

## EFFECT OF HARVESTING TIME ON SOME CHEMICAL COMPONENTS OF SOME CARROT VARIETIES *Daucus carota*, L.

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### ABSTRACT

This investigation was carried out during 1994/ 1995 and 1995/1996 winter seasons in Mallawi Agricultural Research Station El-Minia Governorate, Egypt, to study chemical characters of carrot cv. Balady Selected and Chantenay Red Cored..

The experimental design was split plot with six replicates. Data of the two seasons were combined. The varieties treatments used occupied the main plots however, growth periods were in the sub plots.

Obtained results showed that:

- 1- Dry matter percentages of root and tops of Chantenay Red Cored were higher than those of Balady Selected, and they increased by increasing the plant age.
- 2- The Chantenay Red Cored had higher total soluble solids content in root comparing with Balady Selected.
- 3- Reducing, non-reducing sugars and total sugars contents of roots of Chantenay Red Cored and Balady Selected carrot varieties were found to increase as plant age advanced.
- 4- Anthocyanin pigment content in roots of Balady Selected carrot variety increased by increasing plant age.
- 5- Carotene pigment of Chantenay Red Cored root increased by plant aging.

### INTRODUCTION

Oil is being used for the flavoring of all kinds of food substitutes and the essential oil of carrot fruits is used in modern perfume compositions, preparation of alcoholic liquors and blending with many types of scents. Also oil of herb has an order and flavor differing from that of carrot (Gnether, 1962).

Toul and Popisilova (1963) presented that dry matter content of carrot is an important quality character as it influences processed product yield when carrot was canned or dehydrated. Also, Nour El-Din (1964) showed that the decrease in percentage of dry matter in the old roots (130 days after sowing) may be explained on the basis that the condensation of sugar results in an increase in the metabolic water.

The soluble dry matter and sugar contents in roots of carrot were highest in the Chantenay group and in some local varieties. Carrots with a

high dry matter content, over-wintered best (Kiss and Holly, 1965 and Riddis and Gillivray, 1966).

Fritz and Habben (1975) found that the percentage of dry matter of the roots increased remarkably with age. Also, Bajaj *et al.* (1980) found that dry matter content in roots of foreign carrot cultivars were greater than local cvs.

Bajaj *et al.* (1980) and Krarup & Mosnaim (1980) reported that there were varietal differences in dry matter content among the different carrot cultivars.

Abd El-Fattah and El-Bassyony (1987) showed that in respect to dry matter content, there were no significant differences among the different cultivars Balady and Chantenay cvs, (12.17 and 12.97 grams/100g. fresh weight), respectively. Such result is explained as Balady cv. is characterized by larger core than Chantenay one.

Abd El-Fattah and El-Bassyony (1987) demonstrated that no significant differences were detected in the total soluble solids percent among Chantenay, Nantes and Balady cultivars in the first season.

Abd El-Fattah and El-Bassyony (1987) found that the anthocyanin pigment of Balady carrot increased up to 24.37 mg/100g fresh Wt. in the first season whereas it reached 15.95 mg/100g fresh wt. in the 2<sup>nd</sup> season.

Abd El-Aal (1988) indicated that the dry matter percentage of the carrot root increased as the age of roots was increased till 115 days after sowing.

Jako (1962) found that high carotene and sugar contents as well as good root yield were found in the carrot variety Nantes. He added that the variety Baures Kieler Rote was distinguished by a high carotene content, 135 mg/100 grams dry matter and was therefore suitable for carotene production. Koralie carrot var. on the other hand is recommended for processing and infant feeding on account of its high sugar content.

Kiss and Holly (1965) and Habben (1972) stated that carotene in carrots was found to be a varietal property.

Sirtautajte (1968) found that carotene accumulated in carrots throughout the growing period, especially during the second part, and slowed down during maturation. Well matured roots contained more carotene than immature roots in which carotene synthesis continued during the early part of storage. In storage, mature roots lost more carotene comparing with immature roots. The carotene content was found to be at the highest level highest (in both at harvest stage or after long term storage in well matured roots, i.e. in autumn or winter sown crops. Early sowing in spring resulted in higher carotene content comparing with the later sowing. He added that well matured roots contained more carotene than immature roots.

Bradley and Dyck (1968) indicated that the age of root differences in colour mainly reflected differences in concentrations of pigment. Good colour was obtained under field temperatures averaging below 60° F. Under such conditions the total carotene was lower, but there was maximum shift to carotene production.

Bradley and Rhodes (1969) stated that number of lines showed seasonal interaction in colour, with better colour in the cool season, while

others showed consistently fair or poor colour in both growing seasons. No single pigment was highly correlated with colour across the range of environmental and genetic diversity encountered in the study. Carotene was the only single component showing a significant positive correlation with colour. The highest multiple relationship with colour considered carotene, other carotenoids except  $\beta$ -carotene and xanthophylls. Within a season this multiple correlation accounted for 47 to 50 % of the colour variance ( $R = 0.710$  spring and  $0.686$  autumn grown carrots).

Malieva (1972) reported that the carrot root of Chantenay contained the highest carotene content (38.3 mg/kg roots.).

Habben (1972) reported that the carotene content of carrot was highly affected by variety and plant age.

Toul (1974) stated that the carotene content of the Chantenay cv. averaged 19.8 mg/100g fresh weight. The carotene and total sugar contents were high in carrots grown at low elevations of southern area in Czechoslovakia with high temperatures during the growing season. Growing the seed in different ecological localities affected the carotene and sugar contents of the roots produced.

Bajaj *et al.* (1980) found that the  $\beta$ -carotene content was great in local cvs. than foreign cvs.

Toul, *et al.* (1986) showed that the carotene content was generally higher in late September than in early August. On the first sampling date, the cv. Karotina had the highest carotene content (16.34 mg/100g) and Olympia the lowest (1.49 mg/100g), the average being (5.8 mg/100g). Rondo Pariser had the highest carotene content (15.35 mg/100g), Campestra the lowest (4.28 mg/100g) and the average was 8.75 mg/100g.

Abd El-Fattah and El-Bassyony (1987) observed that the Chantenay cv. did not significantly differed from Nantes cv. in carotene or Vitamin A contents.

Abd El-Aal (1988) indicated that the cultivar Chantenay Red Cored some what intermediate situation at harvest time, with some overlap in early stages and he added that the carotene content in the cultivar Chantenay Red Cored increased with age until 115 days after sowing, this was followed with no remarkable changes in both seasons.

Evers (1989) showed that the carotene content increased with the length of the growing season.

Hussein *et al.* (1989) found that the total carotene content of Chantenay and Tip Top did not significantly differ.

Heinonen (1990) mentioned that the amounts of the predominant carotenoids, and  $\beta$ -carotenes, ranged from 2200 to 4900 and 4600 to 10300 (g/100 grams fresh weight, respectively. He added that the amount of provitamin A ( $\beta$ -carotene) in carrot cultivars was between 1200 and 2300 (g/100 grams fresh weight, which is high enough to satisfy the human daily vitamin A requirement.

Toul and Popisilova (1963) mentioned that the total sugar contents had differed in carrots due to varieties.

Bajaj, *et al.* (1980) found that the average of, the reducing and non-reducing sugars in carrot root were greater in foreign cv. than in local cvs.

Yano, *et al.* (1981) found that the sugar content of carrots was mainly influenced by the cv. and the date at which they were harvested. Soil type and maturity at harvest affected the carrot sugar contents to a lesser extent. They added that the winter harvested plants contained more Glucose, Fructose, Sucrose and free sugar than those harvested at any other season.

Abd El-Fattah and El-Bassyony (1987) reported that the reducing sugars of Balady and Chantenay did not differ.

Abd El-Aal (1988) stated that the reducing sugar percentage of Chantenay Red Cored ranked last. On the contrary, Chantenay Red Cored showed the highest percentage of non-reducing sugar in both seasons. There were no remarkable differences in total sugars between Chantenay and Nantes Strong Top cultivars. He added that the reducing sugar percentage was noted with advancement of root age until 100 days, followed by remarkable decrease in the non-reducing sugar percentage and increased up to the last sampling date (130 days after sowing).

Zdravkovic (1989) showed that the cultivars Chantenay Rex and three others varieties had a higher carbohydrate content at early stage and their carotene was higher.

The aim of this investigation was to study chemical characters of carrot cv. Balady Selected and Chantenay Red Cored.

## **MATERIALS AND METHODS**

This investigation was carried out during 1994/1995 and 1995/1996 winter seasons in Mallawi Agricultural Research Station El- Minia Governorate, Egypt. The soil type was loamy clay. Two varieties of carrot (Balady Selected and Chantenay Red Cored) were used in this investigation. Seeds of carrot cv. Balady selected used in this study were obtained from Dept. of Hort., Assuit Univ. However, seeds of carrot cv. Chantenay Red Cored were obtained from Ohsens Enke-Denmark Co. Varieties were sown in 15<sup>th</sup> of September in the two seasons of 1995 and 1996. Plants of the two varieties were harvested at six growth periods. The growth periods were 60, 75, 90, 105, 120 and 135 days after sowing. The experimental design was split plot with six replications. The varieties occupied the main plots whereas the six growth periods of carrot plants occupied the subplots. Each subplot consisted of six ridges, 3 m long and 60 cm between ridges (1/333.33 of feddan). The plants were thinned to 5 cm. Normal cultural practices of fertilization and irrigation as well as pest control were followed according the recommendation of Ministry of Agricultural. The samples were taken, 15 days interval when plant age ranged from 60 to 135 days from sowing. Ten plants were randomly taken from each plot, a piece from the middle of the each root was taken and grated. The samples from the ten roots were mixed and used for the determination of the following parameters:

- 1- Dry matter percentage of root.
- 2- Dry matter percentage of top.

10 grams from the roots samples were finely sliced and dried in an electric oven at 75 °C for 24 hours then later raised to 105 °C for two hours till reaching the constant weight as described in A.O.A.C (1990)

**3- Total soluble solids (TSS):**

TSS were determined by Hand Sugar Refractometer model WYT-

**4-Soluble carbohydrates (Reducing, Non-reducing and total sugars percentages):**

Reducing sugars and total sugars were determined by Lane and Eynone volumetric method as described in A.O.A.C. (1980), while non-reducing sugars (sucrose) was estimated by subtracting reducing sugars from total sugars percentage.

**5 - Anthocyanin pigment:**

Ten roots were halved and small piece was taken from each half, grated and put in a freezer till starting determination of anthocyanin content. Anthocyanin pigment was determined according to the method described by Francis (1957) and Ranganna (1997).

**6 - Carotene pigment:**

The sampling method which used in the determining anthocyanin pigment was followed to determine carotenoids concentration in the carrot root. The carotenoids were determined as (carotene) by using the method mentioned by Booth, 1957; Goodwin, 1965; Laferriere and Gabelman, 1968.

**Carrot seeds production:**

A) Chantenay seeds production procedurs were conducted according to the method used Abdel -AZIZ (1991).

B) Balady seeds production:- They were produced locally from selected plants of this cultivar and planted the stecklings on rows.

**Statistical analysis:-**

Data were subjected to statistical analysis according to Steel and Torrie (1982) and treatments were compared using L.S.D 5% test.

## **RESULTS AND DISCUSSION**

**Chemical characteristics:**

**1- Dry matter percentage in carrot roots:**

Dry matter percentage in Chantenay Red Cored roots was 11.53 % whereas it was 9.25 % in of Balady Selected roots (Table 1).

The interaction of variety x growth period was significant. Both varieties used gave the highest dry matter contents at the age of 135 days. The increase in dry matter content of Balady Selected roots were slight from 120 to 135 days growth period were slight.

**2- Dry matter percentage in carrot tops:**

Chantenay Red Cored foliage had higher percentage of dry matter content than that of Balady Selected. It was 17.8 and 15.63 % for chantenay Red cord and Balady selected varieties, respectively (Table 2). The dry matter content of the foliage increased in both varieties gradually to the last growth period.

The interactions between varieties and growth period were significant. In general, a slight gradual increase could be observed in the dry matter percentage of roots and top plant as well as with the advance in age starting from 60 days after sowing up to 135 days where the values reach maximum values. Such a trend is applicable in both varieties. On the other hand the dry matter percentage of roots and top plants of Chantenay Red Cored variety was slightly higher than that of Balady Selected. The previously mentioned results matched with those obtained by Kiss and Holly (1965), Fritz and Habben (1975), Bajaj *et al.* (1980); Abd El-Fattah and El-Bassyony (1987) and Abd El-Aal (1988).

Table 1: Mean values of the dry matter percentage of carrot roots for Balady Selected and Chantenay Red Cored varieties during six harvesting time in 1994/1995 and 1995/1996 winter seasons.

A- Effect of variety:

Variety	Seasons	
	1994 / 95	1995 / 96
Balady selected	9.47	9.03
Chantenay red cored	11.40	11.67

B- Effect of harvesting time:

Harvesting time (days)	Seasons	
	1994 / 95	1995 / 96
60	8.63	8.73
75	9.30	9.26
90	9.93	9.80
105	10.53	10.53
120	11.75	11.62
135	12.45	12.15

C - Interaction between variety and harvesting time

Variety	Harvesting time (days)	Seasons		Means
		1994/95	1995/96	
Balady Selected	60	8.68	8.25	8.47
	75	8.90	8.45	8.68
	90	9.23	8.80	9.01
	105	9.59	9.30	9.45
	120	9.97	9.59	9.78
	135	10.42	9.77	10.09
Means		9.47	9.03	9.25
Chantenay Red Cored	60	8.57	9.21	8.89
	75	9.69	10.07	9.88
	90	10.63	10.80	10.72
	105	11.47	11.75	11.61
	120	13.53	13.65	13.59
	135	14.48	14.52	14.50
Means		11.40	11.67	11.53
Means		10.43	10.34	

Coefficient of variation = 3.37 %      4.32%  
 F-test Variety (V) = .  
 LSD 5% harvesting time (G) = 0.12      0.15  
 LSD 5% VxG = 0.28      0.31  
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**Table 2: Mean values of the dry matter percentage of carrot tops for Balady Selected and Chantenay Red Cored varieties during six harvesting time in 1994/1995 and 1995/1996 winter seasons.**

**A- Effect of variety:**

Variety	Seasons	
	1994 / 95	1995 / 96
Balady selected	14.77	16.49
Chantenay red cored	16.29	17.14

**B- Effect of harvesting time :**

harvesting time (days)	Seasons	
	1994 / 95	1995 / 96
60	12.61	17.02
75	13.87	15.05
90	15.28	15.56
105	16.56	17.97
120	18.64	19.02
135	17.96	17.56

**C - Interaction between variety and harvesting time**

Variety	Harvesting time (days)	Seasons		Means
		1994/95	1995/96	
Balady Selected	60	12.35	17.55	14.95
	75	12.82	15.48	14.15
	90	13.38	14.00	13.69
	105	15.02	16.93	15.98
	120	16.92	17.67	17.29
	135	18.12	17.33	17.73
Means		14.77	16.49	15.63
Chantenay Red Cored	60	12.87	13.17	13.02
	75	14.93	14.62	14.78
	90	17.18	17.13	17.16
	105	18.10	19.02	18.56
	120	20.37	20.37	20.37
	135	23.40	22.47	22.93
Means		17.81	17.79	17.80
Means		16.29	17.14	

Coefficient of variation = 4.80 %      4.2%  
 F-test Variety (V) = .  
 LSD 5% harvesting time (G) = 0.48      0.51  
 LSD 5% VxG = 0.65      0.63

**3- Total soluble solids in carrot roots (TSS):**

It is clear from the data shown in Table (3) that the total soluble solids (TSS) were gradually increased by the advance in age along the different growth periods (i.e. 60, 75, 90, 105, 120, and 135 days after sowing respectively). Such observed trend is applicable for the two varieties of Balady Selected and Chantenay Red Cored in both seasons of 1994/95 and

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1995/96 respectively. The maximum values were found in the last periods, 8.4 % and 8.72 % for Balady Selected, 11.08 and 11.15 for Chantenay Red Cored in both seasons respectively. Chantenay Red Cored had more significant TSS than Balady selected. TSS in Chantenay was 9.98 %, whereas it was 7.58 % in Balady selected.

TSS increased in carrot roots gradually in both varieties reaching a maximum value in 135 days growth period.

The interaction between Variety and growth period was significant. The sweetest roots were observed were in those of Chantenay Red Cored in 135 days growth period. Such obtained results agree with those obtained by Riddls and Gillivray (1966) and Abd El-Fattah and El-Bassyony (1987)

#### **4- Soluble carbohydrates**

##### **4- 1 - Reducing sugars percentage in roots:**

The data in Table (4) show the changes of reducing sugars in roots in six growth periods. Obtained results indicate that the reducing sugars contents increased gradually as the growth period increased, such increases were of high significant values within the growth periods. The maximum value was that of the last growth period (135 days after sowing). Such a trend is applicable for the two varieties Balady Selected and Chantenay Red Cored in both seasons.

The Chantenay Red Cored var. had high significant values than Balady Selected one. Reducing sugars percentage in Chantenay Red Cored was 1.326 % but it was 0.943 % in Balady Selected.

The interactions variety x growth periods was significant.

##### **4- 2- Non-Reducing sugars percentage in roots:**

Data of Table (5), showed that there were gradually significant increases in the non-reducing sugars with the advance in the growth period in both seasons.

Chantenay Red Cored had significant values of non-reducing sugars more than Balady Selected. The highest non-reducing sugars were obtained in Chantenay Red Cored cultivar (1.92%) while the Balady Selected was the least (1.63%).

The 60 and 75 growth periods in Balady Selected cultivar were of higher values than those in Chantenay Red Cored. On the other hand, the other growth periods starting from 90 days in Chantenay Red Cored were higher of non-reducing sugar content than the Balady Selected one.

The interactions variety x growth periods was significant.

##### **4-3- Total sugars percentage of roots:**

Data shown in Table (6), clearly show that the changes in total sugars percentages in the root of Balady Selected and Chantenay Red Cored in both seasons followed a similar trend as that of reducing and non-reducing



**Table 3: Mean values of the total soluble solids percentage of carrot roots for Balady Selected and Chantenay Red Cored varieties during six harvesting time in 1994/1995 and 1995/1996 winter seasons.**

**A- Effect of variety:**

Variety	Seasons	
	1994 / 95	1995 / 96
Balady selected	7.53	7.62
Chantenay red cored	8.74	8.82

**B- Effect of harvesting time :**

harvesting time (days)	Seasons	
	1994 / 95	1995 / 96
60	7.72	7.67
75	8.17	8.19
90	8.59	8.40
105	9.01	9.01
120	9.27	9.49
135	9.74	9.94

**C – Interaction between variety and harvesting time**

Variety	Harvesting time (days)	Seasons		Means
		1994/95	1995/96	
Balady Selected	60	6.67	6.58	6.63
	75	7.71	7.10	7.13
	90	7.42	7.47	7.44
	105	7.60	7.77	7.68
	120	7.95	8.07	8.01
	135	8.40	8.72	8.56
Means		7.53	7.62	7.58
Chantenay Red Cored	60	8.67	8.75	8.71
	75	9.17	9.27	9.22
	90	9.75	9.80	9.78
	105	10.42	10.25	10.33
	120	10.58	10.90	10.74
	135	11.08	11.15	11.12
Means		9.94	10.02	9.98
Means		8.74	8.82	

Coefficient of variation = 3.35 %      3.47%  
 F-test Variety (V)                      \*\*                      -  
 LSD 5% harvesting time (G)           = 0.13                      0.11  
 LSD 5% VxG                                = 0.25                      0.23

**Table 4: Mean values of the reducing sugars percentage in carrot roots for Balady Selected and Chantenay Red Cored varieties during six harvesting time in 1994/1995 and 1995/1996 winter seasons.**

**A- Effect of variety :**

Variety	Seasons	
	1994 / 95	1995 / 96
Balady selected	0.873	1.012
Chantenay red cored	1.286	1.367

**B- Effect of harvesting time :**

Growth period (days)	Seasons	
	1994 / 95	1995 / 96
60	0.397	0.395
75	0.505	0.624
90	0.639	1.01
105	1.092	1.21
120	1.758	1.718
135	2.189	2.047

**C - Interaction between variety and harvesting time**

Variety	Harvesting time (days)	Seasons		Means
		1994/95	1995/96	
Balady Selected	60	0.222	0.422	0.322
	75	0.300	0.755	0.528
	90	0.370	0.970	0.670
	105	1.022	1.068	1.045
	120	1.348	1.255	1.302
	135	1.978	1.603	1.791
Means		0.873	1.012	0.943
Chantenay Red Cored	60	0.372	0.367	0.369
	75	0.710	0.728	0.719
	90	0.907	1.050	0.978
	105	1.162	1.385	1.273
	120	2.167	2.180	2.173
	135	2.400	2.490	2.445
Means		1.286	1.367	1.326
Means		1.080	1.189	

Coefficient of variation = 9.24 %      7.98%  
 F-test Variety (V) = .  
 LSD 5% harvesting time (G) = 0.060      0.58  
 LSD 5% VxG = 0.085      0.91

**Table 5: Mean values of the non-reducing percentage in carrot roots for Balady Selected and Chantenay Red Cored varieties during six harvesting time in 1994/1995 and 1995/1996 winter seasons.**

**A- Effect of variety :**

Variety	Seasons	
	1994 / 95	1995 / 96
Balady selected	1.531	1.726
Chantenay red cored	1.713	2.118

**B- Effect of harvesting time :**

Growth period (days)	Seasons	
	1994 / 95	1995 / 96
60	0.606	0.808
75	0.946	1.076
90	1.101	1.253
105	1.577	1.891
120	2.274	2.968
135	2.929	3.537

**C - Interaction between variety and harvesting time**

Variety	Harvesting time (days)	Seasons		Means
		1994/95	1995/96	
Balady Selected	60	0.553	0.925	0.740
	75	0.985	1.068	1.027
	90	1.065	1.165	1.115
	105	1.698	1.583	1.641
	120	2.150	2.318	2.234
	135	2.733	3.293	3.013
Means		1.531	1.726	1.628
Chantenay Red Cored	60	0.658	0.690	0.674
	75	0.907	1.083	0.995
	90	1.137	1.338	1.237
	105	1.455	2.198	1.827
	120	2.398	3.618	3.008
	135	3.725	3.780	3.752
Means		1.713	2.118	1.916
Means		1.622	1.922	

Coefficient of variation = 5.05 %      4.0%  
 F-test Variety (V)                      \*                      \*  
 LSD 5% harvesting time (G)            = 0.052              0.055  
 LSD 5% VxG                                = 0.073              0.071

**Table 6: Mean values of the total sugars percentage of carrot roots for Balady Selected and Chantenay Red Cored varieties during six harvesting time in 1994/1995 and 1995/1996 winter seasons.**

**A- Effect of variety :**

Variety	Seasons	
	1994 / 95	1995 / 96
Balady selected	2.407	2.739
Chantenay red cored	2.999	3.487

**B- Effect of harvesting time :**

Growth period (days)	Seasons	
	1994 / 95	1995 / 96
60	0.911	1.206
75	1.285	1.816
90	1.739	2.262
105	2.669	3.118
120	4.032	4.688
135	5.419	5.587

**C – Interaction between variety and harvesting time**

Variety	Harvesting time (days)	Seasons		Means
		1994/95	1995/96	
Balady Selected	60	0.792	1.348	1.070
	75	1.285	1.82	1.554
	90	1.435	2.135	1.785
	105	2.720	2.652	2.686
	120	3.498	3.577	3.537
	135	4.712	4.897	4.804
Means		2.407	2.739	2.573
Chantenay Red Cored	60	1.030	1.063	1.047
	75	1.617	1.812	1.714
	90	2.042	2.388	2.215
	105	2.617	3.583	3.100
	120	4.565	5.798	5.182
	135	6.125	6.277	6.201
Means		2.999	3.487	3.243
Means		2.703	3.113	

Coefficient of variation = 2.91 %      3.11%  
 F-test Variety (V) \*      \*\*  
 LSD 5% harvesting time (G) = 0.049      0.051  
 LSD 5% VxG = 0.069      0.071

sugars in this concern. Chantenay Red Cored had significant and higher values of total sugars than Balady Selected. The total sugars contents in roots Chantenay Red Cored and Balady Selected cultivars were 3.24% and 2.27% as mean of the two seasons respectively.

There were significant differences among the different growth periods with regard to total sugars percentage in roots. The two varieties gave higher values of total sugars percentage in 135 days growth periods after

sowing. While, all growth periods of Chantenay Red Cored were of higher values than Balady Selected excepte in the first growth period.

The difference of total sugars percentage between the two seasons was significant. The percentage of total sugars were 2.70% and 3.11% in the 1<sup>st</sup> and 2<sup>nd</sup> seasons respectively.

Obtained results of soluble carobhydrate fractions (i.e. reducing, non-reducing and total sugars) could be supported by those by Toul and Popisilova (1963), Yano *et al.* (1981), Abd El-Aal (1988) and Zdravkovic (1989).

**5- Total anthocyanin in carrot root of Balady Selected:**

Results of Table (7) showed the changes in total anthocyanin pigment in the root of Balady Selected during six growth periods. Significant gradual increments could be observed in the six growth periods was higher. Such increments were significant between each other. The highest value was noticed at the last growth period (90 days).

Anthocyanin pigment in Balady Selected in the second season was significantly higher than the first season.

The results obtained for Balady Selected variety go parallel with those obtained by Abd El-Fattah and El-Bassyony (1987) and Abdel Aziz (1991).

**Table 7: Mean values of the Anthocyanin pigment (mg/100g fresh weight) of carrot root for Balady selected variety during six harvesting time in 1994/1995 and 1995/1996 winter seasons.**

Harvesting time (days)	Seasons		Means
	1994 / 95	1995 / 96	
60	12.4500	15.1333	13.7917
75	15.5667	16.9667	16.2667
90	21.066	20.0833	20.5750
105	23.8333	23.7500	23.7917
120	35.5000	41.7000	38.6000
135	48.2667	53.8667	51.0667
Means	26.1139	28.5833	

Coefficient of variation = 0.911 % 1.1%

LSD 5% harvesting time (G) = 0.901 0.911

**6-The carotene pigment of carrot root of Chantenay Red Cored :**

Data of Table (8) shows the carotene content in Chantenay Red Cored variety as affected by the growth period during the two seasons of 1995 and 1996 respectively. It was clear that the carotene content in Chantenay Red Cored was gradually increased by the advance in the growth period up to the six one (90 days). The carotene was significant during the six growth periods. The higher values were obtained in the last growth period.

It can be mentioned that the first season was significantly of higher values than the second one. The obtained values of carotene pigment in Chantenay Red Cored were 3.43306 and 3.80750 mg/g fresh weigh in 1994/1995 and 1995/1996 respectively.

The obtained results are in agreement with those of Kiss and Holly (1965), Sirtautajte (1968), Bradley and Rhodes (1969), Habben (1972) and Malieva (1972).

The dry matter percentage in roots of Balady selected and Chantenay Red cored were 9.25 % and 11.53 %, respectively. Total soluble solids and sugar percentage values follow the same trend as that of dry matter percentage, as they were higher in roots of Chantenay Red Cored than in Balady Selected ones. The dry matter percentages were 9.98 % and 7.58% in Chantenay Red Cored and Balady Selected respectively.

The total sugars percentage in carrot roots was 3.2423 % in Chantenay Red Cored While it was 2.573 % in Balady Selected.

The anthocyanine pigment (mg/100g fresh weight) increased with the increase in plant age and it was higher in the second season than in the first season. Such a determination was carried out only for the Balady Selected because it belongs to the anthocyanin group of carrot varieties.

The total carotenoids were determined in Chantenay Red Cored and were higher in the second season than in the first one as well as they were increased gradually with the increase in plant age. This coincides generally with the findings of Sirtautajte (1968), Bradley and Rhodes (1969), Habben (1972), Bajaj *et al.* (1980), Abd El- Fattah and El-Bassyone (1987) and Evers (1989).

**Table 8: Mean values of the carotene pigment (mg/100g fresh weight) of carrot root for Chantenay Red Cored variety during six harvesting time in 1994/1995 and 1995/1996 winter seasons.**

Harvesting time (days)	Seasons		Means
	1994/95	1995/96	
60	1.53500	1.75833	1.64667
75	2.06667	2.32000	2.19333
90	2.66000	2.90000	2.78000
105	3.12500	3.48000	3.30250
120	5.23333	5.93667	5.58500
135	5.97833	6.45000	6.21417
Means	3.43306	3.80750	
Coefficient of variation	= 0.043 %	0.052%	
LSD 5% harvesting time	= 0.12609	0.13110	

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#### تأثير مواعيد الحصاد على بعض المكونات الكيميائية في بعض أصناف

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أجرى هذا البحث خلال الموسمين الشتويين لأعوام ١٩٩٤/١٩٩٥ و ١٩٩٥/١٩٩٦ في محطة لبحوث الزراعية بملوى - محافظة المنيا- مصر. ويهدف البحث إلى دراسة وتقييم الصفات الكيميائية لصفى الجزر البلدى المنتخب والشتتاي رد كورد. أقيمت التجربة في تصميم القطع المنشقة مرة واحدة في ٦ مكررات. وضعت الأصناف في القطع الرئيسية والأعمار في القطع المنشقة. ويمكن تلخيص النتائج فيما يلي:-

- ١- ارتفاع نسبة المادة الجافة في الجذر والعرش للصف شنتتاي رد كورد عن البلدى المنتخب. وزيادة المادة الجافة للجذر والعرش بزيادة عمر النبات.
- ٢- تفوق المواد الصلبة الكلية في الجذر للصف شنتتاي رد كورد مقارنة بالصف البلدى المنتخب.
- ٣- السكريات المختزلة والغير مختزله والسكريات الكلية في الجذر لصف شنتتاي رد كورد زادت نسبتها عن نظيرتها في البلدى المنتخب. وتزداد بزيادة النبات في العمر.
- ٤- توجد صبغه الأنثوسيانين في جذور الصف البلدى المنتخب وتزداد الصبغة بزيادة النبات في العمر.
- ٥- توجد صبغه الكاروتين في جذور صف شنتتاي رد كورد وتزداد كميتها كلما ازداد تقدم النبات في العمر.