

Chemical Composition of Buffalo's Raw Milk and its Rural Products in some villages in Sohag Governorate

By

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Abstract:

A lot of 180 samples of fresh buffalo's raw milk, and its rural milk products (laban rayeb, Samna, cream, Kareish cheese, and Mish cheese) were collected from 10 villages from Sohag Governorate). These samples were applied for chemical analysis (pH value, Total Solids, Ash, Total protein and Fat). It was found that the average contents were 6.73, 15.79%, 0.75%, 3.99 % and 6,71 % respectively for Buffalo's milk; 4.63, 11.53%, 0.67%, 4.68% and 2.23% respectively for Laban rayeb; 5.11, 53.5%, 0.52%, 3.04% and 31.4% respectively for Cream; 4.33, 98.61%, 0.05%, 0.19% and 98.38% respectively for Samna; 4.32, 26.56%, 3.02%, 15.31% and 4.24% respectively for Kareish cheese, and were 4.41, 38.8%, 11.37%, 18.51% and 4.9% respectively for Mish cheese. In the cases of Kareish and Mish cheese the cheeses, average of salt content were 7.1 and 15.39 respectively.

Statistical analysis showed that there were highly significant variations among products of the different villages. These variations may be attributed the different behavior of farmers through the milking and manufacture processes of these products.

Key word (milk-laban rayeb-Samna-cream- Kareish cheese- Mish cheese -Sohag Governorate)

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Introduction:

Milk is considered as a nearly complete food since it is a good source for protein, fat and major minerals. Also, milk and milk products are main constituents of the daily diet, especially for vulnerable groups such as infants, school age children and old age **(Davies, et al., 1986)**.

The physical and physical – chemical properties of Egyptian buffalo's milk had been investigated by **Abdel-salam and El- Shibiny (1966), Hofi, et al., (1966) and Soliman (2005)**

Laban rayeb is a type of fermented milks manufactured by Egyptian farmers. Fresh raw milk is placed in an earthenware pot (Matared) and left un-disturbed in a warm place until the cream rises which is churned into butter. The remain coagulated lower partially milk is called laban rayeb, which consumed as a fermented milk or converted to karish cheese **(El-Gendy, 1983)**

Cream is concentrated emulsion of milk lipid globules in skimmed milk. It is prepared commercially by centrifugal separation of the less-dense lipid phase from skimmed milk. Different types of cream are primarily classified according to their fat content (light coffee cream <10 %, coffee cream 15-18%, single or half cream 15-25 %, cream or full cream 30-40% and double cream 45-50%) **Tamime, (2009)**.

Chemically, ghee is a complex lipid consisting of mixed triglycerides, FFAs, phospholipids, sterols, sterols esters, fat-soluble vitamins, carbonyls, hydrocarbons, carotenoids (only in cow ghee), small amounts of charred casein and traces of calcium, phosphorus, iron and zinc. The composition varies depending upon several factors such as species of mammals, breed of cows or buffalos, feeding pattern and season or stage of lactation **Tamime, (2009)**.

Kariesh cheese is a soft acid cheese made from skimmed milk or butter milk obtained from churning of sour cream or by-product called Laban Khad with high protein and low fat contents; apparently it is made only on farmsteads. It is considered to be one of the most important traditional Egyptian dairy products, commonly made in the Egyptian countryside, especially in small villages. (Aldo, et al., (2013)

Abdalla and Ahmed (2010) were investigated the chemical composition of Mish cheese in three plants and they found that the Mish cheese chemical composition were significantly affected by the dairy plant. Fat, protein, total solids, and ash contents ranged from 5.27%, 7.44%, 18.59% and 1.31% respectively to 6.82%, 7.44%, 30.93% and 2.00% in the same respect

This work throws light on chemical composition of buffalo's milk and its rural products in Sohag Governorate, to conduct database used for evaluation the nutrient value of some traditional dairy foods common in most rural villages of Egypt.

Material and methods:

Investigated samples:

180 samples of fresh raw milk and some of house - made rural milk products that including, laban rayeb, Samna, cream, Kareish cheese, and Mish cheese were made from raw milk were collected from 10 villages in Sohag Governorate (Nza El-hesh, Enibes, Bnawett, Basona, Abar El-waqf, El-hwawwash, Arab El-sabha, Awlad Salem, El-mgabra, Mzata)

All investigated raw milk Samples as well as the rural milk products were of buffalo's milk. The above samples were kept under cooling till investigated for their chemical analysis.

Chemicals and Reagents:

All chemicals and reagents used in this study were of analytical grade supplied by BDH and Sigma chemical Companies. Distilled water was used for the preparation of all solutions. Pyrex glassware was used throughout.

chemical analysis:

Moisture, Total Nitrogen (T.N) and Ash:

The moisture, total nitrogen (T.N.) and ash investigated samples were estimated according to A.O.A.C (2000). The crude protein content was calculated as $TN \% \times 6.38$ (**Plummer, 1988**)

pH measurement:

pH of samples was measured using an **Orion pH meter**

Fat content:

The percentage of fat content in investigated samples had been estimated using Gerber method (**Ling, 1963**)

The percentage content of salt:

Salt content were determined by using the "Mohr method" of **A.P.H.A. (2004)**, using silver nitrate.

Statistical analyses:

The obtained data were programmed in a computer for statistical analysis using **SAS (1998)** program

Results and discussions:

The average value of chemical composition of buffalo's milk were 6.73, 15.79%, 0.75%, 0.63%, 3.99% and 6,71% for PH, total solids, ash, total nitrogen, total protein and fat contents respectively (Table 1).

Table (1) Average chemical composition of investigated buffalos milk and its rural products

The results in table (2) show the chemical composition of buffalo's milk from different investigated villages. The pH values ranged from

	No. of Samples	pH	TS %	Ash %	TN %	TP %	Fat %
Milk	30	6.727	15.79	0.745	0.631	3.991	6.709
Laban rayeb	30	4.625	11.53	0.671	0.73	4.682	2.225
Cream	30	5.107	53.5	0.522	0.482	3.042	31.4
Samna	30	4.332	98.61	0.049	0.055	0.19	98.38
Kareish cheese	27	4.31	26.56	3.021	2.386	15.21	4.27
Mish cheese	30	4.409	38.8	11.37	2.904	18.51	4.9

(6.62) to (6.92) for samples of Mzata and Arab El-sabha respectively. The highest total solids percent was recorded from Mzata samples (19.39%), while the lowest one was by Enibes samples (13.77%). The highest total protein content was obtained by El-mgabra village sample (5.14%) while the lowest one was given by samples of Naza El-hesh (3.26%). The content of fat ranged from (5.64%) to (8.4%) for sample of Awlad Salem and El-mgabra respectively. The variations of chemical composition of buffalo's milk were highly significantly, $p > 0.01$ (Table 8). These data of the chemical composition of milk were higher than those reported by **Bakry, et al (2011)** and lower than those found by **soliman, (2005)**.

Table (2) DUNCANS of chemical composition of Milk between investigated villages.

	pH	TS%	Ash%	TN%	TP%	Fat%
Nza El-hesh	6.70 def	15.26 fg	0.75 bcd	0.511 i	3.26 i	6.60 de
Enibes	6.71 cde	13.77 h	0.67 e	0.588 f	3.75 f	6 gf
Bnawett	6.73 bcd	13.82 h	0.88 a	0.602 e	3.84 e	7.32 b
Basona	6.72 bcd	15.39 e	0.71 cde	0.693 c	4.42 c	6.38 def
Abar El-waqf	6.8 b	15.30 f	0.75 bcd	0.644 d	4.11 d	7.2 bc
El-hwawesh	6.65 def	15.74 d	0.7 de	0.644 d	4.11 d	6.12 gef
Arab El-sabha	6.92 a	16.42 c	0.68 e	0.567 g	3.62 g	6.72 cd
Awlad Salem	6.63 ef	15.21 g	0.76 bcd	0.532 h	3.39 h	5.64 g
El-mgabra	6.79 bc	17.63 B	0.76 bcd	0.805 a	5.14 a	8.40 a
Mzata	6.62 f	19.39 a	0.77 bc	0.726 b	4.97 b	6.96 bcd

In The same column, means the same letter are not significant different $p > 0.01$

probably levels. a>b>c>d>e>f>g>h>i>j

The mean values of Laban rayeb composition was 4.63, 11.53%, 0.67%, 0.73 %, 4.68% and 2.23% for PH, total solids, moisture, ash, total nitrogen, total protein and fat content respectively (Table 1)

(Table 3) revealed that there were variations in the chemical composition of Laban rayeb among the different investigated villages. These variations were highly significant $p > 0.01$ (Table 8). The pH values ranged from (4.16) to (4.92) for samples of Bnawett and Arab El-sabha respectively. The highest total solids percent was found in Nza El-hesh (13.94%) while the lowest one was by Arab El-sabha (9.5%).

The highest total protein content was obtained by the sample of Mzata (5.9%) while the lowest one was of that from Bnawett (4.06%).The content value of fat ranged from (1.2%) to (3.00%) for sample of Awlad Salem and El-mgabra respectively. The pH value of

investigated Laban rayeb was in agreement with those found by **Abd-Elhamid, et al (2008)**, while they reported low values for others constitutes.

Table (3) DUNCANS of chemical composition of Laban rayeb between investigated villages.

	pH	TS%	Ash%	TN%	TP%	Fat%
Nza El-hesh	4.87 b	13.94 a	0.75 a	0.742 d	4.73 bc	2.10 cd
Enibes	4.67 cd	12.97 b	0.63 cde	0.693 f	4.42 bcd	2.50 abc
Bnawett	4.16 g	10.46 e	0.62 ed	0.637 I	4.06 d	2.80 a
Basona	4.82 b	10.21 ef	0.74 ab	0.661 h	4.49 bcd	2.75 ab
Abar El-waqf	4.52 e	9.83 fg	0.70 abcd	0.784 b	5.00 b	1.80 de
El-hwaweash	4.64 d	12.58 b	0.71 abc	0.679 g	4.33 cd	2.16 bcd
Arab El-sabha	4.93 a	9.5 g	0.57 e	0.693 f	4.453 bcd	2.50 abc
Awlad Salem	4.52 e	12.75 b	0.63 ced	0.777 c	4.96 b	1.20 f
El-mgabra	4.40 F	12 C	0.66 bcd	0.707 e	4.51 bcd	3.00 a
Mzata	4.72 c	11.03 d	0.70 abcd	0.924 a	5.90 a	1.44 ef

In The same column, means the same letter are not significant different $p > 0.01$ probably levels $a > b > c > d > e > f > g > h > i > j$.

The averages of chemical composition of cream were 5.11, 53.5%, 0.52%, 0.48 %, 3.04% and 31.4% for pH, total solids, ash, total nitrogen, total protein and fat content respectively as shown by (Table 1).

The results in table (4) show the chemical composition of cream samples from different villages. The pH values ranged from (4.76) to 5.71) for samples of El-hwaweash and El-mgabra respectively. The highest total solids percent was given by samples of El-hwaweash (84.2%) while the lowest one was found in Mzata samples (42.69%).The highest total protein content was of Mzata samples (4.06%) while the

lowest one was for sample of Naza El-hesh (2.29%). The content value of fat ranged from (16.8%) to (52.5%) for sample of El-hwaweash and Nza El-hesh respectively. The variations of chemical composition of Cream between investigated villages were highly significant $p > 0.01$ (Table 8). The present average of Fat value cream was higher than that registered by **Bssette and Acosta (1988)**.

Table (4) DUNCANS of chemical composition of cream between investigated villages

	TS%	Ash%	TN%	TP%	Fat%	TS%
Nza El-hesh	5.22 c	59.51 c	0.56 bc	0.406 h	2.29 h	52.50 a
Enibes	4.83 g	46.34 h	0.57 b	0.462 e	2.95 e	29.40 e
Bnawett	4.85 f	43.92 i	0.51 cd	0.455 f	2.9 e	36.75 d
Basona	5.02 e	49.97 e	0.60 ab	0.476 d	3.04 d	42.00 c
Abar El-waqf	5.17 d	50.50 d	0.58 b	0.385 J	2.46 g	21.00 g
El-hwaweash	4.76 h	84.2 a	0.29 f	0.39 I	2.50 g	16.80 h
Arab El-sabha	5.02 e	48.85 f	0.49 d	0.623 b	3.94 b	21.00 g
Awlad Salem	5.17 d	47.85 g	0.43 e	0.546 c	3.48 c	23.10 f
El-mgabra	5.71 a	61.21 b	0.54 bcd	0.434 g	2.77 f	48.30 b
Mzata	5.32 b	42.69 j	0.642 a	0.637 a	4.06 a	23.10 f

In The same column, means the same letter are not significant different $p > 0.01$ probably levels. $a > b > c > d > e > f > g > h > i > j$

The averages chemical composition of samna were 4.33, 98.61%, 0.05%, 0.055 %, 0.19% and 98.38% for PH, total solids, ash, total nitrogen, total protein and fat content respectively (Table 1).

The results in table (5) show the chemical composition of samna samples from different villages. The PH values ranged from (3.1) to (5.6)

for samples of Arab El-sabha and Nza El-hesh respectively. The highest total solids percent was in samples of El-hwaweash (99.92%) while the lowest one was of Bnawett samples (92.98%).

Table (5) DUNCANS of chemical composition of samna between investigated villages.

	pH	TS%	Ash%	TN%	TP%	Fat%
Nza El-hesh	5.60 a	99.36 cd	0.07 ab	0.04 c	0.22 b	99.07 f
Enibes	4.8 c	99.53 c	0.02 b	0.021 e	0.13 d	99.38 d
Bnawett	5.10 b	92.98 g	0.08 ab	0.028 d	0.18 c	92.72 j
Basona	4.5 d	99.17 d	0.05 ab	0.035 c	0.22 b	98.87 g
Abar El-waqf	4.70 c	98.80 e	0.03 b	0.28 a	0.18 c	98.56 h
El-hwaweash	3.63 g	99.92 a	0.03 b	0.021 e	0.13 d	99.76 a
Arab El-sabha	3.1 h	99.82 Ab	0.16 a	0.042 b	0.27 a	99.51 b
Awlad Salem	3.72 f	99.48 cd	0.04 ab	0.035 c	0.22 b	99.22 e
El-mgabra	3.64 g	99.68 abc	0.05 ab	0.035 c	0.22 b	99.41 c
Mzata	4.37 e	97.08 f	0.04 ab	0.021 e	0.13 d	97.25 i

In The same column, means the same letter are not significantly different $p > 0.01$ probably levels $a > b > c > d > e > f > g > h > i > j$.

The highest total protein value was for samples of Arab El-sabha (0.27%) while the lowest value was for Mzata (0.13) samples. The content of fat ranged from 92.72% to 99.76% for sample of Bnawett and El-hwaweash respectively. The chemical composition variations of samna among investigated villages were highly significant $p > 0.01$ (Table 8).

The mean values of Kareish cheese composition were 4.32, 26.56%, 3.02%, 2.403 %, 15.31% and 4.24% for PH, total solids, ash, total nitrogen, total protein and fat contents respectively (Table 1).

The chemical composition analysis of Kareish cheese revealed that there are highly significant variations at $p > 0.01$ between investigated villages samples (Table 8). The pH values ranged from 3.99 to 4.49 for samples of Arab El-sabha and both of Abar El-waqf and Basona villages respectively.

Table (6) DUNCANS of chemical composition of Kareish cheese between investigated villages.

	pH	TS%	Ash%	TN%	TP%	Fat%	Salt%
Nza El-hesh	4.41 b	27.9 c	4.57 a	2.36 e	15.04 f	5.40 a	7.46 d
Bnawett	4.14 f	25.19 g	3.41 bc	2.14 f	13.63 g	2.50 bc	9.06 a
Basona	4.49 a	28.16 b	1.8 e	2.61 c	16.65 c	6.00 a	5.51 f
Abar El-waqf	4.49 a	21.70 h	1.44 d	2.1 f	13.34 h	3.50 b	4.86 g
El-hwaweash	4.22 e	26.04 g	1.57 d	1.85 g	11.79 I	6.00 a	8.25 c
Arab El-sabha	3.99 g	26.48 e	2.69 cd	2.47 d	15.77 d	3.50 b	7.21 e
Awlad Salem	4.31 d	30.7 a	4 ab	2.82 a	17.98 a	5.50 a	7.22 e
El-mgabra	4.35 c	26.9 D	4.40 a	2.72 b	17.33 b	4.00 b	5.57 f
Mzata	4.42 c	26.01 f	3.31 c	2.41 e	15.36 e	2.00 c	8.65 b

In The same column, means the same letter are not significantly different $p > 0.01$ probably levels. a>b>c>d>e>f>g>h>i>j.

The highest total solids value was from sample of Awlad Salem (30.7%), while the lowest value was for Abar El-waqf (21.7%). The highest total protein content was found by Awlad Salem samples (17.98%), while the lowest value was of El- hwaweash samples (11.79%). Fat content value was the highest in both of El- hwaweash and

Basona (6%), while the lowest one was given by samples of Mzata (2.00%) (Table 6). The average values of chemical composition of kareish cheese were lower than those found by **Bakry et al (2011)** except both of fat and protein which were in agreement. **Mohran et al., (1984)** showed some variations that were higher in total solids and protein than present results.

The averages chemical composition of Mish cheese were 4.41, 38.8%, 11.37%, 2.91 %, 18.51% and 4.9% for PH, total solids, ash, total nitrogen, total protein and fat contents respectively (Table 1).

The variations of chemical composition of Mish cheese among investigated villages' samples were highly significant $p > 0.01$ (Table 8).

The results in table (7) show the chemical composition of Mish cheese samples collected from different villages. The PH values ranged from 3.65 to 5.35 for samples of Mzata and Awlad Salem respectively. The highest total solids percent was recorded from Nza El-hesh samples (46.02%), while the lowest value was of Mzata samples (33.36%). The highest total protein content was obtained by Mzata samples (24.29%), while the lowest one was by Abar El-waqf samples (14.62%). The fat content value ranged from 3% to 7% for samples of Awlad Salem and El-mgabra respectively. Such data of the content value of total solids, protein and ash were higher than that reported by **Abdalla and Ahmed (2010)**, while the fat content value was less than their results.

Table (7) DUNCANS of chemical composition of Mish cheese between investigated villages.

	pH	TS%	Ash%	TN%	TP%	Fat%	Salt%
Nza El-hesh	4.23 f	46.02 a	15.56 a	2.84 e	18.11 e	4.50 bcd	23.41 a
Enibes	4.41 e	40.17 d	13.57 b	2.86 e	18.23 e	5.00 bc	16.94 b
Bnawett	4.11 g	36.06 h	12.07 d	2.40 f	15.30 f	6.00 ab	14.76 cd
Basona	5.01 b	39.97 e	12.52 c	2.98 d	19 d	5.00 bc	15.97 c
Abar El-waqf	4.50 d	42.1 b	15.60 a	2.29 g	14.62 g	5.00 bc	22.48 a
El-hwaweash	4.82 c	40.24 c	9.87 f	3.50 b	22.33 b	4.00 cd	13.91 d
Arab El-sabha	3.81 h	38.39 f	6.68 i	3.14 c	20 c	6.00 ab	12.39 e
Awlad Salem	5.35 a	33.89 I	8.11 g	2.89 e	18.32 e	3.00 d	12.47 e
El-mgabra	4.20 f	37.82 g	11.92 e	2.33 fg	14.85 fg	7.00 a	15.97 c
Mzata	3.65 i	33.36 j	7.80 h	3.81 a	24.29 a	3.50 cd	5.58 f

In The same column, means the same letter are not significantly different $p > 0.01$.

probably levels. $a > b > c > d > e > f > g > h > i > j$.

Conclusion:

From these study it was concluded that there are a wide and significant variations of buffalos milk produced by different villages at Sohage gvernotare, may be due to the individual differences among the lactating buffalos and milking conditions, as well as the animal feeding among these villages. Also it could be concluded that there are a significant variations in the composition of house made milk products this may be due the traditional of investigated villages.

Table (8) ANOVA analysis for investigated sohag villages.

Products	S.O.V +	d.f. ++	MS					
			pH	TS%	Ash%	TN%	TP%	Fat%
Milk	L	9	0.025**	8.57**	0.011**	0.025**	1.47**	1.88**
	Error	20	0.002	0.001	0.001	.00001	0.0001	0.103
Laban rayeb	L	9	0.164**	6.95**	0.01**	0.021**	0.787**	1.075**
	Error	20	0.001	0.101	0.002	0.001	0.102	0.106
Cream	L	9	0.24**	457.7**	0.031**	0.025**	1.13**	481**
	Error	20	0.0001	0.002	0.001	0.001	0.002	0.306
Samna	L	9	1.87**	13.62**	0.005**	0.019**	0.007**	13.34**
	Error	20	0.001	0.03	0.004	0.001	0.0001	0.0001
Kareish cheese	L	9	0.078**	396**	3.94**	0.27**	11.1**	6.13**
	Error	20	0.0001	0.004	0.13	0.001	0.0001	0.51
Mish cheese	L	9	0.84**	43.56**	30**	0.73**	29.82**	4.47**
	Error	20	0.002	0.001	0.002	0.002	0.13	0.80

+ source of variance ++ degree of freedom **very significant

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التركيب الكيميائي للبن الجاموسي الخام ومنتجاته الريفية في بعض قري محافظة سوهاج

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الملخص العربي

تم تجميع حوالي ١٨٠ عينة من اللبن الجاموسي الخام ومنتجاته الريفية والتي إشتملت علي كل من: اللبن الرايب- القشدة- السمن- الجبن القريش- جبن المش من عشر قري بمحافظة سوهاج. وتم تحليل تلك العينات لمعرفة تركيبها الكيميائي. من حيث رقم الحموضة و المادة الصلبة الكلية والرماد والنتروجين الكلي والبروتين الكلي والدهن حيث وجد ان متوسط نتائج التحليل كانت كما بالجدول التالي:

المنتجات	رقم الحموض	الجوامد الكلية %	الرماد %	النتروجين الكلي %	البروتين الكلي %	الدهن %
لبن جاموسي	6.727	15.79	0.745	0.631	3.991	6.709
لبن رايب	4.625	11.53	0.671	0.73	4.682	2.225
قشدة	5.107	53.5	0.522	0.482	3.042	31.4
سمن	4.332	98.61	0.049	0.055	0.19	98.38
جبن قريش	4.31	26.56	3.021	2.386	15.21	4.27
جبن المش	4.409	38.8	11.37	2.904	18.51	4.9

وقد وجد ان متوسط نسبة الملح في الجبن القريش تساوي ٧.١٪ بينما كان محتوى جبن المش من الملح مرتفع بمتوسط قدره ١٥.٣٩ ٪ ، وقد اوضحت التحليلات الاحصائية للنتائج المتحصل عليها وجود اختلافات معنوية جدا بين القري في تركيب جميع المنتجات وقد يعزي ذلك الي اختلاف سلوك الفلاحين اثناء عمليتي الحليب وتصنيع هذه المنتجات.

الكلمات الدالة: اللبن- اللبن الرايب- القشدة- السمن- الجبن القريش- جبن المش-محافظة سوهاج