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Physiochemical Quality Properties of the Soft White Cheese locally manufactured in Erbil city

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Abstract

Dairy products are considered the most whole foodstuff that provide human with most of their vital needs. The current study was undertaken to evaluate the microbiological quality and physicochemical properties of the soft white cheese locally produced in different places at Erbil province in Iraq. Four different locations in main area were subjected to this study. The samples were collected aseptically from several cheese workstations. Our finding indicates that, the pH ranged between 5.3 to 6.43 with an average of 5.99, moisture percentage ranged between 45.66 % to 54.75 % with an average of 49.88 .Acidity ranged between 1.4 % to 2.3 % with an average of 1.81 %. The averages of total bacteria count of soft white cheese were detected to be the interval of 4.8×10^{-2} to 7.2×10^{-3} cfu/g. In the all cheese samples the coliform bacteria count was detected to be between 1.6×10^{-2} to 4.1×10^{-2} cfu/g. The yeast and mold count was found to be 2.3×10^{-2} to 5.1×10^{-2} cfu/g. The results found (0) cfu/g of *Staphylococcus aureus* contaminations. The high microbiological content found in the cheese samples, particularly coliforms reflect poor sanitary conditions during processing, a lack of cooling facilities, and the lack of heat treatment to remove undesirable microorganisms and poor health control. Cheeses produced in Erbil are not agreed with the Iraqi Standard.

Chapter one

1. Introduction

Dairy products have been an essential part of the human diet for over 8000 years and are included in some countries' official dietary guidelines. Dairy products have great nutritional factors including carbohydrates, protein, vitamins as well as minerals for example calcium, potassium, and phosphorus. Many dietary recommendations for dairy consumption are based on the importance of dairy products to providing recommended calcium intakes (Johnson, M. E., 2001).

Foodstuffs are subject to spoilage by undesirable microbes throughout harvest, production, storage, and distribution. Dairy products, because of their high nutritional value, particularly their high protein and fat content, provide an ideal development environment for a wide kind of microorganisms (Laslo and György, 2018). Many enteropathogenic species have been found in milk and cheese that has been refrigerated and eaten without being heated. High levels of pathogenic microorganisms in cheese may be caused by post pasteurization contamination, the manufacturing and handling process, equipment, and temperature abuse during transportation, and storage conditions. Food spoilage risks human health and causes huge economic losses. About 15–25% of food products worldwide deteriorate. The kind of spoilage microorganism is primarily determined by the type of dairy product. The microbiological content of a product is correlated to the manufacturing steps. Fungi and spore-forming bacteria are linked to cream cheese and processed cheese. Soft, fresh cheese spoilage is the associated with lactic acid bacteria, psychrotrophs, fungi, coliforms, and their enzymatic degradation (Araújo et al., 2002). While traditional soft white cheese is considered healthy, it could be a good

medium for infectious microbes. The risk of contamination is a problem internationally and not restricted to one area. The Food and Drug Administration (FDA) referred that some raw milk cheeses are a likely cause for health problems. Consumption of cheese contaminated with undesirable microbes was the source for 0.4% of the overall foodborne epidemics in Europe. Because of its high moisture content (55-80%), neutral pH (6-7), and abundance in carbohydrates, proteins, vitamins, and minerals, soft cheese is regarded as a perfect growth medium for many microbes, making it a good environment for microbes which can result in food poisoning and spoilage.

Soft white cheese is a common food all over the world. It is typically consumed within 3-4 weeks of manufacturing in Iraq. In rural areas and remote villages, traditional un-ripened soft cheese is made from unpasteurized milk. Since raw milk contains around 30% of the total microbial count of undesirable microorganisms, this issue means that strict hygienic precautions must be followed in cheese production (Arslan et al., 2011).

Chapter Two

2. Methodology

2.1. Chemicals, Instruments, mediums and sampling

2.1.1. Chemicals

All common laboratory reagent and chemicals were used in the study are obtained from the following companies and their counties origin as shown in table (2.1).

Table (2.1): chemicals and their companies that supplied them:

NO	Instrument name and model	company	origin
1	Ethanol	Merck	Germany
2	Sodium Hydroxide standard (NaOH, 0.1N)	Merck	Germany
3	Phenolphthalein	Merck	Germany

2.1.2. Instruments and manufacture

Table (2.2): common instrument and their companies which are used.

NO	Instrument name and model	company	origin
1	Autoclave	GmbH	Germany
2	pH meter	Binder	Germany
3	Water bath	WTW	Germany
4	Sensitive balance	GmbH	Germany
5	Incubator	Binder	Germany
6	Oven	GmbH	Germany
7	Refrigeration	Binder	Germany

2.1.3. Culture media

The culture media were prepared depending on the recommendation of manufacturer's instruction on the containers, after sterilization by autoclaving at 121°C, pressure 1.2 kg/cm² for 15 minutes.

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2.1.4. Mediums and manufacture

Table (2.3): common mediums and their companies which are used.

NO	Medium	company	origin
1	Nutrient agar	Sigma	Switzerland
2	Peptone water	Sigma	Switzerland
3	Violet red bile agar(VRB),	Sigma	India
4	Baird-Parker agar	Merck	Germany
6	Dichloran Rose Bengal Chloramphenicol (DRBC)	Merck	Germany

2.2. Sampling plan

Soft white cheese is produced in Erbil province in Iraq by farmers using old traditional methods and as such is expected to be exposed to contamination during production or after processing. Four different locations in major areas at Erbil city were subjected to evaluate the physiochemical and microbiological quality. The samples were delivered aseptically and were placed in an icebox from many cheese workstations. The weight of the sample was 250gm.

2.3. Preparation of samples microbiological examination

1- Combine portions from several locations within each Cheese sample unit taken to ensure a representative analytical unit.

2- Serial dilutions of the samples were prepared by adding aseptically 10 gm of the represented Cheese samples to 90 ml of the diluents 0.1% sterile peptone water the latter diluents facilitates dispersal of the curd and consequently release microorganism.

3- Cheese samples were blended for 1 minute in a filter bag by stomacher, to gain a homogeneous suspension.

1. Enumeration of total bacteria Count

Plates count agar was used for enumerated total bacteria count of total bacteria, plates were incubated at 30^0C for 72 hours (ISO No. 4833, 2003).

2. Enumeration of total Coliform

VRBA was used for enumerated coliform by pour plate method; plates were incubated at 37^0C for 24 hours, (ISO No. 4832, 2005).

3. Detection of *Staphylococcus aureus*

Baird-Parker agar commonly used as a screening device for *S.aureus* according to (ISO No. 6888, 2003) spread plate method used for detection and enumeration of the bacterium, the medium is pre-poured and allowed to solidify in the Petri dishes; one ml of the appropriate dilution of the dairy samples were spread evenly over whole surface of the medium using a drigalski spatula to spread properly .Plates were incubated at 37^0C for 24-48 hours. Count Black colonies with clear zone around, and calculate the number of bacteria in 1.0 g or 1.0 ml of sample.

4. Enumeration of total Yeast and Molds

DRBCA was used for enumerated yeast and mould count. Plates were incubated at 25^0C for 72 days (ISO No. 6611, 2004).

2.4. Preparation of sample for chemical analysis for cheese samples

1- (20) g of grated sample was taken and 12 ml distilled water was added and vigorously shaken for pH measurement. (Marshall, 1992).

2- (10) g of grated cheese sample was taken then distilled water at 40^0C was added to make the final volume of 105 ml and vigorously shaken after that filtered. 25 ml portion of the filtrated was titrated, corresponding 2.5g of sample for estimation of acidity (AOAC 920 .124, 2005).

3- (2) g of grated cheese sample was weighed in crucible for estimation of moisture (AOAC 926:08, 1990).

1. Measurement of pH:

pH of dairy samples was measured through electronic digital pH meter (Inolab WTW Series 720). Buffer solution of pH 4 and 7 were used to calibrate the pH meter at 250C.

2. Measurement of Acidity:

Acidity in dairy samples was measured by titration method; phenolphthalein was used as indicator and samples was titrated with standard Sodium Hydroxide Solution 0.1 N. The present of acidity calculated as:

$$\text{Acidity \% (as lactic acid)} = \frac{0.0090 \times \text{Volume of NaOH used x } 100}{\text{Weight of the sample}}$$

3. Moisture content:

The moisture content in dairy samples was determined by drying samples in oven at 103 ± 5°C for 4 hours. The difference in weight before and after drying gives the results of moisture content. The percentage of moisture was calculated by used:

$$\% \text{ Moisture} = \frac{W2 - W3}{W2 - W1} \times 100$$

Where:

W1=mass in gm of dish, W2=mass in gm of dish + sample

W3= mass in gm of dish + dried test sample.

Chapter three

Results and discussion

3.1 Results:

The data in table (1) summarize the chemical composition of local white soft cheese. The pH ranged between 5.3 - 6.43 with an average of 5.99. Moisture percentage ranged between 45.66 % - 54.75 % with an average of 49.88 %. Acidity (lactic acid) ranged between 1.4 % - 2.3 % with an average of 1.81 %. The Iraqi standard (1/693:1988) for chemical properties of cheese for pH is 6.4±0.2, moisture is ≥ 50 % as shown in table 1. In our study, the total plate count in the samples of soft cheese was detected to be the interval of $4.8x10^{-2}$ – $7.2x10^{-3}$ cfu/g. In the all cheese samples examined in this study the coliform bacteria count was detected to be between $1.6x10^{-2}$ and $4.1x10^{-2}$ cfu/g. In this study, the yeast and mould count was detected to be at the interval of $5.1x10^{-2}$ and $2.3x10^{-3}$ cfu/g. As shown in table 2 and figures 1. The Iraqi standard (2270/5: 2006) for microbial content, the yeast and mould count less than $1x10^{-2}$ cfu/g, for coliform count less than $1x10^{-3}$ cfu/g, and no Staphylococcus aureas.

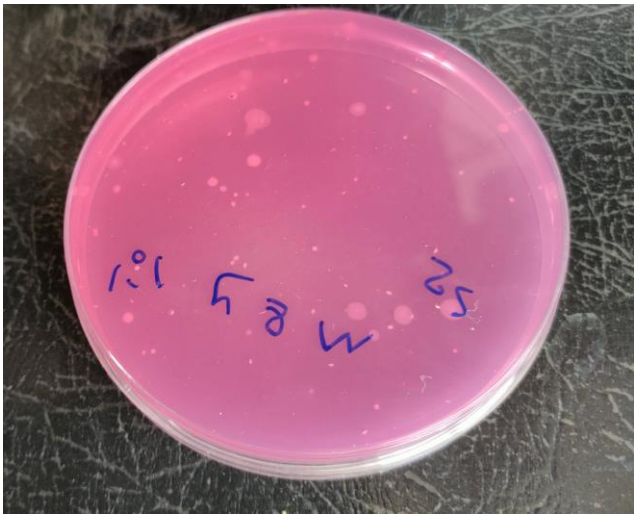
Table (1): The physical and chemical composition of local soft white cheese

No.	pH Iraqi standard 6.4±0.2	Acidity	Moisture Iraqi standard ≥ 50%
1	6	1.4	45.66
2	6.25	1.6	48.9
3	5.3	1.95	50.23
4	6.43	2.3	54.75
Mean	5.99	1.81	49.88

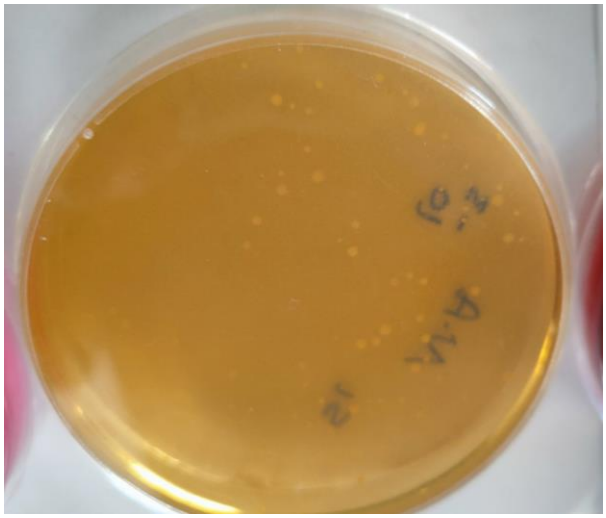
Table (2): The microbial content of local soft white cheese

No.	Total bacteria count cfu/g	Coliforms count cfu/g	*Staphylococcus. aureus* cfu/g	Yeast and Moulds cfu/g
1	$4.8x10^{-2}$	$2x10^{-2}$	0	$5.1x10^{-2}$
2	$6.3x10^{-3}$	$1.6x10^{-2}$	0	$3.7x10^{-2}$
3	$6.6x10^{-2}$	$1.8x10^{-2}$	0	$3.1x10^{-2}$
4	$7.2x10^{-3}$	$4.1x10^{-2}$	0	$2.3x10^{-2}$

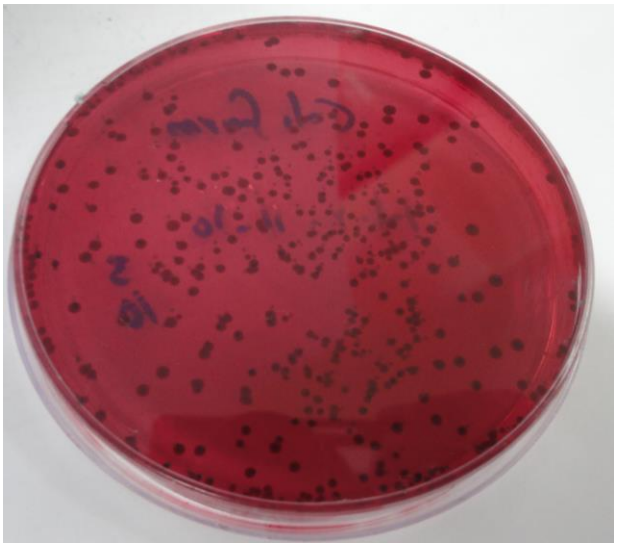
Figure 1: a, b and c, medium used for detection microbiological examination



a. DRBCA



b. Total bacteria count



b. VRBA

3.2 Discussion:

Our result display that the average of pH, acidity, moisture were 6.53, 1.50%, 44.08%, respectively. Haddad and Yamani (2017) they reported that the average of pH, acidity, moisture were 6.0, 0.53% and 56.5%, respectively. The high total bacteria count of the soft white cheese samples revealed the general unhygienic circumstances used through production and storage (Tannous, 1991). Coliforms counts were generally high and were in most samples unacceptable. Presence of coliforms in food samples commonly shows direct or indirect fecal contamination of the milk or the product during processing, handling, and distribution, and thus the possibility of having pathogenic bacteria, virus, or protozoa of fecal origin in the food (Tannous, 1991: Haddad and Yamani, 2017). Some spoilage microorganism include fungal spoilage of dairy foods is established by the presence of a wide variety of metabolic by-products, causing off-odors, off-flavors and visible changes in color or texture. Therefore, it can have effects on food safety and quality, nutrition and consumer's acceptance. Yeast and moulds count in soft white cheese are used as a guide of the proper sanitation quality. Moreover, some species constitute a public health hazard due to production of mycotoxin (Verga, L., 2007).

Chapter four

Conclusion and Recommendation

4. Conclusion:

The high microbial content of the soft white cheese samples reflects the poor overall hygiene conditions throughout production and storage of milk and cheese, absence of refrigeration and lack of stages such as heat treatment to reduce microorganisms.

Recommendation:

Measures to control the quality of the raw material, environmental and hygienic circumstances during preparation and serving should be taken. The results obtained in the study established that the hygienic quality of soft white cheese sold in Erbil is little and does not have enough assurance in terms of public health. Measures to control the quality of the raw material, environmental and hygienic conditions throughout preparation and serving would be taken; markets and treating should be sometimes inspected by specialists. In addition to that, pasteurized milk should be used for the manufacturing of local soft white cheese with its preservation inside the brine.

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