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Character association and path analysis for yield components in turmeric (*Curcuma longa* L.)

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Abstract

Correlation and path analysis of 11 characters of turmeric (*Curcuma longa*) were carried out using 22 genotypes at Raigarh (Chhattisgarh). Plant height, leaf length, thickness of primary and secondary rhizomes and number of secondary rhizomes revealed significant positive associations with rhizome yield. Path analysis showed positive direct effect of plant height, leaf length and thickness of primary and secondary rhizomes on rhizome yield. These traits may be given due emphasis while making selections for improvement in rhizome yield of turmeric.

Key words : *Curcuma longa*, path analysis, turmeric, yield.

In crop improvement programmes, knowledge of various character associations provides the basis of selection for yield and its components. Yield, being a complex quantitative trait, simple correlation coefficients do not furnish precisely the relationship of various traits determining the yield. Path coefficient analysis is a useful tool which reveals direct and indirect effects of various characters influencing yield. No investigation has been carried out in Raigarh region of Chhattisgarh State on this aspect in turmeric (*Curcuma longa* L.). Hence, the present investigation attempts to find out the association among various characters and to identify the character having maximum effect on yield in turmeric.

Twenty-two entries of turmeric including 19 entries collected from Chhattisgarh region namely, IT-1 to IT-17, IT-21 and IT-22 and three varieties namely, Prabha, Pratibha and ACC-593, were grown during *kharif* season 2003 at Regional Agricultural Research Station, Indira Gandhi Agricultural University, Raigarh (Chhattisgarh). The experiment was laid out in a randomized block design with three replications. Standard plot size of 3 m x 1 m was followed consisting of 10 rows of 1 m length with a spacing of 30 cm row to row and 20 cm plant to plant. Recommended package of practices were followed to raise a healthy crop.

Five plants from each plot were randomly selected and observations were recorded for 11 characters namely, plant height, number

of tillers, leaf length and leaf breadth which were recorded at maximum vegetative growth stage and characters like number and thickness of mother rhizome, primary rhizome and secondary rhizome and fresh rhizome yield were recorded at the time of harvest. The data were subjected to correlation analysis, following the method suggested by Singh & Choudhary (1977), and path analysis as suggested by Dewey & Lu (1959).

Correlation coefficient of 11 characters including rhizome yield revealed that plant height and leaf length had maximum significant and positive association among themselves (0.8756) followed by number of primary rhizome and thickness of primary rhizome (0.8048), leaf length and leaf breadth (0.7401) (Table 1). Characters showing high positive association with rhizome yield were thickness of secondary rhizome (0.4446), followed by plant height (0.4383), leaf length (0.4105), thickness of primary rhizome (0.4065) and number of secondary rhizome (0.2827), while characters like number of tillers and number of mother rhizome showed negative correlation with rhizome yield. The rest of the three characters showed non-significant positive correlation with rhizome yield. In order to have better idea of cause and effect relationship, the correlations were partitioned into direct and indirect effects towards rhizome yield.

Path analysis for rhizome yield as dependent variable revealed that thickness of primary rhizome had largest direct effect (0.7645) on yield followed by plant height (0.1921), leaf length (0.1485), leaf breadth (0.0359) and thickness of secondary rhizome (0.02) (Table 2). Among these characters, leaf breadth only showed non-significant positive correlation with yield and the rest had significant positive association. So these characters, except leaf breadth, can be utilized as selection criteria for improving rhizome yield. Highly positive direct effect of leaflet length and thickness of secondary rhizome with yield

Table 1. Genotypic correlation coefficient among 11 quantitative characters in turmeric

Character	Plant height	No. of tillers	Leaf length	Leaf breadth	No. of mother rhizomes	No. of primary rhizomes	No. of secondary rhizomes	Thickness of mother rhizome	Thickness of primary rhizome	Thickness of secondary rhizome	Rhizome yield
Plant height	1.0000	0.0307	0.8756**	0.7359**	-0.1706	-0.1048	0.0724	0.1227	0.1464	0.1917	0.04383**
No. of tillers		1.0000	0.1072	0.1291	-0.2431	0.0249	0.0254	-0.0475	-0.0960	-0.3270	-0.2055
Leaf length			1.0000	0.7401**	-0.2431	-0.1689	0.1452	-0.0407	0.0294	0.1054	0.4105**
Leaf breadth				1.0000	-0.1935	-0.2614	-0.0191	-0.1652	-0.1896	-0.0885	0.2329
No. of mother rhizomes					1.0000	0.4690**	-0.0121	0.5711**	0.3076*	0.0657	-0.2196
No. of primary rhizomes						1.0000	0.3784**	0.7044**	0.8048**	0.2091	0.1101
No. of secondary rhizomes							1.0000	-0.0592	0.3457**	0.1072	0.2827*
Thickness of mother rhizome								1.0000	0.7156**	0.2521*	0.0091
Thickness of primary rhizome									1.0000	0.5777**	0.4065**
Thickness of secondary rhizome										1.0000	0.4446**
Rhizome yield											1.0000

* Significant at 5% level; ** Significant at 1% level

Table 2. Influence of morphological characters on rhizome yield of turmeric

Character	Plant height	No. of tillers	Leaf length	Leaf breadth	No. of mother rhizomes	No. of primary rhizomes	No. of secondary rhizomes	Thickness of mother rhizome	Thickness of primary rhizome	Thickness of secondary rhizome	Correlation with yield
Plant height	*0.1921*	-0.0064	0.1300	0.0264	0.0261	0.0075	-0.0009	-0.0524	0.1120	0.0038	0.0438**
No. of tillers	0.0059	*-0.2074*	0.0159	0.0046	0.0372	-0.0018	-0.0003	0.0203	-0.0734	-0.0065	-0.2055
Leaf length	0.1682	-0.0222	*0.1485*	0.0266	0.0372	0.0122	-0.0019	0.0174	0.0225	0.0021	0.4105**
Leaf breadth	0.1414	-0.0268	0.1099	*0.0359*	0.0296	0.0188	0.0002	0.0705	-0.1450	-0.0018	0.2329
No. of mother rhizomes	-0.0328	0.0504	-0.0361	-0.0070	*-0.1532*	-0.0338	0.0002	-0.2439	0.2352	0.0013	-0.2196
No. of primary rhizomes	-0.0201	-0.0052	-0.0251	-0.0094	-0.0718	*-0.0720*	-0.0050	-0.3008	0.6153	0.0042	0.1101
No. of secondary rhizomes	0.0139	-0.0053	0.0216	-0.0007	0.0018	-0.0272	*-0.0131*	0.0253	0.2643	0.0021	0.2827*
Thickness of mother rhizome	0.0236	0.0098	-0.0060	-0.0059	-0.0875	-0.0507	0.0008	*-0.4271*	0.5471	0.0050	0.0091
Thickness of primary rhizome	0.0281	0.0199	0.0044	-0.0068	-0.0471	-0.0579	-0.0045	-0.3056	*0.7645*	0.0116	0.4065**
Thickness of secondary rhizome	0.0368	0.0678	0.0156	-0.0032	-0.0101	-0.0150	-0.0014	-0.1077	0.4416	*0.0200*	0.4446**

Residual=0.2661; Italicized values show direct effect; * Significant at 5% level; ** Significant at 1% level

was reported in ginger by Abraham & Latha (2003). Thickness of secondary rhizome had low positive direct effect but it showed significant correlation with rhizome yield due to high indirect effect with thickness of primary rhizome.

Though number of primary rhizomes showed significant association with rhizome yield, its negative direct effect reveals that this character could not be directly selected for rhizome yield improvement. Characters such as number of secondary rhizomes and thickness of primary rhizomes had negative direct effect but their non significant positive association with yield of rhizome may be attributed to high positive indirect effect of these characters via thickness of primary rhizome. Panja *et al.* (2002) reported similar type of negative direct effect of number of primary rhizomes and significant positive association with yield due to high indirect effect with number of leaflets and thickness of secondary rhizomes. Residual effect of 0.301 was observed which indicated that few more traits need to be considered to explain the detailed relationship with rhizome yield.

Thus, it can be concluded that characters like plant height, leaf length, thickness of primary and secondary rhizomes will strongly influence high rhizome yield in turmeric.

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