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Correlation and path analysis in ginger (*Zingiber officinale* Rosc.)

Z Abraham & M Latha

National Bureau of Plant Genetic Resources
Regional Station, Vellanikkara, Thrissur – 680 654, Kerala, India

E-mail: trc_nbpgrtsr@sanchar.net.in

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Abstract

Twelve morphological characters recorded from 40 genotypes of ginger were subjected to correlation and path analysis. The results revealed that all characters studied have positive correlation with yield and direct selection based on leaflet number, rhizome length and thickness of secondary rhizome could help to improve the yield. The lowest residual effect indicates the optimistic nature of the characters taken for the study.

Key words: correlation analysis, path analysis, residual effects, *Zingiber officinale*

Ginger (*Zingiber officinale* Rosc.) belongs to the family Zingiberaceae. It is a herbaceous perennial with underground rhizomes having serial leafy shoots of 0.5 to 0.75 m height. Ginger originated in South East Asia and 24 species are reported from India, which includes eight species from Kerala. The underground rhizome of ginger is a source of oil, oleoresin, essence and spice of commerce. Though the share of area under ginger cultivation is less, Kerala is the major exporting state of ginger for its superior quality. Being a vegetatively propagated crop, its scope of improvement through breeding methods is limited. Improving rhizome yield which is a complex character is very difficult by selecting the genotypes for yield *per se*. Hence the association of rhizome yield with the morphological characters is an important factor to be considered for improvement of yield in ginger. The morphological association and the extent of contribution of each character to rhizome yield was found using the correlation and path analysis which are the two important biometrical techniques extensively used. An experiment was conducted using 40 genotypes of ginger, in two replications at National Bureau of Plant Genetic Resources, Regional Station, Thrissur to identify the major yield contributing characters.

The forty genotypes studied include 20 indigenous and 20 exotic collections. Data on twelve characters viz. number of tillers, height of the tiller, leaflet number, leaflet length, leaflet breadth, rhizome length and width, thickness of basal psuedostem, thickness of primary, secondary and tertiary rhizomes and fresh weight of rhizomes were recorded for five plants and the mean values were subjected to correlation and path analysis (Dewey & Lu 1959). The characters such as number of tillers, height of the tiller, leaflet number, leaflet length and breadth were recorded at the maximum vegetative growth stage and rhizome characters were recorded at the time of harvest.

Correlation co-efficients for twelve characters were worked out and high positive association with yield was found between leaflet number (0.6803), followed by tiller height (0.6488), rhi-

Table 1. Influence of morphological characters on yield of ginger

Character	Tiller number	Tiller height	Leaflet. number	Leaf length	Leaf breadth	Thickness of pseudo stem	Rhizome length	Rhizome breadth	Thickness of 1^o rhizome	Thickness of 2^o rhizome	Thickness of 3^o rhizome	Correlation with yield
Tiller number	0.1565	0.0372	0.1337	0.0221	0.0035	-0.0078	0.0898	0.0501	-0.0032	-0.0050	-0.0365	0.4404**
Tiller height	0.0523	0.1113	0.1537	0.0641	0.0238	0.0124	0.0737	0.0430	-0.0159	0.0726	0.0578	0.6488**
Leaflet number	0.0882	0.0720	0.2375	0.0564	0.0131	0.0121	0.0770	0.0491	-0.0161	0.0537	0.0373	0.6803**
Leaf length	0.0325	0.0674	0.1265	0.1058	0.0327	0.0226	0.0619	0.0344	-0.0155	0.0649	0.0492	0.5824**
Leaf breadth	0.0115	0.0548	0.0649	0.0718	0.0482	-0.0046	0.0381	0.0035	-0.0086	0.0559	0.0532	0.3887
Thickness of pseudostem	-0.0108	0.0123	0.0254	0.0211	-0.0020	0.1131	-0.0244	0.0005	-0.0042	0.0268	0.0029	0.1607
Rhizome length	0.0835	0.0487	0.1085	0.0389	0.0109	-0.0164	0.1684	0.0526	-0.0121	0.0586	0.0721	0.6135**
Rhizome breadth	0.0685	0.0418	0.1018	0.0318	0.0015	0.0005	0.0774	0.1145	-0.0116	0.0316	0.0379	0.4957**
Thickness of 1^o rhizome	0.0148	0.0524	0.1132	0.0487	0.0122	0.0140	0.0604	0.0389	-0.0338	0.1068	0.0683	0.4959**
Thickness of 2^o rhizome	-0.0045	0.0467	0.0738	0.0397	0.0156	0.0175	0.0570	0.0209	-0.0209	0.1730	0.0984	0.5172**
Thickness of 3^o rhizome	-0.0329	0.0370	0.0509	0.0300	0.0148	0.0019	0.0697	0.0250	-0.0133	0.0978	0.1739	0.4548**

Residual- 0.2870

** Significant at 0.01%

zome length (0.6135), leaf length (0.5824) and thickness of secondary rhizome (0.5172). All the characters showed significant positive association with yield except for leaf breadth and thickness of basal psuedostem, which were positive but insignificant. Path analysis revealed that characters such as leaflet number, rhizome length, thickness of secondary rhizome, rhizome width and leaflet length have high positive direct effect with yield (Table 1). High positive direct effect of leaflet number and rhizome width with yield was also reported by Pandey & Dhobal (1993) and Premananda Das *et al.* (1999) in ginger. Leaflet number showed high significant association coupled with high positive direct effect, which indicates the importance of this character in selection for yield improvement. Though the thickness of primary rhizome showed significant positive association, its negative direct effect indicates the inappropriateness of selecting this character for improving the rhizome yield. All the characters showed a negative indirect effect via thickness of primary rhizome. But the significant correlation of this character with yield may be due to high positive indirect effect of thickness of primary rhizome via number of leaflets and thickness of secondary rhizome. In turmeric, number of primary fingers showed negative direct effect and significant positive association due to high indirect effect via number of leaflets and thickness of secondary rhizome (Panja *et al.* 2002).

Hence, direct selection based on leaflet number, tiller height, rhizome length, leaflet length, thickness of secondary rhizome will be rewarding for yield improvement. Similar results of improving yield by direct selection of plant height, leaf number, number of primary and secondary fingers and weight of secondary fingers have been obtained in turmeric also (Panja *et al.* 2002). The residual effect was 0.2870, which is low and confers that the characters studied are optimum.

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