

CHEMICAL AND MICROBIOLOGICAL PROPERTIES OF LABAN RAYEB IN EL-WADI EL-GADID (NEW VALLEY) GOVERNORATE, EGYPT

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Abstract

A survey of the Chemical and Microbiological properties of Laban Rayeb in the New valley governorate during winter season and summer season was studied. Twenty seven samples were obtained from 3 different centers from the Governorate (El Dakhla, Balat and El Kharga). Laban rayeb samples were analyzed chemically for the moisture, total solids, total acidity, fat, total and soluble nitrogen. The microbiological analysis were carried out for the total bacterial count, lactic acid bacteria (LAB) count, proteolytic bacteria count, yeasts and molds counts, and the presence of the coliform group & anaerobic bacteria. The mean values of moisture, total solids, acidity, fat, total and soluble nitrogen were 88.64, 11.36, 0.7, 1.53, 0.41%, and 0.18%; respectively in winter season, while during summer season these values were 86.90, 13.10, 1.02, 1.62, 0.55%, and 0.27% in same order. The mean values of total count bacteria (CFU/ml) and lactic acid bacteria, proteolytic bacteria as well as yeast and molds counts were presented with an average of 43.45×10^6 , 32.12×10^5 , 7.51×10^4 and 14.7×10^4 in the samples of winter season respectively, while during summer season these counts were 52.15×10^6 , 45×10^5 , 29.83×10^4 and 19.17×10^5 in the same order. The incidence Coliform bacteria was found to be positive in all samples of Laban Rayeb collected either during winter season or summer season, while the presence of Anaerobic spore former were negative.

Key words: Laban Rayeb, spontaneous fermentation, Chemical, Microbiological properties, New Valley Governorate

INTRODUCTION

Milk is the only food designed for mammals by nature but, mammals have been adapted to consume all other foods. Milk provides nutrition in the form of energy from carbohydrate (present as lactose), nitrogen (from the protein content) and it is a rich source of calcium to build bones, and some other minerals (Tascali *et al.*, 2010).

Traditional fermented milk products are widely consumed in the entire world. These products are important supplement to the local diet and provide vital elements for growth, good health and an appreciate flavor Al-Otaibi, (2009) and Uccello, *et al.*, (2012). Lactic acid starter cultures used for the conversion and preservation of milk by-products are unique bio-converters of energy.

One of the fermented milk widely consumed in Egypt is Laban Rayeb. It is made by natural fermentation of buffalo's and /or cow's milk (Abd-EL-Hamid *et al.*, 2008).

This type of fermented milk is manufactured by Egyptian farmers where fresh milk is placed in an earthenware pot (Matared) and kept in warm room for 12-24 hr in summer and 2-3 days in winter. When the weather is too cold the matared is warmed to enhance milk curdling. The pot is left undisturbed in a warm place until the cream rises and the lower partially skimmed milk coagulates; after removing the cream layer, which is mainly made into farm butter, the remaining curd (Laban Rayeb) is either consumed as fermented milk or is converted to a soft acid cheese known as Kariesh (El-Gendy, 1983).

Rayeb is a curdled dairy product that has been known and highly appreciated by consumers for centuries. It is produced by spontaneous fermentation of cow's milk. It can be consumed as fresh or accompanied with some foods such as bread. Rayeb can be churned to separate Laban from traditional butter (Samet-Bali *et al.*, 2010).

Kosikowski, (1982) reported that the dominant bacteria in fermented milks are progressive type lactic acid *streptococci* and *lactobacilli*, which generally suppress the spoilage and pathogenic organisms very effectively.

The problems of traditionally fermented milk products in the rural areas of developing countries were investigated and they include lack of consistent technology, problems of hygiene, sanitation, short shelf life, syneresis, variable sensory qualities and unattractive presentation to the consumers (Stone *et al.*, 1974).

Chemical composition and hygiene quality is of the greatest importance in public health, processing technology and the quality of milk products Havranek and Rupic (1996). Milk sold from shops and UHT milk is associated with lower levels of hazard while raw milk and milk sold by door-to-door vendors with higher levels (Delia *et al.*, 2009).

The present study was conducted to determine the chemical and microbial characteristics of Laban Rayeb produced in the New valley Governorate during winter and summer seasons and the probability of the presence of some undesirable groups of microorganisms.

MATERIALS AND METHODS

Laban Rayeb samples:

In this work 27 samples of Laban Rayeb were collected from the Governorate from 3 different centers (El Dakhla, Balat and El Kharga), the samples were divided

into 11 samples in winter season (4, 4, 3; respectively) and 16 samples in summer season (4, 6, 6; respectively). Each set of samples were transported under aseptic conditions in an ice packed container to the laboratory.

Samples were prepared for the microbiological analysis following the procedures described by the American Public Health Association (A.P.H.A, 1992). At each time of sampling, 2 cups were taken, one of them was used for the chemical analysis and the second one was used for the microbiological analysis

Chemical Analysis:

Moisture, fat, titratable acidity, total and soluble nitrogen content of Laban Rayeb samples were determined according to described by AOAC, (2000).

Microbial Analysis:

Preparation of Samples:

Under aseptic conditions 1 ml of well stirred Laban Rayeb was transferred to 99 ml sterilized saline (0.85 % NaCl).

Samples were prepared for analysis following the procedures described by the American Public Health Association (A.P.H.A, 1992) to count the following groups:

- Total bacterial count (T.B.C.) was determined using on Nutrient Agar medium by A.P.H.A., (2004).
- Lactic acid bacteria (L.A.B.) in the samples were counted by using MRS agar medium as described in Difco manual, (1998).
- Coliform bacteria were counted by the most probable number dilution tube method using Maconkey broth and the incubation at 37 C° for 48 hrs.
- Counts of yeasts and moulds estimated on malt extract agar medium according to Oxoid manual, (1982) and the incubation at 25° C for about 5-7 days..
- Proteolytic bacteria were determined as showed by Tomas and Tomas, (1975)

The Incidence of anaerobic spores was examined as described by EL-Gendy, *et al.*, (1966). Using deep litmus milk medium isolated of airs using vaspar layer.

- Statically analysis were performed with SPSS 20.0 (SPSS, Inc., Chicago, IL, USA)

RESULTS AND DISCUSSION

The chemical composition of Laban Rayeb collected from the various New valley governorate centers.

Moisture content:

As shown in Tables (1 & 2) the moisture content in Laban Rayeb samples were ranged from 85.18 to 90.74% with average of 88.64% during winter season (Table 1) and from 84.06 to 89.74 % with a mean value of 86.90% during summer season (Table 2).

As shown in Tables 1&2 the total acidity% of Laban Rayeb of winter samples were ranged from 0.56% to 0.83% with average 0.70% and from 0.59 to 1.45% with average value of 1.016% in the samples of summer season.

The high acidity %for samples of hot season may be due to that high temperature which increases the activity of flora.

Fat content:

The results in the Table 1&2 show that the fat content of Laban Rayeb was ranged from 0.58 to 2.18% with an average of 1.53% in the samples collected in winter season, while it was ranged from 0.90 to 2.35% with an average of 1.62% in the samples collected in summer season.

These results were in accordance with that published by Abd-alla (2004) and Abd El-hamid *et al.*, (2008) who found that the average the fat content were 1.60% and 1.68 % in the samples examined during cold and hot season; respectively.

Total nitrogen (TN) and soluble nitrogen (SN) contents:

As shown in the Tables 1& 2 total nitrogen content samples of winter season samples ranged from 0.27 to 0.60% with an average 0.43% while it ranged from 0.39 to 0.78% in summer season with average value of 0.55 % in the samples. On the other hand the content of S.N content was found to be ranged from 0.06 to 0.37% with average value of 0.18 % in the samples collected in winter season, while these values were ranged from 0.09 to 0.49% with average value of 0.27% in the samples collected in summer season.

The highest value of soluble nitrogen recorded in summer season samples may be due to the higher proteolytic activity of fermented micro flora during summer season comparing with winter season (see in Table 4 the high Proteolytic bacterial count during summer season).

Microbial content:

Tables 3&4 show the counts of some microbial groups in Laban Rayeb samples during winter and summer seasons.

The average value of total count bacteria (CFU/ml) in samples of winter season was 43.45×10^6 , which ranged from 24.96×10^6 to 61.93×10^6 , and with an average value 52.15×10^6 , it was ranged from 24.7×10^6 to 79.6×10^6 in the samples collected in summer season. These results are in agreement with Mohran and said (1988) who stated that the total bacterial counts in house hold Algerian fermented milk was within 10^7 and 10^{10} cfu/ml.

In the same trend, It was found that the lactic acid bacteria count in the samples winter season ranged from 14.53×10^5 to 49.70×10^5 with an average value

32.12×10^5 , while samples collected in summer season ranged from 19.90×10^5 to 70.27×10^5 with average value of 45×10^5 .

Table 1. The average chemical composition of Laban Rayeb samples collected from various New valley governorate centers during winter season.

Chemical Analysis %	Center name	Minimum	Maximum	Average	SD*
Moisture	ELdakhla	88.71	91.04	89.88	1.17
	Balat	85.32	90.13	87.73	2.41
	Elkharga	81.50	91.04	88.33	4.65
	<i>Ave</i>	85.18	90.74	88.64	2.74
T.S	ELdakhla	8.96	11.29	10.13	0.53
	Balat	9.87	14.68	12.28	3.61
	Elkharga	8.96	18.5	11.67	1.11
	<i>Ave</i>	9.26	14.82	11.36	1.75
Acidity	ELdakhla	0.553	0.832	0.693	0.13
	Balat	0.534	0.807	0.671	0.14
	Elkharga	0.589	0.861	0.725	0.14
	<i>Ave</i>	0.56	0.83	0.70	0.13
Fat	ELdakhla	0.85	2.15	1.5	0.65
	Balat	0.35	2.55	1.45	1.1
	Elkharga	0.55	1.85	1.65	0.65
	<i>Ave</i>	0.58	2.18	1.53	0.80
TN	ELdakhla	0.178	0.704	0.422	0.22
	Balat	0.166	0.457	0.262	0.13
	Elkharga	0.459	0.645	0.555	0.09
	<i>Ave</i>	0.27	0.60	0.41	0.15
SN	ELdakhla	0.033	0.269	0.152	0.11
	Balat	0.056	0.380	0.141	0.12
	Elkharga	0.078	0.449	0.244	0.14
	<i>Ave</i>	0.06	0.37	0.18	0.12

* Stander Deviation

Table 2. The average chemical composition of Laban Rayeb samples collected from New valley various governorate centers during summer season.

Chemical Analysis %	Center name	Minimum	Maximum	Average	SD*
Moisture	ELdakhla	86.61	89.56	88.09	1.48
	Balat	86.96	89.71	88.34	1.38
	Elkharga	78.62	89.96	84.29	5.67
	Ave	84.06	89.74	86.90	2.84
T.S	ELdakhla	10.44	13.39	11.92	0.20
	Balat	10.29	13.04	11.67	4.72
	Elkharga	10.04	21.38	15.71	2.27
	Ave	10.26	15.94	13.10	2.40
Acidity	ELdakhla	0.545	0.867	0.70	0.16
	Balat	0.577	0.829	0.703	0.13
	Elkharga	0.643	2.65	1.646	1.00
	Ave	0.59	1.45	1.02	0.43
Fat	ELdakhla	1.2	2.2	1.7	0.50
	Balat	0.55	2.55	1.55	1.00
	Elkharga	0.95	2.3	1.62	0.67
	Aver	0.90	2.35	1.62	0.72
TN	ELdakhla	0.371	0.757	0.559	0.16
	Balat	0.371	0.805	0.508	0.20
	Elkharga	0.430	0.775	0.591	0.16
	Aver	0.39	0.78	0.55	0.17
SN	ELdakhla	0.146	0.460	0.310	0.17
	Balat	0.082	0.458	0.237	0.16
	Elkharga	0.054	0.561	0.275	0.26
	Aver	0.09	0.49	0.27	0.11

* Stander Deviation

Table 3. Average counts of the microbial content of Laban Rayeb samples collected during winter season from different centers of New valley governorate.

Microbial count	Center name	Minimum	Maximum	Mean
Total count (T.C)	ELdakhla	42.5×10^6	62×10^6	52.25×10^6
	Balat	32×10^6	121×10^6	76.5×10^6
	Elkharga	0.39×10^6	2.785×10^6	1.587×10^6
	Aver	24.96×10^6	61.93×10^6	43.45×10^6
Lactic acid bacteria (LAB)	ELdakhla	24×10^5	120×10^5	72×10^5
	Balat	9.6×10^5	12.9×10^5	11.25×10^5
	Elkharga	10×10^5	16.2×10^5	13.1×10^5
	Aver	14.53×10^5	49.70×10^5	32.12×10^5
Proteolytic bacteria (Pro)	ELdakhla	0.05×10^4	1×10^4	0.525×10^4
	Balat	1.55×10^4	35.5×10^4	18.52×10^4
	Elkharga	2.2×10^4	4.85×10^4	3.5×10^4
	Aver	1.26×10^4	13.78×10^4	7.51×10^4
Mold and yeast (M&Y)	ELdakhla	0.1×10^4	5.3×10^4	2.7×10^4
	Balat	1×10^4	26×10^4	13.5×10^4
	Elkharga	0.8×10^4	55×10^4	27.9×10^4
	Aver	0.63×10^4	28.77×10^4	14.7×10^4

The results were indicated that the total acidity of these samples collected in summer season (Table 2) were higher than the samples of winter season Table (1). These results were agreement with those obtained by Abd El Gawad *et al.*, (2010) who reported that the mean log count of lactic acid bacteria in Laban Rayeb samples collected from different areas in Egypt were 2.2×10^6 , 1.66×10^6 , 2.2×10^6 , 2.30×10^7 , 2.0×10^7 cfu/ml.

Table 4. Average counts of the microbial content of Laban Rayeb samples collected during summer season from different centers of New valley governorate.

Microbial count	Center name	Minimum	Maximum	Mean
Total count (T.C)	ELdakhla	15×10^6	67×10^6	41×10^6
	Balat	52×10^6	163×10^6	107.5×10^6
	Elkharga	7.1×10^6	8.8×10^6	7.95×10^6
	Ave	24.7×10^6	79.6×10^6	52.15×10^6
Lactic acid bacteria (LAB)	ELdakhla	2.5×10^5	11.6×10^5	7.05×10^5
	Balat	46×10^5	176.5×10^5	111×10^5
	Elkharga	11.2×10^5	22.7×10^5	16.95×10^5
	Ave	19.90×10^5	70.27×10^5	45×10^5
Proteolytic bacteria (Pro)	ELdakhla	4×10^4	51×10^4	27.5×10^4
	Balat	22×10^4	38×10^4	30×10^4
	Elkharga	30×10^4	34×10^4	32×10^4
	Ave	18.67×10^4	41×10^4	29.83×10^4
Mold and yeast (M&Y)	ELdakhla	13.5×10^5	84×10^5	48.75×10^5
	Balat	0.35×10^5	6.4×10^5	3.38×10^5
	Elkharga	0.75×10^5	10×10^5	5.38×10^5
	Ave	4.87×10^5	33.47×10^5	19.17×10^5

Table 5: The Detection presence of coliform group and anaerobic bacteria in Laban Rayeb samples collected from different centers of New valley governorate. during winter and summer season.

Season	Winter season		Summer season	
	Coliform	Anaerobic	Coliform	Anaerobic
Locality				
Microbial group				
ELdakhla	+	-	+	-
Balat	+	-	+	-
Elkharga	+	-	+	-

On the other hand yeast and mold counts in samples of winter season was ranged from 0.63×10^4 to 28.77×10^4 cfu/ml with an average 14.7×10^4 cfu /ml, while their counts in the samples collected in summer season ranged from 4.87×10^5 to

33.47×10^5 with an average 19.17×10^5 cfu /ml .These results show the high content yeasts and molds organisms during summer season in examined Laban Rayeb samples.

Table (5) shows that the incidence Coliform bacteria was found to be positive in all samples of Laban Rayeb collected either during winter season or summer season. It is known that the coliform group is correlated the sanitary and hygienic condition applied during milking and manufacture of the product, while the presence of anaerobic spore former were negative.

CONCLUSION

In conclusion, Laban Rayeb produced traditionally in new valley governorate could be safe for consumption; however more attention must be paid to farmer for improving the hygienic condition of milking and equipment used.

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الخصائص الكيميائية والميكروبيولوجية للبن الرايب في محافظة الوادي الجديد، مصر

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أجريت دراسة مقارنة للخصائص الكيميائية والميكروبيولوجية للبن الرايب في محافظة الوادي الجديد أثناء موسم الشتاء وموسم الصيف وتم الحصول علي ٢٧ عينة من ثلاث مركز مختلفة من المحافظة (الداخلة - بلاط - الخارجة). وتم عمل التحليل الكيميائي للعينات والذي يتمثل في تقدير كلا من الرطوبة والجوامد الكلية ، الحموضة، الدهن، النيتروجين الكلي والنيتروجين الذائب. وأجري التحليل الميكروبيولوجي للعينات والذي يتمثل في العد الكلي للبكتريا، بكتريا حامض اللاكتيك، البكتريا المحللة للبروتين، الخمائر والفطريات والكشف عن وجود بكتريا القولون والبكتريا اللاهوائية.

أشارت النتائج الي ان متوسط القيم للرطوبة والجوامد الكلية ، الحموضة، الدهن، النيتروجين الكلي والنيتروجين الذائب كانت ٨٨,٦٤ ، ١١,٣٦ ، ٠,٧ ، ١,٥٣ ، ٠,٤١ ، ٠,١٨ علي الترتيب وذلك في موسم الشتاء بينما في موسم الصيف كانت ٨٦,٩٠ ، ١٣,١٠ ، ١,٠٢ ، ١,٦٢ ، ٠,٥٥ ، ٠,٢٧ علي نفس الترتيب. وأظهرت النتائج ان متوسط القيم العد الكلي للبكتريا، بكتريا حامض اللاكتيك، البكتريا المحللة للبروتين، الخمائر والفطريات كانت $١٠^٦ \times ٤٣,٤٥$ ، $٣٢,١٢ \times ١٠^٥$ ، $٧,٥١ \times ١٠^٤$ ، $١٤,٧ \times ١٠$ في عينات الموسم الشتوي علي الترتيب بينما في الموسم الصيفي كانت ٥٢,١٥ ، ٤٢ ، ٢٩,٨٣ ، ١٩,١٧ علي نفس الترتيب بالاضافة الي ان جميع العينات التي تم تحليلها موجبة لمجموعة الكوليفورم وسالبة لمجموعة البكتريا اللاهوائية.