Particulars
1.	COR-41	Haryana Agricultural University, Hisar, Haryana
2.	COR-42	College of Agriculture, NDUAT, Kumarganj, Uttar Pradesh
3.	COR-50	
4.	COR-49	College of Agriculture, Pantnagar, Uttarakhand
5.	COR-52	
6.	CS 38	
7.	RCr 41	
8.	COR 39	
9.	RCr 480	S.K.N. College of Agriculture, Jobner, Rajasthan
10.	RCr 436	
11.	RCr 435	
12.	RCr 684	
13.	GDLC-1	Gujarat Agricultural University, Jagudan, Gujarat
14.	CS-11	
15.	COR-45	National Research Centre on Seed Spices, Ajmer, Rajasthan
16.	COR-44	
17.	COR-46	
18.	COR-48	
19.	LCC-278	
20.	LCC-282	
21.	LCC-289	Regional Agricultural Research Station, Lam, Guntur, Andhra Pradesh
22.	LCC-254	
23.	LCC-268	
24.	LCC-286	
25.	LCC-256	
26.	LCC-234	
27.	LCC-302	
28.	LCC-319	
29.	CO (CR) 4	Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu
30.	Green Gold (control)	Ruchi Bioseed Private company, Tamil Nadu

genotypic correlation coefficient values for various traits with the yield are found to be lower than the phenotypic correlation values. This may be due to the effect of the environment modifying the total expression which shows a reduced trend. This indicates that the selection based on these traits will be worthwhile to improve the yield. These findings are in accordance with the earlier findings of Vedamuthu *et al.* (1989), Dhanasekar (1997), Umanath (1998), Tripathi *et al*. (2000) and Ann Riya (2001) in coriander and Kohli *et al.* (1988) in fenugreek.Number of shoots per plant and leaf weight showed a significant positive association with the plant weight. Leaf weight had a positively significant value of genotypic correlation coefficient (0.953) and phenotypic correlation coefficient (0.954) whereas; stem weight had a positively significant value of genotypic correlation coefficient (0.849) and phenotypic correlation coefficient (0.850) with the number of shoots per plant. Leaf weight showed a highly significant positive genotypic correlation (0.953) and phenotypic correlation (0.954) with the number of shoots per plant. Stem weight showed a highly positive and significant genotypic correlation (0.849) and phenotypic correlation (0.850) with the number of shoots per plant. It also exhibited a significant positive genotypic correlation (0.809) and phenotypic correlation (0.811).

Table 2. Estimates of genotypic (g) and phenotypic (p) correlation coefficients for leaf yield and yield attributing traits in coriander genotypes

Characters		No. of shoots per plant	No. of leaves per plant	Leaf weight (g)	Stem weight (g)	Plant weight (g)
Plant height (cm)	G	0.667	0.512	0.692	0.411	0.582
	P	0.666	0.535	0.692	0.419	0.585
No. of shoots per plant	G		0.522	0.953**	0.849*	0.860*
	P		0.523	0.954**	0.850*	0.861*
No. of leaves per plant	G			0.487	0.211	0.447
	P			0.491	0.225	0.452
Leaf weight (g)	G				0.809*	0.882*
	P				0.811*	0.883*
Stem weight (g)	G					0.708
	P					0.710

** Significance at 1 per cent level * Significance at 5 per cent level

The correlation analysis made in this study revealed that there was a positive and highly significant association with the number of shoots per plant and leaf weight per plant. Hence, it is concluded that these traits may be considered as the most important yield contributing attributes in coriander. These results coincide with the findings of Data *et al*. (2005) in fenugreek. Regarding interrelation of the yield components, most of the traits had a highly significant positive correlations with each other. The characters *viz*., leaf weight per plant, stem weight per plant and the number of shoots per plant had a highly significant positive correlation with the most of the characters. Doku (1970) suggested that the selection based on the yield components would be effective in improving the yield, the provided components are highly heritable and genotypic correlations among them are not negative. The inter-correlation between various yield traits were studied by Singh *et al*. (2000) in *Mentha arvensis* and Ram *et al.* (2005) in *Silybum marianum.* Their conclusions generally are in agreement with the results of the present study.

The component characters of plant weight expressing genotypic correlation coefficients were partitioned into direct and indirect effects by path analysis and the results are presented in **Table 3**. Among the characters studied, leaf weight (0.737) and the number of shoots per plant (0.358) recorded a very high positive direct effect on plant weight. But the traits, stem weight (-0.150), plant height (-0.096) and the number of leaves (-0.018) registered very high negative direct effect. The residual effect was observed to be high (0.459).

Plant height exhibited a high positive indirect effect *via,* leaf weight (0.510) and it exhibited a low positive indirect effect *via,* the number of shoots per plant (0.239). Plant height also exhibited negligible negative effects *via,* stem weight (-0.062) and the number of leaves per plant (-0.009). Number of shoots per plant recorded a high positive indirect effect through leaf weight (0.703) and exhibited a high negative indirect effect through stem weight (-0.127) and a negligible negative indirect effect through plant height (-0.064) and a low negative indirect effect through the character number of leaves per plant (-0.010).

Number of leaves per plant exhibited a high positive indirect effect *via,* leaf weight (0.359) and the number of shoots per plant (0.187), while it exhibited negligible negative indirect effects *via,* plant height (-0.049) and stem weight (-0.032). Leaf weight showed a high positive indirect effect through number of shoots per plant (0.342)

but it also exhibited a negative effect through the character stem weight (-0.121) and the negligible negative indirect effect through plant height (-0.067) and the number of leaves per plant (-0.009). Stem weight showed a high positive indirect effect through the character leaf weight (0.597) and the number of shoots per plant (0.304). It showed the negligible negative indirect effect through the character plant height (-0.040) and the number of leaves per plant (-0.004).

Table 3. Path coefficient showing direct and indirect effects of productive and quality traits in coriander genotypes

Characters	Plant height (cm)	No. of shoots per plant	No. of leaves per plant	Leaf weight (g)	Stem weight (g)	r_g with plant weight
Plant height (cm)	**-0.096**	0.239	-0.009	0.510	-0.062	0.582
No. of shoots per plant	-0.064	**0.358**	-0.010	0.703	-0.127	0.860
No. of leaves per plant	-0.049	0.187	**-0.018**	0.359	-0.032	0.447
Leaf weight (g)	-0.067	0.342	-0.009	**0.737**	-0.121	0.882
Stem weight (g)	-0.040	0.304	-0.004	0.597	**-0.150**	0.708

Bold, diagonal values indicate direct effects
Residual effect = 0.459 r_g = Genotypic correlation coefficient

Path analysis helps in measuring the direct effect of each trait as well as indirect effect of other characters towards yield. From the results of the path coefficient analysis, it was evidenced that the leaf weight and the number of shoots per plant exerted the maximum positive direct effect on plant weight. Similar findings were observed by Umanath (1998) and Ann Riya (2001) in coriander. Thus, the results of path analysis among leafy genotypes revealed that greater emphasis should be given to plant weight and number of shoots per plant for improvement of leaf production through selection. The residual effect was observed to be high (0.459), which suggested that the more traits should be included in this study.

To improve leaf yield in coriander, selection should focus on the number of branches per plant, leaf weight and stem weight. These characters have positive associations and positive direct effects on leaf yield.

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