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PATH-COEFFICIENT ANALYSIS IN CHEWING TOBACCO

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ABSTRACT

Thirty eight strains of chewing tobacco (*Nicotiana tabacum* L.) were studied for genotypic and phenotypic correlations and path-coefficient analysis. The total cured and first grade leaf yields were positively correlated with leaf length, leaf breadth, leaf puckering score, leaf spangling score, and days to maturity, and negatively with plant height and internodal length. Path-coefficient analysis showed that leaf length had the highest positive direct effect on both kinds of yield, followed by days to maturity and leaf puckering score. It was concluded that improvement in total cured leaf yield in chewing tobacco is possible through selection for leaf length and for first grade yield through leaf length and leaf puckering score.

Key words: Chewing tobacco, path-coefficient analysis, yield.

Chewing tobacco (*Nicotiana tabacum* L.) is one of the most important cash crops in Bihar. It occupies about 16,000 ha area. Yield components play an important role in deciding the productivity of a crop. A clear understanding and knowledge of association and contribution of various yield components is essential for any selection programme aimed at yield improvement. As more variables are included in correlation studies, the indirect associations become complex. Path-coeffieient analysis is useful for evaluating the relative contribution of each component, both direct and indirect, to the yield. While Sastri and Gopinath [1] and Sastri [2] studied the correlations and path analysis in Natu tobacco and Rao et al. [3] in flue cured Virginia tobacco, no such studies have been carried out so far in chewing tobacco. Hence, an attempt has been made to study the correlations and path coefficient analysis in chewing tobacco.

MATERIALS AND METHODS

The materials for the present study consisted of 38 strains of chewing tobacco, grown in randomized block design with three replications during winter 1984-1985 at the C.T.R.I. Research Station, Pusa, Bihar. Each entry was represented by a single row of 12 plants with 90 cm spacing between as well as within rows. The crop received a basal dose of 25 tonnes of farm yard manure, 170 kg N, 50 kg P_2O_5 and 50 kg K_2O/ha one week before transplanting. Topping was done at 14-leaf stage, followed by flood irrigation. Five competitive random plants were selected from each plot for observations on nine characters (Tables 1, 2). Phenotypic and genotypic correlation coefficients for both total cured leaf and first grade leaf yield were calculated using the formulae suggested by Miller et al. [4]. The path-coefficient analysis was done following Dewey and Lu [5].

RESULTS AND DISCUSSION

The direct and indirect effects of plant height, leaf length, leaf breadth, internodal length, leaf puckering score, leaf spangling score, and days to maturity to total cured leaf yield and first grade leaf yield are presented in Tables 1 and 2, respectively. The genotypic and phenotypic correlation coefficients of each character with the yield of total cured leaf and first grade leaf show that the genotypic correlation coefficient (r_g) were generally higher than the corresponding phenotypic correlation coefficients (r_p). The yield of both total cured and first grade leaves had highly significant positive r_g and r_p with leaf length, leaf breadth, leaf puckering score, leaf spangling score and days to maturity, except r_p with leaf spangling score, where it was significant only at 5% level. As expected, plant height and internodal length were negatively correlated with leaf yield.

Table 1. Direct and indirect effects of plant attributes on total cured leaf yield in chewing tobacco

Character	Parameter	Plant height	Leaf length	Leaf breadth	Internodal length	Leaf puckering score	Leaf spangle score	Days to maturity	Correlation with cured leaf yield
Plant height	r_g	**−1.77**	−0.56	−0.06	2.01	0.05	−0.11	−0.11	−0.55**
	r_p	**−0.17**	−0.12	−0.04	0.01	0.02	0.05	−0.03	−0.27
Leaf length	r_g	0.92	**1.07**	0.13	−1.38	−0.04	0.01	0.13	0.84**
	r_p	0.06	**0.35**	0.12	−0.01	0.02	0.03	0.06	0.64**
Leaf breadth	r_g	0.40	0.51	**0.27**	−0.69	−0.06	0.08	0.12	0.63**
	r_p	0.03	0.21	**0.20**	−0.01	0.02	0.01	0.05	0.52**
Internodal length	r_g	−1.69	−0.70	−0.09	**2.11**	0.05	−0.12	−0.13	−0.57**
	r_p	−0.14	−0.12	−0.03	**0.02**	0.03	0.06	−0.03	−0.22
Leaf puckering score	r_g	−0.11	−0.06	−0.02	0.15	**0.76**	−0.36	0.13	0.49**
	r_p	−0.02	0.05	0.02	0.01	**0.15**	0.18	0.04	0.42**
Leaf spangling score	r_g	−0.47	−0.02	−0.05	−0.62	0.67	**−0.41**	−0.06	0.38*
	r_p	−0.04	0.06	0.01	0.01	0.13	**0.20**	0.01	0.38*
Days to maturity	r_g	0.58	0.43	0.10	−0.87	0.31	−0.07	**0.33**	0.81**
	r_p	0.03	0.15	0.70	−0.01	0.03	0.02	**0.16**	0.45**

*, **Significant at 5% and 1% levels, respectively; values in bold denote direct effects.

Path-coefficient analysis is useful in determining the direct and indirect associations among various attributes. Leaf length had highly significant positive association with total cured leaf and first grade leaf. Most of this association could be explained by the direct effect of leaf length with each yield character. Leaf puckering score had significant positive correlation with yield characters which could be again explained by its positive direct effect on yield characters. Leaf breadth, though significantly positively correlated with each yield character, had small direct effect and more

indirect effect through leaf length and plant height. Similarly, days to maturity had significant positive correlation with yield characters, but the indirect effect through plant height (0.58) and leaf length (0.43) appears to be responsible for this association rather than its direct effect.

Table 2. Direct and indirect effects of first grade leaf yield and its attributes in chewing tobacco

Character	Parameter	Plant height	Leaf length	Leaf breadth	Internodal length	Leaf puckering score	Leaf spangle score	Days to maturity	Correlation with first grade leaf
Plant height	r_g	**−1.61**	−0.42	−0.06	1.75	0.02	−0.01	−0.21	−0.52**
	r_p	**−0.24**	−0.10	−0.03	0.14	0.02	0.04	0.04	−0.21
Leaf length	r_g	0.83	**0.81**	0.12	−1.20	−0.02	−0.05	0.26	0.80**
	r_p	−0.08	**0.28**	0.09	−0.06	0.03	0.02	0.09	0.53**
Leaf breadth	r_g	0.36	0.39	**0.25**	−0.60	−0.03	0.01	0.23	0.59**
	r_p	0.04	0.17	**0.14**	−0.03	0.02	0.01	0.08	0.43**
Internodal length	r_g	−1.53	−0.53	−0.08	**1.84**	0.02	0.01	−0.26	−0.54**
	r_p	−0.20	−0.09	−0.02	**0.17**	0.03	0.04	−0.05	−0.12**
Leaf puckering score	r_g	−0.10	−0.04	−0.02	0.13	**0.31**	0.01	0.26	0.55**
	r_p	−0.03	0.04	0.02	0.03	**0.18**	0.13	0.05	0.42**
Leaf spangling score	r_g	−0.43	−0.02	−0.05	0.54	0.28	**0.01**	0.11	0.44**
	r_p	−0.06	0.04	−0.01	−0.05	0.16	**0.14**	0.02	0.37**
Days to maturity	r_g	0.53	0.33	0.09	−0.76	0.13	0.01	**0.64**	0.95**
	r_p	0.05	0.12	0.05	−0.04	0.04	0.01	**0.22**	0.45**

* ** Significant at 5% and 1% levels, respectively; values in bold denote direct effects.

The leaf spangling score had significant (5% level) positive correlation with the yield of total cured leaf and highly significant with that of first grade leaf. The direct effect of leaf spangling score was negative on total cured leaf yield and little on first grade leaf yield. The indirect effect through leaf puckering score (0.67) appear to be responsible for the correlation between total cured leaf yield and leaf spangling score.

The genotypic correlation between the internodal length and yield characters was significantly negative, whereas its direct effect on cured leaf yield was 2.11 and first grade leaf 1.84, which was highly positive. This may be due to the undesirable indirect effects via plant height (−1.69 and −1.53). Under such situation restrictions are to be imposed to nullify the undesirable indirect effect via plant height [6]. The correlations between plant height and yield characters were significantly negative to its high negative direct effect.

The genotypic associations of leaf length with total as well as first grade leaf yield, days to maturity with total cured leaf yield, and leaf puckering with first grade leaf yield were almost equal to their direct effects. Thus, direct selection for leaf length and days to maturity will significantly contribute to improvement for total cured leaf yield, and leaf length along with leaf puckering score to the first grade leaf yield.

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