

## **EFFECT OF HARVEST DATES ON MATURITY AND YIELD OF SOME PROMISING SUGAR CANE VARIETIES UNDER UPPER EGYPT CONDITIONS.**

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### **ABSTRACT**

The present study was carried out at El-Mattana Agricultural Research Station Farm at Qena Governorate, Upper Egypt during the two seasons of 2003 / 2004 and 2004 / 2005 as plant cane ( Virgin cane ) to study the effect of harvest dates ( 9,10,11,12,13 and 14 months after planting ) on yield and juice quality of some promising sugar cane varieties ( G.84/47 , PH 8013 , G.95/21, G.95/19, G.98/28 and G.98/87) in addition to the commercial variety ( G.T.54/9 ).

Under the environmental conditions of Qena Governorate , the promising varieties PH8013 and G.84/47 as well as the commercial variety G.T.54/9 gave the best cane yield, best juice quality and hence sugar yield per area unit.

Maximization of sugar yield could be achieved after 13 months of age for sugar cane varieties PH.8013, G.95/21 and G.95/19 and these varieties were considered as intermediate maturing varieties, while the varieties G.98/28, G.98/87 and G.T.54/9 gave maximum sugar yield after 14 months of age and these varieties were considered as late maturing varieties. On the other hand, G.84/47 variety could be harvested after 12 months of age and considered as early maturing one .

### **INTRODUCTION**

Sugarcane is considered the main source of sugar in Egypt. It is cultivated mainly in Upper Egypt in about 322035 fed. Moreover average cane yield per feddan is about 50.4 tons .

Growing sugarcane in Egypt depends only on one commercial variety; G.T.54/9. Therefore there is a great need for releasing new varieties to avoid the risk of growing only one variety for a long time. Recently, Sugar Crops Research Institute has developed many promising varieties of sugar cane , among them G.84/47, PH 8013, G. 95/21, G.95/19, G.98/28 and G.98/87. Varietal selection at pre-commercial stage is one of the major components for successful production of sugar cane. Although, production of high stalk yielding potential and sugar per unit area are very important traits ( Nassar, 1996; Besheit et al., 1998 and El-Sogheir and Besheit, 2003 ).

The highly successful production of sugarcane is partially achieved by the long harvest season which extends from late December to late May. Varieties with different maturity periods are needed throughout the crushing season and a knowledge of the changes in juice quality traits of each variety is extremely important to the grower and processor as well ( Ramesh and Mahadevaswamy, 1996 ).

In Egypt, many factors affect growth , yield and juice quality of sugar cane varieties but harvesting time are of prime importance. The obtained results are in line with those of El-Sogheir and Besheit ( 2003 ) who found delaying harvest from 10 to

13 months significantly increased juice sucrose % , purity % , cane and sugar yields / fed. In addition , Gilbert et al. in Florida ( 2006) harvested sugarcane at 5 different dates from mid-October to mid-March. They found that cane and sugar yields/ ha were significantly affected by harvesting dates. Moreover, they mentioned that cane yield was reduced by 28 % when it was harvested in mid-October compared to the optimum harvesting date in mid-February.

Therefore, this study was carried out to study the effect of harvest dates on juice quality and yield of seven sugarcane varieties grown under Qena Governorate , where, about 60 % of total cane area is processed in four mills.

## **MATERIALS AND METHODS**

Two plant cane experiments were conducted at El-Mattana Agricultural Research Station farm at Qena Governorate , Upper Egypt during 2003 and 2004 growing seasons to study the effect of harvest dates on juice quality and yield of seven sugarcane varieties ( five promising varieties developed locally named ( Giza 84/47, 95/21, 95/19, 98/28 and 98/87 ) as well as the variety PH8013 which was imported from Philippine, in addition to the commercial variety G.T.54/9.

A split - plot design with four replications was used in this work, where, the main plots were assigned for harvest date ( The six harvesting dates were started on December, 12 at one month interval up to May 12, representing ( 9, 10, 11, 12, 13 and 14 months of age ), while sugarcane varieties were arranged in the sub plots. Sugarcane was planted on March 12, 2003 and 2004, respectively. Plot size was 35 m<sup>2</sup> ( comprised 5 ridges of 1m apart and 7m long ) .Nitrogen fertilization was added as urea ( 46 % N ) at the rate of 180 Kg N / fed and splitted into two equal doses. The first application was given after 60 days from planting and the second one was added one month later. A fixed dose of phosphorus ( 30 kg P<sub>2</sub>O<sub>5</sub> ) was added during land preparation and potassium ( 24 kg K<sub>2</sub>O ) was applied after 90 days with the second nitrogen dose. The other agricultural operations were practiced as recommended . Physical and chemical properties of the upper 30 cm of the soil of the experiment at revealed that , available nitrogen was 22.4 and 25.8 ppm, available phosphorus 13.4 and 17.2 ppm and available potassium 392 and 450 ppm in the first and second seasons, respectively. Soil texture was clay loam. Meteorological data ( Maximum and minimum temperature ) of Qena Governorate during 2003, 2004 and 2005 seasons were shown in Table 1 .

At every harvest dates a sample of 25 millable cane stalks from each plot was taken randomly, stalk length and diameter were measured in cm and then crushed to determine sucrose and purity % of cane juice as follows :

- 1- Cane stalk length (cm) was measured from land level up to the top visible dewlap.
- 2- Cane stalk diameter (cm) was measured at the middle part of stalks .
- 3- Sucrose percentage was determined using Saccharemeter according to A.O.A.C. (1995).

4- Juice purity percentage was calculated according to the following equation  
 : sucrose % x 100 / Brix

where : Brix % [ Total Soluble Solids ( TSS % ) ] in juice, was determined using Brix hydrometer.

5- Reducing sugars percentage was determined according to the method described by the chemical control lab. Of the Sugar and Integrated Industries Company ( Anonymous, 1981 ).

6-Cane yield ( tons / fed ). The millable cane of three guarded ridges of each sub plot was harvested, cleaned topped, weighed and cane yield( tons/ fed) was determined.

7- Sugar yield ( tons / fed ) was estimated as follows:

Sugar yield ( tons / fed ) = cane yield ( tons/ fed ) x sugar recovery %.

Where: sugar recovery % was determined according to the formula described by Yadav and Sharma ( 1980 ).

$$\text{Sugar recovery} = \frac{\text{Pol \%} - 0.8}{\text{purity \%}} \times \frac{\text{purity \%} - 40}{100 - 40} \times 100$$

All data were subjected to statistical analysis according to the method of Snedecor and Cochran( 1981 ) and treatment means were compared at 5% level using least significant differences (LSD) according to Steel and Torrie ( 1980 ).

**Table (1): Temperatures record at Qena Governorate during the study period in 2003, 2004 and 2005 seasons.**

Months	Year 2003		Year 2004		Year 2005	
	Maxi.	Min.	Maxi.	Min.	Maxi.	Min.
January.	25.65	10.37	23.87	4.03	23.50	3.26
February.	24.24	8.88	29.32	4.69	27.73	6.04
March.	26.13	12.83	33.98	9.26	32.02	8.08
April.	37.12	17.68	37.03	13.05	35.39	15.34
May.	41.19	21.48	41.32	22.16	37.08	17.79
June.	42.45	23.04	40.57	21.33	39.39	22.66
July.	42.77	23.13	41.79	21.51	40.33	22.11
August.	42.83	24.22	40.03	20.15	39.22	21.18
September.	39.93	17.72	42.57	20.34	40.63	21.09
October.	38.08	20.72	37.53	15.15	38.44	19.25
November.	31.66	10.91	31.14	10.12	31.22	10.24
December	25.89	5.77	26.62	4.16	26.12	5.43

## RESULTS AND DISCUSSION

### A-Growth traits:

#### 1- Stalk length ( cm )

Data in Table 2 revealed that stalk length ( cm ) was significantly affected by date of harvest in both seasons. Stalk length was gradually increased as harvest was delayed to reach its maximum values after 14 months. The rate of increase reached 43.2 and 38.1 cm in the first and second seasons, respectively , as compared with harvest after 9 months. The

positive response of cane growth to late harvest was recorded by Mohamed ( 1989 ), Nassar ( 1996 ) and El-Sogheir and Besheit (2003) who reported that stalk length were gradually increased as harvest was delayed up to 14 months after planting.

Varieties differed significantly in stalk length in both seasons ( Table 2 ). G. 84/47 variety gave the tallest stalk with an average of 287.8 and 291.6 cm in the 1<sup>st</sup> and 2<sup>nd</sup> seasons, respectively, while, variety G.98/87 was the shortest one ( 268.6 and 269.7 cm ) in the first and second seasons, respectively. The other varieties ranked in between. The differences among varieties in stalk length were reported by Ramadan ( 1992 ), Nassar ( 1996 ) and El-Sogheir and Besheit ( 2003 ) who found that varieties differed significantly in stalk length , where variety PH8013 exhibited the tallest stalks, and G.86/20 was the shortest one.

The interaction between dates of harvest and varieties was insignificant in both season.

**Table 2 : Stalk length ( cm ) as affected by harvest dates and varieties.**

Varieties (V) Harvest dates (H)	2003 / 2004 seasons							
	G.84/47	PH.8013	G.95/21	G.95/19	G.98/28	G.98/87	G.T.54/9	Mean
9 month	264.7	261.4	245.1	242.3	263.9	245.3	248.9	253.1
10 month	279.9	273.7	258.3	255.4	274.4	258.2	261.4	265.9
11 month	290.4	286.4	268.5	267.6	281.3	265.4	270.2	275.7
12 month	296.8	291.7	275.9	274.4	287.4	271.3	287.3	283.5
13 month	297.3	301.6	288.8	287.6	293.3	280.4	292.6	291.7
14 month	297.7	302.1	290.6	288.2	301.6	291.2	301.8	296.2
Mean	287.8	286.2	271.2	269.3	283.7	268.6	277.0	277.7

LSD at 0.05

H	4.2
V	7.4
HxV	N S

2004 / 2005 seasons								
9 month	271.3	269.3	252.3	248.2	270.4	252.4	255.7	259.9
10 month	281.4	275.4	261.4	257.3	276.4	255.1	265.3	267.5
11 month	295.2	289.3	270.3	270.1	283.5	263.0	273.7	277.9
12 month	299.6	296.2	278.2	276.3	291.6	271.2	285.4	285.5
13 month	300.2	303.3	290.3	283.6	297.3	280.1	294.3	292.7
14 month	301.6	304.3	291.4	284.7	303.4	296.3	304.2	298.0
Mean	291.6	289.6	274.0	270.0	287.1	269.7	279.8	280.3

LSD at 0.05

H	3.7
V	6.3
HxV	N S

**2- Stalk diameter**

Data presented in Table 3 revealed that stalk diameter was insignificantly affected by dates of harvest in both seasons . However, stalk diameter tended to increase as harvest was delayed to reach its maximum values after 14 months of age .

Varieties differed significantly in stalk diameter in both seasons ( Table 3 ). PH.8013 variety gave the thickest stalks in both seasons. Varieties could be descendingly arranged according to stalk diameter as follows : G.T.54/9, G.84/47, G.98/28 , G.95/21, G.95/19 and G.98/87. Similar results have been reviewed by Nassar ( 1996 ) and El-Sogheir and Besheit ( 2003 ) who found that PH8013 variety exhibited the thickest stalk, while, variety G.86/20 had the thinnest ones . Table 3 cleared that varieties x harvest dates interaction was significant with respect to diameter in both seasons. The thickest stalk resulted from PH8013 with an average of 3.15 and 3.17 cm in the 1<sup>st</sup> and 2<sup>nd</sup> seasons, respectively when harvested after 14 months of age.

**Table 3 : Stalk diameter ( cm ) as affected by harvest dates and varieties.**

Harvest dates (H)	2003 / 2004 seasons								
	Varieties (V)	G.84/47	PH.8013	G.95/21	G.95/19	G.98/28	G.98/87	G.T.54/9	Mean
9 month		2.51	2.63	2.30	2.27	2.41	2.23	2.48	2.40
10 month		2.63	2.75	2.42	2.39	2.52	2.35	2.60	2.52
11 month		2.75	2.87	2.54	2.51	2.64	2.47	2.73	2.64
12 month		2.88	2.99	2.66	2.63	2.76	2.61	2.85	2.77
13 month		2.91	3.11	2.78	2.75	2.87	2.73	2.98	2.88
14 month		2.93	3.15	2.81	2.77	2.98	2.86	3.09	2.94
Mean		2.77	2.92	2.59	2.55	2.70	2.54	2.79	2.69

LSD at 0.05

H N S  
V 0.16  
HxV 0.11

2004 / 2005 seasons								
9 month	2.55	2.66	2.34	2.31	2.44	2.31	2.51	2.45
10 month	2.68	2.77	2.45	2.43	2.56	2.40	2.63	2.56
11 month	2.77	2.87	2.56	2.64	2.68	2.51	2.76	2.68
12 month	2.90	2.99	2.68	2.77	2.80	2.63	2.90	2.81
13 month	2.96	3.13	2.81	2.86	2.91	2.77	2.99	2.92
14 month	3.00	3.17	2.88	2.87	3.00	2.88	3.10	2.99
Mean	2.81	2.93	2.62	2.65	2.73	2.58	2.82	2.74

LSD at 0.05

H N S  
V 0.14  
HxV 0.10

**B- Juice quality traits :**

**1-Sucrose %**

Delaying harvest dates from 9 to 13 months caused a significant increase in sucrose percentages ( Table 4 ). Sucrose percentage increased from 16.48 to 18.36 in the first season and from 16.54 to 18.55 in the second season. Thereafter, sucrose has decreased as harvesting was delayed up to 14 months from sowing . The increase in sucrose % accompanying late harvest might have been due to better growth characters. Such effect may be attributed mainly to the effect of high temperatures especially night temperature prevailing during May ( Table 1 ), which, increased respiration and decreased sucrose accumulation . These results are in accordance with those obtained by Mohamed ( 1989 ), Ramesh and Mahadevaswamy ( 1996 ) and El-Sogheir and Besheit ( 2003 ) who reported that sucrose % increased by the delay in harvest date.

**Table 4 : Sucrose percentage as affected by harvest dates and varieties.**

Varieties (V) Harvest dates (H)	2003 / 2004 seasons							Mean
	G.84/47	PH.801 3	G.95/21	G.95/19	G.98/28	G.98/87	G.T.54/ 9	
9 month	17.18	17.02	16.30	16.46	16.10	16.12	16.17	16.48
10 month	17.98	17.86	16.65	16.80	16.77	16.52	16.88	17.07
11 month	18.86	18.19	17.02	17.38	17.13	16.78	17.29	17.52
12 month	19.99	18.90	17.53	17.86	17.78	17.09	17.98	18.16
13 month	19.36	19.22	17.92	18.11	18.20	17.32	18.36	18.36
14 month	17.74	17.50	16.41	16.87	18.65	17.61	18.77	17.65
Mean	18.52	18.12	16.97	17.25	17.44	16.91	17.58	17.54

LSD at 0.05

H	0.19
V	0.36
HxV	0.57

2004 / 2005 seasons								
9 month	17.23	17.11	16.40	16.52	16.15	16.19	16.21	16.54
10 month	18.03	17.94	16.71	16.91	16.92	16.62	17.00	17.16
11 month	18.72	18.22	17.09	17.50	17.21	17.03	17.31	17.58
12 month	20.00	19.10	17.72	18.02	17.92	17.33	17.99	18.30
13 month	19.70	19.41	18.01	18.33	18.38	17.62	18.41	18.55
14 month	17.91	17.80	16.77	16.93	18.73	17.89	18.82	17.84
Mean	18.60	18.26	17.12	17.37	17.55	17.11	17.62	17.66

LSD at 0.05

H	0.22
V	0.43
HxV	0.61

Varieties differed significantly in sucrose content at harvest in both seasons. G.84/47 variety surpassed the other varieties in sucrose content with an average of 18.52 and 18.60 % in the first and second seasons, respectively, followed by PH.8013, G.T.54/9, G.98/28, G.95/19, G.95/21 and G.98/87 in a descending order. Such effect give evidence to the genetic

variation among the used varieties in their efficiency of sugar synthesis and translocation of assimilates to storage organs. Varietal differences in sucrose content was also reported by Nassar ( 1996 ) and Besheit et al ( 1998 ).

The interaction between harvest dates and varieties had a significant effect on sucrose percentage in both seasons ( Table 4 ). G.84/47 and PH.8013 recorded the highest sucrose % ( 19.99 and 19.22 % ) in the first season and ( 20.00 and 19.41 % ) in the second season, when harvested after 12 and 13 months , respectively. These results are in line with those of Mohamed ( 1989 ), Raju and Rao ( 1990 ), Nassar ( 1996 ) and Besheit et al ( 1998).

## 2- Purity %

Data presented in Table 5 indicated that delaying harvest from 9 to 13 months significantly increased purity percentages. The increase in purity percentage ranged from 71.98 to 86.19 and from 72.51 to 86.77 % in the 1<sup>st</sup> and 2<sup>nd</sup> seasons, respectively. Thereafter, purity decreased as harvesting was delayed up to 14 months after sowing. The increase in purity accompanying late harvest may be attributed to the increase of sucrose content . The obtained results are in line with those of Nassar ( 1996 ) and El-Sogheir and Besheit ( 2003 ) who found that delaying harvest from 10 to 13 months significantly increased purity %, thereafter, purity % was decreased as harvesting was delayed to 14 months from sowing.

**Table 5 : Purity percentage as affected by harvest dates and varieties.**

Varieties (V) Harvest dates (H)	2003 / 2004 seasons							Mean
	G.84/47	PH.8013	G.95/21	G.95/19	G.98/28	G.98/87	G.T.54/9	
9 month	74.18	73.26	70.61	70.87	71.92	70.17	72.87	71.98
10 month	82.17	80.19	72.90	73.94	75.87	71.86	76.32	76.18
11 month	86.22	85.11	76.77	77.33	78.03	75.89	79.13	79.78
12 month	89.36	88.13	81.33	82.18	83.98	80.21	84.18	84.20
13 month	86.11	89.10	84.77	85.18	86.97	84.11	87.12	86.19
14 month	83.23	82.10	83.11	84.17	87.87	85.02	88.96	84.92
Mean	83.55	82.98	78.25	78.95	80.77	77.88	81.43	80.54

LSD at 0.05

H 1.70

V 1.22

HxV 2.60

Varieties (V) Harvest dates (H)	2004 / 2005 seasons							Mean
	G.84/47	PH.8013	G.95/21	G.95/19	G.98/28	G.98/87	G.T.54/9	
9 month	75.11	73.91	71.11	71.11	72.18	71.01	73.13	72.51
10 month	83.33	80.99	73.13	74.13	76.13	72.13	76.81	76.66
11 month	87.30	86.03	77.17	77.72	78.19	76.13	79.73	80.32
12 month	90.31	89.11	82.01	82.33	84.15	80.31	84.61	84.69
13 month	87.18	90.03	85.13	85.37	87.18	84.81	87.70	86.77
14 month	83.33	83.11	83.86	84.31	88.11	85.36	89.11	85.31
Mean	84.43	83.86	78.74	79.16	80.99	78.29	81.85	81.05

LSD at 0.05

H 1.63

V 1.17

HxV 2.33

Significant differences among varieties in purity % in both seasons was recorded. G. 84/47 variety gave the highest purity % with an average of 83.55 and 84.43 % in the 1<sup>st</sup> and 2<sup>nd</sup> seasons, respectively. Purity % of the other varieties ranged from 82.98 to 77.88 and 83.86 to 78.29 in 1<sup>st</sup> and 2<sup>nd</sup> seasons. The superiority of G.84/47 may be due to its superiority in sucrose concentration as mentioned before.

Varieties x dates of harvest interaction were significant with respect to this trait in both seasons. G.84/47 variety gave the highest purity percentages at 12 months of age. PH.8013, G.95/21 and G.95/19 varieties gave the highest purity % at 13 months, while G.98/28, G.98/87 and G.T.54/9 gave the highest purity when harvested at 14 months of age . The purity % had the same trend as sucrose % for the same varieties.

**3- Reducing sugars %**

Results shown in Table 6 indicated that cane harvested after 9 months had the highest reducing sugars % and these values decreased gradually by delaying harvest to reach its minimum values at 13 months of age in both seasons, Thereafter, the delay in harvest up to 14 months slightly increased reducing sugars.

**Table 6 : Reducing sugars % as affected by harvest dates and varieties.**

Varieties (V) Harvest dates (H)	2003 / 2004 seasons							
	G.84/47	PH.8013	G.95/21	G.95/19	G.98/28	G.98/87	G.T.54/9	Mean
9 month	0.58	0.64	0.71	0.69	0.68	0.73	0.66	0.67
10 month	0.55	0.60	0.68	0.67	0.65	0.70	0.62	0.64
11 month	0.52	0.57	0.65	0.64	0.62	0.67	0.57	0.61
12 month	0.49	0.54	0.61	0.61	0.58	0.63	0.54	0.57
13 month	0.51	0.52	0.57	0.56	0.53	0.60	0.51	0.54
14 month	0.55	0.57	0.61	0.59	0.51	0.59	0.48	0.56
Mean	0.53	0.57	0.64	0.63	0.60	0.65	0.56	0.60

LSD at 0.05

H 0.02  
V 0.04  
HxV N S

2004 / 2005 seasons								
9 month	0.55	0.63	0.68	0.66	0.65	0.70	0.63	0.64
10 month	0.52	0.57	0.65	0.64	0.62	0.66	0.60	0.61
11 month	0.49	0.54	0.62	0.62	0.57	0.63	0.51	0.57
12 month	0.47	0.51	0.57	0.57	0.55	0.60	0.49	0.54
13 month	0.48	0.48	0.53	0.51	0.51	0.57	0.44	0.50
14 month	0.52	0.54	0.58	0.55	0.49	0.53	0.42	0.52
Mean	0.51	0.55	0.61	0.59	0.57	0.62	0.52	0.57

LSD at 0.05

H 0.03  
V 0.04  
HxV N S

The reduction in reducing sugars % as harvest was delayed is due to the increase in sucrose formation as a result of sugar storage in cane stalks and the reduction in growth rate. Furthermore, the increase in reducing



sugars accompanying delay in harvest up to 14 months may be due to the effect of high temperature on respiration rate. These results are in agreement with those obtained by Mohamed ( 1989 ), Nassar ( 1996 ) and El-Sogheir and Besheit ( 2003 ).

Results in Table 6 revealed that juice of G.98/87 variety exhibited the highest values of reducing sugars % than the other varieties. It is worth to mentioning that, G.98/87 was the lowest one in sucrose content ( Table 5 ). While G.84/47, G.T.54/9 and PH.8013 varieties gave the lowest values of reducing sugars % and the other varieties were in between . Varietal differences in reducing sugars content were reported by Mohamed ( 1989 ), Solomon et al. ( 1990 ), Nassar ( 1996 ) and Besheit et al. ( 1998 ) who noticed that reducing sugar percentage differ widely among varieties.

The interaction between harvesting dates and varieties was insignificant in both seasons ( Table 6 ).

**C- Yields**

**1- Net cane yield ( tons/ fed )**

Data presented in Table 7 revealed that net cane yield / fed was significantly affected by dates of harvest in both seasons. Delaying harvest up to 14 months after planting increased cane yield by 6.22 and 5.95 ton / fed in the 1<sup>st</sup> and 2<sup>nd</sup> seasons as compared with cane harvested after 9 months. Such effect may

**Table 7 : Cane yield ( ton / fed ) as affected by harvest dates and varieties.**

Varieties (V) Harvest dates (H)	2003 / 2004 seasons							Mean
	G.84/47	PH.8013	G.95/21	G.95/19	G.98/28	G.98/87	G.T.54/9	
9 month	45.10	46.11	40.02	40.36	41.19	38.71	45.71	42.46
10 month	46.17	47.40	41.36	41.42	43.94	39.33	46.33	43.71
11 month	47.21	48.80	43.18	43.54	45.51	40.15	47.19	45.08
12 month	48.18	49.96	45.13	45.33	46.36	42.48	48.88	46.62
13 month	48.34	51.10	47.61	47.02	47.11	44.36	50.19	47.96
14 month	48.56	51.73	47.73	47.19	48.03	46.15	51.36	48.68
Mean	47.26	49.18	44.17	44.14	45.36	41.86	48.28	45.75

LSD at 0.05

H	0.42
V	0.61
HxV	0.86

Varieties (V) Harvest dates (H)	2004 / 2005 seasons							Mean
	G.84/47	PH.8013	G.95/21	G.95/19	G.98/28	G.98/87	G.T.54/9	
9 month	46.03	46.39	41.77	41.40	42.10	39.22	46.02	43.28
10 month	46.94	47.98	42.94	42.21	44.77	39.94	46.99	44.54
11 month	47.61	49.17	44.33	44.31	46.43	40.71	47.71	45.75
12 month	48.39	50.33	46.91	46.30	47.11	42.96	49.56	47.37
13 month	48.71	51.18	48.13	47.86	48.01	44.92	50.88	48.53
14 month	49.03	51.46	48.32	48.13	49.11	46.63	51.96	49.23
Mean	47.79	49.42	45.40	45.04	46.26	42.40	48.85	46.45

LSD at 0.05

H	0.39
V	0.52
HxV	0.75

attributed to better growth of cane in terms of stalks length and diameter as mentioned before. These results are in line with those recorded by Nassar ( 1996 ), Singh et al. ( 1997 ) and El-Sogheir and Besheit ( 2003 ) they found that delaying harvest up to 14 months from planting date increased cane yield by 2.125 and 1.953 ton / fed in the 1<sup>st</sup> and 2<sup>nd</sup> seasons as compared with cane 10 months of age.

Varieties differed significantly in net cane yield at harvest in both seasons ( Table 7 ). PH.8013 variety gave the highest cane yield ( 49.18 and 49.42 ton /fed ) followed by the variety G.T.54/9 ( 48.28 and 48.85 tons/ fed. ) in the first and second seasons, respectively. The other varieties could be descending arranged as follows G.84/47, G.98/28, G.95/21, G.95/19 and G.98/87. The superiority of PH.8013 and G.T.54/9 may be attributed to their better growth characteristics in terms of length and diameter of stalk . Varietal differences in cane yield were reported by Raju and Rao ( 1990 ), Nassar ( 1996 ) and El-Sogheir and Besheit ( 2003 ).

Varieties x dates of harvest interaction had a significant effect on net cane yield (tons/ fed ). Varieties differed in their maximum cane yield according to dates of harvest . G.84/47 variety gave the highest net cane yield at 12 months of age . It is worth to mentioning that in most cases the differences in net cane yield between 12 to 14 months were not significant, while , PH.8013 , G.95/21 and G.95/19 varieties gave the highest net cane yield at 13 months of age. On the other hand, G.98/28, G.98/87 and G.T.54/9 varieties gave the highest yield at 14 months of age . The differential yield response of sugar cane varieties to harvest dates was reported by Raju and Rao ( 1990 ), Nassar ( 1996 ), Singh et al. ( 1997 ) and El-Sogheir and Besheit ( 2003 ).

## **2- Sugar yield ( tons / fed )**

Results in Table 8 and Fig. 1 revealed that dates of harvest had a significant effect on sugar yield in both seasons, where, sugar yield increased from (3.87 to 5.86 tons/ fed ) and from ( 4.22 to 6.36 ton / fed ) in the 1<sup>st</sup> and 2<sup>nd</sup> seasons, respectively when harvesting was delayed from 9 to 13 months. On the contrary, delaying harvest date up to 14 months exhibited significant reduction in sugar yield in both seasons. The reduction of sugar yield may be due to the observed reduction in sucrose and purity % as well as the increase in reducing sugars. These results are in agreement with those obtained by Raju and Rao ( 1990 ), Patel et al. ( 1993 ) and Nassar ( 1996 ).

Data in Table 8 revealed that sugar yield was significantly affected by sugar cane varieties in both seasons. The new promising variety PH.8013 exhibited the highest sugar yield recording 5.94 and 6.41 ton /fed in the first and second seasons, respectively followed by G.T.54/9 , G. 84/47, G.95/21, G.95/19 , G.98/87 and G.98/28 in a descending order. The superiority of PH.8013 may be due to better stalk diameter which was reflected in higher net cane yield as well as to the increase in juice quality traits in terms of sucrose % and purity %. Many workers reported differences in sugar yield among varieties, ( Mohamed ,1989 ; Nassar, 1996 ; Besheit et al., 1998 and El-Sogheir and Besheit, 2003 ).

The interaction between harvest dates and varieties had a significant effect on sugar yield in both seasons. G.84/47 variety gave the highest sugar yield

at 12 months of age, while, PH.8013 ,G.95/21 and G.95/19 varieties gave the highest sugar yield at 13 months of age. On the other hand , G.98/28, G.98/87 and G.T.54/9 varieties gave the highest sugar yield at 14 months of age . The differential sugar yield response of sugar cane varieties to harvest date was reported by Nassar ( 1996 ) and El-Sogheir and Besheit ( 2003 ) Who found that G.84/47 variety gave the highest sugar yield when harvested at 12 months from planting date while the other varieties gave the highest sugar yields when harvested after 13 months from planting date

**Table 8 : Sugar yield ( ton / fed ) as affected by harvest dates and varieties.**

Varieties (V) Harvest dates (H)	2003 / 2004 seasons							Mean
	G.84/47	PH.8013	G.95/21	G.95/19	G.98/28	G.98/87	G.T.54/9	
9 month	4.97	4.66	3.77	3.82	2.34	2.86	4.64	3.87
10 month	5.48	5.22	4.32	4.29	2.81	3.33	5.10	4.36
11 month	5.94	5.69	4.82	4.77	3.30	3.91	5.56	4.86
12 month	6.54	6.48	5.33	5.26	3.81	4.40	6.03	5.41
13 month	6.02	7.26	6.01	5.82	4.26	4.96	6.68	5.86
14 month	5.37	6.31	5.13	5.11	4.81	5.52	7.28	5.65
Mean	5.72	5.94	4.90	4.85	3.56	4.16	5.88	5.00

LSD at 0.05

H	0.10
V	0.12
HxV	0.44

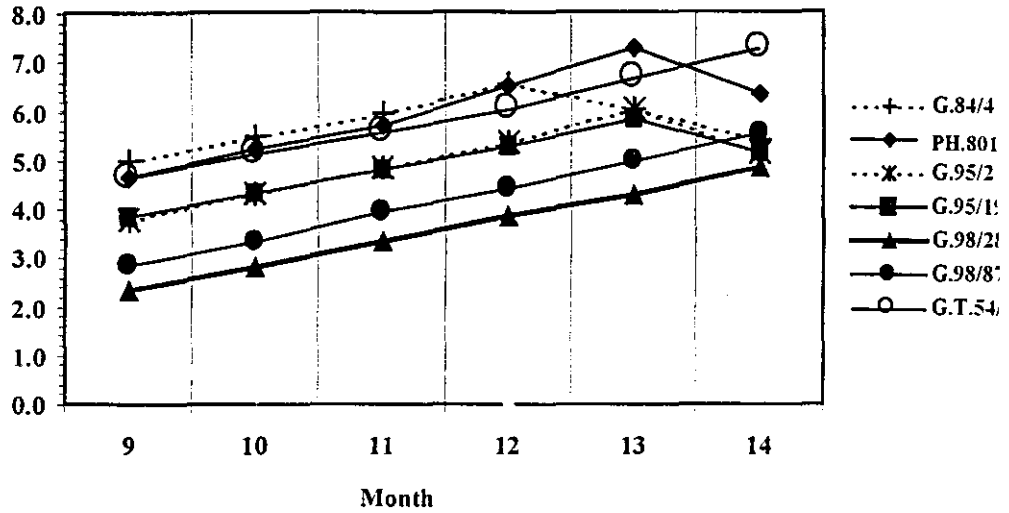
Varieties (V) Harvest dates (H)	2004 / 2005 seasons							Mean
	G.84/47	PH.8013	G.95/21	G.95/19	G.98/28	G.98/87	G.T.54/9	
9 month	5.14	5.18	3.98	4.07	2.88	3.36	4.91	4.22
10 month	5.67	5.87	4.61	4.61	3.43	3.89	5.44	4.79
11 month	6.19	6.40	5.16	5.15	3.98	4.52	5.98	5.34
12 month	6.81	6.92	5.82	5.74	4.51	5.06	6.51	5.91
13 month	6.47	7.56	6.52	6.28	5.04	5.59	7.08	6.36
14 month	5.51	6.52	5.18	5.23	5.57	6.12	7.71	5.98
Mean	5.97	6.41	5.21	5.18	4.24	4.76	6.27	5.43

LSD at 0.05

H	0.15
V	0.16
HxV	0.51

74

Seasons 2003-2004



Seasons 2004-2005

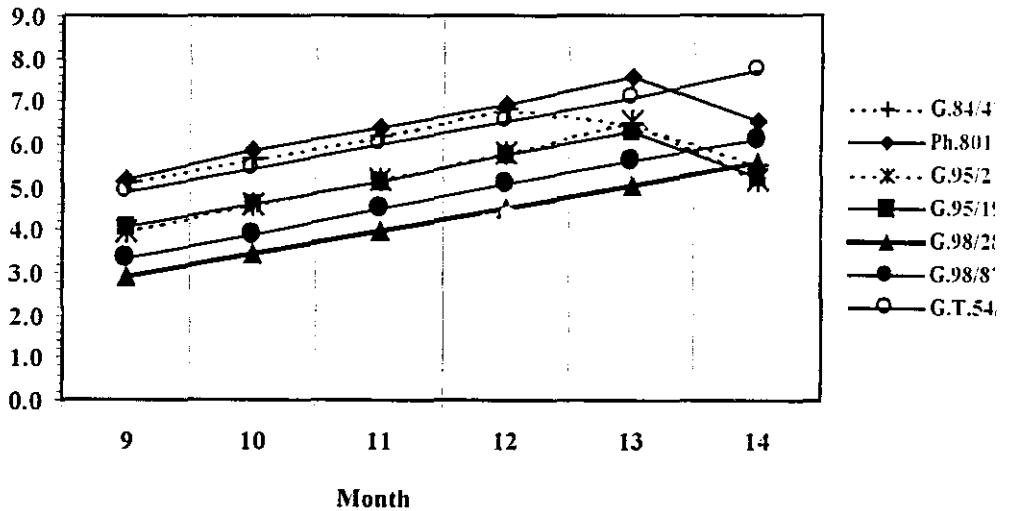


Fig 1 : Sugar yield ( tons / fed ) as affected by harvest dates and varieties

## REFERENCES

- Anonymous ( 1981 ). Chemical control in Egypton sugar production factories. Jan. PP.232.
- A.O.A.C ( 1995 ). Association of official Agricultural chemist official methods of analysis, 16<sup>th</sup> Ed. A.O.A.C. international ,Washington,D.C. USA.
- Besheit, S.Y.; A. Abo Dooh ; Maria G. Beshay; M.K. Ali and H.A. Abd El-Kareem ( 1998 ). Evaluation and borer sensitivity of some new Egypton promising sugar cane varieties. *Egypt. J. Agric. Res.* 76 ( 1 ) : 191 – 202 .
- El-Sogheir, K.S. and S.Y. Besheit ( 2003 ). Effect of harvest dates on quality and yield of some promising sugar cane varieties under South Egypt conditions . *Annals of Agric. Sc.* , Moshtohor, 41 ( 3 ) : 1121 – 1133 .
- Gilbert, R.A. ; J.M. Shine ; J.D. Miller ; R.W. Rice and C.R. Rainbolt ( 2006 ). The effect of genotype, environment and time of harvest on sugarcane yields in Florida, USA. *Field- Crops- Research.* 2006; 95 ( 2 / 3 ) : 156-170.
- Mohamed, B.D. ( 1989 ).Effect of nitrogen fertilizer and harvested time on yield and quality of sugar cane. M.Sc. Thesis, Agric. Fac. Assiut Univ., Assiut , Egypt.
- Nassar, A.M.A. ( 1996 ). Yield and quality response of some sugar cane ( *Sacchrum* spp ) cultivars to potassium nutrition and harvest date. Ph.D., . Thesis, Agric. Fac. , Cairo Univ., Egypt.
- Ramadan, B.S.H. ( 1992 ). Effect of nitrogen sources and rates on sugar cane productivity. Ph.D. Thesis Fac. Agric. Cairo Univ., Egypt.
- Ramesh,P. and M. , Mahadevaswamy ( 1996 ). Effect of planting season and harvesting age of plant and ratoon crops on yield and quality of sugar cane (*Saccharum officinarum* ) varieties. *Indian J. Agric. Sci.*, 66 ( 11 ) : 641 – 644 .
- Raju, D.V.N. and K.L. Rao ( 1990 ). Studies on the performance of different sugar cane varieties when crushed late in season. *Bharatiya sugar* 6 ( 1 ) : 169-176 (Plant Breeding Abst., 1992, 62 : 9251 ).
- Singh, S.N. ; M.L. Shukla and G.P. Singh ( 1997 ). Productivity of sugar cane as influenced by seasons of planting and date of harvesting in Uttar pradesh. *Council of Sugar Cane Res.* Shahjahanpur, Uttar Pradesh, *Indian Sugar* 47 ( 1 ) : 35-42.
- Snedecor, G.W. and W. G. Cochran ( 1981 ). *Statistical Methods.* Seventh Ed., Iowa State Univ. Press, Ames, Iowa , U S A.
- Solomon, S. ; K.K. Srivastava ; S. Bhatnagar and V.K. Madan ( 1990 ). Post harvest changes in invertase activity and juice quality in sugar cane. *Indian Sugar*, 40 ( 12 ) : 895 – 899.
- Steel, R.G.D. and J.H., Torrie ( 1980 ). *Principles and procedures of statistics* Mc. Grow- Hill Book Co. Inc. New York.
- Patel, H.S. ; N.J. Mehta ; M.P. Patel ; R.T. Khatri and P.L. Naik ( 1993 ). Evaluation of early cane cultivars under varying harvesting dates. *Indian Sugar*, 43 ( 8 ) : 641 – 644 .

Yadav, R.L. and R.K. Sharma ( 1980 ). Effect of nitrogen level and harvesting date on quality characteristics and yield of four sugar cane genotypes . Indian J.Agric. Sci., ( 50 ) : 581 – 589 .

تأثير مواعيد الحصاد على النضج والمحصول لبعض أصناف قصب السكر المبشرة  
تحت ظروف مصر العليا  
احمد مصطفى احمد نصار - عبد اللطيف عبد الله ابازيد  
معهد بحوث المحاصيل السكرية - مركز البحوث الزراعيه - الجيزه - مصر

أقيمت تجربتان حقليتان بمحطة بحوث المطاعة بمحافظة قنا بمصر العليا خلال موسمي الزراعة ٢٠٠٣/٢٠٠٤ و ٢٠٠٤/٢٠٠٥ غرس ريبيعي لعمل منحنى النضج لدراسة تأثير مواعيد الحصاد ( ستة مواعيد حصاد هي الحصاد بعد ٩، ١٠، ١١، ١٢، ١٣، ١٤ شهرا من الزراعة على جودة ومحصول ستة أصناف من قصب السكر المبشرة هي جيزة ٤٧/٨٤ وبي اتش ٨٠١٣ و جيزة ٢١/٩٥ و جيزة ١٩ و جيزة ٢٨/٩٨ و جيزة ٨٧/٩٨ مقارنة بالصنف التجاري جيزة تايوان ٩/٥٤ .  
أوضحت النتائج المتحصل عليها تحت هذه الدراسة ما يلي :-  
تحت الظروف البيئية والجوية لمحافظة قنا أعطت الأصناف المبشرة بي اتش ٨٠١٣ و جيزة ٤٧/٨٤ بالإضافة إلى الصنف التجاري جيزة تايوان ٩/٥٤ أعلى إنتاجية من محصول العيدان وصفات الجودة للعصير الناتج ومحصول السكر لوحدة المساحة.  
وقد وجد انه تحت ظروف هذه الدراسة ومحافظة قنا يمكن الحصول على الحدود القصوى من محصول السكر الناتج عند حصاد الأصناف بي اتش ٨٠١٣ ، جيزة ٢١/٩٥ و جيزة ١٩/٩٥ على عمر ١٣ شهرا من تاريخ الزراعة ولهذا تعتبر هذه الأصناف متوسطة النضج. بينما الأصناف جيزة ٢٨/٩٨ ، جيزة ٨٧/٩٨ و جيزة تايوان ٩/٥٤ عند الحصاد على عمر ١٤ شهرا من تاريخ الزراعة ولهذا تعتبر هذه الأصناف متأخرة النضج. وقد اتضح من الدراسة أن الصنف جيزة ٤٧/٨٤ يعطى أعلى إنتاجية عند حصاده على عمر ١٢ شهرا من الزراعة ولذا يمكن اعتباره الصنف المبكر الوحيد.