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Association analysis in sugarcane (*Saccharum officinarum* L.)

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Abstract
Correlation studies among ten characters were studied in twenty genotypes of sugarcane (sugarcane varieties, species and related genera). In general, genotypic correlation coefficients were higher than the corresponding phenotyic correlation coefficients suggesting that the environmnetal influence reduces the relationship between cane yield per plot and its contributing characters and sugar yield per plot and its contributing characters in sugarcane. The cane yield per plot showed significant positive correlation with cane thickness, single cane weight, brix per cent, sucrose per cent and commercial cane sugar per cent. The sugar yield per plot showed significant positive correlation with cane yield per plot and its contributing characters (5) mentioned above.

Keywords: Correlation coefficient, Sugarcane

Introduction
Sugarcane is the one of the most important crops in the world. Sugarcane is widely grown in the tropical and sub-tropical areas of the world. India occupies number one position in the world sugar production. It is an importance source of sugar and other sweeteners. This crop accounts for about sixty per cent of the world's requirement of sugar. Improvement in sugarcane and sugar production depends on the strategies and selection method of any breeding programme, which requires information on yield and its contributing characters. The correlation studies are used to measure the concerned with improving group of characters simultaneously on an understanding of inter-se, it is the prime interest to the breeder. Hence, in the present investigation an attempt is made to understand the type of association existing between yield and its component characters.

Materials and Methods
Twenty sugarcane (*Saccharum complex*) genotype with high yield and sugar content (varieties/clones, species and related genera) were raised (Table 1). The experiment was laid out in randomized block design with two replications. The genotypes were raised in plot of 5 rows with each row of 5 metre length and 0.8 M distance between rows. The recommended agronomic practices were followed. They were evaluated for ten characters including cane yield, sugar yield and its attributing characters *viz.,* cane length, internode length, number of millable cane, cane thickness, single cane weight, brix per cent, sucrose per cent, commercial cane sugar per cent (CCS%), cane yield per plot, sugar yield per plot. The genotypic correlations among the characters were estimated as per method suggested by Goulden (1952).

Results and Discussion
Genotypic and phenotypic coefficients between sugar yield and other nine characters are presented in Table 2. Correlation analysis among cane yield per plot, sugar yield per plot and its contributing characters revealed that the genotypic correlation coefficients in most cases were higher than their phenotypic correlation coefficients indicating the association is largely due to genetic reason. In some cases phenotypic correlation coefficients were higher than genotypic correlation indicating suppressing effect of the environment which modified the expression of the characters at phenotypic level. The cane yield per plot showed significant positive correlation with cane thickness, single cane weight, brix per cent, sucrose per cent and commercial cane sugar per cent. Similarly sugar yield per plot showed significant positive correlation with cane thickness, single cane weight, cane thickness, single cane weight, brix per cent, sucrose per cent, commercial cane sugar per cent and cane yield per plot. The correlation of cane yield per plot with single cane weight and cane thickness was high. In fact the very strong correlation of cane yield with sugar yield is expected as sugar yield is the

product of cane yield per plot and commercial cane sugar per cent. A positive and highly significant correlation between cane yield per plot and its components *viz.*, single cane weight and cane thickness was reported by Brown *et al.* (1969), Balasundaram and Bhagyalakshmi (1978), Punia *et al.* (1983), Reddy and Reddy (1986), Reddy and Reddy (1988), Hapse and Raple (1999) and Anbanandan (2004). The sugar yield per plot was found to be very highly and positively correlated with cane yield per plot and commercial cane sugar per cent. This is in agreement with the results of Batcha (1975), Balasundaram and Bhagyalakshmi (1978), Cuenya *et al.* (1981), Jackson Philip and Roach (1994), Jyotirmoy Ghosh and Sing (1997), Hapse and Repale (1999) and Bissessur *et al.* (2001) and Anbanandan (2004). It is clear from the above that cane yield per plot was highly correlated with cane weight followed by cane thickness and the sugar yield per plot was highly correlated with cane yield per plot and commercial cane sugar per cent. This indicated that selection through sugar quality characters (brix per cent, sucrose per cent, commercial cane sugar per cent) and cane yield contributing characters cane weight and cane thickness would produced varieties with high levels of cane and sugar yield (Tyagi and Lal, 2007). The present findings revealed that more emphasis should be given while selection on cane thickness, single cane weight and commercial cane sugar per cent to increase cane yield and sugar yield in sugarcane.

Table 1: List of genotypes

S. No.	Genotypes
1	*Saccharum officinarum* cv. Badila
2	CoA 6907
3	Co 8021
4	Co Si 95071
5	CoC 671
6	Co 86032
7	CoC 85061
8	CoC 92061
9	CoG 93076
10	Co 8371
11	Co 99004
12	Co 99006
13	Co 7219
14	Co 99012
15	Co 99008
16	CoC 90063
17	*Saccharum spontaneum*
18	*Narenga purphyrocoma*
19	*Erianthus arundinaceus*
20	*Miscanthus sachariflorus*

Table 2: Genotypic and phenotyic correlation analysis for ten characters of sugarcane

S. No.	Characters		Cane length (cm)	Internode length (cm)	Number of millable cane (per plot)	Cane thickness (cm)	Single cane weight (kg)	Brix per cent	Sucrose per cent	Commercial cane sugar per cent	Cane yield per plot (kg)	Sugar yield per plot (kg)
1	Cane length (cm)	G	1.000	0.322	-0.350	0.500*	0.306	0.224	0.225	0.230	0.395	0.267
		P	1.000	0.321	-0.350	0.498*	0.305	0.225	0.226	0.231	0.394	0.266
2	Internode length (cm)	G		1.000	0.570**	-0.587**	-0.729**	-0.788**	-0.793**	-0.785**	-0.672**	-0.725**
		P		1.000	0.568**	-0.585**	-0.728**	-0.786**	-0.791**	-0.783**	-0.670**	-0.719**
3	Number of millable cane (per plot)	G			1.000	-0.842**	-0.854**	-0.809**	-0.812**	-0.802**	-0.699**	-0.644**
		P			1.000	-0.838**	-0.852**	-0.808**	-0.810**	-0.800**	-0.694**	-0.639**
4	Cane thickness (cm)	G				1.000	0.935**	0.829**	0.844**	0.846**	0.905**	0.829**
		P				1.000	0.933**	0.827**	0.841**	0.845**	0.903**	0.825**
5	Single cane weight (kg)	G					1.000	0.908**	0.913**	0.915**	0.947**	0.910**
		P					1.000	0.906**	0.911**	0.913**	0.945**	0.904**
6	Brix per cent	G						1.000	0.998**	0.993**	0.877**	0.926**
		P						1.000	0.997**	0.991**	0.873**	0.919**
7	Sucrose per cent	G							1.000	0.999**	0.886**	0.934**
		P							1.000	0.997**	0.881**	0.927**
8	Commercial cane sugar per cent	G								1.000	0.891**	0.945**
		P								1.000	0.888**	0.941**
9	Cane yield per plot (kg)	G									1.000	0.959**
		P									1.000	0.956**
10	Sugar yield per plot (kg)	G										1.000
		P										1.000

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