

## VARIABILITY, CORRELATION AND PATH ANALYSIS IN GINGER GERMPLASM

B. SASIKUMAR, K. NIRMAL BABU, JOSE ABRAHAM AND P. N. RAVINDRAN

*National Research Centre for Spices, P. O. Mrikunnu, Calicut 673012*

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### ABSTRACT

One hundred collections of ginger evaluated for plant height, leaf number, tiller number, leaf length and width, days to maturity, dry recovery as well as rhizome yield/plant revealed good variability for tiller number and rhizome yield/plant. Moderate variation was observed for plant height, leaf number, days to maturity and dry matter recovery. Plant height, leaf number, tiller number as well as length and width of leaves had positive significant association with rhizome yield. Plant height, followed by leaf length, had maximum direct effects on rhizome yield.

**Key words:** Variability, correlation, path analysis, ginger.

Ginger (*Zingiber officinale* Rose) is an important rhizomatous spice produced and exported from India. Even though many cultivars, mainly identified after their locality of large scale cultivation, are prevalent in the country, little attention has been paid to their systematic evaluation and characterization of this clonally propagated crop. In fact, lack of high yielding and short duration varieties has been a major constraint in increasing production of ginger in our country. The present paper reports results on variability, correlation and path analysis studies done in 100 germplasm collections of ginger under Kerala conditions.

The study was carried out at NRCS farm at Peruvannamuzhy in 1990. One hundred ginger germplasm accessions, including few exotic ones, collected from different states of India by the NRCS were grown in cement tubs (45 x 45 cm) filled with potting mixture. There were 4 plants/tub, replicated twice. The crop was raised as follows:

Association analysis revealed a positive and significant correlation of rhizome yield with plant height, tiller and leaf number, leaf length as well as leaf width (Table 2). Plant height also had a significant and positive association with leaf and tiller number as well as length and width of leaf. The association of leaf number with tiller number, leaf length and leaf width was also positive and significant. However, tiller number had positive significant association with leaf length and negative significant association with dry recovery. Leaf length was positively correlated with leaf width. Leaf width had positive and significant association with dry recovery. All other associations were negligible. Significant positive correlations between rhizome yield and various yield attributes such as plant height, leaf and tiller number, length and width of leaves have been reported in ginger [1-3].

Table 1. Mean, range and coefficient of variation for yield and yield attributes in ginger

Character	Mean	Range	CV, %
Plant height (cm)	59.2	23.1 - 88.6	19.0
Leaf number	37.1	17.0 - 52.0	18.2
Tiller number	16.8	2.7 - 35.5	45.9
Leaf Length (cm)	23.8	17.0 - 36.2	10.9
Leaf width (cm)	2.6	1.9 - 3.7	10.8
Days to maturity	225.8	214.0 - 235.5	13.5
Dry recovery (%)	21.7	14.0 - 28.5	14.3
Rhizome yield/plant (g)	363.1	55.0 - 770.0	39.3

Table 2. Character associations in ginger

Character	Leaf number	Tiller number	Leaf length	Leaf width	Days to maturity	Dry recovery	Rhizome yield/plant
Plant height	0.69**	0.32**	0.59**	0.51**	0.12	0.18	0.47**
Leaf number		0.26**	0.56**	0.36**	0.01	0.07	0.38**
Tiller number			0.30**	-0.13	0.03	-0.29**	0.26**
Leaf length				0.42**	0.04	0.04	0.49**
Leaf width					-0.01	0.42**	0.23**
Days to maturity						0.06	0.03
Dry recovery							-0.10

\*\*Significant at 1% level.

Partitioning of the correlation coefficients into direct and indirect effects revealed that plant height, followed by leaf length, exhibited maximum direct effect on rhizome yield. Dry recovery had a negative direct effect on yield. The correlation between these two traits was also negative, albeit nonsignificant. All other direct effects were negligible. Maximum indirect effects were observed in case of leaf number through plant height followed by leaf length through plant height. Plant height through leaf length also exerted moderately good indirect effect on rhizome yield. The indirect effects of leaf width through plant height, leaf number through leaf length as well as leaf width through leaf length were also moderate.

All other indirect effects were negligible. Predominant direct effect of plant height on rhizome yield of ginger has been reported [2].

The pattern of path coefficients observed in the present case is in agreement with the correlations obtained, but the values are low. However, a residual effect of 0.8217 indicates that the characters studied account for only 18% variability. Nevertheless, the present study confirms that since rhizome yield/plant and plant height had good variability and plant height had positive and significant correlation as well as good direct effect with rhizome yield, this character should be given prime importance while selecting high yielding ginger cultivars. Since leaf length also had positive significant correlation and good direct effect with rhizome yield, this trait is also worth considering during selection programme. As days to maturity and dry recovery had moderate variation there is also some scope for selecting early maturing cultivars having good dry recovery.

Table 3. Direct (in bold) and indirect effects of yield components on rhizome yield of ginger

Character	Plant height	Leaf number	Tiller number	Leaf length	Leaf width	Days to maturity	Dry recovery
Plant height	<b>0.3129</b>	-0.032	0.0062	0.1802	0.0173	-0.0012	-0.0315
Leaf number	0.2174	<b>-0.0047</b>	0.0052	0.1707	0.0123	-0.0001	-0.0124
Tiller number	0.0994	-0.0012	<b>0.0196</b>	0.0923	<b>-0.0044</b>	-0.0003	0.0502
Leaf length	0.1863	-0.0026	0.0059	<b>0.3027</b>	0.0143	-0.0004	-0.0071
Leaf width	0.1594	-0.0017	-0.0026	0.1267	<b>0.0341</b>	0.0000	-0.0723
Days to maturity	0.0383	-0.0000	-0.0006	0.0127	0.0000	<b>-0.0097</b>	-0.0105
Dry recovery	0.0577	-0.0003	-0.0058	0.0125	0.0144	-0.0005	<b>-0.1708</b>

Residual effect 0.8217.

In the present study, cultivars like Santhing Laidum, Sangiguda, PGS-37, PGS-39, Maran, No. 506 and Himachal have recorded more than 600 g (mean) fresh rhizome yield/plant. The dry recovery of these cultivars ranged from 19 (PGS-37) to 25% (No. 506) and days to maturity from 214 (PGS-39) to 223 (Himachal) days. Oleoresin content of these cultivars ranged from 4.6 (Himachal) to 7.5% (PGS-37). Superiority of Maran ginger for cultivation in the plains of Kerala has been reported earlier [4]. The study also indicates that types like China, Ernad, Chernad, Kuruppambadi Local, Thing Pui, Zahirabad, No. 243, Mowshom, Kadan Nariampara, S-557 and Assam are quite suited for conversion to dry ginger as the recovery of dry ginger from these types is above 25%. The maturity period of these high dry-recovery cultivars ranged from 217 (Kadan Nariampara) to 238 (China) days and oleoresin content from 3.2 (Kuruppampadi) to 8.5% (Ernad Chernad and Assam).

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