https://doi.org/10.29321/MAJ.10.A03294

Madras agric. J. 63 (4): 224 — 226, April, 1976.

Path - Analysis in Virginia Tobacco

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ABSTRACT

Correlation and path-coefficient analysis in Virginia tobacco, variety 'Delcrest' showed that length of leaf made maximum contribution to cured-leaf yield, while the breadth of leaf had negative effect. Though plant height showed a positive correlation with yield, its direct effect was negative, indicating that, other factors remaining constant, an increase in plant-height would only reduce yield.

INTRODUCTION

Yield of a crop is the net result of the combined action of the various agronomic characters. A study of the relation between yield and the characters affecting yield would therefore enable us to exploit the potentialities of high yields to the extent possible by manipulating agronomic operations. Path-coefficient specifies the relative importance and measures the direct influence of one variable upon another, besides partitioning of the correlation coefficient into direct and indirect effects. With this in object a study on path-analysis in Virginia tobacco was made and the results presented.

MATERIALS AND METHODS

The virginia variety Delcrest was raised in 15 combinations of 5 levels of nitrogen *viz.*, 0, 20, 40, 60 and 80 kg/ha and 5 levels in each of P_2O_5 and K_2O, *viz.*, 0, 40, 80, 120 and 160 kg/ha, in Central Composite Design replicated 4 times. The experiment was conducted for two seasons at the Tobacco Research Station, Dinhata.

Observations were made on three randomly selected plants in each treatment. Simple correlation coefficients were worked out using all possible combinations of the above three characters related to yield of cured leaf. Path-coefficients were obtained by solving the simultaneous equations as illustrated by Dewey and Lu (1959).

RESULTS AND DISCUSSION

Correlation coefficients: The correlations between yield and length of leaf and height of plant were positive, but not significant, while the correlation between breadth of leaf and yield was highly significant, but negative, contrary to the findings of Rao *et al.* (1973) (Table I). The differing result is probably because the data reported by Rao *et al.* (1973) came from 20 varieties as against only one variety used in the present study.

Path-coefficients: The nature of the causal system and coefficients of factors influencing yield are depicted in Fig. 1. The double arrows in the

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TABLE I. Correlation coefficients between agronomic characters and cured leaf yield in Virginia tobacco.

		Length of leaf (1)	Breadth of leaf (2)	Height of plant (3)	Cured leaf yield (4)
Length of leaf	(1)	1.000	0.710**	0.303**	0.132
Breadth of leaf	(2)		1.000	0.030	−0.598**
Height of plant	(3)			1.000	0.226
Cured leaf yield	(4)				1.000

** Significant at 1% level.

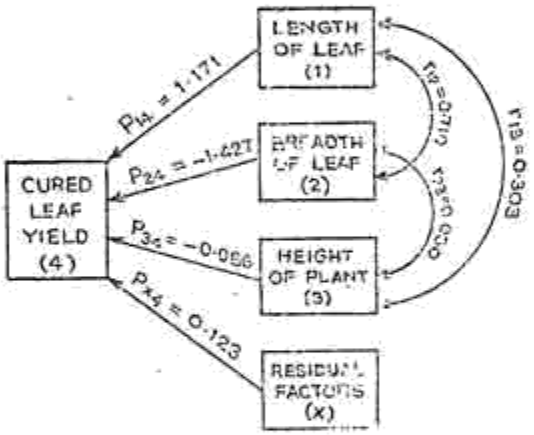

Fig. 1. Path diagram indicating causal system and coefficients of factors affecting yield.

path-diagram indicate mutual association between the agronomic characters as measured by total correlation. The single-arrowed lines indicate direct influence as measured by path-coefficients. The values of 0.123 for P_{x4} and 0.985 for R^2 indicate that the three plant characters selected for the study were adequate to represent yield, but there were some other factors also affecting yield. The value of 1.171 for the direct effect of length of leaf on yield indicates that path-coefficients, like other regression coefficients, can be more than one whereas values for correlation coefficients range between −1 and +1.

The path-analysis (Table II) showed that the effect of length of leaf on yield (1.171) was positive and much more than indicted by the simple correlation coefficient (0.132). However, this strong positive direct effect was largely masked by a near equal negative effect this character exerted on yield via breadth of leaf, resulting in an apparently low correlation.

TABLE II. Components of correlation coefficients

1.	Length of leaf *vs.* cured leaf yield	r = +0.132
	Direct effect	+1.171
	Indirect effect *via.* breadth of leaf	−1.013
	Indirect effect *via.* plant height	−0.026
	Total	+0.132
2.	Breadth of leaf *vs.* cured leaf yield	r = −0.598
	Direct effect	−1.427
	Indirect effect *via.* length of leaf	+0.832
	Indirect effect *via.* plant height	−0.003
	Total	−0.598

TABLE *(Contd.)*

3.	Height of plant *vs.* cured leaf yield	r = +0.226
	Direct effect	−0.086
	Indirect effect *via.* length of leaf	+0.354
	Indirect effect *via.* breadth of leaf	−0.043
	Total	+0.226

The direct effect of breadth of leaf on yield was also much more than the relation exhibited by the simple correlation. Both the direct effect as well as the r-value were negative. The direct effect (−1.427) was to some extent nullified by the indirect positive effect the breadth of leaf had positive effect on yield via leaf-length resulting an r-value of −0.598.

The usefulness of path-analysis may be clearly seen from the study of the effect of plant height on cured-leaf yield. The r-value of +0.226 gives an impression that an increase in plant height would result in an increase in yield. However, path-analysis has shown that the direct effect of plant height on yield is negative though slight. The effect of plant height on yield via breadth of leaf is also negative and small. However, these two negative effects are completely masked by the indirect effect of plant height on yield via length of leaf, resulting in a positive correlation.

The study showed that the length of leaf made the maximum contribution to cured leaf yield in Virginia tobacco, variety 'Delcrest'. Other characters remaining constant, an increaae in height of plant would only decrease the yield, though the r-value between plant height and yield was positive and nearly significant. A selection based on plant height, in view of its considerable positive correlation with yield, would not therefore give desired results.

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