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Research Article

Physiochemical Characteristics and Sensory Properties of Cow's Milk Yoghurt as Affected by Different Level of Gum Arabic Powder

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Abstract

In this study, the physicochemical analyses and sensory properties were investigated in two types of yoghurt produced from cow milk without gum Arabic (control) and with added gum at 0.5%, 1%, 1.5%. All samples stored at the refrigerator for 1, 5 and 10 days. The result showed that the addition of gum Arabic in yoghurt has significantly affected ($p \leq 0.05$) lower content of moisture (84.16%) at 10 days of storage compared to the control yoghurt (88.03%), total dry matter carbohydrate of yoghurt produced by using gum increased directly with increase of concentration of gum added at 1, 5 and 10 days of storage. The protein content of control yoghurt (3.17%) was lower than that of gum yoghurt with 1.5% at the end of storage. Also the total soluble solids were highly increased from 8.76% in control sample to 13.39% in gum yoghurt with 1.5%. The viscosity 0f the control sample expressed the lowest value (1300cps) while the highest value (2200cps) was obtained by gum yoghurt. Moreover, the addition of gum powder resulted in decreasing the pH Value from 5.90 in control yoghurt to 5.20 gum yoghurt at 10 days, also serum separation from 4 to 2ml with 1.5% gum at 10 days of storage. According to sensory properties addition of gum, the powder had a significant effect ($p \leq 0.05$) on texture flavor, appearance, and overall acceptability, the value of yoghurt adding 0.5% gum powder had the highest overall acceptability. Depend on the results of this research; all the main and specific objectives have been done. However, the following recommendations can be suggested such as microbiological analysis as well as the fiber content are worth studying.

Keywords: Physicochemical characteristics; Sensory analysis; Cow's milk; Yoghurt; Gum Arabic

Introduction

Milk is defined as the secretion of the mammary glands of mammals; milk are complete food for human nutrition, it contains all the basic components, which are required for the development and maintenance of human life. Damodaran et al., stated that cow's milk has been used as the most popular source of milk from husbandry and become the main source of milk for human consumption, especially in the Western world [1]. Hydrocolloids have been widely used in textural stabilization of fermented milk products [2]. Hydrocolloids also play an important role in the overall acceptability of food products, because they cause an increase in the physical stability of foods and overall mouth-feel properties [3]. Different types of hydrocolloids such as carrageenan's, pectin, starch, agar, Locust Bean Gum (LBG), xanthan gum and guar gum can be utilized for desirable texture and stabilization of dairy products. In the food industry, hydrocolloids are used as a thickening, stabilizing and gelling agents, and they increase firmness and prevent syneresis [4]. Fermentation is one of the old and safety methods for preserving milk. Increase in acidity consequent to fermentation results in products such as yoghurt, quarg, labneh, kefir and koumiss, which are bacteriological stable under refrigerated conditions and free from pathogens [5]. Fermented dairy foods have long been considered safe and nutritional. The health benefits elicited by Lactic Acid Bacteria (LAB) involved in the production of these foods were the primary reason to associate the consumption of yoghurt. The lactic acid lowers the pH, makes it start, and causes the milk protein to thicken. The fermented milk makes yoghurt easily digestible [6]. Yoghurt is popular fermented milk food in Europe, Asia, and Africa. It is known by quite different names in different parts of the world. In Sudan, it is believed that yoghurt is useful for the treatment of stomach disturbances, and the individuals with such complaints are advised to take yoghurt [7]. Yoghurt is a fermented milk product that contains the characteristic bacterial cultures lactobacillus bulgaricus and Streptococcus thermophiles. Yoghurt is valuable health food for both infants and elderly persons for children its source of protein, fats, carbohydrates and minerals in texture that kids love. The main ingredient in yoghurt is milk. The type of milk depends on the type of yoghurt also stabilizers used in yoghurt to improve the body and texture by increasing firmness, preventing separation of the way and helping to keep the fruit uniformly mixed in the yoghurt. Stabilizers used in yoghurt are alginates, gelatin, gum, pectin, and starch. Gums are polysaccharides that classified according to their origin [8]. Gum Arabic, also called Acacia Gum is the natural exudate from the Acacia Senegal, which has high molecular weight consisting of branched arabinogalactan heteropolymers [9]. The gums can control the rheology and texture throughout the stabilisation of

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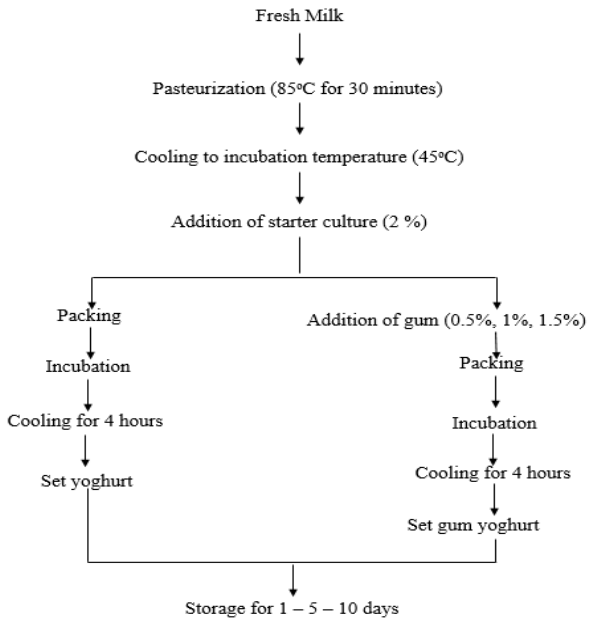

Figure 1: Processing of yoghurt and Gum.

emulsions, suspensions, foams and starch gelatinization [10]. Gum Arabic is primarily indigestible to both humans and animals. It is not degraded in the small intestine but fermented in the large intestine by microorganisms to short-chain fatty acids, particularly propionic acid. It Generally Recognized As Safe (GRAS) for direct addition to human food under the provisions of section 184 1330 of the GRAS. It is approved for use in various food categories at the following maximum permitted usage levels; 2.0% (beverage and beverage bases), 5.6% (chewing gum), 12.4% (confections and frosting), 1.3% (dairy product), 1.5% (fats and oils), 2.5% (gelatins, pudding, and filling), 46.5% (hard candy), 8.3% (nuts and nuts protect), 4% (snack foods). This study will be utilized Gum Arabic to improve the nutritional and rheological properties, to increase the texture during yoghurt processing and to enhance appearance and thus improve the quality of the final yoghurt product. Therefore, the main objective of this study was to assess the physicochemical characteristics and sensory properties of cow's milk yoghurt as affected by the different level of gum Arabic powder.

Materials and Methods

Raw material and reagents

Fresh cow milk was collected from Brahma dairy farm in Wed Elmagdop, Wed Medani city, Sudan at early in the morning, transported to the dairy laboratory of Arahma for processing and analysis done in the laboratory of food science and technology, University of Gezira. The Acacia Senegal (GA) used in this study was obtained from Natural African Forest Products co. (NAFOP), Khartoum, Sudan. Starter culture (KAPO) used in the manufacture of yoghurt was obtained from the local market. All other chemicals and reagents were of the highest grade commercially available

Methods

Preparation and manufacture of cow yoghurt

Milk was pasteurized at 85°C for 30 min as described by [7], and rapidly cooled to 45°C in this temperature the starter culture (KAPO 2%) was added then packed and incubated in the incubation room at 42°C for 4 hours then stored in refrigerator for 1, 5 and 10 days. The samples were coded as D.

Manufacture of gum yoghurt

Milk was pasteurized at 85°C for 30 min and then cooled to 45°C. Starter culture at rate of 2% of the milk volume was added then added three levels of gum (0.5%, 1 %, 1.5%) after that the mixture was placed into plastic cups and kept in an incubator at 42°C for 4 hours the cups were stored in refrigerator for 1,5 and 10 days. The samples were coded as A, B, C Figure 1.

Chemical Analysis of Yoghurt

Moisture content determination

The moisture content was determined by oven method as described by AOAC, (2005). In this process, 3g of the sample was dried in a hot air oven for 24 hours at 100°C. The loss in weight was determined and recorded as the moisture content and expressed as:

$$\text{Moisture \%} = \frac{W1 - W2}{W1} \times 100$$

Where; W1 = initial weight of the sample, W2 = weight of the dried sample, dry matter (%) = 100- the total of moisture.

Protein content

The protein content was determined by the Kjeldahl method [11]. In a clean, dry Kjeldahl flask, 1g yoghurt was placed, and then 25ml of concerted H_2SO_4. The mixture was then digested on a heater until a clear solution table ($CuSo_4$). The mixture was then digested on a heater until a clear solution was obtained after 3 Hours. The flasks were removed and left to cool. The digested sample was poured into a volumetric flask (100ml) and diluted to 100ml with distilled water. Then 20ml were taken, neutralised using 50ml of 40% sodium hydroxide (NaOH) and the neutralised solution was then distilled. The distillate was received in a conical flask containing 25ml of 4% boric acid plus three drops of indicia tor (bromocresol green plus methyl red). The distillation was continued until the volume of the flask was 75ml. The flask was then removed from the distillatory, and the distillate was then titrated against 0.1 N HCL the end was obtained (red color.) The protein content was calculated as follows:

$$\text{Nitrogen } (\%) = \frac{T \times 0.1 \times 0.014 \times 5}{\text{Weight of sample}}$$

Protein (%) Nitrogen (%) × 6.25, Where: T= Titration figure, 0.1: Normality of HCL, 0.014= Atomic weight of nitrogen/1000, 5= Dilution factor, 6.25 = Conversion factor of milk nitrogen into protein.

Ash content determination

The ash content was determined by the direct heating method as contain in [12]. In this method, 3g each of the samples was measured into a crucible of known weight; the sample was burnt to ash in a muffle furnace for 3h at 550°C. It was then cooled in a desiccator, and the weight of the ash was finally determined. The ash content was calculated as;

$$\text{Ash \%} = \frac{W1 - W2}{W1} \times 100$$

Where; W1 = Initial weight of the sample, W2 = weight of the dried sample.

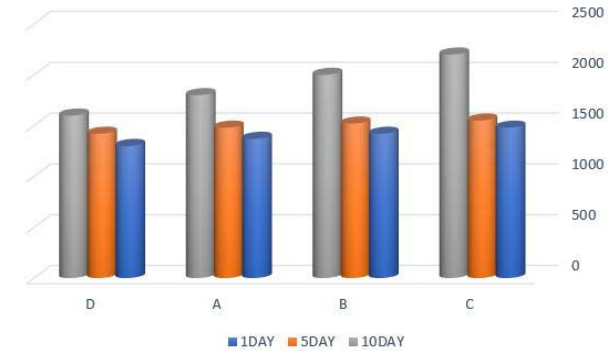

Figure 2: Changes in Viscosity of yoghurt during storage.

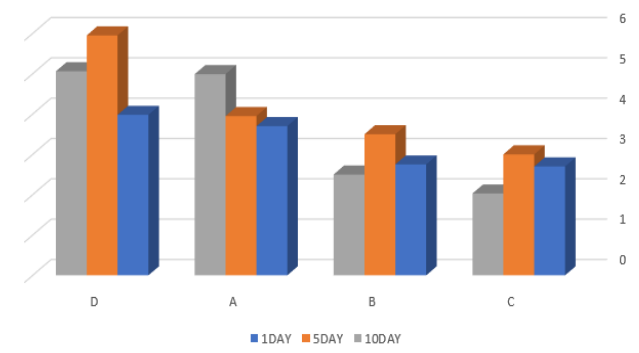

Figure 3: Changes in serum separation of yoghurt during storage.

Fat content

The fat content was determined by the Gerber method according to AOAC, (2003) as follows: 9.5 milliner's 851f sulfuric acid (density 1.815 mg/ml at 20°C and distilled water at 3ml of amyl alcohol (density 0.814-0.816mg*malt 20°C) and distilled water (at 20°C) and distilled water (at be seen. Gerber tubes were centrifuged at 3000 revaluations per minute (rpm) for 15 minutes, and the tubes were then transferred to a bath at 65°C. For 3 minutes. The fat per cent was then read out directly from the fat column.

Carbohydrate content determination

The content of total carbohydrate was calculated by subtracting the sum of moisture, protein, fat, and ash from 100 (AOAC, 2003). For determination of pH (hydrogen ion concentration) in the products, a method of AOAC, [13] was adopted, and digital pH meter was used. The sample solution was taken in the beaker and directly inserted the electrode into the solution. When the first reading was completed, the electrode was wiped with distilled water and dried-up with tissue paper. Similarly, as a continuing series, all other samples were determined accordingly.

Determination of titratable acidity

Titratable acidity as tartaric acid was determined according to the method of AOAC, (2000). Each sample of the products was treated with 0.1 N NaOH solution using titration kit; of which three to five drops of phenolphthalein indicator were used. The volume of alkali used was noted and calculated using the following formula.

$$\text{Titrable acidity } (\%) = \frac{1 \times \text{Eq. Wt. of acid} \times \text{Normality of NaOH} \times \text{titer} \times 100}{10 \times \text{Weight of sample (g)}}$$

Determination of total soluble solids

The Total Soluble Solids (TSS) were determined as per method described by [14] using Digital-Bench- Refractometer. Before use, the instrument was cleaned and adjusted to zero at 20°C using distilled water. An appropriate quantity of sample of each product prepared was placed on the prism-plate of the refractometer with the help of a glass rod and folding back the cover. For each sample, the instrument was calibrated using distilled water. The reading appeared on the screen was directly recorded as total soluble solids as Brix.

Viscosity determination

The viscosity of the samples was determined by the method of [15]. In this study the reading was taken at 32°C, the spindle speed was an adjusted according to the thickness of the yoghurt sample in this case the specification combination used was speed 60 and spindle number 4. To calculate the final viscosity in centipoises, a factor of 100 was used.

Table 1: The proximate chemical composition of control yoghurt and yoghurt added with gum powder on the first day of storage.

Parameter	Samples			
	D	A	B	C
Moisture content %	88.03±10^{a}	85.93±0.09^{b}	85.64±0.18^{c}	85.59+0.04^{c}
Dry matter	11.95 ±0.10^{c}	14.10 ±0.09^{b}	14.36 ±0.18^{a}	14.40 ±0.04^{a}
Protein content %	3.17±0.03^{c}	5.27±0.07^{a}	5.20 ±0.06^{a}	4.99±0.07^{b}
Ash content %	0.57±0.0 4^{c}	0.63±0.02^{b}	0.65±0.01^{ab}	0.68 ±0.01^{a}
Fat content%	2.47 ±0.06^{a}	1.80±00^{b}	1.87±0.11^{b}	1.86 ±0.02^{b}
Carbohydrate %	5.04±0.12^{d}	5.56±0.07^{c}	5.86 ±0.02^{b}	6.12±0.11^{a}

Means with the different superscript letters in the same row are significantly different (p≤ .0.05). D: Control yoghurt sample; A: Yoghurt with gum 0.5%; B: Yoghurt with gum 1%; C: Yoghurt with gum 1.5%.

Serum separation

Serum was determined by putting 25ml of yoghurt sample on filter paper. After 2 hours the volume collected in ml per 25ml of initial yoghurt sample.

Sensory evaluation

All types of yoghurt were subjected to sensory evaluation using 12 panellists on the first day of the storage. The panellists from the Department of Food Engineering and Technology of Gezira University were chosen to evaluate the color, texture, flavor, taste, appearance, and over acceptability by using hedonic scale with 1 as extremely bad and 9 excellent. For this evaluation a special testing area was used so that distraction can be minimized and conditions can be controlled, the testing room should be quiet, comfortable environment uniform level of lighting and good ventilation, each panellist was provided with water for rising, the samples were given codes before being tested and evaluation sheet was prepared for the panellists.

Statistical analysis

Statistical analysis was conducted by using the Analysis Of Variance (ANOVA), and Duncan s multiple range test was used to determine the differences using SPSS software 16.0 USA. P value is <0.05; it was considered statistically significant. All experiments were conducted in triplicate.

Results and Discussion

The proximate chemical composition of yoghurt and yoghurt with gum at the First days of storage.

Data in Table 1 indicated that the proximate analysis of two types of yoghurt, control yoghurt, and yoghurt with an additional three levels of gum powder (0.5 %, 1% and 1.5%). The two types of yoghurt were stored at 6c for 1, 5 and 10 days. The value of moisture in control yoghurt at the first day of storage was 88.03%, and this value was higher than those found in yoghurt with (0.5%, 1% and 1.5%) gum powder which were 85.93, 85.64 and 85.59%, respectively. The control value was lower than that reported by [16], which was 84.93%, while 86.97% with (1%) that reported by [17] was higher than value 85.64% with 1% gum powder. Also in this Table show the dry matter content was higher in yoghurt added with gum powder compared to control yoghurt the value recorded was 14.10, 14.36 and 14.40% in gum yoghurt and was 11.95% in control yoghurt. Table 1 also shows the effect of the first day of storage in protein content, the protein content of control yoghurt was 3.17%, and this value was lower than that reported by [17] which was 3.73% and also than that reported by [18] who reported as 3.3%. The protein content of control yoghurt was lower than protein content of gum which was 5.27, 5.20 and 4.99 respectively. The value 5.27 was lower than (6.70%) that reported by [16] however, a protein with 1% gum powder was higher than that reported by [17].

Ash content of control yoghurt in Table 1 was 0.57%, this value was lower than the value reported by [19] who reported the value of 0.66%. Also, this value was lower than the value of yoghurt added with 0.5 %, 1%, and 1.5% gum powder which were 0.63, 0.65 and 0.68%. The value with 1% gum powder was lower than that reported by [17]. The fat content of control yoghurt at the first day of storage was 2.47% this value was higher than those of yoghurt added with gum 0.5%, 1% and 1.5% which were 1.80, 1.87 and 1.86% respectively. The value of fat content of control yoghurt was higher than that reported by Huyam which was 0.95% and lower than that reported by [17] which was 3.18. The carbohydrate content of control yoghurt at the first day of storage was 5.04%; this value was lower compared to yoghurt added with gum 0.5%, 1% and 1.5% which were 5.56, 5.86 and 6.12% respectively.

The result of the chemical composition of two types of yoghurt in Table 2 shows the pH value on control yoghurt at the first of storage was 5.90, this value was higher than that reported by Frank, Sahar, which were similar value (4.4), while the value of yoghurt with gum 0.5%, 1% and 1.5% were 5.83, 5.80 and 5.88, respectively [20,21]. The titratable acidity (as lactic acid%) on control yoghurt was 1.72, this value was higher than that reported by Somia, Sahar and Abbas which were 0.91%, 1.05%, and 1.5%, respectively [19 21, 22]. Also, the control yoghurt value was higher compared to yoghurt with gum 0.5%, 1% and 1.5% which were 0.89, 0.85, and 0.83, respectively. The total solids content of control yoghurt on the first day of storage was 8.67%, this value was lower than that reported by Sahar and Khadija [16,21] which were 15.64%, and 15.07%, respectively, and lower than total solids of gum yoghurt value 9.30, 9.60 and 9.9%.

Data in Table 3 indicated the moisture content of control yoghurt decreased at five days of storage with value (87.80%). Also,

Table 2: Physiochemical of control yoghurt and yoghurt added with gum powder on the first day of storage.

Parameter	Samples			
	D	A	B	C
pH value	5.90±0.02^{a}	5.83±0.06^{bc}	5.80±0.01^{c}	5.88±0.02^{ab}
Acidity %	1.72±0.05^{a}	.089±0.02^{b}	0.85±0.09^{b}	0.83±o.02^{b}
Total solids %	8.67±0.20^{c}	9.30±0.01^{b}	9.60±0.01^{ab}	9.90±0.04^{a}

Means with the different superscript letters in the same row are significantly different (p≤ .0.05). D: Control yoghurt sample; A: Yoghurt with gum 0.5%; B: Yoghurt with gum 1%; C: Yoghurt with gum 1.5%.

Table 3: The proximate Chemical composition of control yoghurt and yoghurt added with gum powder at the 5th day of storage.

Parameter	Samples			
	D	A	B	C
Moisture content %	87.80±0.07^{a}	85.86±0.12^{b}	85.33±0.20^{c}	85.32±0.03^{c}
Dry matter %	12.19±0.08^{c}	14.22±0.14^{b}	14.62±0.21^{a}	14.67±0.03^{a}
Protein content %	3.52±0.03^{c}	5.48±0.09^{a}	5.33±0.07^{b}	5.23±0.07^{b}
Ash content %	0.50±00^{d}	0.56±0.01^{c}	0.62±0.01^{b}	0.64±0.01^{a}
Fat content %	2.53±0.06^{a}	1.87±0.06^{c}	2.07±0.11^{b}	1.90±00^{c}
Carbohydrate %	5.13±0.15^{d}	5.79±0.13^{c}	5.98±0.05^{b}	6.25±0.01^{a}

Means with the different superscript letters in the same row are significantly different (p≤ .0.05). D: Control yoghurt sample; A: Yoghurt with gum 0.5%; B: Yoghurt with gum 1%; C: Yoghurt with gum 1.5%.

the moisture content of yoghurt with gum 0.5 %, 1% and 1.5% was decreased to 85.86, 85.33 and 85.32% respectively, that due to the addition of gum Arabic which has water absorbing properties. The dry matter content on control yoghurt and yoghurt with gum 0.5%, 1% and 1.5%, were increased to value 12.19, 14.22, 14.62 and 14.6% respectively, that due to decrease of the value of moisture content. The protein content on control yoghurt and yoghurt with three levels of gum at the five days of storage had increased with value of 3.52, 5.48, 5.33 and 5.23%, respectively, the increase in protein content in yoghurt due to the effect of gum powder in yoghurt. Also, in Table 3 shows ash content on control yoghurt was 0.50%, this value was decreased compared to ash value at the first day, while the ash content on the yoghurt with gum 0.5 %, 1% and 1.5% were 0.56, 0.62 and 0.64%, respectively. The fat value on control yoghurt was 2.53%, this value was slightly increased compared to the value on control yoghurt on the first day of storage also, was higher than that gum yoghurt 0.5%, 1 and 1.5% with value 1.87, 2.07 and 1.90% respectively. It was statistically observed that the fat content was no significant difference between the 3 samples treated with gum at first and five days. In the same Table 2, the carbohydrate percentage on control yoghurt was 5.13% this was lower compared to gum yoghurt 0.5%, 1 % and 1.5% which were 5.79, 5.98 and 6.25%, respectively, and were higher compared to the first day. This increased due to the addition of gum powder.

The chemical composition of two types of yoghurt was presented in Table 4. The pH value was gradually decreased during fermentation when yoghurt processed, the reduction in pH continued until five days of storage on control yoghurt and gum yoghurt with value 5.69, 5.80, 5.46 and 5.73 respectively. The pH value declined may be due to continued fermentation by the lactic acid bacteria, while the titratable acidity was increased in the yoghurt with gum (0.90, 1 and

Table 4: The chemical composition of control yoghurt and yoghurt added with gum powder at the 5th day of storage.

Parameter	Samples			
	D	A	B	C
pH value	5.69±0.01[a]	5.80±0.01[a]	5.46±0.01[a]	5.73±0.05[a]
Acidity %	1.75±0.05[a]	0.90±0.03[c]	1.00±0.04[b]	0.96±0.01[b]
Total solids %	9.40±0.01[d]	10.59±0.01[c]	11.30±0.01[b]	12.00±0.10[a]

Means with the different superscript letters in the same row are significantly different (p≤ .0.05). D: Control yoghurt sample; A: Yoghurt with gum 0.5%; B: Yoghurt with gum 1%; C: Yoghurt with gum 1.5%.

Table 5: The proximate chemical composition of control yoghurt and gum yoghurt at the10th day of storage.

Parameter	Samples			
	D	A	B	C
Moisture content %	84.30±0.04[a]	85.02±0.10[a]	84.22±0.13[a]	84.61±00[a]
Dry matter %	12.70±0.04[d]	14.97±0.10[c]	15.42±0.11[b]	15.78±0.09[a]
Protein content %	3.86±0.01[c]	5.84±0.02[a]	5.80±0.03[a]	5.60±0.05[b]
Ash content %	0.56±0.01[d]	0.63±0.03[c]	0.73±0.01[b]	0.67±0.02[a]
Fat content %	2.45±0.06[a]	2.00±0.04[c]	2.27±0.07[b]	2.00±00[c]
Carbohydrate %	5.28±0.21[d]	5.93±0.01[c]	6.27±0.07[b]	6.48±0.04[a]

Means with the different superscript letters in the same row are significantly different (p≤ .0.05). D: Control yoghurt sample; A: Yoghurt with gum 0.5%; B: Yoghurt with gum 1%; C: Yoghurt with gum 1.5%.

Table 6: The chemical composition of control yoghurt and gum yoghurt at 10th day of storage.

Parameter	Samples			
	D	A	B	C
pH value	5.320±0.01[a]	5.30±0.01[a]	5.07±0.01[c]	5.20±0.02[b]
Acidity %	1.13±0.01[b]	1.07±0.01[c]	1.15±0.01[a]	1.12±0.01[b]
Total solids %	9.78±0.01[d]	11.77±0.02[c]	12.70±0.05[b]	13.39±0.02[a]

Means with the different superscript letters in the same row are significantly different (p≤ .0.05). D: Control yoghurt sample; A: Yoghurt with gum 0.5%; B: Yoghurt with gum 1%; C: Yoghurt with gum 1.5%.

0.96 respectively), but the value on control was decreased. On the other hand, the total solids were increased in two types of yoghurt with value (9.40, 10.59, 11.30 and 12.0, % respectively). The increased in gum yoghurt due to the addition of gum powder.

In two types of yoghurt the moisture content was continued to decrease with values from 84.30 to 85.02% and from 84.22 to 84.16%, respectively on control and yoghurt with gum 0.5%, 1% and 1.5%, while the dry matter content was increased from 12.70 to 14.97% and from 15.42 to 15.78% respectively, on control and gum yoghurt. Also, the protein content was increased on control and gum yoghurt with value 3.86 to 5.84 % and from 5.80 to 5.60%, respectively. In the same table shows the ash value was increased compared to 5 days of storage. The value on control yoghurt was 0.056%, this value was lower than gum yoghurt 0.5 %, 1% and 1.5%, which were 0.63, 0.73 and 0.67%, respectively, this due to the presence of some mineral in the gum powder such as calcium, magnesium. The fat content in gum yoghurt statistically was no significant difference between all samples at the 5th, and 10th day, while the control value was decreased to 2.45%. On the other hand, the carbohydrate content was increased on control and gum yoghurt with value from 5.28 to 5.93% and from 6.27 to 6.48% respectively Table 5.

Table 7: Mean score for sensory evaluation characteristics of gum yoghurt during the first day on storage.

Samples	Colour	Texture	Taste	Flavour	Overall	Appearance
D	6.92[b]	6.91[b]	7.17[a]	7.25[ab]	7.33[ab]	7.50[ab]
A	8.67[a]	8.50[a]	7.50[a]	7.75[a]	7.58[a]	8.17[a]
B	6.17[b]	6.25[b]	6.58[a]	6.33[b]	6.08[b]	6.83[ab]
C	7.00[b]	6.83[b]	6.92[a]	6.50[ab]	6.42[ab]	6.33[b]

Means with the different superscript letters in the same row are significantly different (p≤ .0.05). D: Control yoghurt sample; A: Yoghurt with gum 0.5%; B: Yoghurt with gum 1%; C: Yoghurt with gum 1.5%.

The pH value was continued to decrease with value (5.32, 5.30, 5.07 and 5.20 respectively), on control yoghurt and gum yoghurt. The acidity value at the 10th day of storage in gum yoghurt was increased to 1.07, 1.15 and 1.12% respectively. The acidity on control yoghurt was decreased to 1.13% the total solids content of yoghurt with gum 0.5%, 1% and 1.5% was continued to increase with increasing the concentration of gum powder with value (11.77, 12.70 and 13.39% respectively), also the total solids on control yoghurt were increased with value (9.78%) Table 6.

Figure 2 shows the viscosity at different storage day 1, 5 and ten days for yoghurt as a control without gum added and with 0.5%, 1% and 1.5% gum added. The viscosity of gum yoghurt was increased with increasing concentrations of added gum powder 0.5%, 1%, 1.5%. Treatments C obtained the highest viscosity (1480cps) followed by B: 1420cps, A: 1370cps, and D: 1300cps as control during the first day of storage. The increase in viscosity was continued until five days of storage in gum yoghurt with value (1480, 1520 and 1520 cps, respectively). However, at the ten days of storage, the increase in viscosity was continued in gum yoghurt and control yoghurt with value (1800, 1999, 2000 and1598 cps, respectively), this was similarly reported by [17]. The increased of viscosity may be due to the interaction between gum powder and casein particles thus contributing a strong gel.

Figure 3 shows the result of the serum separation of the two types of yoghurt sample yoghurt as control and yoghurt with 0.5%, 1% and 1.5% gum powder serum separation occurs in fermented milk products due to the aggregation and sedimentation of casein particles during storage. Figure 2 shows serum from the first day of storage, the yoghurt with 1.5% showed low value (2.70%) while the control showed high serum value (3.98), however, at 5 days of storage, the amount of serum increased to 5.95% in control yoghurt, this amount was higher compared to gum yoghurt 0.5%, 1%, and 1.5% with amount of 3.95, 3.50, 2.99%. The increase in control yoghurt may be attributed to free water in control yoghurt while the reduction in gum yoghurt due to addition gum powder which gum has water absorbing properties. At the 10 days of storage, the amount in control decreased to 5.06%, this amount was higher compared to gum yoghurt 0.5 %, 1% and 1.5% with 4.99, 2.50 and 2.03% respectively.

Sensory Analysis

Sensory evaluation is a scientific discipline that analyses and measures human responses to the composition of food and drink, appearance, odour, texture and taste. In this sensory study, evaluation was conducted for two types of yoghurt control yoghurt and yoghurt

prepared by adding three levels of gum powder 0.5 %, 1% and 1.5% at the first day of storage by 12 panellists were asked for color, texture, taste, flavor, overall and appearance. The result shows the color of yoghurt with 0.5% gum powder had the highest scores compared to the other sample, with no significant difference between sample with 1% and 1.5% gum, and control yoghurt and there was significant difference between sample with 0.5% gum and yoghurt with 1% and 1.5% gum and control yoghurt. In addition, the highest texture in the sample with 0.5% gum compared to the other samples with 1 and 1.5% gum and control yoghurt with a significant difference between the sample with 1 and 1.5% gum, and control yoghurt Table 7.

There was a significant difference between the sample with 0.5 and 1% gum. The highest scores of appearances in the sample with 0.5% gum compared to yoghurt with 1 and 1.5% gum, and control yoghurt, with no significant difference between the sample with 0.5, 1% gum and control yoghurt but there was a significant difference between the sample with 0.5% gum and yoghurt with 1.5% gum.

Conclusion

Gum Arabic is widely used for an industrial purpose such as a stabilizer, a thickener, an emulsifier, textiles, pharmaceutical industry, and in the food industry. Gum Arabic is primarily used in confectionery, bakery, dairy, and beverage. Gum Arabic used as a stabilizer in the frozen product due to it is water absorption properties. In the present study, the investigation of physicochemical and sensory evaluation of the two types of yoghurt, yoghurt with addition three levels 0.5%, 1% and 1.5% gum powder and yoghurt were prepared without addition gum powder, two types of yoghurt were stored at 6°C for 1, 5 and 10 days. The physicochemical analysis showed that there were increased in dry matter, ash content, protein content, carbohydrate, viscosity, and acidity. Also, the addition of gum powder it has reduced pH value, serum separation, and moisture content, also, to improve sensory properties such as texture, which is one of the most important. Characteristics that define the quality of yoghurt and affect its appearance, mouth feel and overall acceptability. Consumer mostly preferred yoghurt with 0.5% gum powder.

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