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Chemical and Bacteriological Evaluation of White Full Cream packed and Unpacked Soft Cheese

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Abstract

The aim of This work to evaluate chemical composition and bacteriological contamination of white full cream soft cheese. Twinty random samples of packed and unpacked (10 of each) white soft cheese were collected from different local markets at Kafr El Zayat cit,(EL-Gharbia Gov.), there were decreasing in protein content, volatile fatty acids and calcium % in unpacked white soft cheese with mean values (14.8 ± 1.9, 1.1 ± 0.03 and 7.4 ± 0.06) when comparison with mean values of packed soft white cheese (20.12 ±1.2, 1.7 ± 0.08 and 7.6 ± 0.04) respectively. The bacteriological examination revealed that there were a significance increase in total bacterial count, the Enterobacteriaceae, coliform count and staphylococci count in unpacked white soft cheese with mean values (7×10^5 ± 0.18, 3.12 $\times10^3$ ± 0.45, 1.27× 10^3 ± 0.1 and 3.44 $\times10^3$ ± 0.23) when comparison with mean values of packed soft cheese (3×10^3 ± 0.28, 2.05× 10^2 ±0.37, 1.42×10^2 ± 0.29 and 1.15×10^2 ± 0.26) respectively. Serological typing of E. coli strains of which isolated from unpacked soft white cheese in a percentages of 1% was belonged to O_{119} : K $_{69}$ (B_{19}). No any samples examined was positive to staphylococcus aureus. The microbiological finding showed the presence of high counts of micro-organisms investigation and poor hygienic quality.

Introduction

Cheese is produced throughout the world; it is an ancient food with origins that predate recorded history. It is a dairy product made from pressed milk curds. Different varieties are made from unripened (fresh) cheese or ripened (aged) cheese. White full cream soft cheese is the most popular type of cheese produced in Egypt, as it is consumed by a large section of population. It is prepared under a variety of condition and gets frequently contaminated by different micro-organisms during processing, handling, distribution and storage. Bad Manufacture Practice (BMP) may lead to disturbance in chemical composition which may render the product repulsive and even unfit for human consumption or may even constitute a health hazards among consumers. With increasing in milk price, some producers may resort to adultration to get false traditional product by adding oils to skimmed milk to enhance taste and flavor. Plant oil as source of fat in cheese may disturb proximate

composition and physiochemical properties of cheese (Li and Jiang, 2004). Cheese is a vital fermented dairy product which had a major role in human nutrition for centuries. Cheese is perhaps the oldest processed food known to mankind and one of the most ubiquitous food stuffs in the world (Chemical and Engineering News, 2000). It is an excellent tasty, 99% digestible energy food, which is suitable for all age groups and contains high quality proteins(Koskowiski 1982). According to Ramkant (2006) cheese is a product that made from the curd obtained from milk by coagulating the casein with the help of rennet or similar enzymes in the presence of lactic acid microorganism.In this respect, Law(1999) defined cheese as the fresh or ripened product obtained after coagulation and whey separation of milk, cream or partlyskimmed milk, buttermilk or a mixture of these products. The objectives of cheese making are to obtain the optimum cheese composition with respect to moisture, acidity, pH, fat, protein and minerals (Price and Bush,1974). So ,the main objective of this study was to investigate the chemical and Bacteriological examination composition of packed and unpacked white soft cheese.

Materials and Methods

Twenty random cheese samples (packed and unpacked white soft cheese 10 of each) were collected from different places (local markets) in Kafr El-Zayatcity(5 samples from each source). Each sample was collected in clean dry and sterilized plastic container. All collected samples were then placed in an insolated box containing ice crystals, to suppress microbial growth during transportation to the laboratory. The samples were kept at 4º C till applying different examinations.

1- The Bacteriological examination was carried out and follow's ;

Preparation of serial dilution (A.P.H.A,1992).

1. Determination of total bacterial count according to(I.C.M.S.F,1986).
2. Coliform and Enterobacteriaceae count.
3. Staphylococci count.
4. Isolation and Identification of Escherichia coli (Edwards and Ewing,1972).
5. Isolation and Identification of Staphylococcus aureus described by A.O.A.C(2000)

2- Chemical analysis:

Collected cheese samples were analyzed chemically to determine the following parameters:

Moisture content, protein content, ash content, calcium and phosphorus according to AOAC(2000). Fat content was determined according to Foley and Murphy(1974). The total

volatile fatty acids (TVFA) content in cheese was determined by the direct distillation method of Koiskowski(1982). Vitamin A was determined according to AOAC(2005)

3- Statistical Analysis

Sciences (SPSS, 1998). Means tested using two-factor Analysis of Variance (ANOVA), and then separated using Duncan´s Multiple Range Test (DMRT) according to Mead and Gurnow (1983).

Result and Discussion

Table(1): Prevalence and bacteriological examination in examined cheese samples (packed and unpacked white soft cheese)(n=10).

Microorganisms	Packed cheese			Unpacked cheese		
	Min	**Max**	**Mean ± SE**	**Min**	**Max**	**Mean ± SE**
Total Bacterial count	**8.4×10^2**	**2.3×10^3**	**$3\times10^3\pm0.28\times10^3$**	**1.5×10^4**	**5×10^6**	**$7\times10^5\pm0.18\times10^3$****
Enterobacteriaceae count	**1.1×10^2**	**9.8×10^2**	**$2.05\times10^2\pm0.37\times10^2$**	**3.6×10^2**	**2.6×10^4**	**$3.12\times10^3\pm0.45\times10^3$****
Coliform count/gm	**1.0×10^2**	**8.0×10^2**	**$1.42\times10^2\pm0.29\times10^2$**	**2×10^2**	**1.1×10^4**	**$1.27\times10^3\pm0.16\times10^2$****
Staphylococci count/gm	1×10^2	7×10^2	$1.15\times10^2\pm0.26\times10^2$	2×10^2	2×10^4	$3.44\times10^3\pm0.63\times10^2$**

*** Significantly different at $p\leq0.001$*

Table(2): Serodiagnosis of E. coli isolated from examined samples of packed and unpacked white soft cheese.

Isolated E.coli	*packed*		*Unpacked*		*Strain character*
	No	*%*	*No*	*%*	
O_{119}:K_{69} (B_{16})	-	-	*1*	*1%*	*EPEC*

EPEC= Enteropathogenic E.coli

Table(3): Chemical Analysis in the examined cheese samples(packed and unpacked white soft cheese).

Chemical Parameters	Packed cheese			Unpacked cheese		
	Min	Max	Mean ± SE	Min	Max	Mean ± SE
Moisture %	43.37	55.14	49.49±2.4	49.22	66.3	57.75±3.1*
Protein %	18.28	21.89	20.12±1.3	13.9	16.1	14.8±1.9*
Total-volatile-fattyacids (0.1NmlNaoH/100gcheese)	1.2	2.1	1.7±0.08	o.7	1.2	1.1±0.03*
Fat %	19.46	25.93	22.27±1.9	23.4	28.9	273±2.3**
Ash %	5.35	6.22	5.57±1.07	6.1	7.8	7.1±1.33*
Calcium %	7	9.2	7.6±0.04	6.5	8.4	7.4±0.06
VitaminA (IU)	1720	3100	2460±11.3	1500	2500	2000±18.2*
Phosphorus %	4.25	5.48	4.8	4.4	5.8	4.9

**Significantly different at $p \leq 0.5$*

*** Significantly different at $p \leq 0.001$*

1-Bacteriological Examination:

In this study there were significant differences between packed and unpacked soft cheese. Table (1) pointed out that the total bacterial count in unpacked white soft cheese ranged from 1.5×10^4 to 5×10^6 with mean count value of $7\times10^5 \pm 0.18\times10^3$ while total bacterial count ranged from 8.4×10^2 to 2.3×10^3 with mean value $3\times10^3 \pm 0.28\times 10^3$ in packed soft white cheese. Nearly similar incidence was reported by **El-Kholy(1986)**.

Inspection of this table revealed that the enterobacteriacac count in unpacked white soft cheese ranged from 3.6×10^2 to 2.6×10^4 with mean value $3.12\times 10^3 \pm 0.45\times 10^3$ when compared with $2.5\times 10^2 \pm 0.37\times 10^2$ in packed soft white cheese. Nearly similar results

were recorded by **Aiad (2002)**. Comparatively higher finding where recorded by **El-Kholy(1989)**.

Contamination of any food article with enterobactereiaceae not only give indication of the neglected hygienic measures during production, handling and distribution but also the possibility of presences of enteric pathogens in that food, Moreover objectionable changes which may be inducted in the contaminated food render it unmarketable that causing economic losses **(ICMSF, 1986)**.

Table (1) indicated that the examination of unpacked white soft cheese samples were contaminated with coliform with mean count value of $1.27\times10^3 \pm 0.16\times 10^2$ while in packed white soft cheese the mean count value of $1.4\times 10^2 \pm 0.29\times10^2$. Nearly similar incidence was reported by **El-Kholy (1986)**. Higher counts were reported by **Aiad (2002)**.

the variation in results may depend on the difference in manufacturing practices using contaminated utensils and equipments, handling products to consumers and the effectiveness of hygienic measures applied during cheese making. **Ahmed et al., (1988).**

On focusing on table (1), it was found that staphylococci count in unpacked white soft cheese ranged from 2×10^2 to 2×10^4 with a mean value $3.44\times10^3 \pm 0.23\times10^2$ while mean value $1.15\times10^2 \pm 0.26 \times10^2$ in packed soft white cheese.

These results agree with **Ozen et al, (2011)**.who found that the microbiological quality of white pickled cheese produced in small dairy plants was investigated and found the average count of staphylococci was between 10^3 and10^6 cfu/g in all of the samples and 44% of the samples was found to be contaminated with coagulase positive staphylococci, and **Lemya et al,(2010)** who examined 36 of white soft cheese samples and found that the average count of stafphlococci was 25.63×10^2 .

In table (2), it is noticed that the Enteropathogenic E.coli (EPEC) O_{119}:K_{69} (B_{19}) was isolated from examined unpacked white soft cheese with a percentage of 1% while not detected in any o packed white cheese sample. Presence of Escherichia coli in a food production is indicative of direct and indirect fecal contamination. Certain serovars of E.coli remain as a major cause of infant diarrhea in visitors in this area from industrialized countries. **Sizemore et al,(2004)**.

According to Egyptian Organization for Standardizations and Quality Control "E.O.S." (2005). Milk and its products must be free from Aerobic plate count ,Staphylococci,E.coli and allowed 10 cells/gm for coliform.

2-Chemical Analysis:

In table (3),the moisture content of packed cheese ranged between 43.37 % and 55.14 % with an average value of 49.49%,but the moisture content of unpacked cheese ranged between 49.22% and 66.3% with an average of 57.75 This range is close to the usual value for semi hard cheese (45 – 55%) and also in close agreement with that found by **Ali(1987)** for cheese samples (56%).Also, the results were agreement with those reported by **Alla Gabo(1986)** and **Elshibilyet al,(1993)**, who reported moisture content of 61.2% and a range of 54.6–56.4%, respectively. The study showed significant variation between packed and unpacked cheese.

The protein content of cheeses ranged from 18.28 % to 21.89 % with an average value of 20.12 %,while the protein content of unpacked cheese was from 13.9% and 16.1 % with an average of14.8%. These results agreed with those of **Ceylan*et al.*,(2003)** who reported a range of 16.00 to 22.71% in orgu cheese, higher than those reported by Ali(1987) who found a value of 13.8%, and lower than those reported by **Elowni and Hamid(2007)**, **Nuser(2001)** and **Suliman*et al.*,(2005)** who reported protein content of 22.5%, 23.26% and 33.0% for white cheese, respectively. Statistically, highly significant differences ($P \leq 0.001$) in protein content of different cheese samples were found. The higher amount of biologically valuable proteins in the cheese adds to its nutritive value. The protein content of different varieties of cheese generally varies between 20-35%. The biological value of protein is least influenced by the enzymes utilized during the preparation of cheese making or employed during ripening .The study showed highly significant variation between packed and unpacked cheese. *According to Egyptian Organization for Standardizations and Quality Control "E.O.S." (2005) . Milk and its products protein % not less than 10 % .*

As regards to the fat content of packed cheese samples ranged between 19.46% and 25.93 % with an average value of 22.27,but the fat content of unpacked cheese ranged between 23.4% and 28.9% with an average value of 27.3%. These values were in close agreement to that reported by **Elowni and Hamid(2007)** who reported a range of 19.17% to 23.83% in Sudan. On the other hand, fat contents determined in the present study were higher in unpacked cheese than those reported by **Aly and Galal(2002)** and **Elowni and Hamid(2009)** for cheese samples, who reported fat contents of 12.80%, 11.70%, and 18.9 ± 0.18, respectively. Statistical analysis showed highly significant differences ($P \leq 0.001$) in fat content of collected cheese samples. The variation in fat content in this study could be attributed to several factors like breed, individuality of animal, type of feed, health and age of the animal when the milk was taken and feed additives.

The fat content in the cheese is adjusted to different levels so that the cheese of different varieties containing varying levels of fat can be produced. Cheese, when it is fresh has a fat content of up to 12% level. Consumers generally prefer high fat cheeses due to high fat content and this imparts a better flavor to the cheese.

Concerning to the ash content of cheese samples raged from 5.35 % to 6.22 % with an average of 5.57 %,but the ash content of unpacked cheese ranged between 6.1% and 7.8%The variation in ash contents could be due to the different salt levels used by different producers. Statistically ,there is a significant difference ($P > 0.05$) was found in the ash content between the packed and unpacked cheese samples. The obtained results were higher than those reported by **Abdel-Razig(1996)** and **Elowni and Hamid(2007)** for soft white cheese, who reported a value of 2.2% and 4.8%, respectively.

On the other hand, the range of volatile fatty acids contents of collectedpacked cheese samples from different areas was 1.2 and 2.1 (0.1N ml NaOH /100g cheese) with an average of 1.70 (0.1N ml NaOH /100g cheese, but of unpacked cheese was 0.7 and 1.2. The result indicated that significant ($P \leq 0.01$) differences were observed in volatile fatty acid content between the cheese samples. The variation of volatile fatty acids content of the different cheese samples was possibly due to the variation in manufacturing conditions. The findings in this study were lower than those obtained by **Elowni and Hamid(2007 &2009)**, who found that the average of volatile fatty acids content of Sudanese white cheese were 9.7 and 14.12 ± 3.09 (0.1N ml NaOH /100g cheese), respectively. Pasteurization of milk inactivates the native lipase and hence has no role to play in the cheese ripening.

The concentration of fat soluble vitamins in cheese is dependent that on fat content. About 80-85% of the vitamin A presents in milk is passed on to cheese. A significant differences werw observed of Vit.A between packed and unpacked cheese.

Cheese is a natural source of calcium and people eat cheese, among other reasons, to get calcium. However, even people who eat cheese do not necessarily eat sufficient quantities to obtain some or all of the calcium they may require. Calcium content in packed cheese ranged from7 to 9.2% with an average 7.6%, and from 6.5 to 8.4% in unpacked cheese. The phosphorus was 4.25 to 5.48% with an average 4.8 in packed cheese and from 4.4 to 5.8 % with an average 4.9% in unpacked cheese.The milk salts, Ca and PO_4, have an important role in the rennet coagulation of milk and in the structure and buffering of cheese. Addition of Ca reduces the rennet coagulation time of milk that is due to the neutralization of negatively charged residues on casein, which increases the aggregation of renneted micelles. Addition of low concentrations of calcium also increases gel firmness.

The rate of acid production and the pH of the whey at draining are the critical factors that determine the mineral content of cheese. Both pH and the proportion of undissolved milk salts have important effects on cheese texture. An important role is suggested for colloidal calcium phosphate in buffering during the acidification of milk and cheese as reported by

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