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Effect of Harvesting Age on Yield, Yield Components and Quality of Some Promising Sugarcane Varieties.

Ahmed, A. Z.[1] and A. O. Awadalla[2]

[1] Sugar Crops Research Institute, Agriculture Research Center, Giza, Egypt

[2] Department of Agronomy, Faculty of Agriculture and Natural Resources, Aswan University, Aswan, Egypt

***Corresponding author: Ahmed Zaky Ahmed, Sugar Crops Res. Inst. (SCRI), Agric. Res. Center (ARC), Egypt. Mob: 01222812770**

E-mail: Ahmedazarc@ yahoo.com

ABSTRACT

Two field trails were carried out at El-Mattana Agricultural Research Station (latitude of 25.17^{o} N and longitude of 32.33^{o} E), Luxor Governorate, Upper Egypt during 2013/2014 (virgin cane) and 2014/2015 (first ratoon crop,) to find out the optimum harvesting age for some sugarcane varieties. Treatments consisted of a factorial combination of three promising sugarcane varieties (G.98-28, G. 99-160 and G.2003-49) and five harvesting age (10, 11, 12, 13 and 14-months) were arranged in factorial experiment conducted in randomized Complete Block Design with three replications. The results showed that all of the studied traits were significantly influenced by delaying the harvest age from 10 to 14-month age. Also, the results showed that the three promising sugarcane varieties significantly differed in stalk cane length, diameter, as well as Brix, sucrose purity, sugar recovery percentages, cane and sugar yields (Ton/fed.). Generally, promising sugarcane variety G.2003-49 was superior over the other two varieties i.e. G.98-28 and G. 99-160 in cane and sugar yields (Ton/fed.).

INTRODUCTION

Sugar cane is grown in five main production Governorates in south Egypt for sugar production and harvesting season exchange more than 5 months from January to May. Harvesting age is the major important factor affecting sugarcane yield and quality parameters. A little information on the optimum harvesting age in order to maximize sugar production, either in different governorates or for different crop ages .within anyone governorate

Many investigators proved an evidence of the role of harvesting age to improving all sugar cane characters (Jadhav et. al., 2000 ;Ahmed 2003; Amolo, *et. al.*, 2006; Abd El-Razek *et. al.*, 2011 ;Osman *et. al.*, 2011; Ongin and Olweny 2011; El-Geddawy *et al*. 2012 ; *Mequanent and Ayele; 2014* ; Ahmed et. al., 2016 and Endris et. al., 2016).

The new sugarcane varieties is considered one of the essential wings for Production. Many investigators pointed out the important role of varieties in respect to their influence one yield and quality (Kumara and Bandara 2002 ; Sohu, *et al*. 2008; Ahmed, *et al*. 2011; Islam, *et al*. 2011; Galal, *et al*. 2015; Yousif, *et al*. 2015 and Mehareb, *et al*. 2016).

Therefore, the present work was carried out to determine the optimum harvesting age for three promising sugarcane varieties under Upper Egypt conditions.

MAT ERIALS AND METHODS

This study was conducted at EL-Mattana Agricultural Research Station, (latitude of 25.17^{o} N and longitude of 32.33^{o} E), Luxor Governorate, Egypt including virgin plant and the 1st ratoon crops grown during 2013/2014 and 2014/2015 seasons to determine the optimum harvesting age for three promising sugarcane varieties. The study included fifteen treatments represent the combination of three sugarcane varieties (G.98-28, G.99-160 and G.2003-49) and five harvesting ages (10, 11, 12, 13 and 14 months). Sugarcane varieties were planted in mid-February. A factorial experiment conducted in complete randomized block design with three replications was used. Plot area was 35 m^2 (including five ridges of one meter width and seven meters in length). All plots received normal agronomic practices recommended for the sugarcane crop. The following data were recorded at harvest:

1. Stalk height (cm) was measured from soil surface up to the top visible dewlap.
2. Stalk cane diameter (cm) was measured at the middle part of stalks.
3. Stalk cane weight (kg).
4. Brix percentage(TSS %) was determined by Brix Hydrometer according to A.O.A.C. (2005).
5. Sucrose percentage was determined by Saccharemeter according to A.O.A.C. (2005).
6. Richness percentage was calculated according to the following formula described by the chemical control Lab of the Sugar and Integrated Industries Company E.S. I. I. C. (1981).

Richness % = (sucrose% gm. juice x richness factor) /100.

Where:

Sucrose % gm. juice= (sucrose %cm^3 juice) / juice density

Juice density was taken from Schibler Tables.

Richness factor = 100 - (fiber % x 1.3)

1.3 = percent water free from sugar.

7. Sugar recovery percentage was calculated according to the following formula described by Yadav and Sharma (1980).

Sugar recovery % = [Sucrose % - 0.4(Brix % - sucrose %)] x 0.73

8. Cane yield (ton/fad.): it was determined from the weight of the three middle guarded ridges of each plot converted into ton/ fad.
9. Sugar yield (ton/fad.) was estimated as follows:

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

The collected data were statistically analyzed according to the method described by Snedecor and Cochran (1981). Treatment means were compared using revised LSD at 5% level of difference as outlined by Steel and Torrie (1980).

RESULTS AND DISCUSSION

1. Stalk height:

The obtained data in Table (1) showed that stalk height was significantly affected by harvesting age. The stalk height significantly increased with increasing harvest age until 14 months of the three cane varieties. Also, the present result cleared that the increase in stalk height at the 14 months age amounted to 10.93 % and 11.42 % over that of 10-months in the plant cane and 1st ratoon crops respectively. Such effect might be attributed to demonstrate that there was a substantial amount of growth in terms of cane stalk height at the end of harvesting ages for the promising varieties. These results are in accordance with those obtained by Ahmed (2003); Osman *et al.* (2011); El-Geddawy *et al.* (2012) and Hagos *et al.* (2014) they reported that Stalk height was significantly affected by harvesting age.

Also, data in the same table showed that the three sugarcane varieties differed significantly in stalk height in both cane plant and first ratoon crops. It is clear from the data that promising sugarcane variety G. 2003-49 had the highest stalks as compared with G.98-28 and G.99-160 varieties. This result may be due to the genetic differences among varieties in their ability of the formation of internodes and /or determination of their height. This result is in line with those obtained by Sohu, et. al. (2008); Ahmed, *et al.* (2011) and Yousif, *et al.* (2015)they pointed out that the significant variance between the sugarcane varieties in stalk height in both seasons.

Table (1) cleared that the interaction between varieties and harvesting age was significantly in both of plant cane and first ratoon crops. The highest value obtained from G.2003-49 variety which harvested after 14 months, while the lowest value recorded by harvesting G. 99-160 variety after 10 month, the highest values was true in the harvesting age was 14 months.

Table 1. Stalk height (cm) of sugarcane varieties as affected by harvesting age.

Harvesting age	plant cane crop 2013/2014				First ratoon crop 2014/2015			
(Months)	G.98-28	G.99-160	G.2003-49	Mean	G.98-28	G.99-160	G.2003-49	Mean
10	234	244	262	247	241	253	269	254
11	239	247	264	250	242	256	272	257
12	243	265	280	263	252	271	285	270
13	251	270	269	263	259	274	294	276
14	261	272	290	274	265	278	307	283
Mean	246	260	273		252	266	285	
LSD at 0.05 level for:								
Harvest age (H)				10.0				3.5
Varieties (V)				7.8				2.7
H x V				17.4				6.0

2- Stalk cane diameter:

The millable cane diameter is one of the most important parameter influencing cane yields. Results illustrated in Table (2) revealed that the millable cane diameter was significantly affected by the harvesting age in the first and second seasons. Results also indicated that millable cane diameter increased gradually as harvesting delayed up to 14 months age. Those results are in agreement with those found by Ahmed (2003); Ongin and Olweny (2011); El-Geddawy *et al.* (2012) and Ahmed, *et al.* (2016) they reported that harvesting at 14 months age recorded the highest mean values of cane diameter.

A significant variation was observed in millable cane diameter among the tested promising sugarcane varieties in the two seasons. The results pointed out that G.99-160 variety characterized with the thickest millable canes followed by G.98-28 variety. The superiority of G.99-160 variety in stalk diameter may be controlled by genetic make-up. This observation was true in the two sugarcane crops. This result is in accordance with those reported by Sohu, *et al.* (2008); Ahmed, *et al.* (2011) and Yousif, *et al.* (2015) they found that significant differences in millable cane diameter were found among the tested sugar cane varieties.

Table 2. Millable cane diameter (cm) of sugarcane varieties as affected by harvesting age.

Harvesting age	plant cane crop 2013/2014				First ratoon crop 2014/2015			
(months)	G.98-28	G.99-160	G.2003-49	Mean	G.98-28	G.99-160	G.2003-49	Mean
10	2.54	2.61	2.56	2.57	2.48	2.61	2.42	2.50
11	2.60	2.65	2.58	2.61	2.52	2.62	2.46	2.53
12	2.67	2.72	2.69	2.69	2.54	2.65	2.55	2.58
13	2.73	2.88	2.65	2.75	2.58	2.73	2.59	2.63
14	2.83	2.99	2.73	2.85	2.72	2.83	2.77	2.77
Mean	2.67	2.77	2.64		2.57	2.69	2.56	
LSD at 0.05 level for:								
Harvest age (H)				0.07				0. 08
Varieties (V)				0.06				0.07
H x V				0.12				0.13

The results in Table (2) shwed that the interaction between harvesting age and varieties was significant in plant and ratoon crops. The thickest stalk cane obtained from G.99-160 variety when harvesting age was after 14 month in both season, whill the lowest value given by G. 98-28 variety 14 months in both season,while the lowest value given by G.98-28 variety with harvesting age of 10 months. This result cleared that all varieties under study behaved the same trend.

3. Stalk cane weight:

Results in Table (3) showed that increasing plant age at harvesting date to 11, 12, 13 and 14 months led to a

significant increase in millable cane weight by 0.050, 0.108, 0.192 and 0 .243 as compared to that obtained by harvesting at age of 10 months respectively, in the 1st season, being 0.044, 0.49, 0.121 and 0.196 in the 2nd one. The increase in millable cane weight by increasing harvesting age may be due to the increase in stalk cane height, diameter and sucrose content (Tables 1 and 2 and 5). These results are in coincide with those mentioned by Abd El-Razek and Besheit (2011); Osman *et al.* (2011); El-Geddawy *et al.* (2012) and Ahmed *et al.* (2016) they reported that stalks cane weight was significantly increased by increasing plant age from 11-14 months.

Also, data in the same Table showed that millable cane weight was significantly affected by tested promising cane varieties in two crops. It is clear from the data that sugar cane variety G.2003-49 had the heaviest millable cane (1.125 and 1.033 kg) followed by G.99-160 variety (1.012 and 0.981), while the lightest millable cane (1.00 and 0.980 kg) were produced by G. 98-28 variety in the first and second seasons respectively. This result may be due to the genetic differences among varieties in their ability of the formation of stalks which reflected in stalk which reflected in stalk height and stalk cane millable cane diameter as shown in Table (1and 2). The results of the present investigation are in line with those of Ahmed *et al.* (2011);Galal, *et al.* (2015) and Yousif, *et al.* (2015) they found that G.T.54-9 variety was superior to the two other varieties in stalk weight.

The interaction between varieties and harvesting age had a significant effect on millable cane weight. In 1st and second seasons, millable cane weight of G.2003-49 variety was significantly increased by delaying harvesting age. In general, the maximum values of millable cane weight were obtained from a harvesting G.2003-49 variety at 14-month old.

Table 3. Millable cane weight (kg) of sugarcane varieties as affected by harvesting age.

Harvesting age	Plant cane crop 2013/2014				First ratoon crop 2014/2015			
(Months)	G.98-28	G.99-160	G.2003-49	Mean	G.98-28	G.99-160	G.2003-49	Mean
10	0.910	0.927	0.943	0.927	0.903	0.910	0.930	0.915
11	0.927	0.953	1.050	0.977	0.913	0.940	1.027	0.959
12	0.980	0.993	1.133	1.035	0.937	0.953	1.003	0.964
13	1.063	1.073	1.220	1.119	1.043	1.007	1.063	1.036
14	1.120	1.113	1.277	1.170	1.103	1.093	1.140	1.111
Mean	1.000	1.012	1.125		0.980	0.981	1.033	
LSD at 0.05 level for:								
Harvest age (H)				0.022				0.030
Varieties (V)				0.017				0.023
H x V				0.037				0.052

4. Brix percentage:

Results in Table (4) showed that increasing harvesting age from 10 to 11, 12, 13 and 14 months led to a significantly and gradually increased in Brix percentage by amounted 1.30, 2.34,4.33 and 5.02 in the 1st season, being 1.48, 2.72, 3.98 and 5.49 in the 2nd one. This result may be due to the continuous accumulation of solids as harvest age progress up to the end of harvesting season. The results of the present study are in accordance with those of Jadhav, *et. al*., (2000); Ongin and Olweny (2011); Osman *et. al*. (2011); Hagos *et al.* (2014) and Endris *et. al*., (2016) they found that significant variation was observed by harvesting age on Brix percent juice.

Results in the same Table showed that significant difference among the examined promising sugarcane varieties in Brix percentage, promising sugarcane G. 2003-49 variety recorded the highest value of this trait. It can be noticed that the value of brix percentage (TSS %) of ratoon crop (20.98) was higher than of plant crop (19.66 %) for all varieties. This probably due to the fact that all sugarcane varieties reached the ripening peak in ratoon crop and did not in plant - cane crop. Since these varieties might have different ability to syntheses and storage the soluble solids substances. Similar result was recorded by Kumara and Bandara (2002); Sohu, *et al.* (2008); Islam, *et al.* (2011) and Mehareb, *et al.* (2016) they found significant differences among evaluated sugarcane varieties for Brix percentage.

Table 4. Brix percentage of sugarcane (TSS %)varieties as affected by harvesting age.

Harvesting age	Plant cane crop 2013/2014				First ratoon crop 2014/2015			
(Months)	G.98-28	G.99-160	G.2003-49	Mean	G.98-28	G.99-160	G.2003-49	Mean
10	16.12	15.49	17.53	16.38	18.14	17.66	18.51	18.10
11	17.07	17.34	18.65	17.68	19.45	19.80	19.48	19.58
12	18.76	18.32	19.10	18.72	20.01	21.07	21.39	20.82
13	20.17	20.51	21.45	20.71	21.96	22.62	21.65	22.08
14	21.61	21.01	21.59	21.40	23.23	23.68	23.86	23.59
Mean	18.75	18.53	19.66		20.56	20.96	20.98	
LSD at 0.05 level for:								
Harvest age (H)				0.48				0.53
Varieties (V)				0.37				0.40
H x V				0.83				0.91

Data also showed that Brix percentage was significantly affected by the interaction between the two studied factors in the tow plant -cane crops. In plant cane crop, Brix percentage of G.99-160 and G.2003-49 varieties were insignificantly increased by delaying harvesting age from 13 to 14 months but G.98-28 variety have significant

difference. In general, the maximum Brix % (21.61 % and 23.86 %) were obtained from G.98-28 and G.2003-49 varieties when it harvested at 14-months age in the 1st, and the 2nd seasons respectively.

5. Sucrose percentage:

Data in the table (5) cleared that delaying harvest from 10 to 14-months age resulted in a significant and an ascendant increase in sucrose percentage of plant cane and 1st ratoon crops. These results might be due to the dilution effect of enzymes changing the reducing sugars and non-sucrose materials to sucrose or it could be due to positive impact of age which allows accumulation of additional sucrose on the harvest age. The obtained result is in accordance with those reported by Amolo, et. al.,(2006); El-Geddawy *et al.* (2012) and Mequanent and Ayele (*2014*) they reported that harvesting cane at the age of 14 months gave a significantly higher sucrose percent than 12 and 16 months of age harvesting

Data in the same Table show that sucrose percentage was significantly affected by cane varieties in two seasons. Generally, sucrose percentage of promising cane variety G. 2003-49 was higher than other varieties in plant cane and first ratoon crops, the variation between G. 2003-49 and G. 99-160 was insignificant. While the variety of G. 98-28 gave the lowest sucrose percentage in plant cane and first ratoon crops. The differences among varieties in sucrose percentage depend on the interaction between varieties and environmental factors during growth, sucrose formation and storage periods.The differences among sugar cane varieties obtained by Kumara and Bandara (2002); Ahmed, *et al.* (2011) and Mehareb, *et al.* (2016) they found that significant differences among evaluated cane varieties for sucrose percentage.

Table 5. sucrose percentage of sugarcane varieties as affected by harvesting age.

Harvesting age	Plant cane crop 2013/2014				First ratoon crop 2014/2015			
(Months)	G.98-28	G.99-160	G.2003-49	Mean	G.98-28	G.99-160	G.2003-49	Mean
10	12.54	12.38	14.34	13.08	14.74	14.51	15.75	15.00
11	13.83	14.61	16.49	14.97	16.46	17.05	16.99	16.83
12	15.78	16.08	16.93	16.26	17.21	18.36	18.62	18.06
13	16.43	17.02	18.01	17.15	18.99	19.67	19.03	19.23
14	19.13	18.61	18.85	18.86	19.87	20.73	20.92	20.51
Mean	15.54	15.74	16.92		17.45	18.06	18.26	
LSD at 0.05 level for:								
Harvest age (H)				0. 52				0.53
Varieties (V)				0.47				0.41
H x V				1.05				4.58

Sucrose percentage was significantly affected by the interaction between harvesting age and varieties in the two crops. In first ratoon crop, sucrose percentage of G.99-160 variety was significantly increased by delaying harvesting age from 10 to 13 months, but this was not the case with the other two varieties. The highest values of sucrose percentage (19.13 and 20.92) were obtained from G.98-28 and G.2003-49 when its harvested at 14-month old in the plant cane and the 1st ratoon crops, respectively. This could be due to the perevius results of brix % (TSS%) which gave the same results.

6. Richness percentage:

Data illustrated in Table (6) showed that harvesting age along crushing season (from10 to 14 months age) had a significant effect on richness percentage, the highest values (15.97 % and 16.86 %) were recorded at the age of 14 months, whereas their values were (10.65 % and 12.69 %) at the age of 10 months. These results are in agreement with those obtained by Ongin and Olweny (2011); Hagos *et al.* (2014); Endris et. al., (2016) and Ahmed, *et al.* (2016) they found that revealed that Richness percentage (Pol %) was significantly affected by increasing harvest age.

Results in the same table showed that richness percentage was significantly affected by the promising sugarcane varieties in the two seasons. In both seasons G. 2003-49 varieties were significantly lower than other two varieties (G. 98-28 and G.99-160). While it was insignificantly difference between (G. 98-28 and G. 2003-49) and (G. 98-28 and G. 99-160) varieties in 1st and 2nd seasons respectively. The difference between the tested cv. in this trait may be due to their gene makeup. These results are in agreement with those obtained by Kumara and Bandara (2002); Islam, *et al*. (2011) and Shridevi, et. al., (2016) they found that Pol percentage differed significantly by genotypes.

Table 6. Richness percentage of sugarcane varieties as affected by harvesting age.

Harvesting age	Plant cane crop 2013/2014				First ratoon crop 2014/2015			
(Months)	G.98-28	G.99-160	G.2003-49	Mean	G.98-28	G.99-160	G.2003-49	Mean
10	11.09	12.18	10.45	10.65	13.34	12.26	12.48	12.69
11	12.64	13.94	12.27	11.71	14.34	14.39	13.94	14.22
12	13.66	14.22	13.45	13.32	15.67	15.47	14.52	15.22
13	14.41	15.18	14.25	13.80	15.96	16.50	15.95	16.14
14	15.75	15.69	15.59	15.97	16.97	17.22	16.38	16.86
Mean	13.51	14.24	13.20		15.26	15.17	14.65	
LSD at 0.05 level for:								
Harvest age (H)				0.51				0.45
Varieties (V)				0.40				0.35
H x V				0.88				0.78

Richness percentage was significantly affected by the interaction between harvesting age and varieties in the two seasons. In first ratoon crop, richness percentage of G.99-160 and G. 2003-49 varieties were insignificantly increased by delaying harvesting age from 13 to 14 months, but this was not the case with the other variety .The varietal differences may be attributed to the genetic constitutes of varieties and its interaction with environmental conditions. The highest value obtained from G. 98-28 variety which harvest after 14 months in both seasons.

7. Sugar recovery percentage:

Data in Table (7) revealed that the age of millable cane plants at harvested was significantly affected on sugar recovery percentage in the first plant cane and first ratoon crops. Also, data indicated that sugar recovery % increased by increasing the age of cane plant at harvest from 10-14 month. The increase in sugar recovery percentage is mainly due to the increase in sucrose percentage (Table 5). These results are in accordance with those obtained by Kumara and Bandara (2002); Ahmed (2003); Amolo, et. al., (2006) and Osman et. al., (2011) they harvest dates significantly differed in sugar recovery percentage.

Furthermore, results in the same table showed that sugar recovery percentage was significantly affected by the promising cane varieties. Also, it is clear that Variety G.2003-49 was superior over the other two studied promising varieties, in plant and first cane ratoon crops. These results could be attributed to higher values of sucrose percentage (Table 5). The differences between sugar cane varieties were reported by Sohu, *et al.* (2008); Islam, *et al.* (2011); Galal , *et al.* 2015 and Shridevi, et. al., (2016) they found that sugar recovery percentage differed significantly by genotypes.

As far the effect of the interaction between the studied factors was significantly in the two seasons. The cane varieties did not behave the same at the different harvesting age. In first ratoon crop, sugar recovery percentage of G.98-28 and G. 99-160 varieties were significantly increased by delaying harvesting age from 12 to 13 months, but this was not the case with G.2003-49 variety. In general, the highest sugar recovery (13.24 and 14.41) was recorded by harvesting G.98-28 and G.2003-49 variety at 14-month old in plant cane and 1st ratoon crops, respectively.

The explain of the results depend on the results of sucrose and richness percentage (Table 5 and 6) which gave the same findings.

Table 7. Sugar recovery percentage of sugarcane varieties as affected by harvesting age

Harvesting age	plant cane crop 2013/2014				First ratoon crop 2014/2015			
(Months)	G.98-28	G.99-160	G.2003-49	Mean	G.98-28	G.99-160	G.2003-49	Mean
10	8.11	8.13	9.53	8.59	9.77	9.67	10.69	10.04
11	9.15	10.30	11.40	10.28	11.14	11.63	11.69	11.49
12	10.65	11.08	11.73	11.15	11.75	12.61	12.79	12.38
13	10.90	11.40	12.14	11.48	13.00	13.48	13.14	13.21
14	13.24	12.89	12.96	13.03	13.52	14.27	14.41	14.07
Mean	10.41	10.76	11.55		11.84	12.33	12.54	
LSD at 0.05 level for:								
Harvest age (H)				0.53				0.40
Varieties (V)				0.41				0.31
H x V				0.92				0.69

8. Net cane yield:

Data in Table (8) delaying harvest date from 10 up to 14 months age significantly increase cane yield in the two crops, this increment amounted by 1.554, 3.975, 7.340 and 9.435 ton/fad. as compared with harvest at age of 11, 12, 13 and 14 months in plant cane, while the increase was 2.028, 2.519, 5.675and 9.379 ton/fad. In 1st ratoon crop respectively. The increase in cane yield of cane plant by delaying harvest date is due to the increase in stalk cane heighst (Table 1), millable cane thickness (Table 2) and millable cane weight (Table 3). These findings are in line with those reported by Ahmed (2003); Amolo, et. al., (2006); Sohu, *et al*. (2008); El-Geddawy *et al.* (2012) and *Mequanent and Ayele (2014)* they reported that delaying harvesting from 10 to 16 month increased cane yield from 72.82 to 97.46 ton/ ha.

Data in the same Table showed that cane yield was significantly affected by examined promising cane varieties in the two seasons. In general, the highest mean values of cane yield (52.327 and 53.262 ton/fad.) were scored by G.2003-49 variety followed by G.98-28 (39.519 and 45.938 ton/fad.) in the plant cane and 1st ratoon crops, respectively. The lowest mean of cane yield (36.547 and 44.243 ton/fad.) was obtained from G. 99-160 varieties in plant cane and in 1st ratoon. The superiority of G.2003-49 may be due to its better millable cane traits (Tables 1,2 and 3). These results are in line with those obtained by Kumara and Bandara (2002); Sohu, et. al. (2008); Islam, *et al*. (2011) and Galal, *et al.* (2015) they found that the variety G.T.54-9 was superior to the two other varieties in cane yields.

Table 8. Cane yield (ton/fad.) of sugarcane varieties as affected by harvesting age.

Harvesting age	plant cane crop 2013/2014				First ratoon crop 2014/2015			
(Months)	G.98-28	G.99-160	G.2003-49	Mean	G.98-28	G.99-160	G.2003-49	Mean
10	36.000	33.410	45.600	38.337	42.660	41.000	48.023	43.894
11	36.690	34.393	48.590	39.891	42.757	42.183	52.827	45.922
12	38.780	35.843	52.313	42.312	43.827	43.590	51.823	46.413
13	41.977	38.827	56.227	45.677	48.790	45.093	54.823	49.569
14	44.150	40.263	58.903	47.772	51.657	49.350	58.813	53.273
Mean	39.519	36.547	52.327		45.938	44.243	53.262	
LSD at 0.05 level for:								
Harvest age (H)				2.311				1.233
Varieties (V)				1.790				0.595
H x V				4.003				1.951

Cane yield was significantly affected by the interaction between harvesting age and varieties in the plant cane and 1st ratoon crops. In the first season, cane yield of G.98-28 and G. 99-160 varieties was insignificantly increased by delaying harvesting age from 10 to 12 months, but this was not true in the case of G.2003-49 variety. In general the highest net cane yield/fad. Produced by G.2003-49 when harvested at 14 monthsage.

9. Sugar yield:

The available data in Table (9) showed that delaying sugarcane harvest up to 14-months resulted in increasing sugar yield by 1.722, 1.021, 0.758 and 0.611 ton/fad. as compared with harvest at age of 10, 11, 12 and 13 months in the plant crop , corresponding to 2.121, 1.336, 0.946 and 0.858 ton/fad. in the first ratoon, respectively. The increase in sugar yield by delaying harvest date is due to the increase in sucrose, sugar recovery percentages and cane yield which reflected on sugar yield as a final product. These results are in line with those recorded by Ahmed,(2003); Amolo, *et. al*., (2006); El-Geddawy *et al.* (2012); Mequanent and Netsanet (2014) and Endris *et. al*., (2016) they found that the maximum value of sugar yield ton/ ha. was recorded at the harvesting age of 14 months.

Data in the same Table showed that the studied promising varieties significantly differed with respect to their sugar yield in the 1st and 2nd seasons. It is cleared that in the planted cane crop, sugarcane variety G. 2003-49 out yielded G.98-28 and G.99-160 varieties by 1.854 and 2.084 tons/fad. respectively. Also, in the first ratoon cane crop, G. 2003-49 out yielded G.98-28 and G.99-160 varieties by 1.188 and 1.240 tons/fad. respectively. The increase in sugar yield of G. 2003-49 variety may be due to the increase in sugar recovery percentage and net cane yield/fed.(Table 7 and 8). These results are in accordance with those obtained by Kumara and Bandara (2002); Sohu, *et al.* (2008); Ahmed, *et al.* (2011) and Mehareb, *et al.* (2016) they found that significant differences among evaluated cane varieties for sugar yield.

Table 9. Sugar yield (ton/fad.) of sugarcane varieties as affected by harvesting age.

Harvesting age	Plant cane crop 2013/2014				First ratoon crop 2014/2015			
(Months)	G.98-28	G.99-160	G.2003-49	Mean	G.98-28	G.99-160	G.2003-49	Mean
10	3.273	2.803	4.537	3.538	4.173	3.963	5.133	4.423
11	3.357	3.550	5.540	4.149	4.763	4.903	6.177	5.281
12	4.000	3.373	5.513	4.296	5.050	4.777	6.280	5.369
13	4.133	3.973	6.137	4.748	5.150	5.497	6.630	5.759
14	4.520	4.433	6.827	5.260	6.347	6.083	7.203	6.544
Mean	3.857	3.627	5.711		5.097	5.045	6.285	
LSD at 0.05 level for:								
Harvest age (H)				0.396				0.283
Varieties (V)				0.307				0.219
H x V				0.686				0.490

The effect of the interaction between studied harvesting ages and cane varieties was significant in the 1st virgin cane and the 1st ratoon crops. The cane varieties did not behave the same at the different harvesting age. In first ratoon crop, sugar yield of G.98-28 and G.2003- 49 varieties were insignificantly increased by delaying harvesting age from 11 to 13 months, but this was not in the case of G.2003-49 variety. Generally, the best harvesting age for the studied cane varieties could be the 14-month to obtain the maximum sugar yield (6.827 and 7.203 ton/fad.) in the plant and ratoon crops, respectively.

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تأثير عمر الحصاد على المحصول و مكوناته و الجودة لبعض أصناف قصب السكر المبشرة.

أحمد ذكى أحمد[١] و عبد المنعم عوض الله عمر[٢]

[١] معهد بحوث المحاصيل السكرية- مركز البحوث الزراعية- الجيزة- مصر

[٢] قسم المحاصيل- كلية الزراعة و الموارد الطبيعية جامعة أسوان-أسوان- مصر.

أجريت هذه الدراسة فى مزرعة محطة البحوث الزراعية بالمطاعنة (دائرة عرض ٢٥,١٧ شمال و خط طول ٣٢,٣٣ شرق) مركز اسنا محافظة الأقصر بمصر العليا خلال موسمى ٢٠١٣/٢٠١٤ و٢٠١٤/٢٠١٥) لمحصولى غرس و خلفة اولى لتحديد العمر الامثل لحصاد الأصناف المختبرة. و قد اشتملت التجربة على ثلاثة اصناف هى (جيزة ٩٨-٢٨ وجيزة ٩٩-١٦٠ و جيزة ٢٠٠٣-٤٩) و خمسة اعمار حصاد هى (١٠، ١١، ١٢، ١٣ و ١٤ شهرا) فى تجربة عاملية باستخدام التصميم الاحصائى قطاعات كاملة العشوائية بثلاث مكررات. وأوضحت النتائج ان جميع الصفات محل الدراسة تأثرت معنوياً بزيادة عمر النباتات عند الحصاد من ١٠ الى ١٤ شهر. كما اظهرت النتائج اختلافاً معنويا بين الاصناف المبشرة الثلاث المختبرة فى مكونات المحصول وهى طول وسمك ووزن السيقان الصالحة للعصر,أيضا فى صفات الجودة أى النسبة المئوية لكل من: المواد الصلبة الذائبة الكلية (البركس), السكروز, ناتج السكر النظرى,الحلاوة بالاضافة الى محصولى القصب و السكر بالطن للفدان. عموماً تفوق الصنف المبشر جيزة ٢٠٠٣-٤٩ على الصنفين الآخرين جيزة ٩٨-٢٨ و جيزة ٩٩-١٦٠ فى محصولى القصب النظيف و السكر بالطن للفدان عند الحصاد فى عمر ١٤ شهراً.