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# Preparation and Properties of Cheese Fudge

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## ABSTRACT

Preparation and properties of cheese fudge as novel sweet dairy products were investigated. Two variations of cheese fudge were prepared with two flavors (vanilla and chocolate ). Cheese fudge was made by using a combination of concentrated milk and sweet cheese curd at the ratio of (1:1). Sugar and hazelnuts were added . Two flavors were used to prepare fudge cheese Cocoa and Vanilla . Cheese fudge were evaluated for sensory quality, peroxide value ,chemical analysis , microbial count and consumer acceptability under different conditions and during storage period. It was observed that the cheese fudge prepared with chocolate flavor having higher sensory scores. .The highest peroxide value was recorded in cheese fudge with vanilla samples after 3 months with value 6.18 (MeqO2/Kg Fat) at (5°C), while it was recorded 5.64 (MeqO2/Kg Fat) in cheese chocolate at the same conditions. Oleic acid and acid presented the most high concentrations of fatty acids in both kinds of cheese fudge. microbiological analysis of cheese fudge revealed that cheese fudge with both flavors had a low total bacterial count that ranged from 1.21 to 2.45 cfu/10-2 when fresh, and after 3 months . Consumer acceptability was checked for sensory characteristics of cheese fudge prepared by using both flavors. It was seen that both products were preferred by most of adults and children selected for the trial.

**Keywords** :Cheese fudge , Sensory quality , Peroxide value, Fatty acids, Microbial count, Consumer acceptability.

## INTRODUCTION

Confectionery dairy products are highly popular among the children throughout the world due to their taste and flavor. They are recognized as an ingredient of a balanced diet, and have wide socio-economic and health importance, of high nutritive value due to their high content of protein, fat, minerals, especially, calcium (Ca2+) & phosphorous, and vitamins. Fortified dairy products with Cocoa enhance fudge nutritional value. Cocoa and chocolate products have long been known to contain high content of flavanol and polyphenolic compounds, with the addition of their significant antioxidant activity (Adam , *et al*.,1931) Knapp and Hearne 1939; Forsyth 1955). The presence of flavanols in cocoa and chocolate results in an increase in short- and long-term health benefits, and reduces the oxidation of LDL cholesterol, reduces platelet aggregation, increases arterial blood flow, and decreased blood pressure (Ariefdjohan and Savaiano 2005; Engler and Engler 2006). It could be found that 50% lower rate of death occurs due to cardiovascular disease and stroke in older men, who consumed the highest amounts of chocolate and/or cocoa, compared with the consumption of lower tertile of cocoa (Buijsse and others 2006). Studies on wine, black and green tea, soy products, and cocoa/chocolate indicate that while green and black tea are beneficial for LDL-cholesterol lowering and long term arterial flow mediated dilation (FMD), only chocolate and cocoa significantly reduced the blood pressure and acute and long-term improvements in FMD (Hooper, et al., 2008). Dark chocolate, natural cocoa powder contain three fold or more flavanol monomers, procyanidins, and antioxidant activity, compared with dark chocolate (USDA 2004; Gu , et al., 2006; Miller, et al., 2006). Flavanols residues in the nonfat cocoa solids portion of the cocoa bean, which comprises about 47% of the bean, while the remainder being cocoa butter. Cocoa powder is made from finely milled cocoa beans, which are pressed to remove most of the cocoa butter, resulting in a powder that is typically 88% to 90% nonfat solids and 10% to 12% cocoa butter. The concentration of the nonfat cocoa solids material makes natural cocoa powder one of the richest sources of procyanidins in the diet (Gu, et al., 2004).

Vanilla extract is the most common product with potential antioxidant Therefore, regardless vanilla is of a dominating flavor in frozen dairy desserts (Cadena,et al., and others 2012), According to Kamat and others (2000), vanilla can provide sufficient protection against protein oxidation and lipid peroxidation occurring in rat liver mitochondria. Dietary vanillin (1.25 to 50 ppm) also resulted in a significant potriglyceridemic effect in high- fat fed animals at all levels tested (Srinivasan and others 2008).

Hazelnut plays an important role in human nutrition because of its unique fatty acid composition (predominating MUFA). Fat soluble bioactives (tocopherols and phytosterols), vitamins (vitamin E), essential minerals (selenium), essential amino acids, antioxidant phenolics (caffeic acid), dietary fiber (soluble), bioactives and phtytochemicals (Alasalvar et al., 2003b). Hazelnut provides a number of non-fat cardioprotective constituents including arginine and magnesium. The presence of distinctive taste- and aroma-active components of hazelnut (Alasalvar et al., 2003a, 2003b) is of positive influence in increasing its consumption. Cheese Fudge with both vanilla and chocolate flavors can be considered as a vehicle for incorporating nutritional , healthy and desirable ingredients, so it can be both enjoyable and nutritional products. The aim of this study was to prepare a new kind of dairy products with nutritious and delicious properties ,using combination of milk forms with natural flavors , and determined its characteristics during storage period under different conditions.

## MATERIALS AND METHODS

Fresh buffalo's milk was obtained from the herd Sakha Station, Animal Production Research Institute,

Ministry of Agriculture. It contained 3.6% protein, 6.1% fat, 0.7% ash and 15.8% total solids. Analyzed by Lactoscans Milk Analyser . Other ingredients such as cocoa powder, dark chocolate, sugar , vinegar and Hazelnuts were purchased from local market in Giza.

Table (1) shown the chemical composition of cheese fudge component elements. which were characteristic by two natural flavors vanilla and cocoa. The high proportion of total solids characterized the constituent materials of cheese fudge which ranged from 95.7 up to 98.3 except buffalo milk which was 15.35.

**Table (1 ) Chemical composition of cheese fudge component elements**

| Chemical composition | Fat | Protein | Total carbohydrate | Moisture | Ash | Total Solid |
|---|---|---|---|---|---|---|
| Buffalo's milk | 6.0 | 3.7 | 4.8 | 85.0 | 0.85 | 15.35 |
| Cocoa Powder | 13.9 | 19.6 | 53.9 | 3.0 | 5.8 | 96.2 |
| Dark Chocolate | 27.0 | 5.7 | 60.5 | 1.0 | 1.5 | 95.7 |
| Hazelnuts | 58.7 | 14.9 | 16.7 | 5.4 | 2.6 | 98.3 |

Two variations of cheese fudge were prepared (vanilla and cacao flavors) using a combination of concentrated milk and sweet cheese curd at different proportions as follow 25: 75 , 50 :50 , 75: 25. Combination of milk and sweet cheese curd with the ratio of 50:50 recorded the highest sensory scores in comparison with the other concentrations .

Raw buffalo's milk was divided to two parts . Part one: Concentrate milk by reducing or evaporating away much of the water in milk, without boiling it, because it will scorch and stick. Simmer it gently on low heat. The ideal temperature to avoid scorching is about 80°C (180°F) until milk has had 60% of its water removed to get (concentrated flavored milk ). Part Two Pour second part of milk into a large, heavy- pot , and bring it to a boil over medium heat. Stir it frequently to keep the milk from scorching. When it comes to a boil, start to add vinegar drop by drop, The ideal temperature 90 °C (194 °F) then immediately, reduce the heat to low, and stir in the vinegar. The milk immediately separate into curds and whey. Pour the mixture into a colander and drain off the whey to get( sweet curd) After removing whey, curd was washing by water which boiling in previous, to decrease the acidity. Mix the first part (concentrated milk) and the second part (sweet curd)at the ratio 1:1 with 15% sugar and 5% hazelnuts and added flavor as 2% vanilla or 10% cocoa to the curd weight, blended till the mixture completely homogenized .Pour and cool this mixture until firm to get vanilla or cocoa fudge cheese. Coat the fudge cheese by chocolate and stored it in the refrigerator at 5°C or put it in deep freezer at -18°C and analyzed chemically, microbiologically, Sensory evaluation, and estimated biologically evaluation.

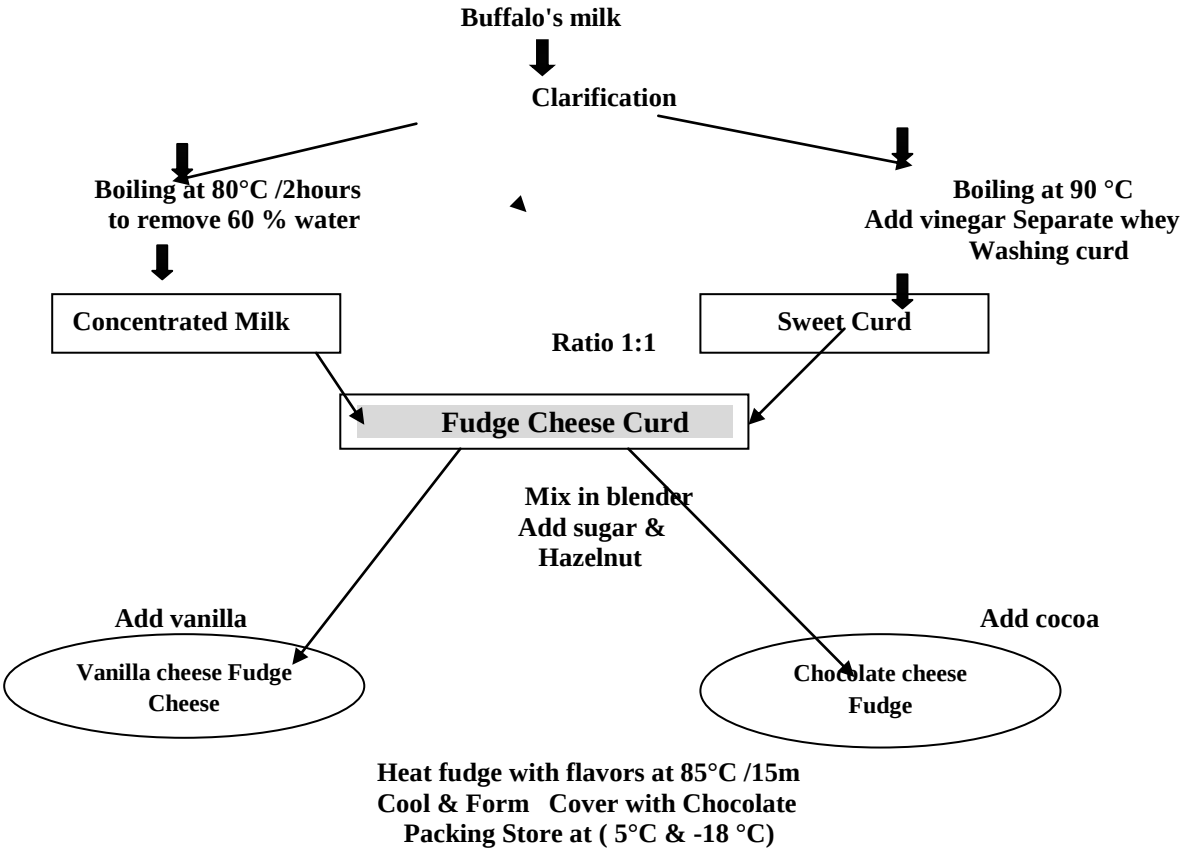


**Fig 1: Processing steps for experimental cheese fudge**

Moisture, fat, protein, total carbohydrate and ash contents of the samples were determined as per the procedures given in AOAC (2005). Peroxide value (PV) was determined as MeqO2/Kg Fat by the iodometric titration method according to AOAC(2012) method no.965.33. Fatty acids composition ,Amino acids were determined according to AOAC(2012).

Total bacterial count, Total coliform count, yeast and molds, Spore form, Staphylococcus aureus and Bacillus cerues were determine according Marshall (1993).

Sensory evaluation of fudge cheese was assessed by 15 panel members of Dairy Science Department. Animal Production, Research Institute, Dokki, Giza for aroma & flavor (40 points), body & texture (40 points) and outer appearance (20 points) as reported by Meyer ( 1973).

Best accepted variation of fudge cheese was subjected for consumer acceptability trials. The consumer acceptability was assessed by two consumer groups namely group-1 and group-2 comprising of 25 adults (20-25 yrs) and 25 children (6-12 yrs).

5-point and 3-point hedonic scales were used by group-1 and group-2, respectively. One and a half hours before the panel session, Cheese fudge were tempered to 19°C. This temperature was chosen for sensory analysis because panel training sessions indicated that panelists could best identify variations in coated with chocolate cheese fudge flavor at this temperature and this in agreement with Krause, *et al.,* (2008) who mentioned that panelists could best identify variations in butter flavor at this temperature Each consumer was asked to consume samples and evaluate them for their overall acceptability on an evaluation card provided to them. For sample evaluation, a 5 g piece of fudge was placed into paper plates consisting of vanilla cheese fudge and cocoa cheese fudge (3 replicates of each) were served to each panelist (Resurreccion, 1998). Panelists were instructed to consume the whole sample and rinse their mouths with water between samples to minimize any residual effect (Grosso and Resurreccion, 2002).

## RESULTS AND DISCUSSION

Processing cheese fudge as a new dairy products presented as follows in figure one . Mixing the two parts ( sweet cheese and prepared concentrated milk) with the ratio 1:1 to form smooth and rich curd , condensed milk slowly heated to a high temperature , usually in the range of 82.2 °C. When properly done, a concentrate of much greater viscosity is obtained , which improves the whipping ability of the product mix and contributes a smooth texture, which then binds more free water . Accordingly, superheating , therefore , functions like a stabilizer. (Chandan,1997).

Results in Table (2) presented that fat content recorded 25.05% and 25.74% for vanilla cheese fudge and Cocoa fudge cheese respectively. Despite its high content of fat cheese does not seem to increase plasma total and LDL-cholesterol concentrations when compared with an equivalent intake of fat from butter. This effect may be due to the high calcium content of cheese, which results in a higher excretion of fecal fat. ( Julie et al., 2011).

**Table (2 ) Chemical composition for fudge cheese components**

| Chemical Composition | Fat % | Protein % | Total Carbohydrate % | Ash % | Total Solid % |
|---|---|---|---|---|---|
| Vanilla Fudge Cheese | 25.05 | 30.25 | 14,91 | 1.69 | 71.9 |
| Cocoa Fudge Cheese | 25.74 | 26.35 | 20.38 | 1.93 | 74.4 |

From the same Table, it could be observed that both vanilla or chocolate cheese fudge had high protein content 30.25 % and 26.35% respectively. The high percentage of protein content in both kinds of cheese fudge coated with chocolate could be attributed to the excess protein content in cocoa powder. Same trend was found by Jayeola, et al., (2010) who mentioned that cocoa powder contains 22% protein, useful amount of vitamin A, riboflavin and nicotinic acid. It also contains minerals, iron and calcium. This will in no doubt be an added nutritional component to the newly formulated cocoa yoghurt. Heat treatment (80°C) used in processing cheese fudge was done to modify milk protein so as to enhance proper viscosity and gelatinization of the product. This is in agreement with the research of Reed(1982). Also from the same table it can be observed that the carbohydrate contents were higher in cocoa flavor than vanilla flavor fudge cheese , it were recorded 20.38 and 14.91 for cocoa and vanilla cheese fudge respectively . This contrast earlier report by the ( International Cocoa Organization 2001) that carbohydrate content of cocoa 26%. Athletes had improvements in endurance performance following consumption of a carbohydrate beverage (Coggan and Coyle 1991) and carbohydrate beverages are also used to increase glycogen recovery speed after exercise to benefit sequential workouts (Pritchett,et al., 2009). Research has shown that the addition of protein to a carbohydrate beverage (such as chocolate milk) ingested post exercise may have a positive influence on exercise recovery (Valentine and others 2008).

For testing the peroxide values (PV), Lipid oxidation is the main cause of spoilage and off flavor formation in chocolate or food coated with chocolate. Antonio (2003). From Table (3) it could be observed that slightly increase in ( PV) indicated at frozen condition (-18°C) , it was increased from 1.24 to 2.13 , and from 1.44 to 1.88 (MeqO2/Kg Fat) in both Cheese fudge (Vanilla and Chocolate Flavor respectively , at the end of three months. On the contrary large increase in PV was observed after three months at refrigerator condition (5°C),it was increased from 1.43

to 6.13 and from1.69 to 5.64 (MeqO2/Kg Fat) in Cheese Fudge with Vanilla and cocoa flavor respectively. It could be concluded that peroxide values increase with the increase of storage time at a refrigerator condition (5°C), but these values of ( PV) in all the samples till 3 months were found less than 10 Meqo2/ kg which could be considered at beginning of alteration of fat (Mattisek et al, 1976). These results are in disagreement with (Krause et al, 2008) who mentioned that the PV of frozen butters increased significantly, whereas the PV of refrigerated butters did not show a significant increase.

**Table (3) Effect of cheese fudge treatments during storage period on peroxide values .**

| Treatments | Conditions | Storage period (Month) | Peroxide Value (MeqO2/Kg Fat) |
|---|---|---|---|
| Cheese Fudge ( Vanilla Flavor) | Frozen (-18°C) | Fresh | 1.24 |
| | | 1 | 1.38 |
| | | 2 | 1.75 |
| | | 3 | 2.13 |
| | Refrigerated (5°C) | Fresh | 1.24 |
| | | 1 | 2.56 |
| | | 2 | 3.97 |
| | | 3 | 6.18 |
| Cheese Fudge ( Chocolate Flavor) | Frozen (-18°C) | Fresh | 1.44 |
| | | 1 | 1.62 |
| | | 2 | 1.74 |
| | | 3 | 1.88 |
| | Refrigerated (5°C) | Fresh | 1.44 |
| | | 1 | 1.82 |
| | | 2 | 2.96 |
| | | 3 | 5.64 |

Data on fatty acids composition for analyzed cheese fudge with vanilla and chocolate flavors samples are shown in Table ( 4 ) . The fatty acids profile with all samples presenting a similar constitution, although with some variation.

**Table (4 ) : Fatty Acids Composition (%) for Cheese Fudge**

| Fatty acids | Cheese Fudge (Vanilla flavor) | Cheese Fudge (Chocolate flavor) |
|---|---|---|
| C8:0 (caprylic acid) | 0.43 | 0.47 |
| C10:0 (caproic acid) | 0.81 | 0.93 |
| C11.0 (Undecanoic acid ) | 2.37 | 2.10 |
| C12:0 (lauric acid) | 7.65 | 10.66 |
| C14:0 (myristic acid) | 9.49 | 9.77 |
| C14:1 ω 5 (Tetradecenoic acid) phytostosteric | 0.63 | 0.56 |
| C15.0 Pentadecanoic acid | 1.39 | 1.27 |
| C16:0 (palmitic acid) | 24.41 | 23.55 |
| C16:1ω 7 Palmitoleic acid | 2.09 | 2.21 |
| C17:0 ( Heptadecanoic acid) | 1.44 | 1.65 |
| C16:3ω 4 (Hexa decatritnoic acid) hexagonic | 0.21 | 0.22 |
| C18:0 (stearic acid) | 9.78 | 10.11 |
| C18:1ω 9 (oleic acid) | 28.88 | 26.88 |
| C18:2ω 6 (linoleic acid) | 8.90 | 8.72 |
| C18:3ω 3 (linolenic acid) | 0.13 | 0.12 |
| C18:4ω 3(Alfa octadecatetraenoic acid) | 0.28 | 0.31 |
| C20:0 (arachidic acid) | 0.23 | 0.22 |
| C20:0 :1 ω 11(Eicosaenoic | 0.26 | 0.11 |
| C20:0 :1 ω 9 Gadolic acids) | 0.10 | ---- |
| C22.0 9 Behenic acids) | 0.14 | ---- |
| Non identified fatty acids | 0.38 | 0.14 |

Oleic acid (C18:1ω 9) was the most abundant fatty acids in either vanilla or chocolate fudge cheese , ranging from 26.88 % in chocolate cheese fudge and 28.88% in vanilla cheese fudge . Milk fat contains 25% oleic acid. Oleic acid is an monounsaturated omega-9 fatty acid with many health benefits. Oleic acid regulates the activity of adrenoreceptor signaling pathways which direct the adrenergic receptors (α- and β-adrenoceptors) that help regulate blood pressure (Teres, *et al.,* (2008). From the same table it could be observed that Palmitic acids (C16:0) was the second in order of importance varying between it was 23.55% in

(chocolate e cheese fudg ) and 24.41% in (vanilla cheese fudge ), follows by Lauric acid ( C12:0), stearic acid (C18:0 ). Stearic acid (systematic name, octadecanoic acid, CH3(CH2)16COOH) is a long-chain fatty acid. Although it is classified as a saturated fatty acid (SFA), both biochemically and for purposes of nutrition labeling and dietary recommendations, data accumulated during the past 50 years indicate that stearic acid (C18:0) is unique among the SFAs in the food supply .Stearic acid has been shown to have a neutral effect on blood total and low density lipoprotein (LDL) cholesterol levels .Lauric, Stearic, myristic , and linoleic acid which represented 10.66%, 10.11%, 9.77% and 8.72% for chocolate fudge cheese ,while in vanilla cheese results were as follows stearic acid , myristic acid, linoleic acid and Lauric acid which recorded 9.78%,9.49%,8.90%and 7.65% respectively . Liu *et al.,* (2000) reported that, the linolenic acid and palmitic acid were the most important fatty acids. Palmitic acid has been thought for many years to raise cholesterol levels if consumed, although a 2002 Canadian study published in the "Asian Pacific Journal of Clinical Nutrition" examined the effects of high consumption of palmitic acid in healthy volunteers and concluded it does not raise cholesterol if it is combined with linoleic acid. In addition Rioux and Legrand (2007) mentioned that Palmitic and myristic acids are involved in cell messaging and immune function. Lauric acid as the same trend increases total serum cholesterol more than many other fatty acids. But most of the increase is attributable to an increase in high-density lipoprotein (HDL) (the "good" blood cholesterol). As a result, lauric acid has been characterized as having "a more favorable effect on total HDL cholesterol than any other fatty acid [examined], either saturated or unsaturated" Mensink, et al.,(2003).

Two main fatty acids essential in the diet are linoleic (or omega-6) fatty acid and alpha-linolenic (or omega-3) acid. Both of them are polyunsaturated fatty acid, they represent 9.03% and 8.84 in both vanilla and cocoa cheese fudge respectively. The important effect due to that Linoleic acid converted to arachidonic acid which can form prostaglandins and thromboxanes – hormone-like lipids that promote blood clotting, induce inflammation and cause smooth muscle contraction. . In alternative pathway it can also form leukotrienes, which are one of the most potent inflammatory agents in the human organism. Chow CK. (1999).

Table ( 5) showed the amino acid content of cheese fudge . it could observed that amino acids was higher in Vanilla Fudge cheese compared to Chocolate fudge cheese . Amino acids are organic compounds that combine to form proteins. Amino acids and proteins are the building blocks of life. Essential amino acids cannot be made by the body.

**Table (5) Amino acids content of cheese fudge with different flavors**

| **Amino Acids gm/100g samles** | **Fudge cheese (Vanilla flavor) (%)** | **Fudge cheese (Chocolate flavor) (%)** |
|---|---|---|
| Essential amino acids | | |
| Tyrosine (TYR) | 1.68 | 1.49 |
| Phynylalanin (PHE) | 1.60 | 1.36 |
| Total aromatic amino acids | 3.28 | 2.85 |
| Therionine (THR) | 1.39 | 1.13 |
| Total sulfur amino acid | 1.39 | 1.13 |
| Leucine (LEU) | 2.88 | 2.32 |
| Isoleucine(ILE) | 1.67 | 1.30 |
| Lysine (LYS) | 0.75 | 0.53 |
| Valine (VAL) | 2.16 | 1.51 |
| Total | 12.13 | 9.64 |
| Non-essential amino acids | | |
| Aspartic( ASP) | 2.34 | 1.98 |
| Glutamic (GLU) | 6.36 | 5.01 |
| Prolin (PRO) | 3.14 | 2.78 |
| Glycine (GLY) | 0.60 | 0.61 |
| Alanine (ALA) | 1.03 | 0.93 |
| Histidine (HIS) | 0.72 | 0.51 |
| Argnine (ARG) | 0.43 | 0.36 |
| Total | 14.62 | 11.57 |

As a result, they must come from food.The 9 essential amino acids are: histidine, isoleucine, leucine, lysine, methionine, phenylalanine, threonine, tryptophan, and valine. Escott-Stump (2008). The three branched-chain amino acid leucine,valine and isoleucine recorded 6.71% and 5.13% these amino acids support numerous metabolic processes ranging from the fundamental role as substrates for protein synthesis to metabolic roles as energy substrates Harper,et al (1984) . The content of lysine was slightly higher in the vanilla flavor sample 0.75% compared to chocolate flavor 0.53% . Sulfur amino acids and their metabolites are of major importance in health and disease. Of the non-essential amino acids, the highest content was that of glutamic acid, which is

responsible for protection from cardiovascular , Boycheva , et al., (.2007) followed by prolin, aspartic and alanin in both flavors.

The results of microbiological analysis of cheese fudge with Vanilla or Cocoa flavors presented in Table ( 6) . It can be observed that cheese fudge with both flavors had a low total bacterial count that ranged from 1.21 to 2.45 cfu/g$10^{-2}$ when fresh, and after 3 months, higher numbers recorded when stored at refrigerated condition (5°C) they were 2.18 and 2.45 cfu/g$10^{-2}$ for vanilla and cocoa fudge cheese respectively at the end of 3 months.

**Table ( 6 ) Microbiological analysis of cheese fudge during storage periods under different conditions**

| Treatments | Conditions | Storage period (Month) | T.B.C cfu/g10-$^{2}$ | T.C.C. CFU/g | Spore form cfu/g$10^{-1}$ | Yeast And Molds CFU/g | *Bacillus Cereus* CFU/g | *Staph. Aureus* CFU/g |
|---|---|---|---|---|---|---|---|---|
| Cheese Fudge (Vanilla Flavor) | Frozen (-18°C) | Fresh | 1.21 | ND | 1.4 | ND | ND | ND |
| | | 1 | 1.30 | ND | 1.6 | ND | ND | ND |
| | | 2 | 1.45 | ND | 1.9 | ND | ND | ND |
| | | 3 | 1.73 | ND | 2.3 | ND | ND | ND |
| | Refrigerated (5°C) | Fresh | 1.49 | ND | 1.3 | ND | ND | ND |
| | | 1 | 1.56 | ND | 1.7 | ND | ND | ND |
| | | 2 | 1.79 | ND | 2.2 | ND | ND | ND |
| | | 3 | 2.18 | ND | 2.6 | ND | ND | ND |
| Cheese Fudge ( Cocoa Flavor) | Frozen (-18°C) | Fresh | 1.40 | ND | 1.7 | ND | ND | ND |
| | | 1 | 1.69 | ND | 2.4 | ND | ND | ND |
| | | 2 | 1.74 | ND | 2..8 | ND | ND | ND |
| | | 3 | 1.98 | ND | 3.1 | ND | ND | ND |
| | Refrigerated (5°C) | Fresh | 1.77 | ND | 1.9 | ND | ND | ND |
| | | 1 | 1.82 | ND | 2.5 | ND | ND | ND |
| | | 2 | 1.96 | ND | 2.9 | ND | ND | ND |
| | | 3 | 2.45 | ND | 3.4 | ND | ND | ND |

**T.B.C : Total bacterial count.**
**T.C.C. : Total coliform count**

Same trend could be observed with the spore form counts. These results can be attributed to the high heat treatment received during processing and to the hygienic conditions during , handling , packing and storage conditions .This is also appearances from the absence of total coliform count , yeasts and moulds, Bacillus cereus , and staph aurous . These results are similar to report by Marina, et al., (2011). there were no remarkably levels of yeasts and molds in the tested samples. Also it can be taken in consideration that Phenolic compound in cocoa powder is richening in flavanol monomers (catachin and epicatechin) and procyanidin oligomers), which can play has an Antimicrobial activity against oral streptococci Smullen, *et al.*,( 2007).

Sensory evaluation and consumer acceptibility was performed to assess the sensory attributes of the product and its acceptability. Chocolate cheese fudge was slightly higher than vanilla fudge cheese . In case of appearance, flavor, body & texture and overall acceptability. There were no significant difference between fudge cheese with both two flavors.. The primary purpose of consumer testing is to assess the personal response by current and potential customers of a product. Consumer acceptability was evaluated for the best acceptable cheese fudge during storage . Almost 80 per cent of the adult consumers from group-1 of 25 adults (20-25 yrs) preferred the preparation and the taste of Chocolate fudge cheese very much while liked moderately by the rest 20 per cent adults, Whom preferred Vanilla fudge cheese .Results also recorded that in group-2 of 25 children (6-12 yrs)most of the children 97 per cent liked both kinds of fudge very much, even they prefer the Chocolate fudge cheese. This is in agreements with (Boor 2001; Thompson , et al., (2004) ; Thompson, et al., (2007) ; NDC( 2010) mentioned that Among the different flavors of flavored milk (e.g., chocolate, strawberry and vanilla), chocolate milk is the most popular milk flavor for both children and adults .

Regarding the sensory evaluation of fudge cheese, the use of preferable combination of condensed milk and sweet cheese curd in the production of cheese fudge , in addition of coating with chocolate contributed to raise the sensory attributes of the product and its acceptability.Table (7) showed highest score for overall acceptability was obtained by Cheese fudge with cocoa Flavor at (5°C )followed by cocoa flavor at -18°C This is in agreement with mentioned that Cocoa products are eaten mainly because they are liked, by young and old, owing to their attractive flavors and appearance which give pleasure in eating (Minife 1989) . Same trend could be observed with vanilla flavor with slightly decrease Similar results were obtained by Ayyavoo and Ramasamy (2013) mentioned that vanilla is the second largest flavor wished in the world and Vanilla is the most preferred flavor in ice cream preparations throughout the world. From the same table slightly decreased was observed by the advancing of storage period in both flavors.

**Table (7) Sensory evaluation of cheese fudge at different storage conditions .**

| Treatments | Conditions | Storage period (Month) | A&F (40) | B&T (40) | O.A (20) | Overall (100) |
|---|---|---|---|---|---|---|
| Fudge Cheese (Vanilla Flavor) | Frozen (-18°C) | Fresh | 37 | 36 | 18 | 91 |
| | | 1 | 36 | 35 | 17 | 88 |
| | | 2 | 36 | 35 | 17 | 88 |
| | | 3 | 36 | 34 | 17 | 87 |
| | Refrigerated (5°C) | Fresh | 37 | 36 | 18 | 91 |
| | | 1 | 37 | 36 | 18 | 91 |
| | | 2 | 37 | 36 | 18 | 91 |
| | | 3 | 36 | 36 | 17 | 89 |
| Fudge Cheese ( Chocolate Flavor) | Frozen (-18°C) | Fresh | 37 | 37 | 18 | 92 |
| | | 1 | 37 | 36 | 17 | 90 |
| | | 2 | 37 | 36 | 17 | 90 |
| | | 3 | 36 | 35 | 17 | 88 |
| | Refrigerated (5°C) | Fresh | 38 | 38 | 18 | 94 |
| | | 1 | 38 | 38 | 17 | 93 |
| | | 2 | 38 | 37 | 17 | 92 |
| | | 3 | 37 | 37 | 17 | 91 |

**A&F: Aroma &Flavor B&T: Body &Texture O.A: outer appearance**

## CONCLUSION

The results of the present study showed that Cheese Fudge with both two flavors Vanilla and Cocoa gain superior scores for taste and texture as delicious rich and creamy with acceptable quality. So it can be introduced to the Egyptian market as healthy , sweaty, nutritional new dairy products.

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## تصنيع وتقييم حلوى الجبن Cheese Fudge

***نعمة رائف عطاللة , *إيمان فؤاد محمد و **نعمات إبراهيم بسيونى**
***معهد بحوث الإنتاج الحيوانى**
****المركز القومى للأغذية و الأعلاف**

تم إعداد وتقدير خواص حلوى الجبن Cheese Fudge بكلا من نكهتى الشيكولاتة و الفانيليا . حيث تم عمل خلطة من لبن مركز و خثرة جبن وذلك بنسبة ١ :١ كما تم إضافة السكر والبندق وكلا من نكهتى الكاكاو و الفانيليا. هذا وقد تمت دراسة الخواص الحسية و الكيميائية و الميكروبية ومدى قبول الستهلكين من أعمار مختلفة لهذا المنتج. هذا وقد أوضح التقييم الحسى لحلوى الجبن إرتفاع درجة القبول خاصة لحلوى الجبن بطعم الشيكولاتة . كما أوضحت النتائج زيادة رقم البيروكسيد بزيادة مدة التخزين على درجة حرارة الثلاجة (٥°م) لكلا من نكهتى الفانيليا و الكاكاو على التوالى. هذا وقد وجدأن جميع العينات تحتوى على الأحماض الدهنية الأساسية مثل الأولبك و اللينوليك و اللينولينك وهذة الأحملض بجانب انها تحسن صفات المنتج ، أيضا تتحول الى أوميجا ٣ و اوميجا٦ حيث تعمل على انتاج الطاقة وإمداد الجسم بالعديد من الفوائد الصحية. كما إحتوت أيضا حلوى الجبن على العديد من الأحماض الأمينية الأساسية و الغير أساسية كالتيروزين ، وفينيل آلانين و الليوسين و الأيزوليوسين و الفالين والتى لها العديد من الفوائد الغذائية و الصحية . هذا و قد زادت نسبة وجود هذة الأحماض فى حلوى الجبن بطعم الكاكاو وذلك يرجع لإرتفاع نسبة البروتين فيها. كما أوضحت النتائج أن جميع العينات كانت خالية من جميع الميكروبات المرضية وذلك طول مدة التخزين سواء على درجة حرارة (٥°م) أو (- ١٨ °م). هذا وقد دلت الدراسة أن المستهلك يعطى إهتماما كبيرا للمنتجات الجديدة التى بمكن أن تتواجد فى الأسواق وتتميز بالمواصفات و الطعم المرغوب.