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Evaluation of Traditional Jordanian Yoghurt Characteristics

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Abstract
This study investigated some of the microbial, chemical and physical characteristics of the traditional Jordanian Yoghurt which is called (Laban Rayeb). Twenty samples of yoghurt were collected from different stores and analyzed over a 10-day period of storage at the fridge temperature. The results indicated that the pH values and the total titratable acidity over the storage period ranged between (3.62-4.30) and (1.36-1.68), respectively. The wheying off and crude tension values increased significantly over the storage period for all the tested samples. The microbial analysis showed that 65% of the samples were contaminated with total coliform and 50% of them were contaminated with Staphylococci and yeast and molds. These results indicate that yogurt sold in some stores has poor microbiological quality control. This could represent a danger to public health. Hence, more attention should be given by government agencies and manufacturers to ensure the best hygienic conditions and appropriate temperature in the process of manufacturing and sale of yogurt in diary stores.
Keywords: Traditional Jordanian Yoghurt, Laban Rayeb, Microbial Analysis, Chemical Analysis, physical Analysis, Total Coliform, Staphylococci.

1. Introduction

Yogurt is a universal diary product that is made throughout the world in different forms and given diverse local names. It is prepared by fermentation of milk using bacterial cultures consisting of a mixture of *Streptococcus thermophilus* and *Lactobacillus delbrueckii* subsp. *bulgaricus* (Lee and Lucey, 2010). Yogurt is a healthy food because of its therapeutic value and it is consumed as both as a food and a thirst quenching beverage (Alfa-Lawal, 1984). Increased yoghurt consumption enhances the immune system due to the presence of yoghurt starter and probiotic bacteria (Amakoromo, 2012). It is a source of several essential nutrients, including protein, calcium, potassium, phosphorus, and vitamins B2 and B12, and serves as a vehicle for fortification (Badot, 2013). Understanding the behavior of yoghurt during storage is vital, because its shelf life depends on whether the product shows any of the physical, chemical, or sensory characteristics that are improper for consumption (Salvador and Fiszman, 2004). Thus, the shelf life of the product is verified by noticing the changes in its chemical, physical and microbiological composition (Sofu and Ekinci, 2007). Several studies around the world have examined the characteristics of Yogurt. Tarakci and Kucukoner (2003) examine the physical, chemical, microbiological and sensory characteristics of some fruit-flavored yoghurt in Turkey. In specific, yoghurt samples with different fruit-flavors(Cornelian, Morello Cherry and Rose hip marmalade, grape molasses, date pulp, and control (without additive)) were prepared and stored up to 10 days at 5°C. The results show that the total aerobic mesophilic bacterial count, coliform count, and yeast and mold counts were determined in yoghurt samples at 1, 6 and 10 days interval. There were significantly differences in the fat, ash, protein, total solids (TS) content and titratable acidity (TA) for samples amounts one day of storage. There were marked differences in the protein and dry matter due to different flavor additives. Syneresis and TA increased over the storage period. The yoghurt containing Grape molasses and Morello had higher flavor scores than using other flavoring. The total mesopilic bacterial count was significantly higher in the yoghurt sample contained grape molasses. Yeast and mould count increased significantly during storage at 5°C. Hussian (2009) *et al.* evaluate and compare the quality of probiotic and natural yogurt. Several samples of probiotic and natural yogurt were bought from supermarkets in Middlesborough (UK) and analyzed for physico-chemical, microbiological and organoleptic properties. Physico-chemical analysis showed that probiotic yogurts have more pH, fat and solid not fat (SNF) contents compared to natural yogurt. While natural yogurts have higher Total Titrable Acidities (TTA) and total solids contents, compared to probiotic yogurts. Organoleptically, probiotic yogurt was found more acceptable compared to natural yogurt. However, the fat contents of natural yogurt are lower and that might affect the overall acceptability of the yogurt. Similarly, an increase in the TA of the natural yogurt might affect the quality of the product. Microbiological analysis found no significant variation in total viable count between probiotic and natural yogurt. Lee and Lucy (2010) investigate the physical and structural attributes of yogurts in USA. Various processing variables are discussed which influence the textural properties of yogurts, such as total solids content, heat treatment, and incubation temperatures. Rodrigues *et al.* (2010) evaluate the microbiological quality of yoghurt commercialized in Viçosa, Minas Gerais, Brazil. Thirty-six samples were collected from markets and analyzed for coliforms (total and thermo tolerant) and lactic acid bacteria (LAB) enumeration and pH, considering different times for expiration. The obtained results indicate adequate quality of yoghurt commercialized in Viçosa. Ifeanyi *et al.* (2013) examine microbiological quality of yogurt sold by street vendors

in Onitsha Metropolis, Anambra State, Nigeria. The results revealed that values of pH monitored varied from 3.69 – 4.50 while a total of five bacteria species belonging to *Escherichia coli*, *Staphylococcus aureus*, *Streptococcus, Lactobacillus* and *Bacillus* species, and three fungi species belonging to *Aspergillus, Rhizopus* and *Saccharomyces* were isolated from the samples. Overall, the findings suggest that the yogurt traded by street vendors in Onitsha Metropolis has poor microbiological quality control which poses danger to public health. El-Ansary (2014) assesses the microbiological quality of fifty random samples of yoghurt collected from vendors and wholesale markets in El-Behera Governorate in Egypt. The findings of the study indicate that yogurt traded in wholesale market in El-Behera Governorate has poor microbiological quality control. Indeed, Coliform, Enterococci, *Staphylococcus aureus* count, yeast count and mould are detected in the samples under investigation. Rotar *et al.* (2015) investigate whether goji berries and honey affect the sensorial quality of yoghurt, the chemical properties, the viability of lactic acid bacteria (LAB) and the concurrent microflora development. Two types of yoghurts (yoghurt with goji berries and yoghurt with honey and goji berries) were developed. The results confirm the use of goji berries as enhancer of probiotic levels in yoghurt, while honey can provide bacteriostatic/bactericidal effect for contaminants. Igwegbi *et al.* (2015) study the suitability and acceptability of yoghurt drink prepared from goat milk, either singly or admixed with 75% cow milk in Nigeria. Chemical and microbial analyses were carried out on both the fresh milk and the prepared product. The chemical analysis included quantification of the fat, protein, moisture, ash, total solids (TS), pH and titratable acidity (TA) of the fresh milk and the yoghurt drink; while the microbial analysis included the determination of the total bacterial count (TBC), coliform count, yeast and mould counts of the fresh milk prior to processing and on processed yoghurt drink 24h after the processing. Sensory evaluation was also conducted on the processed yoghurt drink to determine the level of acceptability of the product. Results of the chemical and microbial analyses, as well as the sensory evaluation of yoghurt drinks prepared separately from goat and cow milks and the admixture, showed that the composition of goat milk is comparable to that of cow's milk (goat's milk was even better in some aspects than the cow's milk). It was concluded that goat milk has a very good potential for future utilization on commercial level, including yoghurt production in Nigeria. This study investigates some of the microbial, chemical, and physical characteristics of the traditional Jordanian Yoghurt which is called (Laban Rayeb). To the best of author's knowledge, this is the first study in Jordan that does so. The remaining of the study is organized as follows: Section 2 describes materials and methods. Section 3 reports the results and discussion. Section 4 concludes.

2. Material and Method

Twenty samples of yogurt (Laban Rayeb) were collected from different stores located in Irbid, a northern city in Jordan. These stores manufacture the traditional yogurt which is made from fresh cow milk in the following steps:

1. Heating cow milk at 85-90 ºC for 5-10 minutes.
2. Cooling the heated cow milk to 45 ºC.
3. Adding a starter in a percentage equals 2-3%. The starter represents a yogurt sample that is manufactured one day before rather than a pure culture.
4. Incubating the mix prepared in the third step at 40-45 ºC for 3-4 hours.
5. Putting the yoghurt manufactured in the fridge at 4-6 ºC.

All the stores where samples are collected follow the previous steps in manufacturing the traditional yoghurt (Laban Rayeb). The samples are studied upon arrival and after 2, 4, 6, 8 and 10 days of storage in refrigerator at 4-6 ºC. The following analyses are performed:

pH analysis

The pH values were measured by the method described by Akpakpunam and Safa- Dedeh, (1995). In specific, the pH value was determined by inserting the electrode of the pH meter in the sample then taking the result displayed on the pH meter.

Measurement of Total Titratable Acidity (TTA)

Total Titratable Acidity (TTA) was determined by the method described by AOAC (2005). Each sample was dissolved in distilled water and mixed thoroughly. 1ml of phenolphthalein indicator was introduced into 10ml of the mixed solution. It was titrated against standard sodium hydroxide solution until pink colour persisted for about 10-15 seconds for complete neutralization.

Wheying Off and Curd Tension

The amount of separated whey is determined using measuring cylinder; curd tension using Westfal balance as modified by EL-Shabrawy (1973).

Microbial Analysis

The microbial count of each sample was estimated using different media, each to detect certain type of bacteria. For counting the total coliform bacteria, the VRBA (Violet red bile agar) medium Difco) was used (Standard method for the examination of dairy products microbiological and chemical, 1960). Plates were incubated at

37°C for 48h. The MSA (manitol salt agar) was used to enumerate the total staphylococci; plates were incubated at 37°C for 48h. Finally, potato dextrose agar was used to detect yeast and moulds.

3. Results and Discussion

The analysis of the study includes the evaluation of microbial, chemical and physical characteristics of the twenty yogurt samples. Table 1 displays the pH values and Acidity percentages of the samples of the study upon arrival and after 2, 4, 6, 8 and 10 days of storage at fridge temperature. The results indicate that the pH values of the samples were similar and ranged between (3.62-4.30). All samples showed decreases in pH values over the storage period. The results of total titratable acidity (TA) indicate that all samples had TA within narrow range. The acidity values increased over the study period and ranged between (1.36-1.68). These values are within those known for normal yoghurt.

Table 1: pH Values and Acidity.

samples	pH value						Acidity (%)					
	Zero time	2 days	4 days	6 days	8 days	10 days	Zero time	2 days	4 days	6 days	8 days	10 days
1	4.11	4.00	3.84	3.80	3.76	3.72	1.43	1.46	1.48	1.52	1.56	1.59
2	4.02	4.00	3.92	3.88	3.79	3.78	1.50	1.52	1.56	1.55	1.58	1.63
3	3.98	3.91	3.84	3.76	3.69	3.64	1.45	1.47	1.50	1.54	1.59	1.64
4	4.00	3.91	3.85	3.79	3.71	3.69	1.39	1.43	1.48	1.52	1.56	1.60
5	3.97	3.92	3.84	3.97	3.90	3.81	1.45	1.48	1.51	1.56	1.60	1.63
6	4.00	3.94	3.84	3.78	3.69	3.64	1.37	1.41	1.46	1.51	1.57	1.61
7	4.10	4.01	3.97	3.89	3.78	3.70	1.49	1.52	1.56	1.61	1.65	1.68
8	3.99	3.93	3.89	3.77	3.70	3.65	1.38	1.42	1.46	1.51	1.55	1.60
9	3.99	3.92	3.84	3.78	3.70	3.68	1.43	1.45	1.48	1.52	1.55	1.59
10	4.03	3.98	3.90	3.81	3.76	3.69	1.44	1.48	1.53	1.57	1.60	1.63
11	4.30	4.26	4.20	4.09	3.99	3.87	1.39	1.42	1.47	1.54	1.59	1.65
12	3.88	3.84	3.79	3.71	3.68	3.62	1.51	1.54	1.59	1.62	1.64	1.66
13	4.00	3.88	3.80	3.75	3.69	3.63	1.36	1.39	1.42	1.47	1.52	1.58
14	3.95	3.89	3.81	3.78	3.71	3.68	1.38	1.42	1.44	1.49	1.52	1.56
15	4.01	3.99	3.92	3.86	3.80	3.77	1.51	1.54	1.56	1.59	1.62	1.66
16	4.00	3.96	3.90	3.85	3.78	3.71	1.39	1.42	1.45	1.48	1.53	1.58
17	3.98	3.95	3.87	3.76	3.70	3.63	1.36	1.40	1.44	1.49	1.53	1.57
18	4.10	4.01	3.98	3.87	3.81	3.75	1.51	1.54	1.58	1.61	1.65	1.68
19	3.96	3.92	3.89	3.78	3.71	3.64	1.41	1.45	1.47	1.51	1.54	1.61
20	4.00	3.91	3.85	3.79	3.70	3.67	1.39	1.41	1.45	1.50	1.54	1.59

Table 2 shows the crude tension and wheying off values for the twenty samples of the study upon arrival and after 2, 4, 6, 8 and 10 days of storage at fridge temperature. The results show that the crude tension values ranged between (24.5 - 36.8). However, the crude tension values increased for all the twenty samples over the storage period. The rates of increase varied between the different samples. This increase can be attributed to the increased total solids content. The results of the wheying off show that the values of the separated whey from yogurt samples ranged between (0.4-3.5). The whey values increased significantly over the storage period for all the twenty samples of yogurt. Excessive wheying off is considered as an indicator of poor quality or lack of freshness.

Table 2: Curd Tension and Wheying Off.

samples	Curd tension(g)						Wheying- off (ml)					
	Zero time	2 days	4 days	6 days	8 days	10 days	Zero time	2 days	4 days	6 days	8 days	10 days
1	32.3	33.1	33.9	34.2	35.3	36.8	1.3	1.4	1.5	1.7	2.0	2.2
2	30.6	31.5	32.0	32.9	33.3	34.8	0.9	1.2	1.3	1.6	1.8	2.1
3	26.4	27.4	28.1	28.9	29.4	31.5	1.1	1.2	1.4	1.7	1.8	2.2
4	25.8	26.2	27.8	28.1	29.2	30.6	1.8	2.1	2.4	2.7	3.0	3.3
5	29.4	30.0	30.8	31.3	32.5	33.1	0.4	0.5	0.7	0.9	1.3	1.6
6	24.9	25.3	26.1	26.9	27.8	29.1	1.2	1.3	1.6	1.7	2.0	2.3
7	24.8	25.6	26.9	27.4	28.0	29.8	0.8	0.9	1.1	1.2	1.5	1.7
8	31.1	31.8	32.4	33.1	33.9	35.5	1.1	1.3	1.4	1.7	1.9	2.2
9	31.2	32.1	33.0	33.5	33.5	36.1	0.7	0.9	1.1	1.2	1.4	1.6
10	25.6	26.0	26.9	27.4	28.9	29.8	2.1	2.3	2.6	2.8	3.1	3.4
11	29.5	29.9	31.1	31.9	32.7	33.2	1.2	1.4	1.7	2.0	2.2	2.5
12	28.7	29.2	30.0	30.9	31.7	32.6	2.1	2.3	2.5	2.7	3.0	3.2
13	30.2	30.9	31.6	32.1	32.9	33.3	1.9	2.1	2.4	2.8	3.1	3.3
14	27.2	27.9	28.3	29.1	29.9	30.6	0.5	0.6	0.9	1.2	1.4	1.8
15	31.5	32.1	32.9	33.2	34.1	35.0	0.5	0.8	1.0	1.3	1.6	1.9
16	24.5	25.0	25.8	26.1	26.9	27.3	2.2	2.4	2.7	3.1	3.3	3.5
17	33.1	33.8	34.2	35.1	35.9	36.6	1.5	1.7	1.9	2.0	2.3	2.5
18	33.2	33.1	33.9	34.6	35.2	36.1	1.1	1.3	1.6	1.9	2.2	2.4
19	27.6	28.2	28.9	29.5	30.3	31.2	0.9	1.1	1.4	1.7	2.1	2.5
20	28.4	29.5	30.0	30.9	31.4	32.4	0.6	0.9	1.3	1.7	2.0	2.3

Table 3 reports the total coliform counts for the twenty samples of the study upon arrival and after 2, 4, 6, 8 and 10 days of storage at fridge temperature. The results show that the total coliform was not detected in 7 samples out of 20. In other words, 35% of the samples contained no total coliform counts. On the other hand, some samples like 5, 10, 15 showed a significant contamination with total coliform. Sample 5 showed the maximum total coliform count of ($8.7*10^6$) cfu/ml after 10 days of storage. The incidence of total coliform in 65% of the samples indicates poor quality and the unsanitary conditions during the processing and/or contamination at a later stage.

Table 3: Total Coliform Count

Samples	Total coliform (cfu/ml)					
	Zero time	2 days	4 days	6 days	8 days	10 days
1	$2.3*10^2$	$3.5*10^2$	$6.4*10^2$	$1.1*10^3$	$2.0*10^3$	$4.4*10^3$
2	ND	ND	ND	ND	ND	ND
3	$1.3*10^1$	$1.9*10^1$	$4.6*10^1$	$7.9*10^1$	$1.1*10^2$	$2.0*10^2$
4	$7.1*10^2$	$2.3*10^3$	$9.3*10^3$	$2.3*10^4$	$6.8*10^4$	$1.1*10^5$
5	$3.1*10^4$	$9.5*10^4$	$4.8*10^5$	$9.9*10^5$	$3.9*10^6$	$8.7*10^6$
6	$4.6*10^2$	$8.9*10^2$	$3.3*10^3$	$7.8*10^3$	$1.0*10^4$	$7.1*10^5$
7	ND	ND	ND	ND	ND	ND
8	ND	ND	ND	ND	ND	ND
9	$2.3*10^2$	$2.3*10^2$	$2.3*10^2$	$2.3*10^2$	$2.3*10^2$	$2.3*10^2$
10	$5.4*10^3$	$1.2*10^4$	$8.7*10^4$	$2.2*10^5$	$9.1*10^5$	$2.3*10^6$
11	$6.1*10^1$	$2.0*10^2$	$9.5*10^2$	$3.2*10^3$	$5.9*10^3$	$8.8*10^4$
12	ND	ND	ND	ND	ND	ND
13	$7.1*10^1$	$1.6*10^2$	$7.5*10^2$	$2.1*10^3$	$5.7*10^3$	$9.4*10^3$
14	ND	ND	ND	ND	ND	ND
15	$8.0*10^3$	$1.2*10^4$	$6.3*10^3$	$2.0*10^4$	$6.7*10^5$	$1.1*10^6$
16	$2.5*10^2$	$3.9*10^2$	$8.8*10^2$	$1.0*10^3$	$4.9*10^3$	$9.3*10^3$
17	ND	ND	ND	ND	ND	ND
18	$8.3*10^2$	$2.0*10^3$	$7.3*10^3$	$2.2*10^4$	$6.9*10^4$	$2.3*10^5$
19	ND	ND	ND	ND	ND	ND
20	$1.4*10^1$	$8.3*10^1$	$3.9*10^2$	$9.9*10^2$	$2.8*10^3$	$7.8*10^3$

Table 4 reports the Staphylococci counts for the twenty samples of the study upon arrival and after 2, 4, 6, 8 and 10 days of storage at fridge temperature. The results show that the Staphylococci was not detected in 10 samples out of 20. In other words, 50% of the samples contained no Staphylococci counts. Conversely, some

samples like 5, 10, 15 showed a significant contamination with Staphylococci. Sample 5 showed the maximum Staphylococci count of ($5.8*10^3$) cfu/ml after 10 days of storage. The existence of Staphylococci in 50% of the samples indicates contamination at any stage of manufacturing of yogurt samples.

Table 4: Staphylococci Count.

Samples	Staphylococci (cfu/ml)					
	Zero time	2 days	4 days	6 days	8 days	10 days
1	$1.0*10^1$	$2.4*10^1$	$2.9*10^1$	$3.8*10^1$	$5.2*10^1$	$5.9*10^1$
2	ND	ND	ND	ND	ND	ND
3	ND	ND	ND	ND	ND	ND
4	$1.6*10^1$	$2.9*10^1$	$4.3*10^1$	$5.6*10^1$	$8.0*10^1$	$1.0*10^2$
5	$1.3*10^3$	$2.6*10^3$	$4.8*10^3$	$4.9*10^3$	$5.3*10^3$	$5.8*10^3$
6	$1.5*10^1$	$1.7*10^1$	$2.3*10^1$	$2.9*10^1$	$3.4*10^1$	$3.9*10^1$
7	ND	ND	ND	ND	ND	ND
8	ND	ND	ND	ND	ND	ND
9	ND	ND	ND	ND	ND	ND
10	$9.2*10^2$	$1.2*10^3$	$2.6*10^3$	$3.4*10^3$	$3.8*10^3$	$4.1*10^3$
11	$1.3*10^1$	$2.2*10^1$	$3.1*10^1$	$4.2*10^1$	$4.8*10^1$	$5.4*10^1$
12	ND	ND	ND	ND	ND	ND
13	$1.1*10^1$	$1.8*10^1$	$2.1*10^1$	$2.6*10^1$	$3.0*10^1$	$3.8*10^1$
14	ND	ND	ND	ND	ND	ND
15	$3.2*10^2$	$4.4*10^2$	$5.8*10^2$	$6.9*10^2$	$9.7*10^2$	$1.4*10^3$
16	$1.0*10^1$	$1.8*10^1$	$2.1*10^1$	$2.6*10^1$	$2.9*10^1$	$3.2*10^1$
17	ND	ND	ND	ND	ND	ND
18	$2.0*10^1$	$3.1*10^1$	$5.6*10^1$	$7.4*10^1$	$1.4*10^2$	$3.1*10^2$
19	ND	ND	ND	ND	ND	ND
20	ND	ND	ND	ND	ND	ND

Table 5 displays the yeast and mould counts for the twenty samples of the study upon arrival and after 2, 4, 6, 8 and 10 days of storage at fridge temperature. The results show that 50% of the yogurt samples do not contain yeast and molds. On the other hand some samples are highly contaminated with yeast and molds. Sample 10 show the maximum count of yeast and molds after 10 days of storage with a value of ($9.0*10^6$) cfu/ml.

Overall, our findings are compatible with (Tarakci and Kucukoner, 2003; Ifeanyi *et al*., 2013; El-Ansary, 2014) who document poor microbiological quality of traditional yoghurt manufactured in Turkey, Nigeria and Egypt, respectively. However, our findings are contrasting with (Rodrigues *et al.,* 2010; Igbabul *et al.*, 2014; Igwegbe *et al*., 2015) who find adequate quality of yoghurt commercialized in Brazil and Nigeria.

Table 5: Yeast and mould Count

Samples	Yeast and mould (cfu/ml)					
	Zero time	2 days	4 days	6 days	8 days	10 days
1	ND	$4.3*10^1$	$1.5*10^2$	$9.7*10^2$	$4.9*10^4$	$1.1*10^5$
2	ND	ND	ND	ND	ND	ND
3	ND	ND	ND	ND	ND	ND
4	$2.4*10^2$	$9.9*10^2$	$3.7*10^3$	$8.7*10^3$	$3.2*10^4$	$1.2*10^5$
5	$3.4*10^3$	$9.6*10^3$	$2.9*10^4$	$8.7*10^4$	$2.2*10^5$	$7.6*10^5$
6	$8.7*10^2$	$1.5*10^3$	$8.8*10^3$	$3.9*10^4$	$7.8*10^4$	$1.9*10^5$
7	ND	ND	ND	ND	ND	ND
8	ND	ND	ND	ND	ND	ND
9	ND	ND	ND	ND	ND	ND
10	$3.6*10^4$	$5.7*10^4$	$9.9*10^4$	$8.1*10^5$	$4.8*10^6$	$9.0*10^6$
11	$2.9*10^2$	$5.8*10^2$	$9.3*10^2$	$7.4*10^3$	$2.8*10^4$	$7.4*10^4$
12	ND	ND	ND	ND	ND	ND
13	$9.2*10^1$	$4.4*10^2$	$1.1*10^3$	$8.6*10^3$	$3.8*10^4$	$8.0*10^4$
14	ND	ND	ND	ND	ND	ND
15	$5.9*10^4$	$9.1*10^4$	$5.6*10^5$	$9.8*10^5$	$1.8*10^6$	$6.4*10^6$
16	$2.5*10^2$	$9.1*10^1$	$3.8*10^2$	$1.0*10^3$	$8.2*10^3$	$2.9*10^4$
17	ND	ND	ND	ND	ND	ND
18	$3.9*10^2$	$8.5*10^2$	$3.4*10^3$	$9.6*10^3$	$5.2*10^4$	$9.9*10^4$
19	ND	ND	ND	ND	ND	ND
20	ND	ND	ND	ND	ND	ND

4. Conclusion

This study examined some of the microbial, chemical and physical characteristics of the traditional Jordanian Yoghurt which is called (Laban Rayeb).In specific, we investigated the pH values, total titratable acidity (TTA), crude tension, wheying off, total coliform count, Staphylococci count and yeast and mould count for twenty samples of yogurt collected from different diary stores. The analysis is performed over ten-day period of storage in the fridge from the arrival of the samples. The results indicated that pH values decreased over the storage period and ranged between (3.62-4.30). On the other hand, TTA, crude tension and wheying off values had increased over the 10-day storage period to reach their maximums of 4.30, 1.68, 36.8 and 3.5, respectively on the last day of storage. The microbial analysis showed that 65% of the yogurt samples were contaminated by total coliform while 50% of these samples were contaminated by staphylococci and yeast and molds. The results indicate the poor quality of yoghurt sold in some of the examined diary stores which may be attributed to inadequate hygienic conditions or storage at inappropriate temperatures. These findings suggest that governments should assert more attention to quality control in diary stores.

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