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Production of Healthy Yoghurt Fortified With Kaki Juice (Persimmon)

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FORTIFICATION of yoghurt with kaki juice was high in calories but very low. In fat ,is agood source of fiber and contain health benefiting flavonoid Poly phenolic antioxidant compound. Yoghurt was made from milk supplemented with 5,10,15, and20% of kaki juice. The effect of the added on the composition titratable acidity ,PH,acetaldehyde and diacetyl ,volatile fatty acids ,minerals ,antioxidant capacity ,total phenolic compound and sensory properties of the prepared flavoured yoghurt was studied . Data revealed that fat, total protein, ash content decreased,but the minerals, acetaldehyde and diacetyl of yoghurt increased with the increase of the percentage of added kaki juice. TVFA was increased by the end of storage period, with increasing Kaki juice supplementation as T5 scored highest value. While yoghurt sample 20 % of persimmon scored high sensory analysis values. The highest viscosity values were detected scored in the yogurt sample with 20% persimmon on the 12th day.

Keywords: Antioxidant activity, Chemical properties, Persimmon, Sensory properties, Yogurt

Introduction

Yoghurt have been produced and consumed all over the world for a very long time. Benefits to health or nutrition may be possibly derived from the consumption of such beverages. Yoghurt is the most popular fermented milk produced in Egypt and worldwide. Its consumption in Egypt has been increased tremendously. Many health benefits have been attributed to yoghurt such as improved lactose tolerance, protection against gastrointestinal infections, effective treatment for specific types of diarrhea, relief of constipation, improved immunity and cholesterol reduction concentration (Tvede, 1996 and Burttris, 1997).

Fortification of dairy products with some food additives has been suggested to increase their potential health effects (Mahmoud et al., 2013) found that the addition of beats to flavored yoghurt imported a natural color to the product without any adverse effect on the quality of the product. Fermentation technologies play an important role in ensuring the food security of millions of people around the world, particularly the marginal and vulnerable groups. This has been achieved through improving food preservation.

Persimmons (Kaki) the fruits are moderately high in calories (provides to 70 calories/100g) but very low in fats. Its smooth textured fresh is a very good source of dietary fiber 100g of fresh fruit holds 3.69 or 9.5% of recommended daily intake of fiber. Kaki contain health benefiting flavonoid, poly phenolic antioxidant compounds such as catechins and gallocatechinsin addition to having an important anti-tumor compounds betulinic acid. Catechins are known to have anti-infective, anti-inflammatory and anti-hemorrhagic (or events bleeding from small blood vessels) properties. Fresh Kaki composes other antioxidant compound like vitamin-A, beta-carotene, lycopene, lutein, zeaxanthin and kryptoxanthin.Together, these compounds functions as protectives scavengers against oxygen-derived free radicals and reactive oxygen species (Ros) that play a role in aging and various disease processes.

Also, kaki is a good source of vitamin-C another powerful antioxidant (especially native Chinese and American persimmons, provide 80% of DRI). Regular consumption of foods rich in vitamin C helps the body. Persimmons generally consumed as a fresh fruit in Europe and has a positive impact on human health (Karaman et al, 2014). It con

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tains many bioactive compounds, especially ascorbic acid, condensed tannins, and carotenoids. Bioactive compounds contribute to human health mainly through their antioxidant properties (Karaman et al., 2014). Production healthy yoghurt.

Materials and Methods

Materials

Fresh buffalo milk, was obtained from food technology research institute, agriculture research center Giza, Egypt. Active *streptococcus thermophiles ENCC 1043* and *lactobacillus delbruechiisub sp. bulgaricusEM CC 1102* were obtained from the Egyptian Microbial Culture Collection (EMCC) at Cairo microbiological research center (Cairo mircen), faculty of Agriculture, Ain Shams university. Persimmons (Kaki) and sugar obtained from the local market.

Persimmons (Kaki) juice preparation

Kaki extract was prepared as prescribed by Galal et al. (2004), Kaki was washed thoroughly in cold water using as tiff fruit ***brush*** to remove the dirt and adhering chemicals scraped lightly. The extract was obtained by blending in blender with filter The obtained juice was heated to 85^{O}C/5min, hot fitted into clean glass bottles, Sealed and Stored in refrigerator on 5^{0}C till further use.

Manufacture of yoghurt:

Kaki juice was added at ratio 0,5, 10, 15 and 20% to fresh buffalo milk (T_1, T_2, T_3, T_4 and T_5) respectively as T_1 is prepared without added kaki juice then heated to 90°C for 10 min and cooled to 40°C. Active starter (2%) was added and mixed. The inoculated batches were packed in plastic cups and incubated at 42°C for 2-3 hr until complete coagulation. All batches were stored at 6±1°C in refrigerator for 12 days and sampled for analysis after 1, 3, 6, 9 and 12 days. This experiment was triplicate.

TABLE 1. Chemical composition of Kaki juice and buffaloes milk (g/100g).

Ingredient	Kaki Juice	Buffaloes milk
Moisture	80.00	87.00
Fat	0.29	6.70
Protein	0.69	4.22
Ash	0.32	0.77
Acidity	0.81	0.16
pH	5.9	6.61
Carbohydrate	7.40	4.60

Method and analysis

Chemical analysis

Chemical analysis of kaki juice and buffaloes milkt treatments were analyzed for total solid T.S%, fat%, total protein%, ash%, titratable acidity% and pH value according to the methods of A.O.A.C. (1995). Diacetyl and acetaldehyde contents was measured according to the method described by branded (1960). The method of Kosikowski (1996) was used to determine the total volatile fatty acids (TVFA).B-carotene and vitamins, A, B, C, D, and E were determined by HPLC methods according to Kimura et al., 2007; Gottfried, 1996. Flavonoids and phenols were determined by HPLC method with UV detector at wavelengths 330 nm, according to Mattila et al., 2000.Calcium, sodium, Potassium and iron concentration were determined by atomic absorption (themo – tarrell. Ash, Smith – Hieftje (1000) in their digest solutions according to **AOAC** 2000.

Microbiological analysis

Different prepared yoghurtl samples were examined for total bacterial counts (TBC), molds and yeasts counts using standard plate count media and potato Dextrose agar media, respectively according to the American public health association (APHA, 1992), Lactobacilli counts were enumerated according to DeMon et al (1960), using MRS media, while *streptococci* count was enumerated, according to Skinner and Euesnel (1978) using yeast lactose agar media.

Determination of viscosity

Viscosity of different prepared yoghurt samples were measured at 10 ± 1°C using a rotary viscometer (RHEOTEST, Type Rv and Prue er

All parameters were calculated from the descending flow curve to express the data corresponding the yoghurt. Dynamic viscosity was calculated at shear rat 10.48 to14.06 sce^{-1}. Attached to a workstation loaded with software V88 viscosity programme. All samples were adjusted to 10 ± 1°C before loading on the device.

Sensory evaluation

Prepared yoghurt samples were judged by ten panelists from the staff of department of dairy science and technology and department of food science and technology according to Kebary and Hussen (1999a). The yoghurt was evaluated organoleptic after zero time and after 12 days of storage period. Panelists evaluated yoghurt for flavor (45 points), body & texture (35 points), acidity (10 points), appearance (10 points) and overall acceptability (100 points).The data obtained were exposed to proper statistical analysis according to statistical analysis system user's guide (SAS, 1996).

Results and Discussion

Physical and chemical analysis

Total solids contents

The results indicated that the yoghurt fortified with Kaki juice led slight differences in total solids of the final product (Table 2). Total solids content of all yoghurt treatments changed significantly ($P > 0.05$) during the storage period..These results are in agreement with the results obtained by El-Shibiny et al. (1979) and Kuchkoner and Tarake, (2004).

Total protein content

The results revealed that control treatment, that made without adding kaki juice contained lowest ($P \leq 0.05$) protein content than other treatments (Table 2). These results might be due to the dilution effect occurred with Kaki juice adding. On the other hand, yoghurt samples contained 0, 5, 10, 15 and 20%kaki juice were not significantly ($P > 0.05$) different from each other, which means that Kaki juice added did not significantly affect the protein content during the storage period. Similar trends were obtained by Kebary et al. (2004) and saint –E ve et al. (2006).

Fat content

The effect of using different Kaki juice percentages on fat content of different samples yoghurt treatments during the storage period are shown in Table 2. Fat content of yoghurt treatments slightly decreased, but were non significantl different ($P > 0.05$) among all treatments, which means that addition Kaki juice did not affect significantly ($P > 0.05$) the fat content of yoghurt. Fat content of all yoghurt treatments didn't change significantly ($P > 0.05$) as storage period progressed (Table 2). Similar trend were obtained by Kebary et al (2004) and Badawi et al., (2004).

Ash content

The effect of using different Kaki juice percentages on ash content of yoghurt treatments during the storage period are presented in Table 2. The ash content of all treatments showed no significant ($P > 0.05$) differences among yoghurt treatments. . These results are in agreement with those reported by Kebary et al. (2004) and Badawi et al. (2004).

Titratable acidity and pH value

Changes in titratable acidity of different prepared yoghurt samples during the storage period are presented in Table 3. It could be observed that there were not significant differences among yoghurt treatments ($P < 0.05$). Titratable acidity of all yoghurt treatments increased gradually up to the end of storage period. Titratable acidity of all treatment increased markedly during the last six days of storage, acidity of yoghurt samples contained kaki juice 0, 5, 10, 15 and 20% were 0.660, 0.700, 0.725, 0.765 and 0.800% respectively at the zero time of storge period(fresh).On the other hand it reached 0.85, 0.875, 0.935, 0.995 and 1.030% for the aforementioned yoghurt samples respectivel. These results are in agreement with those reported by Hamdy et al. (1972) and kebary et al. (2004). The changes in pH value during the storage of yoghurt treatments with adding kaki juice were not significantly ($P > 0.05$) different control treatment had the highest pH value and was significantly ($P \leq 0.05$) different from other treatments these results are in agreement with those reported by El-**Shibiny** et al. (1979). The results also indicated that pH values dropped during the storage period of all prepared yoghurt samples.

Changes in aroma development

The effect of addition Kaki juice on diacetyl during the storage period of yoghurt treatments is shown (Table 4). Data indicated that the lowest diacetyl recorded for control yoghurt sample (prepared without added Kaki juice) and was significantly ($P \leq 0.05$) different with other treatments.Yoghurt sample contained 20%kaki juice showed the highest diacetyl content. Diacetyl content of all yoghurt treatments increased gradually up to the sixth day of storage, then decreased as storage period progressed (Table 4).

TABLE 2. Chemical composition of yoghurt fortified with different levels of Kaki juice during storage period for 12 days at 5°C.

Component (%)	Storage period days	Treatments				
		T1	T2	T3	T4	T5
Total solid	Fresh	17.6533 bA	17.8533 bA	18.0133 abA	18.2600 abA	18.5133 aAB
	3	17.7300 bA	17.9000 abA	18.1333 abA	18.3356abA	18.5400 aAB
	6	17.7500 bA	17.9200 bA	18.1567 abA	18.2167 abA	18.6267 aAB
	9	17.8167 bA	17.9500 bA	18.2067 abA	18.4267 abA	18.6533 aA
	12	17.8000 aA	17.9967 aA	18.1967 aA	18.4233 aA	18.0067 aB
Protein	Fresh	4.7700 aA	4.7253 aA	4.6833 aA	4.6570 aA	4.6150aA
	3	4.7200 aA	4.6900 aA	4.6267 aAB	4.5967 aAB	4.5367 aAB
	6	4.5200 aAB	4.4633 aAB	4.4267 aABC	4.3700 aABC	4.3500 aABC
	9	4.1800 aB	4.1500 aB	4.1167 aBC	4.0500 aBC	4..0000 aC
	12	4.1700 aB	4.1233 aB	4.1100 aC	4.0700 aC	4.0267 aBC
Fat	Fresh	5.6667 aA	5.7233 aA	5.4600 aA	5.4567 aA	5.3267 aA
	3	5.6500 aA	5.6300 aA	5.3233 aA	5.3600 aA	5.2567 aA
	6	5.2333 aA	5.1733 aA	5.1367 aA	5.0900 aA	5.02167 aA
	9	5.3400 aA	5.2800 aA	5.2433 aA	5.1467 aA	5.0933 aA
	12	5.3233 aA	5.2300 aA	5.1867 aA	5.1067 aA	5.0667 aA
Ash	Fresh	0.9667 aA	0.9400 aA	0.9233 aA	.9067 aA	0.9033 aA
	3	0.9567 aA	0.9333 aA	0.9133 aA	0.8933 aA	0.8767 aA
	6	1.0033 aA	1.0025 aA	1.0016 aA	1.0009 aA	1.0000 aA
	9	1.0433 aA	1.0433 aA	1.0355 aA	1.0333 aA	1.0300 aA
	12	1.0400 aA	1.0267 aA	1.0230 aA	1.0100 aA	1.0033 aA

A, B. C…. means with same latter for same treatment during storage period are not significantly different significant at 0.05 level and a,b,c… means with the same letter are not significantly

TABLE 3. Effect of Kaki juice on titratable acidity and pH value of yoghurt during storage period for 12 days at 5°C.

Storage period days	Treatments					LSD
	T1	T2	T3	T4	T5	
	Titratable acidity%					
Fresh	0.660^{cb}	0.700^{cb}	0.725^{b}	0.765^{a}	0.800^{a}	0.0501
3	0.700^{cbB}	0.740^{bB}	0.780^{abB}	0.840^{aAB}	0.895^{aA}	0.0335
6	0.745^{bB}	0.75^{bB}	0.820^{aAB}	0.870^{aAB}	0.930^{aA}	0.0381
9	0.795^{aAB}	0.825^{abB}	0.830^{aAB}	0.9520^{aA}	0.965^{aA}	0.039
12	0.850^{aAB}	0.875^{aAB}	0.935^{aAB}	0.995^{aA}	1.030^{aA}	0.0354
	pH Value					
Fresh	5.135^{a}	5.025^{a}	5.111^{a}	5.105^{a}	5.125^{a}	0.0230
3	4.995^{aA}	4.810^{bB}	4.840^{abB}	4.885^{aAB}	4.915^{bA}	0.027
6	4.945^{aA}	4.775^{abB}	4.790^{Ab}	4.815^{bB}	4.905^{bA}	0.0325
9	4.890^{bA}	4.695^{CB}	4.735^{Bb}	4.765^{abB}	4.820^{AbB}	0.0508
12	4.740^{AbB}	4.665^{cbB}	4.100^{cbB}	4.715^{bB}	4.720^{bB}	0.0527

See Table (2) for details

Similar results were reported by El-Shibiny etial. (1979) and Lubbers et al. (2004). The effect of kaki juice on acetaldehyde (u.mol/g) during the storage period of different yoghurt treatments is shown in Table 4. Data indicated that the lowest acetaldehyde content recorded with control sample which made without adding Kaki juice. The content of acetaldehyde increased when the ratio was increased. Acetaldehyde content of all samples decreased during the storage($P < 0.05$). Acetaldehyde can easily be oxidised to acetate at lower pH values, and therefore, the level of acetaldehyde decreases during storage (Tamime and Rebinson 2000).

Total volatile fatty acids (TVFA) content:

The effect Kaki juice added on total volatile fatty acids (TVFA) during the storage period of yoghurt treatments is shown (Table 5). Data indicated that lowest TVFA recorded for yoghurt control sample prepared without adding Kaki juice and was significantly ($P \leq 0.05$) different for other prepared yoghurt samples Yoghurt sample contained 20% kaki juice (T5) showed the highest TVFA content in comparison to other yoghurt samples. Total volatile fatty acids (TVFA) content of all yoghurt treatment increased gradually up to the end of storage period. The increase in the level of volatile fatty acids in yoghurt is dependent on several variables such as the strains of starter bacteria, type of milk. This could be attributed to the lipolytic activity of lactic acid bacteria. These results are in accordance with those reported by Rosic and Kurman (1978) El-Shibiny et al. (1979).

Microbiological analysis

Total bacterial count

Table 6 shows total bacterial counts of yoghurt made with different Kaki juice. Total bacterial counts reached their maximum counts at 3rd day of storage period. It could be noticed that total bacterial count of ally yoghurt treatments increased during the first three days of storage, then decreased gradually up to the end of storage period. This decrease could be attributed to the acidity devloped. The results are in agreement with those reported by Hur et al. (1992) and Kebary(1996).

Counts of mould and yeasts

Table 6 shows that yoghurt treatments were free from yeasts and moulds during the first three days of storage period. After that they appeared towards the end of storage period. These results are in agreement with those reported by Mehriz et al. (1993). Who found that moulds and yeasts were only detected at the end of storage period while Kanna and Singh (1979) found that the yeasts and moulds were absent in yoghurt.

TABLE 4. Effect of Kaki juice on diacetyl and acetaldehyde (mg/100g) of yoghurt during storage period.

Treatments	Storage period (days)				
	0	3	6	9	12
			Diacetyl		
T_1	17.85^{b}	18.52^{bA}	18.63^{aA}	17.89^{bB}	16.89^{cCD}
T_2	17.93^{ba}	18.65^{aA}	18.79^{aA}	17.32^{cbB}	17.00^{cC}
T_3	17.95^{ba}	18.67^{aA}	18.87^{aA}	17.48^{cbB}	17.02^{cC}
T_4	18.12^{a}	18.78^{aA}	18.89^{aA}	17.65^{cbB}	17.22^{cCB}
T_5	18.18^{a}	18.95^{aA}	19.02^{aA}	17.97^{bB}	17.10^{cCB}
			Acetaldhyde		
T_1	245.5^{b}	240.6^{bA}	229.3^{bB}	218.6^{bB}	202.5^{cbB}
T_2	286.6^{a}	269.5^{abA}	259.2^{abA}	225.3^{bB}	211.9^{cbB}
T_3	318.2^{a}	311.2^{aA}	305.6^{abA}	271.9^{abA}	230.5^{Bb}
T_4	320.5^{a}	312.9^{aA}	308.3^{aA}	285.4^{aA}	255.7^{Bb}
T_5	333.6^{a}	325.2^{aA}	310.5^{aA}	290.7^{aA}	218.3^{bB}

See Table(2) for details and was significantly ($P \leq 0.05$) different. Treatment that contained 20% showed the highest acetaldehyde content.

TABLE 5. Effect of Kaki juice on total volatile fatty acid (TVFA) (ml NaOH0.1N/100g) of yoghurt during storage period.

Treatments	Storage period (days)				
	0	3	6	9	12
T_1	12.5^{c}	12.5^{cC}	12.7^{cC}	12.8^{cC}	13.00^{Cc}
T_2	13.0^{c}	13.5^{cB}	14.0^{cB}	15.5^{bB}	16.5^{bA}
T_3	13.8^{C}	14.2^{cbB}	14.6^{cbB}	16.5^{bA}	17.5^{aA}
T_4	14.7^{b}	15.5^{ABC}	16.4^{bA}	17.4^{AB}	18.3^{aA}
T_5	16.2^{a}	17.0^{abA}	17.8^{aA}	18.5^{aA}	19.0^{aA}

See Table(2) for details

TABLE 6. Effect of Kaki juice on total bacterial count of yoghurt log Cfu/gm of sample during storage period and mould& yeast.

Treat	Storage period (days)T.C					Storage period (days) m. mould& Yeast(Count)				
	0	3	6	9	12	0	3.	6	9	12
T_1	10.17^{a}	10.28^{aA}	10.21^{aA}	10.12^{aA}	9.88^{bA}	ND	ND	4.29^{CB}	4.32^{bB}	4.35^{bB}
T_2	10.26^{a}	10.35^{aA}	10.33^{aA}	10.25^{aA}	10.13^{aA}	ND	ND	4.40^{Bb}	4.43^{bA}	4.45^{bA}
T_3	10.30^{a}	10.39^{aA}	10.36^{aA}	10.22^{Aa}	10.18^{aA}	ND	ND	4.42^{Ba}	4.46^{bA}	4.48^{bA}
T_4	10.27^{a}	10.37^{aA}	10.31^{aA}	10.22^{AaA}	10.11^{aA}	ND	ND	2.50^{aA}	4.57^{aA}	4.76^{aA}
T_5	10.23^{a}	10.35^{aA}	10.29^{aA}	10.18^{aA}	10.09^{aA}	ND	ND	4.59^{Aa}	4.65^{aA}	4.84^{aA}

See Table(2) for details.

Lacto bacilli and streptococci counts

Data in Table 7 shows lactobacilli counts and streptococci counts during the storage period of yoghurt made with Kaki juice. Contents of lactobacilli and streptococci bacteria increased gradually in all treatments up to the end of storage period. The effects of storage period and the variation oftreatment on L. delbrueckii subsp. bulgaricus counts werestatistically significant ($P < 0.05$). At the end of the storageperiod, T3 had higherL. delbrueckii subsp. bulgaricus counts than the other samples. S. thermophilus counts were significantly affected($P < 0.05$) by storage. These results are in agreement with those found by Badran (1986), Kebary et al. (1996) and Arslan and Bayarkci(2016).

TABLE 7. Effect of kaki juice on lactobacilli count and streptococci count(Cfu/gm. Of yoghurt during storage period.

Treat.	Lactobacilli count Storage period (days)					Streptococci count				
	0	3	6	9	12	0	3.	6	9	12
T_1	11.65^{a}	11.66^{bA}	11.7^{aA}	11.79^{aA}	11.82^{aA}	11.26^{a}	11.29^{aA}	11.33^{aA}	11.35^{aA}	11.38^{aA}
T_2	11.65^{a}	11.70^{aA}	11.73^{aA}	11.87^{aA}	11.93^{aA}	11.18^{a}	11.22^{aA}	11.25^{aA}	11.28^{aA}	11.31^{aA}
T_3	11.44^{a}	11.64^{bA}	11.73^{aA}	11.80^{aA}	11.85^{aA}	10.57^{b}	10.62^{bA}	10.67^{bA}	10.68^{bA}	10.71^{bA}
T_4	11.41^{a}	11.45^{bA}	11.57^{bA}	11.62^{aA}	11.77^{aA}	10.38^{b}	10.41^{bA}	10.44^{bA}	10.46^{AB}	10.4^{bA}
T_5	11.38^{a}	11.40^{bA}	11.52^{bA}	11.60^{aA}	11.74^{aA}	10.12^{b}	10.22^{bB}	10.28^{bB}	10.32^{bB}	10.38^{bA}

See Table (2) for details.

Apparent viscosity

Effect of adding kaki juice on viscosity of different prepared yoghurt samples are shown in Table 8. Treatment T_5 (20%) had higher apparent viscosity than other treatments, then decreased gradually in all treatments up to the end of storage period. These values in agreement with those reported by Martin et al. (2003) and Attunes et al. (2004).

Mineral contents

The results in Table 9 indicated that the increases in the K, Ca, Na and Fe in yoghurt mad with different Kaki juice showed the high content of these lements by increase addition Kaki juice in yoghurt. There are a high significantly ($P < 0.05$) differences in mineral contents between treatments compared to control.

TABLE 8. Effect of adding Kaki juice on apparent viscosity of yoghurt treatments (cp).

Treatments	Apparent viscosity of yoghurt	
	Fresh	12 day
T_1	49.68^{CDE}	45.98^{DE}
T_2	52.96^{CD}	50.67^{CDE}
T_3	55.85^{CD}	46.45^{DE}
T_4	79.85^{B}	65.22^{CB}
T_5	95.50^{A}	81.32^{AB}

See Table (2) for details.

TABLE 9. minerals content(mg/100gm) of different yoghurt samples contained kaki juice.

Treatments	Ca	Na	K	Fe
T_1	195.04^{bc}	68.47^{c}	54.06^{cd}	0.53^{cd}
T_2	195.96^{a}	68.72^{bc}	66.76^{c}	5.59^{c}
T_3	195.40^{b}	68.96^{b}	79.46^{cb}	10.67^{Cb}
T_4	195.53^{ab}	69.21^{ab}	92.10^{b}	15.74^{b}
T_5	195.03^{bc}	69.45^{a}	104.86^{a}	20.81^{a}

See Table (2) for details.

Vitamins and B-carotene

Data in Table 10 show vitamins (E, K and C) and B-carotene contents of yoghurt samples. Data in the same table(10), showed increase in all vitamins (E, K and C) by increasing Kaki juice precent in all treatments these results are in the line with Kiplamai and Tuito CK (2009).

Total phenol content and antioxidant activity

The antioxidant capacity (AC) of yoghurt fortified with kaki juice was determined by the DPPH radical scavenging activity,table(12) show AC results antioxidant activity of yoghurt supplemented with kaki juice (35.78 to 56.35%) was significanty higher than that of control sample(21.68%) .The antioxidant activityof, yoghurt, treatment (5,10,15,20%) was35.78, 46.75, 48.80 and 56.35%, respect ively. The antioxidant activity remained over 25% during storage. Amirdivani and Baba (2011) and Sengul et al. (2012) found that herbal yoghurt and yoghurts supplemented with sour cherry pulp had higher antioxidant activity than plain yoghurt and that the antioxidant activity increased during 7 days of storage. Generally ,there were significant differences in the phenolic contents.Table 11 and antioxidant activity of the samples ($P>0.05$).The samples T5,andT4 had the lowest reduction in phenolic content at the end of storage. Samples T5,and T4 had the lowest reduction in antioxidant activity values at the end of storage .These are agree with Arslan and Bayrakci (2016).

TABLE 10. Vitamins and B carotene content(ugl100g) of different yoghurt samples contained kaki juice detected by HPLC.

Treatments	E	K	C	B-carotene
T_1	50.00	0.70	1.00	-
T_2	50.04	0.83	1.38	12.65
T_3	50.07	0.96	1.75	25.30
T_4	50.11	1.09	1.83	37.95
T_5	50.15	1.22	1.95	50.60

See Table (2) for details

TABLE 11. Total phenol content (equivalent gallic acid mg/100g) of yoghurt fortified with different levels of kaki juice.

Treatments	Storage period (days)				
	0	3	6	9	12
T_1	–	–	–	–	–
T_2	12.93	12.50	12.20	11.98	11.15
T_3	22.50	21.95	19.35	18.10	17.68
T_4	30.58	32.50	30.85	29.50	36.83
T_5	42.10	41.50	37.75	36.50	38.83

(-) non found

TABLE 12. Total antioxidant activity% of yoghurt fortified with different levels of kaki juice.

Treatments	Storage period (days)				
	0	3	6	9	12
.T_1	21.68	20.85	18.50	16.85	14.45
T_2	35.78	34.85	32.50	28.75	26.50
T_3	46.75	43.86	40.65	38.95	32.68
T_4	48.80	47.50	45.78	39.56	34.68
T_5	56.35	54.26	52.26	48.45	44.23

See Table (2) for details.

Flavonoids and phenols fractions detected:

The data in Table 13 show some flavonoids and phenols in yoghurt treatments, it could be noticed that the five compounds of flavonoids (rutin, Rosmarinic, euecatin, hespirtin and Kaempforol) were not detected in control. Treatminet T5(20%) should the highest level in rutin, rosmarinic,eceucatin, Hespirtinand kaempforol acid (7.43, 12.067, 8.44,42.51 and 7.63 my/100g) respectively. Hepiritin acid has numerus 5 biological and pharmacological activities petrarsen (2013), Phenols (Catechol and Benzoic) show the higher phenols (catechol and benzoic) in treatment T_5 20% than other treatments show in Table 13.

Organoleptic evaluation:

The effect of Kaki juice on organoleptic evaluation during storage period of yoghurt is shown in Table 15, scores of organoleptic evaluation (Flavor, body & texture, appearance, acidity and total scores) followed similar trends. Although all yoghurt treatments were accepted by the panelists, kaki juice treatments were the most accepted and preferred by the panelist than other treatments. Scores of organoleptic properties of all yoghurt treatments did not change significantly ($P < 0.05$) during storage period up to the sixth day then decreased as storage period proceeded (Table 14). These results agreewith those reported by Badui et al (2004) and Siant – Eve et al. (2006).

TABLE 13. Flavonoids content (ug/100g) of different yoghurt samples contained kaki juice determined by HPLC

Component	T_1	T_2	T_3	T_4	T_5
Naringin	-	0.7318	1.9714	2.5488	3.6286
Luteolin	-	0.19210	0.5266	1.0795	2.2971
Rutin	-	1.6999	3.2577	5.2372	7.4315
Hespordin	-	0.9224	1.6597	3.6039	5.2561
Rosmarinic	-	1.0094	5.3079	8.2200	12.0677
Quecatin	-	5.0927	5.1609	6.1337	8.4448
Quercitin	-	0.9244	1.8654	2.8682	4.3434
Hespirtin	-	25.4927	28.7902	40.8677	42.5063
KaempFerol	-	1.1492	3.10492	5.754	7.629
Apegenin	-	0.0998	0.1979	0.2786	0.3103
7-Hyd-Flavone	-	0.1191	0.3172	0.4975	0.9782

See Table (2) for details.

TABLE 14. Phenols components conent(ug/100g) of different yoghurt samples contained kaki juice determined by HPLC .

Component	T_1	T_2	T_3	T_4	T_5
Gallic	-	2.0892	3.0616	6.5012	8.8773
Pyrogallol	-	2.8125	3.6701	5.5259	7.6808
Amino Benzoic acid	-	0.3196	0.3482	0.5264	0.8293
Cotechin	-	0.3189	0.3969	0.4688	0.9438
Protocatchouic	-	2.1734	3.0847	6.4994	8.5143
Chldogenic	-	0.5539	0.7321	0.8949	1.805
Catechol	-	2.6486	4.0300	5.1911	10.834
Epi-Catechin	-	1.6503	5.844	3.0247	1.8873
Caffeine	-	1.7073	5.676	6.3499	1.9048
P-OH Benzois	-	1.2178	2.4303	3.3996	3.8548
Caffeic	-	0.2917	0.4194	0.8113	0.0321
Vanillic	-	0.6987	0.8111	1.5534	2.5480
P-Coumaric	-	1.2364	1.8751	2.7709	2.9660
Ferulic	-	0.0855	0.5627	0.7518	0.9083
ISo – ferulic	-	0.6421	1.4575	2.3672	4.6051
Resverratole	-	0.9545	1.9588	0.3339	0.5245
Ellagic	-	2.7633	3.5276	5.9506	6.6175
Benzoic	-	6.5418	12.4030	14.4977	25.6307
3, 4, 5 methoxy	-	1.2061	0.5495	1.8692	2.6598
CinnaminCounarin	-	0.5259	1.7071	1.8036	0.7735
Salicylic	-	6.8166	7.6745	7.9586	9.4059
Cinammic	-	0.4861	1.5759	2.2116	5.3388

See Table (2) for details.

TABLE 15. organoleptic score of yoghurt samples during storage period for 12 days.

Appearance	Fresh	3days	6days	9days	12days
T1	7.8^{A}	8.3^{aA}	8.2^{aA}	7.3^{bA}	7.3^{bA}
T2	8.4^{A}	8.7^{aA}	8.1^{aA}	7.7^{bA}	$7.bA^{c}$
T3	7.8^{A}	7.8^{bA}	7.5^{bA}	7.8^{bA}	6.2^{bB}
T4	8.2^{A}	8.2^{aA}	6.3^{bB}	6.6^{bB}	6.4^{bB}
T5	8.4^{A}	7.3^{bA}	7.1^{bA}	7.6^{bA}	6.4^{bB}
Body & Texture					
T1	27.0^{A}	26.3^{bB}	25.5^{bB}	24.7^{Bc}	24.5^{cB}
T2	27.2^{A}	25.5^{bB}	26.6^{bA}	26.3^{bA}	25.2^{Bb}
T3	24.0^{A}	26.5^{bB}	26.6^{bA}	25.7^{bB}	22.4^{cd}
T4	25.3^{A}	26.5^{bB}	23.0^{Cd}	24.7^{CB}	22.6^{cd}
T5	26.5^{A}	23.3^{Cd}	23.2^{Cd}	26.2^{bA}	21.1^{d}
Acidity					
T1	8.1^{A}	8.0^{Aa}	8.5^{Aa}	6.5^{Bbc}	6.7^{Bbc}
T2	8.2^{A}	7.4^{BC}	7.6^{Bb}	7.6^{Bb}	8.0^{Aa}
T3	7.3^{C}	7.9^{Ab}	8.5^{Aa}	7.4^{Bb}	6.6^{bc}
T4	7.8^{B}	8.0^{Aa}	7.0^{BbC}	6.6^{BbC}	6.6^{bc}
T5	7.8^{B}	6.9^{Bb}	6.2^{Cd}	7.6^{Bbc}	6.4^{cd}
Flavour					
T1	45.5^{A}	46.7^{aA}	45.7^{bA}	44.1^{Bbc}	45.0^{BC}
T2	46.2^{A}	46.2^{aA}	46.2^{Ab}	46.9^{Bb}	45.5^{Bb}
T3	46.6^{A}	46.3^{Aa}	46.4^{Ab}	46.7^{Bb}	43.2^{bcd}
T4	45.7^{A}	45.7^{bA}	44.4^{Cd}	44.1^{Bbc}	41.6^{cd}
T5	46.4^{A}	46.4^{aA}	45.1^{d}	45.7^{Bbc}	39.6^{de}
Total Score					
T1	88.6^{A}	88.6^{Aa}	87.8^{Bb}	82.6^{cd}	84.0^{Bb}
T2	90.0^{A}	87.1^{Bb}	87.4^{Bb}	88.5^{Aa}	86.0^{ABb}
T3	86.0^{A}	88.8^{Aa}	87.8^{Bb}	87.6^{Aa}	78.0^{cb}
T4	87.0^{A}	89.1^{Aa}	80.3^{Cbc}	82.0^{Bbc}	77.0^{cb}
T5	89.0^{A}	79.8^{Bcd}	80.4^{Bcd}	87.1^{Bc}	73.3^{cd}

See Table (1) for details.

Conclusion

Yoghurt has many health and nutritional benefits including bioavailability of minerals. Improve digestion of protein, lactose turned into lactic acid in addition to the possibility of transformation of beta – carotene into vitamin A. the Kaki (Persimmon) enriched sample 20% was characterized by the content of antioxidant activity, phenols, flavonoid, vitamins E, K, C, , ascorbic acid and carotenoids. The sensory scores of samples5,10% the functional beverages were high and accepted.

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إنتاج زبادي صحي با ستخدام ثمرة الكاكا

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الزبادي من الألبان المتخمرة التي يتم إنتاجها واستهلاكها منذ فترات زمنية بعيدة في جميع أنحاء العالم ولها العديد من الفوائدالصحية والغذائية. وفي هذه الدراسة تم إعداد خمسة معاملات من الزبادي مع عصير الكاكا حيث تم خلطها بنسب مختلفة بعد البسترة والتبريد وأضافة البادئ والتحين. ثم حفظها على درجة حرارة الثلاجة ولمدة ١٢ يوم ثم إجراء التقييم الحسي للزبادي وإجراء التحاليل الطبيعية والكيماوية والميكروبيولوجية وقد أشارت النتائج المتحصل عليها إلى تقبل هذا المنتج حسيًا خصوصاعينات الزبادى المحتوية على ٥و١٠٪ من عصيرثمرة الكاكا من جانب المحكمين. ووجد أيضًا أن هناك ارتفاع ملحوظ في محتوى مضادات الأكسدة بينا كاروتين واحتوت نسب جيدة من البروتين والدهن. وأيضًا تم تقدير فيتامينات أ. ب. د. ج والعناصر المعدنية. الفينولات و الفلافونيد. وأظهرالتحليل الميكروبيولوجي زيادة العد الكلي بعد ستة أيام ثم انخفاض هذا العدد بعد ١٢ يوم من التخزين على درجة حرارة الثلاجة.