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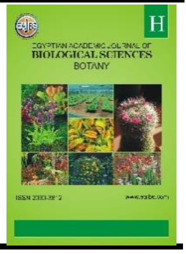

Response of Some Sugar Beet Varieties to Abscisic Acid Under Different Storage Periods

Nadia K. El-Safy[1]; Hossam M. El-Sharnoby[1]; and Amr M. El-Sheikh[2]
1-Plant physiology and Chemistry Dept., Sugar Crops Research Inst., ARC, Egypt.
2-Breed and genetic Dept., Sugar Crops Research Inst., ARC, Egypt.
E-Mail : **nadia.kamel32@yahoo.com**

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ABSTRACT

To investigate the effect of Abscisic acid (ABA) and storage period on yield and quality of the three sugar beet varieties, in this respect two field experiments were conducted at the Experimental Farm of Agricultural Station in Sabahia, Alexandria, Egypt during 2016/2017 and 2017/2018 seasons. A split-split plot design in three replications was used in both seasons, where the main plots were allocated by the three sugar beet varieties i.e. (Classic, Farida and Gloriosa), meanwhile, the sub plot was occupied by the four rates of Abscisic acid (ABA) (contra =water, 1000, 2000 and 3000 ppm) as foliar application one time before harvesting date, while storage periods (2, 4, 6, and 8 days after harvest) were occupied the sub-sub plots in both seasons. The obtained results revealed that there was a significant difference between the three sugar beet varieties to its response to the four concentration of Abscisic acid (ABA) under the three storage periods in yield, its components and quality, whereas the Classic variety recorded the highest mean values of these traits followed by Farida variety while the lowest ones recorded with Gloriosa variety in both seasons. Increasing ABA concentration up to 3000 ppm increased TSS (%), sucrose (%) and purity (%) in sugar beetroots, which recorded the highest mean values of these traits followed by 2000 ppm, while the lowest ones recorded with control treatments (water spray), storage period at 2 days after harvest, on the other side, storage period at 4 or 6 days were had in a significant difference in the two seasons. In general, sowing Classic variety gave the highest values of the studied characters with 2000 ppm ABA under storage period 2 -6 days after harvest in Alexandria conditions, Egypt.

INTRODUCTION

Sugar beet comes in the same rank as sugar cane, as a vital source of sugar production in Egypt. Varieties are considered as an important factor as the effect of sugar production from sugar beet. Increasing sugar beet yield and quality are the main aim of the governmental policy to increase sugar production in order to gradually cover the gap between sugar production and consumption by sowing the appropriate variety. The total sugar beet cultivated area reached 545188 feddans with an average tonnage of 17.51 tons that contributed to about 56 % of total sugar production in Egypt, However, the total sugar beet cultivated area in the World estimated to 444784 hectares with an average of 17.80 t (FAO 2018).

Abscisic acid (ABA) can improve the strength of plants and promote the unloading of photosynthates in phloem as well as their transport, thus promoting the translocation and accumulation of photosynthates. Abscisic acid (ABA) can increase phloem unloading and transformation of photosynthates in sink organs by improving sink strength, which results in high yield (Dewdney and McWha, 1979; Clifford *et al.*, 1986; Oliver *et al.*, 2007). Also, at *Phaseolus* ABA enhanced sink strength of plants, which contributes to loading in phloem and transformation of photosynthates in a sink (Tietz *et al.*, 1981; Clifford *et al.*, 1986). The pattern of changes of ABA content in storage roots appeared to be a V shape, and the minimum was reported at 110 days after planting. The content in the late growth stage was higher than that in the early growth stage. Furthermore, ABA is a key phytohormone that regulates apoplectic unloading, and it act an important role in assimilating transport (Tietz *et al.*, 1981). On the other hand, Abscisic acid (ABA) plays an important role in the physiological adaptation of plants to drought stress (Jakab *et al.*, 2005; Jiang and Lafitte, 2007; Maleki *et al.*, 2011). It has been reported that ABA is not directly involved in modulation of cell enlargement and division (Hooker and Thorpe, 1998; Kurahashi *et al.*, 2009) but it indirectly regulates plant growth by improving stomatal resistance to control transpiration and CO_2 uptake (Jiang and Lafitte, 2007). These ABA-induced adaptive changes can be of great position for the survival and better growth of crops under unfavorable environmental conditions (Ruggiero *et al.*, 2004, Hartung and Jiang, 2007; Maggio *et al.*, 2010). Although varied roles of ABA are well recognized (Zeevaart and Creelman, 1988; Ren *et al.*, 2007), it ruins unclear how this hormone coordinately regulates GB metabolism in relation to BADH activity and choline content, and in turn crop growth of different maize hybrids by both exogenous ABA and fluridone (Flu), a direct inhibitor of ABA synthesis (Zhang *et al.*, 2006; Hancock *et al.*, 2011). ABA content had a significantly positive correlation with sucrose content (%), and a highly significant positive correlation with a soluble sugar content of storage roots. (Tang *et al.*, 2009). So, Abscisic acid application improved GB accumulation, leaf relative water content and shoot dry matter production in both cultivars. The endogenous ABA was probably convoluted in the regulation of GB metabolism by regulating BADH activity, and resulting in variation of water relations and growth of plant under drought, especially in the drought-sensitive cultivar (Zhang *et al.*, 2012).

The aim of this study is to study the effect of Abscisic acid (ABA) on growth, yield, yield components and some technological (quality) characters of three sugar beet varieties over different storage periods of the under Sabahia Region, Alexandria, Egypt.

MATERIALS AND METHODS

Two field experiments were conducted at the Experimental farm of agricultural Station in Sabahia throughout 2016/2017 and 2017/2018 seasons, to study the effect of Abscisic acid (ABA) and storage period on yield, yield components and quality of the three sugar beet varieties.

A. Experimental Set-Up; Site Description, Plant Material, Chemicals and Experimental Design:

The study was done under Sabahia Region condition, Alexandria, Egypt (31° 12′ 54″ N 29° 58 ′ 27″ E; elevation -3 m; Mediterranean climate). The preceding summer crop was maize (*Zea mays* L.), Variety, Giza 168 in both seasons.

Chemical analysis for the experimental site was according to the method described by Chapman and Pratt (1978) which is presented in (Table A).

Table 1A. Physical and chemical Experimental site soil properties.

Soil properties	2016/2017	2017/2018
A- Mechanical		
Clay %	44.50	45.60
Silts %	42.50	41.80
Sands	13.00	12.60
Texture soil	**Clay loam**	
B- Chemical analysis clay loam soil		
PH	8.22	8.25
Ec (ds/m)	1.95	1.98
Anions (meq/l)		
HCo_3	1.90	1.88
Cl^-	25.01	24.77
So_4	1.85	1.78
Cations (meq/l)		
Cu^{++} (meg/l)	5.85	5.77
Mg^{++} (meg/l)	6.09	5.98
Na^{++} (meg/l)	14.10	13.99
K^+ (meg/l)	1.65	1.60
Available nitrogen (ppm)	88.0	85.0
K (ppm)	6.30	6.35
Organic matter (%)	0.44	0.45

Sugar beet varieties were obtained from Sugar Crop Research Institute (SCRI), Agricultural Research Center, Giza. Seed type and origin of sugar the three beet varieties, i.e. Classic, Farida and Gloriosa used in the study. Table (B).

Table 1B. Seed type and origin of sugar beet varieties used in the study:

Origin	Seed type	Variety
Germany	Polygerm	Classic
Netherlands	Polygerm	Farida
Germany	Polygerm	Gloriosa

B. Abscisic Acid and Concentrations:

Abscisic acid (ABA); Sigma®, St. Louis, MO, United States was obtained through personal communication with colleagues from the City of Scientific Research and Technological Applications (SRTA-City). Treatments of ABA (±) were at concentrations of 1000, 2000 and 3000 ppm along with 0.5% (v/v) Tween 20 was utilized. A solution consists of water with 0.5% (v/v) Tween 20 was used as a control treatment. Treatments were done pre-harvest by two weeks (15 days) as foliar application in the early morning. Care was taken through the implementation of foliar sprays to avoid over-spraying non-target plots.

C. Storage Periods And Their Conditions:

Two storage trails were accomplished between 2016 and 2018. Storage Samples of sugar beet roots of the three varieties were individually divided into three groups (100 roots for each group) and stored for 8 days The groups stored after removing tops carefully without injury, poorly topped and damaged roots were eliminated (every group was covered with

its top) at out-door under the prevailing natural conditions. Periods chosen were 2, 4, 6, and 8 days postharvest. The storage conditions of the stored sugar beet varieties were as follows:
-Harvest date after 180 days from sowing.
-Temperature range; 14 – 29 C°.
-Relative humidity range; 43 – 85%.
The analysis was handled at 2, 4, 6 and 8 days of stored periods.

D. Experimental Design and Sampling:

Split-split plot design in three replications was used in both seasons, where the main plots were allocated by the three sugar beet varieties i.e. (Classic, Farida and Gloriosa), meanwhile, the sub plot was distributed by the four rates of Abscisic acid (ABA) (control=water, 1000, 2000 and 3000 ppm) as foliar application one time before harvesting date, while storage periods (2, 4, 6, and 8 days after harvest) were occupied the sub- sub plot in both seasons.

The experiment unit was 10.5 m^2, each experimental individual unit included 5 ridges, 60 cm apart, and 3.5 m long.

The soil of field experiments was prepared through two ploughing and leveling, Calcium superphosphate (12.5 % P_2O_5) was applied during tillage operation at rate of 100 kg/fed potassium sulfate (48 % K_2O) was applied at the rate of 24 kg K_2O/fed with the first irrigation.

Seeds were hand sown as the usual dry sowing on one side of the ridge in hills 25 cm apart at the rate of 4-5 seed ball per hill on sown at 10th and 11th October and harvested after 6 months in both seasons, respectively.

Plants were kept free from weeds, which were manually controlled by hand hoeing three times. The common agricultural practices for growing sugar beet according to the recommendations of Sugar Crops Research Institute (SCRI) were followed, except for the factors under this study.

All samplings were performed early in the morning (between 9 and 10 a.m. local time) with an average temperature of 14±2°C during pre-harvest and 29 ± 2°C during post-harvest for the first experiment.

E. The Studied Characters:

Each group of 100 plants was divided into two subgroups, each one with 50 plants. At harvest, Plants from one subgroup were used for physiological and technological measurements i.e., root yield (t/fed), sugar yield (t/fed), TSS (%), and sucrose (%) of the three sugar beet varieties were recorded before storage in both seasons.

Plants from one subgroup were used for physiological and biochemical measurements, while at postharvest, plants from the other subgroup were used for final assessment for stored roots at the four periods (2, 4, 6, and 8 days after harvest) as TSS (%), sucrose (%) and purity (%) for both seasons.

The inner two fortified rows of each plot were harvested and Sugar beet plants were up-rooted, cleaned, topped, and to determine the following characters:

A. Root length (cm), root diameter (cm), leaves weight (g)/plant and root weight /plant.

B. Top, root and sugar yields:

1. Top yield/fed (ton).
2. Root yield/fed (ton).
3. Sugar yield/fed (ton) was calculated using the following equation:

$$\text{Sugar yield/fed (ton)} = \text{root yield} \times \text{sucrose \%}.$$

In fresh samples of sugar beetroots, total soluble solids percentage (TSS %) was determined using Hand Reflectometer, as well sucrose percentage (%) estimated by using digital Sacharometer after preparing the samples according to the method described by AOAC (1995).

Juice purity% was calculated using the following equation:

Juice Purity % = (sucrose % ÷ TSS %) ×100.

F. Statistical Analysis

All obtained data were statistically analyzed according to the technique of analysis of variance (ANOVA) for the split-split plot design as published by Gomez and Gomez (1984). The Least Significant Difference (LSD) method was used to test the differences between treatment means at a 5% level of probability. Correlations of the traits obtained from the experiment were computed using Costat program. All the statistical analyses were performed using CoStat V 6.4 (2005) for Windows.

RESULTS AND DISCUSSION

Results are presented in Tables (2 and 3) showed the average values of root length (cm), root diameter (cm), leaves weight (g)/plan, root weight /plant, root yield (t/fed), sugar yield (t/fed), TSS (%), and sucrose (%) of the three sugar beet varieties under abscisic acid (ABA) in both seasons 2016/2017 and 2017/2018.

The results in Table (2) indicated that there was a significant difference among the three sugar beet varieties in the studied characters i.e., root height (cm), root diameter (cm), top weight (g)/plan, root weigh/plant, root yield (t/fed), sugar yield (t/fed), TSS (%), and sucrose (%), where the Classic variety recorded the highest mean values of these traits followed by Farida variety while the lowest ones recorded with Gloriosa variety in both seasons. The differences among sugar beet varieties understudy could be due to the variation in the makeup of the genes and their response to the environmental condition. The differences among sugar beet varieties were found by El-Sheikh *et al*. (2009), Hozayn *et al*. (2013) and Mohamed and Yasin (2013); Chomontowski *et al.* (2019).

Table 2. Root height (cm), root diameter (cm), top weight (g)/plan, root weight /plant, root yield (t/fed), sugar yield (t/fed), TSS (%), and sucrose (%) of the three sugar beet varieties under abscisic acid (ABA) in both seasons.

Sugar beet varieties	Root length (cm)		Root diameter (cm)		leaves weigh /plant		Root weigh /plant		Root yield (t/fed)		Sugar yield (t/fed)		TSS (%)		Sucrose (%)	
	2016/2017	2017/2018	2016/2017	2017/2018	2016/22017	2017/2018	2016/2017	2017/2018	2016/2017	2017/2018	2016/2017	2017/2018	2016/22017	2017/2018	2016/2017	2017/2018
Classic	47.0a	47.1a	15.3a	15.5a	733.3a	733.5a	1150.0 a	1100.0a	26.3a	26.7a	5.3a	5.5a	25.3a	25.4a	18.8a	18.8a
Farida	43.3b	43.0b	13.7b	13.5b	653.3ab	726.7a	1050.0ab	1050.0a	24.0b	23.7b	4.3b	4.8b	23.0b	22.7b	17.7b	18.0b
Gloriosa	42.3b	41.7b	13.7b	13.3b	648.7b	633.3b	905.0b	898.3b	23.0b	23.0b	3.9b	3.8b	21.0b	20.7c	17.3b	17.5b
LSD at 0.05	3.7	3.5	1.2	1.1	82.0	67.1	146.0	112.46	1.5	1.2	0.8	0.7	2.1	1.2	1.0	0.8

Results in Table (3) showed the average values of TSS (%), sucrose (%) and purity (%) of the three sugar beet varieties as affected by abscisic acid (ABA) and storage periods and their interaction during 2016/2017 and 2017/2018 seasons.

Concerning the effect of varieties, Table (3) revealed that there was a significant difference among the three sugar beet varieties in the studied characters i.e., TSS (%), sucrose (%) and purity (%), where the Classic variety recorded the highest mean values of these traits followed by Farida variety while the lowest ones recorded with Gloriosa variety in both seasons. The differences among sugar beet varieties understudy could be due to the variation in the makeup of the genes and their response to the environmental condition. The differences among sugar beet varieties were found by El-Sheikh *et al*. (2009), Hozayn *et al*. (2013) and Mohamed and Yasin (2013).

Respecting the effect of the application of Abscisic acid (ABA), Table (3) revealed that increasing ABA concentration up to 3000 ppm increased TSS (%), sucrose (%) and purity (%) in sugar beetroots, which recorded the highest mean values of these traits followed by 2000 ppm, while the lowest ones recorded with control treatments (water spray) in the two seasons. This increase in the studied characters may be due to the role of ABA in the quality of plants. ABA has many (Jakab *et al.*, 2005; Ren *et al.*, 2006; Jiang and Lafitte, 2007; Oliver *et al.*, 2007; Maleki *et al*., 2011) These results are in agreement with those recorded by Tang *et al.*, (2009); Zhang *et al*. (2012).

With regard to the effect of the storage period, the results in Table (3) revealed that the highest values of TSS (%), sucrose (%) and purity (%) of sugar beet roots were recorded with a storage period at 2 days after harvest, on the other hand, storage period at 4 or 6 days were had in a significant difference in sucrose (%) and purity (%) of sugar beet roots as compared with the other treatments, while the lowest ones recorded with storage period at 8 days after harvest especially in TSS (%) and Sucrose (%).In this respect, ABA improved plant resistance to salt, drought and cold conditions and played a regulatory role under biological stress (Wei *el al*., 2015; Fang *et al*., 2017).

Also, the results in Table (3) recorded that there was a significant difference between all the combined interactions (AB, AC, BC, and ABC) in both seasons.

Table 3. TSS (%), sucrose (%) and purity (%) of the three sugar beet varieties as affected by abscisic acid (ABA) and storage periods and their interactions in both seasons.

Treatments	TSS (%)		Sucrose (%)		Purity (%)	
	2016/2017	2017/2018	2016/2017	2017/2018	2016/2017	2017/2018
Sugar beet varieties						
Classic	21.81a	20.88b	15.27a	15.06a	**70.01**	**72.13**
Farida	21.00b	21.02a	14.91b	14.99a	68.10b	68.85ab
Gloriosa	20.38c	20.42b	14.88b	14.96b	68.42ab	68.29b
LSD for A at 0.05	0.38	0.28	0.23	0.11	0.59	0.77
Abscisic acid (ABA)						
Water	20.72c	19.78d	14.77b	14.57c	68.56b	68.17b
1000 ppm	20.00d	20.28c	14.63b	14.94b	68.06b	68.47b
2000 ppm	22.19a	21.25b	15.49a	15.20ab	68.03b	68.72b
3000 ppm	21.33b	21.78a	15.18a	15.31a	69.25a	69.64a
LSD for B at 0.05	0.50	0.48	0.36	0.35	0.60	0.74
Storage period						
2 days after harvest	23.00a	22.36a	16.45a	15.88a	68.67a	68.69a
4 days after harvest	22.03b	21.92b	15.62b	15.92a	68.22a	68.61a
6 days after harvest	20.36c	20.14c	14.56c	14.40b	68.56a	68.86a
8 days after harvest	18.86d	18.67d	13.45d	13.82c	68.44a	68.83a
LSD for C at 0.05	0.34	0.31	0.34	0.31	0.59	0.73
Interaction						
A x B	*	*	*	*	*	*
A x C	*	*	*	*	*	*
B x C	*	*	*	*	*	*
A x B x C	*	*	*	*	*	*

The same letters in column

*: Significant difference at 0.05 level of probability**.**

Table (4) revealed that the interaction between variety and ABA was significant on TSS (%), sucrose (%) and purity (%), whereas sprayed Classic variety by 2000 or 3000 ppm from ABA increased TSS (%), sucrose (%) and purity (%) of the sugar beet comparing with the other treatments during 2016/2017 and 2017/2018 seasons.

Table 4. The interaction effect between sugar beet varieties and ABA concentration on TSS (%), sucrose (%) and purity (%) in both seasons.

Treatments		TSS (%)		Sucrose (%)		Purity (%)	
A) Variety	**B) ABA concentration (ppm)**	**2016/2017**	**2017/2018**	**2016/2017**	**2017/2018**	**2016/2017**	**2017/2018**
Classic	Water	19.25	17.67	13.63	13.85	**70.80**	**78.38**
	1000	21.25	21.92	14.76	15.54	68.17	68.58
	2000	24.33	21.50	16.98	15.06	67.42	68.08
	3000	22.42	22.42	15.70	15.79	70.75	69.91
Farida	Water	21.17	19.92	15.07	14.18	68.50	69.25
	1000	17.50	21.25	14.03	15.58	67.42	68.17
	2000	21.08	21.17	14.79	15.20	68.58	67.42
	3000	21.75	21.75	15.75	15.00	67.92	66.75
Gloriosa	Water	21.75	21.75	15.62	15.67	67.92	67.92
	1000	21.25	17.67	15.10	13.69	68.58	67.42
	2000	21.7	21.08	14.70	15.34	68.08	68.58
	3000	19.83	21.17	14.08	15.14	69.08	68.50
LSD for AB at 0.05		0.87	0.83	0.62	0.61	1.03	1.29

Table (5) cleared that the interaction between variety and storage period was significant on TSS (%), sucrose (%) and purity (%), whereas the highest mean values TSS (%), sucrose (%) and purity (%) of the sugar beet were recorded with stored Classic variety at 2 or 4 days after harvest as compared with the other treatments during 2016/2017 and 2017/2018 seasons.

Table 5. The interaction effect between sugar beet varieties and Storage period on TSS (%), sucrose (%) and purity (%) in both seasons.

Treatment		TSS (%)		Sucrose (%)		Purity (%)	
A) Varieties	**C) Storage period (days After harvest)**	**2016/2017**	**2017/2018**	**2016/2017**	**2017/2018**	**2016/2017**	**2017/2018**
Classic	2	24.17	22.25	16.84	15.59	**69.67**	70.07
	4	22.08	21.75	15.37	15.66	68.08	68.67
	6	20.92	20.25	14.76	14.44	69.92	68.33
	8	20.08	19.25	14.10	14.57	69.08	67.83
Farida	2	22.08	22.75	16.16	16.12	67.67	69.50
	4	21.75	22.25	15.79	16.10	67.92	68.08
	6	19.83	20.33	14.62	14.30	68.42	68.92
	8	17.83	18.75	13.08	13.44	68.42	69.08
Gloriosa	2	22.75	22.08	16.34	15.92	68.83	67.67
	4	22.75	21.75	15.69	16.01	68.67	67.92
	6	20.3	19.83	14.29	14.46	68.33	68.42
	8	18.67	18.00	13.19	13.46	67.83	68.42
LSD for AC at 0.05		0.59	0.53	0.58	0.53	1.03	1.28

Table (6) cleared that the interaction between ABA and storage period was significant on TSS (%), sucrose (%) and purity (%), whereas the highest mean values TSS (%), sucrose (%) and purity (%) of the sugar beet were recorded with when the sugar beet root sprayed by ABA at the rate of 3000 ppm which increase storage period at 2 or 4 days after harvest compared with the other treatments during 2016/2017 and 2017/2018 seasons.

Table 6. Interaction effect between ABA and Storage period on TSS (%), sucrose (%) and purity (%) in both seasons.

Treatments		TSS (%)		Sucrose (%)		Purity (%)	
B) ABA concent ration (ppm)	C) Storage period (days after harvest)	2016/2017	2017/2018	2016/2017	2017/2018	2016/2017	2017/2018
Water	2	23.89	22.22	16.94	15.76	**70.91**	70.93
	4	21.56	20.44	15.02	14.70	67.56	68.33
	6	19.56	19.33	14.25	14.16	68.33	67.89
	8	17.89	17.11	12.87	13.66	69.56	68.89
1000	2	21.33	21.33	16.01	15.76	68.78	68.78
	4	21.11	21.11	15.46	16.31	68.44	68.44
	6	19.56	20.00	14.05	14.15	68.67	68.67
	8	18.00	18.67	12.99	13.52	66.33	66.33
2000	2	22.78	21.89	16.06	15.45	67.33	67.33
	4	23.22	22.78	16.17	16.30	67.89	67.89
	6	21.56	20.44	15.08	14.78	67.89	67.89
	8	21.22	19.89	14.67	14.27	69.00	69.00
3000	2	24.00	24.00	16.78	16.54	69.78	69.67
	4	22.22	23.33	15.81	16.37	69.00	68.22
	6	20.78	20.78	14.83	14.50	69.33	68.78
	8	18.33	19.00	13.28	13.85	68.89	69.56
LSD for BC at 0.05		0.68	0.62	0.67	0.61	1.19	1.48

Conclusion

The obtained results from this study revealed that it can be concluded that Classic variety recorded the highest top, root, and sugar yields and high quality, also recorded the highest value of quality under storage period at 2 or 4 days after harvest with foliar application of ABA under the studied condition, Alexandria, Egypt.

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ARABIC SUMMARY

استجابة بعض أصناف بنجر السكر لحامض الابسيسك تحت فترات التخزين المختلفة

نـادية كـامل الصـافي[1] – حسام محمد الشرنوبـي [1] – عمرو محمد الشيـخ[2]

[1]قسم بحوث الفسيولوجي والكيمياء – معهد بحوث المحاصيل السكرية – مركز البحوث الزراعية – مصر

[2] قسم بحوث التربية والوراثة – معهد بحوث المحاصيل السكرية – مركز البحوث الزراعية – مصر

بنجر السكر من المحاصيل السكرية الاستراتيجية في مصر والعالم ويعتبر أهم محاصيل السكر ويساهم باكثر من 55 % من انتاج السكر في مصر لذلك لابد الاهتمام به في جميع مراحل نمو وانتاجه فقد يحدث نقص في جودة المحصول خاصة اذا حدث تأخير في توريد محصول الجذور الناتج وكان يجب وجود حل لهذه المشكلة وذلك برش النباتات بحامض الابسيسك لإطالة فترة التخزين للمحصول. ولذا أجريت تجربتان حقليتان في المزرعة البحثية بمحطة البحوث بالصبحية بالأسكندرية خلال موسمي 2017/2016 و 2018/2017 ، لدراسة استجابة بعض أصناف بنجر السكر للرش الورقي لحامض الابسيسك وفترات التخزين من خلال تقدير صفات النمو والمحصول وجودته والفترة التخزينية. وزعت المعاملات في تصميم القطع المنشقة مرتين ، حيث وزعت أصناف بنجر السكر الثلاثه (Classic و Farida و Gloriosa) عشوائياً في القطع الرئيسية ، ووزعت معاملات الرش الأربعة بحامض الابسيسك (الرش بالماء ، 1000 ، 2000 ، 3000 جزء في المليون) عشوائياً في القطع الشقية الاولى وفترات التخزين (2 ، 4 ، 6 ، 8 يوم بعد الحصاد) في القطع الشقية الثانية في ثلاثة مكررات.

وكان ميعاد الزراعة في 10 ، 11 اكتوبر خلال موسمي الدراسة على التالي ، وزرعت النباتات على مسافة 25 سم وبين الخطوط 60 سم ، وكانت مساحة القطعة التجريبية 10.5 م^2 . وتم الرش بحامض الابسيسك مرة واحدة قبل الحصاد ب 15 يوم. واجريت العمليات الزراعية الأخري على حسب توصيات وزارة الزراعة واستصلاح الأراضي. وسجلت الصفات التالية : وزن النبات و وزن الجذر و قطر الجذر ومحصول الجذور و محصول العرش ومحصول السكر والمواد الذائبة الكلية ونسبة السكروز ونسبة النقاوة.

لخصت أهم النتائج فيما يلي:

أشارت النتائج المتحصل عليها الي وجود اختلافات معنوية بين أصناف بنجر السكر تحت الدراسة في الصفات المحصول ومكوناته وجودته حيث ان صنف بنجر السكر كلاسيك Classic حقق أعلى قيم في معظم صفات المحصول والجودة متبوعا بصنف فريدة مقارنة بالصنف Gloriosa الذى اعطى أقل القيم في معظم الصفات خلال موسمي الزراعة.

كما أظهرت النتائج المتحصل عليها ان زيادة تركيز الرش بحامض الأبسيسك حتى 3000 جزء في المليون اثر تأثيراً معنوياً على الصفات المدروسة خاصة صفات الجودة مقارنة بالكنترول (الرش بالماء) خلال موسمي الدراسة.

وجد أن زيادة فترة التخزين أثرت بالسلب على جودة جذور بنجر السكر حيث فترة التخزين 2 أو 4 يوم سجلت أعلى قيم لصفات الجودة مقارنة 6 او 8 يوم بعد الحصاد خلال موسمي الدراسة.

أوضحت النتائج أن هناك تأثير معنوي بالتداخل بين أصناف بنجر السكر والرش بحامض الابسيسك على صفات

الجودة في بنجر السكر حيث أن صنف كلاسيك Classic مع الرش بمعدل 2000 أو 3000 جزء في المليون من الابسيسك حقق أعلى متوسطات قيم في صفات الجودة مقارنة بباقي المعاملات تحت الدراسة خلال موسمي الدراسة.

أوضحت النتائج أن هناك تأثير معنوي بالتداخل بين أصناف بنجر السكر وفترة التخزين حيث أن صنف كلاسيك Classic مع فترة تخزين 2 يوم بعد الحصاد أو 4 يوم بعد الحصاد سجل أعلى متوسطات قيم في صفات الجودة بباقي المعاملات تحت الدراسة خلال موسمي الدراسة.

أوضحت النتائج أن هناك تأثير معنوي بالتداخل بين أصناف بنجر السكر وفترة التخزين حيث أن صنف كلاسيك Classic مع فترة تخزين 2 يوم بعد الحصاد أو 4 أيام بعد الحصاد سجل أعلى متوسطات قيم في صفات الجودة بباقي المعاملات تحت الدراسة خلال موسمي الدراسة.

أوضحت النتائج أن هناك تأثير معنوي للتداخل بين الرش الورقي لحامض الابسيسك وفترة التخزين حيث أن الرش بحامض الابسيسك لنباتات بنجر السكر بمعدل 3000 جزء في مليون مع فترة تخزين 2 أو 4 أيام بعد الحصاد سجل أعلى متوسطات قيم في صفات الجودة بباقي المعاملات تحت الدراسة خلال موسمي الدراسة.

كما أنه كان للتداخل الثلاثي من الدرجة الثانية كان معنوياً خلال موسمي الدراسة على صفات الجودة.

التوصية:

توصي الدراسة للحصول على محصول وجودة عالية من بنجر السكر يمكن زراعة الصنف كلاسيك أو فريدة والرش الورقي بحامض الابسيسك بمعدل 3000 جزء في المليون ذلك يمكن تخزين جذور بنجر السكر لفترة يومين او 4 أيام دون ان تتأثر صفات الجودة خاصة عند التأخير في توريد المحصول تحت ظروف منطقة الصبحية - محافظة الأسكندرية - مصر.