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Chemical and Microbiological Qualities of Certain Local Dairy Products in Assiut City

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ABSTRACT

Thirty samples (10 raw milk, 10 yoghurt and 10 cheeses) were randomly collected from local markets in Assiut city. All samples were chemically analyzed for acidity, fat, total nitrogen, soluble nitrogen, salt and ash contents, microbiologically for total counts of bacteria, molds & yeasts and for the incidence of coliform bacteria. The obtained results were (0.13-0.20), (0.63 – 0.81) and (0.27-0.97) for titratable acidity, (3- 7.3), (3.0-4.7) and (1.00- 35.00) for fat contents, (0.47-0.60–), (0.70-0.83) and (2.05-3.7) for total nitrogen (TN%), (0.28-0.45), (0.011-0.029) and(0.014-1.33) for soluble nitrogen (SN%) , (0.17-0.29), (0.16- 0.31) and (2.34 – 9.56) for salt contents and (0.40 -1.05) , (0.70 – 0.89) and (2.5 – 7.52) for ash contents of liquid raw milk, yoghurt and cheese samples respectively. microbiological analysis the total bacterial counts (TBC) were (2.25×10^5 - 5.25×10^7), (4.9×10^5 - 7.25×10^7) and (4.1×10^5 - 18.75×10^7), molds & yeasts (1×10^2 - 45×10^2),(1×10^2 - 40×10^2)and (1×10^2- 17×10^2) for liquid raw milk, yoghurt and cheese samples respectively. The results also showed that, most of the investigated samples were free from coliform bacteria except for raw milk.

Keywords: Milk, white soft cheese, Roquefort cheese, Ras cheese.

INTRODUCTION

Fresh milk is considered as a complete diet because it contains the essential nutrients such as lactose, fat, protein, minerals and vitamins in balanced ratio rather than the other foods (Hossain and Dev, 2013). Moreover, milk can be considered as a source of macro and micro-nutrients, and contains a number of active compounds that play a significant role in both nutrition and health protection (Ceballos *et al*., 2009).Yogurt is an important dairy product, particularly for consumers with lactose intolerance. As well as Yogurt is considered a healthy food because it contains viable bacteria that is considered a probiotics. (Trowell *et al*., 1976; Lunn and Buttriss, 2007).Cheese is an important integral part of diet consumed in Egypt. It is consumed almost three times a day. There are many traditional local cheese type produced in local regions. Kariesh cheese is one of the most popular local type of fresh soft cheese in Egyptian cities and Arabian countries, similar to Domiati(A.M.Abd-Ehamid, 2012; R.C.Brown, 2004). Domiati cheese is the most popular type of pickled soft cheese by all socioeconomic classes in Egypt due to its nutritional value, convenience and good taste. When fully ripened it has strong sharp flavor as well as smooth body and texture (Yousef *et al*., 2001 and Kepary *et al*., 2007).Ras cheese is the national hard cheese type produced in Egypt. It is known in Egyptian markets as "Romi cheese". It is similar to the Greek variety "Kefalotyri cheese". The manufacture of Ras cheese was described by Hofi *et al*. (1970). As recently reviewed by Abou-Donia (2002). BIue veined cheese (Roquefort type) is semi hard cheese represents a cheese type of considerable commercial importance in the United States (Gripon, 1993).Milk and dairy products are important components of a healthy diet. However, they can present a health hazard due to the possible contamination with pathogenic bacteria when there are consumed unpasteurized or expose to environment, (Angulo *et al*., 2009).

This study conducted to throw the light on the chemical and microbiological quality of raw milk and some dairy products in Assiut city

MATERIAL AND METHODS

30 samples of milk and dairy products (6 raw buffalo's milk and 4 raw cow's milk, 4 soft cheeses, 3 Ras cheeses and 3 Roquefort cheeses and 10 brands of yoghurt) were collected from different shops in Assiut city, were kept in ice box at 5 Cº and transferred immediately to the laboratory for analysis. Samples were analyzed for titratable acidity, total nitrogen and the soluble nitrogen which was determined by Kjeldahl method according to the method described in A.O.A.C. (2000). Fat contents of were determined using Gerber method (Ling ,1963). Ash content was determined by ignition at 550Cº in an electric muffle furnace (AOAC, 2005). Salt content in cheese was determined according IDF standards (1972).

Microbiological analysis was done by weighing and emulsifying 10 ml.or gram of the examined sample in a sterile mortar with 90 ml sodium citrate solution to obtain 1:10 dilution required for the microbial analysis.

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Total Plate Counts(TPC) were done by plating on agar medium and incubated for 48 hours at 30- 37ºC. Each dilution was plated in duplicated, and plates containing 30-300 colonies were considered Frank and Youssef (2004).Yeast and moulds counts were enumerated in one ml of the appropriate dilution of molds on potato dextrose agar medium and incubated at 28-30ºC for 6 days in (Smith and Dawson.1944) and one ml of the appropriate dilution of yeast on yeast- molds extract medium and incubated at 28-30ºC for 3 days in yeast.

For determining the presence of coliforms inoculation of dairy samples or their dilution was carried out into Mac Conkey broth (Mohran, 1971).

Statistical analysis was done using the Statistix version 8.

RESULTS AND DISCUSSION

Data in Table (1) illustrate the chemical composition of both cow's and buffalo's milks collected from Assiut city. Results of cow's milk analysis showed that 0.133± 0.144,3.908 ±0.688,0.48± 0.0135, 0.305±0.0198, 0.231±0.048 and 0.681 of titratable acidity, fat content, total nitrogen , soluble nitrogen , salt content and ash, respectively, while the corresponding results of buffalos milk were 0.180± 0.014, 6.572±4.184, 0.56±0.0217, 0.418±0.0172,0.200±0.039 and 0.691 titratable acidity, fat content, total nitrogen, soluble nitrogen, salt content and ash, in the same order. Higher mean values of titratable acidity, fat content, total nitrogen and soluble nitrogen were obtained in buffalo's than cow's milk and the differences between th em were significant ($P \leq 0.05$).

Table 1. Gross chemical composition of Cow's Milk and Buffalo's Milk:

Samples	Chemical properties (Mean± SD)					
	Acidity	Fat	T.N	S.N	Salt	Ash
Cow's Milk	0.133 ± 0.144	3.908 ±0.688	0.48 ±0.0135	0.305 ±0.0198	0.231 ±0.048	0.681
Buffalo's Milk	0.180 ± 0.014	6.572 ±4.184	0.56 ±0.0217	0.418 ±0.0172	0.200 ±0.039	0.691
P- value	0.183	0.032*	0.0000	0.0000	0.231	0.90
General Mean	0.156	5.24	0.52	0.3615	0.431	0.687

In the same column, means with the same letter are not significantly different (p<0.05) * significant

Data in Table (2) indicate the mean values of microbiological examination of cow's and buffalo's milks being collected from Assiut city. The total bacterial counts (TBC) were $1.231\times10^7\pm1.638$ in cow's milk samples, compared with $1.465\times10^7\pm1.797$ in buffalo's milk. Total count of fungi and yeasts in cow's and buffalos milk samples were $8.853\times10^2\pm7.103$, and $23.417\times10^2\pm$ 21.309 $10.833\times10^2\pm10.739$ and $22.389\times10^2\pm19.947$, respectively. On the other hand the incidence of coliform bacteria in both milk samples were examined and the results revealed that 75% of the cow's milk samples showed a positive presence of coliform bacteria, compared with 100% of buffalo's milk samples were showed a positive presence for the coliform bacteria test. The results showed non-significant differences between all examined properties ($P \leq 0.05$).

Table 2. Microbiological properties of Cow's Milk and Buffalo's Milk:

Samples	Microbiological examination (Mean± SD)				
	Total bacterial counts cfu/g	Fungi counts	Yeasts	Total of yeast and Fungi	Coliform bacteria group incidence
Cow's milk	$1.231\times10^7\pm1.638$	$8.853\times10^2\pm 7.103$	$23.417\times10^2\pm 21.309$	$32.27\times104\pm28.412$	75%
Buffaloes milk	$1.465\times10^7\pm1.797$	$10.833\times10^2\pm10.739$	$22.389\times10^2\pm19.947$	$33.22\times10^4\pm30.686$	100%
P- Value	0.386	0.0830	0.3907	0.4737	
General mean values	1.348×10^7	9.843×10^2	22.903×10^2	32.745×10^4	87.5%

In the same column, means with the same letter are not significantly different (p<0.05) * significant

Mean values of titratable acidity, fat content, total nitrogen, soluble nitrogen , salt content and ash content of different types of cheese collected from local market in Assiut city were presented in Table (3). It could be observed that the highest value of titratable acidity was for Ras cheese with 0.84±0.11 determined as lactic acid followed by Roquefort cheese with 0.740±0.078 and the lowest values was for Baramiely cheese with 0.48±0.104, it would be also observed that there are no significant differences between Kareish cheese and Baramiely cheese($P \leq 0.05$), while in case of Ras cheese and Roquefort cheese it was significant difference at ($P \leq 0.05$). from the same Table it was observed that the fat content of Roquefort cheese recorded the highest mean values with (32.33±2.066) followed by Ras cheese with (31.67±2.16) while the while the Karfeish cheese recorded the lowest mean value with (2.00±0.894). The results showed singnificant differences between all cheese verities ($P \leq 0.05$).

Table 3. Gross chemical composition of different types of cheeses.

Cheese Samples	Chemicals properties of cheese (Mean+SD)					
	Titratable Acidity	Fat content	Total nitrogen	Soluble nitrogen	Salt content	Ash content
Ras cheese	0.84 ±0.11a	31.67 ± 2.16a	3.42 ±0.32a	0.41 ±0.05b	5.097 ±0.493b	6.63 ± 0.65b
Roquefort cheese	0.740 ±0.078b	32.33 ±2.066a	3.50 ±0.14a	1.25 ±0.05a	4.340 ±0.729b	4.08 ± 0.52c
Kareish cheese	0.440 ±0.125c	2.000 ±0.894c	2.42 ± 0.22b	0.35 ±0.04c	2.912 ±0.370c	2.84 ± 0.27d
Baramiely (Domiati)	0.48 ±0.104c	21.67 ±1.862b	2.11 ± 0.09c	0.015 ±8.944d	5.445 ±0.845a	7.22 ± 0.25a
General mean values	0.4835	21.92	2.86	0.51	5.20	5.19

In the same column, means with the same letter are not significantly different (p<0.05) * significant

From the data presented in the previously mentioned Table could be observed also that both of total nitrogen and soluble nitrogen of Requeforti cheese were of higher values than the rest cheese with 3.50±0.14 and 1.25 ±0.05, followed by Ras cheese with 3.42 ±0.32 and 0.41 ±0.05, respectively. The examined samples of Baramiely

cheese showed the lowest mean values of total nitrogen and soluble nitrogen with 2.11 ±0.09 and 0.15 ±8.94, respectively. Statistically it was observed that the differences between total nitrogen and soluble nitrogen in all studied cheese were significant (P≤ 0.05). As with the salt content tabulated in the previous Table showed that the Barameily cheese had the highest value of salt of 5.445% ±0.845, followed by Ras cheese of 5.097% ±0.493, while the lowest values of salt percentage was for Kareish cheese 2.912%±0.370.from the statistical analysis it was observed there is a significant difference between different type of investigated cheeses (P≤ 0.05). From previous finding it was concluded that the differences in the chemical composition of different type of investigated cheeses may be related to the difference in starter culture used in its manufacture, the repining period, storage condition moisture percentage and the salt contents in its manufacturing procedure which reflects on its final chemical composition.

Data in Table 4 represents the mean values of some microbiological properties of different types of cheese collected from Assiut city. The results indicated that the total bacterial counts of cheese 0.375×107 ± 0.320, 0.248×107 ± 0.161, 1.213×107± 1.566 and 1.269×107 ± 1.406 for Ras cheese , Roquefort cheese , Kareish cheese and Baramiely cheese, respectively. It was observed from these data that the total bacterial counts were closely related to each other, to the extent that there are no statistically significant differences between the investigated cheese types. Total yeasts and moulds were calculated and the results indicated that, Baramiely cheese recorded the highest total yeasts and moulds with mean values of 12.8×104 followed by Roquefort cheese with mean values of 4.837×104 . The difference between the investigated cheese types in their contents of total yeasts and moulds may be related to the different parameters and conditions of during its manufacture procesure and during storage period . as well as the cheese were tested for the incidence of coliform bacteria, the obtained results indicated that, coliform bacteria group had not detectedinall cheeses varieties , except for Ras cheese which about 66.66% of the investigated samples confirm the presence of coliform bacteria.

Table 4. Microbiological properties of different types of cheeses.

Cheese samles	Cheese microbiological properties (Mean ±SD) cfu / gram of cheese.				
	Total bacterial counts	Mould counts	Yeasts	Total Yeast & Mould	Coliform bacteria group incidence
Ras cheese	0.375×10^{7} ± 0.320a	2.04×10^{2} ± 1.67b	1.33×10^{2} ± 1.966b	3.37×10^{4}	66.66%
Requforti cheese	0.248×10^{7} ± 0.161a	3.67×10^{4} ± 2.58a	1.167×10^{2} ± 1.941b	4.837×10^{4}	ND
Kareish cheese	1.213×10^{7} ± 1.566a	3.00×10^{2} ± 2.450 b	0.00 ±0.00b	3.00×10^{2}	ND
Baramiely cheese	1.269×10^{7} ± 1.406a	2.8×10^{2} ± 2.858b	10×10^{2} ± 9.960a	12.8×10^{4}	ND
General mean values	0.776×10^{7}	3.12×10^{2}	3.124×10^{2}	6.24×10^{4}	—

In the same column, means with the same letter are not significantly different (p<0.05) * significant

Results tabulated in Table 5 represent the chemical analysis of ten brands of yoghurt collected from Assiut city. Regarding to the titratable acidity, it was noticed that all titratable acidity were closely related with general mean value of 0.731% determined as lactic acid this may be due to the starter culture used in its manufacturing , the incubation temperature and the storage condition was the same in all investigated brands. So, there are no singnificant differences was found between all measurements of titratable acidity in the tenth brands. Looking at the fat percentages, it was observed that, brand 3, 7 and 10 gained the highest fat percentage with4.367 ±0.709,4.400±0.794and 4.167 ±0.764 respectively, followed by brand 2 and 4 which recorded the same fat percentage near to 3.7%. The rest brands 1,5,8 and 9 had the lowest mean values with3.333 ±0.289, 3.233 ±0.252, 3.167 ±0.289 and 3.067 ± 0.116 respectively. The differences between the highest fat contents were non-significant also the same between the lowest values, but a significant differences were found between the highest measurements of brand 3,7 and 10 from side and the lowest measurements of the rest brand . This may be due to the difference in the raw milk composition used in the manufacture process and may be related to unfollowed the milk standardization approach at the beginning of yoghurt manufacture process. With regard to the total nitrogen content, it was found that, the total nitrogen content was ranged from 0.717 ±0.01 for Brand 1 to 0.811 ±0.015 for Brand 5 with an general average of 0.77. from other side the results showed that, the soluble nitrogen contents was ranged from 0.014 ±2.517E-03 for Brand 3 to 0.028± 2.082E-03 for Brand 8 with a general average of 0.0215. It was observed also that, the differences between both of total nitrogen in all investigated yoghurt brands and soluble nitrogen in all brands were not big to be statically significant to some extent.The salt percentage results should that, all brands mean value werein between the range 0.183±0.025 for Brand4 to 0.283 ±0.025 for Brand6 with an average of 0.2068. finally the ash content data showed that all values in the range of 0.75±0.02 for Brand2 and 0. 87 ±0.01 for 6 and Brand8, with general average of 0.799.

Data in Table 6 represents the microbiological properties of 10 brands of yoghurt collected from Assiut city. From these data it could be concluded that, the total bacterial counts was ranged from 1.19×107± 1.702 for Brand9 to 2.735×107± 3.928for Brand 10 with an average of 1.7629×107 cfu/gram. Furthermore all the obtained results showed no significant differences between all Barnds. This may be due to the same starter cultures used for their manufacture, and the same storage conditions in the smarkets before saleing. In case of mould counts the obtained results revealed that, the total mould counts ranged from 1×102± 1d cfu/gram for Brand -5 to 25×102± 13.23ab for Brand- 9 with an average of 9.831×102 cfu/gram yoghurt. While in case of yeasts count it could be observed that, the total yeasts count was ranged from 0.00 cfu/gram for Brand-1 to 26.67×102± 2.887 for Brand (8,9 and 10) with an average of 14.3337×102 cfu/gram yoghurt. Collectively it was found that, the mould and yeasts counts

were ranged between 4.667× 104 cfu for Brand-7 to 51.67× 104 cfu for Brand- 9 with an average of 24.16×104 cfu/gram yoghurt. Finally with regard to the incidence of coliform bacteria groups in studied samplesthe obtained results revealed that, all investigated Brands (1-10) had no coliform bacteria group except for Brands (2and 6).

Table 5. Gross chemical composition of different brands of yoghurt.

Yoghurt brand	yoghurt chemical properties (Mean ± SD)					
	Titratable acidity	Fat content	Total nitrogen content	Soluble nitrogen content	Salt content	Ash content
Brand-1	0.730 ±0.700ab	3.333 ±0.289bc	0.717 ±0.01c	0.015 ± 0.001527 d	0.237 ±0.031c	0.77 ± 0.02bcd
Brand-2	0.727 ±0.667ab	3.767 ±0.751abc	0.75 ±0.015bc	0.014 ± 0.002517 d	0.277 ±0.031ab	0.75 ± 0.02cd
Brand-3	0.693 ±0.035ab	4.367 ±0.709a	0.75 ± 0.020bc	0.016 ± 0.001527 d	0.211 ±0.028cd	0.78 ± 0.02bc
Brand-4	0.720 ±0.076ab	3.733 ±0.701abc	0.78 ±0.02ab	0.02 ± 0. 001527 c	0.183 ±0.025d	0.81 ± 1.000e-02b
Brand-5	0.770 ±0.036ab	3.233 ±0.252bc	0.811 ±0.015a	0.021 ± 0.002082 c	0.243 ±0.015bc	0.74 ± 0.04d
Brand-6	0.680 ±0.020b	3.333 ±0.289bc	0.79 ±0.015ab	0.023 ± 0.002000 bc	0.283 ±0.025a	0.87 ± 0.01a
Brand-7	0.777 ±0.042a	4.400 ±0.794a	0.79 ±0.02ab	0.025 ± 0.002517 ab	0.210 ±0.01cd	0.86 ± 0.02a
Brand-8	0.703 ±0.075ab	3.167 ±0.289c	0.79 ± 0.03a	0.028 ±0.002082 a	0.230 ±0.01c	0.87 ± 0.02a
Brand-9	0.760 ±0.036ab	3.067 ±0.116c	0.73 ±0.03c	0.026 ± 0.0026 ab	0.217 ±0.015cd	0.76 ± 0.06cd
Brand-10	0.750 ±0.062ab	4.167 ±0.764ab	0.78 ±0.15ab	0.027 ± 0.001527 a	0.187 ±0.015d	0.78 ± 5.774e-03bc
General mean	0.731	3.66	0.77	0.0215	0.2068	0.799

In the same column, means with the same letter are not significantly different (p<0.05) * significant

Table 6. Microbiological properties of different brands of yoghurt.

yoghurt samples	yoghurt microbiological properties (Mean±SD / cfu/gram)				
	Total bacterial counts	Mould counts	Yeasts counts	Total of yeast &mould	Coliform bacteria group incidence
Brand -1	$1.470\times10^7 \pm 2.072$a	$27.33\times10^2 \pm 23.46$a	ND c	27.33×10^4	ND
Brand -2	$1.48\times10^7 \pm 1.665$a	$4.33\times10^2 \pm 4.163$cd	$5\times10^2 \pm 5$c	9.33×10^4	+
Brand -3	$1.59\times10^7 \pm 2.269$a	$18.33\times10^2 \pm 5.774$abc	12.33 ± 11.37bc	30.66×10^4	ND
Brand-4	$2.244\times10^7 \pm 3.182$a	$10\times10^2 \pm 4.360$bcd	$12.33\times10^2 \pm 11.37$bc	22.33×10^4	ND
Brand -5	$2.24\times10^7 \pm 3.182$a	$1\times10^2 \pm 1$d	$13\times10^2 \pm 10.583$abc	14×10^4	ND
Brannd -6	$1.19\times10^7 \pm 1.664$a	$1.66\times10^2 \pm 0.577$d	$19\times10^2 \pm 10$ab	20.66×10^4	+
Brand -7	$1.65\times10^7 \pm 2.354$a	$3\times10^2 \pm 1$cd	$1.667\times10^2 \pm 1.528$c	4.667×10^4	ND
Brand -8	$1.844\times10^7 \pm 2.354$a	$4.33\times10^2 \pm 5.132$cd	$26.67\times10^2 \pm 2.887$a	31×10^4	ND
Brand-9	$1.19\times10^7 \pm 1.702$a	$25\times10^2 \pm 13.23$ab	$26.67\times10^2 \pm 2.88$a	51.67×10^4	ND
Brand -10	$2.735\times10^7 \pm 3.928$a	$3.33\times10^2 \pm 5.77$cd	$26.67\times10^2 \pm 2.887$a	30×10^4	ND
General mean values	1.7629×10^7	9.831×10^2	14.3337×10^2	24.16×10^4	—

In the same column, means with the same letter are not significantly different (p<0.05) * significant

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تقييم الجودة الكيميائية والميكروبيولوجية لبعض منتجات الألبان بمدينة أسيوط

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تم جمع ثلاثين عينة من منتجات ألبان مختلفة من الأسواق المحلية بمدينة أسيوط. شملت العينات 10 لبن خام و 10 زبادي و 10 عينات من الجبن . تم تحليل جميع العينات كيميائياً (الحموضة ، الدهون ، النيتروجين الكلي ، النيتروجين القابل للذوبان ، الملح والرماد) وكذلك ميكروبيولوجياً لـ (العدد الكلي للبكتيريا ، الخمائر والفطريات ومدي تواجد بكتيريا القولون). و كانت النتائج المتحصل عليها كالتالي (0.13-0.20) ، (0.63 - 0.81) و (0.27-0.97) للحموضة مقدرة كنسبة مئوية لحامض اللاكتيك ، (3- 7.3) ، (0.3-4.7) و (1.00-35.00) لمحتوي العينات من الدهن ، (0.47 -0.60) و (0.70- 0.83) و (2.05-3.7) للنيتروجين الكلي و (0.28-0.45) و (0.011-0.029) و (0.014-1.33) للنيتروجين القابل للذوبان في الماء،(0.17 – 0.29) ،(0.16 – 0.31) و (2.34 - 9.56) لمحتويات الملح و (0.40 -1.05) ، (0.7 0 - 0.89) و (2.5 - 7.52) للرماد في كل من اللبن الخام والجبن وعينات الزبادي علي التوالي . بينما كانت نتائج التحليل الميكروبيولوجي كالتالي (2.25×10^5 - 5.25×10^7) ، (4.9×10^5 - 7.25×10^7) و (4.1×10^5 - 18.75×10^7) للعدد الكلي للبكتيريا ، (1×10^2-45×10^2) و (1×10^2-40×10^2) و (1×10^2 -17×10^2) للعدد الكلي للخمائر والفطريات لعينات اللبن الخام والجبن والزبادي على التوالي.كما دلت النتائج المتحصل عليها علي خلو العينات موضع الدراسة من مجاميع بكتيرا القولون فيما عدي عينات اللبن الخام .