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PATH COEFFICIENT ANALYSIS IN SUGARCANE GENOTYPES

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Abstract

The present study aimed to determine the relationship between sugar yield and its components in sugarcane (*Saccharum officinarum* L.). The genotypic correlation and path analysis of sugar yield per plot and its contributing characters were analysed in eighteen hybrids along with its nine parents (Six lines, three testers). The cause and effect relationship indicated that commercial cane sugar percent and brix percent exerted maximum positive direct effect towards the dependent variable *viz.*, sugar yield per plot. Therefore, selection and manipulation of any one of these traits is likely to improve sugar yield per plot.

Key words: Path analysis, *Saccharum officinarum* L.

Introduction

Sugarcane is a very versatile plant. It provides food directly in the form carbohydrates, indirectly as a single cell protein, alternative to fossil fuel in the form ethanol from molasses, biogas and organic fertilizers from fibre and press mud. Sugar yield the end product. It is determined by the action and interaction of many component traits. Therefore, selection made on the basis of its phenotypic expression alone are likely to be misleading. Path coefficient is an excellent means of studying direct and indirect effects of interrelated components of a complex trait (Kang *et al.,* 1989). Path coefficient analysis measures the direct influence of one variable on another. Each correlation coefficient between a predictor variable and the response variables is partitioned into its components parts: the direct effect or path coefficient (a standardized partial regression coefficient) for the predict or variable and indirect effects, which involve the product of a correlation coefficient between two predict or variable with the appropriate path coefficient in the path diagram (Dewey and Lu, 1959). Determination of inter-relationships among yield components, is of paramount importance for a better understanding of both direct and indirect effects of the specific components. Plant breeders generally, select for only a few traits and it is very important to know the effects of traits on other important characters as well. Therefore, this experiment was conducted to ascertain the cause and effect of component traits towards dependent variable-the sugar yield.

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Materials and methods

Six lines namely *Saccharum officinarum* L *cv.* Badila (L1), CoC 671 (L2), CoC 85061 (L3), CoC 92061 (L4), Co 86032 (L5) and CoG 93076 (L6) and three testers *viz., Saccharum spontaneum* (T1), *Erianthus arundinaceus* (T2) and *Miscanthus sacchariflorus* (T3) were crossed in L × T fashion and obtained eighteen hybrids. All the parents and its hybrids were raised in a Randomized Block Design with three replications in 5 rows plots of 6m length with spacing of 80x30cm. Recommended agronomic practices and need based plant protection measures were judiciously followed. They were evaluated for six characters *viz.,* cane yield, brix percent, sucrose percent, purity coefficient, commercial cane sugar (CCS) percent, cane yield per plot and sugar yield per plot. The genotypic correlations among the characters were estimated as per the method suggested by Goulden (1952) and path coefficient analysis was worked as per the method suggested by Dewey and Lu (1959).

Results and Discussion

Path coefficient analysis exhibits the association of sugar yield per plot with its components is due to the direct effects of component characters on sugar yield per plot or is a consequence of its indirect effects via some other traits. Path coefficients were computed from the genotypic correlation coefficients among sugar yield

Table 2: Direct and indirect effects of components on sugar yield per plot.

Characters	Brix percent	Sucrose percent	Purity coefficient	CCS percent	Cane yield per plot
Brix%	0.92	0.92	-0.78	0.91	0.88
Sucrose %	0.93	0.07	0.66	0.96	-0.96
Purity coefficient	0.44	0.46	0.06	0.47	-0.44
CCS%	0.48	0.45	0.53	0.96	0.35
Cane yield per plot	0.07	0.07	0.07	0.06	0.07

and its components. Direct and indirect effects of various components were estimated and presented in Table 1. Path analysis revealed that commercial cane sugar percent exerted the maximum positive direct effect (0.96) on sugar yield per plot followed by brix percent (0.92) which were equal to genetic correlation coefficient, towards sugar yield per plot.

The commercial cane sugar percent exerted the highest direct effect (0.96) on sugar yield per plot and it was indirectly influenced sugar yield per plot through cane yield per plot (0.35), brix percent (0.48), sucrose percent (0.45) and purity coefficient (0.53). Brix percent also had direct effect (0.92) on sugar yield and had indirect positive effects through sucrose percent (0.92), commercial cane sugar percent (0.91) and cane yield per plot (0.88) while, negative indirect effect with purity coefficient (-0.78).

The Cane yield per plot exerted moderate positive direct effect (0.07) on sugar yield per plot and had indirect effect through brix percent (0.07), sucrose percent (0.07), purity coefficient (0.7) and commercial cane sugar percent (0.06). Moderate positive direct effect was observed in sucrose percent (0.07) where indirectly influenced sugar yield per plot through commercial cane sugar percent (0.96), brix percent (0.93) and purity coefficient (0.66) and negative indirect effect through cane yield per plot (-0.96). Low and positive direct effect was observed with purity coefficient towards sugar yield per plot (0.06) and positive indirect effect through commercial cane sugar percent (0.47), sucrose percent (0.46) and brix percent (0.44) whereas, negative indirect effect through cane yield per plot (-0.44). Similar results were earlier obtained by Das *et al*. (1997), Patel *et al*. (1993), Bakshi Ram (1996) and Kamat and Singh (2002). The result ambly indicated that these characters (*viz*., CCS percent, Brix percent and cane yield per plot) deserved greater weightage while formulating selection indices for sugarcane improvement.

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