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Research Article

Correlation and Path Analysis Studies in Rustica Tobacco (*Nicotiana rustica* L.)

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ABSTRACT

The present investigation was carried out at Agricultural Research Station, Sardarkrushinagar Dantiwada Agricultural University, Ladol during rabi 2019-20. The experimental material consisted of thirty-five genotypes which were evaluated in Randomized Block Design with four replications. The genotypes were evaluated for 11 characters. Correlation studies revealed that cured leaf yield per plant had positive and significant association with plant height, number of leaves per plant, leaf length, leaf width at both genotypic and phenotypic levels. Path coefficients analysis based on genotypic correlation revealed that number of leaves per plant showed highest positive direct effect followed by leaf width, days to flowering, plant height, reducing sugar content and leaf length. Path coefficients analysis based on genotypic correlation revealed that number of leaves per plant showed highest positive direct effect followed by leaf width, days to flowering, plant height, reducing sugar content and leaf length. Hence, these traits may be directly attributed for the improvement of cured leaf yield and important in the selection of better genotypes in rustica tobacco. Hence, these traits may be directly attributed for the improvement of cured leaf yield and important in the selection of better genotypes in rustica tobacco. To improve cured leaf yield, proper attention should therefore be paid to number of leaves per plant, leaf length, leaf width, days to flowering and plant height. Selection for these traits will therefore directly become helpful in increasing the cured leaf yield in rustica tobacco.

Keywords: *Correlation, Path analysis Direct effect, indirect effect and Tobacco.*

INTRODUCTION

Tobacco is one of the important cash crops and bio factory for molecular farmings, is considered native of Americas and its cultivation was thought to have begun as early as 6000 BC. It is believed that wilted and dried leaf blades were rolled to make cigars.

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Columbus noted Cuban natives smoking cigars when he discovered America. In 1560, Jean Nicot, the French Ambassador to Portugal, brought tobacco to England and France. It is reported that Nicot gifted tobacco to the Queen of France to cure headache. From his name Nicot, the botanical name of the plant *Nicotiana* and the word nicotine (principle alkaloid of tobacco) have been derived. The genus *Nicotiana* belonging to *Solanaceae* family is represented by about 60 species of which, *Nicotiana tabacum* and *Nicotiana rustica* are cultivated extensively. It is a *Solanaceous* crop and belongs to the genus *Nicotiana*. Out of 66 species of *Nicotiana*, 45 of them are being maintained in India. Out of these, only two species *viz*., *tabacum* and *rustica* are under cultivation. *Nicotiana rustica* have chromosome number 2n=4x=48 and it is natural allotetraploid arised by hybridization of wild progenitor *Nicotiana paniculata* and *Nicotiana undulata*. The *Nicotiana rustica* varieties known as *Vilayati* and *Calcutti* tobacco, which are characterised by short plant stature with puckered leaf and yellow flowers.

Rustica tobacco is unlike *Nicotiana tabacum*, it is short day and low temperature loving plant best suited for winter cultivation in Gujarat and northern states of India. Major production of rustica varieties in the country is confined to the tobacco growing areas of North India. Snuff, chewing and hookah tobacco are mostly produced in West Bengal, Gujarat, Orissa, Uttar Pradesh, Karnataka, Tamil Nadu and Bihar. In Gujarat, bidi tobacco, chewing (*lal and kala chopadia)*, hookah (*Gadaku)* and rustica tobacco are cultivated. In which, rustica tobacco occupy an area of 1.14 lakh ha with the production of 2,40,100 tonnes and productivity was 102 kg/ha (Anonymous, 2019-20). The study of correlation of characters will help in simultaneous selection for more than one character. Furthermore, the yield is dependent on many component characters and the total correlation is insufficient to explain the true association among the characters. Therefore, path coefficient analysis helps for sorting out the total correlation into direct and indirect effects and useful in selecting high yielding accessions.

MATERIALS AND METHODS

The present investigation entitled was carried out at Agricultural Research Station, Sardarkrushinagar Dantiwada Agricultural University, Ladol during *rabi* 2019-20. The experimental material consisted of thirty-five genotypes which were received from Agricultural Research Station, Ladol were evaluated in Randomized Block Design with four replications. Each plot consist of a double row of 10 plants with inter and intra row spacing being 60 cm and 45 cm. The genotypes were evaluated for 11 characters *viz.,* cured leaf yield (g/plant), days to flowering, days to maturity, plant height (cm), number of leaves per plant, leaf length (cm), leaf width (cm), leaf thickness (mg/cm^2), nicotine content (%), reducing sugar content (%) and chloride content (%) to study correlation and path analysis. The observations on cured leaf yield and its components were recorded from five randomly selected tagged plants for each genotypes in each replication and the average value per plant was computed. The plant height as well as leaf measurements was recorded at maturity. The observations on days to flowering and days to maturity was recorded per plot basis. Correlation and path coefficients were worked out as per method suggested by Al-Jibouri et al. and Dewey and Lu, respectively.

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.Cured leaf yield was significantly and positively associated with days to flowering (r_g= 0.735, r_p= 0.652) and days to maturity (r_g= 0.952, r_p= 0.881) suggested that late flowering and maturing genotypes would be higher yielder but such

association may be prove to be constrain in breeding high yielding early varieties. This findings were agreement with Dobhal and Monga (1989), Datta (2002), Patel and Makwana (2002), Lalithadevi et al. (2002), Patel and Kingaonkar (2005), Nama (2011), Maleki et al. (2011), Patel et al. (2011), Ramchandra et al. (2014), Parajuli et al. (2015), Shah et al. (2016), Ahmed et al. (2017), Katba et al. (2018) and Netravati et al. (2018).

Significant positive correlation of number of leaves per plant (r_g= 0.715, r_p= 0.515), leaf length (r_g= 0.676, r_p= 0.489), leaf width (r_g= 0.039, r_p= 0.062) and plant height (r_g= 0.295, r_p= 0.206) with cured leaf yield suggested that number of leaves per plant and plant height would be good index for isolating high yielding varieties. This findings were relevant with Maleki et al. (2011) and Ramchandra et al. (2014).Correlation studies revealed that cured leaf yield per plant had positive and significant association with plant height, number of leaves per plant, leaf length, leaf width at both genotypic and phenotypic levels. Hence, these characters should be given due consideration. While, selecting for increasing yield. Days to flowering and days to maturity showed positive and significant correlation which indicated that selecting early maturing genotypes would likely to decrease cured leaf yield. On the other hand, leaf thickness (r_g= -0.375, r_p= -0.280), nicotine content (r_g= -0.227, r_p= -0.179) and chloride content (r_g= -0016, r_p= -0.043) was negatively associated with cured leaf yield per plant. Earlier identical results were obtained by Parajuli et al. (2015), Katba et al. (2018) and Netravati et al. (2018). The estimated value of genotypic and phenotypic correlations revealed comparatively higher degree of genotypic correlation coefficient than their phenotypic counterpart for most of the characters, which indicated strong and inherent association between two characters.

Path coefficient analysis is useful in determining direct and indirect effects using various attributes. The overall path analysis based on genotypic correlation revealed that number of leaves per plant (1.910) showed highest positive direct effect followed by leaf width (1.256), days to flowering (0.642), plant height (0.106), reducing sugar content (0.105) and leaf length (0.006). Hence, these traits may be directly attributed for the improvement of cured leaf yield and important in the selection of better genotypes in rustica tobacco. The direct effect of days to maturity, leaf thickness, nicotine content and chloride content were negative. Hence, selection based on number of leaves per plant, leaf width and days to flowering with positive direct effect would be useful to improve cured leaf yield. Earlier identical results were reported by Patel and Makwana (2002), Patel and Kingaonkar (2005), Nama (2011), Parajuli et al. (2015) and Katba et al. (2018).

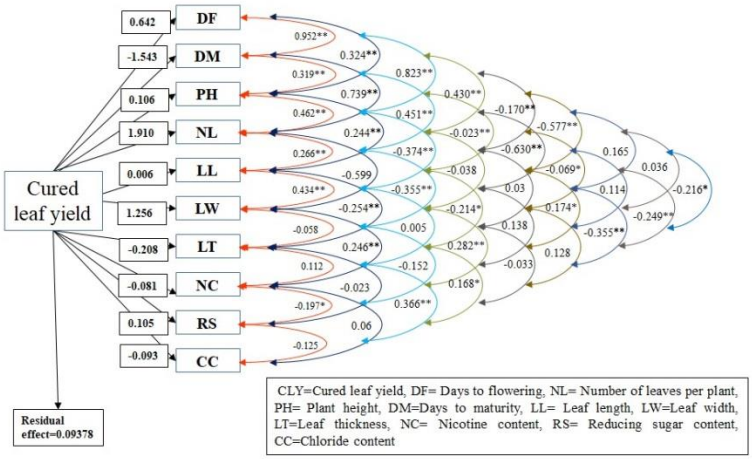

Fig. 1: Genotypic path diagram in rustica tobacco

Table 1: Genotypic and Phenotypic correlations between different characters of rustica tobacco

Character		DF	DM	PH	NL	LL	LW	LT	NC	RSC	CC	CLY
DF	r_g		0.952**	0.324**	0.823**	0.430**	0.170**	-0.577**	-0.165	0.036	-0.216*	0.735**
	r_p		0.881**	0.297**	0.659**	0.289**	0.062**	-0.506**	-0.150	0.031	-0.209*	0.652**
DM	r_g			0.319**	0.739**	0.451**	-0.023	-0.630**	-0.069	0.114	-0.249**	0.668**
	r_p			0.269**	0.551**	0.292**	-0.028	-0.534**	-0.060	0.104	-0.232**	0.572**
PH	r_g				0.462**	0.244**	-0.374**	-0.038	0.030	0.174*	-0.355**	0.295**
	r_p				0.424**	0.161	-0.233**	-0.066	0.024	0.176*	-0.303**	0.206**
NL	r_g					0.266**	0.599**	-0.355**	-0.214*	0.138	-0.128	0.715**
	r_p					0.135**	0.353**	-0.259**	-0.178*	0.130	-0.091	0.515**
LL	r_g						0.434**	-0.254**	0.005	0.282**	-0.033	0.676**
	r_p						0.376**	-0.212**	0.017	0.218**	-0.015	0.489**
LW	r_g							-0.058	0.246**	-0.152	0.168*	0.039**
	r_p							-0.050	0.150**	-0.137	0.082*	0.062**
LT	r_g								0.112	-0.023	0.366**	-0.280**
	r_p								0.107	-0.025	0.318**	-0.227**
NC	r_g									-0.197*	0.060	-0.277**
	r_p									-0.173*	0.050	-0.179*
RSC	r_g										-0.125	0.078
	r_p										-0.110	0.070
CC	r_g											-0.016
	r_p											-0.043

DF= Days to flowering, DM=Days to maturity, PH= Plant height, NL= Number of leaves per plant, LL= Leaf length, LW=Leaf width, LT=Leaf thickness, NC= Nicotine content, RS= Reducing sugar content, CC=Chloride content, CLY=Cured leaf yield

Table 2: Path coefficient analysis showing direct and indirect effect of different characters on cured leaf yield in rustica tobacco

Characters	DF	DM	PH	NL	LL	LW	LT	NC	RSC	CC	Genotypic correlation with CLY
DF	**0.642**	-1.460	0.034	1.572	0.003	-0.213	0.120	0.013	0.004	0.020	0.735**
DM	0.611	**-1.534**	0.034	1.411	0.003	-0.029	0.131	0.006	0.012	0.023	0.668**
PH	0.208	-0.489	**0.106**	0.882	0.002	-0.470	0.008	-0.003	0.018	0.033	0.295**
NL	0.528	-1.133	0.049	**1.910**	0.001	-0.753	0.070	0.017	0.015	0.012	0.715**
LL	0.276	-0.692	0.026	0.431	**0.006**	0.545	0.053	-0.001	0.030	0.003	0.676**
LW	-0.109	0.035	-0.040	-1.145	0.003	**1.256**	0.012	-0.020	-0.016	-0.016	0.039**
LT	-0.370	0.966	-0.004	-0.639	-0.002	-0.073	**-0.208**	-0.009	-0.003	-0.034	-0.375**
NC	-0.106	0.106	0.003	-0.408	0.001	0.309	-0.023	**-0.081**	-0.021	-0.006	-0.227**
RSC	0.023	-0.175	0.018	0.263	0.002	0.191	0.005	0.016	**0.105**	0.012	0.078
CC	-0.139	0.382	-0.038	-0.245	-0.001	0.211	-0.076	-0.005	-0.013	**-0.093**	-0.016

DF= Days to flowering, DM=Days to maturity, PH= Plant height, NL= Number of leaves per plant, LL= Leaf length, LW=Leaf width, LT=Leaf thickness, NC= Nicotine content, RS= Reducing sugar content, CC=Chloride content, CLY=Cured leaf yield

CONCLUSION

Correlation studies revealed that cured leaf yield per plant had positive and significant association with plant height, number of leaves per plant, leaf length, leaf width at both genotypic and phenotypic levels. Hence, these characters should be given due consideration while selecting for increasing yield. Path coefficients analysis based on genotypic correlation revealed that number of leaves per plant showed highest positive direct effect followed by leaf width, days to flowering, plant height, reducing sugar content and leaf length. Hence, these traits may be directly

attributed for the improvement of cured leaf yield and important in the selection of better genotypes in rustica tobacco.

REFERENCES

Ahmed, S., & Mohammad, F. (2017). Heritability estimates and correlation analysis for production traits in FCV Tobacco. *Sarhad Journal of Agriculture*. *33*(2), 212-219.

Al-Jibouri, H. A., Miller, P. A., & Robinson, H. F. (1958). Genotypic and environmental variances and co-variances in an upland cotton cross of interspecific origin. *Agronomy Journal*. *50*, 633-637.

Anonymous (2019-20). Area and production of principle crops. Directorate of Agriculture, Government of Gujarat, Gandhinagar.

Datta, A. K. (2002). Study of morpho-physiological traits related to draught under irrigated and rainfed conditions in bidi tobacco (*Nicotiana tabacum* L.). M.Sc. (Agri.) Thesis (Unpublished), submitted to Gujarat Agricultural University, Sardarkrushinagar.

Dewey, D. R., & Lu, K. H. (1959). A correlation and path co-efficient analysis of crested wheat grass seed production. *Agronomy Journal. 57*, 515-518.

Dobhal, V. K., & Dilip, Monga (1989). Hookah and chewing tobacco germplasm evaluation. I. Variability for yield and quality characters. *Tobacco Research*. *15*(2), 142-145.

Katba, P. J., Pandor, B. L., & Gediya, L. N. (2018). Genetic association among different characters in tobacco (*Nicotiana rustica* L.). *Journal of pharmacognosy and phytochemistry. 8*(1), 146-148.

Lalithadevi, D., Lakshmiarayana, R., & Alturi, J. B. (2002). Genetic variability and correlation studies on seed and other characters in tobacco (*Nicotiana tabacum* L.). *Tobacco Research. 28*(2), 90-96.

Maleki, H. H., Ghasem, K., Reza, D., & Sarrafi, A. (2011). Correlation and sequential path analysis of some agronomic traits in tobacco (*Nicotiana tabaccum* L.) to improve dry leaf yield. *Australian Journal of Crop Science*. *5*(12), 1644-1648.

Nama, R. K. (2011). Genetic variability in rustica tobacco. M.Sc. (Agri.) Thesis (Unpublished), submitted to Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar, Gujarat State.

Netravati, M., & Kumar, A. (2018). Correlation and path analysis studies on F_2 populations of FCV tobacco (Nicotiana tabacum L.). *Journal of Pharmacognosy and Phytochemistry. 7*(4), 3430-3433.

Parajuli, S., Patel, D. A., & Delvadia, D. R. (2015). Genetic variability, correlation and path analysis for cured yield and its components in rustica tobacco (Nicotiana rustica L.). *International journal of tropical agriculture. 33*(3), 2087-2092.

Patel, A. D., & Kingaonkar (2005). Genetic analysis in tobacco (Nicotiana tabacum L.). *Tobacco Research. 32*(1), *11-16.*

Patel, A. D., & Makwana, M. G. (2002). Genetic association in rustica tobacco (Nicotiana rustica L.). *Tobacco Research. 32*(2), 45-49.

Ramchandra, R. K., Nagappa, B. H., Reddy, A. B., & Harish Babu, B. N. (2014). Correlation and path analysis studies on bidi tobacco (*Nicotiana tabaccum* L.). *Indo- American Journal of Agriculture and Veterinary Sciences*. *2*(3), 62-69.