Multiple Regression Analysis in Cultivars of *Zingiber Officinale* Rosc.

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ABSTRACT

The linear relationship between the morphological characters like height of pseudostem, number of leaves and the breadth and length of last fully opened leaf and yield was studied in 23 cultivars of ginger by multiple regression technique. Based on the morphological characters, the final yield could be predicted fairly accurately with an R^2 of 73 percent.

The partitioning of phenotypic correlation between yield and the morphological characters into direct and indirect effects by the method of path coefficient analysis revealed that the character plant height exhibited a high direct effect as well as high indirect effect in the establishment of correlation between yield and other morphological characters.

A knowledge of the relative importance of components of rhizome yield is helpful to initiate effective selection programme in ginger. Path coefficient analysis (Wright, 1921) is helpful in the analysis of correlation into components, due to direct effect and indirect effect of the characters involved. A study of the relationship between morphological characters in the early stages of the crop and the final yield would also help in predicting the ultimate rhizome yield. The present study was undertaken in cultivars of ginger to study the phenotypic correlation between various characters and rhizome yield and their direct and indirect effect on yield.

Materials and methods

Twenty three cultivars of *Z. officinale* used in the present investigation were from the germplasm collection maintained at the Central Plantation Crops Research Institute, Regional Station, Calicut. The materials were planted in three replications of 3m × 1m beds. The morphology of 23 cultivars were observed at 45, 60, 90 and 120 days after planting and the following characters were recorded: height of the plant, number of leaves, and breadth and length of last fully opened leaf. Measurements were taken from ten plants in each bed.

Results and discussion

The linear relationship between the morphological characters observed on the 90th and 120th day and the final yield was studied by multiple regression technique. The study showed that the final yield could be fairly accurately estimated based on the data for 90th

and 120th day after planting. Slight improvements in the prediction value was noticed with advancement in the age of the plants. Since the maximum R^2 that could be recorded was 73%, it is likely that additional characters like number of tillers would have contributed towards increasing the prediction value. The analysis also indicated that these morphological characters taken on a sample basis would help in predicting the final yield in the field well in advance of the harvest.

The relationship between yield and morphological characters observed on 90th and 120th day as obtained by multiple regression technique is given in Table 1. Based on the phenotypic correlations between the characters,

Table 1. **Linear relationship between morphological characters and yield**

Days after planting	Regression equation	Coefficient of determination
90	$Y = 138.79 + 6.67X_1 - 4.89X_2 - 4.93X_3 - 16.29X_4$	$R^2 = 0.6229$
120	$Y = 75.65 + 5.02X_1 + 3.18X_2 - 3.64X_3 + 25.29X_4$	$R^2 = 0.7354$

Y = yield
X_1 = height
X_2 = number of leaves
X_3 = length of last fully opened leaf
X_4 = breadth of last fully opened leaf

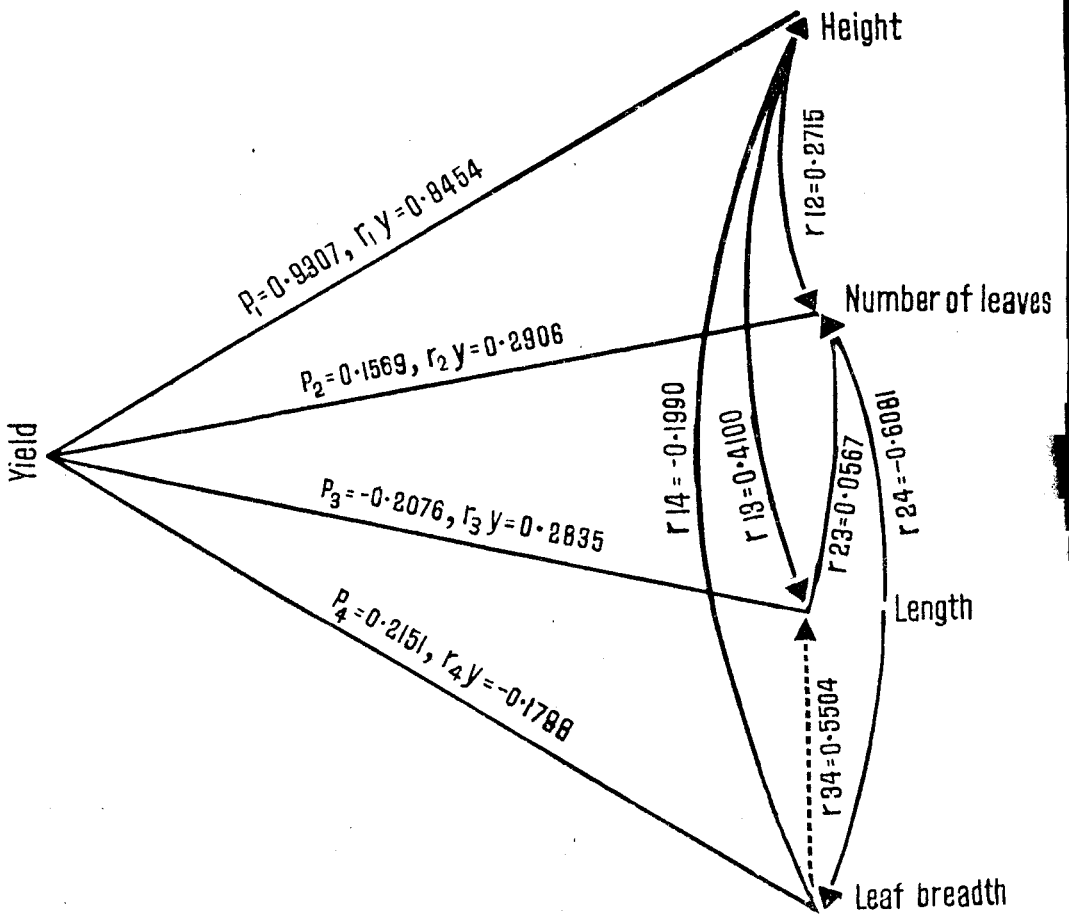
standardised partial regression coefficients were worked out to study the magnitude of character associations. Correlations between yield and the individual morphological characters were partitioned into direct and indirect effects. Only that recorded on 120th day was analysed and the results are presented in Table 2. The analysis revealed that the phenotypic correlation between yield and height was quite high, and so also the direct effect of height towards the correlation. Moreover, it was found that the indirect effect of height in the manifestation of the correlations between yield and other characters were also very high (Table 2). The direct effect of number of leaves was

Table 2. **Partitioning of phenotypic correlation between yield and morphological characters into direct and indirect effects**

Plant characters	Height	No. of leaves	Length of leaf	Breadth of leaf	Correlation between yield and morphological characters
Height	0.9307	0.0426	−0.0861	−0.0428	0.8454
Number of leaves	0.2527	0.1569	0.0118	−0.1308	0.2106
Length of leaf	0.3816	−0.0089	−0.2076	0.1184	0.2835
Breadth of leaf	0.1825	−0.0955	−0.1142	0.2151	0.1798

found to be low. Even though length of leaf has got a negative direct effect, it was compensated by a high positive indirect effect by plant height in establishing a positive correlation between leaf length and final yield. The relationship has been diagrammatically shown in Fig. 1. In a recent report, Mohanty and Sarma (1979) found significant positive genotypic and phenotypic correlations between yield and plant height, number of leaves and number of tillers. They also observed a positive correlation between yield and rhizome characters like total number of fingers, girth of the secondary fingers and the number of adventitious roots. But nevertheless, rhizome characters may not be of direct use for prediction of final yield well in advance of the harvest.

Fig. 1. **Diagrammatic representation of inter-relationship between yield and morphological characters**



P_1, P_2, P_3 and P_4 indicate direct effects. r values indicate phenotypic correlations.

REFERENCES

MOHANTY, D. C. AND SARMA, Y. N. 1979. Genetic variability and correlation for yield and other variables in ginger germplasm. *Indian J. Agric. Sci.* **49**: 250–253.

WRIGHT, S. 1921. Correlation and causation. *Jour. Agric. Res.* **20**: 557–585.

DISCUSSION

L. Krishnaswamy (DCD) : I do not understand why you haven't included the tiller number in your studies?

G. S. Nair (KAU) : In my opinion tiller number may not be an important factor, because larger number of tillers tend to reduce the finger size. But the number of effective tillers, may be important.

R. Gopalakrishnan (CWRDM) : Have you observed any relation between tiller number and height of plants?

R. Balakrishnan (CPCRI) : We have not studied this aspect.