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Correlation and Path Coefficient Analyses in Sugarcane (*Saccharum officinarum* L.)

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ABSTRACT

Investigation on extent of character association and path coefficient analyses were conducted in sugarcane. Correlation studies revealed that cane yield was significantly and positively correlated with length of millable cane, diameter of cane, single cane weight, number of internodes cane^{-1} and number of millable canes at both phenotypic and genotypic levels. Path coefficient analysis revealed that stalk population at 270 DAP, length of millable cane, diameter of cane, single cane weight, number of internodes cane^{-1} , number of millable canes and per cent juice sucrose had high positive direct effect on cane yield plot^{-1} . Hence, emphasis should be given on length of millable ca ne, diameter of cane, single cane weight, number of internodes cane^{-1} and number of millable canes, while making selection for improvement of cane yield in sugarcane.

key words : Correlation, Path Coefficient Analysis, Sugarcane

Sugarcane (*Saccharum officinarum* L.) contributes about 60 per cent to the world sugar production. It is the cheapest source of sweetening agent. Emphasis on future breeding programmes should be aimed at increasing the productivity per unit area which in turn will increase the total sugarcane production. Therefore, the present study on character association and path analyses in sugarcane (*Saccharum officinarum* L.).

MATERIAL AND METHODS

The present investigation was conducted at Sugarcane Research Station, Vuyyur during 2007-08 crop season. The experimental material consisted of twelve sugarcane genotypes which were grown in randomized block design with three replications. Each clone was accommodated in plots having 8 rows of 8 meter length of 80 cm apart. Observations on various traits like shoot population at 120 DAP, stalk population at 240 DAP, stalk population at 270 DAP, length of millable cane, diameter of cane, single cane weight, number of internodes cane^{-1}, number of millable canes, per cent juice sucrose and cane yield were recorded from each replication in each genotype. Correlation coefficients were calculated following Falconer (1964). The direct and indirect contributions of various characters were calculated through path coefficient analysis as per Wright (1921) and Dewey and Lu (1959).

RESULTS AND DISCUSSION

Analysis of variance revealed highly significant differences among the genotypes for all the characters. Genotypic and phenotypic correlation coefficients and direct and indirect effects of characters on yield at phenotypic level are presented in Tables 1 and 2, respectively. In general genotypic correlation coefficients were higher than phenotypic correlation coefficients indicating strong inherent association between characters governed largely by genetic causes and are generally less subjected to environmental forces.

Length of millable cane, diameter of cane, single cane weight, number of internodes cane^{-1} and number of millable canes showed significant positive association with cane yield both at genotypic and phenotypic levels indicating that these characters can be improved simultaneously, which isin agreement with Singh *et al.,* (2005), Kadian *et al.,* (2006), Mishra *et al.,* (2006), Patel *et al.,* (2006) and Sabitha (2007).

Shoot population at 120 DAP, stalk population at 240 DAP and stalk population at 270 DAP were positively and significantly associated with number of millable canes as also reported by Sabitha (2007). Diameter of cane showed positive significant association with single cane weight. Length of millable cane and diameter of cane showed positive significant association with number of internodes cane^{-1} at genotypic level as also reported by Malavia and Ramani (1992).

Table 1. Estimates of phenotypic and genotypic correlation coefficients among cane yield and components in sugarcane (*Saccharum officinarum* L.)

Character	Shoot population at 120 DAP	Stalk population at 240 DAP	Stalk population at 270 DAP	Length of millable cane	Diameter of cane	Single cane weight	Number of internodes cane^{-1}	Number of millable canes	Sucrose per cent at 300 days	Cane yield plot^{-1}
Shoot population at 120 DAP	-	0.418*	0.415*	0.019	-0.035	0.153	0.002	0.353*	-0.111	0.079
Stalk population at 240 DAP	0.376*	-	0.578**	-0.004	-0.125	-0.229	0.032	0.419*	-0.102	0.062
Stalk population at 270 DAP	0.714**	1.495**	-	-0.061	-0.052	-0.139	0.100	0.585**	-0.139	0.293
Length of millable cane at harvest	-0.062	-0.159	-0.159	-	0.148	0.180	0.315	0.058	-0.104	0.455**
Diameter of cane at harvest	-0.041	0.047	-0.018	0.233	-	0.450**	0.249	-0.041	-0.518**	0.380*
Single cane weight at harvest	0.081	-0.556**	-0.527**	0.281	0.593**	-	-0.093	-0.204	-0.075	0.468**
Number of internodes cane^{-1} at harvest	0.350*	0.371*	0.173	0.563**	0.445**	-0.022	-	0.101	-0.089	0.332*
Number of millable canes at harvest	0.899**	1.045**	1.229**	-0.164	-0.146	-0.226	0.172	-	0.006	0.434**
Juice sucrose per cent at 300 days	-0.292	-0.478**	-0.304	-0.251	-0.622**	-0.064	-0.307	-0.061	-	0.002
Cane Yield plot^{-1}	0.132	0.072	0.039	0.572**	0.477**	0.633**	0.486**	0.330*	0.006	-

*,** = Significant at 0.05 and 0.01 levels of probability, respectively

Values above diagonal indicate phenotypic correlation coefficients and values below diagonal indicate genotypic correlation coefficients, respectively

Table 2. Estimates of (phenotypic) direct and indirect effects of yield components on cane yield in sugarcane (*Saccharum officinarum* L.)

Character	Shoot population at 120 DAP	Stalk population at 240 DAP	Stalk population at 270 DAP	Length of millable cane	Diameter of cane	Single cane weight	Number of internodes cane^{-1}	Number of millable canes	Juice Sucrose per cent at 300 days
Shoot population at 120 DAP	**-0.2413**	-0.1008	-0.1000	-0.0046	0.0084	-0.0369	-0.0005	-0.0852	0.0268
Stalk population at 240 DAP	-0.0038	**-0.0092**	-0.0053	0.0000	0.0012	0.0021	-0.0003	-0.0038	0.0009
Stalk population at 270 DAP	0.0948	0.1322	**0.2286**	-0.0139	-0.0118	-0.0318	0.0229	0.1337	-0.0317
Length of millable cane at harvest	0.0053	-0.0011	-0.0171	**0.2798**	0.0415	0.0506	0.0882	0.0161	-0.0292
Diameter of cane at harvest	-0.0054	-0.0195	-0.0080	0.0230	**0.1552**	0.0698	0.0386	-0.0064	-0.0803
Single cane weight at harvest	0.0827	-0.1243	-0.0752	0.0979	0.2435	**0.5410**	-0.0504	-0.1102	-0.0408
Number of internodes cane^{-1} at harvest	0.0004	0.0064	0.0202	0.0637	0.0503	-0.0188	**0.2020**	0.0204	-0.0179
Number of millable canes at harvest	0.1654	0.1960	0.2740	0.0270	-0.0194	-0.0954	0.0472	**0.4684**	0.0028
Juice sucrose per cent at 300 days	-0.0190	-0.0174	-0.0237	-0.0178	-0.0885	-0.0129	-0.0152	0.0010	**0.1711**
Correlation coefficients with cane Yield plot^{-1}	0.0791	0.0623	0.2933	0.4550**	0.3802*	0.4678**	0.3325*	0.4340*	0.0018

*,** = Significant at 0.05 and 0.01 levels of probability, respectively

Residual effect = 0.4924 Values in bold indicate direct effects

Path coefficient analysis revealed that stalk population at 270 DAP, length of millable cane, diameter of cane, single cane weight, number of internodes cane^{-1}, number of millable canes and per cent juice sucrose exerted the highest direct effect on cane yield (Table 2). Hapse and Repale (1999) observed positive direct effect of length of millable cane and diameter of cane on cane yield. Chandrakant *et al*., (2007) reported positive direct effect of single cane weight and of number of millable canes on cane yield. Number of internodes cane^{-1} showed positive direct effect on cane yield as also reported by Thippeswamy *et al.,* (2003) and Kadian and Mehla (2006). Mishra *et al.,* (2006) observed positive direct effect of per cent juice sucrose on cane yield.

The correlation and path coefficient analyses revealed that the characters length of millable cane, diameter of cane, single cane weight, number of internodes cane^{-1} and number of millable canes recorded highly significant positive association with cane yield and also high positive direct effect as well as indirect effect through other characters. Hence, simultaneous selection based on length of millable cane, diameter of cane, single cane weight, number of internodes cane^{-1} and number of millable canes appears more promising in improving the cane yield in sugarcane.

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