J. Agric. Sci. Mansoura Univ., 28 (3):2063 - 2097, 2003

EFFECT OF POTASSIUM FERTILIZER LEVELS ON BABY CARROT GROWTH AND STRORAGEABILITY

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ABSTRACT

Two baby carrot varieties,i.e., Babette and Mini express were planted at the Experimental Research Farm,Faculty of Agriculture, Suez Canal University during 1999/2000 and 2000/2001 seasons, to study the effect three potassium fertilizer levels, i.e. 0.0, 150 & 300 kg. /fed.on growth characters, total yield and its components and storageability of carrot roots

Results showed that, Mini express cv was higher than Babette cv in weight of whole plant and root fresh weight . While. Babette was higher than Mini express variety in root length . Mini express was smaller than Babette in core diameter , core diameter/ root diameter ratio and dry matter content. Increasing potassium fertilizer levels from (150 to 300 kg./fed.) increased foliage height , weight of the whole plant ,root fresh weight , root weight/plant weight ratio , root length ,root diameter , core diameter , core diameter /root diameter ratio as well as dry matter content. So high potassium fertilizer level i.e. 300kg./fed. decreased fiber content which means high quality of baby carrot roots . Potassium fertilizer up to (300kg./fed.) produced the highest total whole yield ,total root yield , net weight percent, marketable yield and marketable root ratio.

In storageability study Babette variety being higher in appearance than Mini express variety. Also, Babette variety tended to be higher than Mini express in carotene content and vitamin A .In spite of that there were no significant differences between both of the tested varieties in weight loss, reducing and total sugar content .

Addition potassium fertilizer up to (300kg./fed.) ,resulted in lowest weight loss percent ,as well as decay percent and texture value that means (good root quality).

INTRODUCTION

As for baby carrots (*Daucus carota* L.), they are special varieties of carrot ,grown for mini-carrots .These varieties are grown close together ,resulting in smaller ,more tender carrots ,which need only 120 days ,till harvest instead of 140-150 days in other varieties .In general ,carrots is an excellent source of B-carotene ,the presource of Vitamin "A". Carrots are also good source of carbohydrates and minerals for example calcium , phosphorous ,iron and magnesium .

With respect to baby carrots ,a uniform smooth ,non-branched, good colour and flavoured roots are referred through investigating the response of baby carrots to potassium fertilizer .

Postharvest handling operation for baby carrot is relatively simple ,but require precooling and cold storage facilities to prevent quality losses and to minimize mechanical damage during handling ,until the product reaches the market .

Sangakkara (1990) pointed out the beneficial role of K in improving growth, may be due to its possible role in plant metabolism including the activation of large group of enzymes and the major role of potassium in protein synthesis . Sharangi and Paria(1995) stated that, shoot growth and root diameter increased with increasing rate of K. Fresh market carrots are harvested when they reach ¾ to 1¼ inch in diameter. Baby or mini carrots are not allowed to exceed ¾ in diameter and ¼ to ½ inch in diameter is preferred (Douglas,1998) .

Dry matter content increased during the growth of carrots especially during the period of most intensive carrot growth (Fritz and Habben 1977). Hole *et al.* (1987) showed that the higher root yields tended to be associated with larger shoots.

Carrot yields responded positively to direct potassium application and the application of K improved the N% and helped in translocation of N whenever was available to plant (Prabhakar *et al.* ,1987; Lasztity ,1989 and Dahdouh ,1999) .

Eppendorfer and Eggum(1995) reported that fibre content was only slightly affected by N,P,S,K, Ca and water. Also, Elkner *et al.* (1998) pointed out that roots of late cultivars of carrot had a better fibre composition than those of early cultivars.

Shibairo *et al.* (1997) showed that moisture loss was significantly greater when carrots were stored at low relative humidity (RH) compared to high RH. Moisture loss differences among cultivars were mainly associated with the specific surface area of the root. Shibario *et al.* (1998) mentioned that increase in K concentration in the nutrient medium decreased postharvest moisture loss. Berg *et al.* (1966) revealed that high temperature (37-39°F) increased sprouting and reduced table quality . El-Bassyony(1983) found highly significant effect of carrot cultivars, age on TSS/ acid ratio. Lee (1986) and Toul *et al.* (1986) mentioned that the provitamin A carotene content of carrots increased up to 3 weeks before harvest time , and then decreased ,during storage at 2°C and 90 % relative humidity. Fleury *et al.*(1994) showed that differences in carotene content between the cultivars could largely be explained by the different development stages at which carotene was stored. Watanabe and Takagi(2000) showed that carotenoid was higher in the cortex compared with those in core tissue. Utsun *et al.* (1990) and Dily *et al.* (1994) pointed out that at the end of six months, there was a decrease at the total sugar, sucrose and ascorbic acid and an increase in the invert sugar content .

The aim of this work was to study the effect of potassium fertilizer on growth and quality features of tow baby carrot cvs.

MATERIALS AND METHODS

Field experiments were carried out at the Agricultural Experi-mental Station of the Faculty of Agriculture, Suez Canal University, Ismailia Governorate during 1999 – 2000 and 2000 - 2001.

The experiments were designed as a split plot design with four replicates. Each replicate consisted of two baby carrot varieties named "Babtte" and "Mini Express" which were placed in the main plots and three potassium fertilizer levels i.e , zero,150 and 300 kg./fed. which were placed in the sub plot .the plot area was 8 m^2 , carrots seeds were sown at 8 October in 1999 – 2000 and 2000 - 2001 . All plots were uniformly irrigated and other recommended agricultural practices for commercial carrot production were followed:

Studied traits:

After 8 tell 13 weeks from sowing date the followed character were studied:

Root and foliage length (cm), root and core diameter (cm) root weight , whole plant weight (gm), dry matter content and ratio of bcth root / plant weight and core / root diameter.

Yield and its components at harvesting time:

Total whole yield Ton/Fed.

Total root yield Ton/Fed.

$$\text{Net weight \%} = \frac{\text{Total root yield}}{\text{Total whole yield}} \times 100$$ (EL-Bassiouny1983).

Marketable yield (kg/fed.)

Marketable root ratio, calculated according to the formula :

$$\text{Marketable root} = \frac{\text{Marketable root yield}}{\text{Total root yield}} \times 100$$

Non –Marketable yield (Kg/Fed.): consisted of

Malformed (Ton/Fed.).

Small sized (Ton/Fed.).

Cracked (Ton/Fed.).

Splited (Ton/Fed.).

Storageability :

Storage experiments were carried out at the Vegetable Handling Department, Agriculture Research Center. Marketable baby carrot root samples were harvested from the field at the early morning and washed several times by tap water followed by washing in 150 ppm chlorated water. The samples were then allowed to dry. Baby carrot roots were selected and then placed in small trays(500gm), wrapped with transparent stretch film of 0.09 micron thickness ,labeled ,weighted and placed in carton boxes which consisted of 4 replicates .Root samples were used for evaluation at zero day then stored either at 0°C and room temperature 22°c $\pm$ 2. Samples were taken weekly after storage date. Root samples for both cold storage and room temperature were weekly tested to determine the changes in physical and chemical characters as follows:-

Physical and visual quality:-

Weight loss percentage . Decay %

Appearance (visual quality). Texture

Chemical characters:-

Total soluble solids (TSS) was measured with hand refractometer.

Total acidity; was determined by titration of the blend flesh with 0.1 N solution of NaOH using phenolphthaline as indicator. The results were calculated as citric acid content(A.O.A.C., 1975).

T.S.S/Acid ratio:

$$= \frac{\text{T.S.S}}{\text{Total cidity}} \times 100$$

Carotene content and VitaminA; the carotene content was multiplied by 1667 to find international units/100 gm. (A.O.A.C., 1975).

Sugar content:

Sugar content was determined as mentioned by Forsee (1938).

Fibre content (%); it was determined according to the A.O.A.C.(1975)

Statistical Analysis:

Data were, statistically, analysed according to Snedecor and Cochran (1989).The treatment means were compared according to the New L.S.D. test as prescribed by Waller and Duncan (1969).

RESULTS AND DISCUSSION

Growth character:

Obtained data in Tables (1-a and b) show that there were significant differences between Babette and Mini express varieties in whole plant fresh weight and root fresh weight in both growing seasons except root weight /plant weight ratio in the first season at harvest date.

Concerning root length, it could be noticed that Babette variety gave the highest value followed with significant differences by Mini express only in the second season, while the variety Mini express resulted the smallest core diameter, core diameter / root diameter ratio as well as total dry matter content without significant differences with Babette var. Obtaine data are in similer trend to those reported by fritz and hàbben (1977).

The variability between the two baby carrot varieties might be due to the heredity differences and to variation in nutrient use efficiency. These differences in root diameter may be due to the genetical differences concerning the division of the combial cells and the enlargement of the newly formed cells

It is observed from Tables (1-a and b) that potassium fertilization had significant effect on all vegetative studied traits.

Increasing potassium fertilization levels from 150 to 300 kg/Feddan caused significant increase in foliage height, weight of the whole plant, root fresh weight, root weight/plant weight ratio, root length, root diameter, core diameter core diameter/root diameter ratio as well as dry matter content, these hold true in both growing seasons. On the other hand, the highest thickness of root, core diameter and core/root diameter ratio were produced from plants received the highest potassium fertilizer level.

Table (1a): Effect of baby carrot varieties and potassium fertilizer levels on growth characters and fibre content at harvest date.

Growth Characters / Treatments	1999 - 2000 season									
	Foliage height (cm)	Weight of whole plant (gm)	Root fresh weight (gm)	Root weight plant weight %	Root length (cm)	Root diameter (cm)	Core diameter (cm)	Core diameter / rootdiameter %	Dry matter gm /100g. freshweight	Fiber content %
Effect of varities										
Babette	26.93 a	35.45 b	28.53 b	80.37 a	13.72 a	1.95 a	.50 a	25.13 a	12.27 a	4.84 a
Mini express	27.63 a	36.24 a	29.60 a	81.51 a	13.59 a	2.10 a	.49 a	23.47 a	12.24 a	5 04 a
Effect of potassium fertilizer levels										
control	25.41 c	33.98 c	25.96 c	76 39 c	12.99 b	1 85 c	0.42 b	22.64 b	11 18 c	5 21 a
150kg./fed.	27.45 b	36.25 b	29.85 b	82.34 b	13.83 a	2.03 b	0.51 a	24.76 a	12.40 b	4.91 b
300kg./fed.	28.98 a	37.32 a	31.38 a	84.09 a	14.14 a	2.20 a	0.55 a	25.49 a	13.19 a	4.70 c
Effect of interaction										
Babette x control	25.1	33.9	25.9	76.4	13	1.8	0.4	22.2	11.5	5.18
Babette x 150kg./fed.	27.1	35.6	28.8	80.9	13.9	1.95	0.53	25.7	12.4	4.69
Babette x 300kg./fed.	28.6	36.8	30.9	83.8	14.3	2.1	0.56	27.5	13	4.66
Mini express x control	25.7	34.1	26	76.4	13	1.9	0.44	23.1	10.9	5 25
Mini express x 150kg./fed.	27.8	36.9	30.9	83.7	13.8	2 1	0 5	23.9	12.4	5.14
Mini express x 300kg./fed.	29.4	37.8	31.9	84.4	14	2 3	0 54	23 4	13.4	4.74
L.S.D.	N.S.	N.S.	0.71	1.29	N.S.	N.S.	N.S.	N.S.	N.S.	N.S

Table (1-b): Effect of baby carrot varieties and potassium fertilizer levels on growth characters at harvest date.

Growth Characters / Treatments	2000-2001 season									
	Foliage height (cm)	Weight of whole plant (gm)	Root fresh weight (gm)	Root weight plant weight (%)	Root length (cm)	Root diameter (cm)	Core diameter (cm)	Core diameter / root diameter (%)	Dry matter gm /100g. fresh weight	Fiber content (%)
Effect of varieties										
Babette	27.08 a	36.24 b	29.24 b	80.58 b	13.75 a	1.98 a	0.46 a	23.50 a	12.28 a	4.86 a
Mini express	27.5 a	36.76 a	29.87 a	81.13 a	12.54 b	2.08 a	0.48 a	23.13 a	12.20 a	5.08 a
Effect of potassium fertilizer levels										
control	25.06 c	34.74 c	26.65 c	76.67 c	12.06 c	1.84 c	0.42 c	22.59 b	11.38 c	5.23 a
150kg./fed.	27.31 b	36.66 b	29.75 b	81.14 b	12.88 b	1.98 b	0.48 b	24.09 a	12.21 b	4.93 b
300kg./fed.	29.50 a	38.07 a	32.27 a	84.76 a	14.50 a	2.26 a	0.53 a	23.27 ab	13.14 a	4.76 b
Effect of interaction										
Babette x control	24.3	34.7	26.6	76.5	12.8	1.79	0.41	22.9	11.5	5.14
Babette x 150kg./fed.	27.5	36.3	29.4	81	13.6	1.99	0.47	23.6	12.3	4.72
Babette x 300kg./fed.	29.5	37.7	31.8	84.2	14.9	2.15	0.52	24	13.1	4.71
Mini express x control	25.9	34.8	26.7	76.8	11.4	1.9	0.42	22.2	11.3	5.3
Mini express x 150kg./fed.	27.1	37.1	30.1	81.3	12.1	1.98	0.49	24.6	12.2	5.15
Mini express x 300kg./fed.	29.5	38.4	32.8	85.3	14.1	2.36	0.54	22.5	13.2	4.8
L.S.D.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.

High potassium fertilizer level i.e. 300kg/Feddan decreased fibers content which means high quality of baby carrot roots. Results may be attributed to the changes in carbohydrate metabolism which are presumably related to high K requirement of certain regulatory enzymes. Obtained data are in similar trend to those reported by Sharangi and Paria(1995)

Regarding the interaction between varieties and potassium fertilization, obtained data in Tables (1-a and b) showed no significant effect on all growth characters except root fresh weight and root weight/plant weight ratio only in the first season. Whereas, these differences did not reach the level of significantce, except in fibers content whereas high potassium fertilizer level produced high quality of baby carrot roots with low fiber content similar results were obtained by Eppendorfer and Eggum (1995) and Elkner et al (1998).

Total yield and its components:

Obtained results in Tables 2 (a and b) showed no significant differences between Babette and Mini express varieties in yield and its components. In spite of that Babette var. tended to be higher than Mini express variety in total yield, total root yield, net weight % and marketable yield, without significant difference.

Data in Tables (2-a and 2-b) generally showed significant differences, among the tested potassium fertilizer levels. In fact potassium fertilizer up to 300kg K/fed produced significantly the highest total whole yield, total root yield, net weight %, marketable yield, marketable root % and non-marketable yield, followed by the rate of 150kg K/fed without significant differences sometimes. In fact no significant differences were sometimes obtained between potassium fertilizer levels at the rate of 150kg K/fed and control, especially in the second season. In spite of that results generally showed no significant differences for the components of non marketable yield, i.e., malformed, small-sized, cracked and splitted roots. These results might be attributed to that potassium involves in plant metabolism as well as large number of enzymes that are activated by potassium application, in addition to the induction of nutrient absorption by root system, that increase the plant internal translocation capacity and hence the transport of nutrients essential to metabolism Sangakkara (1990). Results in similar trend were obtained by Caluvert (1972), Krarup *et al.* (1984), Ivashchenko (1985), Hole et al (1987), Prabhakar *et al.*(1987), Lasztity (1989).

The same Tables (2-a and b) indicated no interaction effects between the tested baby carrot varieties and potassium fertilizer levels.

Storageability :

Results in Table (3) generally showed no significant differences between the tested baby carrot varieties in loss in weight under the condition of cold storage and room temperature in (1999-2000) and (2000-2001) seasons, except in room temperature Mini express in (2000-2001) was significantly higher than Babette variety. This may be attributed to the genetic differences between carrot varieties.

Table (2-a): Effect of baby carrot varieties, potassium fertilizer levels and their interaction on total yield and its components (ton/fed.)

Growth Characters	1999 - 2000									
	Total yield Ton/fed.				%	Non marketable yield (Ton/fed.)				
Treatments	Total Whole plant yield	Total root yield	Marketable yield	Net weight	Marketable root	Malformed	Small sized	Cracked	Splited	Total
Effect of varieties										
Babette	5.318 a	4.279 a	3.155 a	80.44 a	73.64 a	0.337 a	0.365 a	0.200 a	0.222 a	1.124 a
Mini express	5.101 a	4.057 a	3.010 a	79.43 a	73.95 a	0.324 a	0.345 a	0.186 a	0.193 a	1.048 a
Effect of potassium fertilizer levels										
control	4.776 c	3.717 c	2.621 c	77.84 b	70.54 b	0.346 a	0.371 a	0.166 a	0.213 a	1.096 ab
150kg./fed.	5.189 b	4.174 b	3.138 b	80.46 a	75.24 a	0.308 a	0.341 a	0.190 a	0.197 a	1.036 b
300kg./fed.	5.663 a	4.614 a	3.487 a	81.50 a	75.61 a	0.338 a	0.352 a	0.224 a	0.211 a	1.126 a
Effect of interaction										
Babette x control	4.845	3.809	2.702	78.7	70.99	0.346	0.381	0.147	0.234	1.107
Babette x 150kg./fed.	5.266	4.255	3.189	80.85	75.05	0.312	0.346	0.204	0.205	1.066
Babette x 300kg./fed.	5.844	4.773	3.573	81.76	74.87	0.355	0.368	0.251	0.226	1.2
Mini express x control	4.707	3.624	2.539	76.98	70.09	0.347	0.362	0.185	0.192	1.085
Mini express x 150kg./fed.	5.112	4.093	3.088	80.07	75.42	0.303	0.336	0.176	0.19	1.005
Mini express x 300kg./fed.	5.483	4.455	3.402	81.23	76.36	0.322	0.336	0.197	0.196	1.053
L.S.D.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.

Table (2-B): Effect of baby carrot varieties, potassium fertilizer levels and their interaction on total yield and its components(Ton/fed.).

Growth Characters	2000 – 2001									
	Total yield Ton/fed.%					Non marketable yield				
Treatments	Total Whole plant yielde	Total root yield	Marketable yield	Net weight	Marketable root	Malformed	Small sized	Cracked	Splited	Total
Effect of varieties										
Babette	5.335 a	4.284 a	3.22 a	80.31 a	75.07 a	0.335 a	0.351 a	0.163 a	0.216 a	1.064 a
Mini express	5.397 a	3.997 a	2.89 b	74.52 a	72.12 a	0.342 a	0.368 a	0.177 a	0.231 a	1.109 a
Effect of potassium fertilizer levels										
control	5.076 b	3.855 b	2.766 b	72.29 b	71.57 b	0.363 a	0.349 a	0.167 a	0.223 a	1.089 a
150kg./fed.	5.173 b	4.013 b	2.966 b	79.02 a	73.90 ab	0.313 a	0.339 a	0.181 a	0.214 a	1.047 a
300kg./fed.	5.849 a	4.553 a	3.429 a	77.94 a	75.31 a	0.353 a	0.376 a	0.162 a	0.233 a	1.124 a
Effect of interaction										
Babette x control	5.08	5.95	2.89	77.8	73.1	0.36	0.35	0.14	0.22	1.06
Babette x 150kg./fed.	5.14	4.18	3.16	81.5	76.5	0.31	0.33	0.17	0.21	1.02
Babette x 300kg./fed.	5.79	4.72	3.62	81.6	76.6	0.34	0.37	0.18	0.22	1.11
Mini express x control	5.07	3.76	2.65	72.8	70	0.34	0.38	0.19	0.23	1.12
Mini express x 150kg./fed.	5.21	3.85	2.78	76.6	72.3	0.32	0.35	0.19	0.22	1.07
Mini express x 300kg./fed.	5.91	4.38	3.24	74.2	74	0.37	0.38	0.14	0.25	1.14
L.S.D.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S	N.S	N.S	N.S.	N.S.

Also results indicate that Babette variety being significantly higher in appearance than *Mini express* variety, specially under the condition of cold storage in both (1999-2000) and (2000-2001) seasons. Mean while, Babette variety tended to the nigher in appearance under the condition of room temperature in both two seasons.

With respect to texture, decay%, T.S.S., acidity and T.S.S./Acid ratio, obtained data in tables revealed that there were no significant differences between the tested baby carrot varieties under the conditions of cold storage and room temperature except in (2000-2001) season, under the room condition. Mini express variety was significantly higher in TSS/Acid ratio than *Babette variety*. Results had a similar trend to that reported by Berg et., al., (1966) and El-Bassyony (1983).

Regarding carotene content and Vitamin "A", results generally showed that Babette variety tended to be higher than Mini express variety without significant differences under the condition of cold storage and room temperature in both (1999/2000) & (2000/2001) seasons. Similar trend were obtained by Lee (1986), *Toul et al* (1986) and Watanabe and Takagi (2000).

With respect to *total and reducing sugars content*, data showed no significant differences between the tested baby carrot varieties in total and reducing sugars, *under the condition of cold* storage and room temperature.

Obtained results may be again attributed to the inherited varietal characters beside the aforementioned results, which generally showed no clear differences between the tested baby carrot varieties in most of the tested quality features.

It is clear from the obtained results in Table (4) that the highest level of potassium fertilizer (300 Kg./Fed.) significantly *resulted in lowest values of* weight loss percent, increased the appearance value of roots , increased TSS percent *and decreased texture value (good root quality)* compared with those produced from both lower rate (150 Kg./Fed.) and untreated plants *(control) This trend* hold true in decay percent under all studied treatments. Results had a similar trend to that obtained by Shibario *et al.* (1998) The obtained data hold true under both cold and room temperature as well as in both studied seasons. These results may be due to the role of potassium fertilizer in translocation of most chemical compounds such as carbohydrates and nitrogenous substances, which may reflected *on pectic substances*. Those pectic substances could be increased texture values and furthermore, caused more *firmer roots. These results are similar* to those reported by Suogala (1999) who pointed out that changes in the modulus of elasticity and *firmness of* tissues may serve as indicators of freshness and keeping quality of tissues during the harvest, transportation and on storage .

As for carrot roots acidity and TSS/Acid ratio, both higher and lower rates of K_2O (300 and 150 Kg./fed.) seemed to increase acidity as well as the ratio between TSS and Acidity of roots than the control treatment under cold temperature while these trend *did not reach the level of significantce* under room temperature. However the total acidity of carrot roots stored *under room temperature* were higher than those under cold storage.

Table (3): Effect of baby carrot varieties on storageability of baby carrot.

* a- Effect of baby carrot varieties

Quality features	Cold stroage OC°				Room temperature			
	(1999-2000)		(2000-2001)		(1999-2000)		(2000-2001)	
	Baby carret varieties				Baby carrot varieties			
	Babette	Mini express	Babette	Mini express	Babette	Mini express	Babette	Mini express
Loss in weight %	2.01 a	2.11 a	2.01 a	2.10 a	7.98 a	8.62 a	9.35 a	10.44 a
Appearance	8.54 a	8.49 b	8.51 a	8.45 b	6.83 a	6.85 a	6.88 a	6.87 a
texture	1.56 a	1.53 a	1.61 a	1 60 a	2.48 a	2.53 a	2.55 a	2.53 a
Decay %	4 18 a	4.42 a	4.82 a	4.82 a	14.94 a	14.42 a	15.52 a	15.73 a
T.S.S	9.04 a	8.99 a	8.91 a	9.01 a	9.33 a	9.33 a	9.24 a	9.39 a
Acidity (g.citric acid)	0.48 a	0.47 a	0.49 a	0.46 a	0.53 a	0.53 a	0.53 a	0.51 a
TSS/Acid ratio	20.25 a	20.57 a	19.76 a	21.03 a	18.96 a	19.49 a	18.73 b	20.18 a
caroten content (mg./100g Fresh wt.)	5 81 a	5.62 a	5.59 a	5.22 a	5.19 a	4.65 a	4.93 a	4.62 a
Vitamin 'A' (international unit)	9680 a	9320 a	93307 a	8720 a	86498 a	7758 a	8219 a	7698 a
Total sugars	23.10 a	22.57 a	22.98 a	22.46 a	21.19 c	21.02 a	21.04 a	21.09 a
Reducing sugars	10.13 a	9.87 fg	9.87 a	9.81 I	9.94 a	9.63 a	9 89 ghi	9.63 a

Table (4): Effect of patassim fertilizer levels on storageability of carrots.

Quality features	Cold storage OC°						Room temperature					
	(1999-2000)			(2000-2001)			(1999-2000)			(2000-2001)		
	Potassium fertilizer levels Kg. fed .						Potassium fertilizer levels Kg. fed .					
	300 kg/Fed.	150 kg/Fed.	Contrpl	300 kg/Fed.	150 kg/Fed.	Control	300 kg/Fed.	150 kg/Fed.	Control	300 kg/Fed	150 kg/Fed	Control
Loss in weight %	1.90 b	2.00 b	2.27 a	1.87 e	1.95 b	2.34 a	7.62 c	8.33 b	8.95 a	9.37 b	10.02 a	10.31 a
Appearance	8.84 a	8.68 b	8.03 c	8.84 a	8.68 b	8.03 c	7.73 a	6.95 b	5.85 c	7.58 a	7.00 b	6.05 c
texture	1.18 c	1.44 b	2.01 a	1.24 c	1.50 b	2.04 a	2.05 c	2.48 b	3.00 a	2.13 c	2.53 b	2 98 a
Decay %	1.00 c	2.88 b	9.01 a	1.61 c	3.53 b	9.34 a	11.29 c	14.67 b	18.08 a	12.29 b	15.84 a	18.75 a
T.S.S	9.27 a	9.02 b	8.77 c	9.25 a	9.00 b	8.62 c	9.52 a	9.33 b	9.15 c	9.50 a	9.29 b	9.15 b
Acidity (g.citric acid)	0.49 a	0.48 a	0.46 b	0.47 a	0.48 a	0.48 a	0.55 a	0.53 a	0.50 b	0.53 a	0.52 a	0.51 a
TSS/Acid ratio	20.38 a	20.14 a	20.71 a	21.21 a	20.38 ab	19.61 b	18.73 b	18.97 b	19.97 a	19.19 a	19.64 a	19.55 a
Caroten content (mg./100g Fresh wt.)	5.95 a	5.75 b	5.44 c	5.68 a	5.57 a	4.98 b	5.21 a	4.96 a	4.59 b	5.24 a	4.85 b	4.23 c
Vitamin 'A' (international unit)	9913 a	9581 b	9007 e	9468 a	9286 a	8319 b	8680 a	8274 a	7656 b	8736 a	8088 b	7053 c
Total sugars	24.57 a	22.84 b	21.10 c	24.51 a	22.72 b	20.93 c	22.45 a	21.23 b	19.62 c	22.31 a	21.17 b	19.71 c
Reducing sugars	10.99 a	9.96 b	9.05 c	10.71 a	9.86 c	8.95 c	10.46 a	9.71 b	9.20 c	10.42 a	9.68 b	9.18 c

This may be due to the role of the potassium in translocation of most chemical compounds such as carbohydrates and nitrogenous substances, which may be reflected on main acids such as citric, malic, succinic, fumaric and quinic acids, which were common in carrots, Ruhl and Herrmann (1985).

With respect to carotene content and Vitamin "A", obtained data generally showed that potassium fertilizer levels at the rate of 300 Kg./Fed. Produced significantly the highest carotene content and Vitamin "A" followed by 150 Kg./Fed. without significant differences sometimes and that was true under the condition of cold storage and room temperature

Also, results generally showed that potassium fertilizer produced significantly the highest total and reducing sugar content. According to these results, potassium fertilizer up to (300 Kg./Fed.) being the most effective, followed by 150 Kg./Fed. while control treatment produced the lowest sugars content, that was true under both storage treatments, as well at two seasons.

Results in Table (5-a) showed significant differences between storage periods in loss in weight %, it generally increased throughout elongation of storage period i.e., 12 weeks under the condition of cold storage which were 1.79 and 1.7% after 6 weeks of storage raised to 3.74 and 3.6% after 12 weeks of storage under 0°C for the first and second season respectively. The increase under the condition of room temperature being started, as expected, earlier than under the condition of cold storage. The rate of increase in loss in weight percent during storage period was 8.19% and 9.93% after 3 weeks of storage then raised to 13.23 and after 15.32 after 5 weeks of storage for first and second seasons respectively

Regarding appearance, results generally showed that the appearance of baby carrot roots decreased gradually toward the end of storage period, i.e., 12 weeks. The rate of decrease in appearance during storage was also found to be inversely related to storage temperature, and that was true in both (1999-2000) and (2000-2001) seasons. Results in similar trend were obtained by Lim-Byungseon *et al.* (1998).

The texture and decay % of baby carrot roots were relatively higher under the condition of room temperature than cold storage. The disorder of baby carrot roots increased gradually toward the end of storage period, i.e. 12 and 5 weeks for cold storage and room temperature respectively.

In fact the activity of hydrolysis enzymes, responsible for root softness, is significantly reduced under both treatments conditions, this may be the reason behind lower texture values (higher firmness) of cold carrot roots.

Furthermore, the reduction in texture quality might be attributed to the utilization of dry matter in respiration, water loss in transpiration and metabolic activity. Also, root texture values were sometimes correlated with heat units summation and higher temperature (room conditions) may have an accelerating softening effect on roots which in turn causes a linear decrease in root texture quality. The obtained herein results are in agreement with Lim-Byungseon *et al.* (1998) and Suojala (1999).

Data in the same Table showed significant differences between storage periods.

Table (5a): Effect of storage period on storageability of carrots.

***Room temperature**

Quality features	Storage period .											
	Zero day		1 week		2 weeks		3 week		4 weeks		5 week	
Loss in weight :												
(1999-2000)	—		4.19	e	5.26	d	8.19	c	10.64	b	13.23	a
(2000-2001)	—		5.61	d	5.98	d	9.93	c	12.65	b	15.32	a
Appearance:												
(1999-2000)	9.00	a	8.29	b	7.00	c	6.75	d	6.29	d	5.88	e
(2000-2001)	9.00	a	8.33	b	7.08	c	6.83	d	6.29	d	5.83	e
texture :												
(1999-2000)	1.00	f	1.54	e	2.21	d	2.54	c	2.92	b	3.33	a
(2000-2001)	1.00	f	1.58	e	2.17	d	2.58	c	3.00	b	3.38	a
Decay %												
(1999-2000)	0.00	e	0.00	e	8.50	d	13.13	c	21.38	b	30.41	a
(2000-2001)	0.00	e	0.00	e	9.18	d	14.13	c	23.52	b	31.31	a
T.S.S												
(1999-2000)	8.97	e	8.90	e	9.10	d	9.33	c	9.62	b	10.07	a
(2000-2001)	9.05	c	8.87	d	9.03	c	9.10	c	9.68	c	10.15	a
Acidity												
(1999-2000)	0.30	f	0.41	e	0.50	d	0.54	c	0.65	b	0.76	a
(2000-2001)	0.32	f	0.40	e	0.44	d	0.53	c	0.66	b	0.76	a

Table (5a): Effect of storage period on storageability of carrots. *Room temperature

Quality features	Storage period											
	Zero day		1 week		2 weeks		3 week		4 weeks		5 week	
TSS/Acid ratio:												
(1999-2000)	29.80	a	21.93	b	18.42	c	17.22	c	14.72	d	13.26	e
(2000-2001)	28.14	a	22.80	b	20.61	c	17.22	d	14.64	e	13.34	e
Coroten content:												
(1999-2000)	4.47	c	3.68	d	3.89	d	4.39	e	6.25	b	6.85	a
(2000-2001)	3.99	c	3.33	d	3.84	c	4.10	c	6.55	b	6.84	a
Vitamin 'A'												
(1999-2000)	7448.85	c	6140.95	d	6477.96	d	7316.88	c	10414.03	b	11424.37	a
(2000-2001)	6653.69	c	5546.96	d	6401.14	c	6832.48	c	10914.41	b	11407.56	a
Total sugars:												
(1999-2000)	24.24	a	21.56	b	20.07	c	19.54	d	19.42	d	21.78	b
(2000-2001)	24.29	a	21.38	c	19.98	d	19.44	e	19.38	e	21.89	b
Reducing sugars:												
(1999-2000)	11.92	a	9.21	cd	9.23	cd	9.41	c	9.18	d	9.75	b
(2000-2001)	11.84	a	9.14	d	9.27	c	9.41	c	9.14	d	9.75	b

Table (5a) Effect of storage period on storageability of carrots.

Quality features	Cold storoge °c												
	Storage period .												
	Zero day	1 weeks	2 weeks	3 weeks	4 weeks	5 weeks	6 weeks	7 weeks	8 weeks	9 weeks	10 weeks	11 weeks	12 weeks
Loss in weight :													
(1999-2000)	—	0.74 k	0.89 j	0.98 j	1.24 l	1.67 h	1.79 g	2.02 f	2.40 e	2.72 d	3.15 c	3.38 b	3.74 a
(2000-2001)	—	0.78 h	0.90 h	1.13 g	1.25 g	1.64 f	1.71 f	2.22 e	2.54 d	2.66 d	2.93 c	3.28 b	3.60 a
Appearance:													
(1999-2000)	9.00 a	9.00 a	9.00 a	8.96 a	8.83 ab	8.83 ab	8.71 bc	8.67 bc	8.54 cd	8.46 d	8.21 e	7.83 f	7.17 g
(2000-2001)	9.00 a	9.00 a	9.00 a	8.96 a	8.83 ab	8.83 ab	8.71 bc	8.67 bc	8.54 cd	8.42 d	8.13 e	7.71 f	7.00 g
Texture:													
(1999-2000)	1.00 g	1.00 g	1.00 g	1.00 g	1.13 fg	1.21 fg	1.29 ef	1.42 e	1.67 d	1.83 d	2.08 c	2.29 b	2.58 a
(2000-2001)	1.00 h	1.00 h	1.00 h	1.00 h	1.08 gh	1.21 fg	1.33 ef	1.46 e	1.71 d	1.88 d	2.21 c	2.46 b	2.79 a
Decay %													
(1999-2000)	0.00 e	0.00 e	0.00 e	0.00 e	0.00 e	0.00 e	0.00 e	2.04 de	4.08 d	6.71 c	9.95 b	13.75 a	15.04 a
(2000-2001)	0.00 f	0.00 f	0.00 f	0.00 f	0.00 f	0.00 f	0.00 f	2.62 e	4.84 d	7.81 c	10.93 b	15.18 a	16.47 a
T.S.S													
(1999-2000)	8.97 d	8.97 d	9.25 b	8.40 f	9.13 c	9.35 b	8.90 d	9.25 b	8.97 d	8.78 e	8.70 e	8.93 d	9.62 a
(2000-2001)	9.05 d	8.78 fg	9.15 bc	8.60 i	8.97 de	9.18 b	8.71 ghi	9.32 a	8.88 ef	8.65 hi	8.73 gh	9.03 d	9.40 a

Table (5a): Effect of storage period on storageability of carrots.

Quality features	Cold storoge °c												
	Storage period .												
	Zero day	1 weeks	2 weeks	3 weeks	4 weeks	5 weeks	6 weeks	7 weeks	8 weeks	9 weeks	10 weeks	11 weeks	12 weeks
(1999-2000)	0.30 h	0.33 g	0.36 fg	0.40 e	0.43 d	0.37 Ef	0.44 d	0.49 c	0.53 b	0.54 b	0.55 b	0.71 a	0.72 a
(2000-2001)	0.32 ij	0.30 j	0.34 l	0.37 h	0.42 g	0.43 Fg	0.45 f	0.50 e	0.54 d	0.55 d	0.61 c	0.66 b	0.69 a
(1999-2000)	29.80 a	27.18 b	26.45 bc	21.24 d	21.54 d	25.20 c	20.08 de	18.90	16.95 f	16.18 f	15.78 f	12.60 g	13.46 g
(2000-2001)	28.14 b	29.89 a	27.78 b	24.00 c	21.77 d	21.54 d	19.37 e	18.72	16.37 f	15.70 fg	14.42 gh	13.77 h	13.66 h
(1999-2000)	4.47 d	3.72 e	3.78 e	4.53 d	7.28 b	5.38 C	5.65 c	4.48 d	8.35 a	4.52 d	7.55 b	7.19 b	7.38 b
(2000-2001)	3.99 g	3.40 h	3.89 g	4.10 fg	6.66 d	5.34 e	5.28 e	4.04 g	70.18 bc	4.41 f	7.47 ab	6.95 cd	7.63 a
(1999-2000)	7448 d	6193 e	6294 e	7552 d	12130 b	8962 c	9413 c	7459 d	13923 a	7529 d	12581 b	11986 b	12031 b
(2000-2001)	6653 g	5763 h	6486 g	6825 fg	11093 d	8909 e	8799 e	6733 g	11965 bc	7343 f	12445 ab	11592 cd	12716 a
(1999-2000)	11.92 a		9.92 c		9.13 e		10.32 b		9.28 de		9.53 d		9.90 c
(2000-2001)	11.84 a		9.69 c		9.08 e		10.14 b		8.89 e		9.40 d		9.83 e
Total sugars:													
(1999-2000)	24.24 a		23.75 b		22.00 d		22.88 c		21.44 e		22.61 c		22.95 e
(2000-2001)	24.29 a		23.12 b		22.07 de		22.38 cd		21.71 e		22 67 bc		22.82 bc

The content of total soluble solids, Acidity,Caroten content and Vitamin A in baby carrot roots was raised by storage, after which it started to be gradually depressed, although sometimes tended to be again favoured, after which it started to increase toward the end of storage period, i.e., 12 and 5 weeks for cold and room temperature respectively and for both seasons. This may be due to the big losses in weight as well as the change in carbohydrates, nitrogenous compounds and mineral salts as carrot roots advanced in storage periods. Results had a similar trend to that obtained by EL–Bassiouny (1983).

Data generally revealed that TSS/Acid ratio decreased gradually, and then started to be raised up to particular level, after which it decreased gradually during storage period as to reach a minimum at the end of storage period under the conditions of cold storage and room temperature respectively, and that was true in both seasons.

Obtained data showed that reducing and total sugars decreased with prolongation storage period until 8 and 4 weeks in cold and room temperature respectively, then it began to increase gradually. The reduction in sugars at the first period of storage may be due to the utilization of sugars in respiration and the condensation of sugars to other forms of carbohydrates compounds. While, the increament in sugars at the end of storage period, i.e., 12 and 5 weeks under cold and room temperature might owe to the rate of moisture loss through transpiration and the conversion complex compounds to sugars.

Results in general showed no significant interaction for loss in weight percent, appearance, texture and decay percent under the conditions of cold storage and room temperature in both seasons, except in loss in weight percent under the condition of cold storage (2000 - 2001) season, (Table 6).

With respect to T.S.S., Acidity and TSS/Acid ratio data, generally, showed significant interaction under the conditions of cold storage and that was clear in first season for both T.S.S. and T.S.S./Acid ratio, but in second season for Acidity, and there were no significant interaction under the condition of room temperature and that was true for both seasons.

Regarding carotene content, Vitamin "A" and reducing sugars results generally indicate significant interaction in (1999-2000) under the condition of cold storage and in (2000-2001) under the condition of room temperature. Data also showed no significant interaction between baby carrot varieties and potassium fertilizer levels in total sugar content under the condition of cold storage and room temperature in both seasons Obtained data are in similar trend to those reported by Sharangi and Paria(1997).

Results in Table (7a) showed no significant interaction for appearance, texture, decay%, acidity except under the condition of room temperature (2000-2001) and TSS/Acid ratio except in (2000-2001) under the condition of cold storage and room temperature, while there were significant interaction between baby carrot varieties and storage period for loss in weight, T.S.S., carotene content, Vitamin "A", total sugar except under the condition of room temperature in both seasons and reducing sugars except under the condition of cold storage (2000-2001). Mini express variety seemed to be higher in loss in weight and T.S.S., under the condition of cold storage and room temperature .

Table(6 a): Interaction between potassium fertilizer levels and baby carrot varieties

potassium fertilizer levels	Cold storage 0co						Room temperature					
	(1999-2000)season			(2000-2001)season			(1999-2000)season			(2000-2001)season		
	Baby carrot varieties						Baby carrot varieties					
	Babette	Mini express	L.S.D	Babette	Mini express	L.S.D	Babette	Mini express	L.S.D	Babette	Mini express	L.S.D
Loss in weight :												
300 kg./Fed.	1.85	1.95	N S.	1.89	1.85	0.11	7.41	7.83	N.S.	8.55	10.19	N.S.
150 kg./Fed.	1.94	2.06		1.87	2.03		8.03	8.63		9.67	10.36	
Control	2.24	2.31		2.28	2.40		8.50	9.40		9 84	10.78	
Appearance:												
300 kg./Fed.	8.83	8.85	N.S.	8.79	8.81	N.S.	7.70	7.75	N.S	7 55	7 60	N.S
150 kg./Fed.	8.73	8.63		8.71	8.60		6.95	6.95		7 00	7.00	
Control	8.06	8.00		8.04	7.94		5.85	5.85		6 10	6.00	
Texture :												
300 kg./Fed.	1.23	1.13	N.S.	1.29	1.19	N.S.	2.00	2.10	N S.	2.15	2.10	N.S.
150 kg./Fed.	1.44	1.44		1.48	1.52		2.40	2.55		2 50	2.55	
Control	2.00	2.02		2.02	2.06		3.05	2.95		3.00	2.95	
Decay % c												
300 kg./Fed.	1 01	0 99	N.S.	fg	1.55	N.S.	12.48	I	N.S.	12.65	11.93	N S.
150 kg./Fed.	2.92	2.84		3.64	3.42		14.57	14.78		15.41	16.26	
Control	8.61	9.42		9.18	9.49		17.78	18.39		18.50	19.00	
T.S.S												
300 kg./Fed.	9.35	9.18	0.08	9.25	9.25	N.S.	9.52	9.52	N.S.	9 40	9.60	N.S.
150 kg./Fed.	9.02	9 01		8.92	9.08		9.32	9 33		9 18	9 40	
Control	8 75	8.78		8.56	8.69	.	9 17	9.13		9.13	9.17	.
Acidity												
300 kg./Fed.	0.49	0 49	N.S.	0.46	0.48	3.18	0.55	0.55	N.S.	0.53	0.54	N S.
150 kg./Fed.	0.49	0.47		0.50	0.46		0.53	0.54		0.54	0 50	
Control	0.46	0 45		0.51	0.45		0.51	0 49		0.52	0.50	

Table(6 b): Interaction between potassium fertilizer levels and baby carrot varieties.

Potassium fertilizer levels	Cold storage 0co						Room temperature					
	(1999-2000)season			(2000-2001)season			(1999-2000)season			(2000-2001)season		
	Baby carrot varieties						Baby carrot varieties					
	Babette	Mini express	L.S.D	Babette	Mini express	L.S.D	Babette	Mini express	L.S.D	Babette	Mini express	L.S.D
TSS/Acid ratio:												
300 kg./Fed.	20.92	19.84	1.73	21.79	20.63	1.97	18.43	19.03	N.S.	19 08	19.29	N.S
150 kg./Fed.	19.49	20.79		19.27	21.49		19.02	18.92		18 31	20.97	
Control	20.34	21.09		18.23	20.96		19.43	20.51		18.81	20.28	
Caroten content:												
300 kg./Fed.	5.99	5.91	0.17	5.88	5.48	N S.	5.69	4.72	N.S.	5.49	4.99	0.35
150 kg./Fed.	5.84	5.66		5.85	5.29		5.14	4.78		4.85	4.86	
Control	5.60	5.28		5.06	4.90		4 73	4.45		4 45	4.01	
Vitamin 'A'												
300 kg./Fed.	9979.75	9848.08	284.94	9797.47	9139.97	N.S.	9490.37	7870.32	N.S.	9156.69	8316.66	590.40
150 kg./Fed	9727.84	9434.77		9757.40	8816.25		8574.91	7974.79		8082.31	8093.98	
Control	9335.20	8678.92		2435.34	8204.66		7882.55	7430.10		7420 39	6686.20	
Reducing sugars:												
300 kg./Fed.	11.34	10.64	0.29	10.80	10.62	N.S.	10.47	10.45	N.S.	10.34	10.50	0.17
150 kg./Fed.	10.03	9.89		9.87	9.85		9.84	9.56		9.83	9.52	
Control	9.01	9.09		8.93	8.97		9.51	8.89		9.51	8 85	
Total sugars:												
300 kg./Fed.	24.79	24.35	N.S.	24.80	24.23	N S.	22.58	22.32	N.S.	22.26	22.37	N.S.
150 kg./Fed.	23.13	22.55		23.05	22.39		21.23	21.23		21 20	21.14	
Control	21.39	20.82		21.09	20.77		19.74	19.50		19.66	19 75	

Table (7a): Interaction between baby carrot varieties and storage period.

Baby corrot vorieties	*Room temperature (1999-2000)season							*Room temperature (2000-2001)season						
	Storage period in weeks													
	Zero day	1	2	3	4	5	L.S.D	Zero day	1	2	3	4	5	L.S.D
Loss in weight :														
Babette	—	4.09	5.13	7.91	10.12	12.67	0.44	—	5.50	5.58	9.16	11.98	14.55	0.60
Mini express	—	4.29	5.39	8.48	11.58	13.79		—	5.71	6.38	10.71	13.33	16.09	
Appearance:														
Babette	9.00	8.33	7.00	6.75	6.33	5.75	N.S	9.00	8.42	7.08	6.75	6.42	5.75	N.S
Mini express	9.00	8.25	7.00	6.75	6.25	6.00		9.00	8.25	7.08	6.92	6.17	5.92	
texture :														
Babette	1.00	1.58	2.17	2.58	2.83	3.25	N.S	1.00	1.67	2.08	2.67	3.00	3.33	N.S
Mini express	1.00	1.50	2 25	2.50	3.00	3.42		1.00	1.50	2.25	2.50	3.00	3.42	
Decay %														
Babette	0.00	0.00	8.17	11.90	22.69	31.94	N.S	0.00	0.00	8.71	12.95	23.78	32.18	N.S
Mini express	0.00	0.00	8.84	14.36	20.07	28.85		0.00	0.00	9.66	15.31	23.26	30.42	
T.S.S														
Babette	9.03	8.87	9.10	9.43	9.57	10.00	0.12	9.07	8.83	8.96	9.03	9.43	10.13	0.22
Mini express	8.90	8.93	9.10	9.47	9.67	10.13		9.03	8.90	9.13	9.17	9.93	10.17	

Table (7a): Interaction between baby carrot varieties and storage period.

Baby carrot varieties	*Room temperature (1999-2000)season Storage period in weeks							*Room temperature (2000-2001)season Storage period in weeks						
	Zero day	1	2	3	4	5	L.S.D	Zero day	1	2	3	4	5	L.S.D
Acidity														
Babelte	0.32	0.42	0.49	0.54	0.64	0.76	N.S	0.32	0.44	0.48	0.53	0.65	0.77	0.05
Mini express	0.29	0.40	0.49	0.55	0.68	0.77		0.32	0.36	0.41	0.54	0.58	0.76	
TSS/Acid ratio:														
Babelte	28.25	21.33	18.38	17.45	15.08	13.26	N.S	28.21	20.31	18.76	17.28	14.61	13.24	2.46
Mini express	31.35	22.52	18.45	16.99	14.36	13.25		28.07	25.29	22.46	17.15	14.66	13.43	
caroten content:														
Babelte	4.60	3.89	4.54	4.51	6.41	7.19	0.41.	4.06	3.68	4.44	4.28	6.32	6.82	0.39
Mini express	4.33	3.48	3.23	4.27	6.10	6.52		3.93	2.98	3.24	3.92	6.78	6.87	
Vitamin 'A'														
Babelte	7672	6477	7576	7517	10664	11987	680	6762	6130	7393	7135	10531	11365	654
Mini express	7225	5804	5379	7116	10163	10861		6544	4963	5409	6529	11296	11449	
Reducing sugars:														
Babelte	11.99	9.12	9.51	9.78	9.46	9.77	0.269	11.85	9.01	9.59	9.78	9.37	9.76	0.235
Mini express	11.86	9.31	8.95	9.04	8.91	9.22		11.83	9.27	8.95	9.04	8.91	9.75	
Total Sugers:														
Babelte	24.60	21.82	19.93	19.66	19.41	21.75		24.42	21.34	19.83	19.44	19.38	21.84	
Mini express	23.88	21.29	20.22	19.47	19.43	21.81	N.S	24.17	21.43	20.14	19.45	19.39	21.94	N.S

Table (7a) Interaction between baby carrot varieties and storage period.
* Cold storage °C

Baby corrot vorieties	(1999-2000)season													
	Storage period in weeks													
	Zero day	1	2	3	4	5	6	7	8	9	10	11	12	L.S.D
Loss in weight :														
Babette	—	0.79	0.89	0.98	1.21	1.55	1.71	1.95	2.29	2.65	3.13	3.29	3.65	
Mini express	—	0.68	0.88	0.97	1.27	1.79	1.86	2.09	2.50	2.78	3.17	3.46	3.83	0.14
Appearance:														
Babette	9.00	9.00	9.00	9.00	8.83	8.83	8.75	8.67	8.58	8.50	8.25	7.83	7.25	
Mini express	9.00	9.00	9.00	8.92	8.83	8.83	8.67	8.67	8.50	8.42	8.17	7.83	7.08	N.S
texture:														
Babette	1.00	1.00	1.00	1.00	1.08	1.25	1.33	1.42	1.67	1.83	2.08	2.33	2.67	
Mini express	1.00	1.00	1.00	1.00	1.17	1.17	1.25	1.42	1.67	1.83	2.08	2.25	2.50	N.S
Decay %														
Babette	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.29	4.66	7.72	10.35	14.70	17.14	
Mini express	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.96	5.02	7.90	11.52	15.65	15.81	N.S
T.S.S														
Babette	9.03	8.90	9.53	8.43	9.00	9.53	8.90	9.10	8.90	8.87	8.83	9.03	9.57	
Mini express	8.90	9.03	8.97	8.43	9.27	9.17	8.90	8.98	9.03	8.77	8.57	8.83	9.67	0.15

To be followed

Table (7a) Interaction between baby carrot varieties and storage period. * Cold storage ⁰ C

Baby corrot vorieties	(1999-2000)season													
	Storage period in weeks													
	Zero day	1	2	3	4	5	6	7	8	9	10	11	12	L.S.D
Acidity														
Babette	0.32	0.34	0.36	0.41	0.43	0.37	0.45	0.49	0.54	0.55	0.54	0.72	0.74	
Mini express	0.29	0.33	0.36	0.39	0.43	0.38	0.44	0.49	0.53	0.54	0.57	0.71	0.69	N.S
TSS/Acid ratio:														
Babette	28.25	26.53	27.23	20.76	21.26	25.93	19.93	18.53	16.62	16.09	16.52	12.64	12.97	
Mini express	31.34	27.82	25.66	21.73	21.81	24.47	20.23	19.27	17.27	16.28	15.04	12.56	13.96	N.S
caroten content:														
Babette	4.60	3.73	3.87	4.50	7.32	5.61	5.98	4.42	9.10	4.61	7.17	7.15	7.43	
Mini express	4.33	3.70	3.69	4.56	7.24	5.14	5.32	4.53	7.60	4.43	7.93	7.23	7.33	0.57
Vitamin 'A'														
Babette	7672	6222	6444.3	7501	12197	9356	9963	7375	15173	7679	11945	11925	12393	
Mini express	7225	6164	6145	7604	12062	8568	8864	7544	12674	7379	13217	12047	11669	969
Reducing sugars:														
Babette	11.99		10.16		9.21		10.52		9.71		9.34		9.97	
Mini express	11.86		9.68		9.05		10.12		8.85		9.72		9.83	0.376
Total sugars:														
Babette	24.60		23.92		22.14		23.06		21.18		22.96		23.87	
Mini express	23.88		23.58		21.86		22.71		21.71		22.26		22.03	0.439

Table (7a) Interaction between baby carrot varieties and storage period.

* Cold storage ° C

Baby corrot vorieties	(2000-2001)season													
	Storage period in weeks													
	Zero day	1	2	3	4	5	6	7	8	9	10	11	12	L.S.D
Loss in weight :														
Babette	——	0.88	0.87	1.09	1.37	1.51	1.63	2.11	2.35	2.75	3.06	3.18	3.38	0.18
Mini express	——	0.69	0.93	1.18	1.14	1.77	1.79	2.33	2.73	2.57	2.80	3.39	3.82	
Appearance:														
Babette	9.00	9.00	9.00	9.00	8.83	8.83	8.75	8.67	8.58	8.50	8.17	7.83	7.00	N.S
Mini express	9.00	9.00	9.00	8.92	8.83	8.83	8.67	8.67	8.50	8.33	8.08	7.58	7.00	
texture :														
Babette	1.00	1.00	1.00	1.00	1.08	1.25	1.33	1.42	1.67	1.92	2.17	2.50	2.83	N.S
Mini express	1.00	1.00	1.00	1.00	1.08	1.17	1.33	1.50	1.75	1.83	2.25	2.42	2.75	
Decay %														
Babette	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.07	3.68	6.81	9.13	13.41	15.07	N.S
Mini express	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.01	4.48	6.61	10.77	14.11	15.01	
TSS														
Babette	9.07	8.50	9.55	8.40	8.80	9.37	8.65	9.03	8.77	8.7	8.67	8.97	9.37	0.16
Mini express	9.03	9.07	8.75	9.02	9.13	9.00	8.77	8.97	9.00	8.63	8.80	9.10	9.43	

To be followed

Table (7a) Interaction between baby carrot varieties and storage period.

*Cold storage ^{0}C

Baby corrot vorieties	(2000-2001)season Storage period in weeks													
	Zero day	1	2	3	4	5	6	7	8	9	10	11	12	L.S.D
Acidity														
Babette	0.32	0.31	0.36	0.41	0.46	0.43	0.44	0.50	0.55	0.55	0.65	0.69	0.73	N.S
Mini express	0.32	0.30	0.31	0.33	0.39	0.43	0.47	0.50	0.53	0.55	0.57	0.63	0.66	
TSS/Acid ratio:														
Babette	28.21	29.51	27.34	21.06	19.87	21.84	19.76	18.34	15.84	15.71	13.43	13.07	12 95	2.43
Mini express	28.07	30.27	28.23	26.95	23.67	21.24	18.98	19.11	16.91	15.68	15.41	14.48	14.37	
caroten content:														
Babette	4.06	3.73	4.25	4.53	7.10	5.53	5.54	4.32	7.60	4.21	7.38	6.88	7.66	0.47
Mini express	3.93	3.08	3.54	3.67	6.21	5.15	5.02	3.76	6.76	4.61	7.55	7.03	7.60	
Vitamin 'A'														
Babette	6762	6225	7077	7554	11827	92232	9228	7194	12667	7000	12296	11461	12762	783
Mini express	6544	5301	5895	60.95	10359	8586	8370	6271	11264	7686	12593	11724	12669	
Reducing sugars:														
Babette	11.85		9.75		9.12		10.17		9.02		9.24		9.91	N.S
Mini express	11.83		9.64		9.03		10.11		8.77		9.56		9.74	
Total sugars:														
Babette	24.42		23.21		22.28		22.13		21.86		23.10		23.86	0.445
Mini express	24.17		23.03		21.86		22.62		21.54		22.24		21.78	

Meanwhile Babette variety seemed to be higher in carotene content, Vitamin "A", total and reducing sugars. In addition to that the decrease of quality features, under the condition of room temperature being started, as expected, earlier than under the condition of cold storage. Results had a similar trend to that obtained by Kiss and Holly (1965), Utsam et al (1990) and Dily et al (1994

Results in Table (8a) showed that there were significant interaction for decay percent, TSS, carotene content, Vitamin "A", reducing and total sugars under the condition of cold storage and room temperature in both seasons. also there were significant interaction for loss in weight, appearance and texture except under the condition of room temperature in both seasons, while there were no significant interaction for acidity and TSS/Acid ratio except under the condition of cold storage (2000-2001) season. In fact potassium fertilizer levels being in general effective in all the tested quality features during the storage period and that was more clear at the rate of (300 Kg/Fed.). These results are similar to those reported by Rijbroek and Van (1987)and Shibario *et al.*(1998).

Results showed no significant interaction in all characters under study treatments .

Table (8a): Effect of interaction between potassium fertilizer levels and storage period.

Potassium fertilizer levels	*Room temperature (1999-2000)season							*Room temperature (2000-2001)season						
	Storage period in weeks													
	Zero day	1	2	3	4	5	L.S.D	Zero day	1	2	3	4	5	L.S.D
Loss in weight :														
300 kg./Fed.	—	3.51	4.77	7.39	10.00	12.43	N.S.	—	5.10	5.69	9.05	12.05	14.95	N.S.
150 kg./Fed.	—	4.27	5.23	8.29	10.68	13.17		—	5.83	5.94	10.19	12.78	15.33	
Control	—	4.79	5.77	8.89	11.24	14.08		—	5.89	6.31	10.54	13.13	15.68	
Appearance:														
300 kg./Fed	9.00	8.88	7.88	7.75	7.25	6.88	N.S.	9.00	8.63	7.88	7.63	7.13	6.63	0.65
150 kg./Fed.	9.00	8.38	7.25	7.00	6.25	6.88		9.00	8.38	7.25	7.00	6.38	6.00	
Control	9.00	7.63	5.88	5.50	5.38	4.88		9.00	8.00	6.13	5.88	5.38	4.88	
Texture :														
300 kg./Fed.	1.00	1.25	1.75	2.00	2.38	2.88	N.S.	1.00	1.38	1.88	2.00	2.50	2.88	N.S.
150 kg./Fed.	1.00	1.50	2.13	2.50	2.88	3.38		1.00	1.50	2.00	2.63	3.00	3.50	
Control	1.00	1.88	2.75	3.13	3.50	3.75		1.00	1.88	2.63	3.13	3.50	3.75	
Decay %														
300 kg./Fed.	0.00	0.00	6.04	6.71	16.18	27.54	7.10	0.00	0.00	0.00	7.85	18.41	28.24	6.07
150 kg./Fed.	0.00	0.00	9.15	15.19	22.46	28.71		0.00	0.00	9.68	14.71	24.43	30.37	
Control	0.00	0.00	10.32	19.63	25.50	34.97		0.00	0.00	10.92	19.84	27.73	35.28	
T.S.S														
300 kg./Fed.	9.10	9.00	9.25	9.55	9.85	10.35	0.15	9.25	9.05	9.00	9.25	10.10	10.35	0.267
150 kg./Fed.	8.95	8.85	9.05	9.35	9.65	10.10		9.00	8.80	9.15	9.00	9.65	10.15	
Control	8.85	8.85	9.00	9.10	9.35	9.75		8.90	8.75	8.95	9.05	9.30	9.95	
Acidity														
300 kg./Fed	0.32	0.45	0.50	0.56	0.68	0.78	N.S.	0.33	0.45	0.44	0.52	0.67	0.79	N.S.
150 kg./Fed.	0.31	0.41	0.51	0.56	0.66	0.77		0.33	0.38	0.44	0.55	0.68	0.77	
Control	0.29	0.38	0.48	0.51	0.63	0.73		0.31	0.38	0.45	0.53	0.65	0.74	

Table (8a): Effect of interaction between potassium fertilizer levels and storoge period. (8a1) *Room temperature *Room temperature

Potassium fertilizer levels	(1999-2000)season							(2000-2001)season						
	Storage period in weeks													
	Zero day	1	2	3	4	5	L.S.D	Zero day	1	2	3	4	5	L.S.D
TSS/Acid ratio:														
300 kg /Fed.	28.77	20.34	18.48	16.99	14.56	13.23	N.S.	28.20	20.39	20.39	17.79	15.19	13.14	N.S.
150 kg./Fed	29.33	22.09	17.77	16.91	14.62	13.09		27.74	24.58	21.15	16.69	14.34	13.32	
Control	31.30	23.34	18.99	17.76	14.97	13.44		28.47	23.43	20.28	17.16	14.39	13.55	
Carolen content:														
300 kg./Fed	4.85	3.82	4.35	4.51	6.59	7.13	0.50	4.32	3.56	4.46	4.24	7.47	7.39	0.48
150 kg./Fed.	4.52	3.80	3.64	4.55	6.33	6.94		4.08	3.63	3.87	4.20	6.53	6.82	
Control	4.03	3.43	3.67	4.11	5.82	6.43		3.58	2.80	3.19	3.86	5.65	6.31	
Vitamin 'A' c														
300 kg./Fed	8084	6371	7246	7511	10986	11880	299	7196	5933	7441	7073	12442	12332	801
150 kg./Fed	7536	6325	6074	7581	10559	11570		6801	6042	6445	6996	10876	11365	
Control	6725	5725	6112	6857	9695	10821		5962	4664	5316	6426	9423	10521	
Reducing sugars:														
300 kg./Fed.	12.61	10.15	9.79	10.00	9.55	10.65	0.33	12.38	10.08	9.84	10.04	9.56	10.63	0.288
150 kg./Fed.	12.32	9.15	8.85	9.06	9.09	9.72		12.33	9.05	8.97	9.03	9.01	9.68	
Control	10.85	8.34	9.06	9.17	8.90	8.88		10.82	8.28	9.01	9.16	8.86	8.96	
Total sugars:														
300 kg./Fed.	25.16	23.67	21.94	20.29	20.20	23.45	0.49	25.33	23.00	21.87	20.18	20.15	23.27	0.449
150 kg./Fed	24.35	21.29	19.96	19.89	19.64	22.26		24.07	21.33	19.84	19.72	19.64	22.41	
Control	23.23	19.71	18.33	18.43	18.42	19.62		23.48	19.74	18.24	18.43	18.37	19.99	

Table (8a) Interaction between potassium fertilizer levels and storoge period.

*Room temperature *Cold storoge ^{0}c

Potassium fertiliZer levels	(1999-2000)season Storage period in weeks													
	Zero day	1	2	3	4	5	6	7	8	9	10	11	12	L.S.D
Loss in weight :														
300 kg./Fed	——	0.71	0.86	0.92	1.13	1.52	1.67	1.82	2.25	2.53	2.95	3.12	3.41	0.169
150 kg./Fed	——	0.67	0.84	0.93	1.23	1.70	1.74	2.00	2.34	2.62	3.07	3.29	3.58	
Control	——	0.84	0.98	1.08	1.36	1.79	1.94	2.24	2.61	3.00	3.42	3.73	4.26	
Appearance:														
300 kg./Fed	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	8.25	7.88	0.440
150 kg./Fed.	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	8.88	8.75	8.13	8.00	7.38	
Control	9.00	9.00	9.00	8.88	8.50	8.50	8.13	8.00	7.75	7.63	7.50	7.25	6.25	
Texture :														
300 kg./Fed.	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.13	1.38	1.63	2.00	0.456
150 kg./Fed.	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.25	1.50	1.75	2.00	2.25	2.50	
Control	1.00	1.00	1.00	1.00	1.38	1.63	1.88	2.00	2.50	2.63	2.88	3.00	3.25	
Decay %														
300 kg./Fed.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.82	6.19	5.820
150 kg./Fed.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.85	6.31	11.44	13.97	
Control	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.12	12.24	17.28	23.54	24.01	24.97	
T.S.S														
300 kg./Fed.	9.10	9.05	9.65	8.75	9.40	9.70	9.00	9.50	9.15	9.00	9.00	9.20	9.95	0.181
150 kg./Fed.	8.95	8.85	9.40	8.25	9.15	9.35	8.85	9.30	9.00	8.80	8.75	8.90	9.65	
Control	8.85	9.00	8.70	8.20	8.85	9.00	8.85	8.95	8.75	8.55	8.35	8.70	9.25	
Acidity														
300 kg./Fed.	0.32	0.34	0.36	0.39	0.44	0.39	0.46	0.51	0.54	0.55	0.58	0.73	0.74	N.S.
150 kg./Fed.	0.31	0.35	0.36	0.41	0.42	0.39	0.45	0.49	0.53	0.55	0.57	0.72	0.71	
Control	0.29	0.31	0.35	0.39	0.42	0.35	0.42	0.48	0.52	0.53	0.51	0.68	0.71	

Table (8a) Interaction between potassium fertilizer levels and storoge period.

*Room temperature *Cold storoge ^{0}c

Potassium fertiliZer levels	(1999-2000)season Storage period in weeks													
	Zero day	1	2	3	4	5	6	7	8	9	10	11	12	L.S.D
TSS/Acid ratio:														
300 kg./Fed.	28.77	26.70	27.41	22.22	21.66	25.04	19.69	18.67	17.11	16.32	15.41	12.59	13.40	N.S.
150 kg./Fed	29.33	25.55	27.09	20.34	21.73	24.37	19.62	19.16	16.86	15.95	15.48	12.45	13.87	
Control	31.29	29.28	24.84	21.17	21.22	26.20	20.93	18.87	16.88	16.28	16.46	12.75	13.12	
Caroten content:														
300 kg./Fed	4.85	3.82	3.72	4.78	7.41	6.17	5.29	4.51	8.58	4.39	8.13	7.68	7.98	0.700
150 kg./Fed	4.52	3.94	3.88	4.50	7.28	5.26	5.53	4.73	8.10	4.66	7.64	7.15	7.53	
Control	4.03	3.36	3.72	4.32	7.14	6.54	8.12	4.19	8.38	4.50	6.87	6.74	6.65	
Vitamin 'A'														
300 kg./Fed	8084	63741	62064	79838	12350.80	10289.14	682052	751317	14301.19	731646	13560.22	12798.41	13301.58	1187.800
150 kg./Fed	753651	65661	647046	74955	12134.51	876759	922309	788241	13506.87	776614	12740.05	11919.05	12548.76	
Control	67250	56396	62071	71996	11905.30	783032	10197.46	698390	13963.21	750650	11445.21	11243.50	10244.55	
Reducing sugars:														
300 kg./Fed	12.61		11.40		9.96		10.98		10.50		10.49		10.98	0.461
150 kg./Fed	12.32		9.71		9.07		10.18		8.93		9.57		9.80	
Control	10.85		8.67		8.36		9.63		8.40		8.52		8.93	
Total sugars:														
300 kg./Fed	25.16		25.52		24.20		24.71		23.18		24.17		25.05	0.538
150 kg./Fed	24.35		23.99		22.08		23.13		21.23		22.61		22.52	
Control	23.23		20.72		19.72		20.80		19.92		21.08		21.29	

Table (8a): Effect of interaction between potassium fertilizer levels and storoge period.

*Room temperature *Cold storoge ^{0}c

Potassium fertiliZer levels	(2000-2001)season Storage period in weeks													
	Zero day	1	2	3	4	5	6	7	8	9	10	11	12	L.S.D
Loss in weight :														
300 kg./Fed.	—	0.77	0.77	1.07	1.25	1.53	1.78	2.02	2.22	2.40	2.58	2.92	3.18	0.225
150 kg./Fed.	—	0.66	0.93	1.13	1.18	1.57	1.51	2.13	2.61	2.45	2.81	3.21	3.40	
Control	—	0.92	1.00	1.20	1.33	1.83	1.85	2.50	2.79	3.33	3.41	3.72	4.22	
Appearance:														
300 kg./Fed.	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	8.75	8.25	7.63	0.462
150 kg./Fed.	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	8.88	8.75	8.13	7.88	7.25	
Control	9.00	9.00	9.00	8.88	8.50	8.50	8.13	8.00	7.75	7.50	7.50	7.00	6.13	
Texture :														
300 kg./Fed.	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.25	1.50	1.88	2.25	0.455
150 kg./Fed.	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.38	1.75	1.75	2.13	2.38	2.63	
Control	1.00	1.00	1.00	1.00	1.25	1.63	2.00	2.00	2.38	2.63	3.00	3.13	3.50	
Decay %														
300 kg./Fed.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.37	9.79	5.24
150 kg./Fed.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.10	9.27	11.73	15.23	
Control	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.87	14.51	17.33	23.53	24.43	24.38	
T.S.S														
300 kg./Fed.	9.25	9.10	9.45	9.15	9.40	9.35	8.80	9.55	9.10	8.90	9.05	9.30	9.85	0.193
150 kg./Fed.	9.00	8.75	9.38	8.55	9.10	9.20	8.80	9.50	8.90	8.75	8.75	9.00	9.35	
Control	8.90	8.50	8.63	8.10	8.40	9.00	8.53	8.90	8.65	8.30	8.40	8.80	9.00	
Acidity														
300 kg./Fed.	0.33	0.32	0.30	0.36	0.38	0.46	0.47	0.51	0.55	0.54	0.57	0.64	0.66	0.045
150 kg./Fed.	0.33	0.30	0.33	0.36	0.44	0.45	0.41	0.48	0.54	0.59	0.65	0.69	0.71	
Control	0.31	0.28	0.37	0.40	0.45	0.39	0.49	0.50	0.55	0.53	0.62	0.66	0.70	

Table (8a): Effect of interaction between potassium fertilizer levels and storoge period.

(8a1) *Room temperature *Cold storoge °c

Potassium fertiliZer levels	(2000-2001)season													
	Storage period in weeks													
	Zero day	1	2	3	4	5	6	7	8	9	10	11	12	L.S.D
TSS/Acid ratio:														
300 kg./Fed	28.20	28.31	31 49	25.89	24 72	20.72	18.95	18 71	16.67	16.49	15.99	14.66	14 90	2.98
150 kg./Fed	27 74	29.48	28.33	24.75	21.17	20.72	21.58	19.68	16.69	14.90	13.62	13 16	13 12	
Control	28.47	31.88	23.53	21.37	19.41	23 18	17 58	17.79	15 77	15.71	13.65	13 51	12.96	
Caroten content:														
300 kg /Fed	4 32	3.63	4.26	3.85	7.34	6.31	4.40	4.01	7.74	4 37	8 13	7 42	8.28	0.58
150 kg./Fed	4.08	3.54	3.95	4 73	6.95	5.48	5.23	4.09	7.29	4.48	8.04	6.85	7.72	
Control	3.58	3.04	3.47	3.92	5.67	5.97	6.21	4.02	6.50	4.37	6 24	6.59	6.88	
Vitamin 'A'														
300 kg /Fed	7196	605121	710309	6085	12238.28	10511 27	733313	667884	12907.16	727479	13544.38	12367 89	13801 51	963 54
150 kg./Fed.	6801	590852	657673	785673	11585.65	915433	871924	682178	12148.27	746566	13396.01	11420 62	12873.41	
Control	5962	533107	57799	653297	945731	706225	10345.82	669884	10842.17	728896	10394.99	10990 12	11473 13	
Reducing sugars:														
300 kg /Fed.	12.38		10.81		9.91		10 81		9.69		10.44		10 93	0.24
150 kg./Fed	12.33		9.69		9.01		10.20		8.71		9.40		9 70	
Control	10.82		8.59		8.31		9.41		8.29		8.37		8.85	
Total sugars:														
300 kg./Fed.	25.33		25.22		24.08		23.82		23.77		24.34		25.05	0 545
150 kg./Fed	24.07		23.09		22.49		22.68		21.76		22.64		22.32	
Control	23.48		21.05		19.64		20.63		19.57		21.03		21 10	

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تأثير مستويات التسميد البوتاسى على نمو وتخزين الجزر الصغير

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تم زراعة تجربة حقلية فى مزرعة كلية الزراعة – جامعة قناة السويس بالإسماعيلية خلال موسمى ١٩٩٩ ، ٢٠٠٠م كذلك أجريت تجربة التخزين لكلا الموسمين فى معمل تداول وتخزين الخضر بمعهد بحوث البساتين بالجيزة وذلك لدراسة تأثير ثلاثة مستويات من التسميد البوتاسى هى صفر ، ١٥٠ ، ٣٠٠ كيلو جرام سلفات بوتاسيوم للفدان على النمو والمحصول وصفات والقدرة التخزينية للجذور الصغيرة Mimi express ، Babette .

ولقد أظهرت النتائج تفوق الصنف Mimi express عن الصنف Babette فى الوزن الكلى للنبات والوزن الطازج للجذور كما كان أقل فى قطر الكور والمادة الجافة بينما تفوق الصنف Babette فى طول الجذر .

وأدت زيادة التسميد البوتاسى حتى ٣٠٠كجم/فدان إلى زيادة فى إرتفاع النبات والوزن الكلى للنبات والوزن الطازج للجذور والنسبة بين وزن النبات إلى وزن الجذور أيضا زيادة طول الجذور وقطرها وقطر الكور مع زيادة محتواها من المادة الجافة . كما قل محتوى الألياف فى الجذور مما يعنى زيادة جودتها .

كما نتج عن زيادة التسميد البوتاسى زيادة المحصول الكلى والمحصول القابل للتسويق . وفى تجربة التخزين أظهر الصنف Babette جودة فى المظهر مع زيادة فى محتوى الكاروتين وفيتامين A . كما كان للتسميد البوتاسى حتى أعلى مستوى أثرا معنويا فى تقليل كل من الفقد فى الوزن ونسبة الجذور التالفة .