

A Study on Relationship Between Yield, Juice Quality and Sugarcane Plant Characters

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ABSTRACT

Data on sugarcane were collected from an experiment conducted at the Institute, during 1981-82. The studies of multiple correlation and partial regression indicated that the plant characters like stalk height, diameter and the no. of internodes had influenced directly the yield of sugarcane and the commercial cane sugar. The juice quality was found to be affected significantly by the juice ingredients sucrose content, purity co-efficient and commercial cane sugar.

INTRODUCTION

Field experiment of various designs have been developed to study the response of sugarcane yield and its juice ingredients to different treatments. But very little information is available on the affect of main sugarcane yield contributing characters like height, diameter and the no. of internodes on its yield as well as the effect of juice ingredients on juice quality.

The present investigation was undertaken to study the affect of cane height, diameter and the no. of internodes on sugarcane yield and the sugarcane juice ingredients on its juice quality.

Parashar *et. al.* (1980) found that, not only a single factor was solely responsible for the sugarcane yield, but the characters like height, diameter and the no. of internodes had a significant bearing on the cane yield. The height of the cane largely depends on the no. of internodes. They further indicated that the glrth of cane also played a significant role towards the cane weight i. e. taller and thicker canes lead to higher cane yield.

They concluded after reviewing the works of others that the longer stalks with greater stalk diameter gave significantly greater sugar yield.

Parashar *et. al.* (1982) also showed that each component of juice affected the juice quality significantly and the quality of sugarcane juice had a direct effect on the sugar recovery and production. Therefore, an experiment was conducted to study the interrelationship between yield and quality and their few yield contributing factors.

MATERIALS AND METHODS

The experiment conducted at Sugarcane Research and Training Institute during 1981-82 to study the effect of intercrop on sugarcane yield was used to study the interrelationship between the yield of cane, juice quality and their respective yield and quality affecting factors.

The experiment with four replications was laidout in a randomised block design having six treatments. Each plot (10m x 10m) contained ten rows and each row spaced 1m apart. Ultimately the twenty four plots of the experiment contained 240 rows of 10m length each. A random sample of three canes from each row was taken. All the three canes were weighed together, internodes of each cane were counted, diameter of cane were recorded. Then the average weight (kg) per stalk, no. of internodes, diameter (cm) and height (m) were calculated.

Apart from these biometric observations, for the study of juice quality, a random sample of five cane from each plot was taken and crushed for juice extraction in a power cane crusher. The juice was analysed for total soluble solids and sucrose content in the laboratory and the available commercial cane sugar (c. c. s.) were calculated according to the formula of Mathur (1978).

Ultimately 240 observations on heights, weights, diameters and no. of Internodes and 24 observations on total saluble solids (brix), sucrose content, purity co-efficients and commercial cane sugar were utilized for their interrelationship studies, particularly for the co relation and regression studies of cane weight with their ancillary characters like, height, diameter and the no. of internodes and of total solids with sucrose content, purity co-efficient and commercial cane sugar and statistical test of significance were followed as per the methods of Johnston (1972).

RESULTS AND DISCUSSION

The correlation co-efficients (Table 1) revealed that each of the character like height, diameter and the no. of internodes had a highly significant positive correlation with individual cane yield (cane weight) and the no. of internodes were found to be significantly correlated with the cane height.

Table 1. Correlations of sugarcane weight with its biometric characters.

Characters	Height (m)	Diameter (cm)	No. of internodes (per cane)
Cane weight (kg) (per cane)	0.87**	0.70**	0.80**
Height	—	—	0.89**

** Indicates significant at 1% level of significance.

When multiple correlation and partial regression of these three characters with individual cane yield were computed (Table 2) multiple correlation was found to be highly significant having the height and diameter highly significant partial regressions. This result showed that taller and thicker cane lead to higher cane yield which confirmed the findings of parashar *et. al.* (1980).

Table 2. Multiple correlation and partial regressions of sugarcane weight with its biometric characters.

Characters	Height(m) b_1	Diameter(cm) b_2	No. of internodes (per stalk) b_3	Multiple correlation (R)
Cane weight (kg) (per cane)	0.4548**	0.7887**	0.000847	0.9648**
Multiple regression Y= equation	-1.7979	$+0.4548x_1$	$+0.7887x_2$	$+0.000847x_3$

Y=Cane weight; x_1 =Cane height; x_2 =Cane girth (diameter);
 x_3 =No. of internodes (per cane)

** Indicate significant 1% level of significance.

Table 3. Correlations of sugar (c. c. s.) yield with height and diameter of the cane.

Characters	Height(m)	Diameter (cm)
Commercial cane sugar (kg)	0.82**	0.53**
Height(m)	—	0.21

** Indicates significant at 1% level of significance.

The commercial cane sugar (c. c. s.) was highly correlated with height and diameter leading to highly significant multiple correlation and partial regressions (Table 3 & 4). This result implied that the longer stalks with greater stalk diameter gave significantly higher sugar yield which agrees with parashar *et. al.* (1980).

Table 4. Multiple correlation and partial regression of sugar (c. c. s.) with height and diameter of the cane.

Characters	Height (m) b_1	Diameter (cm) b_2	Multiple correlation (R)
Commercial cane sugar (kg)	0.0867**	0.1270**	0.8992**
Multiple regression equation $Y = -0.2990 + 0.0867 x_1 + 0.1270 x_2$			

Y = Commercial cane sugar (kg); x_1 = Height (m), x_2 = Diameter (cm)

** Indicates significant at 1% level of significance.

In case of juice quality, total soluble solids was found (Table 5) to have highly significant correlation with sucrose content and commercial cane sugar and the commercial cane sugar was found to be significantly correlated with each of the juice ingredients which coincided with the finding of parashar *et. al.* (1982).

Table 5. Correlations in juice ingredients.

Characters	Sucrose content (%)	Purity coefficient (%)	Commercial cane sugar (%)
Total soluble solids (%)	0.69**	-0.29	0.54**
Sucrose content (%)	—	0.46*	0.98**
Purity co-efficient (%)	—	—	0.62**

** Indicates significant at 1% level of significance.

* Indicates significant at 5% level of significance.

The study was ultimately showing, how were the plant characters acting towards the enhancement of the yield of cane and sugar and affecting the quality of juice.

Table 6. Multible correlation and partial regression in juice ingredients.

Characters	Sucrose content (%) b_1	Purity coefficient (%) b_2	Commercial cane sugar (%) b_3	Multiple correlation (R)
Total soluble solids (%)	4.2921**	0.0017	- 3.2976**	0.9999**
Multiple regression equation	$Y = -0.0478$	$+4.2921 x_1$	$+0.0017 x_2$	$-3.297 x_3$

Y = Total soluble solids (%); x_1 = Sucrose content (%).

x_2 = Purity co-efficient (%); x_3 = Commercial cane sugar (%).

** Indicates significant at 1% level of significance.

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