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CORRELATION STUDIES IN MULBERRY (*MORUS* SPP.)

K. VIJAYAN, A. TIKADER, K. K. DAS, S. P. CHAKRABORTY
AND B. N. ROY

Central Sericultural Research and Training Institute, Berhampore 742 101

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ABSTRACT

Correlation coefficients and path coefficients were calculated for leaf yield and its twelve components from 23 genotypes comprising 8 parental and 15 selected F1 hybrids in mulberry (*Morus* spp.). Leaf yield is found to have higher positive correlation with laminar index (w.t.), weight of 100 dry leaves, number of branches per plant, internodal distance, annual aerial biomass, stem weight, number of leaves per branch and secondary branches per plant. Path analysis revealed that internodal distance, annual aerial biomass, stem weight, number of leaves per branch, number of primary branches had strong direct effect on leaf yield.

Key words : *Morus alba*, mulberry, correlation, path coefficient, leaf yield.

The leaf yield, a complex trait, in mulberry is attributed by several quantitative traits. A comprehensive knowledge of correlation of these traits with leaf yield is of great importance for screening and selecting high yielding genotypes, from a large number of F1 hybrids. However, the information available on this aspect is too fragmentary to make an effective selection procedure in mulberry. Hamada [1] observed a strong dependency of leaf yield on total length of shoot and leaf weight per unit length of shoot. Das and Krishnaswamy [2] considered average plant height and average number of branches per plant as dependable characters in the selection of genotypes for high leaf yield. Rangaswami *et al.* [3] reported importance of bigger leaf size and shorter inter nodal distance. Susheelamma *et al.* [4] reported higher contribution of number of secondary branches per plant, primary branches per plant and number of leaves per metre length of shoot to leaf yield. However, Bari *et al.* [5] found strong associations among stem weight, leaf number per plant, leaf size and leaf yield. Bindroo *et al.* [6] reported that leaf dry matter per plant, number of primary branches per plant and weight of 100 leaves were important parameters for selection of high yielding genotypes. Since these earlier reports have identified the importance of many traits on leaf yield but failed to pin point the most important ones for rapid and reliable selection of high yielding genotypes, the present study has been undertaken considering all the twelve traits reported to be important so far to elucidate the relative importance and to identify the principal components of leaf yield so that appropriate selection method can be adopted to evolve high yielding genotypes.

MATERIALS AND METHODS

Twenty three genotypes, consisting of eight parents and fifteen selected F1 hybrids were planted in RBD with three replications, keeping recommended plant spacing. Leaf yield was recorded five times with commercial crop schedule in West Bengal, (1992-1994). Morphological characters viz. laminar index (wt.), laminar index length, growth rate, weight of 100 dry leaves, number of primary branches per plant, plant height, inter nodal distance, annual aerial biomass, moisture content, stem weight, leaves per plant and secondary branches per plant were recorded in three seasons after third year of plantation. Moisture content was calculated on 50 leaves collected from 5th to 9th positions from top of each branches oven dried at 80°C for 48 hours. Laminar Index was calculated by taking individual observations on lamina and petiole. Annual aerial biomass was recorded after one year undisturbed growth of plant. Direct and indirect path effects were calculated using the procedure suggested by Dewey and Lu [7].

RESULTS AND DISCUSSION

The simple correlation coefficient (Table 1) and path analysis (Table 2) among various characters revealed a highly complex and wide spectrum of relationships. Laminar index by weight was positively correlated with leaf yield, internodal distance and annual aerial bio-mass but had negative direct effect on leaf yield. Laminar index by length was negatively correlated with leaf yield and had negative direct effect on leaf yield.

Growth rate was found to have low positive correlation and direct effect on leaf yield. The weight of 100 dry leaves had positive correlation and negative direct effect on leaf yield, which was in agreement with the findings of Susheelamma *et al.* [4]. Number of primary branches per plant was significantly and positively correlated with leaf yield, plant height, number of leaves per metre length of shoot, secondary branches per plant and annual aerial biomass and showed direct positive effect on leaf yield. This also confirms the earlier observations that number

Table 1. Simple correlation among different quantitative traits in mulberry

Characters	Laminar index (weight)	Laminar index (Length)	Growth rate	Wt. of 100 dry leaves	No. of primary branches	Plant height	Inter nodal distance	Annual aerial biomass	Moisture content	Stem weight	No. of Leaves/ plant	No. of Sec. branches	Leaf yield/ plant
	1	2	3	4	5	6	7	8	9	10	11	12	13
1	1.000	-0.176	-0.091	0.280*	0.092	0.164	0.364**	0.274*	-0.102	0.170	0.100	-0.032	0.263*
2		1.000	-0.125	-0.031	0.137	-0.164	0.066	-0.024	-0.004	-0.338**	0.100	0.164	-0.236*
3			1.000	0.257*	-0.069	0.086	0.135	0.015	0.076	0.133	-0.071	-0.011	0.152
4				1.000	-0.352**	0.054	0.482**	0.061	-0.430**	0.234*	0.025	0.013	0.348**
5					1.000	0.402**	0.134	0.576**	0.008	0.022	0.249*	0.260*	0.366**
6						1.000	0.584**	0.495**	0.012	0.334**	0.114	0.324**	0.296*
7							1.000	0.262*	-0.163	0.149	-0.112	0.141	0.236*
8								1.000	-0.111	0.249*	0.301*	0.317**	0.735**
9									1.000	-0.021	-0.202	-0.434**	-0.192
10										1.000	-0.565**	0.084	0.417
11											1.000	0.306**	0.289*
12												1.000	0.238*
13													1.000

*at 5% significant; **at 1% significant.

Table 2. Path analysis in mulberry

Charac-ters	Laminar index (wt.) 1	Laminar index (L.) 2	Growth rate 3	Wt. of 100 dry leaves 4	No. of primary branches 5	Plant height 6	Inter nodal dist. 7	Annual aerial biomass 8	Moisture content 9	Stem weight 10	No. of leaves/ plant 11	Secondary branches/ plant 12
1	**-0.270**	0.047	0.025	-0.076	-0.025	-0.044	-0.098	0.028	-0.046	-0.027	0.009	0.009
2	0.035	**-0.202**	0.025	0.006	-0.028	0.033	-0.026	0.005	0.001	0.069	-0.020	-0.033
3	-0.002	-0.003	**0.028**	0.007	-0.002	0.002	0.004	0.001	0.002	0.004	-0.002	-0.001
4	-0.029	0.003	-0.026	**-0.103**	0.036	-0.005	-0.049	-0.006	0.045	-0.024	-0.003	-0.001
5	0.010	0.015	-0.008	-0.040	**0.115**	0.046	0.015	0.066	-0.00	0.003	0.029	0.030
6	-0.131	0.132	-0.069	-0.043	-0.327	**-0.798**	-0.466	-0.396	-0.010	-0.267	-0.092	-0.259
7	0.260	0.048	0.097	0.345	0.096	0.418	**0.715**	0.188	-0.117	0.107	-0.081	0.101
8	0.121	-0.011	0.006	0.027	0.253	0.217	0.115	**0.439**	-0.048	0.110	0.132	0.139
9	-0.008	-0.001	0.007	-0.037	-0.001	0.001	-0.014	-0.010	**0.087**	-0.002	-0.018	-0.038
10	0.175	-0.348	0.136	0.240	0.022	0.344	0.153	0.257	-0.022	**1.029**	-0.582	0.086
11	0.098	0.099	-0.070	0.025	0.245	0.112	-0.110	0.296	-0.199	-0.555	**0.982**	0.301
12	0.003	-0.016	0.001	-0.001	-0.025	-0.031	-0.014	-0.031	0.042	-0.008	-0.030	**-0.096**

Residual effect = 0.083; Figures in bold: Direct effect of primary branches per plant is an important parameter for plant selection in mulberry [4, 5].

Plant height had a positive correlation with leaf yield, number of branches, internodal distance, leaves per branches, and secondary branches per plant. However, it showed a negative direct effect on leaf yield.

Internodal distance was having low but positive correlation with leaf yield, laminar index, weight of 100 dry leaf and biomass and is also having direct positive effect on leaf yield. Since this finding was not in agreement with earlier report [3] its relation with leaf yield was further investigated and it has been found that an exponential relation is existing between internodal distance and leaf yield. The quadratic form ($y = a + bx + cx^2$) was found fitting best ($R^2 = 0.86$). The leaf yield rose sharply with the increase in internodal distance up to 4.5 cm and remained constant up to 5.5 cm then started declining indicating that the optimum internodal distance for higher leaf yield lies between 4.5 cm to 5.5 cm. Hence, while selecting plants for higher leaf yield, internodal distance should be kept as optimum as possible (Fig. 1).

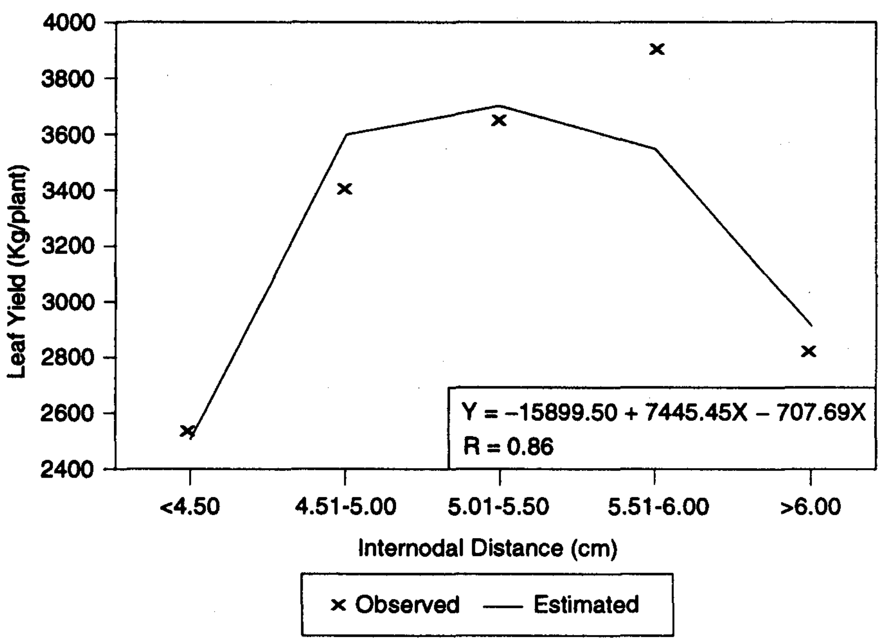

Fig. 1. Relationship between internodal distance and leaf yield

Annual aerial bio-mass and stem weight had positive correlation with leaf yield. Laminar index, primary branches per plant, plant height, inter nodal distance and number of leaves per plant. As these traits had strong positive effect on leaf yield, they should be considered while selecting high yielding genotypes.

Number of leaves per branch was positively correlated with leaf yield, number of primary branches and secondary branches and had very strong positive direct effect on leaf yield. Correlation of secondary branches with leaf yield was positive but the direct effect was negative, which contradicts the earlier report [4].

Considering the over all direct and indirect effects alongwith various associations among different yield attributing traits, it can be concluded that in mulberry number of primary branches per plant, stem weight, number of leaves per plant, annual aerial biomass along with optimum inter nodal distance are to be considered as important parameters for selecting high yielding genotypes.

REFERENCES

1. S. Hamada. 1959. Principles in high yielding mulberry culture. J. Silk Worm T-11., 8: L 125-132
2. B. C. Das and Krishnaswamy. 1969. Estimation of components of variation of leaf yield and its traits in mulberry. J. Sericult. Sci. Japan., 38: 242-248.
3. G. Rangaswami, M. M. Narashimhenna, C. R. Sastry and M. S. Jolly. 1976. Sericulture manual-1. Mulberry cultivation, FAO, Rome : pp. 27
4. B. N. Susheelamma, M. S. Jolly, K. S. Giridhar, N. K. Dwivedi and N. Suryanarayana. 1988. Correlation and path analysis in mulberry under stress and non-stress conditions. Sericologia., 28: 239-244.
5. M. A. Bari, M. A. Qaiyyum and S. U. Ahmed. 1989. Correlation studies in mulberry (Morus alba L.). Indian Journal of Sericulture., 28(1): 11-17.
6. B. B. Bindroo, A. K. Tikku and R. K. Pandit. 1990. Variation of some metric traits in mulberry. Indian Forester., 116: 320-324.
7. D. R. Dewey and K. H. Lu. 1959. A correlation and path coefficient analysis of components of crested wheat grass seed production. Agronomy J., 51: 515-518.