

Association between Cane Yield and Quality Components in Sugarcane Clones

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ABSTRACT

Considerable variability in both phenotypic and genotypic level for cane yield and millable cane per hectare was observed. An important genotypic correlation (0.86) and Phenotypic correlation (0.75) were estimated between cane yield and millable cane/ha, significant genotypic correlation (0.86) between cane yield and height was also found. Besides, other important genotypic correlation of height and juice purity was 0.58. No important correlations were estimated in this study between cane yield and the components of quality except recovery percent (0.57) at genotypic level.

INTRODUCTION

In evolution, natural selection operates on genetically variable population and plant breeders have accelerated this process both on creation of variability and increasing the effectiveness of selection (Simmonds, 1969). New sugarcane varieties are produced by hybridization and selection based on phenotypic variation. Phenotypic correlations among the characters used in sugarcane breeding for identification of desirable associations may be unfavourable in practical clonal selection. Hebert and Henderson 1959 found a negative phenotypic correlation (-0.35) between number of stalk/plot and stalk/stool. George (1962) found a negative correlation (-0.52) between stalk length and juice brix. This relationship is harmful for sugarcane breeding and there is a serious limitation as obtaining maximum sugar yield. Mariotti (1971) showed any sort of association among the agronomic characters of the population could not be considered as a limitation in sugarcane breeding. In this paper results are reported concerning phenotypic and genotypic associations among yield, yield components and quality components in sugarcane clones.

MATERIALS AND METHODS

A trial was conducted comprising sixteen genotypes including two standard variety (Isd 2/54 & Isd 16) in a randomised complete design with three replications in the experimental farm of Sugarcane Research and Training Institute, Ishurdi, Pabna during the cropping season 1986-87. The plot size was 5m x 6m maintaining one meter row to row distance. Normal cultural practices were followed as and when

required for the optimum growth and development of plants. Data on the following parameters were recorded from the three middle rows.

- i) Height (m) and girth (cm) of 10 randomly selected stalks were measured during the harvesting time.
- ii) Number of millable cane and cane yield of middle three rows of each plot were taken.
- iii) Weight per stalk (kg) was measured from ten randomly selected canes from each plot.
- iv) POL percent and purity percent were measured from chemical analysis of ten randomly selected canes of each plot.
- v) Sugar yield was estimated from cane yield and recovery percent.

Analysis of variance for the characters included in this study was performed. Genotypic and phenotypic correlation were worked out following Al-Jibouri *et al.* (1958).

RESULTS AND DISCUSSION

Range, mean, phenotypic and genotypic components of variation and genetic coefficient of variation for different characters are presented in the Table 1. The range of variations were very much pronounced in cane yield and millable cane/ha which also showed the highest genetic variability. The other component characters such as height, girth and weight of individual stalk showed poor genetic variability. Such results indicated that improvement in yield would be possible through selection based on the characters which showed maximum variation.

Table 1. Range, mean, phenotypic and genotypic variation and genetic coefficient of variation (%) for cane yield, its components and quality characters.

Character	Range	Mean	Phenotypic variation	Genotypic variation	Genetic CV (%)
Cane yield (TCH)	31.55–96.69	70.62	489.39	181.42	19.07
Height (m)	1.96–2.68	2.39	0.10	0.02	5.92
Girth (cm)	1.87–2.38	2.13	0.05	0.01	4.70
Millable cane/ha (000)	30.55–104.82	85.98	702.54	182.27	15.70
Wt/Stalk (kg)	0.67–1.05	0.84	0.03	0.01	11.91
Juice purity (%)	86.33–90.33	88.07	8.36	2.02	1.61
POL(%)	14.49–18.96	17.05	4.01	1.12	6.21
Recovery (%)	9.03–12.15	10.33	1.77	0.49	6.78

Phenotypic and genotypic correlation between cane yield and its components and quality components are presented in the Table 2. Cane yield showed significant phenotypic correlation with millable cane/ha and wt/stalk. The genotypic correlations of millable cane/ha, height and recovery percent with cane yield was significant. Millable cane/ha with height showed significant correlation only in genotypic level. The negative phenotypic correlation (-0.01) and the genotypic correlation (0.01) between millable cane/ha and girth is of particular interest. It indicates that there is maximum of variation in the population to be selected. The result was partially supported by the findings of Mariotti (1971) who found negative phenotypic association between girth and millable cane/plot. Height with Wt/stalk, purity percent revealed significant correlation but with pol percent and recovery percent showed significantly negative correlation at genotypic level. Genotypically pol and recovery percent showed significantly negative association with wt/stalk. At phenotypic level recovery percent showed significantly positive correlation with purity and recovery percent. Genotypic association of recovery percent with pol percent was highly significant.

Table 2. Phenotypic and genotypic correlation between cane yield, its components and quality characters.

	Millable cane/ha (000)	Height	Girth	Wt/Stalk	POL (%)	Purity (%)	Recovery (%)
Cane Yield	Ph 0.75** G 0.86**	0.27 0.86**	0.13 0.33	0.51* 0.37	-0.20 -0.43	-0.09 0.43	0.14 0.57*
Millable Cane/ha (000)		Ph 0.06 G 0.62*	-0.01 0.01	-0.46 -0.13	-0.08 -0.12	0.24 0.37	0.07 -0.17
Height			Ph 0.22 G 0.28	0.36 0.79*	0.24 -0.52*	0.02 0.58*	-0.21 -0.59**
Girth				Ph 0.29 G 0.14	-0.14 -0.11	0.11 0.14	-0.15 -0.12
Wt/Stalk					Ph -0.40 G -0.56*	-0.25 0.18	-0.38 -0.55*
POL %						Ph 0.60** G -0.10	0.99** 1.00**
Purity %							Ph 0.69** G -0.14

*, Indicates significant at 5 percent level, **, Indicates significant at 1 percent level.

There is no doubt that millable cane/ha and wt/stalk are the most important characters in the determination of cane yield. Cane quality characters considered in this study did not show unfavourable associations with cane yield.

Such results indicate that there is a bright scope of yield improvement along with superior quality characters in sugarcane.

REFERENCES

- Al-Jibouri, H. A.; Millar, P.A. and Robinson, H.F. 1958. Genotypic and Environmental variance and covariances in an upland cotton cross of interspecific origin. *Agron. J.*, **50** : 633-636.
- George, B. F. 1962. A further study of *Saccharum* programmes in contesting environments. *Proc. ISSCT*, **11** : 488-497.
- Hebert, L. P. and Henderson, M. T. 1959. Breeding behaviour of certain agronomic characters in progenies of sugarcane crosses. USDA Tech. Bull., 1994.
- Mariotti, J. A. 1971. Association among yield and quality components in sugarcane hybrid progenies *Proc. ISSCT*, **14** : 297-302.
- Simmonds, N. W. 1969. Genetical bases of plant breeding. *J. Rubber Res. Inst.*, Malaya. **21**. Part 1, 1-10.