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GENETIC ASSOCIATION AMONG DIFFERENT CHARACTERS IN BIDI TOBACCO (*NICOTIANA TABACUM L.)*

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Tobacco (*Nicotiana tabacum L.*) is an industrial plant because of its cured leaves which are used in cigarette, bidi, and cigar making. Due to the economic significance of cured leaves, the correlated response of cured leaves with other traits is of vital importance in tobacco breeding programmes. In the present research, correlation and path analysis is used to determine the inter relationship among cured leaf yield and other yield attributing traits .A field experiment was undertaken at Regional Agriculture Research Station, Nandyal, Kurnool Dt. Andhra Pradesh during 2017-18 in vertisols under rainfed condition to study twenty five genotypes of tobacco (*Nicotiana tabacum* L.) for correlations and path analysis. The estimates of correlation coefficient revealed that cured leaf yield was positively correlated at both genotypic and phenotypic levels with days to flowering (rg=0.782, rp=0.502**), number of leaves per plant (rg=0.854**, rp=0.874**), plant height (rg=0.704**, rp=0.777**), days to maturity (rg=0.575**, rp=0.431**), leaf length (rg=0.670**,rp=0.811**) and leaf width (rg=0.883**,rp=0.646**), while it was negatively correlated with leaf thickness (rg= -0.623**,rp= -0.781**), nicotine (rg= -0.019 ,rp= -0.012) and reducing sugar content (rg= -0.343**,rp= -425**). Path analysis based on genotypic correlation showed that number of leaves per plant (0.846**), plant height (0.781**) and leaf length (0.865**) are important characters that shows considerable direct effect on cured leaf yield and these characters are to be considered for improving the cured leaf yield, in bidi tobacco.**

INTRODUCTION

Tobacco is a *Solanaceous* crop and belongs to the genus *Nicotiana.* Out of 66 species of *Nicotiana,* only two species *viz., tabacum* and *rustica* are under cultivation and are mainly used for chewing, hookah, bidi and snuff tobaccos. Bidi-tobacco shares about 30% of the total tobacco area and about 40% of tobacco production in the country. Tobacco is grown in 0.4 million hectares in India, accounting for approximately 0.27% of the net cultivated area, and around 80% of tobacco is grown in the states of Andhra Pradesh (44%), Gujarat (24%) and Karnataka (15%). Annual tobacco production is around 700 million kg and the country ranks third in the world in production after China and Brazil. Tobacco is therefore an important cash crop for India. Millions of people are engaged in the production, manufacture and distribution of tobacco and tobacco products. In AP Bidi tobacco is mainly cultivated under rainfed block cotton soils in Kurnool district. The average yield varies between 1000 and 1700 kg/ha .The objective of this study was to work out yield and yield component relationships in bidi tobacco using path-coefficient analysis. Different quantitative character governs the yield of a crop. Study of yield and association between pair of these characters provide basis for further selection.

MATERIALS AND METHODS

The experimental material consist of twenty five genotypes of *bidi* tobacco from the germplasm at Regional Agricultural Research Station, Nandyal were grown in a randomized block design, with three replications during 2017-18. Each plot consisted of single row of ten plants with inter and intra row spacing of 75 cm. The guard row was provided on all sides of each block. The tillage operations and interculturing were done in

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accordance with recommended practices. Five competitive plants were randomly selected from each plot and tagged. Observations on each plant were recorded separately and average values computed. Phenotypic and genetic correlation coefficients for cured leaf yield were calculated for each pair of traits as described by Singh and Choudhari (1989). Correlation coefficients for cured leaf yield were further subjected to path-coefficient analysis and direct and indirect effects were estimated as suggested by Wright (1921).

RESULTS AND DISCUSSION

The correlation coefficient analysis was used to determine the type and magnitude of association between all possible pairs among the characters under study. The association between characters that can be directly observed is phenotypic correlation and it includes the actual correlation excludes the environmental effect and is used in strengthening the interpretation based on phenotypic correlation.

The significant positive genotypic and phenotypic correlation was found for cured leaf yield with number of leaves per plant (rg=0.854**,rp=0.874**), leaf length (rg=0.670**,rp=0.811**), leaf width (rg=0.883**,rp=0.646**), plant height (rg=0.704**,rp=0.777**), days to flowering (rg=0.782**,rp=0.502**) and days to maturity

Table 1: Genetic association of genotypic (rg) and phenotypic (rp) correlation coefficient for different characters

Characters		Days to flowering	No. of leaves/ plant	Plant height (cm)	Days to maturity	Leaf length (cm)	Leaf width (cm)	Leaf thickness (g/cm^2)	Nicotine Content (%)	Reducing sugar content (%)	Chloride Content (%)
Cured leaf yield (g/plant)	rg	0.782**	0.854**	0.704**	0.575**	0.670**	0.883**	-0.623**	-0.019	-0.343**	0.201
	rp	0.502**	0.874**	0.777**	0.431**	0.811**	0.646**	-0.781**	-0.012	-0.425**	0.186
Days to flowering	rg		0.771**	0.549**	0.670**	0.649**	0.598**	-0.532**	-0.040	-0.421**	0.184
	rp		0.760**	0.525**	0.533**	0.616**	0.559**	-0.509**	-0.042	-0.397**	0.192
No. of leaves/plant	rg			0.683**	0.586**	0.799**	0.786**	-0.821**	-0.014	-0.457**	0.281
	rp			0.649**	0.545**	0.750**	0.701**	-0.784**	-0.026	-0.434**	0.261*
Plant height (cm)	rg				0.388*	0.682**	0.543**	-0.725**	0.021	-0.412**	0.088
	rp				0.356**	0.609**	0.511**	-0.692**	0.032	-0.378**	0.079
Days to maturity	rg					0.490**	0.525**	-0.323*	-0.487**	-0.282	-0.059
	rp					0.467**	0.493**	-0.279*	-0.371**	-0.266*	-0.056
Leaf length (cm)	rg						0.845**	-0.743**	0.096	-0.454**	0.260
	rp						0.764**	-0.677**	0.071	-0.413**	0.23*
Leaf width (cm)	rg							-0.651**	0.057	-0.385*	0.241
	rp							-0.606**	0.014	-0.359**	0.236*
Leaf thickness (g/cm^2)	rg								-0.010	0.450**	-0.294
	rp								-0.016	0.405**	-0.272**
Nicotine content (%)	rg									0.113	0.134
	rp									0.078	0.112
Reducing sugar content (%)	rg										-0.188
	rp										-0.179

*, ** significant at 5% and 1% level of significance, respectively.

(rg=0.575**,rp=0.431**) (Table 1). From correlation results, it was clear that almost all growth parameters are positively correlated. Cured leaf yield which was significantly associated with days to flowering and number of leaves per plant suggested that late maturing genotypes would be higher yielding but such association may be prove to be limitation in breeding high yielding early varieties.

The significant positive correlation observed for number of leaves and plant height with cured leaf yield suggested that leaves per plant (rg=0.854**,rp=0.874**) and plant height (rg=0.704**,rp=0.777**) is good index for isolating high yielding varieties. Significant and positive correlation between cured leaf yield, leaf length, leaf width, days to flowering and days to maturity was also reported by Patel (1989), Datta (2002), Patel and Makwana (2002) , Patel and Kingaonkar (2005) and Nama (2011).

The significant negative association was observed between leaf thickness (rg= -0.623**,rp= -0.781**) and reducing sugar content (rg= -0.343**,rp= -425**). Nicotine and chloride content showed non-significant association with this trait. Under this situation when yield and quality had negative association there is a need for balancing yield and quality characters. Correlation between cured leaf yield and leaf thickness was also observed by Datta (2002) and Patel and Makwana (2002). Correlation between cured leaf yield and reducing sugar content (rg= -0.343**,rp= -425**) was also in accordance with Datta (2002) and Nama (2011).

Path coefficient analysis is useful in determining the direct and indirect effect among various attributes. The result revealed that days to flowering (0.682**), number of leaves per plant (0.846**), plant height (0.781**), days to maturity (0.445**), leaf length (0.865**) and leaf width (0.743**) had positive and significant association with cured leaf yield at genotypic level (Table 2). Similar result was also reported by Cho and Jin, (1989), Patel, (1989), Amarnath and Murthy, (1988), Datta, (2002), Patel and Makwana, (2002), Patel and Kingaonkar, (2005) and Nama, (2011).

Leaf thickness (-0.918**) and reducing sugar content (-0.452**) had negative significant association with cured leaf yield as mentioned earlier and is in accordance to reports of Dobhal and Dilip Monga (1989), Datta (2002), Patel and Makwana (2002) and Nama (2011).

The result revealed that the number of leaves per plant (0.846**) showed positive and significant association with cured leaf yield, its direct effect being positive and profound as compared to other traits, which was supported by an indirect effect through leaf thickness, leaf length (0.865**) and

Table 2: Path-coefficient analysis for determining the direct and indirect effect among various attributes on cured leaf yield.

Characters	Days to flowering	No. of leaves/ pl.	Plant height (cm)	Days to maturity	Leaf length (cm)	Leaf width (cm)	Leaf thickness (g/cm^2)	Nicotine content (%)	Reducing sugar content (%)	Chloride content (%)	Genotypic correlation with yield
Days to flowering	-0.052	0.202	0.092	-0.017	0.160	0.057	0.214	0.001	-0.017	-0.017	0.682**
No. of leaves /plant	-0.033	0.227	0.114	-0.021	0.184	0.072	0.335	0.001	-0.021	-0.024	0.846**
Plant height (cm)	-0.028	0.144	0.167	-0.012	0.163	0.052	0.286	-0.001	-0.015	-0.005	0.781**
Days to maturity	-0.030	0.155	0.063	-0.030	0.122	0.054	0.128	0.011	-0.012	0.004	0.445**
Leaf length (cm)	-0.031	0.227	0.111	-0.015	0.237	0.078	0.300	-0.003	-0.020	-0.022	0.865**
Leaf width (cm)	0.030	0.205	0.091	-0.019	0.208	0.083	0.246	-0.002	-0.017	-0.026	0.743**
Leaf thickness (g/cm^2)	0.025	-0.212	-0.121	0.010	-0.183	-0.060	-0.403	-0.003	0.020	0.023	-0.918**
Nicotine content (%)	0.002	-0.004	0.004	0.016	0.024	0.005	0.004	-0.022	0.005	-0.011	-0.015
Reducing sugars content (%)	0.020	-0.121	-0.069	0.008	-0.112	-0.034	-0.174	-0.003	0.044	0.013	-0.452**
Chloride content (%)	-0.09	0.081	0.015	0.002	0.059	0.023	0.110	-0.004	-0.008	-0.085	0.213

*, ** significant at 5% and 1% level of significance, respectively.

plant height (0.781**). Dobhal and Nageswara Rao (1988), Kara and Essendal (1996), Patel and Kingaonkar (2005) and Nama (2011.) also reported similar results.

Significant and positive correlation between plant height (0.781**) and cured leaf yield was observed. Plant height had high direct effect *via* number of leaves per plant, leaf length and leaf thickness. These findings were in accordance with the report of Patel and Makwana, (2002).

Significant and positive correlation of leaf length (0.865**) with cured leaf yield was accounted by its positive direct effect and high indirect effect *via* number of leaves per plant, plant height and leaf thickness. Amarnath and Murthy, (1988), Dobhal and Nageswara Rao, (1988), Datta, (2002), Patel and Makwana, (2002) and Nama, (2011.) also reported such positive correlation.

Leaf width (0.743**) had very little direct effect, however positive correlation with cured leaf yield was caused due to indirect effect of leaf length (0.865**), number of leaves per plant (0.846**) and leaf thickness (-0.918**). Similar result was also been reported in tobacco by Dobhal and Nageswara Rao, (1988), Patel and Makwana, (2002) and Patel and Kingaonkar, (2005).

The overall path analysis based on genotypic correlation revealed that number of curable leaves per plant, plant height, leaf length and leaf width are the strongest attributes influencing cured leaf yield. Hence selection based on number of leaves per plant, plant height, leaf length and leaf width may be useful for bringing out genetic improvement in the cured leaf yield of tobacco.

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