

## Chemical and Microbiological characteristics of Ras cheese collected from Assiut markets

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### Abstract

A group of fifteen Ras cheese samples collected at random from markets in Assiut Governorate as well as five samples as a second group of the same cheese being made in the Dairy Department of Assiut University were analyzed for certain chemical and microbiological properties. The mean value of moisture content was 35.96% in the first group and 40.86% in the second group. The average of titratable acidity, of Fat, of Fat/dry matter, of salt, and of salt in water phase, in the first group were, 1.51%, 35.27%, 52.21%, 3.59% and 10.20%, respectively, while these values in the second group were, 1.22% , 29.9% , 50.62% , 4.90% and 12.06% in the same respect.

The average content of the total nitrogen was 3.47% corresponding to 22.14% total protein (T.P.) in the 1<sup>st</sup> group and 3.76% corresponding to 24.01% of (T.P) in the 2<sup>nd</sup> group. S.N. /T.N. ranged from 8.05% to 24.05% with an average of 16.43 % in the 1<sup>st</sup> group. The cheese D.M % and Fat /D.M % matched the Egyptian official regulations and the salt/water phase was enough to prevent the growth of coliform

bacteria.

The microbiological analyses revealed that the average bacterial count in the 1<sup>st</sup> group was  $46.12 \times 10^6$  cfu/gm which was higher than that in the 2<sup>nd</sup> group ( $26.27 \times 10^6$  cfu/gm).

A wide variation in the total bacterial count was found among the different cheeses samples. coliform bacteria were detected with low counts (50 cfu/gm) in few samples of the 1<sup>st</sup> group, and were not detected in all samples of the 2<sup>nd</sup> group. The numbers of Yeasts and Moulds ranged from 0.00 to  $24.0 \times 10^5$  cfu/gm.

It was concluded that the chemical and microbiological analysis reflect the need of renewal of the standards for the manufacture of Ras cheese in Egypt.

**Key words:** Ras cheese, chemical composition, microbiological analyses, Assiut markets

### Introduction

Ras cheese is the national hard cheese type 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), it is

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made from raw cow milk or from a mixture of cow and buffalo milks. Different groups of microorganisms would be present in this cheese from the used raw milk and from the surrounding environment (Girgis *et al.*, 1992). Some of these microorganisms participate in the development of flavour, body texture, and some of them are undesirable which cause some defects in this cheese. Owing to uncontrolled hygienic conditions, it can be contaminated by moulds and yeasts. Therefore, the final flavour and texture of Ras cheese is influenced by the action of this flora. (Ayad *et al.*, 2004).

Egyptian Standards (2001) stated the chemical and microbial standards of Ras cheese as follows: dry matter % and Fat/D.M % must be not less than 60 and 45%; respectively, and the final product must be free from pathogenic microorganisms. coliforms, yeasts and moulds must be not exceeding 10,100 and 10 cfu/g, of cheese respectively. The chemical and microbial qualities of Ras cheese being collected from Alexandria markets have been investigated (Attia and Gouda, 1987, El-Soda *et al.*, 2003 and Ayad *et al.*, 2004), Cairo and Giza markets (Girgis, *et al.*, 1992 and El-Sayed, *et al.*, 1993) and those markets of Delta region (Awad, *et al.*, 2003 and Ibrahim, 2006).

There is no published data cited on Ras cheese of Assiut markets. The present work investigates the chemical and

microbiological characteristics of Ras cheese available in Assiut markets.

#### Materials and Methods

Fifteen samples of Ras cheese were collected at random from the local Supermarkets in Assiut Governorate as well as five samples being made in the Experimental laboratory of the Dairy Department, Faculty of Agriculture, Assiut Univ. About 100 g of cheese samples were cut with a sterile knife into small pieces and 10 grams of cheese was grounded and mixed with 90 ml 2% sterilized sodium citrate solution under aseptic conditions for the microbiological analysis. The rest of cheese was taken for chemical analysis.

Serial dilutions were made from the above sodium citrate–cheese solution by using of sterile 0.90% saline solution. The total bacterial count was determined using Standard plate count (spc). Plates were incubated at 32±2°C for 48 h. Moulds and Yeasts were detected using potato Dextrose Agar (PDA) recommended by A.P.H.A. (1992) and the incubation was carried out at 25°C for 7 days.

The existense of coliforms were examined using MacConkey broth and incubated at 33-37°C for 24 h. (Mohran, 1971).

The moisture content of the examined cheese was determined according to the methods of A.O.A.C. (2000).

The fat content of cheese had been estimated using Gerber

method (Ling, 1963). The total nitrogen (T.N %) and soluble nitrogen (S.N. %) were determined using the Kjeldahel method reported in A.O.A.C. (2000) and the total proteins (T.P %) was calculated using the following formula (Plummer, 1988):

$$\text{T.P}\% = \text{T.N}\% \times 6.38.$$

Titratable acidity of cheese samples were estimated according to A.O.A.C. (2000), and calculated as % of lactic acid. Salt content of cheese was determined using" Mohr method of A.P.H. A. (2004).

### **Results and Discussion**

**Table (1)** shows the chemical composition of the two groups of Ras cheese samples. The moisture content in the market samples (1<sup>st</sup> group) (ranged between 26.49 and 42.40% with an average of 35.96 %), while it ranged from 39.96 - 42.68% with an average of 40.86 % in the Lab-made samples (2<sup>nd</sup> group). The moisture contents in the examined cheese samples were in agreement with those found by Attia and Gouda (1987), Awad *et al.* (2003) and Ibrahim (2006),

for cheese samples from Alexandria, Delta and Kafr El-Sheik, respectively.

The dry matter in the investigated Ras cheese samples ranged from 57.60 – 73.51% with an average of 64.04 % and from 57.32 – 60.09% with an average 59.14 % in the first and second groups; respectively. These values were higher as compared with the market Ras cheese examined by El-Soda and Abou-Donia (1978), Attia and Gooda (1987), Awad *et al.* (2003) and Abd-Alla (2005), but in the same trend with Girgis *et al.* (1992) and Ibrahim (2006) and matched with The Egyptian Standards (2001).

The statistical analysis represent that the differences between moisture and total solids content in the two examined Ras cheese groups were significant.

Data in Table (1) reveal that the acidity % of the first group ranged from 0.6 to 2.18% with an average of 1.51%, while in the second groups, it ranged from 1.15 -1.36 % with an average of (1.22%). Theses variations were not significant.

Table 1: Some chemical characteristic of Ras cheese in Assiut markets:

Cheese samples	Market samples <sup>1</sup>		Lab. Made <sup>2</sup>		t-test
	Average	Range	Average	Range	
Chemical composition					
Moisture %	35.96	26.49-42.40	40.86	39.96-42.68	*
Total solids %	64.04	57.60-73.51	59.14	57.32-60.09	*
Acidity %	1.51	0.6-2.18	1.22	1.15-1.36	n.s
Fat % (in cheeses)	35.27	29-41	29.90	30-30	**
Fat/dry matter (F/D.M. %)	52.21	45.98-65.23	50.62	49.97-52.34	n.s
Salt % (in cheese)	3.59	2.05-4.8	4.90	3.71-5.01	**
Salt/serum%	10.20	4.96-14.29	12.06	8.69-12.54	n.s
Total nitrogen (T.N. %)	3.47	3.02-3.98	3.76	3.5-3.68	n.s
Total protein (T.P. %)	22.14	19.27-25.20	24.01	22.33-23.45	n.s
Soluble nitrogen (S.N. %)	0.57	0.28-0.76	-	-	*
Soluble nitrogen (S.N / T.N. %)	16.43	24.05-8.05	-	-	*

(1) Average of 15 samples.

(2) Average of 5 samples.

\*: Significant \*\*: Highly significant n.s: Non significant

The average of fat percentage of the first group was higher (35.27%) than that of the second group (29.90%). The same trend was observed when calculated as Fat/dry matter (F/D.M %) being, 52.21% and 50.62%, in the same manner. The differences in cheese fat contents between the two groups were highly significant, while not significant when calculated as Fat/DM.

The (F/D.M %) of market and Lab-made cheese samples are higher than that required by The Egyptian Standards (2001), (45%). The same conclusion was also reported by Girgis, *et al.* (1992) and Awad *et al.* (2003). But the present values are higher

than those found by Attia and Gooda (1987) and Ibrahim (2006).

The salt content in the two groups of Ras cheese samples ranged from 2.05 to 4.8% and 3.71 to 5.01% with averages of 3.5 and 4.9 %, for market and Lab- made cheeses; respectively. This content in the cheese serum were 10.20% and 12.06% in the same respect. It was found that the differences of salt contents in the two groups of cheese were highly significant, while these variations in salt/ serum contents were not significant. Such results agree with the findings of Attia and Gooda (1987), Girgis *et al.* (1992), Awad *et al.*

(2003) and Ibrahim (2006). The high levels of salt content in the water phase affected the growth of Lactic acid bacteria during the ripening period and also the changes of the titratable acidity in cheese.

It could be observed from (Table 1) that the total nitrogen (T.N) contents of market cheese samples ranged between 3.02 and 3.98%, with an average of 3.47%, while those for Lab-made cheeses were (3.5 and 3.68%) with an average of 3.76%. The same trend was obtained when calculated as total protein % (T.P %) which ranged from 19.27-25.20% and 22.33 -23.45% with an average of 22.14 and 24.01% for the first and second groups; respectively.

On the other hand, the soluble nitrogen content in market cheese samples ranged from 0.28 to 0.76%, with a mean value of 0.57%. When this value was calculated as ratio of T.N, it ranged from 8.05 to 24.05% with an average of 16.43 %. The obtained S.N% and S.N/T.N% were higher than that found by Attia and Gooda (1987), 0.44% and 9.89%, respectively.

The wide variations in the chemical composition of the present study and those from previous studies reflect the need of renewal of the standards procedures in selecting the raw material used, the conditions of manufacture and storage of this cheese.

Table (2) shows the microbiological evaluation of the two

Ras cheese groups. The average of the total bacterial count (T.C.) as colony forming unit (cfu/g cheese) is tabulated in Table (2). The first group contained from 0.12 to  $250 \times 10^6$  with a mean value of  $46.12 \times 10^6$  cfu/g, while the second group of cheese contained between 4.05 and  $48.5 \times 10^6$  cfu/g of cheese with an average of  $26.27 \times 10^6$  cfu/g. These results reveal no significant variation in the T.C. of various samples of the investigated two groups of Ras cheese. These variations would depend on the hygienic conditions prevailing during the cheese making as well as the salt content and the probable using of starter or not. The relatively low values of T.C. obtained in some samples might be due to the previously heat treatments of the used milk and /or to the high average of the used salt and low moisture contents. As shown in Table (2) coliforms bacteria were not detected in all cheese samples of Lab- made and some of samples collected from the markets. This might be due to a previous heat treatment of the used milk and the high content at salt.

These findings agree with the results of Attia and Gooda (1987), Girgis *et al.* (1992), but were lower than that found by Ibrahim (2006), that coliforms bacteria were found in a number ranged from  $6.0 \times 10^3$  to  $3.4 \times 10^3$  cfu/g with an average of  $0.50 \times 10^2$  cfu/g.

Assessments of Yeasts (Y) and Moulds (M) counts gave the

same trend of coliforms, where their numbers ranged from 0.00 to  $24.0 \times 10^5$  cfu/g in market cheese samples with an average of  $20.75 \times 10^4$  cfu/g, 70 to  $40 \times 10^2$  cfu/g with average of 23 cfu/g in

the Lab-made cheese samples. The obtained count of (Y&M) was lower than those found by Girgis et al. (1992), who reported a mean counts are  $21.81 \times 10^4$  cfu/g.

**Table 2: Microbial evaluation of Ras cheeses:**

Cheese samples Counts and detection	Market samples <sup>1</sup>		Lab. Made <sup>2</sup>		t-
	Average	Range	Average	Range	
T.B.C. $\times 10^6$ (CFU/g cheese)	46.12	0.12-250.00	26.27	4.05-48.5	n.s
Y.&M. $\times 10^4$ (CFU/g cheese)	20.75	0.00-240.00	0.023	0.007-0.04	n.s
Detection of coliform bacteria $\times 10^2$ (CFU/g cheese)	0.50	0.00- $10^2$	0.0	0.0-0.0	n.s

- (1) Average of 15 samples.
- (2) Average of 5 samples.

\*: Significant    \*\*: Highly significant    n.s: Non significant

In general, the present microbiological results agree with those obtained by Attia and Gooda (1987), Girgis et al. (1992) and Ibrahim (2006).

It is clear that the total microbial count in the present study was slightly higher and this could be attributed to the contamination, which might took place during processing, and or the use of contaminated raw milk.

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## بعض الخواص الكيميائية والميكروبيولوجية للجبن الراس فى أسواق



دينا مصطفى عثمان ، يوسف حسنين شاهين ، حسين عبد الجليل أحمد ، محمد عطيه مهران  
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جرى تقدير بعض الخواص الكيميائية والميكروبيولوجية لعدد خمس عشرة عينة جبن راس جمعت عشوائيا من محلات البيع بأسيوط إلى جانب خمس عينات من إنتاج معمل قسم الالبان بالجامعة.

ووجد أن المحتوى الرطوبي لجبن السوق 35.96% ولجبن المعمل 40.86% والجوامد الكلية تمثل 64.04% و 59.14% على الترتيب كما أن النسبة المئوية لكل من الحموضة - الدهن - الدهن فى المادة الجافة - الملح - الملح فى سيرم الجبن لجبن عينات السوق على النحو التالى : 1.51 - 35.27 - 52.21 - 3.59 و 10.20% على الترتيب بينما فى جبن المعمل كانت تلك القيم كما يلي: 1.22 - 29.9 - 50.62 - 4.90 و 12.06 % بنفس الترتيب.

ونسبة النيتروجين الكلى لجبن السوق يساوى 3.47% ، والتى تعادل 22.14% ، بروتين كلى اما لجبن المعمل فهي 3.76% بما يعادل 24.01% بروتين كلى . كما أن متوسط النسبة المئوية للنيتروجين الذائب على النيتروجين الكلى (SN/TN %) لعينات السوق تعادل 16.43% و تتراوح بين 8.05% و 24.05%.

كما ان نسبة المادة الجافة والدهن فى المادة الجافة تطابق المطلوب بالقانون المصرى. أظهرت نتائج التحليل الميكروبيولوجى زيادة العدد الكلى للميكروبات لعينات السوق عن عينات معمل الكلية حيث كانت فى الأولى 46.16 مليون بينما فى الثانية تساوى 26.27 مليون وحدة مستعمرة فى الجرام مع خلو جميع عينات المعمل من بكتيريا القولون وكذلك بعض عينات السوق واحتواء البعض الاخر على معدل منخفض منها (50 وحدة مستعمرة/جرام). وتراوح عدد الخمائر والفطريات بين الصفر 2.4 مليون مستعمرة/ جرام.

ويستنتج من نتائج الدراسة الحاجة فى مصرالى ضرورة تجديد المواصفات القياسية لصناعة جبن الراس و ضرورة التزام صانعى الجبن الراس بالمواصفات القياسية المحددة فى القانون بعد تجديده.