FACTOR ANALYSIS OF YIELD AND ITS COMPONENT IN SUGAR CANE

Mokadem, Sh. A. [*], I.H. EL-Geddawy [**], Samia, G. A. Mohamed[***]

*** Dept. of Agron. , Fac. of Agric., El-Minia University.**

**** Sugar Crops Res. Inst. Agric. Res. Center, Giza, Egypt.**

***** Cent.Lab.For Design and Stat. Anal. Res. Agric. Res. Center Giza, Egypt**

ABSTRACT

The present work was conducted to study the relative potentiality for some sugar cane promising varieties. Three field experiments were conducted in three successive seasons 1996/97, 1997/98 and 1998/99 at Mallawi Research Station (El-Minia governorate) to evaluate some of the promising sugar cane varieties for yield and quality of plant cane and its ratoon. These varieties were G.T.54-9, G.85-37, G.75-368, G.74-84, G.74-96, and G.68-88. At harvest a sample of 30 stalks was taken at random to determine stalk length, stalk diameter, number of the internodes/plant, juice extraction percentage, TSS percentage, sucrose percentage, glucose percentage, biological cane yield, net cane yield and apparent purity percentage. Simple statistical analysis of complete randomized block design was done. In addition to, factor analysis, stepwise multiple linear regression analysis and simple correlation coefficients were computed among characters studied. An increase in the average performance of all characters studied was observed in Exp.1 (plant cane) compared to the other two experiments except for T.S.S. %, sucrose %, glucose %, and purity %. Highly significant positive correlation was found between yield /fed and internod number for Exp. 1, stalk diameter for Exp. 2 (first ratoon) and Exp.3 (second ratoon). The association between yield and internod number was highly positively significant for Exp.2, but it was highly negative correlation for sucrose % for Exp. 2. Other association among the different characters is also show in Table 2. The factor analysis technique divided the eight characters in the three experiments into three main factors in Exp. 1, three main factors in Exp. 2 and two main factors in Exp. 3, which accounted for 100% of the total variability in the dependence structure of the three experiments. In comparing the factor analysis in the three experiments we concluded that the three experiments here have the same variables in factor A, same variables in factor B, except for T.S.S % and sucrose %. Factor C has the same variables in Exp. 1 and 2 except for stalk length and purity %. Therefore, we could suggest that factor A and factor B was have the same variables in the three experiments. These factors were the most important factors affecting yield/fed in sugar cane. Concerning, variety effect on growth criteria and yield and its component of sugarcane, the results cleared that stalk length, TSS %, sucrose %, purity %, juice extraction %, biological and cane yield significantly affected by the used varieties, whereas stalk diameter and number of internodes/plants were not differed by the examined varieties.

INTRODUCTION

In Egypt, sugar industry depends mainly on sugar cane, which represents about 75 % of the total production of sugar. Increasing the cultivated area of this crop seemed to be impossible as a result of the high consumption of water. Therefore, the only way to face the gap between the consumption and the production is by improving the productivity of unit ground area vertically. Under the best recommended agronomic practices, sugar cane varieties still the corner stone for higher quality and higher yield. Regarding to varieties influence of sugar cane parameters, Mandloi *et al*. (1989) and Murayama *et al*. (1990) reported that variety Co.6304 was superior than variety Co.1305 in respect to brix, sucrose and purity percentages. Ahmed (1995) reported that G.37/85 was superior over G.T.54-9 and G.74/96 in number of plants/m^2, stalk height, stalk diameter and T.S.S.%. Nassar (1996) concluded that sugar cane varieties significantly differed in stalk length, stalk diameter, brix, sucrose, and purity percentages as well as sugar yield, he added that sugar cane variety G.85-37 had the best values in these traits compared with the other varieties. Abd El-Latif and El-Kholy (1998) reported that G.T.54-9 had the highest plant height, stalk diameter, T.S.S % and sucrose %. Abd El-Latif *et al*. (1998) showed that the tested sugar cane varieties i.e. G.T 54-9, G.85-37 and F.153 significantly differed in their stalk height, and diameter, TSS %, sucrose %, purity %, and sugar yield whether grown as plant cane or first ratoon. The present work was conducted to study the relative potentiality for some sugar cane promising varieties.

MATERIAL AND METHODS

Three field experiments were conducted in three successive seasons 1996/97, 1997/98 and 1998/99 at Mallawi Research Station (El-Minia governorate) to evaluate six of the promising sugar cane varieties for yield and quality of plant cane and its ratoon. These varieties were G.T.54-9, G.85-37, G.75-368, G.74-84, G.74-96, and G.68-88. A complete randomized block design with four replications was used. Plot size was 35 m^2 and each plot contains five ridges, seven meters in length and one meters in width. Super phosphate (60 Kg P_2O_5 /fed.) was broadcaster during land preparation. In addition, one hundred kilograms of potassium sulphate (48 K_2O/fed.) was dressed in cane rows 45 days after planting. Nitrogen fertilizer (180 Kg N/fed. for the plant cane and 210-kg N/fed. for ratoon crop) was applied in two equal doses, the first one after 45 days from planting. And the second dose was applied one month later. Planting date was 15 th of March and harvest was done in April, in all seasons. The dry method of sugar cane planting was used. At harvest, a sample of 30 stalks was drawn at random to determine the following morphological and chemical properties for the plant cane and its ratoons:

* Stalk length (cm).

* Stalk diameter (cm).
* Number of the internodes/plant.
* Juice extraction percentage: were determined according to the following equation: ***Juice extraction % = (fresh weight cane baggasse ÷ fresh weight of cane)***.
* TSS percentage was determined by using Brix hydrometer standardized at 20ºC
* Sucrose percentage was determined according to A.O.A.C. (1975).
* Glucose percentage was determined according to Anonymous (1981).
* Biological cane yield (ton/fed.) was estimated by harvesting three guarded rows.
* Net cane yield (ton/fed.) was estimated after topped cleaned and weighed three harvested guarded rows.
* Apparent purity percentage and raw sugar production were estimated according to the following equation: Apparent ***Purity % = (Sucrose % * 100) / Brix %***

Statistical Analysis:

The collected data were subjected to two types of statistical analysis:

1st- Simple statistical analysis of complete randomized block design according to Snedecor and Cochran (1981) was done to find out the significance of the studied characters.

B-Specific analysis was carried out in three methods as follows:

1- The factor analysis method (discussed by Cattel, 1965), which consists of the reduction of a large number of correlated values to a smaller number of clusters of variables called factors. When the contribution of a factor to the total percentage of the trace was less than 10%, the process stopped. After extraction, the matrix of factor loading was submitted to varimax orthogonal rotation, as applied by Kaiser (1958). The effect of rotation to accentuate the large loading in each factor and suppress the minor loading coefficients and that leads to an improvement of opportunity for achieving a meaningful biological interpretation of each factor. Thus, factor analysis indicates both grouping and percentage contribution to total variation in the dependence structure. Since the objective was to determine the way in which yield components, related to each other, yield itself was included in this structure.

2- The stepwise multiple linear regression as applied by Draper and Smith (1966), was used to compute sequence of multiple regression equations in a stepwise manner. At each step one variable was added to the regression equation; it was the one the most reduced the error sum of squares. Equivalently, it was the variable that had the highest partial correlation with the dependent variable adjusted for the variables already added. Similarly, it was the variable, which if added had the highest F value in the regression analysis of variance. Moreover, variables were forced into

the regression equation and automatically removed when the values were low.

3- Simple correlation coefficients were computed among characters studied according to method described by Snedecor and Cochran (1969).

Path coefficient analysis used to identify the different independent characters, which affect the dependent character directly as well as indirectly. It gives us the path in which an independent variable is affecting the dependent variable in a given set of independent variables. The path coefficient analysis proposed by Wright (1921) and utilized by Dewey and LU (1959) was used in this study for the analysis of yield components. A path coefficient is simply a standardized partial regression coefficient as it measures the direct influence of one variable upon another and permits the separation of the correlation coefficient into components of direct and indirect effects.

RESULTS AND DISCUSSION

I- Statistical study:

The mean values for nine characters evaluated and there standard deviation of the means in the three experiments are recorded in Table 1. An increase in the average performance of all characters studied was observed in Exp. 1 compared to the other two experiments except for T.S.S. %, sucrose %, glucose %, and purity %.

Table 1: Mean values and standard deviation for nine sugar cane characters.

Variables	Exp. 1		Exp. 2		Exp. 3	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Stalk L. (X1)	243.33	35.0	241.67	33.47	165.67	11.39
Stalk D. (X2)	2.550	0.27	2.517	0.30	2.3167	0.28
Internod No.(X3)	18.333	2.60	17.0	1.858	16.333	1.370
Extraction % (X4)	58.467	4.97	55.10	3.959	55.108	4.5316
T.S.S% (X5)	20.25	1.29	20.133	1.389	21.333	4.190
Sucrose % (X6)	17.63	1.12	16.157	1.696	18.126	2.003
Glucose % (X7)	0.196	0.11	0.3033	0.283	0.620	0.303
Purity % (X8)	86.235	10.2	80.25	6.671	88.68	2.741
Yield (X9)	65.433	16.3	61.087	14.08	45.916	19.99

Exp. 1 = Plant cane
Exp. 2 = First ratoon
Exp. 3 = Second ratoon

A matrix of simple correlation coefficients for characters under study is also presented in Table 2 for all three experiments. Highly significant positive correlation was found between yield /fed and internod number for Exp. 1, stalk diameter for Exp. 2, and Exp. 3. The association between yield (ton/fed), and internod number was highly positively significant for Exp. 2, but it was highly negative correlation for sucrose % for Exp. 2. Other association

among the different characters is also show in Table 2. Consequently, these results indicated that the improvement of any one of a set of correlated characters would automatically improve other characters.

Moreover, factors were constructed using the principal factor analysis technique to establish the dependence relationship between variables in the three experiments. The principal matrix formed after orthogonal rotation for the eight characters in the three experiments is given in Table 3. The factor analysis technique divided the eight characters in the three experiments into three main factors in Exp. 1, three main factors in Exp. 2 and two main factors in Exp. 3, which accounted for 100% of the total variability in the dependence structure of the three experiments. For purpose of interpretation, only those factor loading greater than 0.50 were considered important. Factor A include three variables which accounted for 30.20%, 36.59%, and 56.90% of the total variance for Exp. 1, Exp. 2, and Exp. 3, respectively (Table 3). For Exp. 1, these variables were internod number, and stalk length. Their loaded variable values were 0.9487 and 0.6915 respectively. For Exp. 2, three variables were obtained: extraction %, T.S.S. %, and glucose %. Their loaded variable values were 0.812, 0.789, 0.801 respectively. For Exp. 3, five variables were obtained: internod number, T.S.S. %, sucrose %, glucose %, and purity %. Their loaded variable values were 0.8302, 0.50773, 0.90234, 0.89118 and 0.77495 respectively.

Factor A might be responsible for stalk length, internod number, and sucrose % more than any other origin of sugar cane.

Factor B included three variables in the three experiments, which account for 39.291%, 34.049%, and 43.096%, respectively of the total variance in the dependence structure. These variables were extraction %, (h^2= 0.7583), glucose % (h^2= 0.8254) and purity % (h^2 = 0.7174) in the first experiment. In the second experiment, the variables were stalk length (h^2 =0.6997), and internod number (h^2=0.8688). The third experiment showed that stalk length, (h^2 = 0.84637), stalk diameter, (h^2 =0.8405) and extraction % (h^2 =0.6742) have the largest contribution.

Table 2: A matrix of simple correlation coefficients of variables in three experiments

Exp.1: Plant cane

Variables	X1	X2	X3	X4	X5	X6	X7	X8	X9
Stalk L.(X1)	1.000								
Stalk D.(X2)	-0.2828	1.000							
Internod No. (X3)	0.5208*	0.2604	1.000						
Extraction %(X4)	-0.2081	0.1638	-0.5200*	1.000					
T.S.S (X5)	-0.3044	0.4364	-0.0645	-0.2985	1.000				
Sucrose% (X6)	-0.3146	0.3743	-0.3950	0.1838	0.6689**	1.000			
Glucose% (X7)	0.2529	-0.1847	-0.2365	0.5371*	-0.6193**	-0.4543	1.000		
Purity%(X8)	0.3466	-0.1007	-0.3620	0.4090	-0.4228	0.0703	0.6196	1.000	
Yield (X9)	0.1816	0.2613	0.7902**	-0.4451	-0.0647	-0.1729	-0.4512	-0.4628	1.000

Factor C included three variables in Exp. 1 and two variables in Exp. 2, which accounted for 30.527% and 29.547% of the total variance in the dependence structure, respectively. These variables were stalk diameter (h^2= 0.8189), T.S.S % (h^2= 0.7938) and sucrose % (h^2= 0.7614) for first experiments and sucrose % (h^2= 0.986) and purity %, (h^2= 0.9515) for second experiment.

Exp.2: First Ratoon

Variables	X1	X2	X3	X4	X5	X6	X7	X8	X9
Stalk L. (X1)	1.000								
Stalk D. (X2)	0.437	1.000							
Internod No(X3)	0.572*	0.714**	1.000						
Extraction%(X4)	0.315	0.440	0.027	1.000					
T.S.S (X5)	-0.130	0.098	-0.197	0.552**	1.000				
Sucrose% (X6)	-0.275	-0.013	-0.178	0.056	0.528*	1.000			
Glucose% (X7)	-0.466	-0.081	0.034	-0.596**	-0.630**	-0.480	1.00		
Purity% (X8)	-0.217	0.078	0.033	-0.307	0.009	0.803	-0.079	1.00	
Yield (X9)	0.866**	0.432	0.501**	0.220	-0.079	-0.538**	-0.246	-0.497	1.00

Exp.3 : Second Ratoon

Variables	X1	X2	X3	X4	X5	X6	X7	X8	X9
Stalk L.(X1)	1.000								
Stalk D.(X2)	0.798**	1.000							
Internod No (X3)	0.631**	0.642**	1.000						
Extraction % (X4)	0.615**	0.638**	0.341	1.000					
T.S.S (X5)	0.219	0.471	0.627**	0.397	1.000				
Sucrose % (X6)	0.517*	0.489	0.787**	0.544*	0.632**	1.000			
Glucose % (X7)	-0.427	-0.361	-0.779	-0.383	-0.504*	-0.907**	1.000		
Purity %(X8)	0.623**	0.562*	0.780**	0.551*	0.371	0.780**	-.817**	1.000	
Yield (X9)	0.483	0.541	0.439	0.080	-0.130	0.228	-0.373	0.448	1.00

*** and** denotes significant at 5% and 1%**

In comparing the factor analysis in the three experiments we concluded variables were grouped to three factors in Exp. 1, and 2 and two factors in Exp. 3. The three experiments here have the same variables in factor one A, same variable in factor B, except for T.S.S % and sucrose %. Factors C have the same variables in Exp. 1 and 2 except for stalk length and purity %. Therefore, we could suggest that factor A and factor B were the same in the three experiments. These factors were the most important factors affecting yield/fed in sugar cane.

However, when stepwise multiple linear regression analysis was taken under consideration, one variable were accepted as significantly contributing to variation in yield/fed for Exp. 1, two variables for Exp. 2 and four variables for Exp. 3. These variables were internod number in Exp. 1, stalk length, purity % in Exp. 2 and stalk diameter, extraction %, T.S.S % and glucose % in Exp. 3.

The prediction equations were formulated as follows:

$\acute{Y}$ = - 25. 2839+4.9482(x3) for Exp. 1

R^2 = 93.96% for all variable

R^2 = 62.45% for acceptance variables

Ý = 34.99 + 0.3351(X1) - 0.6838(X8) for Exp. 2

R^2 = 99.46% for all variable

R^2 = 85.15% for acceptance variables

Ý = 94.2849 + 68.2855(X2) - 2.1064(X4) - 3.1951(X5) - 36.0036(x7) for Exp. 3

R^2 = 82.34% for all variable

R^2 = 77.38% for acceptance variables

Agronomical study:

Data presented in Table 4 obviously shown that sugar cane variety G.T.54-9 surpassed all the studied varieties in respect to stalk height and diameter. This superiority was significant for the plant crop and its ratoons for the plant height, however, the difference between varieties were not enough to reach the level of significance. Moreover, varietal difference in respect to number of internodes / plant were significant only at the plant crop and the new promising variety G. 85-37 recorded the highest value of this trait over all the used varieties, but not over that of G.T.54-9 which appeared insignificant superiority over all the studied varieties in the 1st and 2nd ratoon.

The above-mentioned results may be throw some light on that fact. In addition to the pronounced influence of the environments on growth criteria, the gen make-up is still the major factor affects plant behavior. Abd El-Latif *et al* (1998) showed that the tested sugar cane varieties i.e. G.T.54-9, G.85-37 and F153 significantly differed in their stalk height and stalk diameter.

Concerning, varietal effect on sugar cane juice parameters, the available data in Table 5 clarified that the percentages of the total soluble solids (TSS%), sucrose (S%) and juice purity appeared a significant effect to the examined sugar cane varieties. This finding may be indicates to the effective role of gene make-up on juice quality. In spite of that there was no clear cut trend for the studied varieties on juice percentage, it could be deduced that G.75-368 and G.84-47 had a constant effect on this traits, where the values of these measurements were steadily at the various sugar cane crops i.e. plant cane and its ratoons.

Table 4: Varietal effect on some growth criteria of sugar cane

Varieties	Stalk length			Stalk diameter			Number of internods / plant		
	Plant cane	1st ratoon	2nd ratoon	Plant cane	1st ratoon	2nd ratoon	Plant cane	1st ratoon	2nd ratoon
G.T.54-9	276	301	184	2.7	2.9	2.7	20	20	17
G.75-368	247	241	163	2.4	2.5	2.3	17	16	17
G.84-47	271	219	173	2.4	2.4	2.3	20	17	17
G. 84-68	268	212	151	2.4	2.4	2.0	18	17	14
G.85-37	212	263	157	2.7	2.3	2.2	21	16	17
G.74-96	186	214	166	2.7	2.6	2.4	14	16	16
L.S.D5%	4.45	4.25	5.97	N.S	N.S	N.S	1.88	N.S	N.S

Table 5: Varietal effect on juice quality parameters of sugar cane

Varieties	TSS %	Sucrose %	Purity %

	Plant cane	1st ratoon	2nd ratoon	Plant cane	1st ratoon	2nd ratoon	Plant cane	1st ratoon	2nd ratoon
G.T.54-9	20.0	19.0	20.5	18.4	15.0	18.3	91.7	78.8	89.4
G.75-368	20.0	20.4	22.5	17.9	18.3	19.8	87.4	89.9	88.2
G.84-47	21.5	21.2	21.0	17.6	18.3	19.1	81.8	86.4	90.9
G. 84-68	18.5	18.2	17.0	16.1	14.6	14.2	97.5	80.2	83.7
G.85-37	20.0	21.0	20.5	16.8	15.0	18.3	84.1	71.3	89.4
G.74-96	21.5	21.0	21.5	19.7	15.7	18.9	88.8	74.9	90.5
L.S.D 5%	1.6	1.7	1.8	1.5	1.5	1.7	3.0	1.9	2.7

Data presented in Table 6 show the effect of varieties on yield and yield components of sugar cane. The collected figures revealed that there were significant differences between sugar cane varieties under study in respect to juice extraction percentage. This finding mainly due to their differences in their fiber percentage of these varieties which has a direct effect on juice extraction percentage of sugar cane varieties. Sugar cane variety G.74-96 attained the highest value of juice extraction percentage.

Table 6: Varietal effect on some yields components of sugar cane

Varieties	Juice extraction percentage			Biological yield of stalks (ton / fed.)			Net cane yield (ton / fed.)		
	Plant cane	1st ratoon	2nd ratoon	Plant cane	1st ratoon	2nd ratoon	Plant cane	1st ratoon	2nd ratoon
G.T.54-9	60.2	56.0	58.2	102.15	101.25	93.60	83.70	82.80	73.45
G.75-368	62.8	56.8	56.7	57.15	73.35	52.65	45.90	49.95	27.90
G.84-47	49.3	51.7	54.1	83.25	67.05	60.75	67.50	52.20	38.25
G. 84-68	61.2	49.2	50.0	67.50	72.00	48.15	54.45	54.45	25.20
G.85-37	55.8	57.1	50.0	115.20	83.25	50.85	87.50	74.47	68.4
G.74-96	61.5	59.8	61.7	61.65	58.27	64.35	49.05	52.65	42.30
L.S.D 5%	2.9	2.6	2.2	24.06	13.44	1.32	3.09	16.24	15.13

As to the variety influence on biological and net yield of sugar cane plants, it could be noted that the commercial variety G.T.54-9 and the promising variety G.85-37 significantly surpassed all the studied varieties with relation to the biological and net cane yield. It is also cleared that sugar cane varieties G.T.54-9 and G.85-37 produced the acceptable cane yield in the various crops i.e. plant cane, 1st and 2nd ratoons, meanwhile, the other varieties appeared a big drop in their cane yield in the 2nd ratoon. Abd El-Latif *et al*. (1998) pointed out those sugar cane varieties G.T.54-9, G.85-37 and F. 153 significantly differed in their cane yield whether grown as a plant cane or 1st ratoon.

REFERENCES

Abd El-Latif, F.A, and M.M.El-Kholey (1998). Effect of irrigation and nitrogen fertilization on yield and water relations of sugar cane. J.Agric. Sci. Mansoura Univ., 23 (8): 3621-3632.

Abd El-Latif, F.A, Nour El-Hoda, M.Taha and A.M.A El-Shafai (1998). Performance of some sugar cane varieties grown under different rows spacing. J.Agric. Sci.Mansoura Univ., 23 (7): 341-351.

Ahmed, A.M. (1995) Evaluation of some sugar cane varieties grown in Upper Egypt. M.Sc. Thesis, Agron.Dept. Fac.Agric.Al-Azhar Univ.Egypt.

Anonymous (1981). Chemical control in Egyptian sugar production factories. A.O.A.C. (1955) reported Jan. (1981) pp.252.

A.O.A.C. (1975). Official Methods Analysis 13th ed. Association of Official Agricultural Chemist. Washington, D.C.USA.

Cattel, R.B., (1965). Factor analysis: An introduction to essentials.1.The purpose and underlying models. Biometrics, 21: 190-215.

Dewey, D.R. and K.M.Lu (1959). A correlation and path coefficient analysis of components of crested wheat grass production. Agron. J., 51: 515-518.

Draper, N.r.and H.Smith, (1966). Applied regression analysis. John Willey and Sons Jne., NY., 407 PP.

Kaiser, H.F., (1958). The varimax criterion for analytic mutation in factor analysis in factor analysis. Psychometrika, 23: 187-200.

Mandloi, K.S., R.V.Singh and B.R. Lokhande (1989) 0.Response of sugar cane varieties to row spacing and seed rate. Indian J.Agron.34 (2): 247-249.

Murayama, S., S.M.M. Uddin, A.Nose and Y.Kawawitsu (1990). Effect of agronomic practices on sugar cane yield. Sci Bull., College Agric.Ryukyus Univ.,37: 1-6 Okinawa,Japan.

Nassar, A.M.A. (1996). Yield and quality response of some sugar cane (Succharum spp.) Cultivars to potassium nutrition and date of harvest Ph.D. Thesis, Argon, Dept. Fac.Agric. Cairo Univ.Egypt.

Snedecor, G.W. and WiG. Cochran. (1969). Statistical Methods 6 th ed. Ed. Iowa State Univ. Press, Ames, Iowa, USA.

Snedecor, G.W. and WiG.Cochran. (1981). Statistical Methods. Seventh Ed.Iowa State Univ.Press, Ames, Iowa, USA.

Wright, S. (1921). Correlation and causation.J.Agric.Res. 20: 557-585.

التحليل العاملى للمحصول ومكوناته لقصب السكر

شكرى عبد السلام مقدم*، ابراهيم حنفى الجداوى، ساميه جمعه محمد*****
***قسم المحاصيل – كلية الزراعة- جامعة المنيا.**
****معهد بحوث المحاصيل السكرية- مركز البحوث الزراعية.**
*****المعمل المركزى للتصميم والتحليل الإحصائى.**

يهدف هذا البحث إلى دراسة الأهمية النسبية لبعض الأصناف المبشرة لقصب السكر. تمت الزراعة خلال مواسم ٩٦/ ١٩٩٧ ، ٩٧/ ١٩٩٨ ، ١٩٩٩/٩٨ فى محطة البحوث الزراعية بملوى التابعة لمحافظة المنيا لتقييم بعض الأصناف المبشرة لقصب السكر من ناحية المحصول والجودة وذلك للقصب الغرس والخلفة الأولى و الثانية على التوالى ، كانت الأصناف المستخدمة هى جيزه ٨٥-٣٧ ، جيزه تايوان ٥٤-٩ ، جيزه ٦٨- ٨٨ ، جيزه ٧٤-٩٦ ، جيزه ٤٧-٨٤ ، جيزه ٧٥- ٣٦٨.

تم أخذ عينة عشوائية عند الحصاد تشتمل على ثلاثون ساق وذلك لأجراء القياسات التالية: طول الساق – قطر الساق – عدد السلاميات/ نبات – نسبة الاستخلاص – نسبة المواد الصلبة الذائبة الكلية – نسبة السكروز – نسبة الجلكوز- المحصول البيولوجى والصافى – نسبة النقاوة.

تم تحليل البيانات تحليلا إحصائيا بسيطا فى قطاعات كاملة العشوائية بالإضافة إلى تحليل العوامل ، تحليل الانحدار المتعدد والمرحلى ، معامل الارتباط البسيط على كل الصفات المدروسة.

تشير النتائج إلى زيادة المتوسط لكل الصفات المدروسة بالنسبة لمحصول القصب الغرس مقارنة بمحصولى الخلفة الأولى والثانية عدا الصفات التالية: نسبة المواد الصلبة الذائبة الكلية – نسبة السكروز – نسبة الجلكوز – نسبة النقاوة. كما تشير النتائج إلى أن هناك ارتباط عالى موجب بين المحصول وعدد السلاميات بالنسبة لمحصول الغرس وقطر الساق بالنسبة للخلفة الأولى والثانية. كما تشير أيضا إلى وجود ارتباط عالى المعنوية وموجبا بين المحصول وعدد السلاميات وذلك بالنسبة للخلفة الأولى بينما كان الارتباط عالى المعنوية وسالبا بالنسبة للسكروز وذلك فى الخلفة الأولى.

وبالنسبة للتحليل العاملى فقد تم استخدام ثمانى صفات وذلك بالنسبة لمحصول الغرس والخلف. وتشير نتائج التحليل الإحصائى إلى أن القصب الغرس والخلفة الأولى قد فصلت متغيراتها إلى ثلاث عوامل رئيسية بينما الخلفة الثانية فصلت إلى عاملين رئيسيين. وهذه التجارب تحتوى على ١٠٠ % من العوامل المستخلصة من التحليل الإحصائى.

وبمقارنة العامل الأول فى محصول الغرس والخلف نستنتج أنها تضم نفس المتغيرات فى العامل الأول والعامل الثانى ماعدا نسبة المواد الصلبة الذائبة الكلية ونسبة السكروز وجد أن العامل (C) يحتوى على نفس المتغيرات فى محصول الغرس والخلفة الأولى عدا طول الساق والنقاوة. ولهذا يمكن أن نستنتج أن العاملين (A& B) يحتويان على نفس المتغيرات فى محصول الغرس والخلف. وهذه العوامل تعتبر أكثر العوامل تأثيرا على محصول السكر مع الأخذ فى الاعتبار التأثيرات الصنفية فى المحصول ومكوناته لقصب السكر. كما أوضحت النتائج أن طول الساق والمواد الصلبة الذائبة الكلية والسكروز والنقاوة ونسبة العصير المستخلص والمحصول البيولوجى والصافى تختلف معنويا لهذه الأصناف بينما قطر الساق وعدد السلاميات للنبات لا يتأثر بالتأثيرات الصنفية.

Table 3: The results of factor analysis for eight variables in three experiments in sugar cane.

Variables	Exp.1					Exp.2					Exp.3		
	C. F. C.			h^2	Var.	C.F.C			h^2	Var.	C.F.C		h^2
	A	B	C			A	B	C			A	B	
Internod No. (X3)	0.900	-0.036	0.098	0.948	(X4)	0.826	0.248	-0.260	0.812	(X3)	0.823	0.391	0.830
Stalk L. (X1)	0.777	-0.222	0.195	0.692	(X5)	0.898	-0.160	0.204	0.789	(X5)	0.690	0.179	0.508
Sucrose % (X6)	-0.493	0.561	0.718	0.761	(X7)	-0.870	-0.140	-0.156	0.801	(X6)	0.894	0.321	0.902
Extraction (X4)	-0.379	0.767	0.159	0.758	(X6)	0.399	-0.150	0.897	0.986	(X7)	-0.930	-0.170	0.891
T.S.S.% (X5)	-0.267	-0.544	0.653	0.794	(X1)	0.225	0.750	-0.294	0.700	(X8)	0.735	0.483	0.775
Stalk D. (X2)	0.146	0.032	0.893	0.819	(X3)	-0.180	0.915	0.026	0.869	(X2)	0.286	0.871	0.841
Glucose % (X7)	0.107	0.836	-0.340	0.825	(X2)	0.156	0.861	0.083	0.773	(X1)	0.258	0.883	0.846
Purity % (X8)	0.034	0.846	-0.020	0.717	(X8)	-0.120	0.048	0.967	0.951	(X4)	0.251	0.782	0.674
Total				6.316					6.680				6.270
Contribution	1.902	2.48	1.93			2.44	2.27	1.974			3.57	2.70	
Factor % of total communality	30.195	39.3	30.5	100		36.5	34.5	29.55	100		56.9	43.1	100

C. F. C. = Common factor community **h^2= Community**