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Path Analysis in Turmeric (*Curcuma longa linn*)

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Phenotypic, genotypic and environmental correlation coefficients and geno typic path co-efficient analysis were carried out using twenty three strains of turmeric (*Curcuma longa* L.) Rhizome yield was positively associated with number of tillers, number of leaves, plant height, leaf size and number of secondary fingers suggesting thereby that the phenotypic selection could be made on the basis of the said characters. Path coefficient study revealed that plant height had maximum direct contribution towards yield followed by number of secondary fingers and number of leaves.

Turmeric (*Curcuma longa* Linn) is an important spice crop in India. A knowledge of the inter-relationship between the different morphological & yield traits is necessary for drawing out sound breeding programmes for any crop. Rhizome yield being a complex quantitative trait governed by a large number of genes and is greatly influenced by environmental fluctuations, therefore selection of elite geno types based on yield as such is not effective. Under such circumstances, a breeder has to find out some other characters which contribute to yield. keeping in view their direct and indirect effects upon the yield Path co-efficient analysis proposed by Wright (1921) is very helpful and provides an effective measure to estimate these effects. The present work relates to some correlation studies in turmeric, among various yield contributing traits and their path coefficient values to assess the nature and extent of direct and indirect influence in building up ulitimate rhizome yield.

MATERIAL AND METHODS

Twenty three cultivars of turmeric collected from all over India both exotic and indigenous were grown in a replicated trial at Pandah, Department of Vegetable Crops & Floriculture, Himachal Pradesh Krishi Vishva Vidyalaya, Oachghat. The material was planted during Kharif, 1978-79 in 4 x 1 m sized plots and replicated three times. in a randomised block design. The spacing between row to row and plant to plant was 35 and 30 cm respectively. Observations were recorded on, number of tillers, number of leaves, plant height (cm), size of leaf (sq. cm), number of primary fingers, number of secondary fingers and rhizome yield (g) on ten randomly selected plants.

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Phenotypic & geno typic correlation coefficients were worked out using Aljibouri *et al* (1958). The path coefficient analysis was done according to Dewey and Lu (1959).

RESULTS AND DISCUSSION

The genotypic, pheno typic and environmental correlations for all possible combinations of seven characters are furnished in Table-1

Genotypic correlations were observed to be slightly higher than the respective pheno typic values for most of the traits as reported by Johnson *et al* (1955) and Lal and Hague (1971) indicating a strong inherent association among the traits studied The environment could however, highly influence the pheno typic values, still a fairly strong and significant positive correlation was found between number of tiller and number of leaves, number of leaves & plant height, plant height and size of leaf. Non-significant phenotypic correlations were observed for number of primary fingers per plant (Table 1.)

At genotypic level rhizome yield was found to be highly and positively correlated with plant height and number of secondary fingers per plant. However, non-singificant and negative association of yield with number of primary fingers per plant was observed. The direct and indirect effects of different characters on yield are presented in Table 2.

The plant height (1.3312) and number of secondary fingers (0.6117) had a large and positive direct effects on yield whereas the direct effect of number of leaves was also positive but not so high. Number of tillers (-0.5444 and size of leaf (-0.6917) showed an appreciable negative direct effect whereas it was low for number of primary fingers. These investigations revealed that yield is positively correlated with number of secondary fingers and plant height, both at geno typic and pheno typic levels and each of these two components has a high direct effect on it. It is evident that selection based on any of these characters is expected to give desired correlated response.

on the other hand, number of tillers, size of leaf and number of primary fingers although indicated a positive total pheno typic association, their direct effect on yield was negative, This apparent conflict between total correlation and path coefficient analysis was also observed by several workers viz. Dewey and Lu (1959) in crested wheat grass, Ramanujan and Rai (1963) in *Brassica compestris*, Srivastava and Singh (1971) in wheat and Majumdar *et al* (1974) in okra. According to these workers, the variation between the two analysis arises largely from the fact that the total correlation simply measures mutual association without regard to causation while path analysis specifies the causes and measures the relative importance of each causal factor.

Number of tillers, size of leaf and number of primary fingers although had negative direct effect, but they had maximum positive indirect effect via plant height. This clearly indicates that plant height increases the yield

by effecting number of tillers, size of leaf & number of primary fingers. Very low residual value indicated that major portion of variability in yield was accounted for by its association with plant height, number of secondary fingers, number of tillers, number of leaves & size of leaf.

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Table 1. Genotypic (g), phenotypic (p) and environmental (e) correlations

Character		2	3	4	5	6	7
Rhizome yield	(g)	0.435*	0.483*	0.691**	0.467*	0.074	0.817**
	(p)	0.512	0.554**	0.534*	0.437*	0.127	0.698**
	(e)	0.567**	0.606	0.377*	0.420**	0.366*	0.584
Number of tillers (g)			0.712**	0.739**	0.706**	0.224	0.484*
	(p)		0.784**	0.413	0.553	0.161	0.325
	(e)		0.823**	0.177	0.375	0.113	0.198
Number of leaves	(g)			0.638**	0.479*	0.145	0.138
	(p)			0.575**	0.482*	0.124	0.395
	(e)			0.642**	0.530**	0.114	0.942**
Plant height (cm)	(g)				0.970**	0.194	0.431**
	(p)				0.936**	0.116	0.295
	(e)				0.906**	0.012	0.172
Size of leaf (sq cm)	(g)					0.165	0.205
	(p)					0.112	0.223
	(e)					0.021	0.206
Number of primary fingers	(g)						0.032
	(p)						0.029
	(e)						0.029
Number of secondary fingers	(g)						
	(p)						
	(e)						...

** Significant at 1 percent level

* Significant at 5 percent level

Table 2 Direct and indrect effects obtained through path coefficient analysis

	Number of tilers	No. of leaves	Plant hight.	Size of leaf	Number of Primary fingers	No of Secondary fingers	Total yield (Kg.)
Number of tillers	-0.5444	-0.3876	-0.4023	-0.3843	-0.1219	-0.2935	-0.3450
Number of leaves	0.1929	0.2909	0.1729	0.1298	0.0393	0.0374	0.4825
Plant height	0.9837	0.8493	1.3312	1.2912	0.2582	0.5737	0.6901
Size of leaf	-0.4884	-0.3313	-0.7610	-0.6917	-0.1141	-0.1418	-0.4667
No. of primary fingers	-0.0049	-0.0032	-0.0043	-0.0036	-0.0220	-0.0007	0.0590
No. of secondary fingers	0.294	0.0844	0.2636	0.1254	0.196	0.6117	0.6168