Analyzing Genetic Variability, Heritability, and Genetic Advance in Sugarcane Clones

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Introduction

•The Indian sugarcane industry depends on comprehending heritable genetic variation, ensuring predictable genetic advance within available germplasm for successful trait improvement through selection.

•Genetic variability is crucial for successful sugarcane plant breeding, offering a valuable opportunity to enhance traits through selection and develop improved varieties.

•Knowledge of the mode of inheritance of traits and the expected genetic gain is of paramount importance in planning effective breeding experiments, especially for perennials like sugarcane.

Objectives

•Investigate the genetic variability within a set of 15 sugarcane clones, examining both genotypic and phenotypic coefficients of variation.

•Assessment of genetic advance and heritability for sixteen quantitative and qualitative traits.

Material and Methodology

✓The experimental investigation was executed at G.B. Pant University of Agriculture and Technology (GBPUA&T), employing a randomized block design with three replications.

✓A comprehensive set of sixteen observations was recorded encompassing parameters associated with cane yield components across a selection of 15 distinct sugarcane clones.

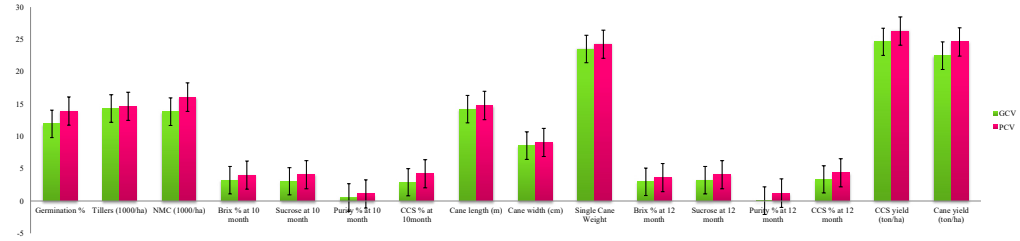
Results

•The analysis of variance revealed significant differences among genotypes for most traits examined.

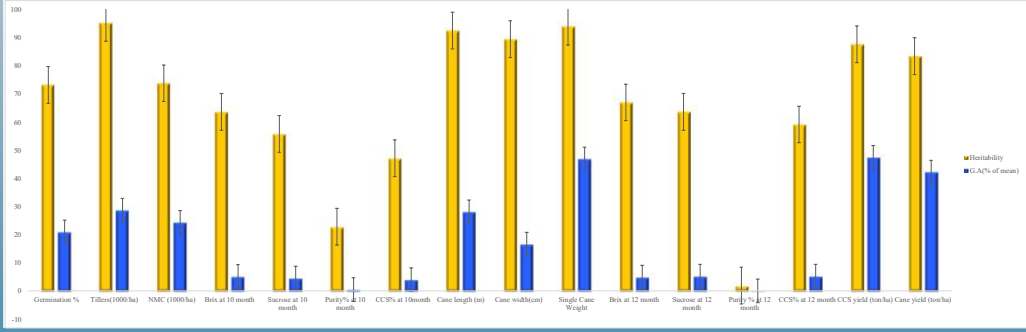
S. NO.	Characters	Co-efficient of Variation%		Heritability %	Genetic advance (% of mean)
		Genotypic	Phenotypic		
1.	Germination per cent	11.901	13.9	73.259	20.98351
2.	Number of Tillers (000'/ha)	14.297	14.651	95.21	28.73
3.	Number of millable cane (000'/ha)	13.79	16.05	73.84	24.41
4.	Juice Brix per cent at 10 month	3.183	3.98	63.68	5.23
5.	Sucrose per cent at 10 month	3.022	4.04	55.85	4.65
6.	Purity per cent at 10 month	0.518	1.082	22.87	0.51
7.	CCS per cent at 10 month	2.881	4.19	47.19	4.07
8.	Cane length (m)	14.207	14.76	92.54	28.15
9.	Cane width (cm)	8.54	9.03	89.48	16.64
10.	Single cane weight (kg)	23.51	24.26	93.95	46.95
11.	Juice Brix per cent at 12 month	2.95	3.6	67.02	4.98
12.	Sucrose per cent at 12 month	3.21	4.02	63.7	5.27
13.	Purity per cent at 12 month	0.0168	1.19	1.96	0.04
14.	CCS per cent at 12 month	3.32	4.32	59.17	5.27
15.	CCS yield (t/ha)	24.62	26.29	87.68	47.49
16.	Cane yield (t/ha)	22.46	24.59	83.4	42.25

Discussion

Single Cane Weight, CCS yield, and Cane yield exhibited the highest genotypic and phenotypic coefficients of variation, suggesting minimal influence of environment and significant additive gene effects, allowing for improvement and selection of genotypes for these traits.



The most significant genetic advance, as a percentage of the mean, along with high heritability was observed for CCS yield, Cane yield, Single cane weight, Cane length, Number of tillers, and Number of Millable Canes. High heritability coupled with high genetic advance indicated that these triats were controlled by additive gene action. Hence, phenotypic selection could be effective in improvement of such triats.



Conclusion

•The present investigation suggested that the selection for yield contributing characters with high genotypic and phenotypic coefficient of variability, heritability and genetic advance as per cent of mean will be more effective for improvement of genotypes.

•High genotypic coefficients of variation should be combined with high heritability and genetic progress as a percentage of the mean to ensure successful selection to improve the trait of interest.