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WHEY CARROT BEVERAGE WITH SOME VEGETABLE OILS

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ABSTRACT

Whey is inevitable by – product of cheese production. Disposal of whey is a problem in the dairy industry, besides the loss of valuable whey nutrients. Therefore, the aim of the present work was devoted to get use of cheese whey as a base for producing carrot beverage supplemented with grape or sesame oils. Whey Carrot Beverage (WCB) was prepared by blending carrot juice (25%), sugar (12 %) and cheese whey (63-62 %) with different concentrations of grape or sesame oils (0, 0.5,1 %). After pasteurization and cooling, the beverage was stored at refrigeration temperature. The prepared beverage has yellow/ orange color, and overall acceptability. It had also high nutrients content including proteins, minerals and ß-carotene. The results revealed that the effect of oils addition increased total solids and fat contents in beverage while decreased pH. Moreover, the addition of oils improved the nutritional value of the beverage by supplying with omega 6, omega 9 and antioxidants. Storing study showed an increase in the total solids; decrease in protein and sugar contents as well as in antioxidant activity. On the other hand, the oxidative study showed that supplementation of beverages with 0.5 and 1% of grape or sesame oils did not affect the shelf- life. The microbiological analysis showed that the resultant product was free from TBC, coliform, yeasts and moulds during storage. It could be concluded that the whey beverage prepared from carrot juice and combined with vegetable oils (grape and sesame oils) was not only of increasing bioavailability of ß-carotene as reported by some investigators, but also possessed an excellent nutritional properties. Whey- carrot beverage could be an interesting and nutritious product in the developing functional foods.

Keywords: whey, carrot, grape oil, sesame oil, beverages, chemical composition, sensory, stability.

INTRODUCTION

Whey is a major by-product of cheese industry which was often disposed as waste, causing a high environmental contamination because of the high biochemical oxygen demand (35-40 g/L) (Bulatović *et al*., (2014). Over years considerable efforts were carried out to find new outlets of whey utilization in terms to reduce environmental pollution (Jeličić *et al.,* 2008). Whey is a source of vitamins and minerals as well as a source of high- quality proteins, among which sulfur amino acids are particularly valuable owing to their anticancer activities (Bounous, 2000). Whey protein has a potential effect for the improvement of health and prevention of diseases. (Bajaj & Sangwan, 2002). Considering to this, in recent years the bioconversion of whey has become an interesting process from the view point of human nutrition, especially for therapeutic purposes, in regard to economy, and with advantage for reducing pollution (Kar, and Misra ,1999).

Developed countries produce different food products by using whey. They produced whey cheese, whey butter, whey powder and different types of drinking items (Hague, 2003). Not every dairy producer has the capability to process whey into a usable product. The equipments required converting whey into food and animal feed products often cost more than companies can afford, and which cause companies will often rely on land spreading to dispose of the whey by-product. So in developing countries, as Egypt, cheese producers cannot engage in producing such kind of products without having necessary equipments and machineries. In the absence of economically viable technology, still whey is not utilized industrially in Egyptian plants and whey has been regarded as a waste product for many years. Therefore a beverage is supposed to be produced using the cheese whey. The manufacture of whey beverages require mixing of appropriate fruit juices, suitable stabilizers and acidulates to develop acceptable whey fruit beverages. Whey blending with fruit products (concentrates, juices, syrups, pulps and nectars) was discussed by Djuric *et al*., (2004). Different fruit juices have been applied with whey beverage preparation such as mango (Gad *et al*., 2013), pineapple (Baljeet *et al.,* 2013), orange (Sady *et al*., 2013) and guava (Singh *et al*., 2014). Liutkevičius *et al*., (2007) used flaxseed oil as source of Omega 3 to prepare functional whey beverage. Many attempts have been done on utilization of whey and permeate in the formulation of various whey beverages in Egypt (Hegazi, 2009; Gad *et al*., 2013), but still there is a lot of scope to explore the possibilities for its utilization in beverage industries. The utilization of whey as a beverage production is more economical and value addition than other methods of treatments and disposal. Therefore the present study was concerned with the production of whey based beverage supplement with carrot. Carrot contains β - carotene, vitamin C, B and E (Nicolle, 2004). β – Carotene is a natural antioxidant and important source for vitamin A (Grune, *et al*., 2010). The bioavailability of β – carotene is great in the presence of oils or fats (Hedrén *et al*., 2002), so the vegetable oils such as grape and sesame oils will be add to whey carrot beverage in this study. Grape and sesame oils have oxidative stability and health benefit. Both oils have mono and polyunsaturated fatty acids (Omega 9 and Omega 6) (Borchani *et al*., 2010; Canbay, and Bardakçi, 2011) which are very important ingredients since their physiological function is related to heart and vascular diseases, reduction cancer and regulation of autonomic nerves (Yi *et al.,* 2009). Also, they are a source of antioxidants including vitamin E, which is one of the important vitamins antioxidant and has been correlated with lowering cholesterol levels (Popovici *et al.,* 2009, Chandra and Kuvibidila, 2012)

The aim of the present study was to utilize cheese whey as a base for preparing nutritive and healthy carrot beverage supplemented with vegetable oils (grape and sesame oils). The influence of vegetable oils on the physicochemical properties of beverages as fresh and during storage was studied.

MATERIALS AND METHODS

Whey was used as base material for preparation of beverage .It was obtained from Karish cheese made by acid coagulation at the Dairy Production Unit, Animal Production Res. Inst. Agric. Res. Center. Physicochemical properties of the whey were presented in Table (1). Commercial grade sugar and carrot (*Daucus carota* L.) were purchased from the local market. Sodium carboxy methyl cellulose (CMC) was obtained from Misr Food Additives-MIFD. Natural grape and sesame oils were extracted from seeds of grape and sesame by Kabtten Co. and were purchased from the local supermarket**.**

Carrot was washed with tap water; then swiped with sterile, clean and dry cloth and kept under room temperature in properly dry place. The carrot was peeled off and cut into small pieces. Juice was extracted in a juicer and filtered with muslin cloth; the juice was kept under refrigerated conditions until used. The physicochemical properties of carrot juice was shown in Table (1).
The Whey Carrot Beverage (WCB) formulations were optimized by sensory evaluation. Overall acceptability of beverage up to major extent and their ranges were selected in accordance with preliminary experiments carried out in the laboratory.

The whey carrot beverages were prepared by blending carrot juice (25%), sugar (12%) and whey (63- 62%) depended on the different levels of oils added (0, 0.5 , 1%). The ingredients were added w/w. During the preparation of beverage different amount of oils were added 0, 0.5 and 1% to whey based carrot beverages. Suitable stabilizer including carboxy methyl cellulos (0.3 %) was added to beverage to prevent coagulation during pasteurization Also, homogenization has been used to alleviate sedimentation by reducing particle size The beverages obtained were filled into glass bottles (200 ml) then pasteurized at 85 °C for 30 sec. and cooled at 5°C in ice bath, then stored under refrigerated conditions (7±1°C) for 120 days. Finally the prepared product was analyzed for various physicochemical properties when fresh and through storage period.

pH values of beverage samples were measured by a digital pH meter (Jenway 3505 pHmeter). Viscosity was determined by using a Brookfield DA – E Viscoetemr at 25˚C. The viscosity reading was expressed in centipoises.

For detecting color measurement, the beverage samples was diluted 20 time with distilled water and was measured by spectrophotometer at wave length 380 – 450 nm and 450 - 495 nm for yellow and orange color respectively as described in Food dye analysis (2009). The averages of absorbance at these wave lengths represent intensity of color.

Total solids, protein, fiber and ash contents were determined according to AOAC method (2007), whereas the fat content of all beverage samples were determined by Rose – Gottlieb method (AOAC, 1991). Total sugars were estimated as described by Ranganna (2004). Total carbohydrates were calculated by difference.

Minerals content of beverage samples as P, Mg, Ca, Fe and K were determined by colorimetric by the method mentioned by El-Merzabani *et al*.,

(1977) for Phosphorus, Teitz (1983), for Magnesium Ginder and King (1972) for Calcium Dreux (1977) for Iron , Sunerman and Sunerman (1958) for potassium. Selenium was determined by using Inductively Coupled Plasma (ICP – AES), Thermo Sci , model : iCA6000 series. Argon gas was used for excitation of the element atom. The blank value for each element was deduced from the sample value.

Determination of β- carotene according to AOAC (2000).

The total antioxidant capacity was performed by the reaction of antioxidants in the sample eliminate certain amount of the provided hydrogen peroxide. The residual H_2O_2 is determined calorimetrically by an enzymatic reaction which involves the conversion of 3, 5, dichloro-2-hydroxy benzensulphonate to a colored according to Koracevic *et al*., (2001). Regarding fatty acids analysis**,** separation condition of fatty acids on GC/MS**.** Instrument: HP 6890 Series Gas Chromatograph System with an HP 5973 Mass Selective Detector. .

Column Description TR-FAME (Thermo 260 M142 P) (30 m, 0.25 mm ID,0.25um Film) (70%Cyanopropyl – Polysilphphenylene siloxane) c a p i l l a r y c o l u m n Injector Temperature 200 °C and Temperature transfer line 250 °C. The carrier gas was He2 (1.5 ml /min).The amount of sample injected was about l µl (5 µl/1 ml solvent) and the ionization energy was 70eV.

Qualitative Identification of the different constituents was performed by comparing their relative retention times and mass spectra with those of authentic reference compound (fatty acid methyl esters, purity 98% by GC). Also, probability merge search software and the NIST MS spectra search program were used. Oxidative stability of beverage samples was followed by determining thiobarbituric acid (TBA) test and peroxide value. TBA was carried out by the method described by Keeney and Smith (1971). Peroxide value (PV) was determined according to the method described in AOAC (1990).

Total bacterial counts (cfu /ml) were enumerated on standard plat out agar, cloliform counts (cfu /ml); yeasts and moulds were detected as described by Richardson (1985).

The sensory analysis was performed by the staff members of dairy departments' Animal production Res. Ins. Agri, Res, C. The beverage samples were evaluated for color (25), appearance (25) and flavor (50).

Table (1) physicochemical properties of carrot juice and whey

Properties	Carrot juice	Whey
pH	6.00	5.20
TS %	12.90	5.72
Fat %	0.25	-
Protein %	1.40	0.91
Ash %	0.42	0.33
Total carbohydrates	10.83	4.5
Fiber	2.3	-
β-Carotene (mg /100 ml)	9.56	-
Total antioxidant (mM /L)	2.00	0.22
Selenium (ppb)*	2.4	0. 13

***ppb = µg/kg**

RESULTS AND DISCUSSION

The physicochemical properties of WCB untreated (control) and treated with oils were given in Table (2). pH value of the WCB was 5.94 and decreased to 5.60 – 5.40 by adding 0.5 and 1% of sesame oil, respectively, while the same ratio of grape oil decreased the pH to 5.50 – 5.30, respectively. This decrease in the pH might be attributed to the free fatty acids content in the oils. The data Also indicate that the viscosity of beverages increased with the addition of oils (0.5 and 1%). This addition changes the total solids of beverage which leads to increase the viscosity. As the TS of WCB was 16.80, an increase of 17.22 – 17.63 and 17.27 – 17.75 with 0.5, 1% grape and sesame oils, respectively. The fat content in untreated beverage was 0.06 % attributed to carrot juice which contained 0.25% fat as shown in Table (1). An increase in fat content with oils addition was observed. Protein content was 0.93 including whey protein and carrot protein. Whey proteins are one of the most nutritionally valuable proteins due to its high content of essential amino acids. On the other hand, data showed negligible differences in the protein and total sugar content between control and supplemented beverages with oils.

Table (2) Effect of oils addition on physicochemical properties of the Whey Carrot Beverage (WCB)

Items	Treatments				
	WCB	WCB_G		WCB_S	
		0.5 %	1 %	0.5 %	1 %
pH values	5.94	5.50	5.30	5.60	5.40
Viscosity	8	9	11	10	12
T.S %	16.80	17.22	17.63	17.27	17.75
Fat %	0.06	0.49	0.93	0.51	0.97
Protein %	0.93	0.93	0.93	0.94	0.95
Total sugar %	15.19	15.20	15.22	15.19	15.20
Ash %	0.370	0.376	0.383	0.375	0.380

WCB: Whey Carrot Beverage.
WCB_G: Whey Carrot Beverage with Grape oil.
WCB_S: Whey Carrot Beverage with Sesame oil.

The minerals content of the beverage samples were detected for calcium, phosphorus, magnesium, potassium, iron and selenium. The results are shown in Table (3). It could be observed that the beverage samples contained high level of minerals. These results attributed to high minerals content in whey (Goyal and Gandhi, 2009) and in carrot (Nicolle, 2004). It was noticed that the highest value of potassium content was followed by phosphorous, magnesium, calcium, iron and selenium in all beverage samples. However, there was a slight increase in the minerals content of the examined beverage with oils, compared with untreated beverage, which might be attributed to the grape and sesame oils (Canbay &Bardaçi, 2011; Youssef *et al.,* 2013).
In general, the minerals play an important role in many physiological functions, and lack of these elements causes disturbance and pathological condition. Potassium is an essential nutrient and has an important role for synthesis of amino acids and proteins. Phosphorus is needed for bone growth, kidney function and cell growth. It also plays a role in maintaining body acid-alkaline balance (Fallon, 2001).

Table (3) Minerals content of the beverage samples

Minerals (mg/100ml)	Treatments				
	WCB	WCB_G		WCB_S	
		0.5 %	1 %	0.5 %	1 %
Ca	12.59	12.89	13.07	13.34	14.14
P	65.31	65.95	66.60	67.80	70.33
Mg	22.75	23.46	24.25	23.15	23.50
K	266.10	268.30	270.86	266.60	267.23
Fe	0.22	0.23	0.25	0.24	0.26
Se (ppb)*	0.70	0.65	0.60	0.92	1.20

*** ppb: µg/kg**

Magnesium supports vascular and respiratory health. Calcium helps prevention colon cancer, osteoporosis, and migraine (Bedigian and Harland, 1986). The results showed that the average content of whey based carrot beverage was 0.7 ppb of selenium. This content might be attributed to carrot juice, which contains 2.4 ppb of selenium as shown in table (1). The data also showed that the selenium content increased in beverage samples treated with sesame oil addition, which agrees with the work of Youssef *et al.*(2013), who reported that the sesame oil had higher level of selenium. Selenium is a major antioxidant nutrient; it stimulates the increase of antibody response to infections and promotes more energy in the body. Medical surveys show that increased selenium intake decreases the risk of cancer disease (Zeng &Combs, 2008).

Data in Table (4) represent the fatty acids profile of Whey Carrot Beverage untreated and treated with oils (grape and sesame), as well as the amount of fatty acids in 100 ml fresh beverage (mg/100ml). Results indicated that the amount of fatty acids were extremely higher in beverage treatments with oils, compared with untreated beverage. Samples treated with oils were higher in unsaturated fatty acids especially the oleic (C $_{18:1}$ Omega 9) and linoleic (C $_{18:2}$ Omega 6) acids. That might be attributed to the addition of the grape and sesame oils which contain high percentage of oleic and linoleic acid (Borchani *et al*., 2010 & Canbay, and Bardakçi, 2011). Such results indicated that the addition of the oils (grape and sesame oils) provide the beverage health benefit. High levels of unsaturated fatty acids play an important role in lowering high blood cholesterol and also in the treatment of atherosclerosis (Yi *et al.,* 2009). Poly-unsaturated fatty acid such as linoleic is essential for the human body because it cannot be synthesized in the body. It was observed that low levels of linolenic acid in beverages which are desired in beverages, because high levels of this fatty acid can cause unfavorable odor and taste in beverages. As reported previously (Baydar, 2001), low levels of linolenic acid are desired in edible oils.

Table (4) Average contents of relative fatty acids* composition of the beverage samples and average content of fatty acids in beverages (mg/100g)

Fatty acids	WCB		WCB_G 1%		WCB_S 1%	
	Relative %	Content mg/100 g	Relative %	Content mg/100 g	Relative %	Content mg/100 g
Palmitic C $_{16:0}$	23.00	13.80	19.07	177.35	11.64	112.01
Palmitoleic C $_{16:1}$	0.20	0.12	-	-	0.12	1.16
Stearic C $_{18:0}$	1.80	1.08	6.00	55.80	6.43	62.37
Oleic C $_{18:1}$	3.20	1.8	29.85	277.61	37.46	363.46
Linoleic C $_{18:2}$	66.10	39.66	41.44	385.39	41.94	406.82
Linolenic C $_{18:3}$	5.60	3.36	0.10	0.93	0.50	4.85
Eicosanoic C $_{20:0}$	-	-	-	-	0.47	4.56

***Average content of relative fatty acids expressed as g/100g fatty acids**

The changes in chemical constituents of beverage samples were given in Table (5). A gradual decrease in pH value of the WCB was observed during storage. The initial pH of 5.94 decreased to 5.26 after 120 days of storage. This decrease in pH is due to increase in acidity content in the product after 120 days of storage. The protein content decreased during storage due to some of the protein is converted into amino acids.

The initial TS of WCB was 16.80 increased to 17.19 after 120 days of storage. This increase in TS content might be attributed to partial evaporation of beverage samples during cold storage periods. The initial total sugar content of the WCB 15.19 decreased to 14.81 after 120 days of storage. This indicates that there was no appreciable change in total sugar content. Maillard reaction and other chemical reaction of sugars with amino acids during the storage resulting decreasing in total sugar content in the samples with the progress of storage period (Phisut and Jiraporn, (2013), however, the storage period in these studies was much higher i.e. 120 day. It was noticed that the rate of change in chemical composition of treated beverage samples with oils was lowest compared to untreated beverage samples**.** Fig. (1) cleared that the average absorbane at 450 - 495 nm for orange color was close to that at 380 to 450 nm for yellow color. This can explain the appearance of the yellow /orange color of whey carrot beverage. Yellow color attributed to color of whey , while orange color related to carrot juice.

According to literature, ß-carotene is the predominant carotenoid in carrots which is responsible for the orange color of carrot (Nicolle, 2004). Carotenoids are one of the most important groups of natural pigments and cause the yellow/orange colors of many fruit and vegetables. The results also showe pronounced change in the color of beverages affected by the oils added. It was noticed that adding grape oil to beverage increasing the intensity of the color compared to sesame oil.

Table (5) Change in chemical composition of the beverage samples during storage period

Items	Storage period (Days)	Treatments				
		WCB	WCB_G		WCB_S	
			0.5 %	1 %	0.5 %	1 %
pH values	Fresh	5.94	5.50	5.30	5.60	5.40
	30	5.35	5.00	4.89	5.10	4.95
	60	5.34	4.95	4.86	5.06	4.93
	90	5.30	4.91	4.84	5.00	4.90
	120	5.26	4.88	4.82	4.98	4.88
TS %	Fresh	16.80	17.22	17.63	17.27	17.75
	30	16.93	17.32	17.78	17.36	17.86
	60	17.03	17.44	17.88	17.44	17.97
	90	17.13	17.53	17.95	17.50	18.07
	120	17.19	17.60	18.00	17.55	18.11
Protein %	Fresh	0.93	0.93	0.93	0.94	0.95
	30	0.65	0.89	0.90	0.81	0.84
	60	0.45	0.86	0.87	0.77	0.80
	90	0.33	0.82	0.84	0.73	0.76
	120	0.33	0.76	0.78	0.65	0.68
Total sugar %	Fresh	15.19	15.20	15.22	15.19	15.20
	30	15.10	15.15	15.19	15.09	15.10
	60	15.00	15.07	15.15	15.00	15.06
	90	14.93	15.00	15.10	14.93	15.00
	120	14.81	14.96	15.06	14.88	14.95

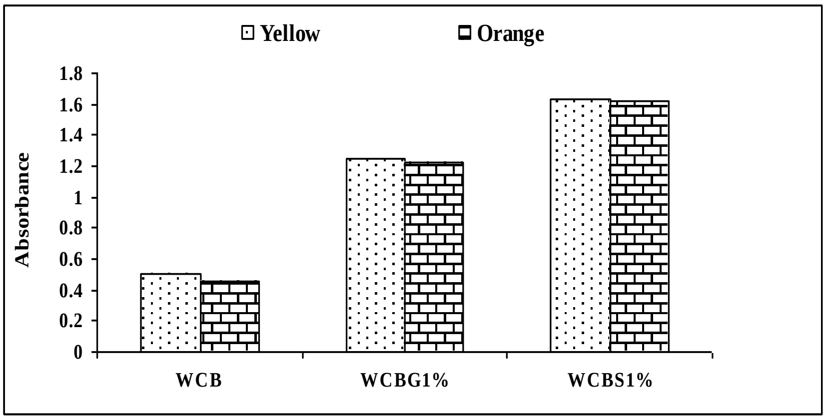

Fig. (1) Effect of oil addition on the whey based carrot beverage color

Change in color of beverage samples during storage period was shown in Fig (2). Generally, the color of all beverage samples were changed after the cold storage. A gradual decrease of color intensity in bevrage samples during storage peroid until 90 days was observed. These results might be due to the possible oxidation process of carrot juice phytochemical compounds during the cold storage. After 120 days the color relativly increased may be attributed to maillared reaction interfarnce with color during storage.

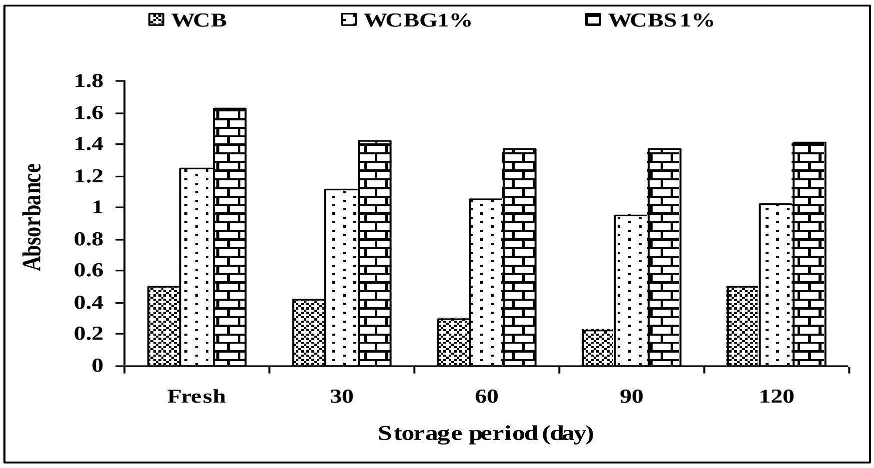

Fig.(2) The color of beverage samples during storage period

The total antioxidants values of the whey beverage were shown in Table (6). The results revealed that whey carrot beverage contained high level of antioxidants related to high antioxidants content in carrot as shown in Table (1). Carrot is rich in beta- carotene as shown in Table (1) which has the greatest antioxidant capacity (Grune, *et al*., 2010). Moreover, the sesame and grape oils addition increased antioxidant content in the whey carrot beverage.

These antioxidants in both oils including vitamin E which has been correlated with lowering cholesterol levels (Popovici *et al.,* 2009, Chandra and Kuvibidila, 2012). Also, antioxidants of sesame oil including lignans which are phytoestrogens play an important role in the reduction of cholesterol, anti-bacterial effects, and even slowing down certain types of cancer (Saarinen *et al*., 2007). Grape oil is one of the best antioxidant supplements because it contains resveratrol which helps in increasing the antioxidant count in the blood. And flavonoids help in promoting healthy heart function and lowers bad cholesterol (Nash, 2004).

Table (6) Effect of oils addition on the total antioxidants activity (mM/L) of beverage samples

Storage period (Days)	Treatments				
	WCB	WCB_G		WCB_S	
		0.5 %	1 %	0.5 %	1 %
Fresh	0.63	0.72	0.80	0.69	0.76
30	0.58	0.66	0.75	0.68	0.74
60	0.52	0.62	0.70	0.66	0.71
90	0.45	0.58	0.64	0.63	0.69
120	0.40	0.54	0.60	0.60	0.66

Regarding the oxidative stability of the beverage, the oxidation processes in the fatty phase of the beverage samples in fresh and after storage for 30, 60, 90, and 120 days at 7 °C were detected (Fig 3). The highest peroxide value of the fatty phase (0.53 meq/kg) was found in the untreated beverage samples after 60 days storage. It was clear in Fig. (3) PV values of treated beverage samples with oils were relatively low, compared with the untreated beverage due to antioxidants in grape and sesame oils which reduced the rate of oxidation. That related to the low quantities of linolenic acid in grape oil and sesame oil as mention_previously in fatty acids composition. This means that grape or sesame oils addition at 0.5% and 1% was relatively improved shelf-life of beverage samples.

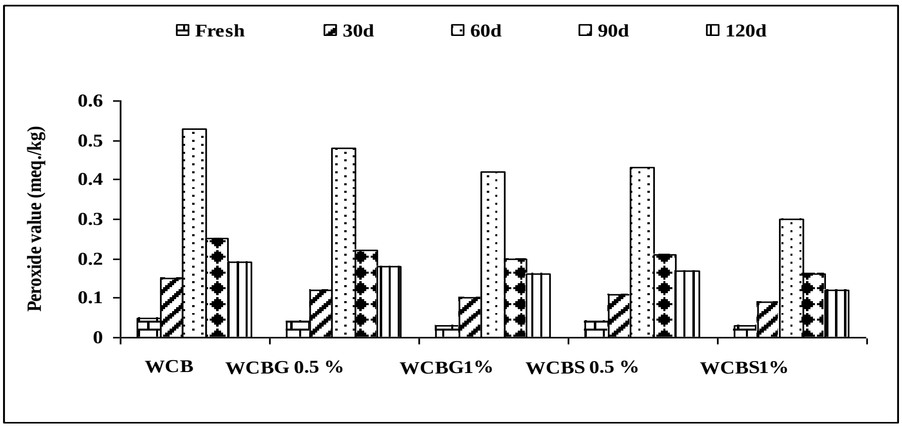

Fig. (3) Peroxide value of beverage samples during storage

These results were agreed with those reports by Sharif *et al*. (2009) and Canbay & Bardakçi (2011**)** that the antioxidant properties of sesame and grape oils extended the shelf life and preserved the flavor over a longer period of time. The oxidative stability of treated beverage with grape and sesame oils was followed by measuring the TBA values. The results of TBA (Fig. 4) indicated the negligible difference in TBA between untreated and treated beverages with oils. According to the results in Fig. (3&4), all samples treated with grape and sesame oils and untreated had remarkable of oxidative stability. This means that grape and sesame oils at 0.5% and 1% had no negative effect on shelf-life of beverage samples.

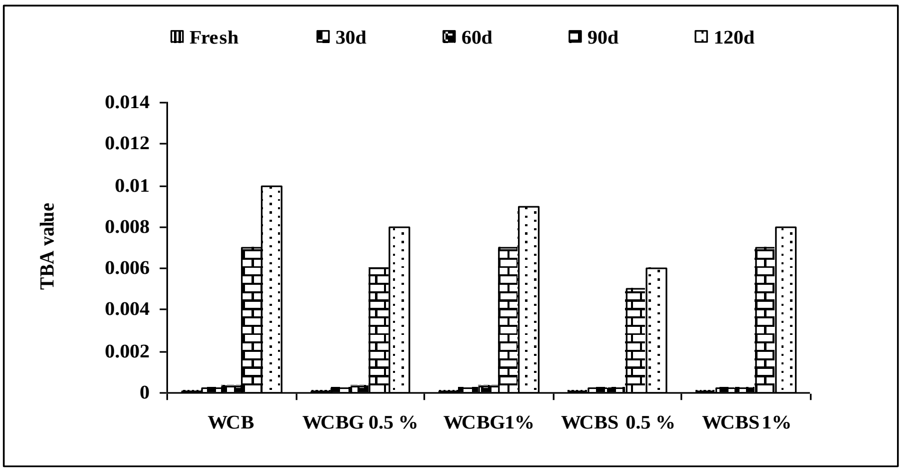

Fig. (4) TBA value of beverage samples during storage

For detecting the microbiological quality of the examined beverages, the results showed that TBC were not detected in all treatments during storage. This result might be due to the carrot antimicrobial activity as reported by Babic *et al.,* (1994), as well as the sesame and grape oil exhibited potent antimicrobial activity with selected microbial strains (Saleem, 2011, Ranjithav *et al.,* 2014). The coliform counts in all beverage samples were <10 cfu / ml. No coliforms were detected during the storage period. This indicated that the heat treatment was effective and that there was no post pasteurization contamination, As with the yeasts and moulds, they were not detected in all of the beverage samples during the storage period. These results are in agreement with Aly *et al.,* (2004) who, reported that the carrot juice with yoghurt suppressed the growth of mold and yeast.

As with the ensory evaluation of the prepared beverages, which was performed by the staff members of Dairy Departments using 100-points hedonic scale to know the overall acceptability of the product. The score (overall acceptability) in fresh condition to be 89 for whey carrot beverage without oils closed to the scores of corresponding samples with oils as shows in Table (7). It was noticed that the addition 0.5 and 1% of grape or sesame oils improved the color and appearance of beverage, while relatively decreased the flavor property of the product in fresh and during storage period. The storage study of whey carrot beverage revealed that all the characteristics i.e. appearance, color, flavor, and overall acceptability of sensory evaluation were in decreasing trend. This might be due to changes occurred during storage.

Table (7) Sensory evaluation of beverage samples during storage

Storage period	Properties	Treatments				
		WCB	WCB_G		WCB_S	
			0.5 %	1 %	0.5 %	1 %
Fresh	Flavor (50)	46	43	41	44	42
	Appearance (25)	22	23	24	22	23
	Color (25)	21	23	24	22	23
	Total (100)	89	89	89	88	88
30 days	Flavor (50)	46	43	41	44	42
	Appearance (25)	22	23	24	22	23
	Color (25)	19	21	22	20	21
	Total (100)	87	87	87	86	86
60 days	Flavor (50)	45	42	41	43	41
	Appearance (25)	21	22	21	20	21
	Color (25)	19	20	21	19	20
	Total (100)	85	84	83	82	82
90 days	Flavor (50)	44	42	41	42	41
	Appearance (25)	20	21	21	20	20
	Color (25)	18	19	20	18	19
	Total (100)	82	82	82	80	80
120 days	Flavor (50)	42	40	39	40	39
	Appearance (25)	19	21	21	20	21
	Color (25)	19	20	19	19	20
	Total (100)	80	81	79	79	80

CONCLUSION

Whey carrot beverage contained higher levels of protein, minerals, β-carotene and antioxidant. Beside adding grape or sesame oil increased the active ingredients like Omega 6, Omega 9 and antioxidant in the beverage. Moreover, the addition of oils improved the color and appearance. It is worth pointing out that for overall sensory quality, Whey- Carrot Beverages with and without oils obtained high scores (88 - 89), which opens the possibility of these beverages for being acceptable to consumers. In view of their functional properties, arising from the bioactive constituents in carrot and whey beside oils, Whey Carrot Beverage could be an interesting product in the constantly growing market for functional foods.

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مشروب الشرش بالجزر وبعض الزيوت النباتية

ماجـــدة عبـــد العزيـــز عبـــد الـــرءوف* ، وحيـــد إبـــراهيم عبـــدالعزيز نصـــر و كريمة أبو العينين مصطفى***
*** قسم بحوث كيمياء الألبان**
**** قسم بحوث تكنولوجيا الألبان – معهد بحوث الإنتاج الحيوانى - مركز البحوث الزراعية - وزارة الزراعة – الدقى**

شرش الجبن منتج ثانوى هام ناتج من صناعة الجبن يتم إهداره بكميات هائلة و يتسبب فى مشكلة تلوث كبرى لمصادر المياه بالإضافة إلى فقدان المواد الغذائية القيمة الموجودة بالشرش. لذا، كان الهدف من الدراسة الحاليةالإستفادة من الشرش لإنتاج مشروب ذات قيمة غدائية عالية بتكلفة منخفضة . وذلك عن طريق مزج عصير الجزر (٢٥٪)، والسكر (١٢٪) مع الشرش بنسب تتراوح بين ٦٣-٦٢٪ تعتمد على تركيزات الزيوت المختلفة مثل زيت العنب وزيت السمسم (٠ ،٥, ، ١٪). بعد إعداد المشروب تمت عملية البسترة والتبريد، ثم التخزين على درجة حرارة الثلاجة. و قد أجرت التحاليل الطبيعية الكيميائية على المنتج وأوضحت النتائج الأتى :

١- مشروب الشرش بالجزر حاز قبولا بشكل عام لدى المحكمين وإتصف باللون الأصفرالبرتقالي .
٢- إضافة زيت العنب أو زيت السمسم بنسب ٥, - ١ % لم يؤثر فى القبول العام للمشروب بل تحسن اللون والمظهر. هذا يعطى إشارة إلى الجودة الحسية.
٣- حصلت مشروبات الشرش بالجزروالمدعمة بزيت العنب أو زيت السمسم فى التحكيم الحسى على درجات عالية تقارب مشروب الشرش بالجزر وهذا مؤشرعلى إمكانية قبول هذه المشروبات لدى المستهلك.
٤- يحتوى مشروب شرش بالجزرعلى مستويات عالية من البروتين والمعادن، بيتا - كاروتين ومضادات الأكسدة.
٥- تأثيرإضافة الزيوت يزيد محتوى المشروب فى الجوامد الكلية والدهون في حين يقلل الرقم الهيدروجيني.
٦ - وعلاوة على ذلك، إضافة زيت العنب وزيت السمسم يزيد المحتوى الغذائي للمشروب بأوميجا ٦، أوميجا ٩ ومضادات الأكسدة.
٧- وأظهرت الدراسة أثناء التخزين اتجاها متزايدا في الجوامد الكلية وإنخفاضا في البروتين والسكر وكذلك في نشاط مضادات الأكسدة.
٨- أظهرت الدراسة أن إضافة زيت العنب وزيت السمسم بنسبة ٥, ، ١٪ لمشروب الشرش المدعم بعصير الجزر لم يؤثر تأثيرا سلبيا على مدة حفظ المنتج .
٩- أوضحت النتائج أن كل المعاملات خالية من العد الكلى للبكتريا و الخميرة والفطر أثناء فطرة التخزين .

نظرا للخصائص الوظيفية، الناشئة عن المكونات النشطة بيولوجيا في الجزر والشرش بجانب الزيوت، مشروب الشرش بالجزرالمدعم بزيت العنب أو السمسم يمكن أن يكون منتج غذائى جدير بالاهتمام فى للأسواق.