

EVALUATION AND EARLY SELECTION OF HYBRIDS PRODUCED BY OPEN POLLINATION FOR THREE VARIETIES OF SUGARCANE (*saccharum officinarum* L.)

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ABSTRACT

Seeds produced via open pollination for the examined three sugarcane varieties (GT54-9, G 85-37 and F 153) were grown at the field of Sabahia Research Station, were seeded to evaluate and investigate the role of open pollination for producing hybrid plants. Comparison between strains and mother plants were performed through measuring six morphological and technological characters. Eight, ten and six clones were produced from open pollination between GT54-9 X ? , G 85-37 X ? and F 153 X? respectively. The eight strains which were produced from GT54-9 X ? were categorized into three groups one each represented the increased or decreased or equal average means of the studied characters as compared to their mother plant. Meanwhile, G 85-37 X ? strains were scheduled in two groups, which represented the increased or decreased average means from their mother plant. It's the first time in Egypt to produce open hybrids from GT-54-9 which recorded here. All unselected strains of hybrids were eliminated visually depending on their poor characters by comparing with mother plants.

INTRODUCTION

The key role in sugarcane breeding programs is the evaluation of large number of seedlings derived from seeds. But, the individual clones selection which applied at this stage of the program has been shown to be inefficient because lack of replication and the associated confounding effects of the environment. Based on fact that indicating that genetic variability is the fundamental base for any successful selection. Somaclonal variation is considered to be a new source of variability and a new tool for geneticists and plant breeders (Larkin and Scowcroft, 1981). In light of these facts, many researches used quantitative and qualitative characters as a tool for effective selection among regenerated plants of many species as an evidence of genetic variation and this selection could be based on two principles: morphological characters which were positively correlated with the sugar production (Gaber *et al.*, 1990), and the technological characters.

The main purpose of this work it meant to prove the significant role of open pollination in production a hybrid plants which superior in their characters to their mother plants which have been evaluated earlier by El Taweel *et al.*, 2007.

MATERIALS AND METHODS

The obtaining seeds of three sugarcane varieties under this study were germinated on clay pots containing peat moss and sand (1:1) and irrigated four times daily with 2 h interval during five days. Seedlings were individually transplanted in clay pots (at 30 cm in diameter).

All planted seedlings were climatized in a green house (at 30 C° and 90 % RH). The grown plants in the green house were then transplanted in the field of Sabahia station at 30th September, 2002. Evaluation of plant crop and first ratoon were performed during two successive seasons 2002 and 2003. The following characters were measured: Plant weight (Kg), Plant height (m), Stalk diameter (cm), Number of tiller, T.S.S% and Sucrose %.

RESULTS AND DISCUSSION

According to the performed comparison which based on six morphological and technological characters between mother plants and strains which produced from GT54-9 X ?, strains were categorized in three groups: (a) eight strains which were superior in stalk diameter, number of tiller, T.S.S% and sucrose %. (b) the mother plants superior to the strains only in plant weight. And (c) strains and mother plants were equal in plant weight. Moreover, with regard to plant height one strain for plant crop and three strains for first ratoon were superior to their mother plants for this characteristic. Furthermore, six and five strains of 1st ratoon and plant crop respectively, surpassed their mother plants in stalk diameter. Additionally, the obtained data from sucrose % indicated that eight and seven strains (for 1st ratoon and plant crop respectively) were superior to their mother plants. Unexpectedly, number of strains which superior to mother plant were equal between 1st ratoon and plant crop in number of tillers and T.S.S % characters.

The obtained data from the same six morphological and technological characters between mother plants and G 85- 37 X? strains were illustrated in two groups. In one hand, mother plants were superior to strains in plant weight. On the other hand, the huge observed superior strains to mother plants in the rest of characters i.e. plant height, stalk diameter, number of tiller, T.S.S% and sucrose %. Additionally, ten strains (for 1st ratoon) were superior to mother plants in plant height. Also, seven and five strains (for 1st ratoon and plant crop respectively) were superior to mother plants in stalk diameter. Furthermore, observed results from T.S.S % showed that seven and eight strains (for 1st ratoon and plant crop respectively) were more in this character than mother plant. Nevertheless, ten and one strains (for 1st ratoon and plant crop, respectively) were superior to mother plants in sucrose %. Equality between strains for 1st ratoon and plant crop was only detected in number of tillers character (ten strains for each of them).

Although, seedlings and strains of F 153 X ? were produced with percentage of 100 %,the mother plants presented high superiority comparing strains in all characters. Also, the all six strains from plant crop were superior

to mother plants in T.S.S %. By contrary, only two strains from plant crop were superior to mother plants in sucrose %.

The selected clones of two varieties GT54-9 and G 85-37 were multiplied by vegetative reproduction then, distributed to two zones of sugarcane reproduction areas (Menia and Gieza) for traditional evaluation. Although, sugarcane was one of the first economic crops improved by using products of Somaclonal variants (Heinz et al., 1977). But, false improvement was expected as a result of some mutations reversion. (Tew,1988). Generally, the obtaining results which indicated the superior of strains to mother varieties added more support to Liu and Chen (1978) who detected genetic changes expressed in most important biochemical characters (esterase Isozymes) as clones were superior in this Isozymes activity and contained more bands than their explants donor. Its useful to refer here that the obtaining of grown hybrid of GT 54-9 has been reported, in this work, for the first time in Egypt.

The visual selection which performed for F 153 X ? was in accordance of Kimbeng (2003) who found that in practice, the decision to accept or reject clone based on visual grade is much easier to make since that decision always equal to acceptable or unacceptable answer.

Based on tables (1&2) and Figures (1-3) , there was an obvious decrease in germination, seedling and strain production for the three crosses. As shown in figure (3), hybrid F- 153 X ? has a rapid decrease through this process. Then, GT54-9 was the middle. Finally, G 37- 85 was the slowest for this decrease. Although, hybrid F- 153 X ? was the slowest for the number of germination, seedlings and strain, but it characterized with 100 % of seedlings and strains.

Table (1): Seeds, germinated, seedlings and strains for the three sugarcane clones.

Cross	Number of			
	Seeds	Germination	Seedlings	Strains
GT-54-9 X?	100	48	12	8
G37-85 X?	100	64	15	10
F 153 X ?	100	6	6	6

Figure (1): Frequency of GT54-C9 X ? clones for each parameters (morphological and technological

Plant weight	Plant height	Stalk diameter	Number of tiller	T.S.S%	Sucrose %
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Figure (2): Frequency of G 85-37 X ? clones for each parameters (morphological and technological characters).

Plant weight	Plant height	Stalk diameter	Number of tiller	T.S.S%	Sucrose %
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Figure (3): Frequency of F 153 X? clones for each parameters (morphological and technological characters).

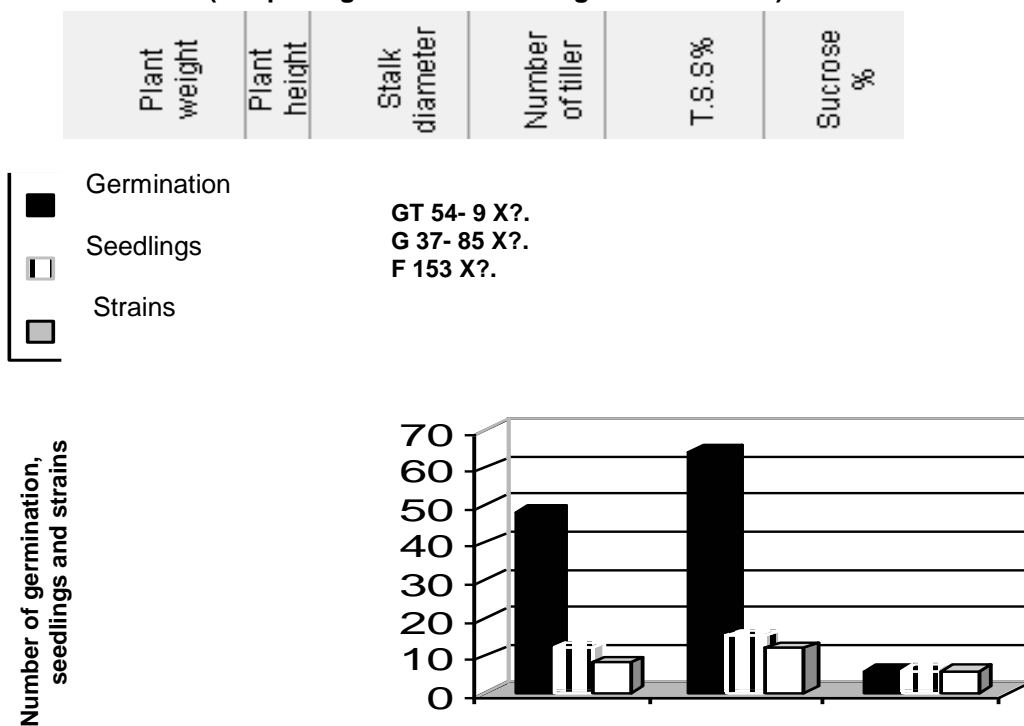


Figure (4): Diagram of germination, seedlings and strain for three cross of sugarcane varieties

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التقييم و الانتخاب المبكر للهجن الناتجة من التلقيح المفتوح لثلاثة اصناف من قصب السكر (*Saccharum officinarum L.*)

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تم دراسة و تقييم النباتات الناتجة من البذور الناتجة من التلقيح المفتوح لثلاثة اصناف من قصب السكر و هي GT54-9, G85-37, F153 و التي تم زراعتها فى حقل محطة بحوث الصبحية بالاسكندرية و ذلك لتقييم الدور الذى يقوم به نظام التلقيح المفتوح فى انتاج نباتات هجينة و ذلك عن طريق المقارنة ما بين النباتات الهجينة و النبات الام من خلال ست قياسات مورفولوجية و تكنولوجية. و تم انتاج 10 و 8 و 6 نباتات من خلال التلقيح المفتوح ما بين GT54-9 X ? و G 85-37 X ? و F 153 X ? على التوالى.

فلقد نتج 8 سلالات ناتجة من GT54-9 X ? و التي تم تقسيمها فى ثلاثة اقسام و التي كانت تزيد او تقل او تتساوى فى متوسط قياساتها مع النباتات الام. و على العكس فان السلالات الناتجة من التلقيح المفتوح ما بين G 85- 37 X ? كانت تترتب فى مجموعتين فقط حيث زاد و قل بعض السلالات فى المقاييس التي تم اخذها مقارنة بالنبات الام. و فى النهاية فانه بالرغم من ان نسبة انتاج السلالات من خلال التلقيح المفتوح F 153 X ? بلغت 100 % فان كل السلالات الناتجة كانت اقل فى قياساتها مقارنة بالنبات الام.

Table (2): Averages of morphological and technological values of clones and their mother plants at plant crop and 1 st ratoon.

Hybrids	parameters	morphological and technological characters											
		Plant weight (Kg)		Plant height (m)		Stalk diameter (cm)		N- of tillers		TSS %		Sucrose %	
		Plant crop	First ratoon	Plant crop	First ratoon	Plant crop	First ratoon	Plant crop	First ratoon	Plant crop	First ratoon	Plant crop	First ratoon
GT54-9 X? (8 clones)	Range	8.9-11.20	10.90-13.9	10.8-15.2	1.85-2.20	1.6-2.3	2.1-3.1	11-19	17-23	15-21	19-23	12.9-19	15.5-18.8
	X of strains	1.89	2.42	1.26	1.99	20.1	2.16	14.5	20.0	19.0	21.25	16.16	17.62
	X of mother Variety	2.70	4.80	1.52	1.99	2.02	2.40	10	14	18.6	20.60	12.9	13.40
	N- of strains superior to mother Variety	-	-	1	3	5	6	8	8	6	6	7	8
G85-37X? (10 clones)	Range	5.5-10.4	8-14	1.1-1.4	1.8-2.3	1.5-2.8	1.9-3.1	8-18	13-22	17-22	18-22	13-18.2	16.3-18.1
	X of strains	1.79	2.06	1.2	2.20	2.11	2.5	14.30	18.8	20.10	20.76	15.91	17.77
	X of mother Variety	2.30	4.60	1.47	1.78	2.0	2.2	9	12	19	20	-	-
	N- of strains superior to mother Variety	-	-	-	10	5	7	10	10	8	7	1	10
X? (6 clones)	Range	0.9-1.20	-	0.92-1.320	-	18-21	-	3.0-8.0	-	18.0-21.0	-	9.00-16.50	-

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	X of strains	9	-	1.2	-	1.83	-	0.83	-	19.5	-	13.2	-
	X of mother Variety	250	-	1.47	-	2.3	-	13.4	-	17.3	-	14.7	-
	N- of strains superior to mother Variety	-	-	-	-	-	-	-	-	6	-	2	-