J. Agric. Sci. Mansoura Univ., 28 (6): 4741 - 4756, 2003

PRODUCTION OF CONCENTRATED APRICOT AND PEACH JUICES.

Dyab, A.S.*; A.I. EL-Desouky; H.E. M. Bahlol ** and S. A. Soliman ****

*** Food Technology Research Institute, Agricultural Research Center, Giza, Egypt.**

**** Food Sci. Dept., Fac. of Agric. Moshtohor, Benha branch, Zagazig Univ., Egypt.**

ABSTRACT

Vacuum concentration and serum-pulp concentration (V.C. & S.P.C.) methods were used to produce concentrated apricot and peach juices. The juice was concentrated without any additive as control and then after adding ethylene diamine tetra acetic acid (EDTA) and/or ascorbic acid. The concentrated juices were stored at -12°C. for nine months. Fresh and concentrated juices were chemically analyzed for some characteristics to indicate the quality of juice. Also, microbiological examination was carried out for fresh and concentrated juices. Furthermore, effect of adding EDTA and/ or ascorbic acid on chemical composition, organoleptic and microbiological examination were studied and, all juices were presented for sensory evaluation.

Generally, it could be concluded that the concentrated juice produced by S.P.C. was better than that produced by V.C., due to lower changes of juice characteristics. Addition of ascorbic acid inhibited the changes of juice characteristics slightly better than the addition of EDTA. Both concentration methods decreased the total bacterial count and yeast and moulds. However the juice concentrated by V.C. contained lower number of microorganisms than that concentrated by S.P.C.. Also, addition of ascorbic acid or EDTA to decrease the microbiological load, but ascorbic acid was more effective.

INTRODUCTION

Apricot is widely cultivated in Egypt, but of a short harvesting season. There are many varieties such as Amar, Hamawy, and Fayoumy (El-Saidawy *et al.*, 1997). Peach is considered an important cultivar in Egypt, such as Meet-Ghamr, Edfina and Sultani. Recently was cultivated in reclaimed lands such as Shekh-Zwaied and Desert red. Peach cultivated in this area has excellent characteristics of flavor, color, texture and high sugar content (El-Saidawy *et al.*, 1997). Both cultivars are preserved to be available with a good quality and suitable price in seasons where no production (Zeid, 1996). The concentrates of juices may be employed as flavoring materials in some food products besides consumption after reconstitution in time of rarity (AbdEl-Fadeel, 1981). Storage of concentrated juice at suitable temperature increases its keeping quality either for use in food products or as reconstituted juice. Moreover concentration of juice reduces the cost of packaging, storage and transportation. Furthermore shipment of concentrates to other markets is much more economic (Asker *et al.*, 1981). Evaporation of excess water in fruit juices is considered to be the most economical and most widely used method of concentration (Karel, 1975). The main idea of serum-pulp separation method is based on low viscosity of the serum, which substantially increases the heat transfer coefficients, facilitates concentration

and reduces flavor deterioration and browning (Askar *et al.*, 1981). Afifi (1995) showed a slight difference in physical and chemical properties of reconstituted juices that were concentrated by different conventional methods or serum-pulp method.

Ethylene diamine tetra acetic acid (EDTA) stabilized ascorbic acid in fruit juice (Timberlake, 1960). Several bacterial species have shown sensitivity to EDTA (Gray and Wilkinson, 1965 and Brown and Richards, 1965). Belitz and Groch (1999) demonstrated that the chelating agents have acquired greater importance in food processing. Their ability to bind metal ions has been contributed significantly to stabilization of food color, aroma, texture and inhibit oxidation of ascorbic acid and fat soluble vitamins.

The aim of this investigation was to study the effect of two concentration methods on producing apricot and peach juice concentrates, as well as study the effect of addition of EDTA and/or ascorbic acid on the characteristics of juices.

MATERIALS AND METHODS

Materials:

Ripe apricot (*Prunus armeniaca*) variety Amar was obtained from Amar village, Kaluobia Governorate and ripe peach (*Prunus persica*) variety Desert red was obtained from local market in Giza City, Egypt.

Methods:

Extraction of juice: Apricot and peach fruits were washed, cut into halves and the kernels were removed. The juice was mechanically extracted using a blender, strained through two layers of cheesecloth. Samples of the juice were chemically analyzed. The extracted juice was pasteurized at 80°C. for 10 min., and then cooled rapidly to 25°C. according to Foda *et al.* (1970). Sodium metabisulfite was added at 0.05% to produce 250 ppm SO_2 . The juice was divided into four parts to be studied in four treatments as follows:

1- Juice without any additive as control.
2- Juice with 0.1% EDTA.
3- Juice with 0.3% ascorbic acid.
4- Juice with 0.1% EDTA plus 0.3% ascorbic acid.

Each part of apricot and peach juice was divided into two portions to be concentrated by the two methods.

Vacuum concentration (V.C.): First portion of juice was concentrated by rotary evaporator under vacuum 28 mmHg at 45-50°C.. The concentration process was continued until the total soluble solids (T.S.S.) of the juice reached to double folds for apricot and peach juices.

Serum-pulp concentration (S.P.C.): Second portion of juice was separated into serum and pulp by centrifugation at 5000 r.p.m. for 15 min., according to the method described by AbdEl-Fadeel (1981). The serum was concentrated to 34% T.S.S. by heating under vacuum and mixed with the separated pulp to obtain 23% and 21% T.S.S. for apricot and peach juice concentrates, respectively. The concentrated juices were packed in glass bottles and heated at 70°C. for 20 min., then cooled and stored at -12°C. for 9 months.

Chemical analysis: Moisture, total soluble solids (T.S.S.), total acidity, ascorbic acid, crude fiber and ash were determined according to A.O.A.C. (1990). The pH value was measured using a Knick pH meter with glass electrode (Ingold u 456-ku-57) at 25°C. as described by A.O.A.C. (1990). Total and reducing sugars were determined according to the methods of Somogy (1952) and Nelson (1974). Color index was determined colorimetrically as described by Rangana (1979). Carotenoids were determined according to Wettestein (1957).

Microbiological examination: Total viable bacterial count (TVBC), yeast and moulds (Y&M) and coliform group were examined according to the methodology of the American Puplic Health Association (1992) and Oxoid (1990).

Sensory evaluation: Juice was evaluated by ten panelists (from Food Technology Research Institute, Agricultural Research Center, Giza, Egypt) for taste, odor, color and overall acceptability according to Ibrahim (1985).

Statistical analysis: Statistical analysis was applied to chemical composition and sensory evaluation for concentrated juices stored for 9 months. Data were treated as data for complete randomization design. Least significant difference (L.S.D.) was calculated at 0.05 level as significance. This analysis was carried out according to Sendecor and Cochran (1980).

RESULTS AND DISCUSSION

Effect of vacuum and serum-pulp concentration methods on apricot juice:

The changes occurred in the concentrated apricot juice by V.C. and S.P.C. are shown in Table (1). The moisture decreased by concentration from 86.53 to 75.27 and 75.21% for concentrated apricot juice by V.C. and S.P.C., respectively. On the other hand, dry mater increased from 13.47 to 24.73 and 24.79% for concentrated apricot juice by V.C. and S.P.C, respectively. The total soluble solides increased from 11.50 to 23.00% and an increase in color index from 0.03 to 0.09 and 0.08 for concentrated apricot juice by V.C. and S.P.C., respectively. This may be caused by increase of darkness due to brown color producing during concentration. Totai acidity decreased from 16.98 to 12.98 and 13.59% which might be attributed to the volatilization of some acids through concentration under vacuum. This results are in agreement with those reported by Abd El- Fadeel (1978), Abd El- Fadeel (1981), Askar *et al.* (1981), Ibrahim (1985), El-Hamzy (1996) and Mostafa (2002).

Reducing sugars increased from 19.67 to 20.92 and 19.81%, while the non-reducing sugars decreased from 27.10 to 20.30 and 23.83% for concentrated apricot juice by V.C. and S.P.C., respectively. The increase of reducing sugars can be attributed to inversion of non-reducing sugars to reducing sugars. Meanwhile, the total sugars decreased from 46.77 to 40.92 and 43.64% for concentrated apricot juice by V.C. and S.P.C., respectively, which might be due to the non-enzymatic browning reactions. These results are in accordance with those given by Afifi (1995). Ascorbic acid content

decreased from 52.41 to 17.10 and 19.97 mg/100g, which might be due to partial part destruction caused by heat. These results are in agreement with those reported by Abd El- Fadeel (1981), El-Hamzy (1996) and Mostafa (2002). Crude fiber increased from 4.23 to 6.15%, while ash decreased from 4.09 to 3.19% for concentrated apricot juice by V.C., the same trend was observed in concentrated apricot juice by S.P.C.. Tese results agree with those reported by Abd El-Fadeel (1981), Afifi (1995) and Mostafa (2002). Total carotenoids decreased from 25.76 to 12.85 and 16.58 mg/100g., which might be attributed to degradation through vacuum concentration, these results agree with those reported by Abd El-Fadeel (1981), El-Hamzy (1996) and Mostafa (2002).

Table (1): Physicochemical properties of fresh and concentrated apricot and peach juices.

Properties	Apricot juice			Peach juice		
	Fresh	V.C.*	S.P.C.**	Fresh	V.C.*	S.P.C.**
Moisture %	86.53	75.27	75.21	88.06	77.57	77.43
Dry matter %	13.47	24.73	24.79	11.94	22.43	22.57
T.S.S.	11.50	23.00	23.00	10.50	21.00	21.00
pH value	3.40	3.40	3.30	4.00	4.00	3.97
Color index	0.03	0.09	0.08	0.10	0.17	0.16
On dry basis						
Total acidity %	16.48	12.98	13.59	4.41	3.23	3.57
Total sugars %	46.77	40.92	43.64	71.18	69.86	70.73
Reducing sugars %	19.67	20.92	19.81	25.37	26.53	25.71
Non reducing sugars %	27.10	20.30	23.83	45.81	43.51	45.02
Ascorbic acid mg/100g	52.41	17.10	19.97	60.88	21.31	23.66
Crude fiber %	4.23	6.15	5.57	3.77	4.85	4.38
Ash %	4.04	3.19	2.95	4.34	4.62	4.43
Carotenoids mg/100g	25.76	12.85	16.58	38.19	18.76	23.12

*** Vacuum concentration ** Serum-pulp concentration**

Generally, it could be concluded that concentrated juice produced by S.P.C. was better than produced by V.C. method, because it caused lower changes in most characteristics.

Effect of vacuum and serum-pulp concentration methods on peach juice:-

The changes occurred in the concentrated peach juice by V.C. and S.P.C. are shown in Table (1). The total soluble solids increased from 10.50 to 21.00%. Moisture decreased from 88.06 to 77.57 and 77.43% for concentrated peach juice by V.C. and S.P.C., respectively, while dry mater increased from 11.94 to 22.43 and 22.57%, beside an increase in color index was observed from 0.10 to 0.17 and 0.16 for concentrated peach juice by V.C. and S.P.C., respectively which attributed to increase of darkness by non-enzymatic browning reaction. The total acidity decreased from 4.41 to 3.23 and 3.57% which might by due to volatilization of some acids during concentration. These results agree with those reported by Abd El-Fadeel (1981), Ibrahim (1985), Sandhu and Bhatia (1985), El-Hamzy (1996) and

Mostafa (2002). Total sugars decreased from 71.18 to 69.86 and 70.73% due to the browning reaction. Whereas, the reducing sugars increased from 25.37 to 26.33 and 25.71%, the non reducing sugars decreased from 45.81 to 43.51 and 45.02% for concentrated peach juice by V.C. and S.P.C., respectively. The increase in reducing sugars may be attributed to the inversion of non reducing sugars to reducing sugars. These results agree with those obtained by Abd El-Fadeel (1981), Ibrahim (1985), El-Hamzy (1996) and Mostafa (2002). Ascorbic asid decreased from 60.88 to 21.31 and 33.66 mg/100g for concentrated apricot juice by V.C. and S.P.C., respectively. The reduction in ascorbic acid could be attributed due to partial destruction by heat concentration. These results are in accordance with those given by Ibrahim (1985), Sandhu and Bhatia (1985), El-Hamzy (1996) and Mostafa (2002). Crude fiber and ash content showed some changes in their values, as crude fiber increased from 3.77 to 4.85 and 4.38%, while ash increased from 4.34 to 4.62 and 4.43% for concentrated peach juice by V.C. and S.P.C., respectively. Carotenoids content decreased from 38.19 to 18.76 and 23.12 mg/100g, which might be attributed to degradation during concentration. These results are in accordance with those reported by Abd El-Fadeel (1981), El-Hamzy (1996) and Mostafa (2002).

Effect of some additives on chemical composition of concentrated apricot juice by V.C. and S.P.C. methods:

The effect of some additives on the chemical composition of concentrated apricot juice is shown in Table (2). Moisture content showed no significant changes in different treatments, compared to treatments (1). The color index in treatments (1) concentrated by V.C. and S.P.C. was 0.09 and 0.08 respectively, and decreased in descend order for treatments (4), (2) and (3) in juice concentrated by the two methods. Total acidity was12.97 and 13.58% for treatments (1) concentrated by V.C. and S.P.C., respectively. Treatment (4) contained the highest total acidity due to the effect of treating by ascorbic acid and EDTA as it reached over 14%. The lowest total acidity was found in treatments (2) recording 13.62 and 13.65%.

Total sugars of apricot juice concentrated by V.C. and S.P.C., for treatments (1) were 40.92% and 43.66%, respectively. The highest total sugars content was found in treatments (2) as they reached 45.21 and 46.52 while the lowest total sugars content was found in treatments (3) and (4) respectively. Reducing sugars content revealed the highest values as they reached 22.11 and 21.34% respectively in treatment (4).

Ascorbic acid was 17.09 and 19.97 mg/100 g in treatments (1) concentrated by V.C. and S.P.C.. The treatments 4 and 3 revealed the maximum content of ascorbic acid as they were 165.47, 166.40, 162.80 and 164.00 mg/100 g, respectively.

On the contrary concentrated apricot juice by S.P.C. method revealed higher percentages of carotenoids than that concentrated by V.C. method as they were 16.57, 18.89, 22.90, 17.44, 12.87, 14.95, 16.06 and 13.13 mg/100 g, respectively. However the highest content was noticed in treatment (3) for S.P.C., while the lowest was of treatment (1) for V.C. method.

Table (2):Physiochemical of concentrated apricot juice stored at -12°C. for 9 months.

Properties	Storage period (month)	V.C.* Treatments					S.P.C.** Treatments				
		1	2	3	4	L.S.D.	1	2	3	4	L.S.D.
Moisture %	0	75.27	75.35	75.42	75.40	0.075	75.21	75.25	75.34	75.38	0.043
	3	75.24	75.31	75.33	75.41		75.18	75.17	75.13	75.33	
	6	75.46	7528	75.23	75.27		75.10	75.12	75.22	75.25	
	9	75.10	75.24	7521	75.23		75.07	75.11	75.20	75.22	
	L.S.D.	0.075				[a]0.151	0.043				[a]0.087
pH	0	3.40	3.30	3.30	3.30		3.30	3.30	3.29	3.25	
	3	3.40	3.30	3.29	3.28		3.30	3.30	3.28	3.25	
	6	3.35	3.30	3.29	3.28		3.30	3.30	3.26	3.24	
	9	3.32	3.30	3.27	3.27		3.30	3.29	3.26	3.25	
Color index	0	0.09	0.08	0.07	0.09	0.0008	0.08	0.07	0.06	0.08	0.007
	3	0.09	0.09	0.08	0.09		0.09	0.07	0.07	0.08	
	6	0.10	0.09	0.08	0.09		0.09	0.08	0.07	0.09	
	9	0.10	0.09	0.09	0.10		0.10	0.09	0.08	0.09	
	L.S.D.	0.0008				[a]0.0016	0.0007				[a]0.0015
On dry basis											
Total acidity %	0	12.97	13.62	13.85	14.04	0.032	13.58	13.65	14.11	14.39	0.050
	3	13.02	13.67	13.95	14.13		13..70	13.80	14.25	14.38	
	6	13.24	13.68	14.09	14.18		13.85	14.02	14.46	14.81	
	9	13.29	13.75	14.21	14.28		14.03	14.11	14.50	14.84	
	L.S.D.	0.032				[a]0.064	0.050				[a]0.101
total sugars %	0	40.92	45.21	44.61	42.57	0.508	43.66	46.52	45.99	45.25	0.366
	3	40.72	44.83	44.59	42.58		42.92	45.77	45.25	44.58	
	6	39.68	44.50	44.21	41.89		41.86	44.89	44.41	44.33	
	9	38.43	43.17	44.37	40.69		40.90	43.66	43.52	42.95	
	L.S.D.	0.508				[a]1.016	0.366				[a]0.732
Reducing sugars %	0	20.63	21.09	21.22	22.11	0.125	19.81	20.38	20.73	21.34	0.060
	3	21.03	21.74	21.92	22.51		20.45	21.14	21.39	21.91	
	6	21.39	22.10	22.36	22.73		20.92	21.65	21.87	22.32	
	9	21.99	22.57	22.71	23.01		21.27	21.95	22.34	22.74	
	L.S.D.	0.125				[a]0.249	0.060				[a]0.120
Ascorbic acid mg/100 g	0	17.09	20.82	162.80	165.47	0.627	19.97	21.57	164.00	166.40	0.662
	3	16.43	19.22	161.20	164.30		18.87	20.41	162.05	165.14	
	6	15.54	17.36	159.79	163.08		16.73	18.80	161.14	164.48	
	9	13.20	14.25	158.24	162.05		13.86	14.91	158.88	162.70	
	L.S.D.	0.627				[a]1.255	.0662				[a]1.325
Crude fiber %	0	6.15	6.23	6.19	6.11	0.090	5.57	5.97	5.81	5.49	0.098
	3	6.14	6.19	6.15	6.15		5.53	5.89	5.77	5.37	
	6	6.11	6.19	6.19	6.11		5.49	5.93	5.77	5.45	
	9	6.07	6.15	6.11	6.07		5.53	5.89	5.77	5.45	
	L.S.D.	0.090				[a]0.180	0.098				[a]0.196
Ash %	0	3.18	3.19	3.18	3.11	0.066	2.94	2.90	2.90	2.86	0.073
	3	3.19	3.16	3.19	3.07		2.94	2.90	2.90	2.84	
	6	3.15	3.19	3.15	3.11		2.92	2.86	2.90	2.86	
	9	3.19	3.19	3.15	3.07		2.94	2.90	2.88	2.82	
	L.S.D.	0.066				[a]0.131	0.073				[a]0.149
Carotenoids mg/100 g	0	12.87	14.95	16.06	13.13	0.162	16.57	18.89	22.90	17.44	0.206
	3	12.61	14.47	15.44	12.94		16.12	18.32	22.38	17.10	
	6	12.14	13.83	15.18	12.59		15.17	17.74	21.86	16.61	
	9	11.77	13.25	14.95	12.21		14.82	17.29	21.14	16.36	
	L.S.D.	0.162				[a]0.324	0.206				[a]0.412

**Vacuum concentration ***serum pulp concentration [a]L.S.D. treatments x storage period

Treatments (1- control 2- 0.1% EDTA 3- 0.3% ascorbic acid 4- 0.1% EDTA + 0.3% ascorbic acid)

Changes in physicochemical of concentrated apricot juice during storage at -12°C. for nine months:

Data in Table (2) Show the changes in physicochemical properties of concentrated apricot juice during storage at -12°C for nine months:

Moisture content: The moisture content of treatment (1) was 75.27% reached to 75.35, 75.42 and 75.40% for treatments (2), (3) and (4), respectively for concentrated juice by V.C.. The moisture content of concentrated juice by S.P.C. was 75.21% for treatment (1), reached to 75.25, 75.34 and 75.38% for treatments (2), (3) and (4), respectively. There are no significant changes after storage periods for concentrated juice. These results are in agreement with those reported by El-Sayed (1976), Bernhardt *et al.* (1979) and Abd El-Latife (1991).

pH value: The pH value of concentrated apricot juice by V.C. was 3.4 for treatment (1) decreased to 3.3 for all treatments. The concentrated juice by S.P.C. had pH 3.3 for treatment (1) decreased to 3.29 and 3.25 for treatments (3) and (4), respectively, this might be due to adding the additives. During storage the pH of all treatments decreased slightly. This could be attributed to the increase of acidity.

Color index: The color index for treatment (1) was 0.09 and decreased to 0.09, 0.08 and 0.07 for treatments (4), (2) and (3), respectively for V.C. method. The color index for concentrated apricot juice by S.P.C. was 0.08 for treatment (1) decreased to 0.08, 0.07 and 0.06 for treatments (4), (2) and (3), respectively. Color index increased significantly during storage periods, which could be attributed to the non-enzymatic browning reaction as reported by Cornwell and Wrolstad (1981), David (1986) and Grandall *et al.*, (1987).

Total acidity: The total acidity of concentrated apricot juice by V.C was 12.97% for treatment (1) which raised to 13.62, 13.85 and 14.04% for treatments (2), (3) and (4), respectively. Total acidity of concentrated apricot juice by S.P.C. was 13.58% for treatment (1) increased to 13.65, 14.11 and 14.39 % for treatments (2), (3) and (4), respectively. Total acidity increased significantly during storage in all treatments attributed to degradation of pectic substances or soluble pectin to galacturonic acid, as reported by El-Sherbiny and Shaker (1981), El-Shiaty *et al.*, (1986) and El-Hamzy (1996).

Total sugars: Total sugars of concentrated apricot juice by V.C. method were 40.92% for treatment (1) and increased to 45.21, 44.61 and 42.57% for treatments (2), (3) and (4), respectively. Concentrated apricot juice by S.P.C. had total sugars content about 43.66% for treatment (1) increased to 46.52, 45.99 and 45.25% for treatments (2), (3) and (4), respectively. A clear decrease in total sugars was observed for all treatments after storage periods which may be related to non-enzymatic browning reactions, these results were in accordance with those given by Ibrahim (1970) and Abd El-Fadeel (1981).

Reducing sugars: Reducing sugars content of concentrated apricot juice by V.C. method , was 20.63% for treatment (1) increased to 21.09, 21.22 and 22.11% for treatments (2), (3) and (4), respectively.Whereas, the concentrated apricot juice by S.P.C., had reducing sugars about 19.81% and increased to 20.38, 20.73 and 21.34% for treatments (2), (3) and (4),

respectively. Reducing sugars during storage periods for all treatments increased significantly, due to inversion of non-reducing sugars to reducing sugars. Also acidity enhances the hydrolysis of sucrose in apricot juice, as reported by Abd El-Fadeel (1981), Ibrahim (1985), Ragab (1987) and El-Hamzy (1996).

Ascorbic acid content: Ascorbic acid content of concentrated apricot juice by (V.C), was 17.09% for treatment (1) increased to 20.82, 162.80 and 165.47%, respectively for treatments (2), (3) and (4). Ascorbic acid of concentrated apricot juice by (S.P.C.) method was 19.97 for treatment (1) increased to 21.57, 166.00 and 166.40 mg/ 100 gm, respectively for treatments (2), (3) and (4). Ascorbic cid content decreased significantly for all treatments during storage periods. These results agree with those obtained by Marcy *et al.* (1984), Ibrahim (1985) and El-Hamzy (1996).

Crude fiber and ash contents: Concerning for crude fiber content, non significant changes occurred in all treatments after storage periods. These results are in agreement with El-Sayed (1976), Abd El-Latief (1991) and Abou-Taleb (1999).The same trend was obtained for ash. These results agree with Abd EL-Latief (1991).

Carotenoides content: Total carotenoids of concentrated apricot juice by V.C. was 12.87 for treatment (1) increased to 16.06, 14.95 and 13.13 mg/ 100 g, respectively for treatments (3), (2) and (4). Total carotenoids of concentrated apricot juice by S.P.C. method were 16.57 mg/100 g for treatment (1), while carotenoids in treatments (3), (2) and (4) were 22.90, 18.89 and 17.44 mg/100 g, respectively. During storage of all treatments, total carotenoids decreased significantly, due to degradation. These results agree with Abd El-Fadeel (1981), Mir and Nath (1993) and Zeid (1996).

Effect of some additives on physiochemical properties of concentrated peach juice by V.C. and S.P.C. methods:

Effect of some additives on physiochemical characteristics of concentrated peach juice by V.C. and S.P.C. methods is shown in Table (3). Moisture content showed no significant changes in different treatments concentrated by V.C. and S.P.C. methods. The color index in treatments (1) concentrated by V.C. and S.P.C. was 0.17 and 0.16, respectively. The color index decreased in descend order for treatments (4), (3) and (2) in concentrated juice by the two methods. Total acidity was 3.23 and 3.57% for concentrated juice treatments (1). Treatment (4) contained the highest total acidity due to the effect of treating by ascorbic acid and EDTA. Total sugars of concentrated peach juice by V.C. and S.P.C. for treatments (1) were 69.86 and 70.73%, respectively. The highest total sugars content was found in treatments (2) and (3) concentrated by V.C. and treatment (3) concentrated by S.P.C.. Reducing sugars content revealed the highest values as they reached to 28.10 and 27.41%, respectively. Ascorbic acid was 21.33 and 23.63 mg/100 g in treatments (1) concentrated peach juice by V.C. and S.P.C., respectively. The treatments (4) and (3) revealed the maximum content of ascorbic acid as they were 274.40, 274.37, 271.52 and 271.88 mg/100 g, respectively.

Table (3): Physiochemical of concentrated peach juice stored at -12°C. for 9 months.

Properties	Storage period (month)	V.C.* Treatments				L.S.D.	S.P.C.** Treatments				L.S.D.
		1	2	3	4		1	2	3	4	
Moisture %	0	77.57	77.59	77.53	77.54	0.067	77.43	77.45	77.47	77.49	0.052
	3	77.52	77.58	77.50	77.533		77.38	77.38	77.40	77.41	
	6	77.45	77.56	77.49	77.47		77.35	77.36	77.38	77.38	
	9	77.43	77.53	77.44	77.42		77.32	77.34	77.35	77.36	
	L.S.D.	0.067				^{a}0.133	0.052				^{a}0.105
PH	0	4.00	3.95	3.95	3.95		3.97	3.90	3.90	3.90	
	3	3.98	3.93	3.90	3.90		3.93	3.90	3.85	3.85	
	6	3.90	3.90	3.85	3.80		3.90	3.85	3.80	3.80	
	9	3.90	3.90	3.85	3.80		3.90	3.80	3.75	3.75	
Color Index	0	0.17	0.13	0.16	0.16	0.001	0.16	0.10	0.14	0.16	0.001
	3	0.19	0.14	0.17	0.18		0.17	0.11	0.15	0.16	
	6	0.19	0.15	0.17	0.19		0.18	0.12	0.16	0.17	
	9	0.20	0.16	0.18	0.19		0.19	0.12	0.17	0.18	
	L.S.D.	0.001				^{a}0.0019	0.001				^{a}0.0051
On dry basis											
Total acidity %	0	3.23	3.32	3.41	3.55	0.041	3.57	3.64	3.79	3.94	0.044
	3	3.58	3.75	3.93	4.14		3.97	4.07	4.15	4.26	
	6	3.75	3.96	4.03	4.27		4.11	4.25	4.36	4.48	
	9	3.944	4.01	4.12	4.32		4.23	4.38	4.52	4.65	
	L.S.D.	0.041				^{a}0.082	0.044				^{a}0.088
Total sugars %	0	69.86	70.68	69.94	69.26	0.239	70.73	71.08	70.82	70.31	0.160
	3	68.77	70.43	69.61	69.19		69.90	70.91	70.52	69.68	
	6	67.94	69.43	68.68	68.05		69.52	70.82	69.98	69.52	
	9	66.50	68.36	67.93	66.94		68.28	69.83	69.50	68.84	
	L.S.D.	0.239				^{a}0.477	0.160				^{a}0.320
Reducing sugars %	0	26.33	26.96	27.64	28.10	0.040	25.71	26.26	26.73	27.41	0.034
	3	26.82	27.39	27.92	28.47		26.07	2.6.75	27.40	2.7.78	
	6	27.37	27.81	28.21	28.93		26.96	27.25	27.82	28.25	
	9	27.89	28.31	28.65	29.41		27.15	27.85	28.33	28.67	
	L.S.D.	0.040				^{a}0.079	0.034				^{a}0.068
Ascorbic acid mg/100g	0	21.33	23.38	271.52	274.40	0.830	23.63	25.68	271.88	274.73	.736
	3	20.00	21.52	269.13	273.28		22.51	24.00	269.71	273.84	
	6	17.78	20.23	266.33	270.97		20.11	21.74	266.85	272.29	
	9	15.77	18.94	264.96	268.60		17.78	19.58	265.43	269.95	
	L.S.D.	0.830				^{a}1.660	0.736				^{a}1.473
Crude fiber %	0	4.86	4.77	4.68	4.54	0.180	4.38	4.34	4.25	4.25	0.136
	3	4.68	4.76	4.72	4.54		4.38	4.29	4.25	4.25	
	6	4.77	4.77	4.63	4.45		4.43	4.34	4.25	4.21	
	9	4.81	4.76	4.63	4.54		4.38	4.34	4.25	4.21	
	L.S.D.	0.185				^{a}0.361	0.136				^{a}0.272
Ash %	0	4.62	4.61	4.62	4.61	0.013	4.34	4.29	4.25	4.25	0.050
	3	4.61	4.59	4.61	4.57		4.32	4.29	4.22	4.26	
	6	4.61	4.61	4.61	4.61		4.34	4.27	4.24	4.22	
	9	4.61	4.61	4.61	4.55		4.31	4.25	4.20	4.24	
	L.S.D.	0.013				^{a}0.025	0.050				^{a}0.99
Carotenoids mg/100g	0	18.76	20.37	21.48	19.03	0.375	23.12	25.47	29.32	24.10	0.351
	3	1850	19.75	20.35	18.67		22.73	24.81	29.02	23.61	
	6	18.04	19.97	19.97	18.18		22.32	24.14	28.53	23.04	
	9	17.65	19.61	19.61	17.89		20.69	23.92	28.00	22.68	
	L.S.D.	0.375				^{a}0.750	0.351				^{a}0.701

*Vacuum concentration **Serum pulp concentration ^{a}L.S.D. treatments x for storage period

Treatments (1- control 2- 0.1% EDTA 3- 0.3% ascorbic acid 4- 0.1% EDTA + 0.3% ascorbic acid).

On the contrary concentrated peach juice by S.P.C. method revealed higher percentages of carotenoids than that concentrated by V.C. method as they were 23.12, 25.47, 29.32, 24.10, 18.76, 20.37, 21.48 and 19.03 mg/100 g, respectively. However the highest content was noticed in treatment (3) for S.P.C., while the lowest was of treatment (1) for V.C. method.

Changes in physicochemical properties of concentrated peach juice during storage at -12°C for nine months:

Changes in physicochemical properties of concentrated peach juice during storage at -12°C for nine months were shown in Table (3).

Moisture content: Moisture content of concentrated peach juice by V.C and S.P.C. was 77.57 and 77.43%, for treatments (1) respectively, and changed to 77.59, 77.53 and 77.54% for treatments (2), (3) and (4), respectively for concentrated peach juice by V.C. method and 77.45, 77.47 and 77.49% for treatments (2), (3) and (4) of concentrated peach juice by S.P.C. method, respectively.

There were no significant changes in moisture for all treatments during storage period. These results are in agreement with Berhardt *et al.* (1979) and Abd El-Latife (1991).

pH value: pH of concentrated juice by V.C. and S.P.C. methods was 4.0 and 3.97, for treatments (1), respectively, and changed to 3.95 and 3.90 for all treatments, respectively. During storage period the pH values of all treatments decreased significantly, due to increase of total acidity.

Color index: Color index of concentrated peach juice by V.C. and S.P.C. methods was 0.17 and 0.16, for treatments (1). Color index of treatments (2), (3) and (4) by V.C. method was 0.13, 0.16 and 0.16, respectively, while was 0.10, 0.14 and 0.16 for treatments (2), (3) and (4), respectively which concentrated by S.P.C. method. Color index increased significantly for all treatments after storage periods which could be attributed to Millard reaction. These results agree with those obtained by Ibrahim (1985) and El-Hamzy (1996).

Total acidity: Total acidity of concentrated peach juice by V.C. and S.P.C. methods was 3.23 and 3.57%, for treatments (1), respectively. Total acidity increased significantly for treatments (2), (3) and (4) concentrated by V.C. as they were 3.32, 3.41 and 3.55%, respectively. Whereas, the treatments (2), (3) and (4) concentrated by S.P.C. method had total acidity about 3.64, 3.79 and 3.94%, respectively. A significant increase in total acidity during storage period for all treatments was found, due to degradation of short-pectic chains to galacturonic acid. These results are in agreement with those obtained by El-Sherbiny and Shaker (1981) and El-Hamzy (1996).

Total sugars: Total sugars of concentrated peach juic by V.C. and S.P.C. methods were 69.86 and 70.73%, for treatments (1) and changed to 70.68, 69.94 and 69.26% for treatments (2), (3) and (4), respectively concentrated by V.C. and 71.08, 70.82 and 70.31 for treatments (2), (3) and (4), respectively concentrated by S.P.C.. Appreciable changes in total sugars content due to the effect of additives could be observed. However; there was a significant decreased for all treatments during storage periods which could

be attributed to the non-enzymatic browning reactions. These results are in line with those obtained by Abd El-Fadeel (1981).

Reducing sugars: Reducing sugars of concentrated peach juice by V.C. and S.P.C. were 26.33 and 25.71% for treatments (1), and increased to 26.96, 27.46 and 28.10%, respectively for treatments (2), (3) and (4) concentrated by V.C.. Reducing sugars content of treatments (2), (3) and (4) by S.P.C. was 26.26, 26.73 and 27.41%, respectively. The reducing sugars of all treatments increased significantly during storage period, these might be related to inversion of non-reducing sugars to reducing sugars or hydrolysis of sucrose to reducing sugars. These results are in agreement with those obtained by Abd El-Fadeel (1981), Ibrahim (1985) and El-Hamzy (1996).

Ascorbic acid content: Ascorbic acid of concentrated peach juice by V.C. and S.P.C. was 21.33 and 23.63 mg/100 g, respectively for treatments (1), and reached to 23.38, 271.52 and 274.40 for treatments (2), (3) and (4) concentrated by V.C. and 25.68, 271.88 and 274.73 mg/100gm, respectively for treatments (2), (3) and (4) concentrated by S.P.C.. A significant decrease in ascorbic acid content was observed for all treatments during storage. Similar results were reported by Ibrahim (1985), El-Shiaty *et al.* (1986) and El-Hamzy (1996).

Crude fiber and Ash contents: Concerning crude fiber content, no significant changes occurred in all treatments after storage periods. These results were in agreement with El-Sayed (1976), and Abou-Taleb (1999). The same trend was obtained for ash. These results agreed with Abd El-Latief (1991).

Carotenoids content: Carotenoids of concentrated peach juice by V.C. and S.P.C. methods were 18.76 and 23.12 mg/100 g, respectively for treatments (1), increased significantly to 20.37, 21.84 and 19.03 mg/100 g, respectively for treatments (2), (3) and (4) concentrated by V.C. and to 25.47, 29.32 and 24.10 mg/ 100 gm, respectively for treatments (2), (3) and (4) concentrated by S.P.C.. During storage of all treatments, total carotenoids decrease significantly, due to degradation. These results agreed with Abd El-Fadeel (1981), Mir and Nath (1993) and Zeid (1996).

Sensory evaluation of concentrated apricot juice:

Data in Table (4) shown that color scores were generally higher in the concentrated apricot juice by S.P.C. than that concentrated by V.C. method. The treatment (3) had higher scores than treatments (2) and (4). So these additives improved the color. Whereas, treatments (1) had the lowest scores. During storage period the scores of color decreased significantly.

The same trend was observed with taste of concentrated apricot juice by V.C. and S.P.C.. The scores of taste for all treatments decreased significantly with storage periods. The best odor was obtained for treatments (3), similar as the same trend of its effect on color and taste. Overall acceptability of concentrated apricot juice treatment (3) concentrated by S.P.C. method had the same trend as previous characteristics, color, taste and odor. Results obtained concerning the organoleptic properties are in agreement with those reported by Ibrahim (1985), Sanad (1991) and Mir and Nath (1993).

Table(4): Sensory evaluation of concentrated apricot juice.

Attributes	Storage period (month)	V.C.* Treatments					S.P.C** Treatments				
		1	2	3	4	L.S.D.	1	2	3	4	L.S.D.
Color	0	7.40	7.60	7.90	7.50	0.476	7.90	8.50	8.80	8.30	0.492
	4	7.00	7.40	7.70	7.30		7.70	8.20	8.50	8.10	
	9	6.70	7.10	7.50	7.00		7.30	8.00	8.30	7.90	
	L.S.D.	0.549				^{a}0.951	0.569				^{a}0.985
Odor	0	7.40	7.30	7.40	7.10	0.447	8.10	8.20	8.20	8.00	0.476
	4	6.60	6.90	7.10	6.50		7.70	7.70	7.90	7.40	
	9	6.40	6.60	6.90	6.20		7.30	7.40	7.60	7.00	
	L.S.D.	0.516				^{a}0.894	0.550				^{a}0.952
Taste	0	7.50	7.70	7.90	7.40	0.443	8.10	8.10	8.30	7.90	0.0460
	4	7.20	7.60	7.70	7.00		7.60	7.80	8.20	7.40	
	9	6.80	7.20	7.40	6.40		7.30	7.50	8.00	7.10	
	L.S.D.	0.512				^{a}0.887	0.531				^{a}0.920
Overall Accept ability	0	7.44	7.47	7.72	7.33	0.268	8.03	8.26	8.83	8.04	0.327
	4	6.93	7.26	7.50	7.06		7.69	7.89	8.16	7.69	
	9	6.61	6.95	7.21	6.57		7.28	7.59	7.93	7.37	
	L.S.D.	0.309				^{a}0.536	0.337				^{a}0.653

*Vacuum concentration **Serum pulp concentration ^{a} treatments x storage period
Treatments (1- control 2- 0.1% EDTA 3- 0.3% ascorbic acid 4- 0.1% EDTA + 0.3% ascorbic acid)

Sensory evaluation of concentrated peach juice:

Data in Table (5) show that the highest score of color was observed in concentrated peach juice by S.P.C.. Color scores were generally higher in treatment (3) followed by treatments (2) and (4), respectively. The color scores decreased significantly after storage periods.Taste of concentrated peach juice by S.P.C. method was better than that concentrated by V.C.. The treatment (3) showed the maximum scores for taste.The same trend was observed with odor. Furthermore, the score of overall acceptability decreased during storage periods for both concentration methods.

Table(5): Sensory evaluation of concentrated peach juice.

Attributes	Storagetime (month)	V.C.* Treatments					S.P.C* Treatments				
		1	2	3	4	L.S.D.	1	2	3	4	L.S.D.
Color	0	7.30	7.80	7.90	7.50	0.443	7.90	8.30	8.50	8.10	0.420
	4	6.90	7.40	7.60	7.20		7.50	7.90	8.00	7.70	
	9	6.50	7.10	7.50	6.80		7.10	7.60	7.80	7.30	
	L.S.D.	0.512				^{a}0.886	0.485				^{a}0.840
Odor	0	6.50	6.80	7.60	6.60	0.451	7.60	8.00	8.60	6.60	0.438
	4	6.00	6.40	7.00	6.20		7.30	7.80	8.20	6.20	
	9	5.70	6.50	6.60	6.00		7.00	7.40	7.90	6.00	
	L.S.D.	0.520				^{a}0.902	0.506				^{a}0.876
Taste	0	6.90	7.20	7.40	7.20	0.391	8.10	8.40	8.50	8.30	0.532
	4	6.40	6.80	7.00	6.60		7.90	8.00	8.10	8.00	
	9	6.10	6.50	6.70	6.20		7.30	7.70	7.90	7.50	
	L.S.D.	0.451				^{a}0.782	0.614				^{a}1.063
Overa ll Accep tabil.	0	6.90	7.27	7.69	7.07	0.247	7.90	8.26	8.55	8.00	0.267
	4	6.43	6.88	7.21	6.67		7.57	7.90	8.06	7.91	
	9	6.09	6.71	6.94	6.32		7.12	7.56	7.87	7.33	
	L.S.D.	0.285				^{a}0.493	0.308				^{a}0.533

*Vacuum concentration **Serum pulp concentration ^{a}treatments x storage periods
Treatments (1- control 2- 0.1% EDTA 3- 0.3% ascorbic acid 4- 0.1% EDTA + 0.3% ascorbic acid)

Generally, the treatments could be descend arranged according to their organoleptic properties of concentrated peach juice by S.P.C. and V.C. in the following sequence treatment (3) followed by (2), (4) and (1).

Microbiological examination of apricot and peach juices:

Data in Table (6) observed that the total viable bacterial count (TVBC) and moulds and yeast (M&Y) of fresh apricot and peach juice were $7.5x10^3$, $8.3x10^4$, $3.7x10^3$, $4.3x10^4$ cfu/g, respectively, and decreased to 6.7, 7.7, 4.0, and $5.3x10^2$ cfu/g for concentrated apricot and peach juice by V.C and S.P.C. methods, respectively.The addition of 0.1% EDTA, 0.3% ascorbic acid and 0.1% EDTA + 0.3 % ascorbic acid led to decrease the total viable bacterial count as shown in the same Table. During storage period, the total viable bacterial count was decreased. The counts of yeast and molds were low in all treatments and a high decrease was observed in treatment (4).

Coliform group: The coliform group was not detected either in fresh apricot or peach juice.

The previous results were in agreement with those obtained by Gibryl (1971), Miers *et al.* (1971), Savani and Harris (1978) and (Bulgarelli and Shelef 1985).

Table (6): Microbiological population of fresh and concentrated apricot and peach juice stored at -12°C. for 9 months.

Items		Fresh apricot juice				Fresh peach juice			
TVBC		$7.5x10^3$				$8.3x10^4$			
Y & M		$3.7 x10^3$				$4.3x10^4$			
	Storage period (month)	V.C* Treatments				S.P.C.** Treatments			
		1	2	3	4	1	2	3	4
Concentrated apricot juice									
TVBC X 10^2	0	6.7	6.3	5.7	5.3	7.7	7.3	6.6	6.3
	4	6.3	5.7	5.6	5.0	7.0	6.6	5.7	6.3
	9	6.3	5.3	4.6	4.3	6.7	6.3	5.7	5.3
Y & M X 10^2	0	2.0	2.0	1.7	1.0	2.6	2.3	1.7	1.7
	4	2.3	2.0	1.0	1.0	2.0	1.7	1.0	1.7
	9	2.0	2.0	1.0	1.0	2.0	1.7	1.0	1.0
Concentrated peach juice									
TVBC X 10^2	0	4.0	4.0	3.6	3.3	5.3	4.6	4.3	3.7
	4	4.0	3.7	3.7	3.0	5.3	4.0	3.6	3.3
	9	3.6	3.3	3.3	3.0	4.7	4.3	3.6	3.0
Y & M X 10^2	0	2.3	2.0	1.3	1.0	2.6	2.0	1.7	1.3
	4	2.3	1.7	1.0	1.0	2.3	2.0	1.3	1.0
	9	2.0	1.6	1.0	1.0	2.0	1.7	1.3	1.0

***Vacuum concentration **Serum pulp concentration**
Treatments (1- control 2- 0.1% EDTA 3- 0.3% ascorbic acid 4- 0.1% EDTA + 0.3% ascorbic acid)

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إنتاج مركزات عصير المشمش والخوخ.

أيمن سيد دياب*- أحمد إبراهيم الدسوقي- همام الطوخى محمد بهلول**- سليمان عباس سليمان**.**

*** معهد بحوث وتكنولوجيا الأغذية- مركز البحوث الزراعية- الجيزة- مصر.**

****قسم علوم الأغذية- كلية الزراعة بمشتهر- جامعة الزقازيق/فرع بنها- مصر.**

تم تركيز عصير المشمش والخوخ بطريقتين (التركيز تحت تفريغ وتركيز السيرم بعد فصله عن اللب). وتم تركيز العصير بدون أي إضافة وكذلك بعد إضافة حمض الأسكوربيك أوالاثيلين ثنائي الأمين رباعي حمض الخليك (EDTA) أو الاثنين معا. تم تخزن العصير لمدة تسعة شهور على درجة حرارة - ١٢°م. تم تحليل كلا من العصير الطازج والمركز كيماويا لدراسة بعض الخصائص التي تدل على جودة العصير. وتم دراسة تأثير إضافة حمض الأسكوربيك وال EDTA إلى العصير على التركيب الكيماوي والناحية الميكروبيولوجية للعصير. كما تم التحكيم الحسي للعصير المركز. وقد أوضحت النتائج ما يلي:

طريقة التركيز بواسطة فصل السيرم تنتج عصير مركز أفضل من العصير المركز الناتج من طريقة التركيز تحت تفريغ وهذا راجع إلى حدوث تغيرات أقل في خواص العصير الكيماوية والطبيعية والحسية عنه فى طريقة التركيز تحت تفريغ.العصير المركز المضاف إليه حمض الأسكوربيك أوال EDTA أو الاثنين معا كان افضل من العصير المركز بدون أي إضافة.كان لإضافة حمض الأسكوربيك تأثير أكبر في وقف التغيرات الكيماوية والطبيعية والحسية بنسبة طفيفة من إضافة ال EDTA .أدت طريقتا التركيز إلى انخفاض العدد البكتيري وكذالك الفطريات والخمائر. في حين إحتوى العصير المركز الناتج من طريقة التركيز تحت تفريغ على عدد أقل من هذه الكائنات الحية. كذلك أدت إضافة حمض الأسكوربيك أو ال EDTA إلي نقص العدد البكتيري والفطريات والخمائروكان حمض الإسكوربيك أكثر تأثيرا في ذلك.