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EVALUATION OF TWO BANANA CULTIVARS GROWING IN SANDY SOIL UNDER DRIP IRRIGATION SYSTEM IN RELATION TO GROWTH ,FRUIT QUALITY AND SUCCESSFUL MARKETING

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ABSTRACT

This investigation was carried out during two successive seasons of 2003 and 2004 on two Cavendish-type banana cultivars are "Williams" and "Grand Nain" growing in sandy soil under drip irrigation system to study their growth, fruit quality and successful marketing. Data show that , Pseudo-stem of "Grand Nain" plants were significantly shorter and thicker than "Williams" plants, therefore the Pseudo-stem of "Grand Nain" plants can be considered more stable than Pseudo-stem of "Williams" plants. On the other hand, at maturity stage (at harvest), "Grand Nain" CV. obtained the highest values of bunch weight and length and finger length, weight, size and angulation %. Also, "Grand Nain" CV. showed the highest SSC%, acidity %, total sugar % and total starch % in fruit than "Williams" CV.

Fruits of two cultivars held at room temperature for 9 days, and the high percent of total loss(25.85 – 32.75%) was in "Williams" CV., whereas this percent was(34.91 – 38.82%)in "Grand Nain" CV. Thus two cultivars banana fruits reached the end of shelf life period(9 days), but "Williams" banana fruits have a suitable marketable condition for Least value of total loss compared with" Grand Nain" CV.

INTRODUCTION

Banana are considered to be one of the most important commercial fruit in many countries. Although banana requires a tropical climate it is, however grown in Egypt, a sub-tropical country, where the temperature very often fells below 10°c in winter., (El-Mahmoudi 1961).

In Egypt, since about twenty years Musa Cavendishi was the prevalent variety grown, it is the dwarf cultivar best suited to the Egyptian climatic condition. About 90% of the local bananas of this cultivar which is known as "Hindi", while the other 10% being of Cros Michel "Maghrabi" cultivar (El-Banna 1981).

In the last two decade, great steps are being adopted with the aim of increasing the production of banana by importing some new cultivars of high yield and good characteristics of fruits. The area of new banana cultivars "Williams" and "Grand Nain" has increased rapidly at the local conditions especially in the new land at the desert under drip irrigation system. Since, both "Williams" and "Grand Nain" CVS. have high yield and good eating quality.

The purpose of this study was to evaluation growth and fruit quality of "Williams" and "Grand Nain" cultivars grown at sandy soil under drip irrigation , as well as assessment the fruit behavior during the shelf life.

MATERIALS AND METHODS

This investigation was carried out during two successive seasons of 2003 and 2004 on two Cavendish – type banana cultivars are "Williams" and "Grand Nain" growing in sandy soil under drip irrigation system at private orchared at EL-Behira governorate.

The plants of both cultivars were in good condition, spaced 3.0×3.0m. free from any pathological and physiological disorder and received the common cultural practices.

For present study 30 plants of both cultivars were selected at random , 10 plants distributed in three blocks in a complete randomized design.

Harvest date for the first and second seasons was estimated when the top hand have slightly yellow according to Von Loesecke (1950) and when the angulation percent reached about 9% according Abou-Aziz *et al.* (1970).

Mature banana fruits of both cultivars were harvested in January at commercial maturity.

The following parameters were curried out to both cultivars:

A - Vegetative characteristics at flowering :-

1. Pseudo-stem length (cm) .
2. Pseudo-stem diameter : It was determined by measuring the basal, middle and terminal girth of plant pseudo-stem and calculated the average diameter .
3. Number of leaves per plant .

B - Fruit harvest characteristics :-

Mature banana fruits for "Williams" and "Grand Nain" CVS. were picked and washed with tap water and air dried , then left at room temperature for 2 days as sweating period before ripening . physical and chemical properties of sweated fruits were measured before exposure to acetylene gas . The following parameters were then made :

1. Bunch weight (kg.).
2. Bunch length (cm.).
3. Hands per bunch .
4. Finger weight gm.[at third hand of bunch]
5. Finger length cm.[at third hand of bunch]
6. Finger size. [at third hand of bunch]
7. Angulation(%): was determined by measuring the equatorial diameter of two different sides and was calculated by dividing the difference between the average of total lowest reading and the average of total highest reading by the average of total highest reading and multiplying by 100 .
8. Fruit firmness : was measured using PHSH – Pull "Dynanometer Model DT (01)". Having planger of 5/16 inch . Fruit firmness expressed as pound/inch^2 .
9. Pulp/peel ratio : the weight pulp and peel as well as pulp/peel ratio was calculated by diving the weight of pulp by the weight of peel .

10. Colour development : was determined according to the standard colour index of the united fruit Co. (7 grades from full green to complete yellow).
11. Moisture contents : were determined by during a preweighed amount of material in a vacuum oven at 70 °C . until it reached a constant weight .
12. Soluble solid content(S.S.C.%) : were determined refractometrically (A .O .A. C . 1975) .
13. Total acidity : was determined by titrating against 0.1 N sodium hydroxide using phenolphthalein as indicator . Results were expressed as percentage of Malic acid in fresh pulp weight (A.O.A.C., 1975) .
14. Total sugar : It was determined calorimetrically by using phenol sulphoric acid reaction methods according to Smith *et al* (1986) . Total sugars were calculated as gram of glucose per 100 grams weight .
15. Starch content :It was determined in the alcoholic residue by direct acid hydrolysis(A .O .A .C., (1975). The reducing power was determined by the method of Somogy as modified Nelson , (1944) and a factor of 0.9 was used for calculation to give the weight of starch in banana fruits .

C - Ripening treatment :-

10 hands from the middle parts of "Williams" and "Grand Nain" bunches were taken after sweating period and exposed to 50 ppm acetylene gas at 18 °C and 85% R.H. for 48 hours . after ripening process banana fruits were taken in-side the ripening room .

Ten fingers from each cultivars were taken to determine some physical and chemical properties .

D – Shelf life :-

For shelf life study , at the ripening treatment 180 banana finger from both cultivars were to be held at room temperature (as shelf life) at 20°C ±2 and 50% RH. Each 20 fingers were put in open carton box to examined at 3 days intervals .Banana fingers in three boxes (3 replicates) were periodically taken at three days intervals to determine the following physical and chemical properties : Total loss in weight % , firmness , decay %, pulp/peel ratio , fruit colour , Angulation % , and pulp and peel moisture % . In addition , SSC , Total acidity ,total sugar and total starch .

The obtained data at both seasons were statistically anallysed according to Snedecor and Cochran (1967) .

RESULTS AND DISCUSSION

A - Plant characteristics of "Williams" and "Grand Nain" banana cultivars at flowering :

1- Pseudo–stem length and circumference :-

It clear from Table (1) that "Williams" plants were significantly taller than"Grand Nain" plants in both seasons. The plant height were (3.11 - 3.30 m.) and (2.42 – 2.60 m.) for "Williams" and "Grand Nain" CVS. respectively in two seasons.

Table(1) :Pseudo–stem length , circumference , leaves/plant and bunch properties of "Williams"and"Grand Nain" banana cultivars during seasons 2003, 2004 .

Properties / Cultivars	Pseudo-stem length (cm.)			Pseudo-stem circumference (cm.)			Total leaves per plant			Bunch weight (kg.)			Bunch length (cm.)			Hands per bunch		
	03	04	M.	03	04	M.	03	04	M.	03	04	M.	03	04	M.	03	04	M.
Williams	3.11	3.30	3.21	72	76	74	40	43	41.5	27	30	28.5	124	130	127	13	15	14.0
Grand Nain	2.42	2.60	2.51	78	80	79	42	39	40.5	28	31	29.5	125	132	128 5	13	14	13.5
L.S.D 5%	0.121	0 127	-	3.183	3 121	-	1.118	3.142	-	1.118	3.142	-	N.S	N.S	-	N.S	0.964	-

Concerning to Pseudo-stem circumference ,the data in Table (1) showed that circumference of "Grand Nain" plants significantly were increaser than "Williams" plants .Since , it gained (78 - 80 cm.) and (72 – 76 cm.) for "Grand Nain" and "Williams" CVS. respectively in both seasons , therefore the Pseudo-stem of "Grand Nain" can be considered more stable than Pseudo-stem of "Williams" . Similar results were found by Robinson and Anderson (1982).

2-Leaves number per plant :-

Data presented in Table (1) indicated that leaves number per plant gave higher values in "Williams" CV. than "Grand Nain" CV. in average in two seasons . Since the obtained data recorded for "Williams" (41.5) and "Grand Nain" (40.5) . Significant difference was noticed in leaves number per plant of two banana cultivars in the two seasons.

B -Fruit characteristics at harvest :-

1-Bunch weight , length and hands / bunch:-

It is obvious from Table (1) that, significant different were observed between the bunch weight and hands per bunch of "Williams" and "Grand Nain" . Since , bunch weight were (27-30 kg.) and (28-31 kg.) for "Williams" and "Grand Nain" CVS. respectively in two seasons under the study .Moreover, the mean of bunch length gained 127cm and 128.5 cm for "Williams" and "Grand Nain" CVS. respectively. Furthermore , data clearly that hands per bunch tended to fluctuate for both cultivars , Since the mean of hands / bunch were 14 and 13.5 for "Williams" and "Grand Nain" CVS. of two seasons

2-Finger weight, length and size:-

Data presented in Table (2) show clear that , "Grand Nain" cultivar gave somewhat increase average finger weight ,length and size than "Williams" in the two seasons . Since ,the mean finger weight were 118.6 gm. and 121.55 gm. For "Williams" and "Grand Nain" CVS. respectively. Yet , "Grand Nain" CV. gave longer fingers than "Williams" CV . Since the mean finger length were 21.45 cm. and 22.60 cm. for "Williams" and "Grand Nain" CVS. respectively . Moreover , "Grand Nain" CV. gave the highest finger size compared with "Williams" CV. during the two seasons under study. Since , finger size gained 106.5cm and 109.5cm for "Williams" and "Grand Nain" respectively as means of two seasons .

3-Angulation percent:-

Data in Table (2) indicated that , somewhat differences were found for the angulation percent between both cultivars under study , which varied from (10.12-11.14%) and (11.06-11.08 %) for "Williams" and "Grand Nain" CVS.

respectively . Abou-Aziz *et al.* (1970) reported that the angulation percentage is one of the principal parameters for using to determine banana fruit maturation .

Table (2) :Fruit properties of "Williams" and "Grand Nain" banana cultivars at maturity indices at harvest time during Seasons 2003 , 2004.

properties	Finger length (cm.)			Finger weight (gm.)			Finger size (cm.)			Finger angulation (%)			Finger firmness (lb/in^2)			Pulp/peel ratio			Fruit colour	
Cultivars	03	04	M.	03	04	M.	03	04	M.	03	04	M.	03	04	M	03	04	M.	03	04
Williams	20 9	22	21.45	117.7	120 1	118.6	105	108	106.5	10.12	11.14	10.63	7.6	6.7	7.15	1.4	1.6	1 5	2	2
Grand Nain	22.2	23	22.6	120.6	122.5	121 55	110	109	109.5	11.06	11.10	11.08	6.6	7	6.80	1.5	1.7	1.6	2	2
L.S.D 5%	0.909	N.S	-	N.S	N.S	-	2.93	N S	-	0.294	N.S	-	0.188	N.S	-	0.04	N S	N.S	N.S	N.S

Colour score :- 1- Green. 2-Green trace with yellow 3-More green than yellow 4-More yellow than green 5-Green tip 6-All yellow 7-Yellow flecked with brown.

4-Finger ferminess:-

It is clear from Table (2) that the firmness of banana finger , ranged between (6.7- 7.6 lb/in^2) and (6.6-7.0 lb/in^2) for "Williams" and "Grand Nain" CVS. at maturity stage .Besides , there were somewhat differences were found for finger firmness between both cultivars at the two seasons of investigation . Wasefe and Nasreia (1990) ; noted that the firmness of banana finger , ranged 8.5-4.0 k/ in^2 for green and ripen banana respectively consequently firmness could be taken as a good parameter for the ripening of banana .

5-Pulp /peel ratio:-

According to Table (2) , it is clear that pulp/peel ratio of "Williams" and "Grand showed slight differences at harvest (maturity stage). Since ,the mean pulp/peel ratio were 1.5 and 1.6 for "Williams" and "Grand Nain" CVS. respectively .Fernandes *et al* (1979) and Wasef and Nasreia (1990) found that the pulp/peel ratio of green at maturation was about 1.2.

6- Fruit colour :-

Table (2) showed that, fruits of both cultivars had score 2 (light green) at harvest during the two seasons under study. These results are in agreement with those reported by Abou-Aziz *et al* (1970) ; and Ahmed (1993).

7- Soluble solids content (SSC):-

It is evident from Table (3) that, during the two seasons of this study, SSC% of "Grand Nain" CV. was significantly higher than SSC% of "Williams" CV. at harvest. Since, SSC% were 5.0-5.5% for "Grand Nain" CV. and 4.5-5.0% for "Williams" CV. in the two seasons, respectively. Similar results found by Patil and hulmani (1998) and Ahmed (2001) .

8-Total acidity:-

It is obvious from Table (3) total acidity of "Grand Nain" fruits at harvest were higher than "Williams" fruits. Since, the values were (0.21& 0.20%) and (0.29& 0.30%) for "Williams" and "Grand Nain" CVS. in the two

seasons respectively. Similar results were obtained by Patll and Hulmani (1998) and Ahmed (2001).

9-Total sugar:-

According to Table (3), it is observed that the total sugar of "Grand Nain" banana fruits at harvest gave somewhat higher sugars content than "Williams" banana fruits at the first and second seasons of this investigation. The total sugar content ranged between (4.2 - 4.4%) and (4.5 - 4.6%) in pulp fruits of "Williams" and "Grand Nain" CVS. at both successive seasons respectively.

10- Total starch:-

Data presented in Table (3) clearly indicated that no significant differences in the amount of starch content at harvest in "Williams" and "Grand Nain" banana fruits in both seasons of study. Since starch content were (20.9& 21.7%) and (20.8& 21.9%) in pulp fruits of "Williams" and "Grand Nain" CVS. in the two seasons respectively.

Table (3):Total soluble solids, total acidity , total sugar and total starch of "Williams" and" Grand Nian" banana cultivars at maturity indices at harvest during seasons, 2003,2004 .

Properties	2003 Season											
	Weight loss (%)				Decay (%)				Total loss (%)			
Cultivars	0	3days	6days	9days	0	3days	6days	9days	0	3days	6days	9days
Williams	1.15	2.5	8.35	10.85	-	-	-	15	1.15	2.5	8.35	25.85
Grand Nain	2.20	4.8	9.90	14.91	-	-	-	20	2.20	4.8	9.90	34.91
L.S.D 5%	0.068	0.148	0.264	0.410	-	-	-	0.545	0.068	0.148	0.264	0 955
2004 Season												
Williams	1.80	3.5	7.90	12.57	-	-	-	20	1.80	3.5	7.90	32.57
Grand Nain	1.90	6.7	10.16	13.82	-	-	-	25	1.90	6.7	10.16	38.82
L.S.D 5%	N.S	0.473	0.756	1.060	-	-	-	1.870	N.S	0.473	0.756	2.929

B - Fruit marketability :-

1- Total loss percentage :

Data presented in Table (4) indicated that the total loss includes loss in fruit weight due to desiccation and decay organisms. Results show clearly that during the two seasons of study, the loss in weight and total loss gradually increased as the shelf life period prolonged in two cultivars. Data show clearly that loss in weight was the main factor causing the highest loss percent of both cultivars during (3&6 days) shelf life period in two seasons, but at 9 days of shelf life decay % was the chief factor causing the highest loss (%) in both cultivars in two seasons. "Grand Nain" CV. had the highest value of loss in weight (%) and total loss(%) compared with "Williams" CV. in two years of study. The total loss (%) values ranged (25.85-32.57%) and (34.91-38.82%) for "Williams" and "Grand Nain" CVS. respectively after 9 days of shelf life in both seasons. From the obtained data it could be detected that both cultivars banana fruits could be held under room temperature for 6 days in good condition, since the total loss% values ranged (7.9-10.16%) after 6 days of shelf life. That means that "Williams" banana fruits gave the best results in this respect during the two seasons. The results go in

according with Abou-Aziz *et al* (1970) Robinson and Anderson (1982), Mahmoud (1996) and Ahmed (2001).

Table (4) : Weight loss(%), decay (%) and total loss (%) of "Williams" and "Grand Nain" banana cultivars stored at room Temperature (as shelf life) during seasons, 2003,2004 .

Properties / Cultivars	SSC (%)			Total acidity (%)			Total sugar (%)			Total starch (%)		
	03	04	M.	03	04	M.	03	04	M.	03	04	M.
Williams	4.5	5.0	4.75	0.21	0.20	0.205	4.2	4.4	4.30	20.9	21.7	21.30
Grand Nain	5.0	5.5	5.25	0.29	0.30	0.295	4.5	4.6	4.55	20.8	21.9	21.32
L.S.D 5%	0.133	0.051	-	0.008	0.005	-	0.120	N.S	-	N.S	N.S	-

2- Fruit firmness (lb/in^2) :

It is clear from Table (5) that the fruit firmness has a rapid decrease after 3 days of shelf life followed by a gradual and continual decrease with the progress of storage period for "Williams" and "Grand Nain" banana fruits at the two seasons of investigation. The firmness of banana finger , ranged between (11.5 to 1.5 lb/in^2) and (11.0 to 1.4 lb/in^2) for green and ripen banana of "Williams" and "Grand Nain" respectively. Results also, revealed that significant differences were found for fruit firmness of "Williams" and "Grand Nain" during shelf life period at first and second seasons. Hernandez *et al* (1993) noted that cultivars "Williams" and "Grand Nain" present a longer shelf life in terms of flesh firmness. These results are confirmed with reported by New and Marriot (1974) and Xue (1995).

3- Pulp /Peel ratio :

It is generally noticed from Table (5) that pulp/peel ratio showed a significant progressive and almost uniform trend of increase as shelf life for both cultivars during two seasons, to reach its maximum values at the end of shelf life period. Pulp/peel ratio for 3,6,9 days under room temperature, ranged between (1.88 to 3.10) and (2.13 to 3.19) for "Williams" and "Grand Nain" banana fruits respectively.

These results coincide with those found by Abou-Aziz *et al* (1970), Wasefand Nasreia (1990) and Ahmed (2001) who mentioned that, as banana ripen, the pulp/peel ratio increased.

4- Angulation percent-

From Table (5), the data show clearly angulation percent for "Williams" and "Grand Nain" banana fruits , gradually decreased with the advance in shelf life at room temperature during the two seasons of study. At the beginning of shelf life period (3 days) angulation (%), ranged between (7.5% to 8.7%) and (7.7% to 9.3%) for "Williams" and "Grand Nain" CVS. respectively, while at 9 day of shelf life angulation (%) ranged between (3.5% to 4.3%) and (2.9% to 3.1%) for "Williams" and "Grand Nain" CVS. respectively. That means that "Grand Nain" banana gave the best results in this respect in both seasons of study.

5- Fruit colour:-

Data in Table (5) showed colour development of banana fruits for "Williams" and "Grand Nain" CVS. during shelf life at both successive seasons. At the beginning shelf life period, fruit had colour score ranged (2.5 to 3.0) for both cultivars fruits, while, at 3 days of shelf life had colour score ranged from (4.0 to 4.5) for both cultivars fruits. Fruits reached score (5.5 to 6.5) at 6 days of shelf life. The fruits reached score 7 (yellow flecked with brown) after 9 days of shelf life. At the end of shelf life period, the fruits were excluded when they reached colour score 7 where the dark spots started to appear in both cultivars fruits.These results are in agreement with reported by Abou-Aziz *et al* (1970); Wasef and Nasreia (1990); Hernandez *et al* (1993) and Ahmed (2001).

6- Peel moisture percent:-

Data in Table (6) reported that the peel moisture% of both cultivars showed gradual decrease throughout the shelf life period at the two seasons. Also, the peel moisture% of banana fruits seemed to have an opposite trend of pulp moisture% during shelf life for " Williams" and"Grand Nain" CVS.

7- Pulp moisture percent:-

According to Table (6), it is clear that the pulp moisture% of" Williams" and "Grand Nain" banana fruits showed a slight increase as shelf life progress, reaching their maximum moisture percent after 9days of shelf life throughout the two successive seasons of investigation. This increase of pulp moisture content may be due to the immigrantion of water and other constituents from peel to the pulp. No significant differences between "Williams" and "Grand Nain" banana fruits were observed during shelf life period at first and second seasons of study.

These results are confirmed with those reported by Abou-Aziz *et al* (1970), New and Marriott (1974); Wasef and Nasreia (1990) and Ahmed (2001).

8- Soluble solids content (SSC) :

The results in Table (6) show that soluble solids content of "Williams" and "Grand Nain" banana fruits increased gradually and significantly with increasing shelf life periods, and reached the maximum values at the end of shelf life periods at the two seasons.

Although, two cultivars fruits ended their shelf life period after 9days, yet, fruits recorded the highest SSC values (20.0 to 21.6%).Moreover, "Grand Nain" banana fruits gave the highest SSC (21.5-21.6%), while "William" banana fruits gave the least SSC compared with

Grand Nain CV.These data are in line with those obtained by Abou-Aziz *et al* (1970), Patil and Hulmani (1998) and Ahmed (2001).

9-Total acidity :

The data in Table (6) clearly that during shelf life periods, acidity percent tended to fluctuate, since a tendency towards a gradual increase for both cultivars at the first season. On the contrary, acidity percent gradually decrease for both cultivars during shelf life periods at the second season.

Table (5) : Fruit firmness, pulp/peel ratio, angulation and fruit colour of "William" and "Grand Nain" banana cultivars stored at room temperature (as shelf life) during seasons, 2003,2004 .

Properties	2003 Season															
	Fruit firmness (lb/in^2)				Pulp/peel ratio				Angulation (%)				Fruit colour			
Cultivars	0	3days	6days	9days	0	3days	6days	9days	0	3days	6days	9days	0	3days	6days	9days
Williams	10.5	3.5	2.6	1.5	1.67	1.90	2.12	3.10	8.5	7.5	6.5	3.5	2.5	4.0	5.5	7
Grand Nain	11.0	3.3	2.2	1.4	1.90	2.20	2.30	3.19	8.2	7.7	5.6	2.9	2.5	4.5	6.5	7
L.S.D 5%	0.293	0.090	0.064	0.038	0.050	0.058	0.061	0.085	0.222	N.S	0.264	0.085	N.S	0.119	0.173	N.S
2004 Season																
Williams	11.5	4.0	2.9	1.9	1.66	1.88	2.36	2.70	9.90	8.7	5.7	4.3	2.5	4.5	6.0	7
Grand Nain	10.8	2.2	1.9	1.8	1.89	2.13	2.60	3.15	10.10	9.3	6.1	3.1	3.0	4.5	6.5	7
L.S.D 5%	N.S	0.216	0.172	N.S	0.144	0.162	0.199	0.239	N.S	N.S	N.S	0.270	0.270	N.S	N.S	N.S

Table (6) : Peel and pulp moisture (%), SSC(%) and acidity (%) of "William" and "Grand Nain" banana cultivars stored at room temperature (as shelf life) during seasons, 2003,2004 .

Properties	2003 Season															
	Peel moisture (%)				Pulp moisture(%)				SSC (%)				Acidity (%)			
Cultivars	0	3days	6days	9days	0	3days	6days	9days	0	3days	6days	9days	0	3days	6days	9days
Williams	85.5	83.3	80.5	79.5	72.2	72.5	73.0	73.5	5.0	10.5	18.0	20.0	0.21	0.28	0.34	0.35
Grand Nain	86.2	82.0	80.9	80.0	73	72.6	72.9	73.1	5.5	13.2	19.5	21.5	0.20	0.31	0.32	0.30
L.S.D 5%	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	0.146	0.355	0.518	0.57	0.005	0.008	0.009	0.009
2004 Season																
Williams	86.4	85.2	83.1	82.0	71.6	72.1	72.0	72.2	5.2	11.2	17.9	19.8	0.35	0.33	0.31	0.22
Grand Nain	84.9	83.2	81.3	79.8	72	71.8	72.4	72.9	5.3	12.5	18.6	21.6	0.37	0.32	0.30	0.29
L.S.D 5%	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	0.956	N.S	1.66	N.S	N.S	N.S	0.021

Fruit acidity of two cultivars increased their total acidity content from (0.21% to 0.35%) and (0.20% to 0.30%) after 9 days of shelf life for "Williams" and "Grand Nain" CVS. respectively at the first season, while fruit acidity decreased their total acidity content from (0.35% to 0.22%) and (0.37% to 0.29%) after 9 days of shelf life for "Williams" and "Grand Nain" CVS. respectively at the second season.Similar results were obtained by Abou-Aziz *et al* (1970) and Wasef and Nasreia (1990) and Ahmed (2001).

10-Total sugars :

According to Table (7), it could observed that the total sugars of "Williams" and "Grand Nain" banana fruits showed a gradual and highly significant increase from the beginning of shelf life up to 6 days, as it had high sugars values, then increased slowly at attain their maximum sugars content at the end of shelf life period in two cultivars fruits at both seasons.

Both cultivars fruits gave significant increase of sugar content throughout shelf life period. Moreover, "Williams" and "Grand Nain"banana fruits ended their shelf life after 9 days, since sugars content gave (19.50%&20.50%) and (20.10%&19.80%) for "Williams" and "GrandNain" CVS. respectively in both seasons. These results agree with those obtained by Kader *et al*(1994) and Ahmed (2001).

11-Total starch :

Data presented in Table (7)) clearly indicated that the amount of starch content in "Williams" and "Grand Nain" banana fruits decreased significantly as the advance in shelf life periods at two seasons of study. The rate of decreased continued as the shelf life periods advanced, reaching to their maximum values at the end of the shelf life period (9 days). The general trend of starch content ended to decrease sharply through 6 and 9 days of the shelf life for both cultivars at two seasons. At the beginning of the shelf life of banana, the total starch content ranged between (19.9% to 21.2%) in banana pulp fruits. While, at the completion of the shelf life (9 days), starch was almost completely hydrolysed with only (1.66% to 1.90%) remaining in the fully ripe fruits. These results are harmony with those reported by Abou-Aziz *et al*(1970); and Wasef and Nasreia (1990) and Ahmed (2001).

Table (7) :Total sugars and total starch of"Williams" and "Grand Nain" banana cultivars stored at room temperature (as shelf life) during seasons 2003,2004

Properties / Cultivars	2003 Season							
	Total sugars (%)				Total starch (%)			
	0	3days	6days	9days	0	3days	6days	9days
Williams	3.20	8.50	18.8	19.50	20.6	7.2	4.5	1.90
Grand Nain	4.00	8.10	17.9	20.10	21.2	9.8	4.6	1.80
L.S.D 5%	0.107	0.221	0.488	0.537	0.566	0.269	0.123	0.049
2004 Season								
Williams	4.20	9.50	15.9	20.50	19.9	7.8	3.3	1.70
Grand Nain	4.81	11.60	16.9	19.80	20.2	11.3	6.3	1.66
L.S.D 5%	0.366	0.871	N.S	N.S	N.S	0.825	0.445	0.131

From the above mention results it can be concluded that :

The Pseudo-stem of "Williams" CV. is taller than "Grand Nain" CV, but circumference of "Grand Nain" plants were increaser than "Williams" plants, therefore the plants of "Grand Nain" can be consided more stable at sand soil."Williams" and "Grand Nain" cultivars are similar in most fruit characteristics at harvest during two seasons of study.

Quality assessments and marketing evaluations did not reveal any major differences between the two cultivars fruits during shelf life periods. The data disclose that "Grand Nain" fruits showed the highest value of decay% and total loss% at the end of shelf life periods (9 days), therefore "Williams" banana fruits gave the best results in this respect during the shelf life at two seasons.

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تقييم صنفين من أصناف الموز النامية في أرض رملية تحت ظـــــروف الـــــري بالتنقيط من ناحية النمو الخضري و جودة الثمار و كفاءة التسويق .

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أجرى هذا البحث خلال موسمي ٢٠٠٣م&٢٠٠٤م بغرض تقييم سلوك صنفين من أصناف الموز وهما صنف ويليامز وصنف جراند نان نامية في أرض رملية وتحت نظام الري بالتنقيط بمحافظة البحيرة و شملت الدراسة النمو الخضري و جودة الثـــمار وكـــــــــفاءة التسويق.

أوضحت الدراسة أن نباتات الصنف جراند نان تمتاز بأنها أقل في الطول و قطر النبات أكثـر سـمكاً مـن نباتات الصنف ويليامز وهذا يجعل الصنف جراند نان أكثر ثباتاً ومقاومة الرياح في المناطق الرمليـة.عـدد الأوراق بالنبات وقت الجمع كان متقارب بين الصنفين إلا أن متوسط عدد الأوراق بالنبات للموسمين كـان أعلى في الصنف ويليامز عن الصـــــنف جراند نان. بخصوص صفات الـسوباطات كـان الـسوباطات أكثر وزناً في الصـــــنف جراند نان وأما طول السوباطات لم يكن هناك فرق بين الصنفين.وكـان عـدد الكفوف بالسوباطة في الصنف ويليامز أعلى من الصنف جراند نان.أمـا صـفات الأصـابع عنـد اكتمـال النمو(عند الجمع) فكانت الأصابع أكثر طولا و وزنا و حجماً في الصنف جراند نان عن الـصنف ويليـامز. ولكن صلابة الثمار كانت أعلى في الصنف ويليامز عن الصنف جراند نان. وبخـصوص وزن اللـب إلـى القشرة كان أعلى نسبياً في ثمار الصنف جراند نان عن ثمار الصنف ويليامز. أوضحت الدراسة أن الصفات الكيميائية للثمار عند اكتمال النمو أن الصنف جراند نان امتاز بارتفاع النسبة المئوية لكل من المواد الـصلبة الذائبة الكلية والحموضة والسكر و النشا عن الصنف ويليامز.

بخصوص الكفاءة التسويقية للثمار أوضحت الدراسة أن الثمار التي تم إنضاجها بغاز الأستيلين ثـم وضعت في جو الغرفة لمدة ٩ أيام كان الفقد الكلى في الوزن فـي نهايـة المـدة كـالأتي : (٢٥,٨٥ – ٣٢,٥٧%) & (٣٤,٩١ – ٣٨,٨٢%) لكل من الصنف ويليامز و جراند نان على التوالي. حيث يلاحـظ أن الصنف جراند نان أعطى أعلى نسبة في الفقد الكلى في الوزن بالمقارنة بالصنف ويليـامز خـلال موسـمي الدراسة. لذلك يعتبر الصنف ويليامز أكثر قدرة تسويقية من الصنف جراند نان. وكانت الثمار فـي أحـسن حالة لكلا الصنفين بعد ٦ أيام في جو الغرفة.