Biochemical Properties of Bio-Fermented Strawberry Milk Beverage Supplemented with Probiotic Bacteria

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ABSTRACT: Dairy products are an adequate alternative as functional foods since they present excellent nutritional value, have wide consumers acceptance, and have potential matrices for inoculation of probiotic microorganisms. Therefore this study aimed to produce a bio-fermented milk beverage fortified with different concentration strawberry juice 4, 8 and 12%. Using *Abt5* probiotic culture composed of *Lactobacillus acidophilus* LA5, *Bifidobacterium* BB-12 and *Streptococcus thermophilus.* The chemical composition, physicochemical and biochemical properties of milk and juice were assessed. Fresh juice contained 91% moisture, 6.30 % total sugar, 1.23% crude protein, 0.2% crude fat , 0.27% total ash, pH 3.3, 0.81% total acidity, 7% total soluble solids (T.S.S**)**, and phenolic compounds 667.22 mg gallic acid equivalent in100g fruit juice (mg GAE/100g of juice), total anthocyanine 47.65 (mg cyaniding-3-glycoside/L).Therefore, it shared a high antioxidant capacity inhibition ratio (92%) through the evaluation of the free radical-scavenging effect on 1,1-diphenyl-2-picrylhydrazine (DPPH). Results indicated that the products incorporated with 4% followed by 8 % juice were more accepted for 8 days at 4±2°C. The recommended level of ABT5 as a probiotic culture was 10^7CFU/ml which were exceeded for various bio fermented milk treatments and remained above 10^7 CFU/ml until the end of storage.

Keyword: Strawberry juice, Probiotic bacteria, Fermented milk, bioactive component, physicochemical characters, sensory evaluation.

INTRODUCTION

Nowadays, the largest segment of functional foods market worldwide is represented by milk and milk derived products fermented with probiotic microorganisms. Various health benefits of such foods include reduction in serum cholesterol, alleviation of lactose intolerance, reduction of diarrhea, prevention and suppression of colon cancer and stimulation of the immune system (Saarela *et al*., 2000). Recent studies indicated that continuous consumption of probiotic foods promotes a number of benefits including balance of intestinal flora as well as increased resistance against pathogenic (Zheng *et al*., 2014 and Zoumpopoulou *et al*., 2017). Dairy products are an adequate alternative as functional foods since they present excellent nutritional value, have wide consumers acceptance and are potential matrices for inoculation of probiotic microorganisms (Andrade *et al*., 2019 and Fernandes *et al.,* 2018) Their components (ingredients) are sources of protein, minerals, and vitamins that provide favorable environment for the development of probiotics (He and Hekmat, 2015; Van Hooijdonk and Hettinga, 2015). Milk-based beverages, fermented milks are among the top, major probiotic foods consumed worldwide. However, food should contain an adequate concentration of probiotics; i.e., above 10^6 UFC/g when consumed in order to have a beneficial effect on health (Lourens-Hattingh and Viljoen 2001). Combined products of fruits together with fermented milk product containing probiotic cultures has a unique possibility to produce a dairy product with all the benefits provided by this class of microorganisms, plus the pharmacological benefits provided by the fruit. Fruits are relatively low in energy and are an excellent source of antioxidants, prebiotic fibers and polyphenols, which can promote digestive health (Fernandez and Marette, 2017). Because of its highly nutritional and health benefit, fermented dairy products fortified with fruits received a lot of interest in recent decades. The use of different fruits has improved its nutritional and sensory properties (Çakmakçi *et al*., 2012). Fruit juices as well as dairy products offer several advantages for probiotic microorganisms (Pereira and Rodrigues, 2018). They are a rich source of nutrients (antioxidant, minerals, and vitamins) and their natural sugars contribute to the growth of probiotics.

Strawberries are a common and important fruit in the Mediterranean diet because of their high content of essential nutrients and beneficial phytochemicals, which seem to have relevant biological activity in human health. Among these phytochemicals, anthocyanin and ellagitannins are the major antioxidant compounds (Giampieri *et al*., 2012).

The objectives of this study were to evaluate the physicochemical and the sensory properties of the fermented milk beverage flavoured with strawberry juice and study the effects on the physicochemical properties and the viability of ABT5 culture during refrigerated storage.

MATERIALS AND METHODS

Materials

Approximately 5 kg of strawberries (*Fragaria ananassa*) were purchased from the local market in Alexandria city**.** Fresh full fat buffalo milk was purchased from the local market in Alexandria Governorate. Freeze dried culture (**FD-DVS ABT-5–Prbiotic)** composed of bacterial strains (*Lactobacillus acidophilus* LA-5, *Bifidobacterium* BB-12 and *Streptococcs thermophilus*) was obtained from Chr. Hansen's, Denmark.

Technological methods

Preparation of strawberry juice

The preparation of strawberry juice was carried out according to Galoburda *et al*., (2014). The strawberries were sorted, cleaned, washed, processed in (National, model SJ -390 blender, Egypt) until obtaining a homogenous mass, blend into polyethylene bags, then frozen and stored in frozen condition at -23±2°C till used.

Preparation of bio- fermented strawberry milk

The frozen strawberry juice was thawed over night at 4±1°C in refrigerator. The thawed strawberry juice was added to the full fat milk at level of 4,8,12% (v/v) concentration, The mixture was homogenized, heated at 85°C for 30 minutes , cooled at 40±2°C, then inoculated with probiotic culture (**FD-DVS ABT-5–Prbiotic at 0.2g/l)** concentration and incubated at 37±2°C to achieve pH value of around 4.6, from initial 6.5 and it lasted in average about 6 hours at 37°C before cooling at 4±2°C and stored at the same temperature in refrigerator for 8 days (Fig.1).

Milk

↓

Adding strawberry juice to milk at 4, 8, 12 %(v/v)

↓

Packing in sterile bottle

↓

Heating to 85°C for 30 minutes

↓

Cooling to 40±2°C

↓

Inoculating with 0.2 g/L FD-DVS ABT-5–Prbiotic culture

↓

Incubating at 37±2°C until pH 4.6 for 6hr

↓

Storing in refrigerator at 4±2°C

Fig.(1). Flow chart for preparation of bio-fermented strawberry milk

Analytical methods

Physico-chemical analysis of milk

The percent of fat, SNF, protein, lactose, density, freezing point (calculated), and ash of milk samples were determined by using Funke Gerber 3510 Laktostar milk content analyzer (Funke Gerber, Berlin, Germany) according to the manufacturer manual (Yıldız, 2008). Titritable acidity was determined as lactic acid % according to AOAC (2008). pH value was measured using a pH meter (Jenway 3505, England) with a glass electrode standardized at 21.5°C over the range 6.7 according to AOAC (2008).

Physico-chemical analysis of strawberry juice

Analytical tests for strawberries juice were carried out in triplicates. Moisture, crude protein, crude fiber and ash contents were determine according to (AOAC 2008). Fat-soluble material was extracted from an oven-dried sample using mixtures of chloroform and methanol as described by Folch *et al*. (1957). Total soluble solid (T.S.S) were determined by hand refractometer (ATAGO Hand Refract meter, Brix° 0–30%, Japan). Titratable acidity (TA) as citric acid (%) was determined by titration to pH 8.2 with 0.1M NaOH solution and expressed as g of citric acid per 100 ml of juice. The pH measurements were performed using a digital pH meter (Jenway 3505, England). Total sugar (%) was determined by phenol sulfuric acid method (Dubois *et al*., 1956).

Folin Ciocalteu reagent was used for analysis of total phenolics content of strawberry juice, using galic acid as standard for the calibration curve. The reaction mixture was kept in dark at ambient temperature (22±2°C) for 2hr before measuring at wave length of 765 nm using UV-Visible spectrophotometer (APEI PD 303, Japan). The results were expressed as mg Gallic acid equivalent in 100g of fruit juice (mg GAE/ 100g of juice) **(**Maurya and singh., 2010).

Total anthocyanins (TA) content as mg as cyaniding-3-glucoside/L of puree. The TA was estimated by pH differential method using two buffer systems potassium chloride buffer pH 1.0 (25 mM) and sodium acetate buffer pH 4.5 (0.4 M) (Ozgen *et al*., 2008). The total flavonoid content was measured using catachin as standard for calibration curve according to Olajire and Azeez (2011).Total Antioxidant Capacity of strawberry juice several methods for determination of antioxidant capacity were used: FRAP, DPPH. The FRAP (ferric reducing/antioxidant power) assay was carried out according to Quisumbing (1978).

The antioxidant capacity of strawberry juice was studied through the evaluation of the free radical-scavenging effect on the 1,1-diphenyl-2-picrylhydrazine (DPPH) radical. The determination was based on the method proposed by Marxen *et al.* (2007).

Microbiological analysis

The convention diluting pouring plate technique was followed for enumerating total microbes in the samples using PCA (Oxoid, England). All plates were counted and the two replicates from the same dilution were calculated directly by colony forming unit (CFU g^{-1}or ml^{-1}).

For counting Lactic acid bacteria group, the MRS agar (Biolife) was used as recommended by the standard methods for examination of dairy products. The plates were incubated for 48h at 37°C (DeMan *et al*., 1960).

Enumeration of yeast and molds was made as recommended by the standard method for examination of dairy product (Marshall, 1993), using the Rose Bengal media. The plates were incubated for 5 day at 21°C. Violet red bile agar (VRBA) was used for enumerating coliform bacteria as described by (Marshall, 1993). The plates were incubated at 37°C for 48 hours.

Sensory evaluation

Ten experienced panelists were chosen for the assessment of the sensory attributes of bio fermented beverage samples. Taste, Color, Appearance, and overall grade of the samples were evaluated. The introduced sensory attributes allowed the differentiation of samples. Samples were coded and were kept at 25°C for 1h after the manufacturing process before sensory assessment. Samples were served in 125 ml plastic cups. All sensory attributes were assessed by the panelists and were rated using a 4-point scale as 1=Bad, 2= Sufficient, 3= Good and 4= Very good according to Poste (1991).

Statistical analysis

The effect of strawberry juice addition on each parameter was estimated by ANOVA ($P < 0.05$) using minitab® statistical software (Çelik *et al.,* 2009). Statistically different groups were determined by Duncan's multiple range tests**.**

RESULT AND DISCUSSION

Physico- chemical analysis of strawberry juice

The results of proximate composition analysis of fresh strawberry juice are shown in Table (1). As shown in the Table, the fresh strawberry juice contained 91% moisture, 0.2% crude fat, 1.23% crude protein, 1% crude fiber, 0.27% ash, respectively. These results are in accordance with these of Sabina *et al*., (2011) and Hossain *et al*., (2016).

Table (1). Proximate composition of strawberry juice (fresh weight)

Proximate composition	Strawberry juice* (%)
Moisture	91.00±0.03
Crude fat	0.20±0.10
Crude protein	1.23±0.15
Crude fiber	1.00±0.01
Ash	0.27±0.06

*Mean±SD

The results of physicochemical properties of fresh Strawberry juice was as follow: total soluble solids content (T.S.S) 7 °Brix, total sugar 6.30% (Keutgen *et al*., 2007), Titritable acidity (as citric acid) 0.81%, pH value 3.3 and viscosity 924.7 mpas. The pH and the titrable acidity of Strawberry juice were in agreement with Galoburda *et al.* (2014), Mansour *et al.*(2014), Alcaraz-Mármol *et al*. (2017).

Table (2). Physicochemical characteristic of strawberry juice (freshweight)

Physicochemical characteristic	Strawberry juice*
Total soluble solid (Brix)°	7.00±0.58
Total sugar (%)	6.30±0.58
Titratable acidity as citric acid (%)	0.81±0.02
pH value	3.30±0.00
Viscosity (mPas)**	924.76±4.51

* Mean±SD ** Mille Pascal

Phenolic compounds in fruits and vegetables have important contributions to sensory attributes, as well as potential health benefits (Radunic *et al*., 2015). Total phenolic, total flavonoid and total anthocyanin content in strawberry juice was shown in Table (3).

Total phenolic content were 667.28±10.18 **GAE/100g.** These result in an agreement with that obtained by Mahmood *et al.,* (2012) and higher than that obtained by Treftz and Omaye (2015). Flavanoid content was 367.3±2.28 mg catchin/100g, it is lower than that found by De Souza *et al.,* (2014).

Total anthocyanin content in the Strawberry juices was 47.61 mg (cyaniding-3-glycoside/L) which was in agreement with that reported by Kelebek and Selli (2011) and was lower than found by de Jesús Ornelas-Paz *et al*.(2013).

Table (3). Total phenolics, flavonoids and anthocyanin content of the Strawberry juice

Component (fresh weight)	Strawberry juice*
Total phenolic mg GAE/100g	667.28±10.18
Total flavonoids mg catchin/100g	367.33±22.81
Total anthocyanin (mg cyaniding-3- glycoside/L)	47.61±2.65

*Mean±SD
mg GAE/100g: gallic acid equivalent in100g of fruit juice

Previous studies stated that strawberry fruit is rich in anthocyanin and it has many health benefits' such as antioxidant ability, anti-inflammatory, anti-cancer and other physiological functions (Giampieri *et al.,* 2012).

Antioxidant potentials of strawberry juices to scaving DPPH was 92 ±0.01% which indicated the high antioxidant capacity in strawberry juice. These results are in agreement with that reported by Bursać *et al*., (2009). The reducing power method was used to confirm the results from the DPPH test, the mean values was 91.1±3.19 µg ascorbic acid/g.

The higher reducing power indicated presence of reductions which are able to break free radical chains by donating hydrogen atoms and thus converting them to a more stable non-reactive species (Huang *et al*, 2005) and Zhang *et al*. (2010).

Table (4). Antioxidant activity of the Strawberry juices

Antioxidant activity	Strawberry juice*
Antioxidant capacity DPPH mg/l	92±0.01
Reducing power µg ascorbic acid/g extract	91.1±3.1

*Mean ± SD DPPH: (1, 1-diphenyl-2-picrylhydrazyl)

Some physicochemical properties of bio-fermented milk beverage:

pH:

Fermented milk beverage pH values without and with Strawberry juice are shown in Figure (2) .The pH is inversely proportional to the acidity of any medium. It is revealed that the pH of fermented milk beverage (control) was found to 4.6. pH values decreased gradually with addition of 4 , 8 and 12 % strawberry juice. This could be attributed to the low pH of Strawberry juice (3.30). Strawberry juice positively affected the rate of acid production. As the pH decreased, acidity increased. This may be due to fermentation of lactose, which produce lactic and acetic acid during fermentation and storage period. These results are in agreement with Hamad *et al*. (2013).

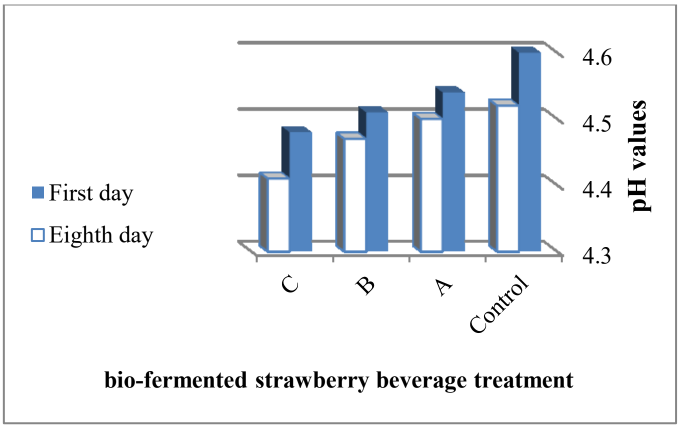

Fig. (2). changes of pH during storage period

Control without juice, A, B, C are fermented milk beverage treatments made milk adding 4 , 8 and 12% strawberry juice, respectively.

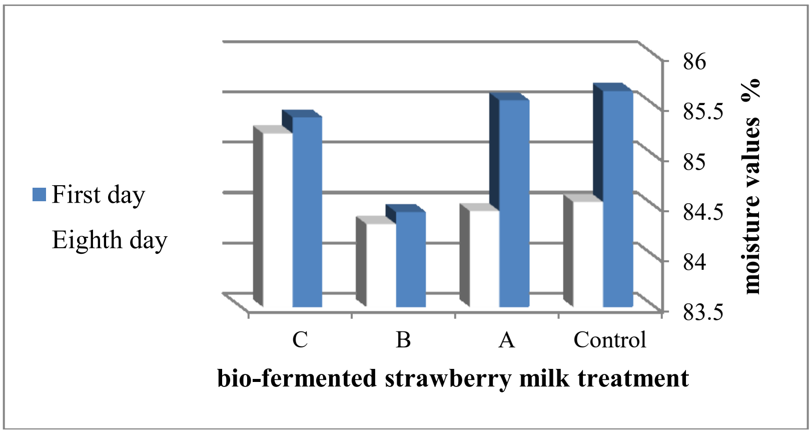

Fig. (3). Change of moisture during storage period

Control without juice, A, B, C are fermented milk beverage treatments made milk adding 4 , 8 and 12% strawberry juice, respectively.

Moisture content:

Moisture content of fermented milk beverage without Strawberry juice (control) was recorded as the highest (85.64 %) among all samples, Figure (3). The addition of strawberry juice increased the TS of fermented milk beverage and therefore decreases in the moisture content of product. The moisture contents of fermented milk beverage with strawberry juice were 85.55, 84.44 and 85.38% at 4, 8 and 12 % concentrations, respectively while decrease at eighth day to 84.45, 84.32 and 85.22%, respectively. Moisture content and the total solids affected the texture, low moisture content and high total solid increased the firmness and consistency of yogurt and therefore affected on mouth feeling (Yousef *et al*., 2013).

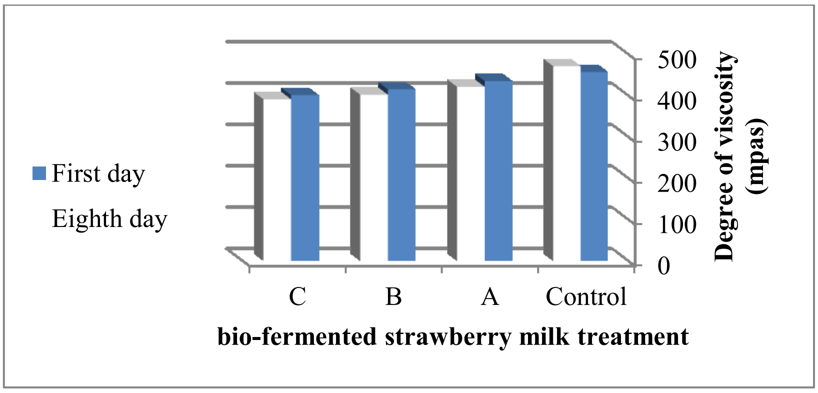

Fig. (4). Change of viscosity (mPas) during storage period

Control without juice, A, B, C are fermented milk beverage treatments made milk adding 4 , 8 and 12% strawberry juice, respectively.

Viscosity:

The viscosity is an important characteristic of foods due to its relation to the density of product. The viscosity was changed in the fermented milk beverage with added Strawberry juice (4, 8 and 12%) as presented in Figure (4). The viscosity of fermented milk beverage without Strawberry juice (control) (471 mPas) was higher than that of fermented milk beverage based on strawberry juice being 435,415 and 401 mPas at concentrations 4, 8 and 12%, respectively. It was evident that increasing the strawberry juice concentration reduced significantly the viscosity value of the fermented milk beverage.

The viscosity of bio fermented milk without or with Strawberry juice increased continuously up to 8 days of storage. It was noted that the lower the pH of the fermented milk beverage, the more resistant the gel network was to syneresis. The increase in acidity during the fermentation and storage period increases the stability of the fermented milk beverage (Longton, 1991).The addition of higher concentration of concentrated fruit juices decreases the water-holding capacity of protein (i.e. diluting the protein content in the milk base); thus the viscosity of the yoghurt decreases. (Ramaswamy and Basak ,1992; Akyüz and Coflkun ,1995). It has been reported that the addition of fruit juices or pulps might be deleterious to the survivability of some species and strains of probiotic microorganisms in food products, particularly due to acidity and the presence of antimicrobial compounds. Buriti *et al.,* (2007) and do Espírito Santo *et al.,* (2012) stated that with increasing of guava pulp amounts added to goat's milk, total solids (TS) content raised but fat and total protein concentrations slightly lowered. The pH values gradually decreased with increasing strawberry juice concentrations.

Probiotic enumeration:

The probiotic enumerations of the samples after preparation of the beverages (on the first day and 8th day of refrigerated storage are shown in Table (5). The addition of fruit juices or pulps might be deleterious to the survivability of some species and strains of probiotic microorganisms in food products, particularly due to acidity and the presence of antimicrobial compounds do Espírito Santo *et al*. (2012). In the present study, it was verified that ABT5 culture is good viability in the presence of strawberry juice. Treatments B (8%) contained strawberry juice had the highest numbers level of ABT5 culture (4.8X10^9) at the end of storage at 4±2°C. This may be attributed to high acid production and accumulation in fermented milk with strawberry juice during storage 4±2°C and nutrients in bio- fermented strawberry milk.

Table (5). Microbiology analysis of bio-fermented strawberry milk starter (ABT5) during refrigerated storage at 4±2°C

Treatment	**Storage period** (days)	**Total Count** CFU/ml	**LAB** CFU/ml	**Coliform** CFU/ml	**Yeasts and Mould** CFU/ml
Control	**Fresh**	3.3X10^7	5.2X10^7	ND	ND
	1	3.2X10^7	3.0X10^8	ND	ND
	4	4.5X10^7	8.1X10^8	ND	ND
	8	5.0X10^7	9.0X10^8	ND	ND
A	**Fresh**	3.0X10^7	5.6X10^7	ND	ND
	1	3.0X10^7	2.0X10^7	ND	ND
	4	3.8X10^7	6.5X10^8	ND	ND
	8	4.0X10^7	8.5X10^8	ND	ND
B	**Fresh**	4.0X10^7	6.7X10^7	ND	ND
	1	1.6X10^7	1.3X10^8	ND	ND
	4	2.4X10^8	4.1X10^9	ND	ND
	8	3.0X10^8	**4.8X10^9**	ND	ND
C	**Fresh**	3.0X10^7	4.0X10^7	ND	ND
	1	3.8X10^7	3.0x10^8	ND	ND
	4	2.1X10^7	4.7X10^8	ND	ND
	8	1.2X10^8	**1.1X10^9**	ND	ND

Control without juice, A, B, C are fermented milk beverage treatments made milk adding 4 , 8 and 12% strawberry juice, respectively.
Fresh: analyses were conducted after fermentation (6 hrs).
ND: Not detected

These result showed that coliform, moulds and yeast did not detected in all treatments it was observed that the total Lactic Acid Bacteria (LAB) count increased during the storage period for all treatment. The highest LAB count 4.8X10^9 CFU/ml was found in treatment number (B) flowed by (C) 1.1X10^{9}CFU/ml , while the control treatment was the least being 5.2X10^7 CFU/ml. These results in agreement with those of (Jayamanne and Adams, 2006), who reported that to be considered a probiotic, the product should present a concentration of probiotic microorganisms above 10^6 CFU/ml.

Table (6). Sensory properties of bio-fermented strawberry milk during storage

Treatments	Fresh*	1	4	8
		Days		
		Flavour		
Control	8.25±0.89	8.25±0.89	8.66 ±0.53	8.00±0.53
A	8.00±0.52	8.00±0.52	8.25±0.71	8.10±0.00
B	8.36±0.71	8.36±0.71	8.50±0.53	8.60±0.52
C	7.00±0.52	7.00±0.25	7.00±0.46	7.00±0.00
		Viscosity		
Control	8.50±0.52	8.50±0.52	8.50±0.53	8.20±0.76
A	8.37±0.52	8.37±0.52	8.25±0.74	8.12±0.35
B	7.62±0.53	7.62±0.53	7.30±0.52	7.25±0.46
C	7.12±0.35	7.12±0.35	7.12±0.35	7.00±0.35
		Colour		
Control	8.12±0.00	8.12±0.00	8.12±0.83	8.12±0.76
A	7.50±0.53	7.50±0.53	7.50±0.64	7.52±0.52
B	8.25±0.35	8.25±0.35	8.22±0.76	8.25±0.46
C	9.00±0.71	9.00±0.71	9.00±0.76	9.00±0.35
		Over accept		
Control	8.22±0.52	8.22±0.52	8.30±0.52	8.12±0.35
A	8.12±0.52	8.12±0.52	8.35±0.46	8.20±0.00
B	8.35±0.46	8.35±0.46	8.87±0.35	8.82±0.00
C	8.25±0.71	8.25±0.71	8.27±0.52	8.00±0.35

Control without juice. A, B, C are fermented milk beverage treatments made milk adding 4,8 and 12% strawberry juice, respectively .

Table (6) illustrated that the sensory properties of bio- fermented strawberry milk control and varying levels of strawberry juice during storage period. The data showed that, the sensory properties such as flavor, taste, viscosity, color, appearance and over acceptability.

Flavor and taste:

From Table (6) the 8% fermented beverage milk had the highest flavor score compared to other samples (Abdalla *et al*., 2015).

Viscosity:

Viscosity of bio-fermented strawberry milk were affected by the addition of juice and throughout the storage period. The score of beverage (T0%) control was higher in viscosity compared to samples (Güven and Karaca ,2002).

Color and appearance:

The resulted scores of the products color revealed that increasing the concentration of strawberry juice enhanced the color and the appearance of the bio- fermented strawberry juice treatments, particularly 12%, and during the storage. These results were in agreement with (Kavas and Kavas, 2016), who reported that increasing the guava pulp concentration to 15% improved the products color.

Over all acceptability:

As shown in Table (6) overall score of bio-fermented strawberry juice were significantly affected by the addition of juice and throughout the storage period. Treatment B geared was received the highest score among fermented strawberry milk. (Abdalla *et al*., 2015).

CONCLUSION

It can be noted that milk fermented with strawberry juice and probiotic bacteria (ABT5) could be manufactured as an alternative probiotic dairy product and can be recommended for consumption. The results showed that the bio fermented strawberry milk beverage contained LAB could serve as a healthy beverage for consumers.

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الملخص العربي

الخواص الكيميائيه الحيوية لمشروب الحليب المتخمر المدعوم بعصير الفراولة وبعض سلالات بكتيريا البروبيوتك

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انتشر في الآونة الأخيرة إستخدام منتجات الألبان كأغذيه وظيفيه نظرا لقيمتها الغذائيه المرتفعه وقبول المستهلك لها ولذلك كان الهدف من الدراسه إنتاج مشروب لبنى متخمربواسطة ABT5 (*Lactobacillus*
Streptococcus thermophilus. and *Acidophilus* LA-5, *Bifidobacterium* BB12)
مدعم بتركيزات مختلفه من عصير الفراوله (٤، ٨، ١٢%) وخلال هذه الدراسه تم تقدير التركيب الكيميائى والفيزيائى وبعض المركبات الحيويه لعصير الفراوله وأوضحت النتائج للعصير الطازج أن نسبه الرطوبه كانت ٩١% ، السكريات الكليه ٦.٣٠%، البروتين الخام %١.٣٣، الدهن ٠.٠٢%, الرماد الكلى ٠.٢٧%, الحموضه الكليه ٠.٨١%, الرقم الهيدروجينى ٣.٣ والمركبات الفينوليه ٦٦٧.٢٢ ملجم /١٠٠ جم من العصير والأنثوسيانين ٤٧.٦٥ ملجم / لتر ونشاط تضاد الاكسدة ٩٤% .وأظهرت نتائج التحاليل الميكروبيولوجيه أن جميع التركيزات أدت الى زياده عدد البكتيريا الداعمه للحيويه وكان التركيز (٤ ,٨ %) الأكثر قبولا لدى المحكمين حتى نهايه فتره التخزين ٨ أيام على درجه الحراره ٤°م من الناحيه الحسيه . وأن المستوى الموصى به من البكتيريا ABT5 كداعمه للحيويه كانت $١٠^{٧}$ مستعمرة ميكروبية/ملى والتى كانت موجوده فى العديد من معاملات المشروبات المتخمرة المدعومه بعصير الفراوله وسلالات بكتيريا البروبيوتك ABT5 تحت الدراسه فكانت اكثر من $١٠^{٧}$ مستعمرة ميكروبية/ملى حتى نهايه فتره التخزين .