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Spreadable Process Cheese Manufacturing from White Brine Cheese and Fermented Milk; Sensorial and Physiochemical Quality

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Dedication

This thesis is dedicated to my father, my mother, my wife, my aunt, my uncle, my supervisors and my colleagues in Al-Quds University.

Declaration:

I certify that this thesis submitted for the degree of master is the result of my own research, except where otherwise acknowledges, and that this thesis (or any part of the same) has not been submitted for the higher degree to any other university or institute.

Arafat Ismail Mohamed Qabaha

Signed …….

Date 12/12/2016

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Abstract

The study was carried out to examine the possibility of using locally white cheese, fermented milk (labaneh) and fresh whey milk in the production of spreadable processed cheese, where locally white cheese with different ripening time (one day, 30 days, 60 days and 90 days) and labaneh with ripening time (one day, 30 days, and 45 days) and different rates (20%, 40%, 50%, and 60%) were used. Fresh whey milk has been used for Spreadable Processed cheese manufacturing instead of water. Different emulsifying salts were used such as BP7, Self L9 and Self H9 from Budenham a German company.

The sensorial analysis, chemical analysis and microbiological tests for locally white cheese, labaneh and other raw materials were conducted during storage time, and they were in conformity with the Palestinian Technical Regulations.

Chemical analysis for the best blend of Spreadable Processed cheese showed that the proportion of total solids was 42%, protein 11.84%, fat 25.1% and pH 5.36. The composition is within the limits of the Palestinian standard No. 638/2014 for spreadable processed cheese.

The microbial tests of the spreadable processed cheese showed that the *Total coliform bacteria*, *Yeasts and Molds* were not detected but presence of growth of *Total aerobic bacteria*; these results show the efficiency of the thermal treatment and health requirements during the manufacturing and storage of spreadable processed cheese.

The results of sensory tests for all mixtures showed that the spreadable processed cheese that is made from cheese and labaneh at a ratio (60:40) is the best and received the highest assessment. The results show that the used emulsifying salt Self L9.0 at a level of 3 % of the final product gives better stability, strength and spreading quality compared to BP 7.0 and Self H9 emulsifying salt.

Sensorial, microbiological and chemical tests showed that spreadable processed cheese can be produced, using white cheese and labaneh until a certain ratio, while maintaining the special product specifications.

The cost of production of one kilogram of spreadable processed cheese is $ 7.5 and the price of a kilogram of white locally white cheese is $ 5.3 and labaneh US $ 3.4.

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Abbreviations

T.A.C	Total Aerobic Count
S. aureus	Staphylococcus aureus
T.C	Total Coliform
F.C	Fecal Coliform
Fig.	Figure
Cfu/g	Colony-forming unit per gram
T.D.S	Total Dissolved Solids
Nil	Absence of Microorganisms
S	Second
m	minute
h	hour

Chapter One

Introduction

1.1 Introduction

Processed cheese is a dairy product which differs from natural cheese in the fact that processed cheese is not made directly from milk (Kapoor et al., 2008). The main ingredient of processed cheese is natural cheese. Processed cheese can be classified into three different types commonly referred to as block variety, slices and cheese spread.

Process cheese is produced by blending natural cheeses of different ages and degrees of maturity in the presence of water, coloring matter, emulsifying salts and other dairy ingredients and in some cases, nondairy ingredients followed by heating and continuous mixing to form a homogeneous product with an extended shelf life.

Spreadable processed cheese has higher moisture content than other processed cheese. The standard American FDA set moisture content 44%- 60%, fat content 20%, and natural cheese content no less than 51%. Therefore, in the case of using new ingredients in processed cheese production it is indispensable to study the influence of these variables on its quality.

Different types of processed cheese are available in the local markets, which are imported from abroad; some of them contain vegetable oils due the high cost of dairy products in the Palestinian territories leading to the fact that families cannot provide their children with these products.

The spreadable processed cheese quantities imported from abroad increased in previous years, according to the Palestinian Central Bureau of Statistics, where the estimated price of spreadable processed cheese in 2012 to $ 14,854 until it reached 2015 to $ 55000, This indicates the growing popularity the demand for spreadable processed cheese products.

Children in Palestine prefer eating spreadable processed cheese because of its standard taste and in many cases, it can be used as a substitute for drinking milk. Among children between 6 and 11 years old, 44 percent of boys and 58 percent of girls do not consume

enough calcium, according to the Office of Dietary Supplements in Canada. Not only is cheese a good source of calcium, it also provides protein and a number of essential vitamins and minerals. Calcium is especially important for children, as they are still building bone mass. Cheese and other dairy products are some of the best sources for this mineral, so it can be a part of a healthy diet for most children as long as fat and calories are taken into consideration.

The Palestinian territories have little or no production of processed cheese, therefore it is imported from abroad, and this increases the cost and therefore are sold at high prices. Some companies have begun to produce specific types of processed analogues cheeses but the know how is still not well developed and the formulations are ready bought and the process is not well controlled.

A need for a local spread process cheese production with desirable rheological properties to Palestinian consumer especially children, as a result of the lack of school lunches, and the short recession times between classes makes spread cheese as a rapid and good source for nutrients and energy during school day.

White cheese is the major cheese product in Palestine and all research studies are focalized on its development. In addition, spring milk production is high and the demand is low, which reduces the price and this affects the farmers due to economic losses as a result of milk reduced prices. Transformation of white brine cheese from a salty solid hard food passes through the process of blending and emulsification leading to a new product with new flavor and texture characteristics, in addition to the different possibilities of fortification.

Using fermented milk in spread cheese formulations will lead to the production of low fat spread cheese which will contain less than 20% fat. However, making low-fat or reduced-fat dairy food is not a very easy task. The presence of fat in dairy products plays an

important role in the physical, rheological, and textural properties. In addition, fat also affects other characteristics like appearance, flavour, and mouthfeel, which affect product acceptability.

In this study, many different formulations of different blends of traditional white cheese were done with the objective of producing a new flavour and texture process cheese suitable for Middle East countries especially in Palestine. The formulation was based on the addition of fermented milk (labaneh which is characterized by its acidity, flavour and nutritional value, and rheological properties) to various blends of white cheese. The final spread cheese is evaluated for its sensorial, microbiological and physicochemical properties. In addition, the cheese spreads were produced using different emulsifying salts with different pHs so as to control the rheological properties evaluated using different types of emulsifiers and dry matters.

Cheese is one of the most widely used ingredients in prepared foods for imparting taste, texture and nutritional qualities. They are very suitable for the food service industry, and they have a relatively long shelf life. Spreadable processed cheese is a dairy product which differs from natural cheese, resulting from heating and mixing one or more natural cheeses with emulsifying salts, drinking water and addition of other ingredients such as fermented milk, Dried skim milk, whey powder or fresh whey calcium caseinate, whey proteins and some other food items such as plant proteins and stabilizers - where it is cooked to obtain a homogeneous and safe from a health standpoint product (Mayer, A. 1973).

Processed cheese may have different forms – i.e. block, slice, spread – but must contain natural cheese. Products which do not meet this requirement must be labeled as cheese imitations or as analogues.

Because of its wide range of food applications, processed cheese spreads have become a popular variety of processed cheese products.

Processed cheese spread is defined as the food prepared by comminuting and mixing, with the aid of heat, one or more varieties of natural cheeses or cheese ingredients, with or without one or more of the dairy ingredients, with one or more emulsifying salts, and with or without one or more of the optional ingredients into a homogeneous plastic mass that should be spreadable at room temperature. Appropriate selection of the natural cheeses is the most important factor to produce the best quality processed cheese and processed cheese spreads.

Some parts of the world use a single variety of natural cheese with different degrees of aging to make processed cheese and processed cheese spreads. However, natural cheeses having microbial defects should not be used to make processed cheese because spore-forming, gas-producing, and pathogenic bacteria are particularly hazardous.

The most commonly used selection criteria include: the type of cheese, the flavour and maturity of the cheese, the texture, and the consistency of the cheese.

The importance of the manufacture of processed can be summarized as follow: high nutritional value, longer shelf life, without a cooling during storage and refrigeration, packaged in different forms and sizes and this gives it a multi-use property, can be controlled so to give different sensorial properties and finally can be consumed by people who do not drink milk.

In this research, a new cheese blend will be proposed in which blends of local white cheese and labaneh will made, with the main objective is to prepare a dairy product with desirable sensorial and rheological properties and low fat percentage.

1.2. Manufacturing: Principles and Techniques

Processed cheese manufacturing consists of several steps:

Selection of natural cheese, computation of the ingredients, addition of emulsifying agents, and other ingredients, Grinding, blending, processing, packaging, cooling, and storage.

The following figure shows the manufacturing steps;

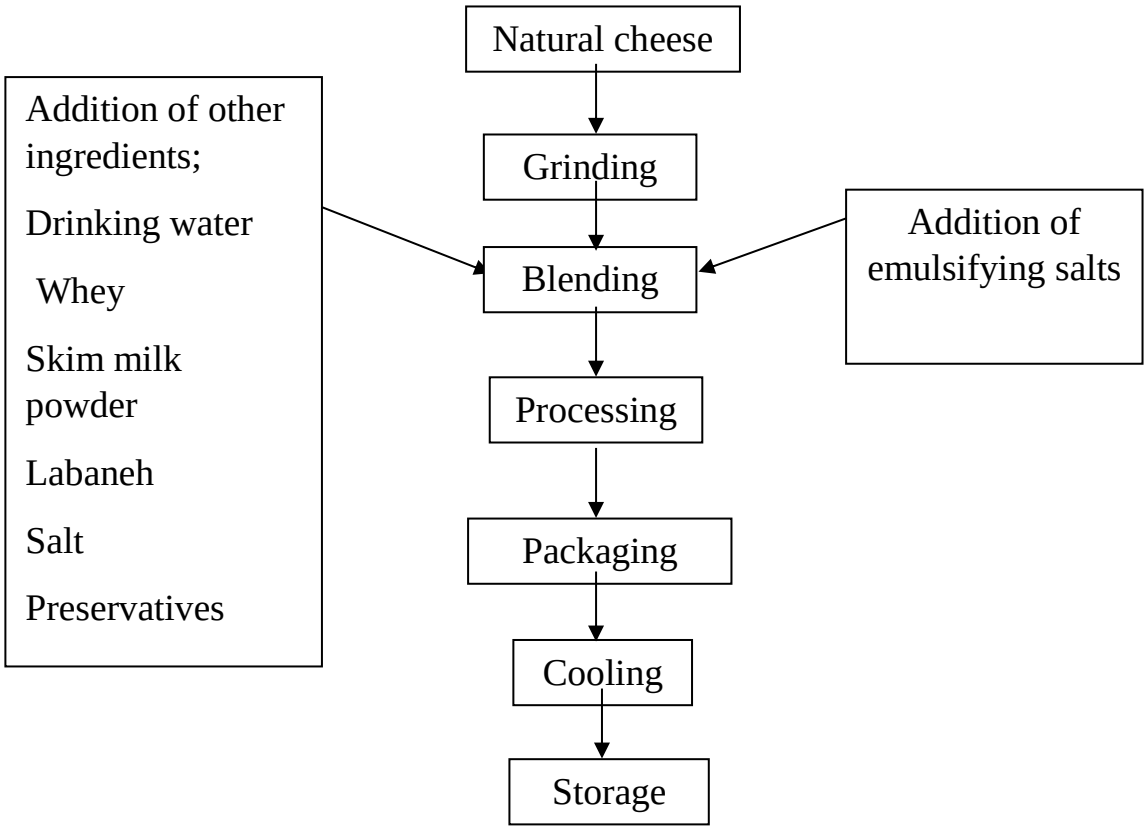


Figure 1.1 Schematic flow chart of the basic steps involved in process cheese manufacture.

1.2.1 Selection of Natural Cheese

Proper selection of natural cheese is of special importance for the successful production of processed cheese. The combination of native cheeses, the proper maturity cheese is of special importance for the processed cheese quality, in terms of taste and flavour. Intact casein, present more in young cheese, has an emulsifying effect on milk fat and stabilizes the emulsion ("long structure") (Berger. et al., 1989). This effect is not expressed by

partially hydrolyzed protein, predominating in matured cheese ("short structure"). So, for example, high-fat spreadable processed cheese requires a larger proportion of young cheese in the blend with correspondingly higher intact casein content (Berger et al., 1989).

1.2.2. Computation of Ingredients

The process of calculating the quantities is based on fat and dry matter contents of natural cheese components as well as the composition of the final product.

Formulation of the material balance of fat and dry matter, including all blend constituents, added water, and condensate from live steam used during processing, must be made in such a way as to yield a product with the desired composition.

1.2.3. Blending

Blending, which could be defined as designing the proper processed cheese blend composition and concerning, above all, selected cheese varieties, is highly influenced by the characteristics desired in the final product. However, there are no strict rules proscribed for designing the particular ratio among cheeses of different maturity in the blend. For processed cheese blocks, mostly young to medium ripe cheese is used, whereas to produce processed cheese spread, a combination of young, semi ripe and ripe cheese is preferred.

The main advantages of a high content of young cheese in the blend can be summarized as follow: The reduction of raw material cost, the possibility of using cheeses with poor curing properties immediately after manufacture, the formation of a stable emulsion with high water binding capacity, and finally the production of a firm body, with good slicing properties of the finished product.

Meanwhile, the main disadvantages are: the production of a tasteless cheese, an emulsifier-like off-flavor, excessive swelling, the tendency to harden during storage, and the presence of small air bubbles (developed due to the high viscosity of the blend).

The advantages of a high content of extra mature cheese in the blend can be summarized as follow: The development of a full flavour, Good flowing properties, and a high melting index (processed cheese melts easily).

The disadvantages are: The possibility of sharp flavour development, a low emulsion stability, and a soft consistency.

In addition to natural cheeses, various other dairy and nondairy ingredients are used in the production of processed cheese products, as shown in (Table.1). Some restrictions may apply, because the quality of the final product is influenced considerably by all the components present in the blend, the non-cheese components must also fulfill certain qualitative requirements (Guinee et al., 2004). The most frequently used dairy, but non-cheese ingredients are concentrated skim milk or skim milk powder, casein, whey protein concentrates, co precipitates, various whey products, and milk fat products.

Skim milk powder promotes the creaming properties and improves the spreadability and stability of processed cheese, but, if used in quantities exceeding 12% of the total mass, it may adversely affect the consistency or may remain undissolved. (Thomas, M.A. 1977). However, skim milk powder may be reconstituted first, its casein precipitated by citric acid or proteolytic enzymes and the resulting curd added to the blend (Caric, M. 1993). Discoloration of processed cheese due to the Maillard reactions is excluded if total lactose content is not over 6% in the final product. Skim milk powder could also be used in processed cheese manufacture by recombination and native cheese production (destined for processing).

Milk protein coprecipitates, characterized with high emulsifying capacity, if added to the blend, increase the stability of the cheese emulsion and improve the physical characteristics of the finished product. Acting as an emulsifying agent, they even enable the reduction of the amount of emulsifying salt added. This is important particularly for dietary and special food products, where limitation of the sodium content may be desirable. Milk protein co-precipitates should not exceed 5% in processed cheeses (Castell. Perez et al., 2005).

Whey products incorporated in processed cheese blends favorably influence both nutritive and economic characteristics of the finished product. Although ordinary whey powder is the most common whey product used in processed cheeses, in concentrations ranging up to 7% in the blend, whey protein products with lower mineral and lactose contents are preferable because they yield processed cheeses with better flavor characteristics. However, some other whey products could be successfully used in the processed cheese blend as well, such as whey concentrate (2-4%), precipitated whey proteins (up to 25% with flavour correction), and native whey protein concentrates obtained by ultrafiltration (5-20%).

All milk fat ingredients (Table 1) used to adjust the fat content of the processed cheese to the desired level must be of high quality and free from off-flavours.

Attempts have recently been made to develop processed cheese blends with improved characteristics that can be produced at a lower cost (Rubin *et al.*, 1983). Egyptian authors (Gouda et al., 1985) have produced processed cheese spreads with good spreadability by partially substituting calcium caseinate for natural cheese in the blend. Although full replacement, with cheese flavour added, failed to yield a spread with good characteristics, partial replacement improved spread ability. The best results were obtained using a blend composed of 6 to 8% skim milk powder, 5 to 7% calcium caseinate, 15% mature Cheddar cheese, 14% butter oil, and 3% emulsifying agent.

In addition to all the mentioned dairy-based products that could be included in the blend for processing, precooked cheese is an important blend component. Precooked, cheese is formerly processed cheese, or often it is the processed cheese from the previous charge. It is used to improve the texture and stability of the finished product, especially when very young or very mature raw cheese is used for processing. The percentage used in the blend varies between 1 and 30% (Kalab et al., 1987), depending on the quality of the precooked cheese and the type of processed cheese wanted. Usually precooked cheese is used in the manufacture of processed cheese spreads to increase the creaming properties of the blend.

The nondairy components of cheese blends can include spices, meat products, vegetables, and other ingredients. They all must be sterile and of the highest quality, with typical flavour. Their quantities must be properly prescribed for blending. The possible nondairy ingredients used in processed cheeses are shown in (Table 2.1).

Table 1.1- A Ingredients used in the Manufacture of Processed Cheese.

Ingredient	**Main function in processed cheese**	**Examples**
Natural cheese	Source of fat, protein, and flavour. Contributes to the structure and functionality of the processed cheese product.	Young, medium, and mature cheddar, other cheese varieties
Milk Fat	Contributes to flavour, texture, and cooking characteristics.	Butter, cream, anhydrous milk fat.
Milk Proteins	Assist in 'creaming' (thickening of the blend during manufacture) and formation of the product. Contribute to texture, rheological, and cooking properties.	Casein, caseinates, milk powder, MPCs.
Low cost dairy solids	Low cost filler. May contribute to textural properties.	Whey powder.
Emulsifying Salts	These are not actually emulsifiers. They are calcium sequestering salts that help convert the insoluble casein to soluble casein that can then emulsify fat and water, forming a stable emulsion. They also control the pH, and are important in allowing 'creaming' of the processed cheese. They provide desired texture and meltability characteristics to the product.	Trisodium citrate, disodium phosphate

Table 1.1- B Ingredients used in the Manufacture of Processed Cheese.

Ingredient	Main function in processed cheese	Examples
Hydrocolloids	Assist in the formation of a physiochemically stable product. Provide desired texture and meltability characteristics.	Guar gum, xanthan gum, carrageenan.
Acidifying Agents	Assist control of the pH of the final product.	Food grade organic acids (e.g. lactic, acetic, citric, phosphoric).
Flavors	Impart desired flavours.	Enzyme modified cheese, starter distillate, smoke extracts.
Flavor Enhancers	Accentuate Flavour.	Sodium chloride, yeast extract.
Sweetening Agents	Increase sweetness.	Sucrose, dextrose, corn syrup, hydrolyzed lactose.
Colors	Impart desired color.	Annatto, paprika, artificial colors.
Preservatives	Retard mold growth and extend shelf life.	Nisin, potassium sorbate, calcium/sodium propionate.
Condiments	Impart variety to appearance, texture, and taste, and give product differentiation.	Sterile preparations of meat, fish, vegetables, nuts, or fruits.

1.2.4. Addition of Emulsifying Agents

Addition of emulsifying agents is the last step in preparing the blend for processing. The quality of emulsifying agent added into the processed cheese blend depends on the type and age of cheese used in the blend (proportion of water and calcium) but is also determined by the final product group, which determines the sort of emulsifying agent as well. The amount of emulsifying salts that can be added to the cheese base are regulated by many countries and usually do not exceed 3 or 4% (Egyptian standards 7123/2010).

1.2.5. Processing

After all preparation treatments, the shredded, minced, and weighed raw material is transported to the cooker, where, by interaction with an emulsifying agent and water, processing is performed. Processing involves heat treatment of the blend with direct and/or indirect steam under partial vacuum. The product is constantly agitated through a

continuous or batch method. If processing is carried out discontinuously, (*i.e*. in a kettle), the temperature can reach 71 ^{o} C to 95 ^{o} C for a period of 4 to 15 min (Caric et al., 1999) depending on various parameters; this heating also provides pasteurization. In newly developed cookers it is also possible to reach the temperatures up to 140 ^{o} C (Berger et al., 1989).

A cooker consists of two double-jacketed, round, stainless steel pans of various sizes (2 to 100 L), fitted with corresponding lids, three-stage switchable stirring equipment, and fittings for direct steam injection and vacuum draw. Double jackets enable indirect steam heating as well. There are specially designed units, similar to cutters used in meat processing, where cutting is completed prior to processing by the aid of rapidly rotating knives with simultaneous heating and homogenization of the product.

The most important working conditions, which affect the processing and thus the quality of the final product, are as follows:

a. Temperature.
b. Duration of processing.
c. Agitation.
d. Acidity (PH) (a rather limited PH range; the increase of PH value, decrease of H +, causes better peptization of casein but can spoil keeping quality and flavor, whereas a decrease in PH value introduces thickening and solidifying of cheese structure). Higher PH values also favor more rapid product deterioration, in the event of post pasteurization contamination.

1.2.6. Homogenization

Homogenization improves the stability of the fat emulsion by decreasing the average fat globule size. It also improves the consistency, structure, and appearance of the processed cheese (Mayer, A. 1973).

1.2.7. Packaging

Processed cheese is usually packed and wrapped in laminated foil; in cardboard or plastic cartons; in tubes, cups, cans, and plastic containers; in sausage form; and occasionally in glass jars.

1.2.8. Cooling

The intensity and method of cooling is highly influenced by the type of processed cheese. Cooling of processed cheese spreads should be as fast as possible, while processed cheese blocks are cooled slowly (Caric et al., 1999). Cooling stops the creaming action by processed cheese spread, thus retaining creamy consistency and short structure. However, slow cooling can intensify Maillard reactions and promote the growth of spore-forming bacteria.

1.2.9. Storage

Processed cheese should be stored at temperatures in the range of 5 ^{o} C to 10 ^{o} C, although such low temperatures may induce formation of calcium diphosphate-calcium pyrophosphate crystals (Caric et al., 1993). These crystals usually occur on the surface of product and can produce a gritty texture, but they are not harmful to the consumer.

1.3. Problem statement

The Palestinian market suffer from high cost of dairy products and many families cannot provide their children with these product and There are a high consumption and demand in Palestinian Territories for cheese specially for processed cheese, because of its sensorial properties and long shelf life and convenience. Children in Palestine prefer eating processed cheese because of its standard taste and in many cases it can be used as a

substitute for drinking milk. Among children between 6 and 11 years old, 44 percent of boys and 58 percent of girls do not consume enough calcium, according to the Office of Dietary Supplements in Canada. Not only is cheese a good source of calcium, it also provides protein and a number of essential vitamins and minerals. Calcium is especially important for children, as they are still building bone mass. Cheese and other dairy products are some of the best sources for this mineral, so it can be a part of a healthy diet for most children as long as fat and calories are taken into consideration.

The Palestinian territories have little or no production of processed cheese, therefore it is imported from abroad, and this increases the cost and therefore are sold at high prices. Some companies have begun to produce specific types of processed analogues cheeses but the know how is still not well developed and the formulations are ready bought and the process is not well controlled.

A need for a local spread process cheese production with desirable rheological properties to Palestinian consumer especially children, as a result of the lack of school lunches, and the short recession times between classes makes spread cheese as a good source for nutrients and energy during school day.

White cheese is the major cheese product in Palestine and all research studies are focalized on its development. In addition, spring milk production is high and the demand is low, which reduces the price and this affects the farmer a lot of losses since the prices and reduced. Transformation of white brine cheese from a salty solid hard food can pass through the process of blending and emulsification leading to a new product with characteristic flavour and texture, in addition to the different possibilities of fortification

Using fermented milk will lead to the production of low fat spread cheese which will contain less than 20% fat However, making low-fat or reduced-fat dairy food is not a very easy task. The presence of fat in dairy products plays an important role in the physical,

rheological, and textural properties. In addition, fat also affects other characteristics like appearance, flavor, and mouthfeel, which affect product acceptability.

1.4 Objectives of The Study

1. Study the possibility of manufacturing processed cheese spreads using white brine cheese and fermented milk as raw materials.
2. Screen a large number of formulations and identify four formulations for further investigation. Formulation conditions will include: different percentages of white cheese and fermented milk, addition of whey protein and different types and amounts of emulsifying salt. The level of intact casein (manipulated by age of the ingredient cheese) will be varied and its effect on the rheological properties will be studied.
3. The best formulation will be manufactured utilizing a specialized Stephan cooker and a cooling system capable of determining best acceptable new spread cheese.
4. Study the chemical composition of processed cheese product to verify the conformity with the Palestinian standards.
5. Assess the keeping quality of processed cheese product; by conducting microbial tests to determine the microbial number directly after manufacturing and then estimate the efficiency of the cooking process, and storage in different temperatures for different periods,
6. Assess the consumer acceptance of processed cheese product by sensorial tests.

1.5 Economic importance of the production of spreadable processed cheese in Palestine

Manufacturing of spreadable processed cheese in Palestine need large quantities of milk and thus increases the demand for milk and encourage farmers to increase cattle breeding,

increasing the commercial agricultural and industrial activity, which has a direct and indirect effect on processed cheese manufacturing industry and increased manpower. More than 10 tons of spreadable processed cheese are imported annually, according to the Palestinian Central Bureau of Statistics.

Chapter Two

Literature Review

2.1 Introduction

The products of the preservative treatment of natural cheeses by the application of heat came to be known as processed cheese or processed cheese food; this product is manufactured in many countries, and numerous variants of this type of product have appeared on the market due to different ingredients used and different physicochemical properties.

The technology of processed cheese making, including analogues, has evolved dramatically over the past century. The manufacturers uses different cheese blends and different emulsifying salts (types and amounts) based largely on experience. Variations in existing definitions and standards for processed cheese products are evident in many countries, and international standards appear to be difficult to harmonise because of possible conflicts with national standards (Tamine, A.Y. 2011). The selection of natural cheeses or its replacement with other ingredients is the criteria for the successful production of processed cheese. It is possible to use one or more blends of cheeses or more variety of cheeses (Caric et al., 1993; Guinee et al., 2004; Kapoor et al., 2007). So as provide the desirable elasticity character in the final product.

The criteria for selection of natural cheese include flavour, texture, consistency and level of acidity. Degraded cheese (off-flavor or microbial defects) should not be used in processed cheese making as the quality of the final product will be reduced or unacceptable (Tamine, A.Y. 2011).

- A Study of Manufacturing Processed Cheese Spread by Using Local Cheese (White, Kashkawan, Karesh,) as Raw Materials . Al-Khalayleh, N., and Thaefer, A. (1993).

The aim of this study is to use local cheese and additions in producing processed cheese spread with good sensory and chemical characteristics. The results show that the best mixture can be used through experiment and sensory evaluation, where the percentage of total dry material in produced processed cheese is 38.6%, fat percentage is 53% and total count bacteria after manufacturing & after storage for 8 weeks in temperature of 5 ^{o} C -7 ^{o} C is 5×10^{-1} cell/g. These bacteria are gram positive rod bacteria spores. This means that heat processing was highly efficient in destroying the green bacterial cells, and storage at temperature of 5 ^{o} C -7 ^{o} C doesn't allow growth of bacteria spores. While samples which stored in temperature of 20-25 ^{o} C show increasing total count bacteria from 5×10^{-1}cell/g directly after manufacturing to 12×10^{-1} & 20×10^{-1} cell/g after 8 weeks of storage without any changes in quality characteristics. We conclude from these results that this product needs refrigerated storage, for conservation product quality if storage more than 8 weeks.

- Development of Processed Spread Cheese from Local White (Nabulsi) Cheese and Labaneh. University of Jordan. Al-Khalayleh, N., (1993).

The aim of this work was to study the possibility of using local white brined boiled cheese and labaneh (labaneh) in the production of a new type of processed cheese spread. An assembly consisting of a mixing vessel supplied with emulsifying mixer placed in a thermostatically controlled water bath was used to perform the cooking experiments Sensory evaluation was used to study certain cheese quality characteristics, it was found that the best ratio of cheese to labaneh was 2.5 to 1 by weight. It was also found that the use of Joha S4 emulsifying salt at a level of 2.2% of the final product gave the best flavor whereas other emulsifying salts tested resulted in unacceptable flavours.

The chemical analysis showed that the moisture content in the product was 61% which was higher than some similar commercial products, but within the limits of Jordanian standards. The contents of protein, fat, ash, and salt in the new product were 14.5, 19.5, 3.3 and 1.3% respectively, while the pH was 5.8.

- Chemical Composition of Processed Cheese Using Sudanese White Cheese. Department of Dairy Production Faculty of Animal Production University of Khartoum P. O. Box 32 Postal code 13314 Khartoum North Sudan. Nour El Diam, M.S.A., El Zubeir., Ibtisam, E.M. (2005).

Trails for production of the processed cheese from the Sudanese white cheese were done during this study. The processed cheese was made from Sudanese white cheese with different ripening time (15days and 30 days) from milk with two level of fat present (2.2% and 4.4%). At time of processing, the processed cheese was packed into two types of containers (glass and plastic) and stored at 4^{o} C for 3months. The result revealed that the different fat percent showed significant differences ($P<0.05$) on the total solids, ash and fat contents. The acidity and protein contents showed non-significant differences ($P>0.05$) with the different fat level of the milk from which the processed cheese was made. The acidity, ash, total solids and protein content showed significant differences ($P<0.05$) with different ripening time (15 days and 30 days). Also, the storage periods showed significant differences ($P<0.05$) with the acidity, ash, total solids, protein and fat contents. The different types of packaging (plastic and glass) showed significant differences ($P<0.05$) for acidity, protein and fat contents. However, ash and total solids contents showed non-significant differences ($P<0.05$) with the different types of packaging of the processed cheese.

Hence, the present study concluded that the Sudanese white cheese could be further reprocessed to obtain the processed Sudanese cheese with improved compositional content especially when fresh cheese was used.

- Utilization of Goats Milk in Manufacture of Processed Cheese. Dairy Science Dept. National Research Center, Dokki, Giza Egypt. Mohamed, A.G., Fatma., Hassan, A.M., Bayoumi, Hala M and Ali. K. Enab.(1997).

Two Formulas of Different Blends Are Used For Manufacture Processed Cheese. First Formula, F1; (Cow. Processed Cheese) Consist Of 38.44% Ras Cheese, 12.80% Cheddar Cheese, 10.26% Butter, 5.12% Skim Milk Powder, 2.50% Emulsifying Salts And 30.88% Water. Second Formula; F2 (Goats Processed Cheese) Consist of Goats Cheese Base 66.40%, 19.92% Butter, 6.64% Skim Milk Powder, 2.00% Emulsifying Salts And 5.04% Water. Both Processed Cheeses Were Storage At 7 ^{o} C for 3 Months. Organoleptically, Chemical and Physical Properties Were Studied. Obtained Results Showed That Processed Cheese That Made from Goats Base (F2) Had Gained a Higher Scores for The Breakdown Properties, Spreading Quality and Free from Gumminess Than Control (F1) And Had Lower Soluble Nitrogen as Well As TVFA Than Control Either Fresh or During Storage. Also, F2 Had a Higher Values in Penetrometer Reading and Meltability While Lower in oil separation. The Color of Treatment (F2) Is Prefer Than F1.

The differences and convergence between this study and some previous studies were that previous studies used only local cheese and some others used labaneh. In this new study local cheese and labaneh were used with different periods of maturation followed by the study of chemical and microbial properties at different periods of maturity and have added fresh whey milk instead of drinking water.

Chapter Three

Materials and Methods

3.1 Introduction:

The purpose of this research was to manufacture a process spread cheese by blending green non-ripened cheese with labaneh using different types of emulsifying agents also at different concentration and the selection of the most suit emulsifying agents.

All the raw materials for preparing spreadable processed cheese were Analyzed as following; chemical analysis, microbial analysis and sensorial analysis. With the objective of ascertaining the extent of final products matching Palestinian specifications, and access to a high quality spreadable processed cheese.

3.2 Materials

Different raw material were used in this study, milk, cheese, Labaneh, rennet enzyme, starter culture, butter, fresh whey, whey powder, emulsifier, water, salt, and potassium sorbate.

Most of the materials were analyzed to study its composition and quality.

3.2.1 Milk

Fresh raw cow's milk was obtained from Alekhlas farm in Hebron to produce the white cheese and Labaneh from a national dairy plant in Ramallah. The samples were analyzed by Sensorial analysis, Chemical analysis and Microbial analysis.

3.2.1.1 Sensorial analysis

The sensorial analysis of raw milk showed that there are no impurities, no smell, it has a good taste, good color in accordance with PSI 2014-600.

3.2.1.2 Chemical analysis:

The milk samples were analyzed (table 3.1) for fat content using Gerber's method and protein content by using Kjeldahl method. Total solids, density and Ash contents were determined according to AOAC (1990), pH-value was determined according to Hanna instrument HI 98190, and penicillin was determined according to Yima Opto electrical - ANT500. (Appendix1).

Table 3.1 Chemical composition (%) of fresh cow's milk.

	density	Protein	fat	Total solid	Ash	PH	Penicillin
Fresh milk	1.307	3.3	2.90	12.33	0.71	6.7	N. D

Each reading represents the arithmetic average of three replications

3.2.1.3 Microbial analysis:

The milk samples were analyzed (table 3.2) for *Total aerobic count, Total coliform, Fecal coliform, Staphylococcus aureus, Salmonella, Yeasts, Molds and Listeria monocytogenes* were enumerated according to BAM, FDA, 8 editions. (Appendix2).

Table 3.2 Microbial analysis of cow's milk samples (cfu/ml)

	T.P.C cfu/ml	*T.C cfu/ml*	*F.C cfu/ml*	*S. aureus cfu/ml*	*Salmonella Per25ml*	*Yeast cfu/ml*	*Mold cfu/ml*	*Listeria monocytogenes Per25ml*
Fresh milk	100000	1000	Nil	Nil	Nil	Nil	Nil	Nil
Pasteurized milk	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil

Each reading represents the arithmetic average of three replications

3.2.2 Fine powder salt

Fine powder salt (sodium chloride): was obtained from local market used to prepare the brine solution at 15% ratio, the objective for using salt was cheese preservation.

3.2.3 Starter culture

Starter cultures were obtained from Danisco Food Ingredient solutions-Denmark, it was added to milk at 2-3%, it contains *Lactobacillus bulgaricus* and *Streptococcus thermophilus* species.

3.2.4 Rennet enzyme

Rennet enzyme was obtained from HANSEN Food Ingredient solutions-Denmark used for milk coagulation and curd formation with activity; 3000IMCU/g and dosage 0.05%.

3.2.5 Potassium sorbate

Potassium sorbate was obtained from ABAC Best Biochemical- China used for cheese preservation.

3.2.6 White cheese

White cheeses were manufactured according to Frank V. Kosikowski (1997), milk was transferred from pasteurizer into double jacket vats with heating and cooling capacity, rennet was added at specific temperature 43 ^{o} C, the milk was then kept for 45 to 60 minutes depending on strength of rennet. After milk coagulation, curd is agitated to separate curd from whey, shaping was done and the cheese was pressed into stainless steel bowl into their final shape. The finished cheese was placed into tank with 15% brine solution (water and salt). Cheese are placed in a cold room, the next day cheeses were

packed and sealed into plastic cans and stored at temperature 4 ^{o} C for 90 days. Chemical and microbiological analyses were determined at 1, 30, 60 and 90 days (Fig 3.1).

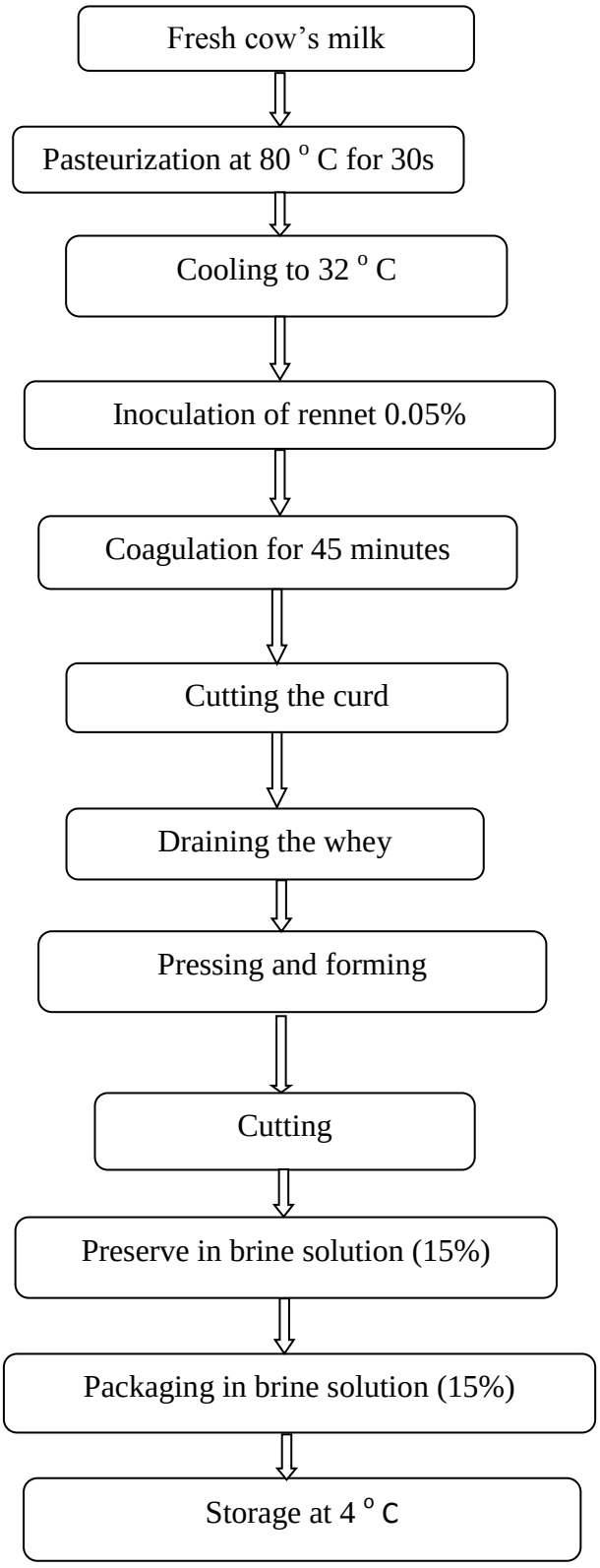


Fig 3.1: Flow diagram for manufacturing of white soft cheese

3.2.6.1 Chemical analysis:

The white cheese samples were analyzed fresh (one day), 30 days, 60 days and 90 days for fat content using Gerber's method and protein content was determined by Kjeldahl method. Total solids, density, potassium sorbate and Ash contents were determined according to AOAC (1990), pH-value was determined according to Hanna instrument HI 98190. (Appendix1).

3.2.6.2 Microbial analysis:

The white cheese samples were analyzed for *Total aerobic count; Total coliform, Fecal coliform, Staphylococcus aureus, Salmonella, Yeasts, Molds* and *Listeria monocytogenes* were enumerated according to BAM, FDA, 8 editions. (Appendix2).

3.2.7 Fermented milk (labaneh)

Labaneh manufactured according to Frank V. Kosikowski (1997), the fresh cow milk was heated to 90 ^{o} C for 10 second by steam using hot plate pasteurizer and it was then cooled to 42 ^{o} C, warm milk was transferred into container and starter cultures were added. The warm milk was incubated for 3-4 hours at 42 ^{o} C until pH 4.1, then it was cooled to 5 ^{o} C, the mixture was then transferred into cloth bags in a chiller room where they are left for two days, and finally it was packed and sealed into plastic cans and stored at 4 ^{o} C for 45 days, chemical and microbiological analysis were done at 1,30 and 45 days (Fig 3.2).

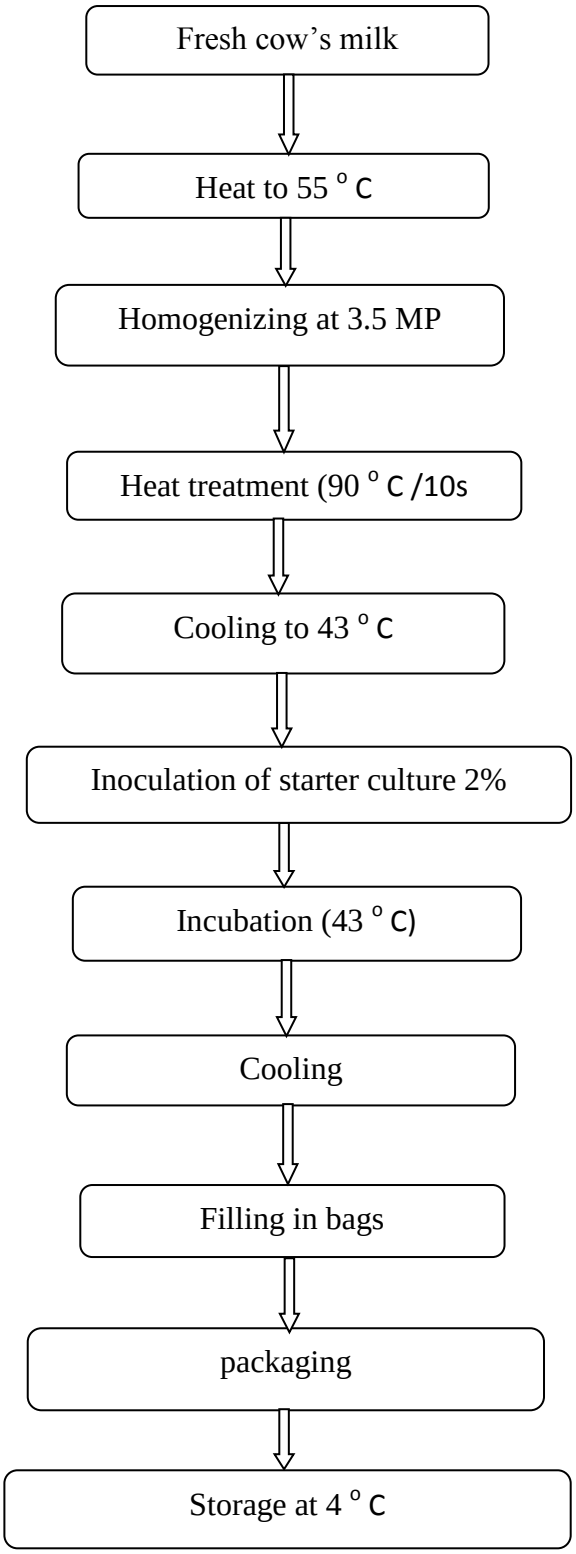


Fig 3.2: Flow diagram for manufacturing of Labaneh

3.2.7.1 Chemical analysis:

The labaneh samples were analyzed fresh (one day), 30 days, 45 days for fat content was determined by Gerber's method and protein content was determined by Kjeldahl method. Total solids, potassium sorbate and Ash contents were determined according to AOAC (1990), PH-value was determined according to Hanna instrument HI 98190. (Appendix1).

3.2.7.2 Microbial analysis:

The labaneh samples were analyzed fresh (one day), 30 days, 45 days for *Total coliform, Fecal coliform, Staphylococcus aureus, Salmonella, Yeasts* and *Molds* were enumerated according to BAM, FDA,8 edition. (Appendix2).

3.2.8 Fresh whey

Fresh whey was obtained from cheese manufacturing used to increase nutrition value and increased total solids content.

3.2.8.1 Chemical analysis:

The fresh whey samples were analyzed (Table 3.3) for fat content was by Gerber's method and protein content was determined by Kjeldahl method. Total solids and Ash contents were determined according to AOAC (1990), PH-value was determined according to Hanna instrument HI 98190. (Appendix1).

Table 3.3 Chemical composition (%) of fresh whey used in manufacture of spreadable processed cheese

	Fat	Protein	T.S	Ash	pH
Fresh whey	0.62%	1.19%	6.80%	0.51%	6.02

Each reading represents the arithmetic average of three replications

3.2.8.2 Microbial analysis:

The fresh whey samples were analyzed (Table 3.4) for *Total aerobic count, Total coliform, Fecal coliform, Staphylococcus aureus, Salmonella, Yeasts* and *Molds* were enumerated according to BAM, FDA, 8 editions. (Appendix2).

Table 3.4 Microbial analysis for fresh whey used in manufacture of spreadable processed cheese cfu/ml

	Fresh whey
T.A.C cfu/ml	NIL
T.C cfu/ml	NIL
F.C cfu/ml	NIL
S. aureus cfu/ml	NIL
Salmonella per25g	NIL
Listeria monocytogenes per25g	NIL
Mold cfu/ml	NIL
Yeast cfu/ml	NIL

Each reading represents the arithmetic average of three replications

3.2.9 Butter

Butter was obtained from local market was used to increase the total solid and to improve the taste.

3.2.9.1 Chemical analysis:

The butter samples were analyzed (Table 3.5) for fat content was determined by Gerber's method and protein content was determined by Kjeldahl method. Total solids and Ash contents were determined according to AOAC (1990). (Appendix1).

Table 3.5: The chemical composite (%) butter used in manufacture of spreadable processed cheese

	fat	Protein	Total solid	Ash
Butter	84%	0.95%	86%	0.10%

Each reading represents the arithmetic average of three replications

3.2.9.2 Microbial analysis

The butter samples were analyzed (Table 3.6) for *Total aerobic count, Total coliform, Fecal coliform, Staphylococcus aureus, Salmonella, Yeasts* and *Molds* were enumerated according to BAM, FDA, 8 editions. (Appendix2).

Table 3.6: Microbial analysis for butter used in manufactured of spreadable processed cheese cfu/g

	T.A.C cfu/g	*F.C cfu/g*	*T.C cfu/g*	*S. aureus cfu/g*	*Salmonella Per25g*	*Yeast cfu/g*	*Mold cfu/g*
Butter	NIL	NIL	NIL	NIL	NIL	NIL	NIL

Each reading represents the arithmetic average of three replications

3.2.10 Whey powder

Whey powder was obtained from local market used to increase the total solid and nutritional value.

3.2.10.1 Chemical analysis:

The whey powder samples were analyzed (Table 3.7) for fat content was determined by Gerber's method and protein content was determined by Kjeldahl method. Total solids and Ash contents were determined according to AOAC (1990). (Appendix1).

Table 3.7: The chemical composition (%) of whey powder used in manufacturing of spreadable processed cheese.

	Fat	Protein	Total solid	Ash
Whey powder	5.5%	52%	92%	6.67%

Each reading represents the arithmetic average of three replications

3.2.10.2 Microbial analysis

The fresh whey samples were analyzed (Table 3.8) for *Total aerobic count, Total coliform, Fecal coliform, Staphylococcus aureus, Salmonella, Yeasts* and *Molds* were enumerated according to BAM, FDA, 8 editions. (Appendix2).

Table 3.8: Microbial analysis for whey powder used in manufactured of spreadable processed cheese cfu/g

	Whey powder
T.A.C cfu/g	210
T.C cfu/g	NIL
F.C cfu/g	NIL
Salmonella per25g	NIL
S. aureus cfu/g	NIL
Yeast cfu/g	NIL
Mold cfu/g	NIL

Each reading represents the arithmetic average of three replications

3.2.11 Emulsifier

Three types of emulsifiers were used: self BP7(combination of sodium polyphosphates(E452) and sodium phosphates(E339) , self L9(combination of sodium polyphosphates(E452) and sodium phosphates(E339) and self H9(combination of sodium polyphosphates(E452) and sodium phosphates(E339) were obtained from Budenheim chemicals – Germany. (Chemical composition)

3.2.12 Water

Drinking water was used in the manufacture of control sample and in prepared brine solution.

3.2.12.1 Chemical analysis:

The drinking water samples were analyzed (Table 3.9) for T.D.S was determined according to AOAC (1990) and PH-value was determined according to Hanna instrument HI 98190. (Appendix1).

Table 3.9: The chemical composition (%) of drinking water.

	T.D.S	pH
Drinking water	180	7.6

Each reading represents the arithmetic average of three replications

3.2.12.2 Microbial analysis

The drinking water samples were analyzed (Table 3.10) for *Total coliform, Fecal coliform* were enumerated according to BAM, FDA, 8 editions. (Appendix2).

Table 3.10: Microbial analysis for drinking water cfu/ml

	T.C cfu/ml	*F.C cfu/ml*
Drinking water	NIL	NIL

Each reading represents the arithmetic average of three replications

3.3 Methods

The experimental work and the methods used were carried out in National Dairy Plant, Central Public Health Laboratory/ Palestinian Ministry of Health and Birzeit University Testing Laboratory.

3.3.1 Manufacture of spreadable processed cheese

Spreadable processed cheese was manufactured (Fig 3.3) according to the method of Meyer (1973) using the processing batch type kettle of 5kg capacities. Different mixes were prepared from fresh cheese, old cheese, labaneh, emulsifying salt (3%), butter, fresh whey and whey powder.

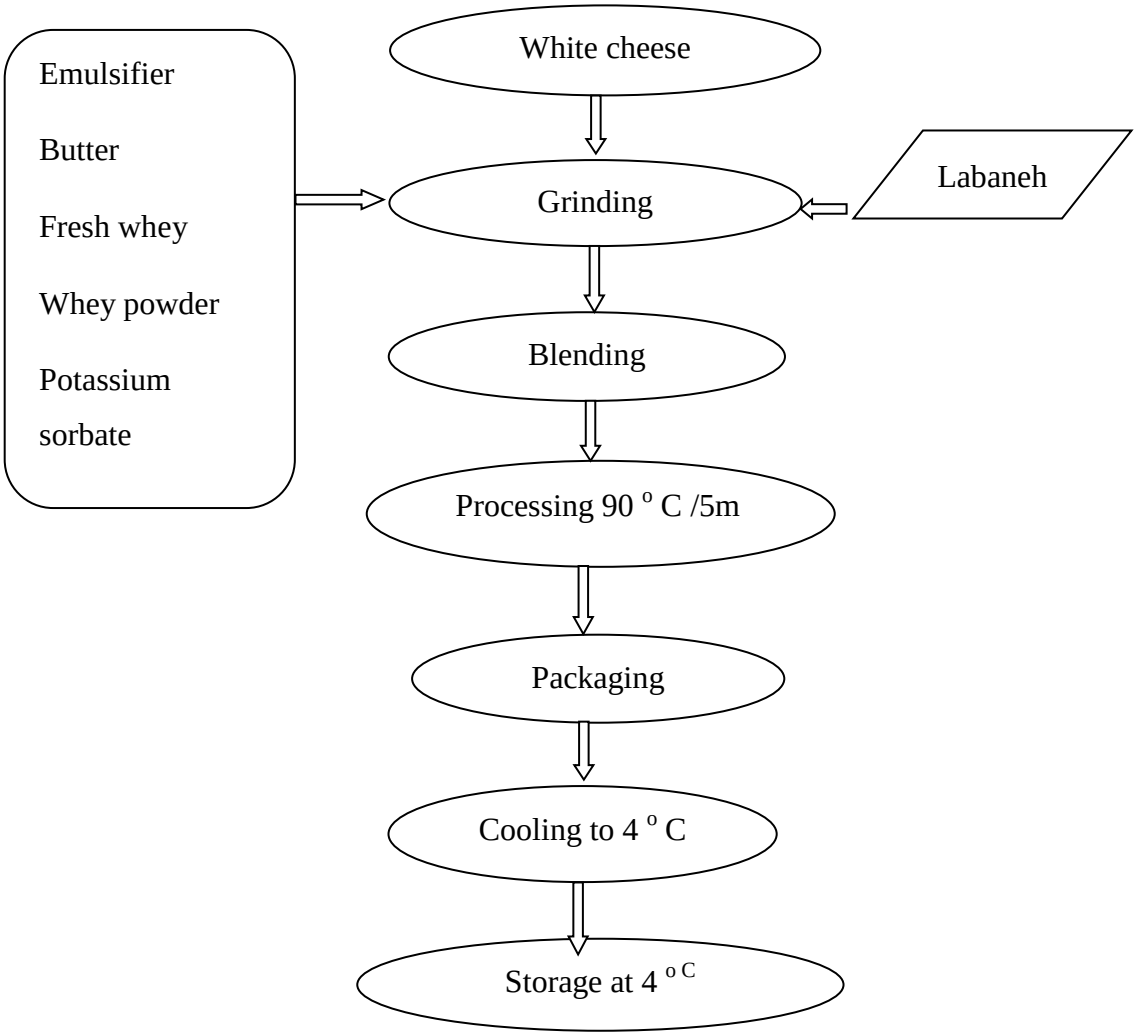


Fig 3.3: Flow diagram for manufacturing of spreadable processed cheese

3.3.2 Apparatus Design and Description

A special device was designed so as to allow the melting, mixing and obtaining of a homogenous blend. A double jacket kettle of 5 Kg capacities with blades made from stainless Steel was locally prepared as follows:

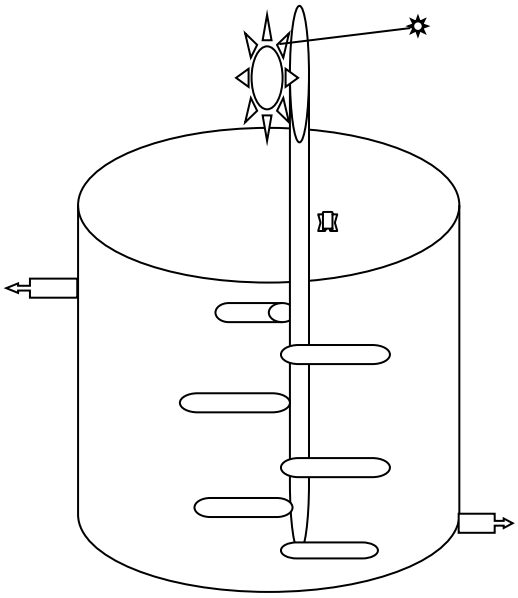


Fig 3.4: Batch type kettle for spread cheese making.

3.3.3 Analysis Methods Used for Dairy Products

Sensorial analysis, Chemical analysis, and Microbial analysis were done to the initial raw materials, intermediate dairy products and final cheese spreads.

The sampling: three different samples were selected randomly according to date of reception and date of follow up.

A schedule for the sampling was prepared in which the ingredients and final products were analyzed.

3.3.3.1 Microbial Analysis:

The spreadable processed cheese samples were analyzed for *Total aerobic count, Total coliform, Fecal coliform, Staphylococcus aureus, Salmonella, Yeasts, Molds* and *Listeria monocytogenes* were enumerated according to BAM, FDA, 8 editions. (Appendix2).

3.3.3.1.1 Total Aerobic Count.

Plate Count Agar was used for *Total aerobic count*. Plates were incubated at 30 ^{o} C for 72 h, according to FDA-BAM. (Appendix 2.1).

3.3.3.1.2 Total Coliform.

Violet Red Bile Agar was used for the enumeration of *Coliforms*. Plates were incubated at 37°C for 24 h. according to FDA-BAM. (Appendix2.2).

3.3.3.1.3 Fecal Coliform.

The method of detection of *Fecal coliforms* in dairy products according to FDA-BAM. (Appendix 2.3).

3.3.3.1.4 Staphylococcus aureus.

The method of detection of *Staphylococcus aureus* in dairy products according to FDA-BAM. (Appendix2.4).

3.3.3.1.5 Salmonella.

The method of detection of *Salmonella* in dairy products according to FDA-BAM. (Appendix 2.5).

3.3.3.1.6 Listeria monocytogenes

The method of detection of *Listeria monocytogenes* in dairy products according to FDA-BAM. (Appendix2.6).

3.3.3.1.7 Yeasts and Molds.

Acidified Potato Dextrose Agar was used for *Yeast* and *Mold* enumeration. Plates were incubated at 25 ^{o} C for 5 days, according to FDA-BAM. (Appendix2.7).

3.3.3.2 Chemical analysis

The spreadable processed cheese samples were analyzed for fat content was determined by Gerber's method and protein content was determined by Kjeldahl method. total solids and Ash contents were determined according to AOAC (1990) pH-value was determined according to Hanna instrument HI 98190. (Appendix1).

3.3.3.2.1 Fat Content.

Fat content was determined by Gerber's method. 3 g cheese sample was weighed into a butyrometer vessel and filled with 10 ml H2SO4 (d: 1.55 g /cm3). 1 ml amyl alcohol was added and centrifuged in Gerber centrifuge for 10 min. The oil level was read from butyrometer vessel. (Appendix1.1).

3.3.3.2.2 Protein Content.

Protein content was determined by Kjeldahl method. (Appendix1.2).

3.3.3.2.3 Total Solids.

Total solid content of the cheeses was determined by using oven drying method. The difference in weight before and after drying for 4 hours at 100 ^{o} C gives the results of solid content. (Appendix1.3).

3.3.3.2.4 Ash.

Ash was determined by dry Ashing method. Samples were dried in oven for 1 h and burned in ash oven at 550 ^{o} C until all black color was disappeared. After cooling in desiccator, they were weighed. The difference in weight before and after burning process gives the ash content. (Appendix1.4).

3.3.3.2.5 PH-value.

PH-value was determined according to Hanna instrument HI 98190. (Appendix1.5).

3.3.3.3 Sensorial analysis

Spreadable processed cheese samples were sensory evaluated using a hedonic scale of 0-9, Evaluation was done by a group containing five experienced staff (Afnor, 1993). The second group included 25 consumers and represent different ages and classes (Larmond, E. 1977).

Table 3.11: Hedonic scale used to evaluate sensorial properties of Spreadable processed cheese.

Sensory attribute (9 point)	1	9
Firmness of body	1very soft	9 very firm
chewiness	1present	9 absent
Gumminess	1 absent	9 very pronounced
Oil separation	1 absent	9 very pronounced
flavor	1 very weak	9 very strong
Smoothness of texture	1 very smooth	9 not smooth
Spreading quality	1 difficult to spread	9 easy to spread
bitter	1 absent	9 very bitter
Overall performance	1 dislike very much	9 like very much

3.3.4 Statistical analysis

The results were analyzed using SPSS statistical soft. Complete Randomized design were used to estimate chemical, microbial and sensory characteristics of spreadable processed cheese.

3.3.5 Experimental Design

The experimental work was done according to the next steps:

a- Emulsifiers type selection and others ingredients.

b- Control sample selection and manufacturing.

c- Labaneh had been added to the formula in different proportions.

d- Different types of emulsifier were used.

e- Chemical, microbial and sensorial analysis were applied on the samples.

There are different parameters to be studied in this research:

1- Effect of type of emulsifier on products quality.

2- Effect of added labaneh on products quality.

3- Effect of added old white cheese (90 days) on products quality.

4- Effect of added old labaneh (45 days) on products quality.

Chapter Four

Results& Discussions

4.1 Introduction

This chapter contains two parts of results, the first part deals with the raw materials used for the production of spreadable processed cheese specially cheese and labaneh physicochemical and microbiological characteristics. The results of chemical and microbial analysis of the locally white cheese and labaneh was studied at different periods of maturity and storage. The second part talking about the results of sensorial, chemical and microbial analysis of spreadable processed cheese manufacturing during storage time and the selection of the best formulation of spreadable process cheese using white locally white cheese, labaneh and the selection of the most suitable emulsifying agent.

4.2 White cheese characterization in function of ripening

Chemical and microbial and sensorial analysis have been made on white cheese during different storage times (one day ,30 days ,60 days and 90 days).

4.2.1 Chemical analysis of the white cheese

The chemical tests done on the White brine cheese were fat, protein, total solid, ash and pH during different storage time. The objective of these analysis was to study the stability and quality of cheese and its efficiency for use in spreadable process cheese

4.2.1.1 Protein content

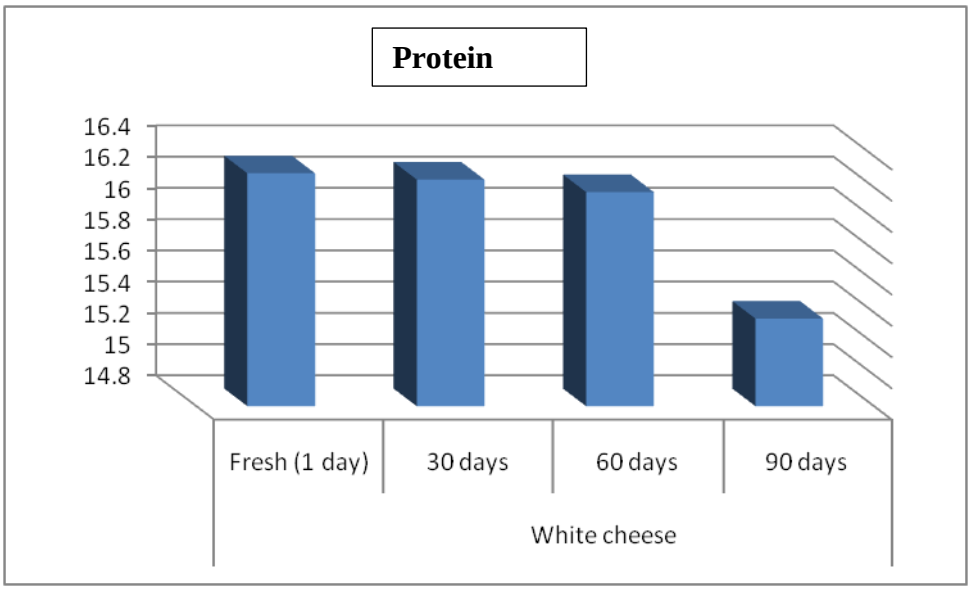


Fig. 4.1 Effect of ripening time on total Protein content in white cheese.

From Fig. (4.1) the protein content in function of time did slightly decrease from 16.29 at fresh(one day) to 15.36 % at the end (90days), this slight decrease in protein content during storage might be due to some protein degradation leading to formation of water soluble compounds , some of which were lost in the pickling solution leading to an increase in nitrogen content of whey , these findings were in agreement with (Hayaloglu et al., 2005) However, due to the method of processing of cheese the changes are low and the product can be considered stable. The decrease in protein content was not statistically significant (P>0.05).

4.2.1.2 Fat content

From Fig. (4.2) the fat content slightly decreased from 20.38 at fresh (one day) to 19.53% at the end of storage time (90days), this was agreed with (Abdalla, M.O. 1992) who found that some fat must have leaked from curd into brine solution, However the decrease in fat content was not statistically significant (P>0.05).

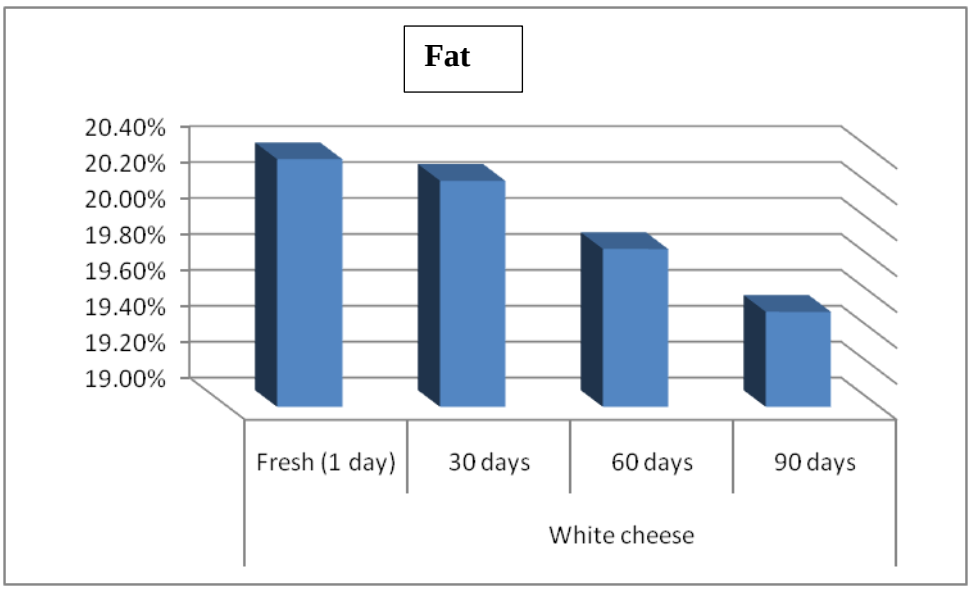


Fig. 4.2 Effect of ripening time on fat content in white cheese

4.2.1.3 Total Solid examination results

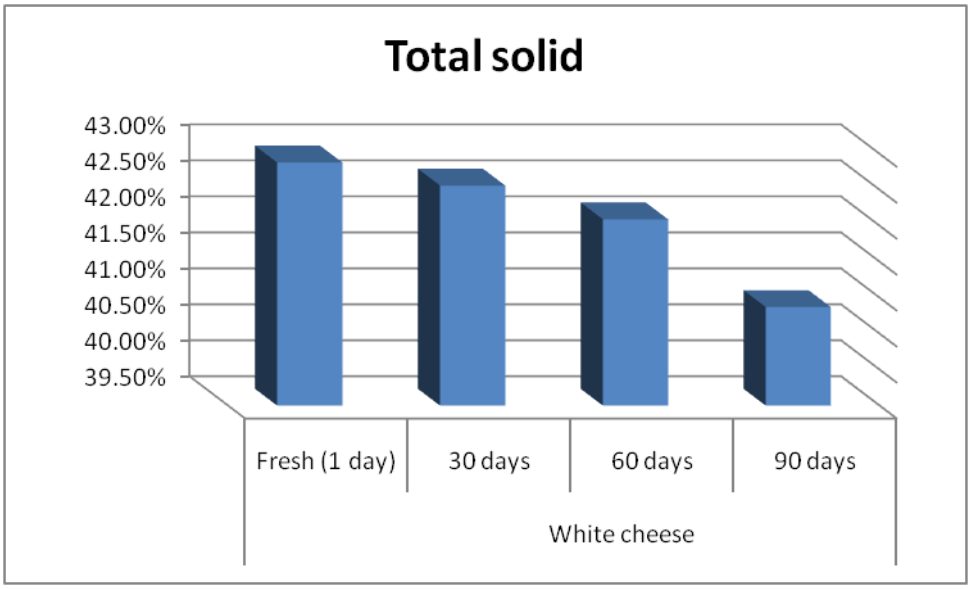


Fig. 4.3 Effect of storage period on Total Solid of white cheese.

From Fig. (4.3) the total solid content slightly decreased from 42.88 at fresh (one day) to 40.87at the end (90days), However the decrease in total solid content was not statistically significant (P>0.05)., this decrease in total solid content during storage might be due to proteolytic and lipolytic, this was agreed with (Nuser, S.M 2001) and (Hayaloglou et al.,

2005) who found that the decrease in total solid content during storage due to the effect of microorganism's activity.

4.2. 1.4 Ash examination results

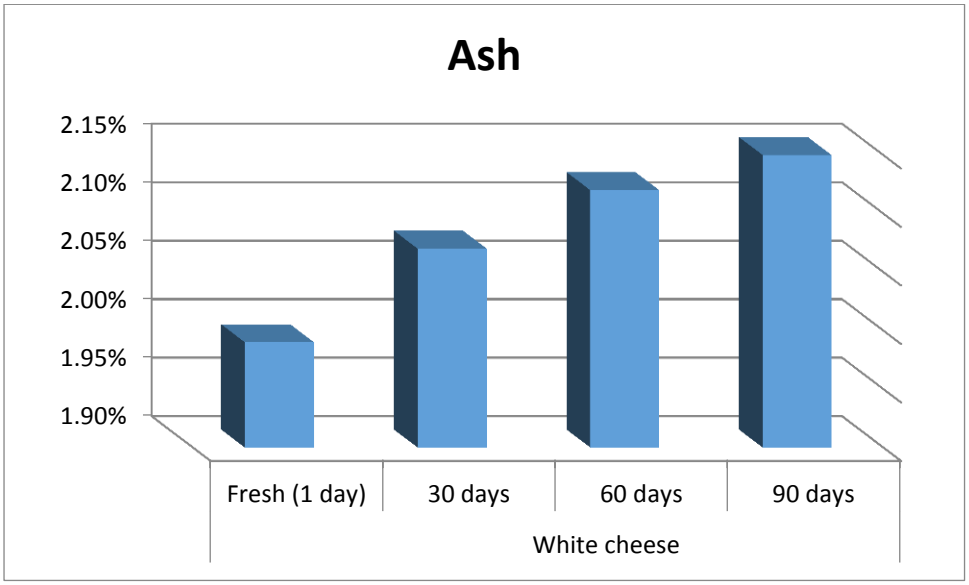


Fig. 4.4 Effect of storage period on Ash of white cheese.

From Fig. (4.4) the Ash content slightly increased from 1.99 at fresh (one day) to 2.15at the end(90days), and this result is in agreement with the findings of (El Owni et al., 2008) who reported increasing ash content during storage period. The increase in ash content could be attributed to the slight decrease in moisture (Abdalla, O.M. et al., 1997). However, the increase in Ash content was not statistically significant (P>0.05).

4.2.1.5 PH examination results

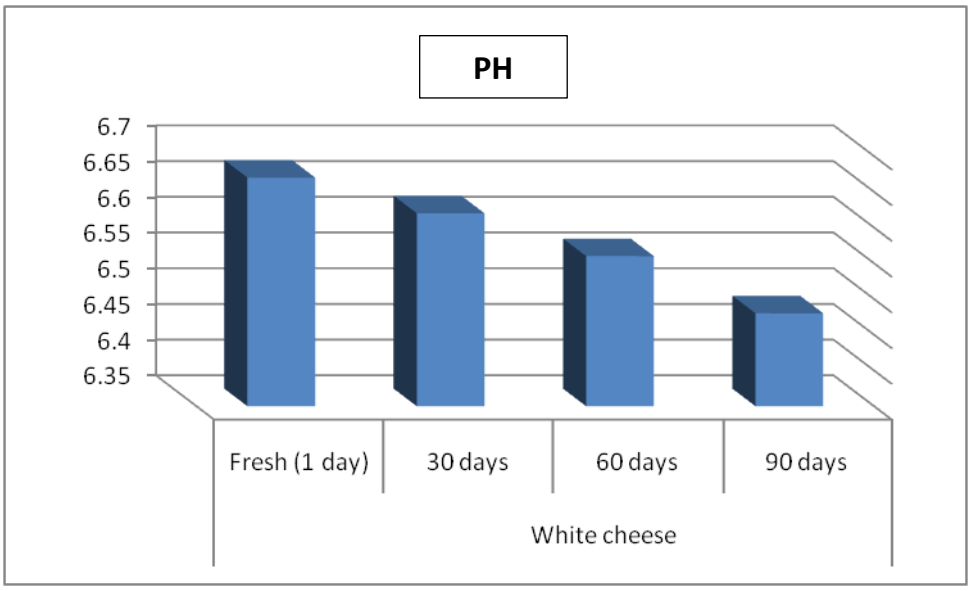


Fig. 4.5 Effect of storage period on PH of white cheese.

From Fig. (4.5) there are few increase in acidity during storage from 6.67at fresh (one day) to 6.48at the end (90days) and the increase in PH did not affect significantly (P>0.05). This was agreed with(El Owni et al., 2008); (Hayaloglu et al., 2005) who found that the increase in acidity towards the end of storage period was mainly due to increase in lactic acid by the action of lactic acid bacteria .

4.2.2 The results of microbial analysis of the white cheese

It was conducted following microbial tests; *Total coliform, Fecal coliform, Salmonella, S. aureus, Listeria monocytogenes, Yeast* and *Mold* recorded nil in all samples of white cheese during storage time, but the *Total aerobic bacteria* count increased as shown in the table (4.1):

Table 4.1 Microbial analysis of white cheese used in manufacture of spreadable processed cheese cfu/g.

	White cheese			
	Fresh (1 day)	30 days	60 days	90 days
T.A.C cfu/g	Nil	400	1059	3200
T.C cfu/g	Nil	Nil	Nil	Nil
F.C cfu/g	Nil	Nil	Nil	Nil
Salmonella per25g	Nil	Nil	Nil	Nil
Yeast cfu/g	Nil	Nil	Nil	Nil
Mold cfu/g	Nil	Nil	Nil	Nil
S. Aureus cfu/g	Nil	Nil	Nil	Nil
Listeria monocytogenes per25g	Nil	Nil	Nil	Nil

4.2.2.1 *Total aerobic bacteria* analysis of white cheese

From Fig. (4.6) the *Total aerobic bacteria* increased from <10 at fresh (one day) to 3200 colonies at the end(90days) this was agreed with (Ceylan et al., 2003) found that the *Total bacteria count* increased during storage period due to the microbial activity of raw milk.

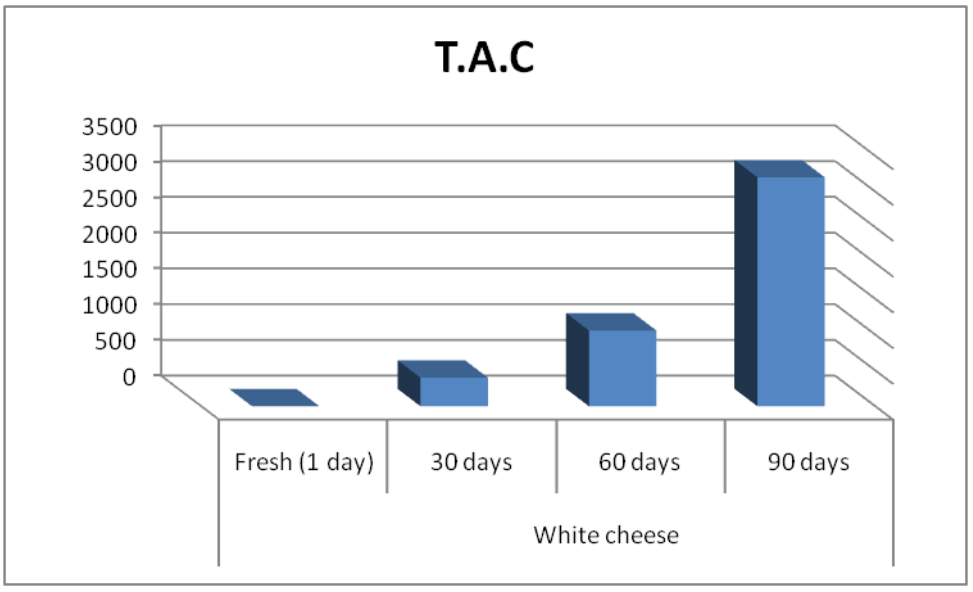


Fig. 4.6 Effect of storage period on growth of *Total aerobic bacteria* of white cheese.

4.2.3 Sensorial analysis of white cheese

White cheese samples were evaluated and found that it has no color and no smell and non-salty.

4.3 Labaneh characterization

Labaneh is a popular fermented milk product in the Middle East, which has a significant role in family nutrition (Abd El-Salam et al., 2011). It is also known under different names in different countries. (Ramos et al., 2009). The chemical, microbial and sensorial analysis have been made on labaneh during storage time (one day, 30 days and 45 days).

4.3.1 Chemical analysis of the labaneh

It was conducted following chemical tests; Fat, Protein, Total Solid, Ash and PH during storage time.

4.3.1.1 Fat content

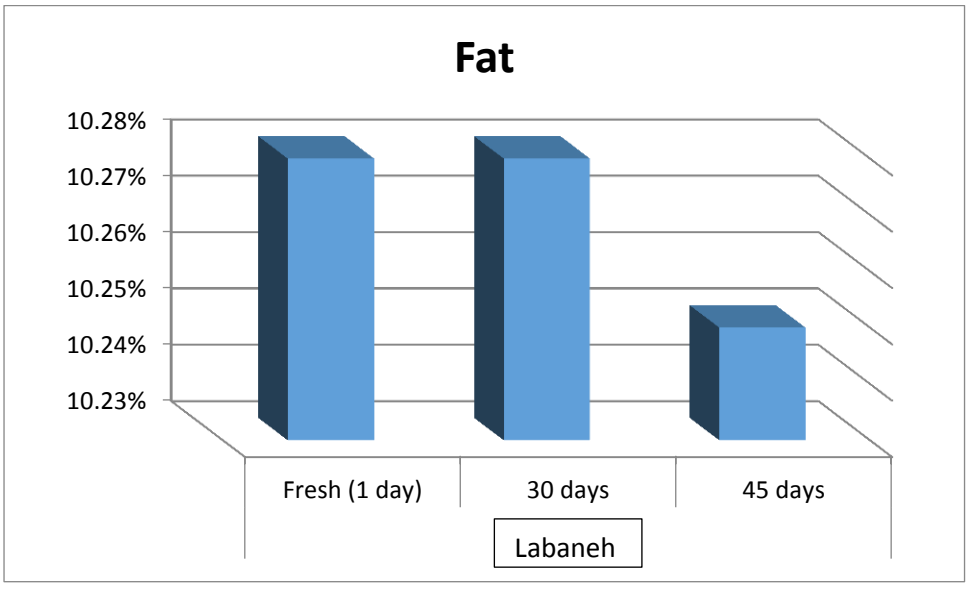


Fig. 4.7 Effect of storage period on fat content of Labaneh.

The results showed from Fig. (4.7) that the fat content slightly decreased from 10.28 at fresh state (one day) to 10.25at the end of storage (45days), due to the decomposition of fat as result of lipolytic enzymes produced during storage, However, this result is not statistically significant (P>0.05).

4.3.1.2 Protein content

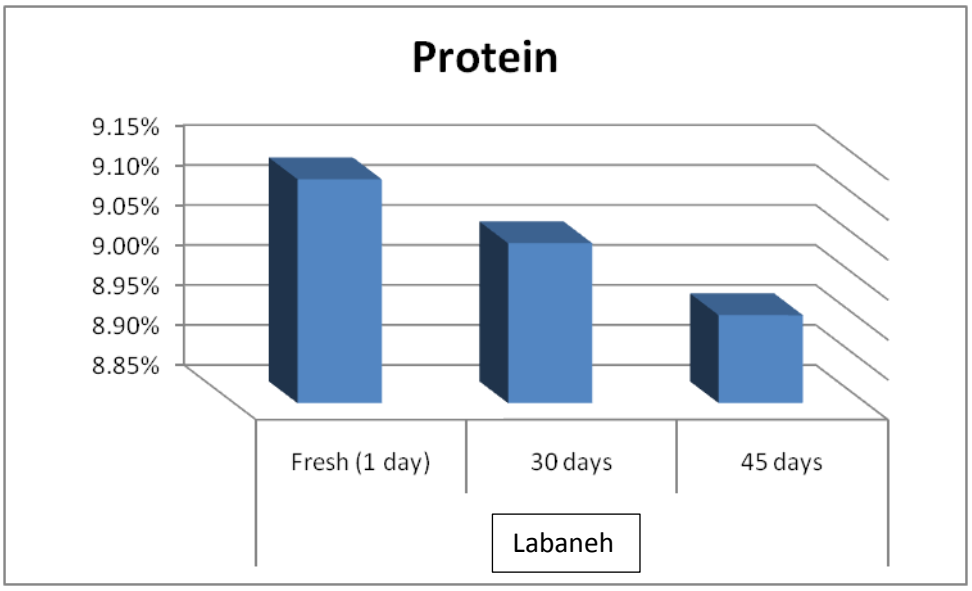


Fig. 4.8 Effect of storage period on protein content of Labaneh.

From Fig. (4.8) the protein content slightly decreased from 9.13at fresh state (one day) to 8.96 at the end storage (45days), this decrease in protein content during storage might be due to protein degradation leading to formation of water soluble compounds. However, the result is not statically significant (P>0.05).

4.3.1.3 Total Solid content

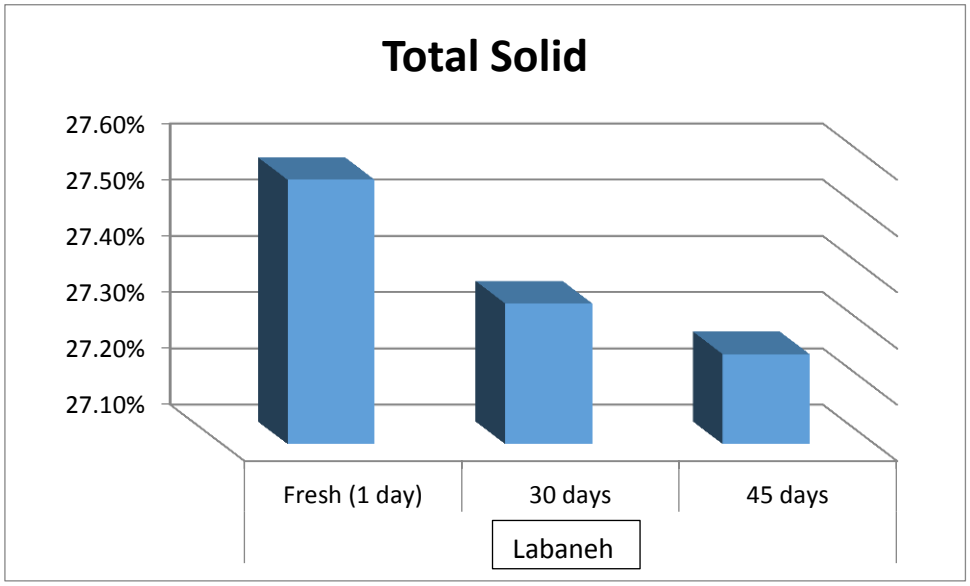


Fig. 4.9 Effect of storage period on Total Solid of Labaneh.

The total solid content slightly decreased from 27.57 at fresh state (one day) to 27.26 at the end of storage (45days) as shown in Fig. (4.9), however the decrease in total solid is not significant (P>0.05), this decrease in total solid content during storage might be due to proteolytic and lipolytic degradation.

4.3.1.4 Ash content

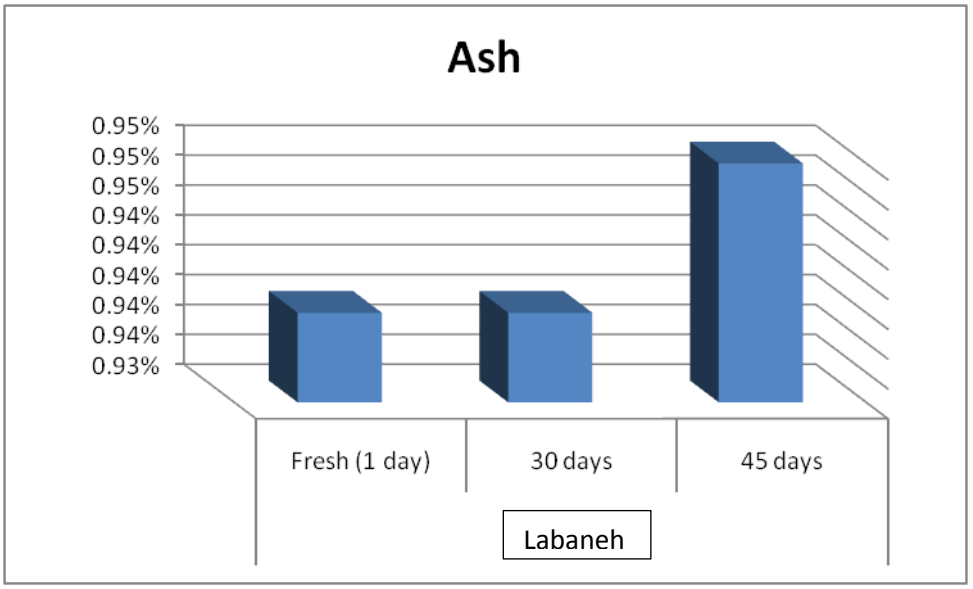


Fig. 4.10 Effect of storage period on Ash of Labaneh

From Fig. (4.10) the Ash content slightly increased from 0.94 at fresh state (one day) to 0.95to the end of storage period (45days), However the increase in Ash content is not statistically significant (P>0.05).

4.3.1.5 PH

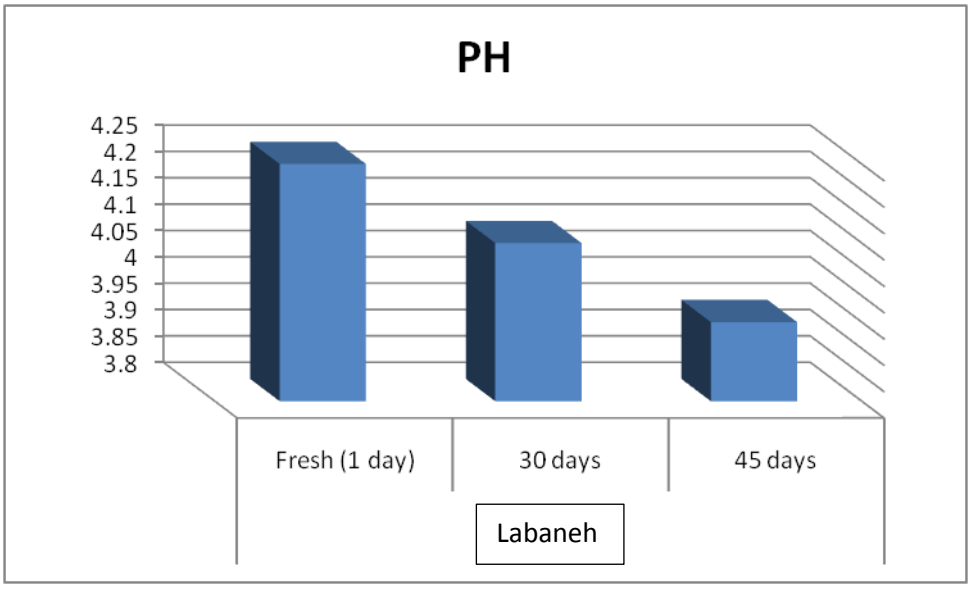


Fig. 4.11 Effect of storage period on PH of Labaneh.

The results showed a slight increase in the acidity during storage from 4.25at fresh state (one day) to 3.95at the end of storage (45days) as shown in Fig. (4.11). However, the increase in PH is statistically significant (P<0.05).

4.3.2 The microbial analysis of the labaneh

Total coliform, Fecal coliform, Salmonella, S. aureus, Yeast and *Mold* recorded nil in all samples of labaneh` during storage time as a result the efficiency of good manufacturing processes, as shown in the table (4.2):

Table 4.2: Microbial analysis of labaneh used in manufacture of spreadable processed cheese cfu/g.

	Labaneh		
	Fresh (1 day)	30 days	45 days
T.C cfu/g	Nil	Nil	Nil
F.C cfu/g	Nil	Nil	Nil
Salmonella per25g	Nil	Nil	Nil
Yeast cfu/g	Nil	Nil	Nil
Mold cfu/g	Nil	Nil	Nil
S. Aureus cfu/g	Nil	Nil	Nil

4.3.3 Sensorial analysis of labaneh

Labaneh samples were evaluated and found that it has no color, no off-flavour and strange taste.

4.4 Microbial, chemical and sensorial analysis of the spreadable processed cheese samples.

4.4.1 Introduction

Processed cheese represents an extremely delicate and complex system as its properties are affected by many variables, such as the composition and nature of the cheeses used as ingredients, type and amount of melting salts, pH and processing parameters (Marchesseau et al., 1997). Therefore, using new ingredients in processed cheese production it is indispensable to study the effect of newly elaborated cheese base addition on physicochemical and textural properties of processed cheese spreads.

In the spreadable processed cheese manufacturing process where several blends of processed cheese have been produced, using different percentages of labaneh and cheese

and different types of emulsifiers. The percentage of used fresh cheese was 60% and that of old ripened cheese was 40%, this ratio was chosen based on different formulations to obtain best texture and color of spread cheese.

The use of emulsifying salts such as disodium phosphate and trisodium citrate in process cheese manufacture aids in improving the emulsification properties of caseins by displacing the calcium phosphate complexes in the insoluble calcium–paracaseinate phosphate network present in natural cheese (Ellinger, 1972; Gupta et al., 1984; Caric et al., 1985). This displacement of the calcium phosphate complex disrupts the major molecular force that cross-links the various monomers of casein in the network. Approximately < 1 to about 5 μm in diameter) in a partially dispersed casein gel network.

The selected types of emulsifying salts in our research was chosen so as to give best results with the use of labaneh in the manufacturing process and the degree of acidity, so as to maintain the pH of final product.

It was used fresh labaneh 80% and old labaneh 20%, this ratio was chosen based on the experiences that has to choose the proportion of the old labaneh with the fresh labaneh and this percentage was best ratio to maintain the PH.

In the manufacturing of spreadable processed cheese, all ingredients were fixed except the percentage of labaneh and white cheese and type of emulsifying salts.

Table (4.3) illustrated the formulations of the blends used for manufacture of spreadable processed cheese composed of white cheese (39%), labaneh (26%), butter (19%), emulsifying salts (3%), whey powder (3%), fresh whey (14.6%) and potassium sorbate (0.3).

Table 4:3: Formulation of the blends used for manufacture of spreadable processed cheese.

Ingredients	Control %	Cheese39%, labaneh 26%
White cheese	65	39
Labaneh	-----	26
Animal Butter	19	19
Emulsifier	3	3
Whey Powder	3	3
Potassium Sorbate	0.3	0.3
Fresh Whey	9.7	9.7
Total	100	100

4.4.2 Chemical analysis of spreadable processed cheese

The results of chemical analysis for all samples spreadable processed cheese indicate that the percentage of total solids and the percentage of fat were identical to the Palestinian standard 638 of year 2014.

4.4.2.1 Total Solids analysis of spreadable processed cheese.

The results of total solid for all samples of spreadable processed cheese indicate that the percentage of total solids were identical to the Syrian specifications number 404 of years 1986 for all percentage of labaneh and cheese used and all types of emulsifier, the total solids content for all the recipe decrease during storage due to the decrease in fat and protein as it is shown in the fig. (4.12, 13, 14), there is significant difference ($p<0.05$) for total solids content during storage. This decrease occurs in all the different types of emulsifying salts used and the decrease is in function of time of storage. The percentage of labaneh has also an effect on the total solids since a higher rate of proteolysis and lipolysis can occur due to the percentage of lactic acid bacteria present. The data agree with those

obtained by (Dholu et al., 1990) who reported that the type of emulsifying salt had no significant influence on moisture content of cheese spreads.

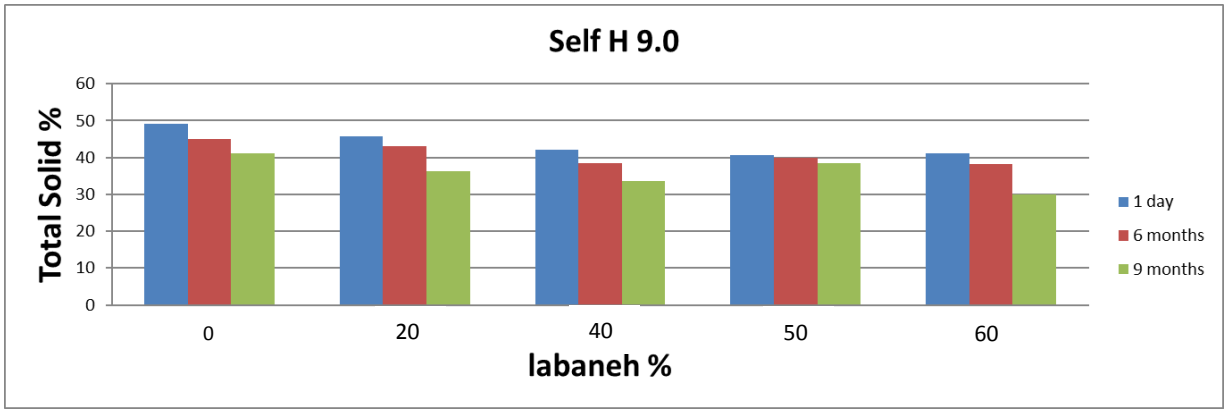


Fig. 4.12 Effect of storage period on total solid of spreadable processed cheese (Emulsifier salt Self H 9.0)

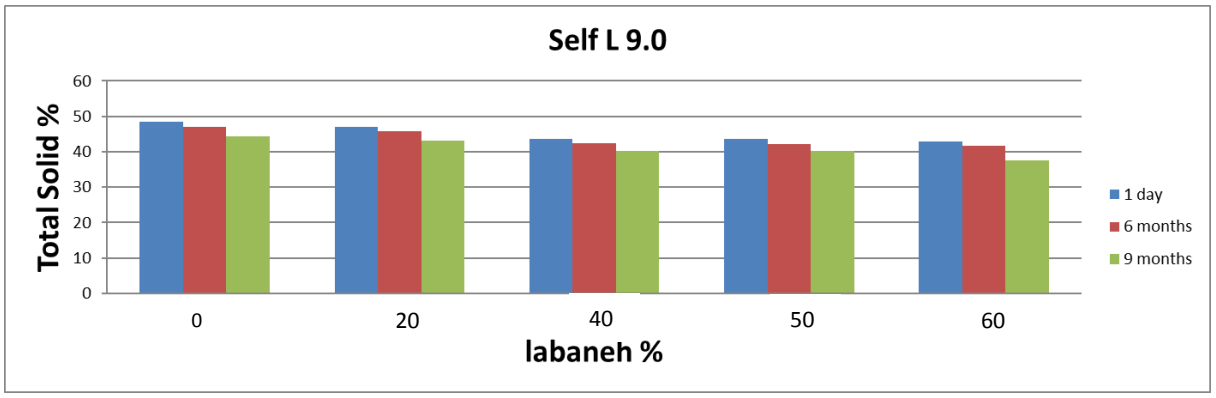


Fig. 4.13 Effect of storage period on total solid of spreadable processed cheese (Emulsifier salt Self L 9.0).

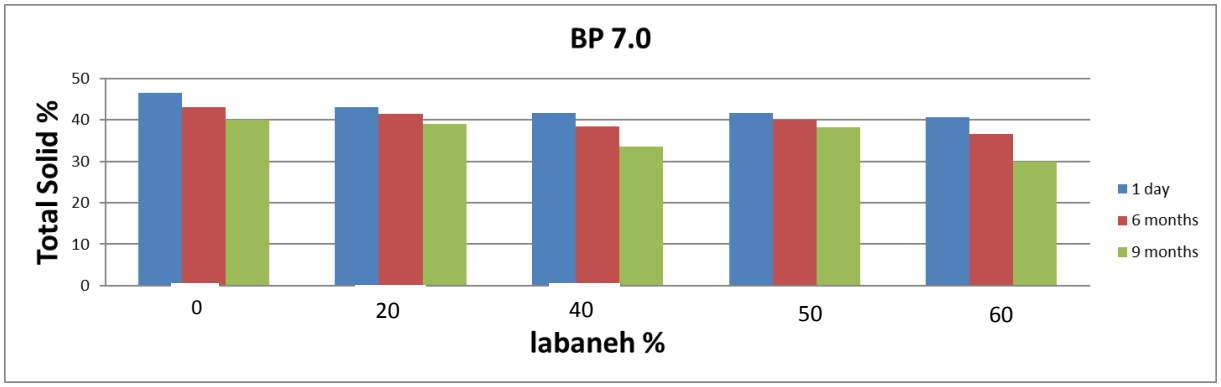


Fig.4.14 Effect of storage period on total solid of spreadable processed cheese (Emulsifier salt BP 7.0).

4.4.2.2 Protein content in spreadable processed cheese.

The protein content slightly decreased during storage in all recipes of spreadable processed cheese as it is shown in the fig. (4.15, 16, 17), this decrease in protein content during storage might be due to protein degradation this was agreed with (Hamed et al., 1997) who found that the decrease in protein due to the limited degradation or assimilation of protein in cheese. The analysis of variance showed that the protein content was not significantly affected ($p \geq 0.05$) by the type of emulsifying agent and storage period the Emulsifier Self L 9.0 gave the least changes in protein content of spreadable process cheese. Data agree with those of (Dholu et al., 1990) who found that the type of emulsifying and storage period at 5 C^{o} up to 3 months had no significant effect on protein content of processed cheese. But the percentage of labaneh had a significant effect on the protein content due to the presence of lactic acid bacteria.

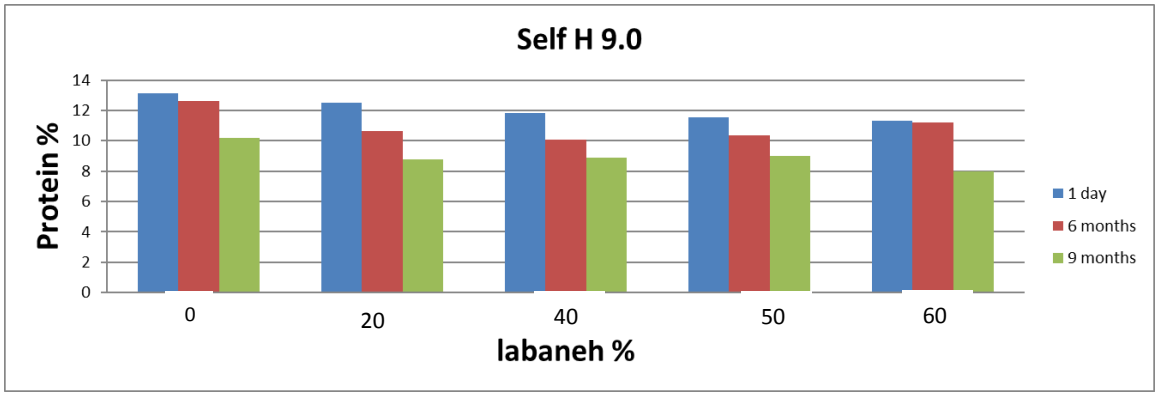


Fig.4.15 Effect of storage period on protein of spreadable processed cheese (Emulsifier salt Self H 9.0).

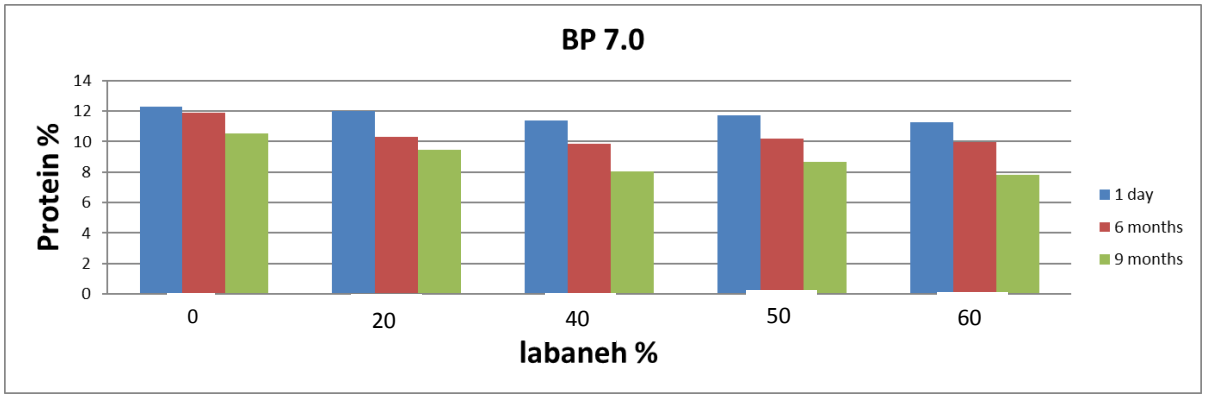


Fig.4.16 Effect of storage period on protein of spreadable processed cheese (Emulsifier salt BP 7.0).

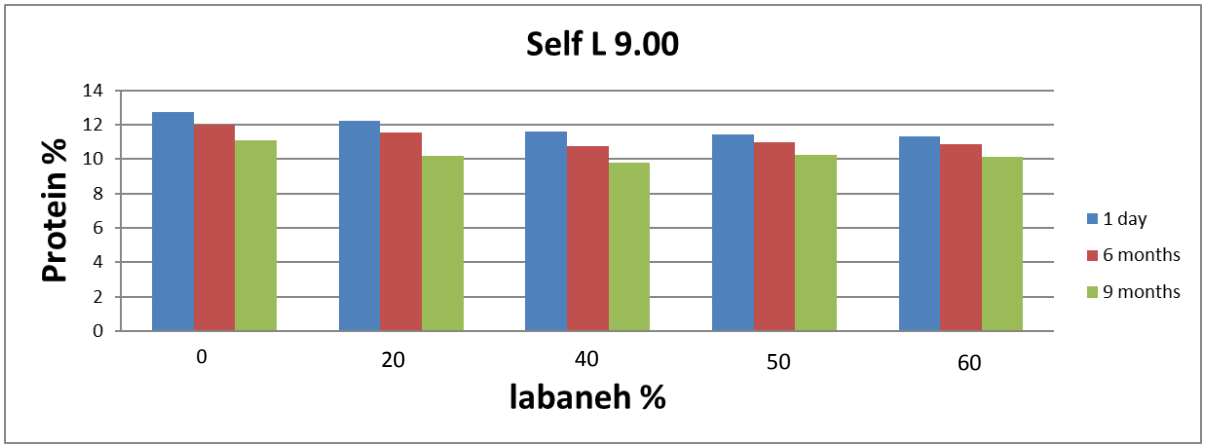


Fig.4.17 Effect of storage period on protein of spreadable processed cheese (Emulsifier Self L 9.0).

4.4.2.3 Fat content of spreadable processed cheese.

The fat content slightly decreased during storage in all recipes of spreadable processed cheese as it is shown in the fig. (4.18, 19,20), this decrease in fat content during storage might be due to fat degradation, r the decrease in fat was significant ($P<0.05$) and this was agreed with (Hamid et al., 1997) who found that the fat content decrease during storage due the active of lipolytic bacteria.

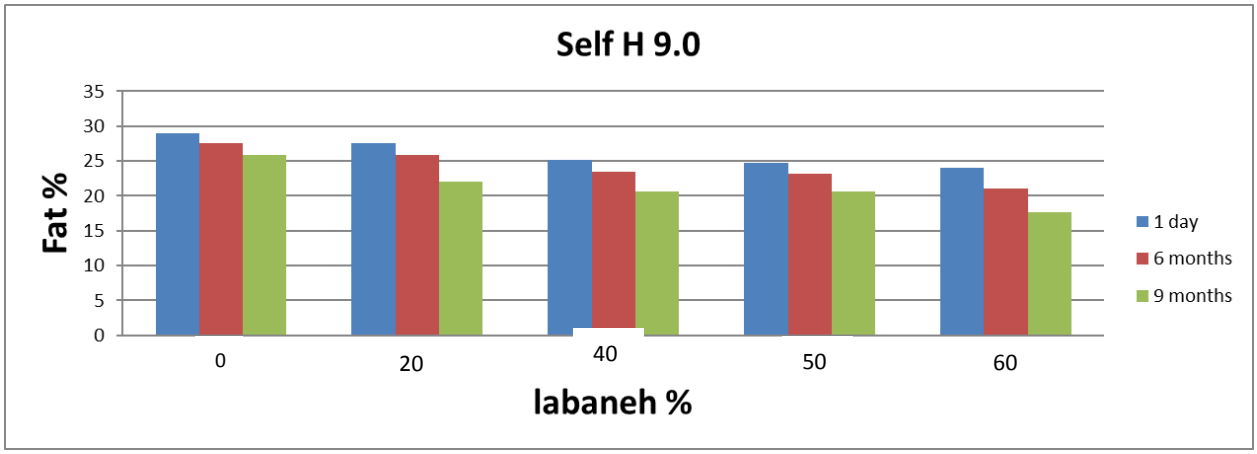


Fig. 4.18 Effect of storage period on Fat of spreadable processed cheese (Emulsifier Self H 9.0).

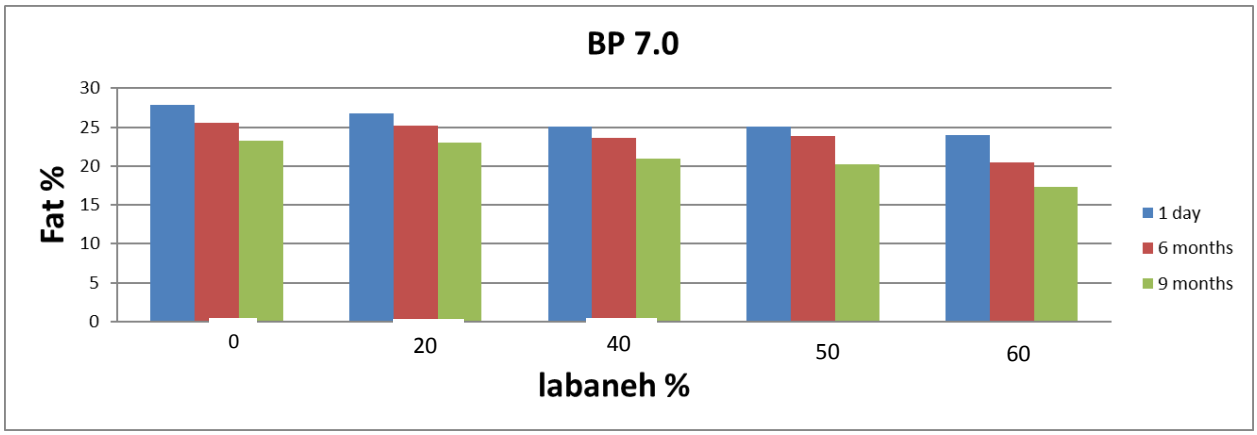


Fig. 4.19 Effect of storage period on fat of spreadable processed cheese (Emulsifier Self BP 7.0).

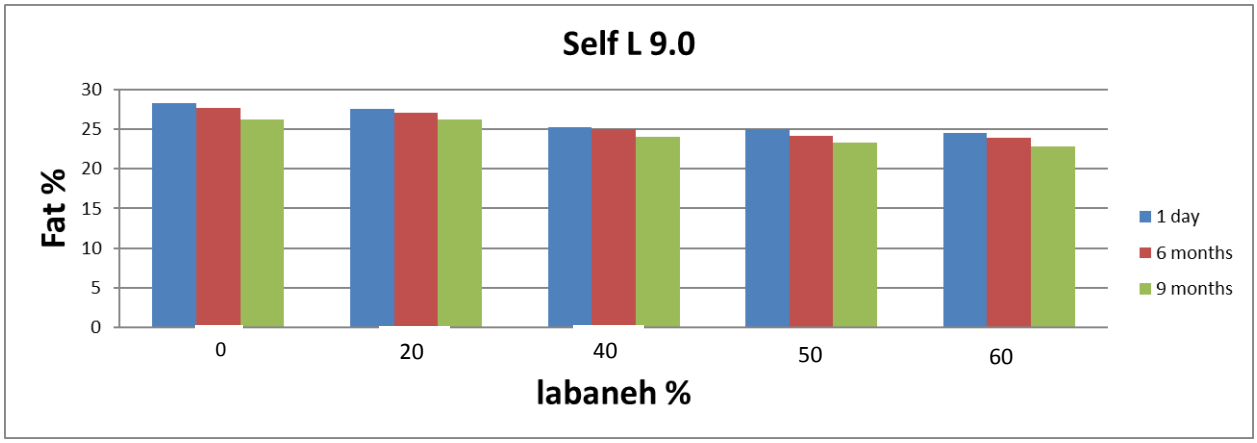


Fig. 4.20 Effect of storage period on fat of spreadable processed cheese (Emulsifier Self L 9.0).

4.4.2.4 Ash analysis of spreadable processed cheese.

The Ash content slightly decreased during storage period in all recipes of spreadable processed cheese as it is shown in the fig.(4.21, 22,23) due to the decrease of total solids during storage period, this was agreed with (Abdalla et al., 1993) who found that the Ash content decrease during storage. Emulsifier Self L 9.0 gave the best results with no significant changes in ash during storage time and the increase in the percentage of labaneh.

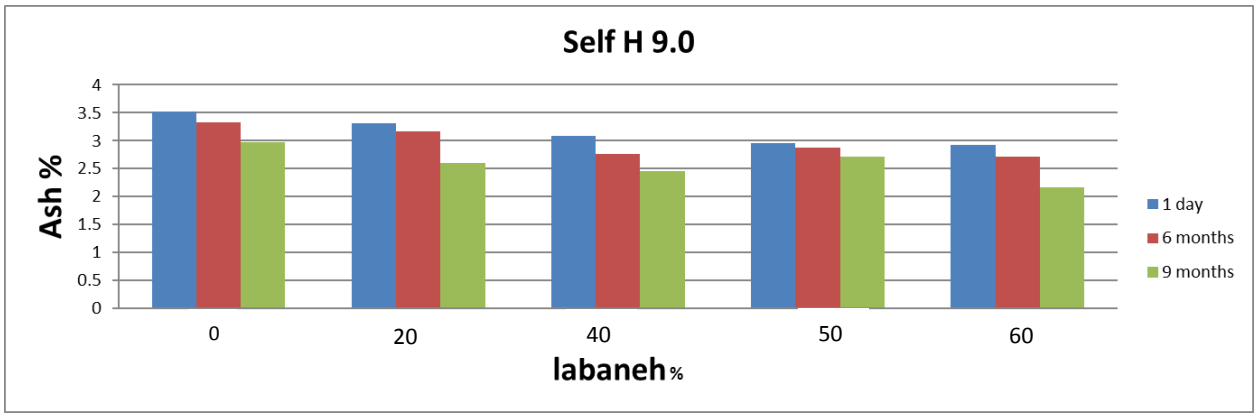


Fig. 4.21 Effect of storage period on Ash of spreadable processed cheese (Emulsifier Self H 9.0).

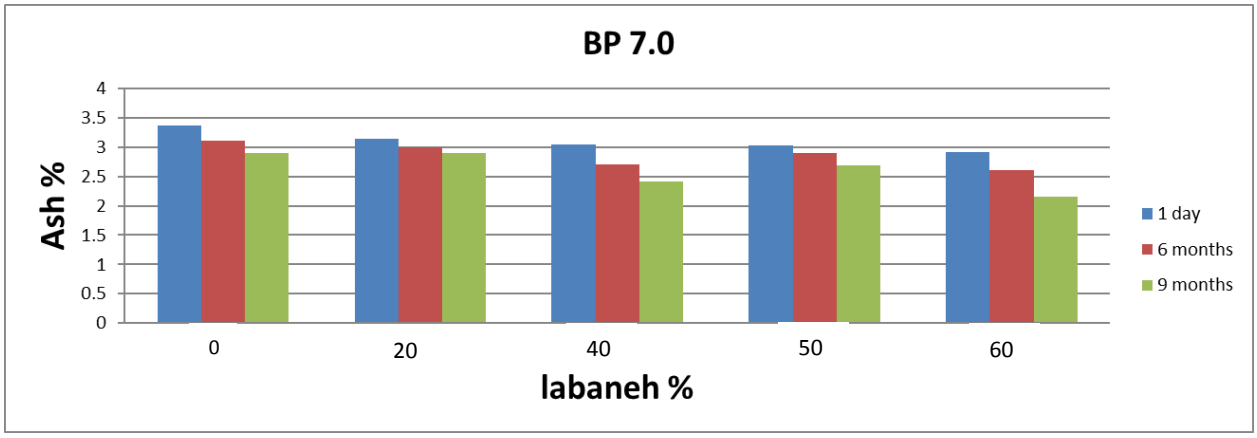


Fig. 4.22 Effect of storage period on Ash of spreadable processed cheese (Emulsifier BP 7.0).

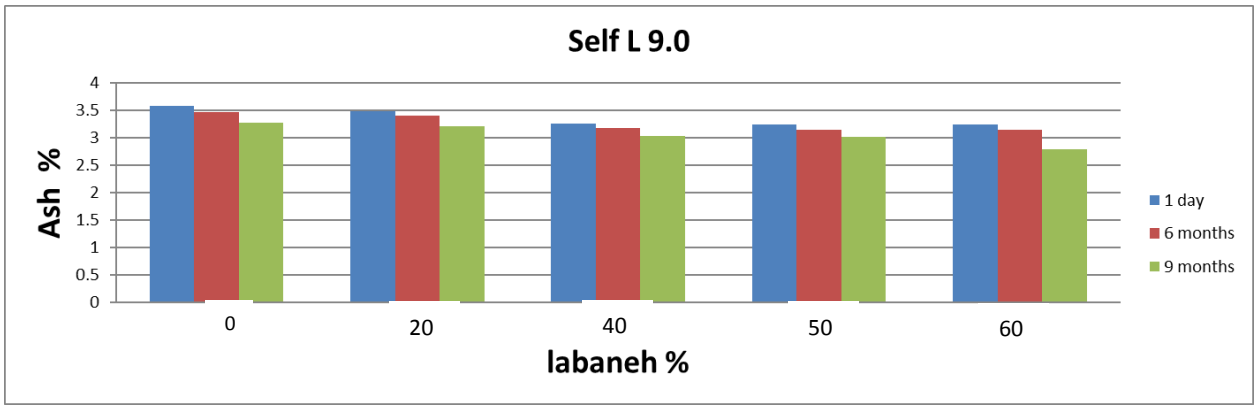


Fig.4.23 Effect of storage period on Ash of spreadable processed cheese (Emulsifier Self L 9.0).

4.4.2.5 PH analysis of spreadable processed cheese.

The PH slightly decreased during storage period in all recipes of spreadable processed cheese as it is shown in the Fig.(4.24, 25,26) due to lactic acid bacteria activity, this was agreed with (Shehata et al., 1982) who found that the decrease of PH during storage might suggest survival of lactic acid bacteria. Also, the decreases in pH values during storage may be due to decomposition occurring in emulsifying salts and their interaction with protein. It could be also due to the changes of cheese component such as lactose and proteins. our data are in agreement with (Tamime et al., 1990-b), (Younis et al., 1991-a), (Chambre et al., 2000).

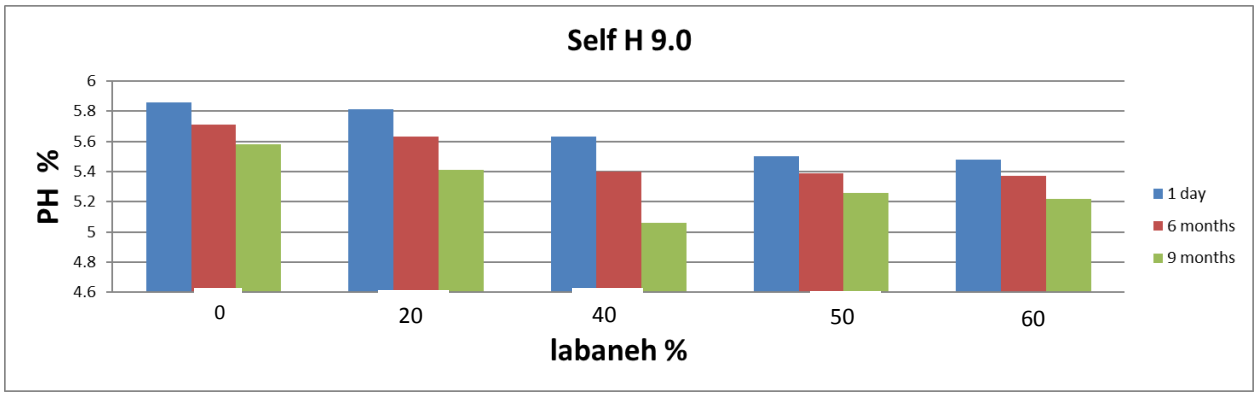


Fig. 4.24 Effect of storage period on PH of spreadable processed cheese (Emulsifier Self H 9.0).

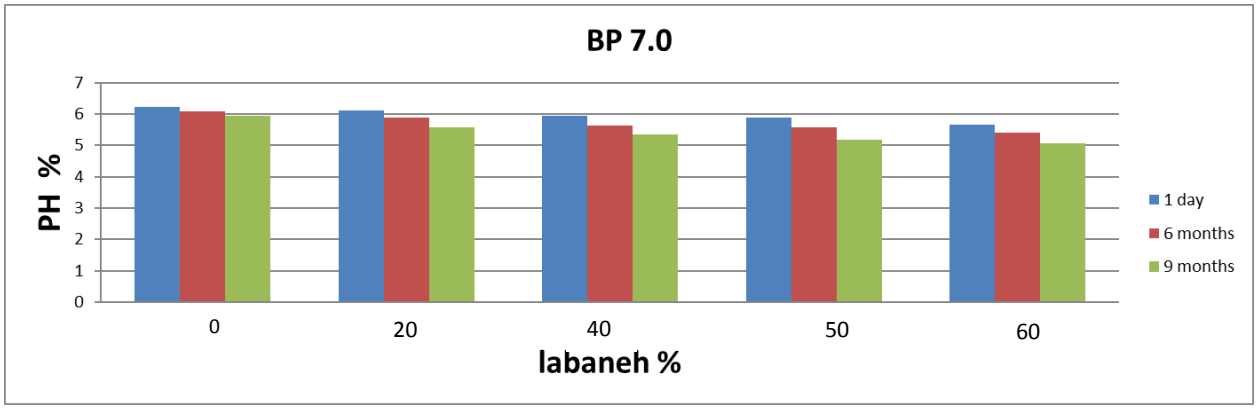


Fig. 4.25 Effect of storage period on PH of spreadable processed cheese (Emulsifier Self BP 7.0).

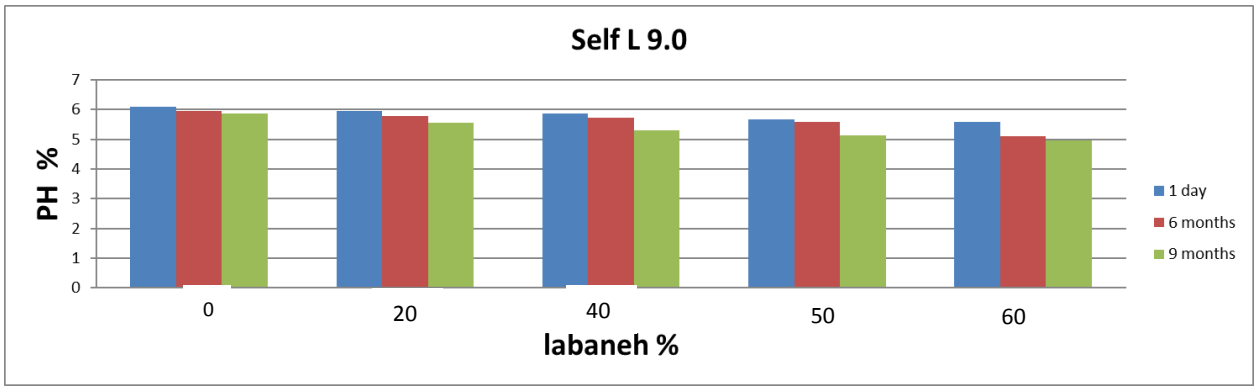


Fig. 4.26 Effect of storage period on PH of spreadable processed cheese (Emulsifier Self L 9.0).

Table 4.4: ANOVA analysis of chemical tests of spreadable processed cheese over the type of emulsion and time.

type = BP.7

			Ratio of Labaneh					
			0	20	40	50	60	ANOVA
mat	Ash	stability	1	1	1	1	.	
	Fat	stability	.	.	1	1	.	
	PH	stability	.	.	.	.	.	
	Protein	stability	1	1	.	.	1	
	Total Solid	stability	1	.	.	.	.	

type =self H.9

			Ratio of Labaneh					ANOVA
			0	20	40	50	60	
mat	Ash	stability	1	1	.	1	1	
	Fat	stability	.	1	1	1	.	negative
	PH	stability	1	.	.	.	.	
	Protein	stability	1	.	1	.	1	
	Total Solid	stability	.	1	.	1	1	

type = L.9

			Ratio of Labaneh					ANOVA
			0	20	40	50	60	
mat	Ash	stability	1	1	1	.	1	
	Fat	stability	1	1	1	1	1	negative
	PH	stability	1	.	1	1	1	negative
	Protein	stability	.	1	.	1	1	
	Total Solid	stability	1	1	1	.	1	negative

According to ANOVA analysis of the differences of chemical tests over the type of emulsion and time, the results of different formulations of spreadable processed cheese shows that the emulsion of self L.90 shows the highest score in the stability with score (20) stability situation, while the self H emulsion was (14) stability situation, while BP 7.0 score was (10) stability situation.

4.4.3 Microbial study of spreadable processed cheese.

4.4.3.1 Introduction

Microbial analysis was conducted for all spreadable processed cheese samples manufactured using the following types of emulsifying salts BP 7.O, Self L9.0 and Self H9.0 and various proportions of labaneh and cheese at different shelf life (one day, six months and nine months).

4.4.3.2 Microbial analysis of spreadable processed cheese (Emulsifier salt BP 7.0).

The results are shown in Fig. (4.27) the effect of storage period on microorganisms on spreadable processed cheese samples. The *Total aerobic count* bacteria appear only after six months and slowly increase during the advancement of storage time in 20% labaneh where it was at 6 months 354 colonies and after 9 months becoming 520 colonies,40% labaneh where it was at 6 months 301 colonies and after 9 months becoming 989 colonies,50% labaneh where it was at 6 months 212 colonies and after 9 months becoming 380 colonies, and 60 % labaneh where it was at 6 months 289 colonies and after 9 months becoming 483 colonies and was not detected in 0% labaneh ,while the *Coliform ,Yeast, Mold, Salmonella, Staphylococcus aureus* and *Listeria monocytogene*s were not detected and was never detected by the end of storage, this was agreed with (Warburton et al., 1986) who found that the spreadable processed cheese shows very low susceptibility to

microbial spoilage . And was agreed with (Caric, M. 1993) who found that the thermal process used in manufacture of processed cheese destroy pathogenic bacteria cells. Significant ($p<0.05$) variation were found between the number of total aerobic bacteria at one day and 9 months in spreadable processed cheese using BP 7.0 emulsifier salt.

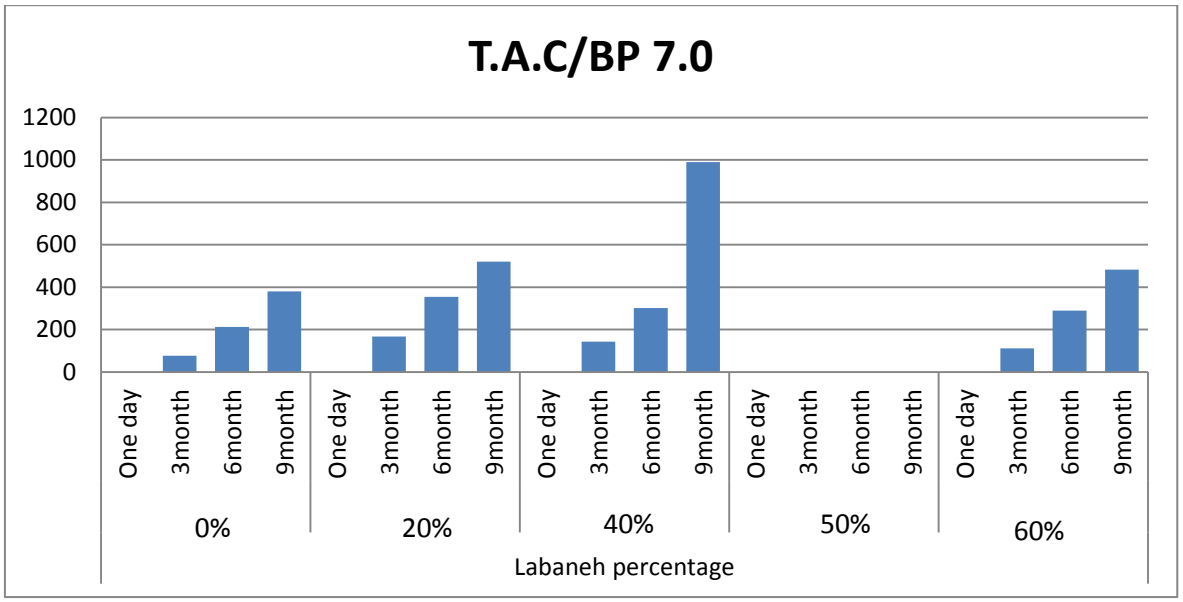


Fig. 4.27 Effect of storage period on growth of *Total aerobic bacteria* x$10^{-1}$of spreadable processed cheese (Emulsifier salt BP 7.0).

These results show that the spreadable processed cheese was initially produced under effective hygienic control and the reduction in the count during storage period reflects the effect of storage at 6±2 ^{o} C.

4.4.3.3 Microbial analysis of spreadable processed cheese (Emulsifier salt Self L 9.0).

The results in Fig. (4.28) show the effect of storage period on microorganism on spreadable processed cheese samples. the *Total aerobic count* bacteria appear after six month and slowly increase during storage in 20% labaneh where it was at 6 months 77 colonies and after 9 months becoming 210 colonies,40% labaneh where it was at 6 months 265 colonies and after 9 months becoming 600 colonies,50% labaneh where it was at 6

months 88 colonies and after 9 months becoming 423 colonies, and 60 % labaneh where it was at 6 months 241 colonies and after 9 months becoming 550 colonies and not detected in 0% labaneh, while the *Coliform ,Yeast, Mold, Salmonella, Staphylococcus aureus* and *Listeria monocytogenes* were not detected and were never detected by the end of storage this was agreed with(Warburton et al., 1986) who found that the spreadable processed cheese shows very low susceptibility to microbial spoilage, and was agreed with (Caric, M. 1993) who found that the thermal process used in manufacture of processed cheese destroy pathogenic bacteria cells. Significant ($p<0.05$) variation were found between the number of *Total aerobic bacteria* at one day and 9 months in spreadable processed cheese used self L 9.0 emulsifier salt.

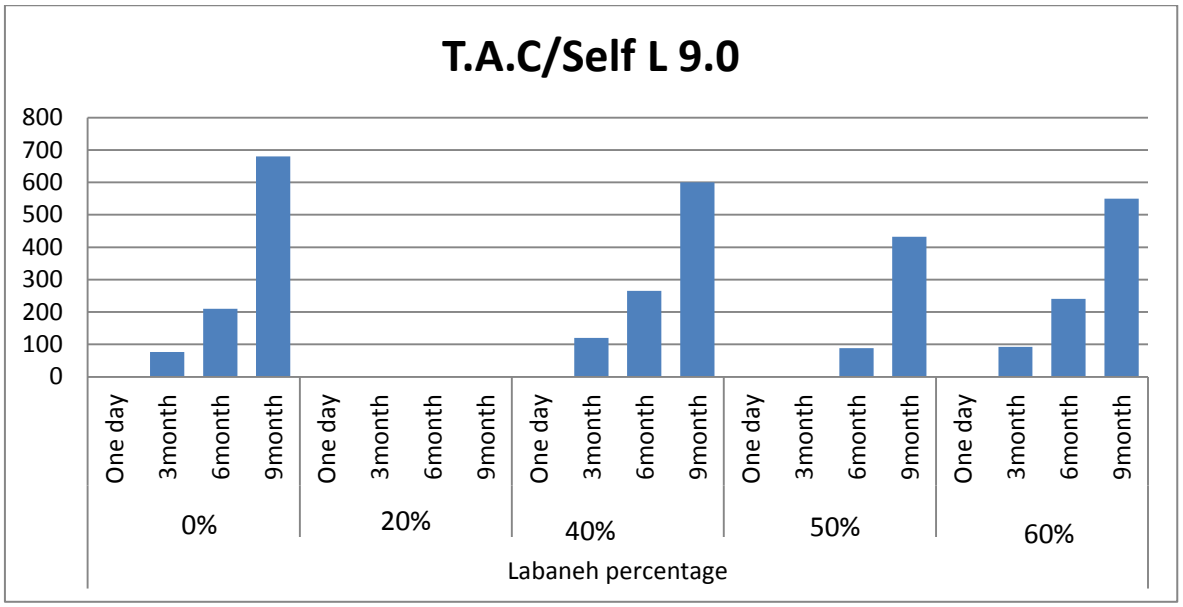


Fig. 4.28 Effect of storage period on growth of *Total aerobic bacteria* x$10^{-1}$of spreadable processed cheese (Emulsifier salt Self L 9.0).

4.4.3.4 Microbial analysis of spreadable processed cheese (Emulsifier salt Self H 9.0).

The results show in Fig.(4.29) the effect of storage period on microorganism on spreadable processed cheese samples. the *Total aerobic count bacteria* appear after six month and slowly increase during storage in 20% labaneh where it was at 6 months 680

colonies and after 9 months becoming 1700 colonies,40% labaneh where it was at 6 months 430 colonies and after 9 months becoming 900 colonies,50% labaneh where it was at 6 months 326 colonies and after 9 months becoming 712 colonies, and 60 % labaneh where it was at 6 months 745 colonies and after 9 months becoming 1400 colonies and not detected in 0% labaneh and in ,while the *Coliform ,Yeast, Mold, Salmonella, Staphylococcus aureus* and *Listeria monocytogenes* were not detected and were never detected by the end of storage this was agreed with(Warburton et al., 1986)who found that the spreadable processed cheese shows very low susceptibility to microbial spoilage . and was agreed with (Caric, M. 1993) who found that the thermal process used in manufacture of processed cheese destroy pathogenic bacteria cells. significant ($p<0.05$) variation were found between the number of *Total aerobic bacteria* at one day and 9 months in spreadable processed cheese used self H 9.0 emulsifier salt.

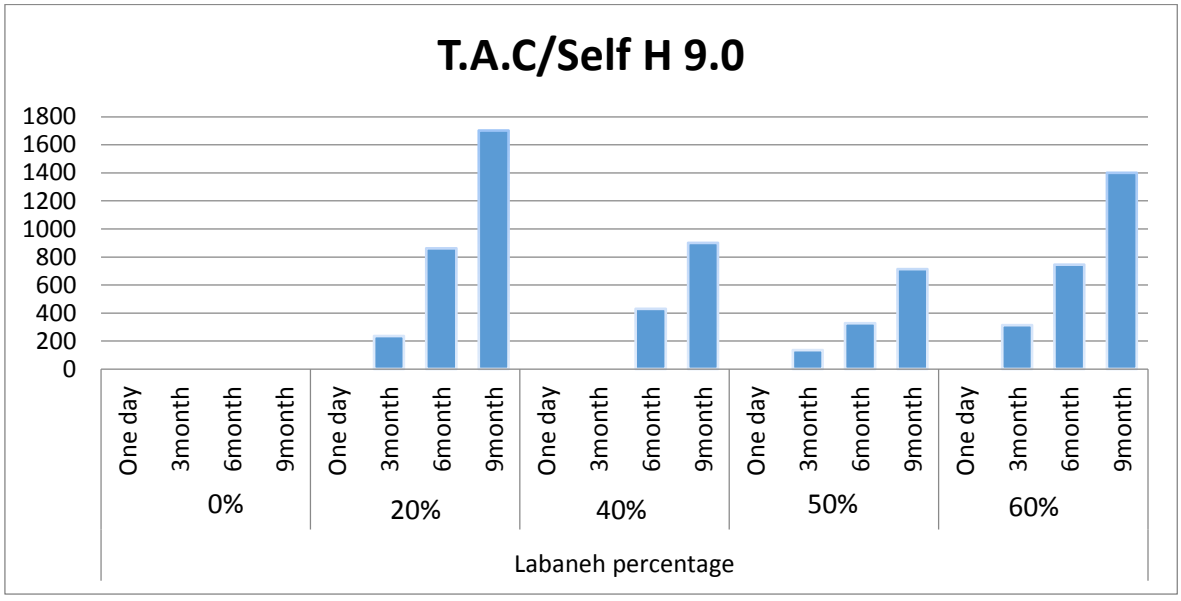


Fig. 4.29 Effect of storage period on growth of Total aerobic bacteria x$10^{-1}$of spreadable processed cheese (Emulsifier salt Self H9.0).

All microbiological examination results of spreadable processed cheese samples conform to the Palestinian specification638/2014.

4.4.4 Sensorial analysis of spreadable processed cheese

4.4.4.1 Introduction

Sensory properties of the spreadable processed cheese samples different from each other depending on the proportion of labaneh and white cheese used and the type of emulsifying salts and the figure below illustrate the different. There is Significant difference at $P<0.05$ between the types of emulsifying salts and there is Significant difference at $P<0.05$ between the different percentage of labaneh and white cheese.

4.4.4.2 Firmness of body analysis of spreadable processed cheese

Firmness of body analysis show Fig.(4.30) that when labaneh percentage increases the firmness of body become very soft and still firm until 50 % then become unstable, the scores for the highest and the second highest positive influences was for the Self L 9.0 got 8.01 then BP 7.0 got 7.12 and Self H 9.0 got 6.55, there is Significant different at $P<0.05$ in firmness between the types of emulsifying salts and there is Significant different at $P<0.05$ in firmness between the different percentage of labaneh and white cheese .

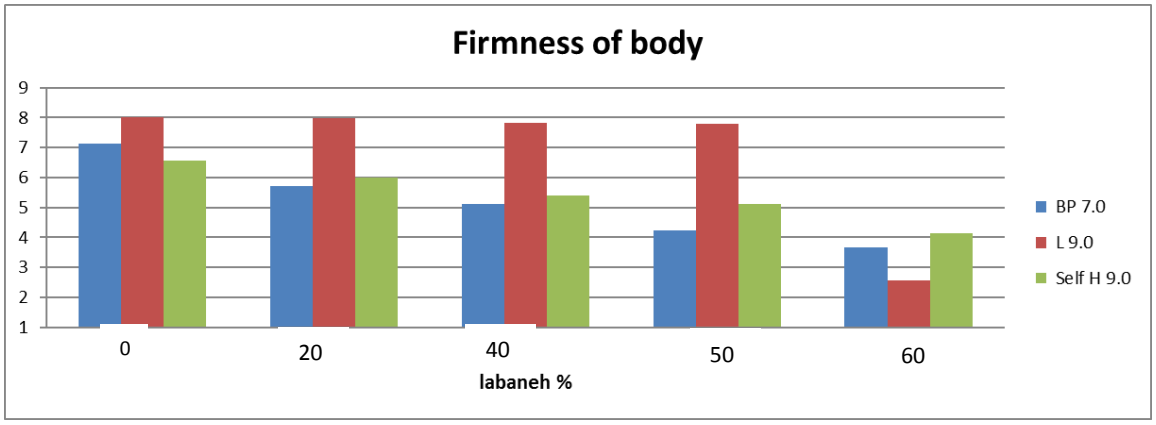


Fig. 4.30 Effect of Labaneh percentage and type of emulsifier on the Firmness of body of spreadable processed cheese.

4.4.4.3 Chewiness analysis of spreadable processed cheese

Chewiness analysis show that Fig. (4.31) chewiness property still stable until labaneh percentage 50% and then become non-chewable and become unstable, and the best emulsifier salt is Self L 9.0 got the higher scores 7.84 then BP 7.0 got 7.56 and Self H 9.0 got 5.34, there is Significant different at P<0.05 in chewiness between the types of emulsifying salts, and there is Significant different at P<0.05 in chewiness between the different percentage of labaneh and white cheese.

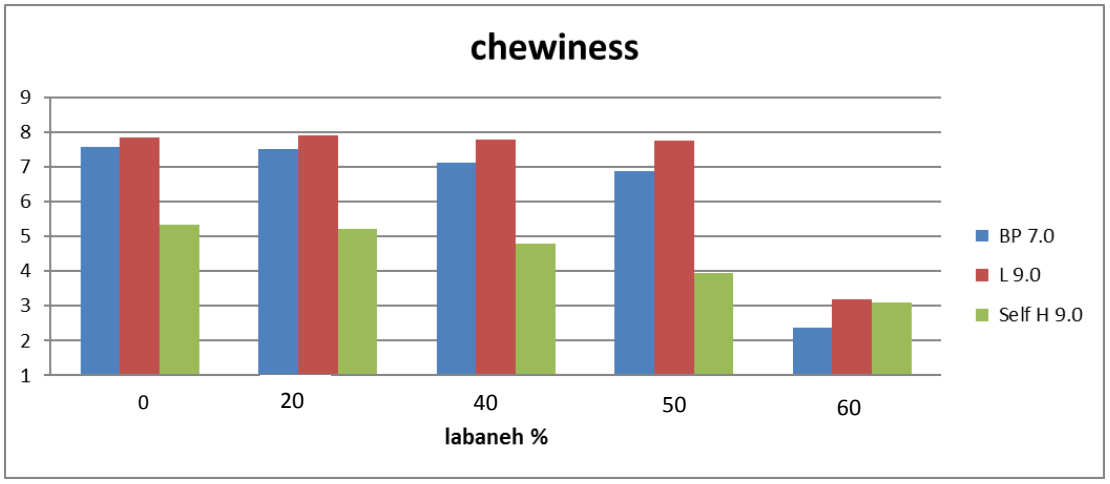


Fig. 4.31 Effect of Labaneh percentage and type of emulsifier on the Chewiness of spreadable processed cheese.

4.4.4.4 Flavour analysis of spreadable processed cheese

Flavour analysis show that Fig. (4.32) flavour property still stable until labaneh percentage 50% and then the smell of spreadable processed cheese disappears, and the best emulsifier salt is Self L 9.0 got the higher scores 7.76 then BP 7.0 got 7.54 and Self H 9.0 got 4.12, there is Significant different at P<0.05 in flavour between the types of emulsifying salts, and there is Significant different at P<0.05 in flavour between the different percentage of labaneh and white cheese.

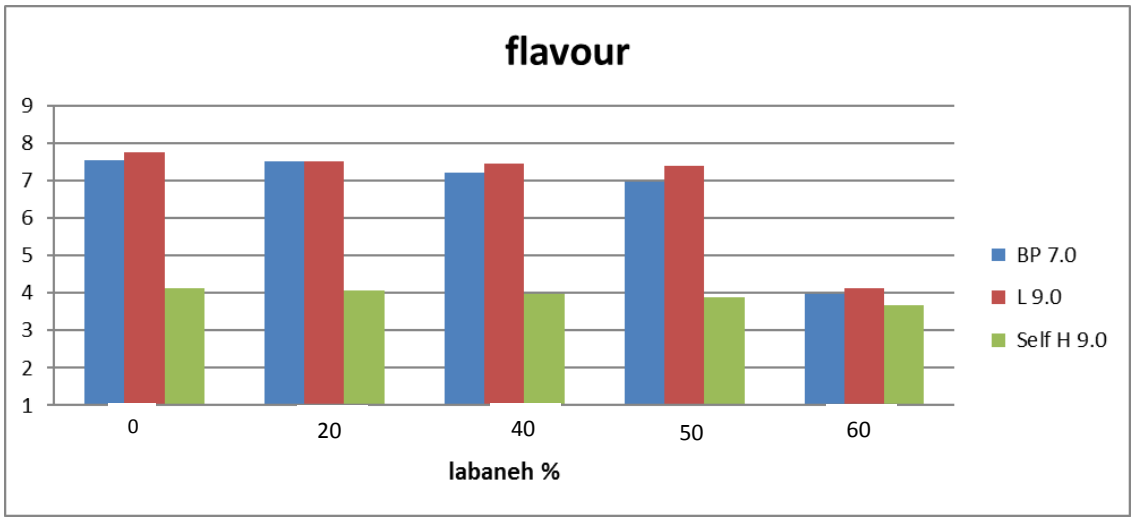


Fig.4.32 Effect of Labaneh percentage and type of emulsifier on the Flavour of spreadable processed cheese.

4.4.4.5 Smoothness of texture analysis of spreadable processed cheese

Smoothness analysis show that Fig. (4.33) when labaneh percentage increase the smoothness become not smooth and there is Significant different at P<0.05 in smoothness between the different percentage of labaneh and white cheese. the best emulsifier salt is Self L 9.0 got the highest scores 8.20 then BP 7.0 got 7 and Self H 9.0 got 6.72, there is Significant difference at P<0.05 in smoothness between the types of emulsifying salts.

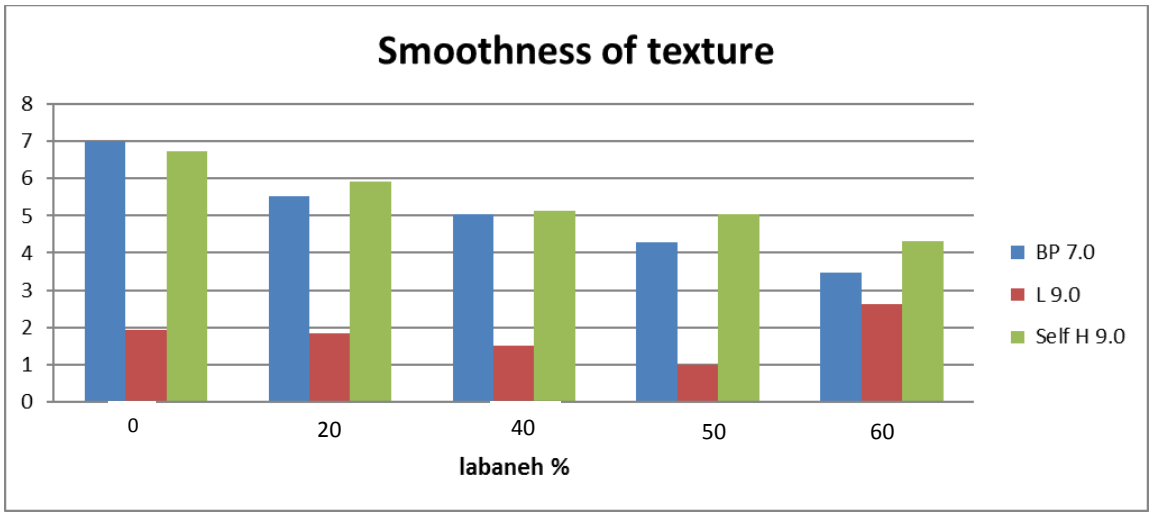


Fig.4.33 Effect of Labaneh percentage and type of emulsifier on the Smoothness of texture of spreadable processed cheese.

4.4.4.6 Spreading quality analysis of spreadable processed cheese

Spreading quality property still stable until labaneh percentage 50% and then the mixture become liquid and this attribute disappear, and there is Significant different at P<0.05 in flavour between the different percentage of labaneh and white cheese. The best emulsifier salt is Self L 9.0 got the higher scores 8.65 then BP 7.0 got 8.63 and Self H 9.0 got 3.85, there is Significant difference at P<0.05 in spreading quality between the types of emulsifying salts as shown in Fig. (4.34).

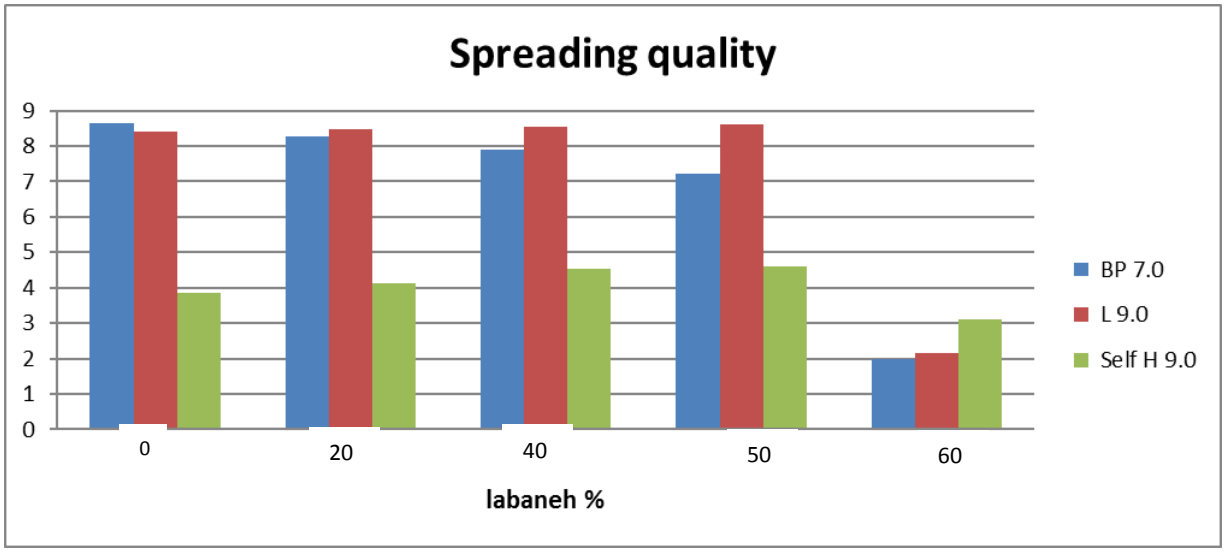


Fig.4.34 Effect of Labaneh percentage and type of emulsifier on the Spreading quality of spreadable processed cheese.

4.4.4.7 Bitterness analysis of spreadable processed cheese

Bitter Sensory evaluation results showed that Fig. (4.35**)** all the spreadable processed cheese samples in which the emulsifier salts BP 7.0 and Self L 9.0 used there is no bitterness and the use of emulsifier salt Self H 9.0 showed the presence of bitterness.

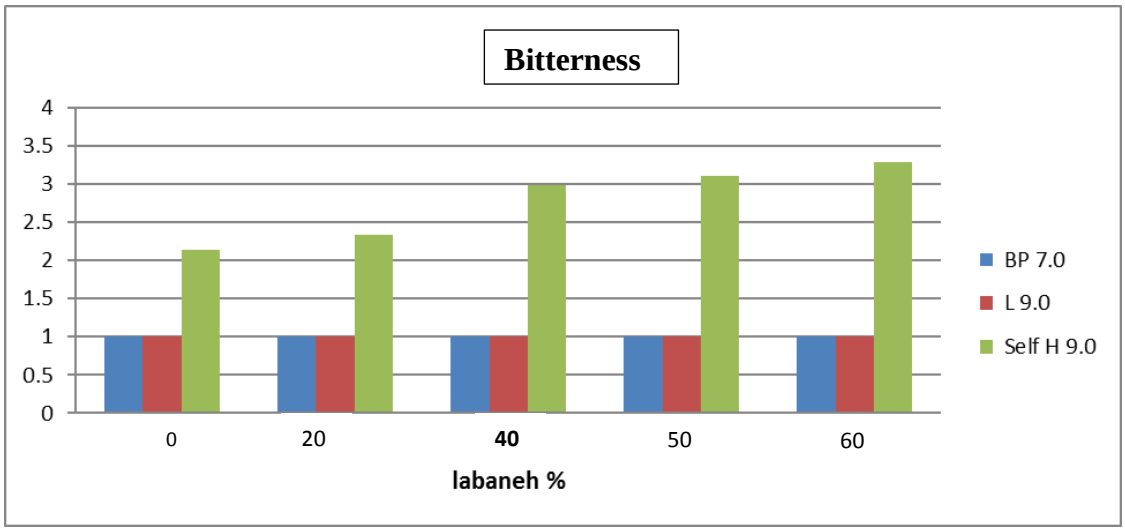


Fig.4.35 Effect of Labaneh percentage and type of emulsifier on the Bitterness of spreadable processed cheese.

4.4.4.8 Oil Separation analysis of spreadable processed cheese.

Oil separation Sensory evaluation results showed that there is no separation in the spreadable processed cheese samples.

4.4.4.9 Gumminess analysis of spreadable processed cheese.

Gumminess Sensory evaluation results showed that there is absent of gumminess Sensory in the spreadable processed cheese samples.

4.4.4.10 Sweetness analysis of spreadable processed cheese

Sweet property still stable until labaneh percentage 50%, and there is Significant different at $P<0.05$ in sweet between the different percentage of labaneh and white cheese. The best emulsifier salt is BP7.0 got the highest scores 6.97 then Self L 9.0got 6.21 and Self H 9.0 got 3.57, there is Significant difference at $P<0.05$ in spreading quality between the types of emulsifying salts as shown in Fig. (4.36).

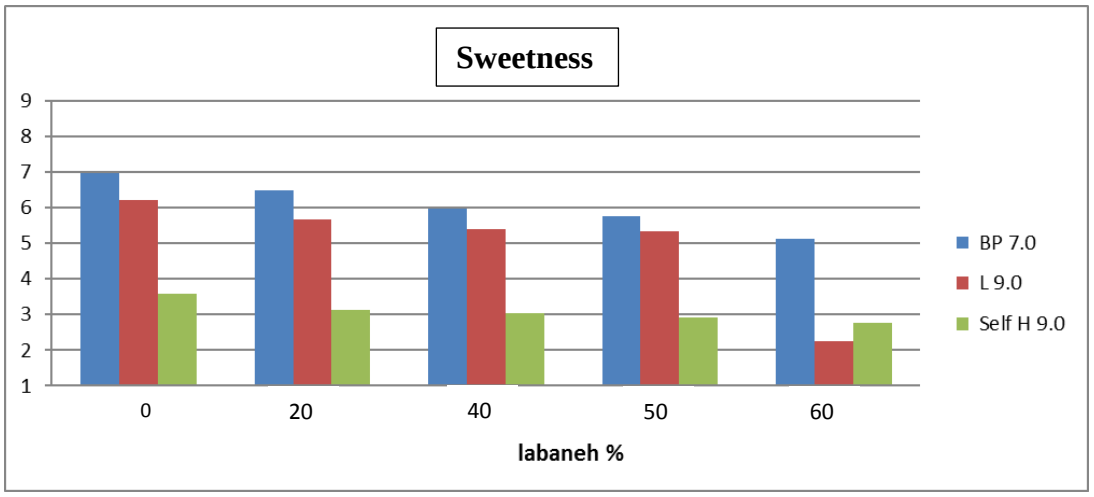


Fig.4.36 Effect of Labaneh percentage and type of emulsifier on the Sweetness of spreadable processed cheese.

4.4.4.11 Overall performance analysis of spreadable processed cheese

In Overall performance, all recipe still stable until labaneh percentage 50%, and there is significant difference at P<0.05 in overall performance between the different percentage of labaneh and white cheese. The best emulsifier salt is Self L 9.0 got the highest scores 8.55 then BP 7.9got 8.22 and Self H 9.0 got 4.32, there is Significant different at P<0.05 in spreading quality between the types of emulsifying salts as shown in Fig. (4.37).

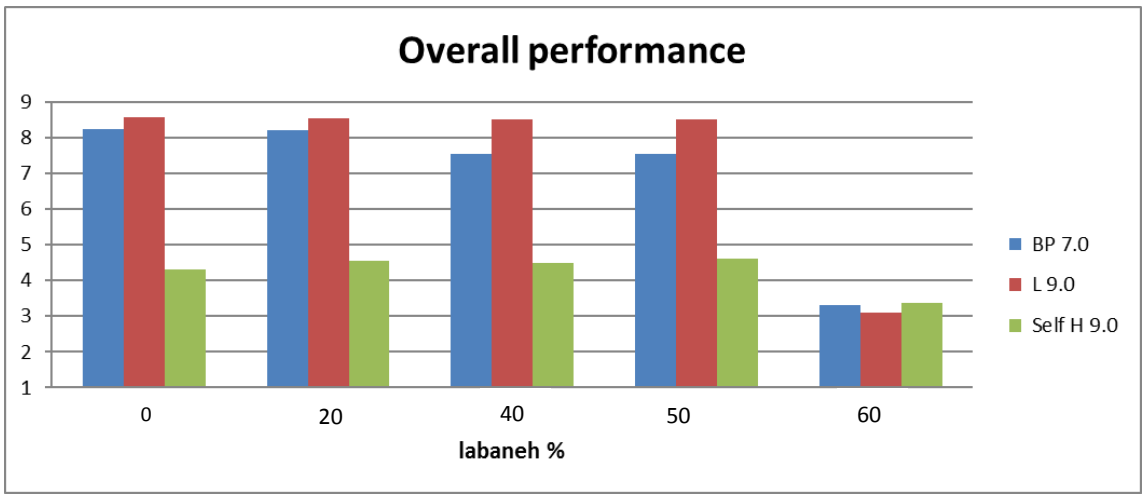


Fig.4.37 Effect of Labaneh percentage and type of emulsifier on the Overall performance of spreadable processed cheese.

Derived from the previous sensory evaluation that the best recipe is to use labaneh even 40%, white cheese 60% and emulsifying salts Self L 9.0. According to ANOVA analysis of the differences of sensorial analysis over the type of emulsion and Labaneh and cheese percentage there was a significant difference for the rest of the indicators, the scores for the highest and the second highest positive influences was for the Self L 9.0 (6), then BP 7.0 was (3) then self H 9.0 was (2).

4.4.5 The nutritional value of spreadable processed cheese samples

Spreadable processed cheese is a highly nutritive food, containing a high content of essential nutrients, especially protein and fat. when studying the manufactured spreadable processed cheese with other international spreadable processed cheese, it was found out that protein content was higher mean what fat content and calories were lower as shown in the table (4.5).

Table 4.5: Nutritional value of spreadable processed cheese manufactured and international spreadable processed cheese .

	Nutritional Fact Per 100 grams	
	spreadable processed cheese manufactured	international spreadable processed cheese
Energy	287 calories	329 calories
Total Fat	25.1 grams	33 grams
Protein	11.84 grams	6 grams
Carbohydrates	3.5 grams	2 grams

Chapter Five

Conclusion

5.1 Conclusion

In Palestine, most of process cheese are made mainly from blends containing imported Cheddar and Gouda cheeses. On the other hand, locally produced locally cheese are not used but are usually available abundantly in the market, this type of cheese does not require ripening to develop the desired flavour and body characteristics. The primary objectives of this research were to identify the optimum level of white cheese and labaneh blends using three different types of emulsifying salts and to characterize the effects of these percentages on chemical, microbial and sensorial properties.

The results showed that locally white cheese can be used as raw material in manufacturing of spreadable processed cheese with the best results of sensory and chemical properties. Labaneh can be used up to 40% with white cheese as a raw material in manufacturing of spreadable processed cheese also with best sensorial and chemical properties for the same product.

Many different formulations of different blends of traditional white cheese (80%, 60%, 50%, 40%) and labaneh (20%,40%,50%,60%) were done using different emulsifying salts(Self L 9,Self H 9, BP 7), the chemical and sensorial properties of the new proposed spreadable blends have showed that the best concentration of labaneh is up to 40% and 60% white cheese in which the proportion of total solids was 42%, protein 11.84%, fat 25.1% and the used emulsifying salt Self L9.0 at a level of 3 % of the final product gives better stability, strength and spreading quality. This new product can be produced and marketed with suitable price and the same specification as the spreadable cheese made by many international companies.

All microbiological examination results of spreadable processed cheese samples conform to the Palestinian standards 638/2014; these results show that the spreadable processed

cheese was initially produced under effective hygienic control. The efficiency of the heat treatment process and sufficient time was essential in maintaining the safety of the product and prevention of spoilage leading to increase shelf life.

Fresh whey has been added in the blend and thus increased the nutritional value of spreadable cheese and decreased the waste from dairy plants rather than pour it into the public sewage system.

Whey powder was used to increase the total solid and nutritional value, butter was used to increase the total solid and improved the taste.

Chapter six

References

6.1 References

Abdalla, M.O. (1992). ‘‘Effect of processing conditions on the microbiological quality of white pickled cheese”. Ph.D. Dissertation, University of Tennessee, Knoxville, U.S.A.

Abdalla, O.M., Christen, G.L., and Davidson, P.M. (1993). ‘‘Chemical composition and Listeria monocytogenes survival in white pickled cheese”. *Journal of Food Protection*, 56: 84-846.

Abd El-Salam, M. H., Hippen, A. R., El-Shafie, K., Assem, F. M., Abbas, H., Abd El-Aziz, M., Sharaf, O., and El-Aassar, M. (2011). ‘‘Preparation and properties of probiotic concentrated yoghurt (labaneh) fortified with conjugated linoleic acid”. *International Journal of Food Science & Technology*, 46(10), 2103 -2110.

http://dx.doi.org/10.1111/j.1365- 2621.2011.02722.x.

Afnor. (1993). ‘‘Controle de la qualite des produits alimentaires. Lait et produits laitiers. Analyse physic–chimic. Partie 4-Analyse sensorielle (norms francaises) ”.

Ali, A., and Al-Dahhan, A. (2013). ‘‘ Effect of emulsifying salt percentages of processed cheese made from developed aushari cheese”. Egypt. J. Appl. Sci., 28: 133-144.

Al-Khalaileh, N. (1993). ‘‘Development of Processed Spread Cheese from Local White (Nabulsi) Cheese and Labanah”. Arab Journal of Food & Nutrition,Volume 11, No.25,2011.University of Jordan.

Al-Khalayleh, N., and Taefor, A. (2011). ‘‘A study of manufacturing processes cheese spread by using local cheese (White, Kashkawan, Karesh) as row materials”. J. Damasks Univ. Agric. Sci., 27: 391-403.

Almarai. (2003). ‘‘The theory of processed cheese manufacture manual”. Almarai company for dairy product. Kingdom of Saudi Arabia, Riyadh.

AOAC, 1990. ‘‘Official Methods of Analysis”. 15thed., Association of Official Analytical Chemists, Washington D.C., U.S.A.

Berger, W., Klostermeyer, H., Merkenich, K., and Uhlmann, G. (1989). ‘‘Process cheese manufacture”. Joha Leitfaden, BKladenburge, P. 71.

Caric, M., and Kalab, M. (1987). ‘‘In cheese: chemistry, physics and microbiology”. 2nd ed. Volume 2, (ed. by Fox) major cheese groups. Chapman and Hall London.

Caric, M., and Kala, M. (1993). ‘‘Processed cheese products. In: Cheese chemistry, physics and microbiology”. Major cheese groups 2nd ed., Chapman and Hall, London.

Caric, M., and Kalab, M. (1999). ‘‘Processed cheese products: Chemistry, Physics and Microbiology”. Page 467-501. In: Fox PF, editor. Cheese.Vol. 2. Major cheese groups.Gaithersburg.MD: Aspen Publishers.

Ceylan, Z.G., Turkoglu, H., and Dayisoylu, S. (2003). ‘‘The microbiological and chemistry quality of Skima cheese produced in Turkey”. Pak.J. Nutr.,2:95097.

Chamber, M., and Daurelles, J., (2000). ‘‘Processed cheese. In: Cheese making. From Science to Quality Assurance”. *EcK, A. 22 J.Agric.&Env.Sci.Dam.Univ*., Egypt Vol.10 (1) 2011 and J. – C. Gillis (Eds), (3rd ed), 641-657. Vererinaer, Denmark.

Dholu, K., Upadhyay, K. G., Prajapati, P. S., and Pandya, A. J. (1990). ‘‘Performance of emulsifiers in process cheese spread made from buffalo milk cheddar cheese”. Brief communications of the XX III International Dairy Congress, Montreal, October 8-12, Vol. II. 950.

Egyptian Standards Organization (ESO). (2002). ‘‘Processed cheese. Part ll: spreadable Processed cheeses. ES No. Egyptian organization for standardization and quality control”.

El Diam, N., Ibtisam, M.S.A., and El Zubeir, E.M. (2007). ‘‘Yield and sensory evaluation of the processed cheese from Sudanese white cheese”. Research Journal of Animal and Veterinary Sciences, 2(1): 47-52.

El-Owni, O.A., and Hamid, O.I. (2008). ‘‘Effect of storage period on weight loss, chemical composition, microbiology and sensory characteristics of Sudanese white cheese (Gibna Bayada)”. Pak. J. Nutr.,7:75-80.

FDA's. ‘‘Bacteriological Analytical Manual (the BAM)”.8 edition.

Fox, P.F. (1993b). ‘‘Cheese: chemistry, physics and microbiology”. 2nd ed. Volume 2, major cheese groups. Chapman and Hall London.

Guinee, T.P., Carić. M., and Kaláb, M. (2004). ‘‘Pasteurized processed cheese and substitute/imitation cheese products”. Volume 2, Pages 349–394.

Hamed, A., Khader, A.F., El Garawany, G.A, and Abdel salam, M.H. (1997). ‘‘Effect of storage on the composition, rheological properties and organoleptic quality of commercial processed cheese”. Egyptian Journal of Dairy Science, 25: 113-122.

Hayaloglou, A.A., Guven,M.,Fox, P.F., and McSweenet, P.L. (2005). ‘‘Influence of starters on chemical, biolchemical and sensory changes in Turkish white cheese during ripening”. J. Dairy Sci.,88:3460-3474.

Kalab, M., Yun, J., and Yiu, S.H. (1987). ‘‘Textural properties and microstructure of process cheese food rework”. Food structure:vol. 6:181–92.

Kapoor, R., and Metzge, L. E. (2008). ‘‘Process Cheese: Scientific and Technological Aspects”. Institute of Food Technologists 7,P 194-212.

Kapoor, R., Metzger, L.E., Biswas, A.C., and Muthukummarappan, K. (2007). ‘‘Effect of natural cheese characteristics on process cheese properties”. J. Dairy Sci., 90: 1625-1634.

Khader, A., Hamed, A., Al-Khamy, A.F., El Garawany, G.A., and Abd El-Salam, M.H. (1997). ‘‘Chemical composition and some properties of market processed cheese”. Egyptian J. Dairy Sci., 25: 269.

Kosikowski, F. V., and Mistry, V.V. (1997). ‘‘Cheese and Fermented Milk Foods”. 3rd Ed. F. V. Kosikowski, L. L. C. Westport, CT.

Larmond, E. (1982). ‘‘Laboratory methods for sensory evaluation”. Canadian Dept. of agriculture publication no.1673.

Marchesseau, S., Gastaldi, E., Lagaude, A., and Cuq, J.L. (1997). ‘‘Influence of pH on protein interactions and microstructure of process cheese”. J Dairy Res 62:479–489.

Meyer, A. (1973). ‘‘Processed cheese manufacture”. London, U.K.: Food Trade Press Ltd.Mizuno, R., Lucey, J.A. (2005). ‘‘Effects of emulsifying salts on the turbidity and calcium-phosphateprotein interactions in casein micelles”. J Dairy Sci 88:3070–8.

Mohamed, A.G., Fatma., Hassan, A.M., Bayoumi, Hala M ., and Ali. K. Enab.(1997). ‘‘Utilization of Goats Milk in Manufacture of Processed Cheese”. Dairy Science Dept. National Research Center, Dokki, Giza Egypt.

Nour El Diam, M.S.A., El Zubeir., and Ibtisam, E.M. (2005). ‘‘Chemical Composition of Processed Cheese Using Sudanese White Cheese”. Department of Dairy Production Faculty of Animal Production University of Khartoum.

Nuser, S.M. (2001). ‘‘The effect of cooking and vacuum packaging on the Quality of white soft cheese”. M.Sc. thesis, University of Khartoum, Sudan.

Ottawa, Ont. (1977). "Laboratory Method for sensory evaluation of food". Research Branch Canda Dept. of Agric. Publication 1637.

Palestinian Central Bureau of Statistics.

Palestine Standards Institution. (2014-600).

Rabou, F. A. H., El-Fattah, A. A. M., Sayed, E. M. M., and Mohamed, A. G. (2005). ‘‘Improvement of nutrional value of processed cheese by using modified emulsifying salts”, Egyptian J. Dairy Sci., 33:, vol. 33, pp. 85–103.

Ramos, T. M., Gajo, A. A., Pinto, S. M., Abreu, L. R., and Pinheiro, A. C. (2009). " Perfil de textura de Labaneh (iogurte Grego) ". Revista do Instituto de Laticínios Cândido Tostes, 64(369), 8-12.

Rubin, J., and Bjerre, P. (1983a). ‘‘Process for preparing cheese base”. US patent 4 401 679.

SAS. (1996). ‘‘Statistical analysis system. SAS user's Guide: statistics, Release 6.12 Education Sas Inst”. Inc. Cary. NC., USA.

Shehata, A.E., Magdoub, M.V.L., Gouda, A., and Hofi, A.A. (1982). ‘‘Effect of age of natural cheese acidity and binding agents of the physical sensory properties of processed cheese spread”. Research Bulletin of Faculty of Agriculture, Ani Shams University, No 88.

Syrian Arab Organization for Standardization and Metrology. (1986). ‘‘Processed cheese number 404 specifications”. Ministry Syrian industry.

Tamime, A. Y. (May 2011). **‘‘** Processed Cheese and Analogues: An Overview. In book: Processed Cheese and Analogues**”**, Wiley-Blackwell pp.1 – 24.

Thomas, M.A. (1973). ‘‘The manufacture of processed cheese—scientific principles”. 1st ed. Richmond, N.S.W., Australia: New South Wales Dept. of Agriculture.

Younis, M.F., Davies, G., and Bradbury, I. (1990, b). ‘‘The quality of processed cheese made from reconstituted skim milk powder cheese base”. Egyptian Journal of Diary science 18: 115-131.

Younis, M. F., Tamime, A. Y., Davies, G., Hunter, E.A., Dawood, A. L. L., and Abdou, S. M.(1991- a). ‘‘Production of processed cheese and cheese base. 3. Compositional quality”. Milchwissenschaft 46(9): 566-569.

Warburton, D.W., Peterkin, P.I., and Weiss, K.F. (1986). ‘‘A survey of the microbiological quality of processed cheese products”. J. Food Protect 49(3):229-232.

تصنيع جبنة مطبوخة قابلة للدهن باستخدام جبنة بيضاء والالبان المخمرة وتأثيرها على الصفات الحسية والفيزوكيميائية

إعداد الطالب: عرفات إسماعيل محمد قبها

إشراف: الدكتورة كلود الاعمى

الملخص

لقد أجريت الدراسة لبحث امكانية استخدام الجبنة المحلية المالحة بعد ازالة الملوحة منها واللبنة ومصل الحليب السائل في انتاج جبن مطبوخ قابل للدهن.

تم استخدام الجبنة المحلية بفترات نضوج مختلفة (يوم، 30 يوم، 60 يوم، 90 يوم) بعد إزالة الملوحة منها بنقعها بالماء وتغيير الماء 4 مرات كل 3 ساعات مرة واحده.

وكذلك تم استخدام اللبنة بفترات نضوج مختلفة (يوم، 30 يوم، 45 يوم) وبنسب مختلفة (20%، 40%، 50%، 60%)، وقد أجريت الفحوصات الكيميائية والميكروبية والحسية للجبنة النابلسية واللبنة خلال فترة التخزين والمواد الأولية الأخرى وكانت مطابقة للتعليمات الفنية الإلزامية الفلسطينية.

تم استبدال المياه الصحية المستخدمة بعملية تصنيع الجبن المطبوخ القابل للدهن بمصل الحليب السائل.

لعملية تصنيع الجينة المطبوخة القابلة للدهن تم استخدام خزان معزول ستانلس ستيل مزود بمحرك ومبادل حراري فبعد عملية التصنيع تم مباشرة تعبأة المنتج بعبوات زجاجية وحفظها بالثلاجة على درجة 4م ْ، لمدة تسعة شهور.

تم استخدام الأنواع التالية من أملاح الاستحلاب Self H9, Self L9, Self BP7 من شركة بودينهيم الألمانية.

أظهرت نتائج الاختبارات الحسية لجميع الخلطات إن أفضل نسبة من الجبنة للبنة هي (40:60) وحصلت على اعلى تقييم، واشارت النتائج أيضاً أن ملح الاستحلاب Self L 9.0 بنسبة 3% من الناتج النهائي أعطي ثباتية وقوام أفضل وقابل للدهن مقارنة مع مواد الاستحلاب الأخرى BP 7.0 و Self H9.

أظهر التحليل الكيميائي لأفضل خلطة من الجبن المطبوخ القابل للدهن هو نسبة المواد ألصلبه 42%، البروتين 11.84%، الدهن 25.1%، درجة الحموضة 5.36، وهي ضمن الحدود المسموح بها في المواصفة السورية رقم 404 لعام 1986 للجبنة المطبوخة القابلة للدهن.

بين الفحص الميكروبي لعينات الجبنة المطبوخة القابلة للدهن خلوها من بكتيريا الكوليفورم والخمائر والأعفان مع وجود نمو لبكتيريا التعداد الكلي وهذا يدل على كفاءة المعاملات الحرارية والاشتراطات الصحية اثناء التصنيع وتم اجراء الفحوصات بفترات متعددة اثناء فترة التخزين.

اظهرت الفحوصات الحسية والميكروبية والكيميائية انه يمكن انتاج جبن مطبوخ قابل للدهن باستخدام الجبنه البيضاء المحلية واللبنة كمواد اولية حتى نسبة معينة مع المحافظة على المواصفات الخاصة للمنتج .

بلغت تكلفة انتاج كيلو غرام واحد من الجبنة المطبوخة القابلة للدهن 7.5 دولار علماً أن سعر كيلو غرام الجبنة النابلسية 5.3 دولار واللبنة 3.4 دولار.

Appendix:

1. Chemical analysis

1.1 Protein determination

1.1.1 Scope

Standard method used for protein determination in end products was kjeldahl method. In which protein determined in this method three steps. Deigestion step, distillation step, and titration step. In this method we obtained N%.

Then protein = N% 6.25

1.1.2 Materials and Reagents:

Kjldahl's apparatus (digestion and combustion unit)

1. Suplhuric acid
2. Potassium suplhate
3. Copper suplhate
4. Sodium hydroxide
5. Hydrochloric acid
6. Cylinders with different volumes.
7. Pipettes with different volumes

1.1.3 Procedure:

Digestion is accomplished by:

1. Weighing out approximately 1gm of the sample containing protein, making a note of the weight, and placing the sample into a digestion flask, along with 12-15 ml of concentrated sulfuric acid (H_2SO_4).
2. Adding seven grams of potassium sulfate and a catalyst, usually cooper.

3. Bringing the digestion tube/ flask and mixture to a "rolling boil" (about 370 ^{o} C to 400 ^{o} C) using a heating a block.
4. Heating the mixture in the tube. Flask until white fumes can be seen, and then continuing the heating for about 60- 90mins.
5. Cooling the tube/ flask and cautiously adding 250 mls of water.

Distillation

The purpose of the next step, distillation, is to separate the ammonia (that is, the nitrogen) from the digestion mixture. This is done by,

1. Reising the pH of the mixture using sodium hydroxide (45% NaOH solution). This has the effect of changing the ammonium (NH_4^+) ions (which are dissolved in the liquid) to ammonia (NH_3), which is a gas.
2. Separating the nitrogen away from the digestion mixture by distilling the ammonia (converting it to a volatile gas, by raising the temperature to boiling point) and then trapping the distilled vapors in a special trapping solution of about 15ml HCI (hydrochloric acid) in 70 ml of water.
3. Removing the trapping flask and rising the condenser with water so as to make sure that all the ammonia has been dissolved.

Titration:

1. Adding an indicator dye to the acid/ ammonia trapping solution. This dye should turn a strong color, indicating that a significant amount of the original trapping acid is still present.

2. Putting a standard solution of NaOH (sodium hydroxide) into the burette (along tube with a tap at the end), and slowly, slowly adding small amounts of the sodium hydroxide solution to the acid solution with the dye.
3. Watching for the point at which the dye turns orange, indication that the "endpoint" has been reached and that now all the acid has been neutralized by the base.
4. Recording the volume of the neutralizing base (sodium hydroxide solution) that was necessary to reach the endpoint.
5. Performing a calculation to find the amount of ammonia, and thus nitrogen that came from the original sample.

1.1.4 Calculation:

Moles of acid = molarity of acid x volume used in flask

(moles A= M x V)

Moles of base = molarity of base x volume added from burette

(moles B= M x V)

Gms nitrogen = moles nitrogen x atomic mass

(g N = moles N x 14.0067)

% nitrogen = (gms nitrogen/ gms sample) x 100

% N = (gN / gS) x 100

Protein % = %N x 6.25

1.2 Fat Determination

1.2.1 Scope

The standard method used in fat determination for end products was Babcock method.

1.2.2 Reagent:

1. Babcock centrifuge.
2. Water bath at 55 ^{o} C.
3. Torsion balance, 9 and 18 weights.
4. Babcock shaker.
5. Glassware: 50% cheese bottles, 50% Paley bottles, 17.5ml cylinders, 17.6 pipette.
6. Reagents: Babcock sulphuric acid (Sp. Gr. 1.82 – 1.83).

1.2.3 Procedure:

1. Temper cream sample to 20 ^{o} C and mix. Grind cheese to small particles.
2. Weigh 9 g of cream into 50% cream bottle and add 9 ml of distilled water at 20 ^{o} C. Weigh 9 g of cheese into a 50% Paley bottle and add 10ml of distilled water at 60 ^{o} C.
3. Add 17.5 ml sulphuric acid in at least three increments. Mix until color is uniform chocolate brown and all cheese particles are dissolved.
4. Centrifuge 5 min.
5. Add distilled water at 60 ^{o} C to bring contents to within one- quarter inch of base of neck. Do not mix.
6. Centrifuge 2 min.
7. Add water at 60 ^{o} C to float fat into neck of bottle. Do not mix.
8. Centrifuge 1 min.
9. Temper bottles in water bat at 55 ^{o} C, for 5 min.
10. Measure the length of the fat column from the demarcation between fat and the bottom of the lower meniscus.

1.3 Ash Determination

1.3.1 Scope

The standard method used for ash determination in end products was dry ashing method.

1. Crucible
2. Glass rod
3. Muffle furnace
4. Bunsen burner
5. Analytical balance.

1.3.2 Procedure:

1. Take a clean and dry crucible, and then weigh it (crucible w 1).
2. Add approximately 10g of milk and record the weight to be used in calculation (crucible + sample w2).
3. According to the high moisture content in milk, milk must dry to prevent spattering and crust formation during combustion.
4. Dry ashing procedures use a high temperature muffle furnace capable of maintaining temperatures of between 500 ^{o} C and 600 ^{o} C for 12 hrs.
5. Water and other volatile materials are vaporized and organic substances are burned in the presence of the oxygen in air to CO_2, H_2o and N_2. Most minerals are converted to oxides, sulfates, phosphates, chlorides or silicates.
6. Transfer the crucible into the desiccators to remove the moisture form desiccators and so on do not effect on the result.
7. Weight the sample after combustion (crucible + as w3)

Ash content = (w3 – w1) / (w2 – w1) * 100%

1.4 Total solid Determination

1.4.1 Scope

The standard method used to determine total solid for and product was Oven drying method. In which water evaporated from the sample and the remain portion was total solid in sample.

1.4.2 Reagents:

1. Analytical balance with readability of 0.1mg
2. Desiccator
3. Drying oven
4. Water bath
5. Pipette.

1.4.3 Procedure

a. Oven temperature should be 103°C ± 2 ^{o} C
b. A flat – bottomed dish and glass rod are put in the oven (for 15 minutes)
c. Cool in a desiccator and weight them.
d. Add 10ml of milk, mix them well by using the glass rod.

   Heat it on a water bath of 30 minutes and mix well so as to break the protein layer that forms on the surface and prevent the vapor from going out.
e. Put them in the oven for 3 hours at 103 ^{o} C.
f. Leave the samples to cool in the desiccator then weight them 3 times at 0 times, 30min, until weight is constant.

1.4.4 Calculation

$$\text{Total solids} = \frac{\text{final mass of milk} * 100}{\text{Initial mass of milk}}$$

2. Microbial Analysis

2.1 Determination of Total Aerobic Count in Dairy and General Food Products

2.1.1 Objective:

This procedure describes the method of determination of Total Aerobic count (TAC) in dairy and general food products according to FDA-BAM.

2.1.2 Materials and consumables:

1. Peptone water.
2. Stomacher bags (22cm ×14.5 cm)
3. Saline.
4. Plate count agar medium.

2.1.3 Instrumentation:

1. Stomacher.
2. Microscope.
3. Vortex
4. Incubator
5. Electric balance.

2.1.4 Procedure:

4.1Sample preparation

1. Add 50g or 50ml of test sample to 200 ml peptone water.
2. Blend in a stomacher for one minute at medium speed.

Enumeration:

1. Make serial dilutions in saline.

2. Make duplicate plates of Plat Count Agar medium of each dilution by spread plate technique.

3. Incubate plates for 48-72 hours at 35 ^{o} C - 37 ^{o} C.

4. Count colonies and calculate the total aerobic counts per gram or milliliter of sample.

2.1.5 Quality control:

1. Ti is not necessary to run any control in this procedure, but we can run a mixed culture of two or three microorganisms alone with the sample.

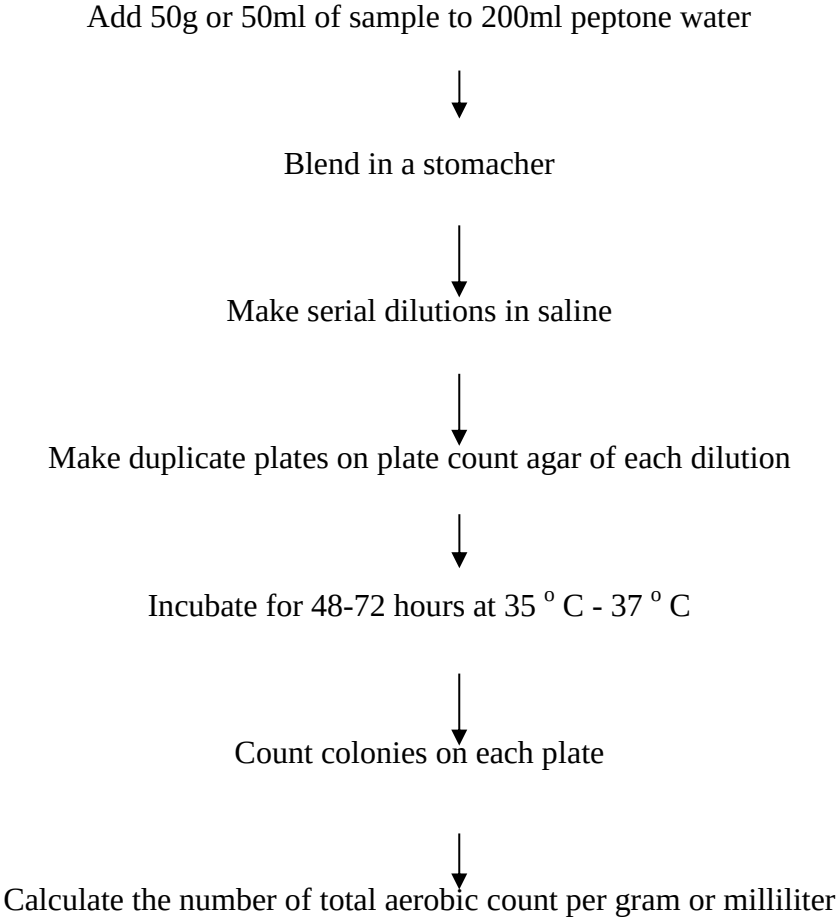
2.1.6 Confirmation:

1. No confirmation steps are necessary.

2.1.7 References:

Bacteriological Analytical Manual, Edition 8, Revision A, 1998. Chapter 3.

Determination of TAC in Dairy and General Food Products



2.2 Detection of total Coliforms in Dairy and General Food Products

2.2.1 Objective:

This procedure describes the method of detection of Total Coliforms in dairy and general food products.

2.2.2 **Materials** and consumables:

1. Peptone water (buffered)
2. Stomacher bags (22cm ×14.5 cm)
3. Violet Red Bile Lactose (VRBL) MEDIUM.
4. SALINE.

Instrumentation:

1. Stomacher.
2. Microscope.
3. Vortex.
4. Electronic Balance.
5. Incubator.

2.2.3 Procedure:

2.2.3.1 Sample Preparation:

1. Add 50g or 50ml of test sample to 200ml peptone water.
2. Blend in a stomacher for one minute at medium speed.

2.2.3.2 Enumeration:

1. Make serial dilutions in saline.

2. Spread 0.1 ml of each dilution on VRBL medium.
3. Incubate for 24 hours at 35 ^{o} C.
4. Count purple- red colonies with diameter greater than 0.5mm and calculate the number of Total Coliforms per gram of milliliter of sample.
5. Do biochemical tests for the suspected colonies.

2.2.4 Confirmation:

Confirm the suspected colonies by all or some of the following tests.

1. Kligler test
2. ONPG
3. Methyl Red
4. Voges- Proskauer
5. Citrate
6. Lactose fermentation.
7. Glucose fermentation.
8. API- E20.

2.2.5 REFERENCES:

Bacteriological Analytical Manual, 8th Edition, Revision A, 1998. Chapter 4.

2.3 determination of Fecal Coliforms in Dairy and General Food Products

2.3.1 Objective:

This procedure describes the method of detection of fecal coliforms in dairy and general food products

2.3.2 Materials and consumables:

1. Peptone water (buffered)
2. Stomacher bags (22cm ×14.5cm)
3. Saline
4. Violet Red Bile Lactose (VRBL) MEDIUM.
5. Eosin Methylene Blue (EMB) medium.

2.3.3 Instrumentation:

1. Stomacher.
2. Microscope
3. Vortex.
4. Electronic Balance
5. Incubator.

2.3.4 Procedure:

2.3.4.1 Sample Preparation

1. Add 50g or 50ml test sample to 200m1 peptone water.
2. Blend in a stomacher for one minute at medium speed.

2.3.4.2 Enumeration

1. Make serial dilutions in saline.
2. Spread 0.1m1 of each dilution on EMB medium
3. Incubate for 18-24 hours at 44.5 ^{o} C.
4. Count green metallic sheen colonies with diameter greater than 0.5mm and calculate the number of Fecal Coliforms per gram of milliliter of sample.
5. Do biochemical tests for the suspected colonies.

2.3.5 Confirmation:

1.3.5.1 Confirm by all or some of the following Biochemical test:

1. Indol.
2. Methyl red.
3. Voges – Proskauer
4. Citrate
5. Glucose fermentation
6. Lactose fermentation
7. API 20E

2.3.6 REFERENCES:

Bacteriological Analytical Manual, 8th Edition, Revision A, 1998. Chapter 4.

2.4 Detection of Staphylococcus aureus in General Food Products

2.4.1 Objective:

This procedure describes the method of detection of staphylococcus aureus in general food products.

2.4.2 Materials and consumables:

1. Peptone water.
2. Stomacher bags (22cm ×14.5cm)
3. Sterile saline.
4. Baird – Parker medium.
4. Rabbit plasma.

5.3% H_2O_2.

6 . Staphylase kit.

1. Instrumentation:

a. Stomacher

b. Microscope.

c. Vortex.

d. Electronic Balance.

e. Incubator.

2 Procedure:

a. Sample Preparation.

i. Add 50g or 50ml of sample to 200ml of peptone water.

ii. Blend in a stomacher for one minute at medium speed.

b. Enumeration.

i. Make serial dilutions in saline.

ii. Spread 0.1ml of each dilution.

iii. Plates should be incubated for 18- 48 hours at 37 ^{o} C.

iv. Count black colonies with clear zone around.

v. Calculate the number of colonies per 1.0g or 1.0 ml of Sample.

vi. Do confirmation tests.

3 Confirmation:

a. Confirm by all or some of the following Biochemical tests.

i. Mannitol hydrolysis.

ii. Coagulase test.

iii. Gelatin liquefaction.

iv. Growth in the presence of 10% sodium chloride.

v. DN Ase.

vi. Nitrate reduction.

vii. Phosphates.

4 References:

Bacteriological Analytical Manual, 8th Edition, Revision. A, 1998. Chapter 12.

2.5 Detection of Salmonella in Food Products

2.5.1 Objective: this procedure describes the methods of Salmonella detection in food products according to reference manuals.

2.5.2 Scope: food and food products.

1. **Personnel**: people with a food microbiology, well trained medical science technologist in food microbiology or microbiology degree capable of handling microorganisms.

2. Materials and Media

2.1. Buffered peptone water.

2.2. Stomacher bags.

2.3. Rappaport- vassiliadis (RV) MEDIUM.

2.4. Selenite cystine (SC) broth.

2.5. Tetrathionate (TT) broth.

2.6. Hektoen enteric (HE) agar.

2.7. Bismuth sulfite (BS) agar.

2.8. Brilliant green (BG) agar.

2.9. Xylose lysine desoxycholate (XLD) agar.

2.10. Triple sugar iron (TSI) agar.

2.11. Urea broth.

2.12. Lysine iron (LIA) agar.

2.13. Lysine decarboxylase broth.

2.14. Salmonella polyvalent somatic (O) antiserum.

2.15. Salmonella polyvalent flagellar (H) antiserum or salmonellay antiserum kit (Oxoid).

2.16. Salmonella somatic groups (O) antiserum A- I and Vi (optional).

2.17. Salmonella spicer – Edward flagellar (H) antiserum (optional)

2.18. Commercial biochemical kit as API 20E (optional) or other biochemical tests.

2.19. Different sets of glassware, spoons, knives, scissors, forceps and others.

2.20. Bacteriological needles.

2.21. Sterile pipettes with different volumes.

2.22. Racks.

2.23. Plates for media.

3. Instruments:

3.1. Stomachers.

3.2. Microscope.

3.3. Vortex.

3.4. Electronic balances 0-500gram, 0.1-gram sensitivity.

3.5. Incubators.

3.6. Lamp.

3.7. Bunsen burner.

3.8. Ph meter.

3.9. Autoclave.

3.10. Refrigerator.

4. Procedure:

4.1. Weigh 25 gram of food into 225 ml of sterile buffered peptone water and homogenize the mixture for 2 minutes.

4.2. Incubate the preenrichment broth at 35 ^{o} C for 24 hours.

4.3. Prepare secondary enrichment broth using Rappaport- vassiliadis along with selenite cystine or tetrathionate broth, by adding 0.1ml of preenrichment broth to 10ml of Rappaport – vassiliadis and 1ml of preenrichment broth to 10ml of Tetrathionate of Selenite cystine broth and then vortex.

4.4. Mix tubes and streak 3mm (10 micrometers) of all broths by using at least two of the four main selective agar medias as (BG, BS, XLD, HE).

4.5. Incubate the above plates 24 hours at 35 ^{o} C.

4.6. Examine the plates for the presence of salmonella.

A – For typical Salmonella, the colony morphology will be:

HE agar: blue green to blue colonies with or without black centers or may appear completely black colonies.

XLD agar: pink colonies with or without black centers or may appear completely black colonies.

BS agar: brown, gray or black colonies and sometimes they have metallic sheen.

BG agar: pink with pink – red colonies with red surroundings.

B- for atypical Salmonella, the colony morphology will be:

In the absence of typical type, search for atypical one which can produce different morphology and color in their selective agar, the color may be yellow on HE AND XLD, green on BS. Agar or others, apply the confirmation tests to identify the colonies.

Confirmation:

4.7. Confirm by all or some of the following Biochemical tests:

A. Kligler iron agar (KIA).

B. Lysine iron agar (LIA).

C. Urea test.

4.8. API 20E or other commercial kits like BDBBL crystal Kit.

4.9. Serological tests:

After biochemical confirmation, serological tests should be done for final confirmation as follows:

a. Agglutination test by salmonella polyvalent sornatic (O) antiserum.

b. Agglutination test by salmonella polyvalent flagellar (H) antiserum or using salmonella Spicer- Edward flagellar antiserum. Salmonella antiserum kit (oxoid) is alternative.

c. Optional: indentify the salmonella somatic (O) group isolated using different monovalents A-I and Vi and this is for microbiological and epidemiological purposes.

5. References:

Bacteriological Analytical Manual, 8th Edition, Revision A, 1988. Chapter 5.

Note: attached table for biochemical and serological reactions for Salmonella.

2.6 Detection of Listeria in Food Products

2.6.1Objective:

This procedure describes the method of detection of Listeria in food products.

1. Personnel:

People with a food microbiology or a microbiology degree and capable of handling microorganisms can carry on with this procedure.

2. Materials and consumables:

2.1. Listeria enrichment broth with supplement.

2.2. Listeria selective medium with supplement.

2.3. Stomacher bags.

2.4. Biochemical test.

2.5. API Listeria if Available.

3. Instrumentations:

3.1. Stomacher.

3.2. Microscope.

3.3. Incubator.

4. Procedure:

4.1. Add 25 gram of sample to 225 ml of Listeria enrichment broth (Fraser broth)

4.2. Blend in a stomacher for 1 minute.

4.3. Incubate for 48 ± 2 hours at 35 ^{o} C.

4.4. Streaks one loopful of the enrichment broth on Oxford media and Pal cam media.

4.5. Incubate the plates at 35 ^{o} C for 48 ± 2 hours.

4.6. Do biochemical or other confirmation tests to identify suspected colonies of Listeria monocytogenes.

5. Enumeration of Listeria for fish samples (Quantitative):

5.1. Add 25g of fish sample to 225ml of sterile 0.1% peptone water.

5.2. Blend in a stomacher for 1 minute.

5.3. Make serial dilution.

5.4. Spread 0.1m. of each dilution on the surface of Oxford or Palcam agar.

5.5. Incubate at 37 ^{o} C for 48 2 hours.

5.6. Do biochemical or other confirmation tests (such as PCR) to identify suspected colonies of Listeria monocytogenes.

5.7. Count colonies.

6. Confirmation:

6.1. Catalase test as BO22

6.2. Gram stain. As B039.

6.3. B-hemolytic on blood agar.

6.4. Motility test at 25 ^{o} C and at 35 ^{o} C

. as B052.

6.5. API Listeria as kit leaflet.

6.6. PCR.

7. REFERENCES:

7.1. Bacteriological Analytical Manual, 8th Edition, Chapter 10.

Onlinelink.http://www.fda.gov/Food/ScienceResearch/LaboratoryMethods/BacteriologicalAnalyticalManualBAM.

7.2. FISIS method for isolation and identification of Listeria monocytogenes from processed meat and poultry products. Laboratory communication, No. 57, May 1989: USDA, FSIS, Microbiology Division, Beltsville, MD.

2.7 Detection of Yeasts and Molds in Dairy and General Food Products

2.7.1 Objective:

This procedure describes the method of detection of Yeasts and Molds in Dairy and General Food Products according to COFRAC.

2.7.2 Personal:

People with a Food Microbiology or a Microbiology degree and capable of handling microorganisms can carry on with procedure.

2.7.3 Materials and consumables:

1. Peptone water
2. Stomacher bags (22cmX14.5cm).
3. Yeast extract Glucose Chloramphenicol (YGC) medium

2.7.4 Instrumentation:

1. Stomacher
2. Microscope
3. Vortex
4. Electronic Balance

5. Incubator

2.7.5 Procedures:

1. Sample Preparation

1. Add 50g or 50ml test sample to 200ml peptone water
2. Blend in a stomacher for one minute at medium speed

2. Enumeration

1. Make serial dilutions in saline
2. Spread 0.1ml of each dilution into YGC medium
3. Incubate for at least 5 days at 25 ^{o} C -26 ^{o} C.
4. Count colonies at 3,4 and 5 days.
5. The suspected colonies should be confirmed

3 Confirmation:

1. Microscopic examination (Wet Mount).

4 References:

Bacteriological Analytical Manual, 8th Edition, Revision A, 1998 Chapter 18.

3. Standard for Labaneh

م ف 647

للمواصفة الخاصة

باللبنة

Labaneh

المحتويات

1- المجال

تنطبق هذه المواصفة على اللبنة المصنعة من الحليب البقري و/أو حليب الاغنام فقط.

2- المراجع التكميلية

م ف 21 الانحراف في أوزان وحجوم المواد الغذائية المغلفة و المعدة للبيع.
م ف 35 الحليب البقري المعد للشرب.
م ف 59 مدة الصلاحية للمواد الغذائية.
م ف 135 بطاقة بيان المنتوجات الغذائية المعبأة.
م ف600 الحليب الخام.

م ف 188 زيت الزيتون
م ف 215 ملح الطعام

3- تعريفات

1-3 اللبنة: منتج حليبي يتم الحصول عليه عن طريق عملية التخمر للحليب او منتجاته بواسطة بادئات مناسبة ونقية من بكتيريا حامض اللاكتيك ومن ثم تركيزه باحدى الطرق المناسبة .

2-3 لبنة في الزيت(لبنة جامدة بالزيت): هي لبنة جامدة القوام على شكل كرات محفوظة بوسط من زيت الزيتون فقط.

3-3 لبنة الخزين (اللبنة الجامدة): هي لبنة جامدة القوام معبأة بعبوات مناسبة لاعادة استخدامها من جديد كلبنة عادية او كلبنة بالزيت.

4- التعبئة

1-4 يجب ان يعبأ المنتوج في عبوات تستعمل لمرة واحدة فقط، و ان تكون محكمة الاغلاق. و يجب ان تكون نظيفة و ان لا تؤثر على طعم او لون او رائحة المنتوج و ان لا تؤدي الى تلوثه و ان تحافظ على الخصائص المميزة له.

2-4 المواد التي تصنع منها الاوعية يجب ان تطابق المواصفات الفلسطينية في حال وجودها، وفي حال عدم وجودها يجب ان تطابق المواصفات الامريكية FDA.

5- المتطلبات العامة

1-5 يجب ان يكون قوام المنتج متجانسا.

2-5 يجب ان يكون للمنتج اللون و الطعم و الرائحة الطبيعية الخاصة به و بدون عفن او طعم مرارة او أي طعم او رائحة غير مقبولين.

3-5 يجب ان يخلو المنتوج من اية شوائب و مواد غريبة.

4-5 يجب ان لا تظهر علامات للتلف و الفساد على المنتج

6- وسم الانتاج (بطاقة البيان)

يجب ان تدون المعلومات التالية على بطاقة البيان

1-6 اسم المنتج و عنوانه و علامته التجارية ان وجدت.

2-6 اسم المنتوج عبارة لبنة او لبنة في الزيت او لبنة خزين حسب الحالة.

3-6 مصدر الحليب بقري، غنم، خليط ونوعه طازج، جاف او حسب الحالة.

4-6 المحتوى بالوحدات الدولية.

5-6 نسبة الدسم.

6-6 تاريخ الانتاج و تاريخ الانتهاء بحيث لا تزيد مدة الصلاحية عما هو محدد في المواصفة الفلسطينية م ف.59

7-6 طريقة الحفظ و التخزين بالنسبة للبنة العادية (يحفظ في الثلاجة على درجة حرارة التبريد) اما بالنسبة لمنتوج اللبنة بالزيت (يحفظ في مكان جاف بعيد عن اشعة الشمس المباشرة).

8-6 المكونات و الاضافات كامله و بترتيب تنازلي.

9-6 اية تعليمات اخرى من تعليمات المواصفة الفلسطينية م ف 135.

7- الاشتراطات القياسية

1-7 يسمح باضافة المواد المنكّهة الطبيعية مثل (الزعتر والثوم والشطة والجوز وغيرها من المواد الطبيعية) وذلك حسب ممارسات التصنيع الجيد.

2-7 يجب ان تخلو اللبنة من كافة المواد الملونة

3-7 يسمح باضافة المادة الحافظة(سوربات البوتاسيوم) بحيث لا تزيد عن 300 ملغم/كغم .

4-7 يجب أن تخلو كافة انواع وأشكال اللبنة من النشا والمواد المالئة كالطحين وغيره.

5-7 يجب ان لا تزيد نسبة الحموضة الكلية في اللبنة العادية عن 2.5% محسوبة كحامض لاكتيك و ان لا تزيد هذه النسبة على 3.5% محسوبة كحامض لاكتيك في اللبنة في الزيت و لبنة الخزين.

6-7 يجب ان لا تزيد نسبة ملح الطعام على 1.5% في اللبنة العادية و ان لا تزيد على 5% في اللبنة المحفوظة بالزيت و اللبنة المعدة للتخزين.

7-7 تحدد نسبة الدسم و نسبة الجوامد الكلية كما في الجدول (1):

جدول (1)

النوع	نسبة الدسم (حد ادنى)	نسبة الجوامد الكلية (حد ادنى)
لبنة عادية-كاملة الدسم (بقري)	%9	%23
لبنة عادية-كاملةالدسم (خليط من بقري و أغنام)	%9	%23
لبنة عادية-كاملة الدسم (حليب أغنام)	%12	%27
لبنة في الزيت-كاملة الدسم (أبقار أو أغنام او خليط منهما)	%12	%35
لبنة الخزين-كاملة الدسم (أبقار أو أغنام او خليط منهما)	%12	%35

7-7 في حالة انتاج لبنة نصف دسم أو منزوعة الدسم يجب ان تكون لها نسب الدسم الواردة في جدول (2)

جدول(2)

النوع	نسبة الدسم
لبنة عادية- نصف دسم (أبقار)	5 % حد ادنى
لبنة عادية – منزوعة الدسم (أبقار)	1.5 % حد اقصى
لبنة عادية- نصف دسم (أغنام)	6 % حد ادنى
لبنة عادية – منزوعة الدسم (أغنام))	1.5 % حد اقصى
لبنة في الزيت – نصف دسم (أبقار أو أغنام او خليط منهما)	6 % حد ادنى
لبنة في الزيت – منزوعة الدسم (أبقار أو أغنام او خليط منهما)	1.5 % حد أقصى
لبنة خزين – نصف دسم (أبقار أو أغنام او خليط منهما)	6 % حد أدنى
لبنة خزين – منزوعة الدسم (أبقار أو أغنام او خليط منهما)	1.5 % حد أقصى

7-8 يجب ان تخلو كافة انواع و اشكال اللبنة من أي دسم نباتي او حيواني عدا دسم الحليب و يستثنى من ذلك اللبنة بالزيت التي يكون وسط التعبئة هو زيت الزيتون فقط.

7-9 يجب ان لا تقل النسبة الوزنية للبنة في الزيت عن 55% (وزن مصفى).

7-10 يجوز تصنيع اللبنة بخلط نوعين من الحليب الطازج على ان يذكر ذلك على بطاقة البيان.

8- الاشتراطات الصحية

8-1 يجب ان يتم تصنيع المنتج في ظروف صحية سليمة حسب المواصفة الفلسطينية 851 الخاصة بالشروط الصحية الواجب توفرها في مصانع المواد الغذائية.

8-2 يجب ان تخلو اللبنة من كافة الاحياء الدقيقة الممرضة وافرازاتها.

8-3 يجب ان لا يزيد العدد الكلي للكوليفورم عن 10خلايا/غرام.

8-4 يجب ان لا يزيد عدد خلايا العفن عن 10خلايا/غم.

8-5 يجب ان لا يزيد عدد الخمائر عن 1000 خلية/ غرام.

9- المحتوى

يجب ان لا يزيد الانحراف في المحتوى عما هو محدد في المواصفة الفلسطينية م ف 21 فيما يتعلق بالمنتوجات سهلة التعبئة.

- طرق الفحص

تجرى طرق الفحص بالرجوع الى كتاب جمعية الكيميائيين التحليليين الرسميين.A.O.A.C.

11- المطابقة مع المواصفة

تعتبر عبوة واحدة مطابقة للمواصفة اذا طابقت جميع بنودها، و غير مطابقة اذا لم تطابق أي بند من بنودها.

12- المراجع

المواصفة القياسية الاردنية رقم 2003/108 الحليب ومنتجات الحليب- اللبنة

13-اصطلاحات

كامل الدسم	**Full cream**
نصف دسم	**Half cream**
منزوعة الدسم	**Skimmed**
كائنات حية دقيقة ممرضة	**Pathogenic microorganisms**

4. Standard for White cheese

مواصفة فلسطينية الطبعة الأولي

م م ف 836-4-2016 حلت محل م ف 836-4-2005

منتوجات الأجبان - الأجبان البيضاء الطرية

Cheese products - Soft white cheese

1- المجال

تختص هذه المواصفة القياسية الفلسطينية بالاشتراطات الواجب توفرها في الأجبان البيضاء الطرية المملحة أو الحلوه المنتجة من حليب الأبقار أو الماعز أو الأغنام المبستر أو اي خليط مما ذكر.

2- المراجع التكميلية

م ف 21 الانحراف في اوزان وحجوم المنتوجات الغذائية المغلفة والمعدة للبيع.

م ف 135 بطاقة بيان المنتوجات الغذائية المعباة والمغلفة والمعدة للبيع.

م ف 851 الشروط الصحية الواجب توفرها في مصانع المواد الغذائية.

م ف 59 مدة الصلاحية للمواد الغذائية.

م ف 41 مياه الشرب.

م ف 215 ملح الطعام.

م ف 600 الحليب الخام.

م ف 485 التوابل والبهارات المخلوطة.

التعليمات الفنية الالزامية 16 الفلسطينية الخاصة بالمواد المضافة.

التعليمات الفنية الالزامية 33 الخاصة بالشروط الصحية للغذاء.

3- التعاريف

1-3 الأجبان الطرية: هي إحدى منتجات الحليب الناتجة عن تجبن أنواع الحليب المختلفة المسموح بتداولها وذلك عن طريق اضافة الأنزيمات (المنفحة) أو البادئات المناسبة أو خليط منهما لصناعة هذه الأجبان مع فصل الشرش (المصل) الزائد بعد التجبن، بحيث لاتقل نسبة الرطوبة في المنتج النهائي عن 50%.

2-3 بهارات: هي نباتات أو عصارات طبيعيه لنباتات تضاف للأغذيه بكميات صغيرة من اجل تحسين خصائص النكهة والرائحة للمنتوج والتي يمكن أن تجرى لها عمليات فيزيائيه فقط مثل التجفيف والتقطيع ولا تجرى لها عمليات كيماويه تؤدى إلى تحللها.

3-3 البسترة : هي معامله حرارية يتم فيها تسخين كل جزء من اجزاء الحليب أو منتجاته الى حرارة معينة ومدة زمنيه معينه بهدف القضاء كافة الاحياء الدقيقه الممرضه ومعظم الاحياء الاخرى ومن ثم تبريده بشكل مفاجئ الى درجة حراره منخفضة مابين 4-5م°.

4- المواد الأوليه والإضافات

1-4 المواد الأولية: تتكون المواد الأولية من المواد التالية:

1-1-4 الحليب (يجب أن يكون مبسترا).

- **حليب بقري.**
- **حليب ماعز.**
- **حليب أغنام.**
- **حليب خالي من الدهون (حليب فرز).**

2-1-4 مواد تجبن مثل:

- **الإنزيمات المناسبة والآمنه.**
- **مواد تساعد على التجبن مثل:**
- **كلوريد الكالسيوم (بكميه لا تزيد عن 200 ملغم/لتر حليب).**

- مزارع نقية غير ضارة من بكتيريا حامض اللاكتيك كبادئ و/أو بكتيريا وخمائر مكسبة للنكهات.

2-4 المكونات الغذائية المسموح بأضافتها:

1-2-4 ملح الطعام.

2-2-4 بهارات.

3-2-4 الخضراوات والفاكهة والمكسرات، وفي حالة إضافة فواكه يسمح بإضافة المواد التالية (سكروز، فركتوز، شراب الجلوكوز، عسل النحل).

4-2-4 حليب مجفف بحيث لاتزيد نسبته عن 5% من وزن الحليب.

5-2-4 زبدة وقشدة الحليب بكافة اشكالها.

3-4 المواد المضافة:

يسمح بأي اضافات للأجبان الطرية المملحة أو الحلوه بحسب ما هو منصوص عليه في التعليمات الفنية الإلزامية الفلسطينية الخاصة بالمواد المضافة.

4-4 يجب أن تطابق جميع المواد الأولية والمكونات الغذائية المضافة المواصفات الفلسطينية والتعليمات الفنية الإلزامية الفلسطينية الخاصة بها.

5- التصنيف

يصنف المنتوج كما يلي:

1-5 حسب إضافة الملح:

1-1-5 أجبان مالحة بحيث لا تقل نسبة الملح عن 2% من وزن المنتوج.

2-1-5 أجبان حلوه.

2-5 حسب مصدر الحليب.

1-2-5 بقري.

2-2-5 ماعز.

3-2-5 أغنام.

4-2-5 أي خليط مما ذكر أعلاه.

6- الأشتراطات التركيبية

1-6 محتوى الدهون والماء: يجب أن يكون محتوى الدهون والماء كما هو محدد في جدول 1.

جدول 1- محتوى الدهون والماء

نوع المنتوج	محتوى الدهون (نسبه مئوية وزنية)		محتوى الماء (نسبه مئوية وزنية)حد أقصى
	عينة واحدة	عينه مختلطة	
0.5% دهون	0.5 حد أقصى	0.5 حد أقصى	75
5% دهون	7-4	6-4	70
9% دهون	12-7.5	13-8	65
16%دهون	20-14	19-14	60
24% دهون	21 حد أدنى	24 حد أدنى	55
30% دهون	27 حد أدنى	30 حد أدنى	50

2-6 محتوى الملح: في حالة الأجبان المالحة يجب أن لا تقل نسبة الملح عن 2% ويجب أن يذكر ذلك في بطاقة البيان.

3-6 المكونات الغذائية من الفواكهه أو الخضروات يجب أن لا تزيد عن 5% من وزن الجبنة المالحة.

4-6 فعاليه البسترة: يفحص ذلك عن طريق فحص الفوسفاتيز ويجب أن لا يزيد محتوى الفينول عن 1 ميكروغرام/غم من المنتوج.

7- الأشتراطات القياسية

يجب ان تتوفر الاشتراطات القياسية التالية في المنتج النهائي:

1-7 يجب أن يكون للمنتوج الرائحة واللون والطعم الخاص به.

2-7 يجب ان يكون المنتوج متجانسا.

3-7 يجب أن يخلو المنتوج من المواد الغريبة أو الشوائب أو علامات التلف والفساد وأية رائحة أو طعم غريبين.

4-7 يجب ان يخلو المنتوج من المواد الغريبة ومن الحشرات أو اجزاء الحشرات أو اي ملوثات.

5-7 يجب أن يخلو المنتوج من التزنخ.

8- التعبئه والتغليف والتخزين

1-8 يجب ان يعبأ المنتج النهائي في عبوات مناسبة ونظيفة وسليمة ومحكمة الإغلاق وتحمي المنتوج من التلوث والفساد وانسياب السوائل منه واليه.

2-8 في كل مراحل التخزين والنقل والتسويق يجب المحافظة على الشروط الصحية المناسبة والتي تمنع التلوث اوالتلف.

3-8 يجب ان تحافظ العبوات على الخواص المميزة للمنتوج ولاتعطي ولا تضيف للمنتوج طعم او رائحة ولاتلوث المنتوج.

4-8 جميع العبوات المستخدمة يجب أن تطابق المواصفات الفلسطينية والتعليمات الفنية الإلزامية الفلسطينية الخاصة بها.

5-8 درجه الحرارة: يجب أن لا تزيد درجه حرارة حفظ المنتوج عن 4م° وخلال عملية النقل عن 7م°.

9- الشروط الصحية

1-9 أن يتم تصنيع المنتج طبقا للمواصفة الفلسطينية رقم 851 الخاصة بالشروط الصحية الواجب توفرها في مصانع المواد الغذائية
والتعليمات الفنية الالزامية الفلسطينية 33 الخاصة بالشروط الصحية للغذاء.

2-9 أن يخلو المنتج من كافة الكائنات الحية الدقيقة الممرضة وإفرازاتها.

10- الملوثات

1-10 يجب أن لاتزيد نسبة الملوثات المعدنية وبقايا المبيدات وبقايا العلاجات البيطرية عن الحدود المسموح بها في التعليمات الفنية
الإلزامية الفلسطينية الخاصة بها.

11- وسم الإنتاج

إضافة الى ما ورد في المواصفة الفلسطينية رقم 135 الخاصة ببطاقة بيان المنتوجات الغذائية المعبأة، يجب أن تدون على كل عبوة البيانات الإيضاحية التاليه باللغة العربية ويجوز كتابتها بأي لغة اخرى اختياريا الى جانب اللغة العربية الأساسية :

1-11 اسم المنتج أو الشركة المنتجة وعنوانها وعلامتها التجارية إن وجدت.

2-11 اسم المستورد أو الوكيل أو الموزع وعنوانه.

3-11 بلد المنشأ.

4-11 اسم المنتوج حسب التصنيف.

5-11 المواد الأولية والمكونات الغذائية حسب بند 4 مرتبة تنازليا.

6-11 يجب ذكر نسبة الدسم على المنتوج.

7-11 تاريخ الإنتاج والانتهاء وفق م ف59 .

8-11 الوزن الصافي للمنتوج.

9-11 تعليمات التخزين وحفظ المنتوج.

11-11 أية تعليمات أخرى من المواصفة الفلسطينية .135

12- المحتوى

يجب ان لا يزيد الانحراف في الوزن عما هو محدد في المواصفة الفلسطينية م ف 21.

13- طرق الفحص

تجرى طرق الفحص بالرجوع الى كتاب AOAC أو اي مرجع دولي معتمد.

14- المطابقة مع المواصفة

تعتبر عبوة واحدة مطابقة للمواصفة اذا طابقت جميع بنودها وغير مطابقة اذا لم تطابق أي بند من بنودها.

15- المراجع

15-1 المواصفة القياسية الأردنية رقم 2006/246 الأجبان الطرية.

15-2 المواصفة القياسية لهيئة التقييس لدول مجلس التعاون لدول الخليج العربية رقم 2008/6 الجبن.

15-3 Codex General Standard for Cheese (CACA - 6-1978 , Rev. 1-1 1999 Amended 2006).

16- المصطلحات

لاغراض هذة المواصفة تحمل المصطلحات العربية المذكورة أدناة المعنى للمصطلحات الانجليزية المقابلة لها:

رقم البند	المصطلح العربي	المقابل الانجليزي
3-3	البسترة	Pasteurization
4-2-5	حليب مخلوط	Mixed milk
2-1-4	مواد تجبن	Coagulation materials

5. Standard for Hard Processed Cheese and Spreadable Processed Cheese

مواصفة فلسطينية م ف 638- 2014

الاجبان المطبوخة

Hard Processed Cheese and Spreadable Processed Cheese

المحتويات

1- المجال

تنطبق هذه المواصفة على الاجبان المطبوخة الصلبة والاجبان المطبوخه القابله للدهن و على الأجبان المطبوخة الصلبة والأجبان المطبوخة القابلة للدهن مع الزيوت النباتية .

2- المراجع التكميلية

م ف 836 منتوجات الأجبان (4 أجزاء)

م ف 330 الاضافات الغذائية (جزئين)

م ف 21 الانحراف في اوزان وحجوم المنتوجات الغذائية المغلفه والمعدة للبيع.

م ف 59 مدة صلاحية المواد الغذائية.

م ف 135 بطاقة بيان المنتوجات الغذائية المعبأه.

م ف 27 الزيوت النباتية (5 أجزاء)

3- التعريفات

الجبن المطبوخ الصلب والجبن المطبوخ القابل للدَهْن: هو منتج غذائي مصنّع من فرم وخلط وصهر نوع أو أكثر من الجبنة بمساعدة الحرارة وأملاح استحلاب مناسبة مع اضافة مواد أو اضافات أخرى اختياريا.

الجبن المطبوخ الصلب والجبن المطبوخ القابل للدهن مع الزيوت النباتية : هو منتج غذائي مصنّع من فرم وخلط وصهر نوع أو أكثر من الجبنة ومزجها (خلطها) مع الزيوت النباتية المهدرجة أو غير المهدرجة بمساعدة الحرارة وأملاح استحلاب مناسبة مع اضافة مواد أو اضافات أخرى اختياريا.

4- المواد الاختيارية

يسمح باضافة المواد الاختيارية التالية:

4-1 القشده، الزبده وزيت الزبدة ومنتجات حليبية أخرى.

4-2 ملح الطعام.

4-3 الخل.

4-4 التوابل والبهارات وبكميات كافية لاعطاء الصفات المميزة للمنتج.

5-4 أغذية مطبوخة أو محضّرة بغير الطبخ مثل (منتجات اللحوم والأحياء البحرية وعيش الغراب والفواكه) بكميات كافية بهدف اعطاء الطعم والنكهة للمنتج، بحيث لا تزيد عن 16.6 % من وزن المواد الصلبة الكلية في المنتج النهائي على أساس المادة الجافة.

6-4 السكريات (أية مواد كربوهيدراتية مُحلّية)

7-4 انزيمات و بادئات غير ضارة .

5- الاضافات الغذائية

يتم اضافة أملاح الاستحلاب ، المواد المعدّلة للحموضة، المواد الملونة ، المواد الحافظة، وكل ما هو مسموح اضافته للأجبان المطبوخة السادة والمنكهة كمًّا ونوعاً وذلك حسب التعليمات الفنية الالزامية رقم 17 الخاصة بالمواد الملونة المضافة الى المنتوجات الغذائية والتعليمات الفنية الالزامية رقم 18 الخاصة بالمواد المضافة الى المنتوجات الغذائية عدا المواد الملونة والمحليات.

6- التعبئة و التغليف و النقل و التخزين

1-6 يعبأ المنتوج بعبوات محكمة الإغلاق تحميه من التلف والفساد

2-6 يجب أن تحافظ العبوات على الخصائص الحسية للمنتوج وتمنع تلوثه أو تغير لونه أو رائحته.

3-6 جميع العبوات المستخدمة يجب أن تطابق المواصفات الفلسطينية إن وجدت وفي حال عدم وجودها يجب أن تطابق مواصفات إدارة الأغذية والأدوية الأمريكية FDA.

7- وسم الانتاج (بطاقة البيان)

1-7 اسم المنتج وعنوانه وعلامته التجاريه ان وجدت.

2-7 اسم الوكيل المعتمد او الموزع المعتمد وعنوانه.

3-7 اسم المنتوج : جبنة مطبوخة صلبة او جبنه مطبوخه قابله للدهن ، او حسب الحالة "مع تبيان احتوائه على زيوت نباتية في حال استخدامها" .

4-7 في حال احتواء المنتوج على توابل او خل او غيرها من المواد المنكهة فيجب ان يقترن ذلك الي جانب اسم المنتوج.

5-7 المكونات بما فيها الاضافات والمواد الاختيارية مرتبه ترتيب تنازلياً.

6-7 النسبه المئويه للدهن

7-7 الوزن الصافي بالوحدات الدوليه.

8-7 عدد القطع في حالة المنتوجات ذوات القطع.

9-7 تاريخ الانتاج والانتهاء.

10-7 <u>طريقة الحفظ و التخزين (للعبوات المعقمة والحفوظة على درجة حرارة الغرفة: كتابة عبارة تحفظ مبردة بعد الفتح)</u>

(للعبوات الأخرى غير المعقمة يجب حفظها في الثلاجة طوال فترة صلاحيتها)

11-7 <u>بلد المنشأ</u>

12-7 أي تعليمات اخرى من المواصفة الفلسطينية م ف 135.

8- المتطلبات العامة

1-8 ان يكون للمنتوج الطعم والرائحه واللون المميزه له.

2-8 ان يخلو المنتوج من المواد الغريبه او علامات التلف او الفساد.

3-8 ان يكون للمنتوج قوام متماسك ومتجانس.

4-8 ان يخلو المنتوج من علامات التعفن او الفجوات غير العادية.

9- الاشتراطات القياسية

1-9 ان لا تزيد نسبة ملح الطعام (كلوريد الصوديوم) في الجبن المطبوخ القابل للدهن عن 3% وفي الجبن المطبوخ الصلب عن 4%.

2-9 <u>للأجبان المطبوخة مع الزيوت النباتية ، يجب ألا يقل دهن الحليب عن 5 % من مجموع الدهن الكلي</u> .

3-9 أن يكون المنتج خاليا من أي دسم حيواني غير دسم الحليب الطبيعي.

4-9 أن تكون نسبة المواد الجافة ونسبة االدهن للمواد الجافة في تركيبة المنتج كما هو موضح في الجدول رقم 2.

جدول (2)

% لدهن الحليب في الماده الجافه للاجبان المطبوخة غير المحتوية على زيوت نباتية	% للدهن في المادة الجافة للأجبان المطبوخة المحتوية على زيوت نباتية	حد ادنى للمادة الجافه في الاجبان المطبوخه الصلبة %	حد ادنى للمادة الجافه في الاجبان المطبوخه القابله للدهن %
65	65	53	45
60	60	52	44
55	55	51	44
50	50	50	43
45	45	48	41
40	40	46	39
35	35	44	36
30	30	42	33
25	25	40	31
20	20	38	29
15	15	37	29
10	10	36	29
اقل من 10	اقل من 10	34	29

10- الاشتراطات الصحية

1-10 أن يتم تصنيع المنتج وتعبئته ضمن شروط صحية محددة وذلك حسب المواصفة الفلسطينية رقم 851 الخاصة بالشروط الصحية الخاصة بمصانع المواد الغذائية

2-10 أن لا يزيد العدد الكلي للأحياء الدقيقة الهوائية (*Total Aerobic Count*) عن 1000 خلية/ غم

3-10 أن لا يزيد العدد الكلي للكوليفورم(*Total coliforms*)عن 100 خلية/ غم

4-10 أن يخلو المنتج من بكتيريا ستافيلوكوكس اوريوس (*Staphylococcus aureus*)

5-10 أن يخلو المنتج من بكتيريا ايشريشيا كولاي (*Escherichia coli*)

5-10 أن يخلو المنتج من الليستيريا (*Listeria monocytogenes*) في 25 غرام

6-10 أن يخلو المنتج من السالمونيلا(*Salmonella*) في 25 غرام

7-10 أن لا يزيد عدد خلايا العفن (Moulds) عن 100 لكل غرام

8-10 أن لا يزيد عدد خلايا الخمائر (Yeasts) عن 100 لكل غرام

11- الملوثات المعدنية

يجب أن لا تزيد الملوثات المعدنية عما هو مدرج في الجدول التالي:

المعدن	النسبة (حد اقصى)
الزرنيخ	0.25 جزء في المليون
الرصاص	0.3 جزء في المليون
الزئبق	0.02 جزء في المليون
الكادميوم	0.05 جزء في المليون
النحاس	0.3 جزء في المليون
الزنك	20 جزء في المليون

12- المحتوى

يجب ان لا يزيد الانحراف في الوزن عما هو محدد في المواصفة الفلسطينية م ف 21.

13- طرق الفحص

تجرى طرق الفحص والاختبار بالرجوع للمواصفات القياسية الفلسطينية في حال وجودها وفي حال عدم وجودها يتم الرجوع الى كتاب جمعية الكيميائيين التحليليين الرسميين AOAC.

14- المطابقة مع المواصفة

تعتبر العينه مطابقة للمواصفة اذا طابقت جميع بنودها وتعتبر غير مطابقة اذا لم تطابق أي بند من بنودها.

15- المراجع

المواصفة القياسية السعودية رقم 131-1993 الجبن المطبوخ ومعجون الجبن المطبوخ.

المواصفة القياسية الاردنية رقم 1520- 2004 مزيج الأجبان المطبوخة والاجبان المطبوخة القابلة للدهن مع الزيوت و/أو الدهون النباتية

Codex Stan A-8b-2008	**Codex general for processed cheese and spreadable processed cheese.**
GB 25192-2010	**Processed cheese**

اصطلاحات

Butter oil	**زيت الزبده**
Lactose	**لاكتوز**
Vegetable spices	**التوابل النباتية**
Beta-carotene	**بيتا كاروتين**
Curcumin	**الكركم**
Nisin	**النيسين**
Designation	**التسميه**
Milk fat in dry matter	**دسم حليب في المادة الجافه**
Dry matter in processed cheese	**الماده الجافه في الاجبان المطبوخه**
Emulsifiers’	**مواد استحلاب**
Acidifiers	**مواد معدله للحموضه**
Taste intensifiers	**محسنات الطعم**

6. Accreditation of Birzeit University- Laboratory

State of Palestine
Ministry of National Economy
Palestine Accreditation unit

دولة فلسطين
وزارة الاقتصاد الوطني
وحدة الاعتماد الفلسطيني

PALAC

Accredited testing Lab.

LAC- 009-A

Palestine Accreditation Unit
is accrediting the Laboratory of:

وحدة الاعتماد الفلسطيني
تعتمد مختبر:

مركز مختبرات جامعة بيرزيت للفحوص- وحدة فحص المواد الغذائية و المياه- بيرزيت

Center of Birzeit University Testing Laboratories- Food Stuffs and Water Testing Unit- Birzeit

To carry out tests detailed in the attached **Accreditation Schedule LAS-009-A, which is an integral part of this certificate and cannot be read without.** This certificate is granted after assuring the qualifications and compliance with the accreditation requirements and the requirements of ISO/ IEC 17025:2005.

للقيام بالفحوصات المحددة في **ملحق الاعتماد رقم LAS-009-A المرفق الذي يعتبر جزءاً لا يتجزأ من الشهادة و لا تقرأ دونه**، و ذلك بعد التحقق من مؤهلات و مطابقة المختبر لمتطلبات الاعتماد و متطلبات المواصفة ISO/ IEC 17025:2005.

Initial issue:	3/11/1998	الإصدار الأول:
Renewed on:	23/8/2016	التجديد:
Valid to:	22/8/2017	سارية حتى:

Eng. Ahmad Jallad
Chair of Accreditation Unit

م. أحمد جلاد
رئيس وحدة الاعتماد

دولة فلسطين
وزارة الاقتصاد الوطني
وحدة الاعتماد
Accreditation Unit
State of Palestine

7. Accreditation of Central Public Health Laboratory

Accredited testing Lab.

وحدة الاعتماد الفلسطيني تعتمد مختبر

Palestine Accreditation Unit

is accrediting the Laboratory of:

Central Public Health Laboratory " Ministry of Health- Ramallah

To carry out tests detailed in the attached Accreditaticn Schedule **L.4S- 021, which** is an integral part of' this certificate and **cannot be read without**. This certificate is panted after assuring the qualifications and comp1iance with the accreditation requirements and the requirements of ISO/ IEC 17025:2005.

للقيام بالفحوصات المحددة في ملحق الاعتماد رقم LAS-021 المرفق الذي يعتبر جزءاً لا يتجزأ من الشهادة و لا تقرأ دونه، و ذلك بعد التحقق من مؤهلات و مطابقة المختبر امتطلبات الاعتماد و متطلبات ISO/ IEC 17025:2005.

Initial issue: 18/3/2004 الإصدار الأول

Renewed on: 23/8/2016 التجديد

i : 22/8/2017 سارية حتى:

Ajallad

Jallad

Eng. Ahmad م. أحمد جلاد

Chair of Acc on Unit رئيس وحدة الاعتماد