

Evaluation of Some Imported Wild Cane Genotypes Imported from USA Under Egyptian Conditions

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ABSTRACT

Eighteen wild American ENTRIES GENOTYPES of cane and two noble varieties of sugarcane were planted at the end of March in the experimental farm of El-Sabahia Research Station, Alexandria, Egypt during 2003/2004, 2004/2005 and 2005/2006 seasons in three replication for evaluation.

Ammonium nitrate was added at the rate of 40 kg per feddan. irrigation practices were applied at 10-15 days intervals through the growing season except August and September were at 3-5 days intervals.

All their practices were carried out in a similar manner whenever possible.

The results showed that the flowering, the crossing dates and number of seedlings varied for cultivars genotypes and seasons. It could be concluded that the differences among agronomic characters for the four wild studies varieties were highly significant in the most studied characters. "Hinds special" variety proved to be superior to other wild varieties.

INTRODUCTION

Sugarcane was spread to Persia and then to Egypt through Arab invasions. It is known to be one of the oldest cultivated plants in the world, and is grown commercially in the tropical and subtropical regions. It is the foremost crop, where adequate environmental conditions for the crop prevail.

In Egypt, the imported varieties of sugarcane is the only source of sugar up to 1970 A.D. It is grown extensively in Upper Egypt. After the previous date, the production of sugar did not overcome the consumption. This induce the Egyptian investigators to search for other methods and crops to cover the gap between the production and consumption.

Now, the gap between production (1,772,000 tons) and consumption (2,600,000 tons) was 828,000 tons. The ratio of sufficient was 68.2%.

To overcome the gap between the consumption and production, the Egyptian investigators studied induction factors which increase the crop such as new varieties, cultural methods, environmental conditions, control of the infestation of insects and diseases, flowering induction for germplasm and crossing of the flowering varieties to produce progenies.

The present work was designed to study the behaviour of some wild cane American genotypes in order to crossing these varieties with the local varieties for economical characters under Sabahia Research Station, Alexandria, Egypt.

MATERIALS AND METHODS

Eighteen wild American genotypes of cane and two noble varieties of sugar cane were planted at the experimental farm of El-Sabahia Research Station, Alexandria, Egypt during 2003/2004, 2004/2005 and 2005/2006 seasons. The experimental design was complete randomized blocks with three replications. Cane seed cuttings were planted in one and half row method at the end of March 2003, 2004 and 2005 seasons. Each variety was cultivated in two ridges. The length of ridge was 5 m. Ridging took place from east to west, with a distance of 125 cm between every two ridges. Ammonium nitrate was added at the ratio of 40 kg per feddan. Irrigation practices were applied to 10-15 days intervals through the growing seasons with the exception of August and September were at 3-5 days intervals. Samples were taken from the four varieties Hinds Special, S.E.S.90, *Saccharum spontaneum*, and U.S. 57-118-4, respectively. Three plants were chopped from each plot at the end of flowering period at random and determined within and between plants as follows in the plant crop: Stalk length and width per cm., tillers number, internodes length and number, leaf length, width and number, and Total Soluble Solids. The stalk length was taken by measuring the distance between soil surface and dewlap (top of stem) with tapeline. The internodes length and leaf width were measured by tapeline. Stalk diameter was taken by vernier calipers. Total Soluble Solids were determined by hand refractometer. Internodes, leaves and tillers number were counted.

After the selection of a given varieties, the average data of the four varieties (Hinds Special, S.E.S.90, *Saccharum spontaneum* and U.S.57-118-4) for the preceding seasons were statistically analysed according to Snedecor (1969).

The full flowering dates were recorded in plant crop, first and second ratoon in the studied varieties. The crossing were done between G.T.54-9 and C.P.84-

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226 varieties and wild varieties U.S.57-118-4, and S.E.S.90, however, the other varieties the crossing were open pollination.

After seed harvesting, it is collected and were sown in 5 pots. Each pot was contained 100 seeds. The seedling numbers were counted.

RESULTS AND DISCUSSIONS

The tabulated data in Table (2) clear that the flowering dates varied among cultivars and ratoons. These variations were due to the growth vigour of stalk and interaction between the planted genotypes and environmental conditions (Table 1). Also, Table (2) indicates average of wild American sugarcane crosses (open pollination) during 2003/2004, 2004/2005 and 2005/2006 seasons, respectively.

Table 1. Temperature degrees and relative humidity from 2003 to 2006 seasons at Sabahia Research Station at Alexandria, Egypt

No.	Month	Temperature degrees				Relative humidity			
		Average of		Mean	Range	Average of		Mean	Range
		Max.	Min.			Max.	Min.		
1	January 2003	21.5	9.8	15.6	11.7	96.0	55.0	76.0	41.0
2	February	23.8	12.2	18.3	11.6	99.0	72.0	75.0	27.0
3	March	20.1	9.3	14.7	10.8	97.0	57.0	77.0	40.0
4	April	25.8	13.2	19.5	12.6	96.0	46.0	71.0	50.0
5	May	30.1	16.8	23.5	13.3	98.0	56.0	77.0	42.0
6	June	31.9	19.2	25.6	12.7	100.0	58.0	79.0	42.0
7	July	32.8	23.3	28.0	19.5	96.0	62.0	79.0	34.0
8	August	40.3	22.8	31.6	17.5	98.6	66.2	42.2	32.4
9	September	32.3	20.3	26.3	12.0	96.0	56.0	76.0	40.0
10	October	31.7	18.1	24.9	13.6	100.0	50.0	75.0	50.0
11	November	23.7	12.0	17.9	11.7	100.0	82.0	91.0	18.0
12	December	21.2	10.6	15.9	10.6	98.0	61.0	79.0	37.0
13	January 2004	17.9	7.8	13.3	10.1	98.0	66.0	32.0	32.0
14	February	24.9	13.4	19.2	11.5	100.0	73.0	87.0	27.0
15	March	23.9	11.2	17.3	12.7	99.0	58.0	78.0	41.0
16	April	26.0	12.0	19.2	14.0	99.0	51.0	75.0	28.0
17	May	28.1	16.5	22.3	11.6	98.0	50.0	74.0	48.0
18	June	30.1	19.4	24.8	10.7	99.0	62.0	81.0	37.0
19	July	33.0	22.1	27.6	10.9	99.0	61.0	80.0	38.0
20	August	33.3	22.0	27.7	11.3	99.0	64.0	81.0	35.0
21	September	31.5	19.6	25.6	11.9	99.0	58.0	78.0	41.0
22	October	31.4	17.3	24.3	14.1	89.0	37.0	63.0	52.0
23	November	26.0	15.2	20.6	10.8	99.0	62.0	80.0	37.0
24	December	20.1	10.5	15.8	9.6	98.0	60.0	78.0	38.0
25	January 2005	16.7	6.6	12.3	10.1	99.0	69.0	82.0	30.0
26	February	19.6	8.9	14.3	10.7	98.0	67.0	82.0	31.0
27	March	21.8	12.2	17.1	9.6	95.0	57.0	76.0	38.0
28	April	23.7	13.3	18.5	10.4	99.0	56.0	77.0	43.0
29	May	28.5	15.9	22.2	12.6	99.0	57.0	78.0	42.0
30	June	30.1	19.5	24.8	10.6	99.0	64.0	82.0	35.0
31	July	32.3	21.5	26.9	10.8	100.0	64.0	82.0	36.0
32	August	32.8	23.1	28.0	9.7	89.0	58.0	73.0	31.0
33	September	33.1	20.7	26.7	12.4	97.0	57.0	77.0	40.0
34	October	27.7	17.4	22.5	10.3	96.0	61.0	78.0	35.0
35	November	24.0	13.3	18.6	10.7	97.0	59.0	78.0	38.0
36	December	20.0	10.0	17.9	10.0	97.8	60.0	78.8	37.8
37	January 2006	18.1	8.8	13.4	9.3	100.0	73.0	87.0	17.0
38	February	20.1	8.8	14.5	11.3	98.0	67.0	82.0	31.0
39	March	22.3	11.3	16.8	11.0	99.0	53.0	76.0	46.0
40	April	26.2	14.5	20.3	11.8	98.1	56.0	77.0	42.1
41	May	27.9	14.8	21.4	13.1	100.0	61.0	80.0	38.0
42	June	31.1	19.9	25.5	11.2	100.0	62.0	81.0	38.0

Monthly Agricultural Meteorology from 2003 to 2006 seasons, Agricultural Research Centre, Giza, Cairo.

Table 2. Average full flowering dates of eighteen wild cane American varieties, two varieties of sugarcane and crossing of the prior varieties during plant crop, first and second ratoon for 2003/2004, 2004/2005 and 2005/2006 seasons at El Sabahia Res. St., Alex., Egypt

Cultivars	Period per days from sowing to full flowering			Crossing			
	Plant Crop	First Ratoon	Second Ratoon	Pots No.	Seedling No.	Seeding	
1 Hindo Special	220	282	305	Hinds Special X?	5	7	-
2 S.E.S.90	228	228	282	S.E.S.90 X?	5	12	-
3 <i>Saccharum spontaneum</i>	339	345	397	<i>Saccharum Spont. X?</i>	5	5	-
4 US.57-118-4	228	282	302	U.S.57-118-4 X?	5	8	-
5 N.G.21-21				N.G.21-21 X?	5	8	-
6 IK76-35				IK76-35 X?	5	6	-
7 IN84-24				IN84-24 X?	5	3	-
8 I.J.76-319				I.J.76-319 X?	5	9	-
9 Malagache				Malagache X?	5	11	-
10 N.G.51-127				N.G.51-127 X?	5	3	-
11 PHIL				PHIL X?	5	3	-
12 OLOANG				OLOANG X?	5	4	-
13 S.E.S.323				S.E.S.323 X?	5	3	-
14 S.E.220				S.E.S.220 X?	5	15	-
15 IN84-126				IN84-125 X?	5	6	-
16 IND81-59				IND81-59 X?	5	6	-
17 IND81-46				IND81-46 X?	5	6	-
18 IND22				IND22 X?	5	6	-
19 CP.84-226				C.P.84-226 X U.S.57-118.4	5	-	-
CP.84-226				C.P.84-226 X S.E.S.90	5	-	-
20 G.T.54-9				G.T.54-9 X U.S.57-118-4	5	-	-
G.T.54-9				G.T.54-9 X S.E.S.90	5	-	-

Flowering dates from January to February

The crossing dates varied with the variation of the varieties and seasons. The seedling number in pots after two months from sowing varied with the variation of varieties and seasons. These results are in agreement with those obtained by Chu and Serapion (1971), Rao *et al.* (1973), Nour *et al.* (1977 & 1984), Gaber *et al.* (1984, a, b & c), Gaber *et al.* (1992), Gaber & Rashwan (1993), Abou El-Fatth *et al.* (1994), Abou El-Fatth and Gaber (2004), Gaber and Abou El-Fatth (2004) and Gaber *et al.* (2007).

Table (3) shows the analysis of variance between four wild American varieties of sugarcane (Hinds special, S.E.S.90, *Saccharum spontaneum*, and U.S.57-118-4) in Sabahia Research Station during 2003/2004, 2004/2005 and 2005/2006. It is clear that the differences between the certain varieties were highly significant in most studied characters, but these differences within the varieties (between plants) were not significant (Table 5). However, Table (4) indicates that Hinds Special was superior to the other varieties (S.E.S.90, *Saccharum spontaneum* and U.S.57-118-4).

These results were agreement with those obtained by Gaber and Abou El-Fatth (2004) (Figures 1, 2 and 3).

Regarding to Table (1) shows the temperature degrees and relative humidity were differed from one month to another, one day to other and from one season to another. It is due to the variation of environmental conditions. Subsequently, it is referred to the prior varieties. Beside the genetic variations and the interaction between genotypes and climatic conditions.

In this aspect it could be referred to Humbert (1968), Gaber *et al.* 1984c), Gaber and Rashwan (1990), Gaber *et al.* (1992), Gaber and Rashwan (1993), Gaber and Abo El-Fatth (2004), Abo El-Fatth and Gaber (2004), and Gaber *et al.* (2007) who found that sugarcane flowering vary tremendously due to many factors as follows: variable soil fertility, use of fertilizers, cultural practices, varieties used, irrigation, control of weeds, pests and diseases, and other factors

In Egypt sugarcane flowering is considered to be new direction in cane breeding programme. The above mentioned data agree with those reported by Breet 1950 and Climents & Awado (1964) who reported that the optimum conditions for floral initiation and tasselling in sugarcane.

Table 3. Analysis of variance between four wild American varieties of sugarcane in Sabahia Research Station at Alexandria, Egypt, during 2003/2004 , 2004/2005 and 2005/2006 seasons

Source of variation	D.F	Means Squares								T.S.S.
		Stalk (cm)		Tillers No.	Internodes		Leaf		T.S.S.	
		L	W		L	No.	L	W		
Replicates	2	114.25	0.0003	272.88	0.75	0.6667	148.5834	0.0013	1.33	-
Among varieties	3	5440.97**	2.12445**	34.88	109.33**	134.2500**	4507.00**	13.0100	69.42**	-
Error	6	66.47	0.00162	96.44	0.0833	1.0000	132.25	0.00125	1.33	-

L = Length per cm
W = Width per cm
No. = Number
T.S.S. = Total Soluble Solids

Table 4. The average of some agronomic characters of some American wild cane varieties at El Sabahia Research Station during 2003/2004, 2004/2005 and 2005/2006 seasons, Alexandria, Egypt

Genotypes	Stalk		Tillers No.	Internodes		Leaf		T.S.S	
	Length cm	Width cm		Length cm	No.	Length cm	Width cm		No.
1	238.0 ^a	2.46 ^a	61.33	23.7 ^a	20.3 ^a	190.5 ^a	4.11	20.1 ^a	15.2
2	42.00 ^c	0.65 ^c	58.00	13.70 ^b	2.00 ^b	127.00 ^b	0.64	12.00 ^b	-
3	150.7 ^c	0.72 ^c	63.10	9.80 ^d	3.20 ^b	120.90 ^b	1.07	12.30 ^b	-
4	182.0 ^b	0.99 ^b	63.70	13.00 ^c	3.20 ^b	100.00 ^c	0.49	9.00 ^c	-

1 = Hinds Special
2 = S.E.S.90
3 = Saccharum spontaneum
4 = U.S.57-118-4

Within each character, any two means not marked with the same letter are significantly different at 0.01 and 0.05 level according to Duncan's multiple range test, 1955.

Table 5. Analysis of variance within (between plants) some wild cane American varieties in Sabahia Research Station at Alexandria, Egypt during 2003/2004, 2004/2005 and 2005/2006 seasons

Varieties	Source of variation	D.F.	Means Squares								
			Stalk - cm		Tillers No.	Internodes		Leaf		T.S.S.	
			L	W		L cm	No.	L cm	W cm		No.
I. Hinds Special	Reps	2	100.000	0.0200	-	1.0000	1.7800	11.610	0.000	2.7800	0.1000
	Between plots	2	33.330	0.0000	-	1.0000	0.1150	11.610	0.030	0.1100	0.7350
	Error	4	233.330	0.0000	-	1.0000	0.4470	18.940	0.030	0.5550	0.8550
II. S.E.S. 90	Reps	2	16.110	0.005	269.445	0.335	2.110	8.3300	0.0140	2.110	-
	Between plots	2	16.110	0.005	19.445	0.335	0.125	0.0000	0.0075	0.110	-
	Error	4	10.700	0.005	27.777	1.165	2.210	33.3350	0.0135	2.225	-
III. Saccharum spontanium	Reps	2	19.440	0.005	6.780	0.4450	0.3300	4.0000	0.0100	0.3350	-
	Between plots	2	19.440	0.005	4.110	0.1100	0.3300	0.0000	1.0100	0.3350	-
	Error	4	13.895	0.005	6.890	0.6125	0.6700	0.5000	0.0275	0.6650	-
IV. U.S.S.7-118-4	Reps	2	836.1100	0.0016	264.330	0.3300	3.1100	1652.775*	0.01500	8.1100	-
	Between plots	2	86.1100	0.0016	121.000	1.0000	0.1100	11.1100	0.0200	5.4450	-
	Error	4	223.6100	0.0009	479.3300	0.3330	0.2250	77.7800	0.0025	4.8900	-

L = Length
W = Width
No. = Number
T.S.S. = Total soluble solids
Vars. = Varieties

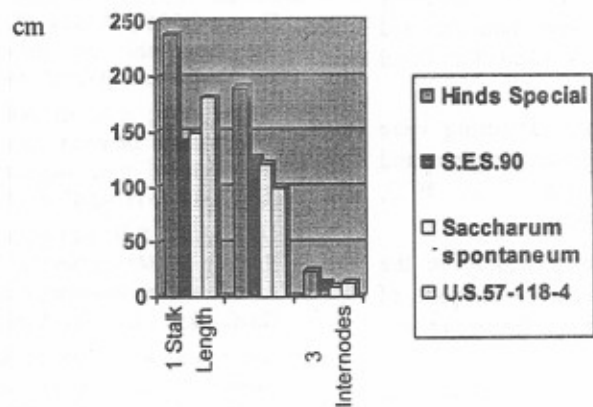


Fig. 1. Stalk, leaf and Internodes length

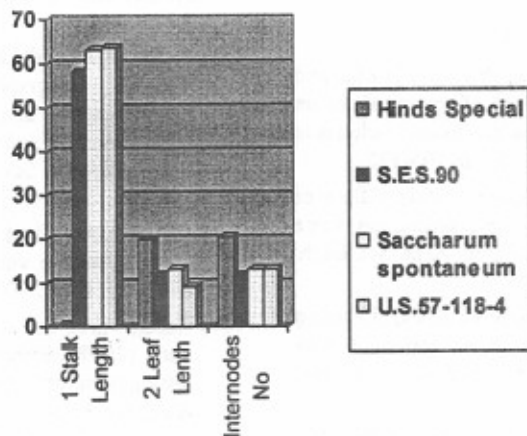


Fig. 2. Tillers, leaf and internodes number

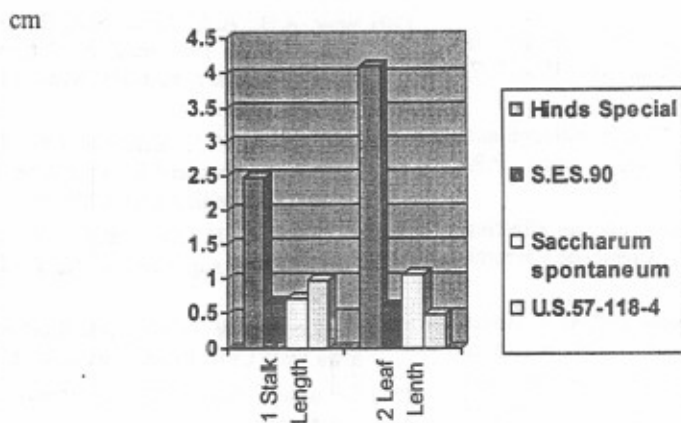


Fig. 3. Stalk and leaf width of four cane varieties

It was concluded from Rao and Kirshnumurthy (1968) that the conditions of temperature, humidity and day length in Alexandria, Egypt is ideal for floral induction (Rao *et al.*, 1973).

In Egypt the trials of sugarcane flowering were succeeded with controlling of irrigations regime and nitrogen fertilization at Alexandria (Rao *et al.*, 1973, Nour *et al.* 1977 and Allam *et al.*, 1977).

The varieties of sugarcane differ widely in the physiological characters, especially the occurrence of flowering under Egyptian conditions (Gaber *et al.*, 1981a).

The end product of this study that to improve the local varieties, we must to select the sugarcane varieties which highly in yield and sucrose content, and crossing these varieties for the economic characters of wild varieties as tillering and resistance for diseases.

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الملخص العربي

تقييم بعض سلالات قصب السكر البرية المستوردة من الولايات المتحدة الأمريكية تحت الظروف المصرية

عبد الحميد عبد الحميد جابر، محمد فوزى أبو الفتح

- تم زراعة ثمانية عشر سلالة برية من القصب البرى مستوردة من الولايات المتحدة الأمريكية وكذلك صنفان من قصب السكر النبيل بمحطة البحوث الزراعية بالصباحية خلال مواسم ٢٠٠٣/٢٠٠٤، ٢٠٠٤/٢٠٠٥، ٢٠٠٥/٢٠٠٦ في ثلاث مكررات لتقييمها- وتم التسميد بمعدل ٤٠ كجم نتر وجين للفدان وتم الري بمعدل ١٠-١٥ يوماً خلال موسم النمو ما عدا شهرى أغسطس وسبتمبر فكانت بمعدل من ٣-٥ يوم وتم إجراء باقى العمليات الزراعية كما هو متبع فى المنطقة وتم الحصول على النتائج التالية:-
- ١- اختلفت السلالات فيما بينها فى تواريخ التزهير والتزهجين وكذلك عدد البادرات التى تم الحصول عليها وذلك فى جميع الأصناف التى كانت تحت الدراسة.
 - ٢- وجد أن الاختلافات فى الصفات الزراعية كانت معنوية جداً وذلك فى الأربعة أصناف التى تم دراستها وذلك فى معظم الصفات المدروسة.
 - ٣- وجد أن الصنف هندز إسبيشيل Hinds Special تفوق على باقى الأصناف.