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Physicochemical Composition and Microbiological Quality of Oggtt: Saudi Arabian Traditional Dried Fermented Milk

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ABSTRACT

Oggtt or Madheer is fermented dried milk product traditionally processed by Bedouins in Saudi Arabia and other Arabian Gulf states. The present proposal had studied fourteen items of physiochemical composition and seven microbiological quality attributes of fifty commercial Oggtt samples collected from local markets of Jeddah, Saudi Arabia. Moreover, fifty selected isolates of Lactic Acid Bacteria (LAB) as a natural flora in Oggtt were identified by phenotype and biotype methods. Results obtained referred to relatively inferior solubility but the remaining items indicated high nutritious quality include detection of PUFA and essential amino acids. Oggtt was safe for human consumption based on absence of food borne pathogens in the samples examined. Oggtt contain unique LAB species. The impact of the study highlight to improve method of manufacture of Oggtt and call attention of the local dairy industry to produce Oggtt on an industrial scale to satisfy the growing awareness of consumers toward increased consumption of Oggtt.

Key words: Oggtt, madheer, LAB, PUFA, amino acids

INTRODUCTION

Oggtt or Madheer is an indigenous sun dried fermented buttermilk consumed in Saudi Arabia and other Arabian gulf states. The product is processed by desert dwellers (Bedouins) since centuries ago and continues up till now (El-Erian, 1979; Al-Ruqaie *et al*., 1987). It is primitively manufactured (home made) under uncontrolled and possibly unhygienic conditions. Oggtt is processed from raw camel, caprine, ovine or bovine milk or their mixtures. Milk intended for processing was left to be spontaneously fermented for 1-2 days before being churned in certain container made of goat's skin to obtain butter and the resultant fermented buttermilk is used for preparing Oggtt. Briefly, the method of processing includes boiling buttermilk while stirring until it becomes thick in texture as a result of water evaporation. Table salt may be added to the thick product and being left to cool at room temperature before it is drained through a cheese cloth and finally shaped by hands into pieces of irregular shapes. Patties are then arranged on a clean cloth and left under direct sun heat for drying (El-Erian, 1979; Al-Abdulkarim *et al*., 2013). It is consumed by Bedouins as it is or with Arabic coffee and date during their early breakfast.

Bedouins process such dairy product during spring season where there is a plentiful production of raw milk mainly for their subsequent consumption. Excess production more than their needs is sold in the local markets. Other natives used to consume Oggtt for its high nutritive value and as it is claimed in the folk medicine that it may control blood sugar in diabetic individuals. The

product has a good keeping quality at ambient temperature due to its low a_w and low pH (below 4.0). Moreover, it is easy to transport Oggtt from place to another during their travel in the desert.

Studies on the chemical composition and nutritive value of Oggtt in Saudi Arabia had been carried out early since, 1979 as reported by El-Erian (1979). During the 80's of the last century, accumulated research data were published on different aspects related to Oggtt by several investigators. For instance, Sawaya *et al*. (1984) studied the chemical composition and nutritive value of Madheer (Oggtt), Salji (1986) discussed Oggtt shelf life, chemical composition, sensory qualities and mode of consumption. Al-Ruqaie and El-Nakhal (1986) produced tamr Oggtt from date and Oggtt as a new product. Al-Ruqaie *et al*. (1987) had published a study on improvement the quality of Oggtt. The chemical composition and microbial flora of Oggtt made by Bedouins were studied by Al Mashhadi *et al*. (1987) and Abu-Lehia (1988). The acceptability of Oggtt produced from different types of milk was studied by Al-Mohizea *et al*. (1988).

More recently, other publications were reported dealing with cooked Oggtt in central region of the Kingdom of Saudi Arabia that cover some topics in the subject (Al-Abdulkarim *et al*., 2012, 2013). However, We had observed, to our best of knowledge, that data on the fatty acids profile especially polyunsaturated fatty acids (PUFA), conjugated linoleic (CLA), solubility index along with the microbiological content and safety of such indigenous fermented dairy product are lacking or insufficient. Moreover, the possibility to produce it on industrial scale using the modern technologies such as Ultra Filtration (UF) and vacuum drying were suggested. Therefore, the aims of the present study were to perform a comprehensive investigation on Oggtt with special reference to its aforementioned characteristics. The objective of the current research reported the physiochemical composition and microbiological quality of market Oggtt while the production of probiotic yoghurt using modern technologies will be followed as another part of the work.

MATERIALS AND METHODS

Samples: Fifty Oggtt samples were collected from local markets of Jeddah city and transferred in sterilized containers to the laboratory for the study. Two types were obtained according to their colors; the first type of brown color was designated as (B) Oggtt while the second type of creamy color was designated as (C) Oggtt (Fig. 1a, b), respectively. Both types were represented by 25 samples each of which weighed about 500 g. The following parameters were carried out.

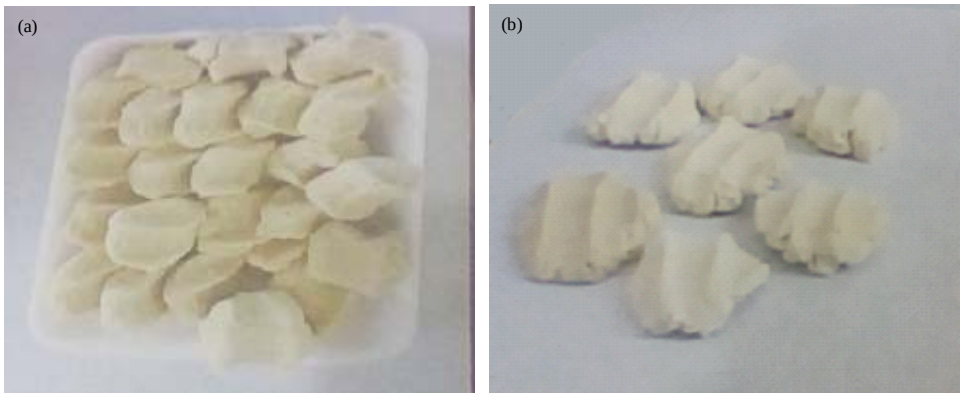

Fig. 1(a-b): (a) Brown color Oggtt (B) and (b) Creamy color Oggtt (C) samples

Physicochemical analysis

Moisture content (M): Moisture content was determined according to the method reported by AOAC (1995).

pH determination: pH values of Oggtt samples were determined at room temperature (25±2°C) using digital pH meter (AD8000 pH meter, Hungary). Ten grams of sample were reconstituted in 90 mL distilled water and measured for pH value.

Titratable Acidity (TA): The TA of Oggtt was determined according to (AOAC., 1995) by titration against (0.1 N) NaOH on reconstituted Oggtt solution in presence of phenophthalein indicator.

Solubility Index (SI): The test involves adding 10 g of Oggtt to 100 mL of water at 25°C with high speed mixing using magnetic stirrer for 90 sec. The reconstituted Oggtt is left for 15 min in a special scaled tube. Then the amount of sediment at the bottom of the tube is measured in milliliter and is termed as solubility index according to the American Dairy Products Institute (ADPI., 2002).

Determination of Total Solids (TS): The TS was determined gravimetrically according to the method of AOAC (1995).

Determination of fat content (F): Fat was determined according to the method of AOCS (1990). Briefly, 2 g of ground sample was weighed, extracted by petroleum ether in a stopper flask overnight at 50°C in a thermostatically controlled water bath. The ether was evaporated to dryness and the extract was weighed. Fat percentage was calculated following the formula:

$$\text{Fat (\%)} = \frac{\text{Weight of extract}}{\text{Weight of sample}} \times 100$$

Determination of Lactose (L): Lactose was determined as described by Barnett and Tawab (1957).

Determination of Total Protein (TP): Protein content was determined according to the method reported by Lowry *et al*. (1951).

Total Nitrogen (TN) measurement: The TN in Oggtt samples was determined by kjeldahl method reported by IDF (1993).

Determination of sodium chloride (NaCl): The Oggtt samples were analyzed for NaCl content according to the method described by Ling (1963).

Determination of amino acid content: The method using the Waters PICO-TAG system for the amino acid analysis of food materials as recommended by White *et al*. (1986) was adopted in this study.

Determination of minerals (MI): The method reported by AOAC (2000) was adopted for the determination of seven minerals, namely; sodium, calcium, magnesium, phosphorous, potassium, manganese and zinc were traced in Oggtt samples.

Determination of Free Fatty Acids (FFA) profile: The FFA of Oggtt were converted into FFAM according to the method of Luddy *et al*. (1960). The GC Auto system XL (Perkin Elmer, Waltham, MA, USA) equipped with a Flame Ionization Detector (FID) was used to quantify FFAM of Oggtt. The conditions of the GC analysis were as follows: fused silica capillary column DB-b (60×6.32 mm inner diameter, i.d.) initial oven temperature of 50°C was increased to 240°C at 3°C/min and injector and detector temperature at 230 and 250°C, respectively. Helium was used as a carrier gas at a flow rate of 1 mL min^{-1}.

Identification of CLA isomers by GC/Ms: The method adopted by Christie (2003) was used to convert FFA extracted from Oggtt into FFAME. A 6890N GC system equipped with an FID, HP percentage phenyl methyl silixate capillary column (30×0.32 mm, i.d and 0.25 μm film thickness) and HP 5973 mass selective detector (Agilent technologies, Santa Clara, CA, USA). Helium was used as a carrier gas at a flow rate of 1.5/min. The oven temperature was held at 70°C for 2 min, then increased to 230°C at 8°C/min and maintained at this temperature for 20 min. Injector and detector temperatures were 250 and 280°C, respectively. The FAME were identified by comparing the retention times with those of a standard FAME mixture (Sigma Aldrich, purity<99.0% by GC) using probability merge search software and the National Institute of Standards and Technology MS spectra search program.

Statistical analysis: Data were expressed as Means±Standard Error (SE). Statistical analysis was performed using the General Linear Model (GLM) procedure with software SAS Institute (2001).

Microbiological examination

Microbiological counts: Oggtt samples were examined for microbiological counts according to Duncan *et al*. (2004). Aerobic Bacteria (AB), Coliforms,(C), Yeast and Molds (Y and M), Enterococci, (E), Lactobacilli (L), Staphylococci (S) and *Listeria* sp.(Li) counts were determined. Media used were plate count agar (PCA, Difco, USA), violet Red Bile Agar (VRBA, Merck, Germany), potato dextrose agar (PDA, Hi media, India), kanamycin azide agar (KAA, Hi media, India), MRS agar (Oxoid), Baird Parker agar (Oxoid, UK) and oxford medium (Oxoid, UK) for items AB, C, Y and M, E, L, S and Li, respectively. The method used for microbiological analysis started by aseptically weighed 25 g ground Oggtt sample, dissolved in 225 mL sterilized saline solution and vortexes for 5 min. Then 1 mL reconstituted Oggtt was pipette into tubes of 9 mL sterilized saline solution to make serial dilutions. Finally, 1 mL sample of each dilution was transferred to the plates of different selective media mentioned, streaked on the surface of the medium and plates were incubated at 30 or 37 for 48 h according to the target item. Colonies were counted, multiplied by the decimal dilution and reported as colony forming unit per gram (CfU g^{-1}).

Identification of isolated Lactic Acid Bacteria (LAB): Representative separated colonies were picked from plates of MRS, M17 and KAA agar media, inoculated in corresponding broth media and propagated at the exact incubation temperature suitable for relevant bacteria. Purification was repeated until finally obtaining well separated colonies. Fifty separated colonies were subjected for phenotype and biotype identification using Gram stain, shape, production of catalase enzyme and biotype (Vos *et al*., 2009). API 20 strips (Bio-merieux, France) were used for G +ve cocci and catalase negative. On the other hand, G +ve rods, catalase negative were identified using API 50 CHL.

RESULTS

Physicochemical composition: Table 1 showed the average gross composition of Oggtt samples. Results of TS, M, F, TP, TN, L, NaCl, pH, TA and SI were 96. 81 and 96.10%; 3.19 and 3.84%; 0.52 and 0.52%; 38.81 and 37.54%; 6.04 and 5.87%; 10.84 and 11.32%; 2.27 and 2.53%; 4.41 and 4.61; 0.75 and 0.55; 14 and 9 mL for (B) and (C) Oggtt types, respectively.

Amino acid profile: Table 2 reported the amino acid profile of Oggtt. Seventeen different amino acids were detected in both types of Oggtt. Results indicated that the contents of amino acids in (C) type were higher than their corresponding in (B) type for 15 amino acids. However, as an exception, methionine (meth) and cysteine (cys) were nearly the same in both types of Oggtt, respectively.

Mineral contents (MI): The MI were cited in Table 3. The following minerals were detected in both types of Oggtt. These were phosphorous, potassium, calcium, sodium, magnesium, manganese and zinc. The amounts of minerals are tabulated as mg/100 g sample.

Free Fatty Acids (FFA) profile: Table 4 reported percentage of the FFA profile according to their retention time/min and relative area percentage. Oggtt samples contained 11 fatty acids from C10 up to C18.3 and conjugated linoleic acid (CLA) of the C10 C12 isomer. On the other hand, Oggtt samples contained 10 fatty acids from C9-C18: 2.

Microbiological counts: Figure 2 showed the average counts for samples of Oggtt as colony forming unit per gram (CFU g^{-1}). Counts of (AB), (E), (L), (C), Y and M, Li and S were 53×10^{-2},

Table 1: Average gross composition of Oggtt samples

Items	B* (Oggtt)	C* (Oggtt)
Total solids (%)	96.81F±0.048[a]	96.10B±0..012[a]
Moisture (%)	3.19[a]	3.84[b]
Fat content (%)	0.52B±0.0[a]	0.52 B±0.0[a]
Total protein (%)	38.81A±0.012[a]	37.54C±0.015[b]
Total nitrogen (%)	6.04A±0.0[a]	5.87B±0.0[b]
Lactose (%)	10.84C±0.133[a]	11.32A±0.0[b]
Sodium chloride (%)	2.27D±0.0[a]	2.53A±0.006[a]
pH	4.41C±0.014[a]	4.61A±0.013[a]
Acidity (%)	0.75A±0.003[a]	0.55E±0.006[b]
Solubility index	14.00 mL[a]	9.00 mL[b]

Means (n = 3±SE) with the same letter in the line are not significantly different at p≤0.05, B*: Brown color Oggtt, C*: Creamy color Oggtt

Table 2: Amino acids content of Oggtt samples

	Oggtt sample (mg/100 g)			Oggtt sample (mg/100 g)	
Amino acids	B*	C*	Amino acid	B*	C*
Asp	1.03	1.42	Tyr	1.52	2.23
Glu	1.24	1.57	Val	2.90	3.75
Ser	1.44	2.41	Meth	5.65	5.76
Gly	0.29	1.44	Cys	12.20	12.13
His	1.13	2.61	Ile	15.26	36.80
Arg	0.88	1.37	Leu	21.57	25.63
Thr	0.23	0.74	Phe	21.98	30.85
Ala	0.16	0.38	Lys	39.76	52.44
Pro	8.91	16.34			

B*: Brown color Oggtt, C*: Creamy color Oggtt, ASP: Aspartic, Glu: glutamic, Ser: Serine, Gly: Glycine, His: Histidine, Arg: Arginine: Thr: Threonine, Ala: Alanine, Pro: Proline, Tyr: Tyrosine, Val: Valine, Meth: Methionine, Cys: Cysteine, Ile: Isoleucine, Leu: Leucine, Phe: Phenylalanine, Lys: lysine

52×10^{-3}, 5×10^{-1}, 7×10^{-1}, 3×10^{-1}, 7×10^{-1}, 2×10^{-3}, 36×10^{-1}, 7×10^{-1}, 35×10^{-1}; ND, ND in B and C types of Oggtt, respectively. The frequency distribution of positive samples for all items was recorded in Table 5.

Identification of selected bacterial isolates: Figure 3 reported the results of phenotype and biotype identification of 50 strains randomly picked from plates used for counting different groups of bacteria. The frequency distribution as showed by Fig. 3 for the bacterial species were: 8

Table 3: Minerals content of Oggtt samples

	Oggtt sample (mg/100 g)	
Elements	B*	C*
Phosphorous	889.00	886.00
Potassium	2011.00	1191.00
Calcium	1221.00	920.00
Sodium	798.50	550.00
Magnesium	320.00	185.00
Manganese	0.20	0.15
Zinc	11.18	12.28

B*: Brown color Oggtt, C*: Creamy color Oggtt

Table 4: Fatty acids profile of Oggtt samples

		B* (Oggtt)		C* (Oggtt)	
Fatty acids		Rt/min	Ra (%)	Rt/min	Ra (%)
Octanoic	C9.0	-	-	5.21	10.08
Decanoic	C10.0	9.41	3.36	9.42	8.88
Dodecanoic	C12.0	13.42	3.39	13.41	3.47
Tetradecanoic	C14.0	18.75	17.0	19.73	13.82
Pentadecanoic	C15.0	21.11	8.73	21.08	7.90
Palmitic	C16.0	23.93	27.03	23.91	25.30
Stearic	C18.0	28.66	3.36	28.65	4.91
Oleic	C18.1	29.28	22.37	29.26	15.80
Linoleic	C18.2	30.56	2.28	30.55	1.27
CLA (c10, c12)	C18.2	33.0	a*		
Linolenic	C18.3	32.8	a*		

B*: Brown color Oggtt, C*: Creamy color Oggtt, Rt: Retention time/min., Ra: Relative area, a*: No peak area calculated

Table 5: Comparison of composition of Oggtt with others in literature

References	Moisture (%)	pH	Titratable acidity (%)	Fat (%)	Protein (%)	Lactose (%)
Al-Ruqaie *et al*. (1987) in Oggtt	5.40-7.5			18.9-19.8	30.4-32.45	
Sawaya *et al*. (1984) in Oggtt				15.3	35.5	
El-Erian (1979) in Oggtt	4.24-8.51			16.0-21		
Al-Abdulkarim *et al*. (2013) in Oggtt	7.00-10	4-0-4.3	0.39-0.45	5.0	16.0-16.1	2.8
This study	3.19-3.84	4.41-4.61	0.55-0.75	0.52	38.81-37.54	10.48-11.32

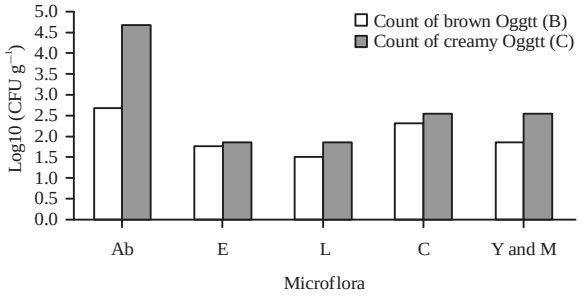

Fig. 2: Log10 CFU g^{-1} of Oggtt microflora counts, AB: Aerobic bacteria, E: Enterococci, L: Lactobacilli, C: Coliforms, Y and M: Yeasts and molds

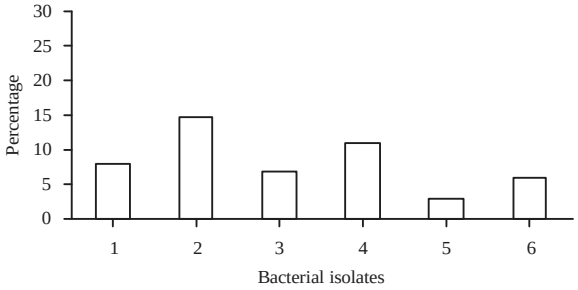

Fig. 3: Percentage distribution of identified bacteria isolated from Oggtt, 1: *Enterococcus faecium*, 2: *Lactobacillus casei*, 3: *Lactobacillus plantarum*, 4: *Lactobacillus acidophilus*, 5: *Lactobacillus fermentum*, 6: *Lactococcus lactis*

(16%), 15 (30%), 7 (14%), 11 (22%), 3 (6%) and 6 (12%) for *E. faecium*, *L. casei*, *L. plantarum*, *L. acidophilus*, *L. fermentum* and *Lac. lactis*, respectively.

DISCUSSION

Physicochemical composition

Moisture content: Table 1 showed that moisture content of Oggtt in this study (3.19 and 3.84%) were nearly similar to the figures reported by Sawaya *et al*. (1984) averaging 3.9%. In contrary, Al-Abdulkarim *et al*. (2013) found that moisture content of Oggtt was 7.0%. The difference observed may be attributed to the deference in the method of processing of Oggtt especially the time of exposure to drying under the sun heat. Oggtt containing lower moisture is expected to keep for a longer time than the other one.

pH of Oggtt: According to data shown in Table 1, pH of Oggtt in this study were 4.41 and 4.61 for (B) and (C) Oggtt types. On the other band, this result is similar to that reported by Al-Abdulkarim *et al*. (2013).

Titratable Acidity (TA): The TA for (B) and (C) Oggtt samples were 0.75 and 0.55%, respectively. These figures were higher than that reported by Al-Abdulkarim *et al*. (2013). Variation in period of fermentation, method of processing along with the severity of heat treatment may be the cause of such differences between the figures reported here.

Solubility Index (SI): Solubility index is an important feature of milk powder. Oggtt is considered as a type of powder milk because Oggtt, during its manufacture is exposed to high heat treatment same as roller drying process. Therefore, the solubility of Oggtt is highly affected by the heat treatment especially in the presence of lactic acid which encourages insolubility of milk protein (ADPI., 2002). Therefore, (B) Oggtt which was subjected to high heat indicated by its brown color reflected insolubility index higher than the (C) Oggttt exposed to mild heat treatment.

Total solids (TS): The figures of the total solids obtained in this study were higher than their counterparts reported by Abu-Lehia (1988). The source of buttermilk used in the production of Oggtt could explain the situation as the product may be processed from bovine, ovine, caprine or camel milk which differs in their total solids.

Fat content (FA): Sawaya *et al.* (1984) and Abu-Lehia (1988) reported fat content of 15.3 and 19.6%, receptively. However, we found only 0.52% fat in Oggtt test samples. This variation in fat percentages may be due to the original fat percentage in the milk used in processing.

Lactose (L) determination: The lactose contents were 10.84 and 11.32% for (B) and (C) Oggtt samples, respectively. Our figures reported here are much higher than the corresponding figures of Al-Abdulkarim *et al.* (2013).

Total Protein (TP): Total protein was 38.81 and 37.54% for (B) and (C) Oggtt samples, receptively compared to only 35.5% reported by Sawaya *et al.* (1984). On the other hand, our findings were lower than that reported by Abu-Lehia (1988) being 50%. The reasons related to type of buttermilk and method of processing could explain such controversy in results between studies.

Sodium chloride: Sodium chloride is added to the buttermilk during processing of Oggtt. The amount of salt added during processing differs according to the condition and acceptability of consumers from district to another. Therefore, in the present study salt contents were 2.27 and 2.53% for (B) and (C) Oggtt samples, respectively compared to 11.8% in the report of Abu-Lehia (1988).

Amino acids profile: During the present study we analyzed Oggtt samples to identify their amino acids profile (Table 2). Results indicated that both types of Oggtt contained 17 different amino acids. However, the amounts of amino acids (mg/100 mg) were significantly higher in type (C) Oggtt than those in type (B). This could be explained in the light that (B) Oggtt type might have been exposed to higher heat treatment during processing. Excessive heat might cause denaturation of protein. Other investigators pointed the presence of 18 amino acids in Oggtt (Sawaya *et al*., 1984).

Mineral content (MI): Table 3 showed the presence of seven minerals in Oggtt determined as miligram per 100 g of sample. Another study reported by Abu-Lehia (1988) documented the presence of nine minerals in jameed (similar to Oggtt). Also, the amounts of minerals reported differ between our study and the cited one. This could be attributed to similar observation mentioned in the previous items discussed before.

Fatty Acids (FA) profile of Oggtt: Table 4 gives the content of 12 fatty acids in Oggtt from C9: 0 to C18: 3 including Conjugated Linoleic Acid (CLA), C10 C12, C18: 2. Sawaya *et al.* (1984) reported that Oggtt studied contained 20 fatty acids from C4: 0 to C23: 0 in different percentages.

Comparison of Oggtt composition with results found in literature: Table 5 summarizes the results reported by different researchers who analyzed Oggttt. For moisture content the result of our study clearly was the lowest compared to the figures obtained by Al-Ruqaie *et al.* (1987), El-Erian (1979) and Al-Abdulkarim *et al.* (2013).

Figures for pH in our study showed slight difference compared with those reported by Al-Abdulkarim *et al.* (2013). However, for titratable acidity our results were clearly higher than those reported by the previous authors. Fat content of Oggtt showed wide variation as reported by

different investigators cited in Table 5. The lowest figure of fat content (0.52%) was shown in our study. Higher fat contents of 18.9-19.8% followed by 16-21 and 15.3% were mentioned by Al-Ruqaie *et al*. (1987), El-Erian (1979) and Sawaya *et al*. (1984), respectively. Fat content of 5% was reported by Al-Abdulkarim *et al*. (2013).

Protein content of Oggtt showed wide variation as shown by Table 5. The lowest protein content of (16.0-16.1%) was mentioned by Al-Abdulkarim *et al*. (2013). On the other hand, Sawaya *et al*. (1984) and Al-Ruqaie *et al*. (1987) on studying protein content of Oggtt reported figures 35.5% for the first authors and from 30.4-32.45% for the second team of researchers. However, a higher percentage of 37.54-38.81% was reported in the present study.

Lactose reached 10.48-11.32% in this study while it was as low as 2.8% as reported by Al-Abdulkarim *et al*. (2013).

The wide variation in chemical composition of Oggtt between the results reported in the literature and the present study could be due to the variation in type of used buttermilk which may be originated from camel, caprine, ovine or bovine milk. Also if Oggtt was processed from whole milk, this could stand for the explanation regarding different levels of fat content in the resultant Oggtt.

Microbial content of Oggtt: Figure 2 showed the average counts of different groups of microorganisms present in Oggtt samples under study. Averages of 53×10^{-2} and 52×10^{-3}, 5×10^{-1} and 7×10^{-1}, 2×10^{-2} and 36×10^{-1}, 7×10^{-1} and 35×10^{-1} were obtained as CFU g^{-1} in B and C Oggtt for aerobic bacteria (SPC), Enterococci (E), Lactobacilli (L), Coliforms (C), Yeast and Molds (Y and M), Listeria (Li), respectively. Staphylococci (S) could not be detected in any of the tested Oggtt samples. Incidence of different groups of microorganisms varied widely between the two types of Oggtt samples examined. As appeared in Table 5, for SPC, all Oggtt samples (B and C types) were positive. The other groups of microorganisms showed different trend being positive while the remaining revealed negative counts.

To the best of our knowledge indicated that this is the first attempt to determine microbial profile of Oggtt in the kingdom. Therefore, we are unable to make any comparison for this item with other data. However, we can observe when referred to Fig. 2 that creamy Oggtt contains relatively high counts for all items compared to brown Oggtt. This could be attributed to the high heat treatment used during processing the brown type than the creamy type which receives less temperature during manufacture. The difference in color between B and C types stands as an indication for the degree of severity of heat treatment. Worthy mention, that the source of microorganisms in Oggtt came from those who survive heat processing and the others which are present as post processing contamination. The heat labile microorganisms such as staphylococci, L. monocytogenes, coliforms, yeast and molds, lactobacilli and enterococci are examples for the post processing contamination. On the other band, spore forming bacilli and clostridia which are heat resistant are examples for the microorganisms survived during heat processing.

Types of bacteria identified in Oggtt: Figure 3 showed the results of identification of 50 strains isolated from Oggtt. Isolates were first phenotype using the classic keys include gram stain, presence of catalase and shape. Then, different groups were biotype using the suitable API Kits according to the manufacturer instructions (Bio-merieux, France). Out of 50 isolates identified, 8 (16%), 15 (30%), 7 (14%), 11 (22%), 3 (6%) and 6 (12%) were recognized being *E. faecium*, *L. casei*, *L. plantarum*, *L. acidephilus*, *L. fermentum* and *L. Lactis*, respectively (Fig. 3).

Figure 3 showed the different species of LAB identified. Research is needed to study the isolates which have potential probiotic characteristics to select them and applied in processing different probiotic dairy products for the health benefits of consumers. In such case the molecular identification using PCR and 16s DNA sequence will be applied to assure the systematic situation of the selected probiotics.

CONCLUSION

The physicochemical and microbiological quality of market Oggtt was dealt with in the first part of the present proposal. Results obtained and mentioned here indicated to an inferior quality of the traditional Oggtt. Moreover, the primitive method of processing constitutes a risk hazard which may result in contamination by undesirable pathogenic bacteria and molds. Therefore, the aims of the second part of the research work were to produce probiotic added Oggtt along with using more sophisticated and hygienic methods of processing. The probiotic bacteria are known for their health benefit on humans as documented by accumulative research over the last decades. Another aim was to suggest a modified method of processing improved Oggtt which could be used by Bedouins or small scale dairies. This depends upon using vacuum drying process mentioned by a group of German scientists. In addition, we advise the dairy industry in the kingdom to process Oggtt during the winter seasons where a surplus milk could be obtained. During winter, the consumption of laban normally goes down. Production of improved Oggtt is a good idea where the dairy plant can produce cream but ter, Oggtt and Milk Fat Global Membrane (MFGM) known to be rich in phospholipids which has many-health-related functions.

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