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THE STUDY OF THE MANUFACTURE OF BRAIDED CHEESE FROM SKIM BUFFALO MILK BY USING DIFFERENT SOILS, AND ITS CHEMICAL, RHEOLOGICAL AND SENSORY EVALUATION

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Abstract
This current study was conducted to exploit the buffalo skim milk resulting from fat sorting for the purpose of making local custard and using it in the manufacture of braided cheese as well as using fat substitutes in cheese production and knowing the changes in rheological properties and the effect on the chemical and sensory composition and the percentage of purification, as well as the use of types of deserts in the manufacture of cheese, which is Badi = 330 and consists of (streptococcus Salivarus Subsp thrmophilus and produces EPS and a low content of Lactobacillus delbueckilssp ,101 = Streptococcus thermophiles. Lactobacilus acidphilus. Bifidobacterium lactic ,In the manufacture of cheese and knowing the best type of deserts in the cheese industry, if sorted buffalo milk was used as a control treatment, and skim buffalo milk modified at 3% of vegetable fat, chemical tests were carried out, which included estimating the percentage of moisture, protein, fat, carbohydrates, ash, and total acidity ,The rheological tests also included an examination of elasticity, cohesion and hardness, in addition to estimating the percentage of purification and conducting sensory evaluation, the results showed a decrease in the percentage of moisture in all treatments during storage in salted whey .Where the percentage of moisture decreased in all treatments, where there was a decrease in the percentage of total solids represented by protein, ash and fat, and there was a clear decrease in the percentage of carbohydrates compared to the control treatments. The results also varied in the rheological tests, where there was a decrease in stiffness in the control treatment of buffalo skim milk for the fourteenth day compared to the first day and the replacement treatment. It was also noted that the elasticity and cohesion of the control treatments decreased compared to the replacement treatments. The results also showed an improvement in the sensory properties of the control treatments. Compare with substitution coefficients. This study aimed to produce braided cheese with high specifications and quality that meet the requirements of the Iraqi consumer: 1- Studying the effect of different primers on the manufacture of braided cheese. 2- Mixing buffalo skim milk with modified buffalo skim milk with a percentage of 3% of fat improved the rheological properties and gave softness and texture as well. 3- During the study and comparison between the treatments manufactured with the addition of Al-Badi, it was found that the best treatment was skim buffalo milk modified with 3% of vegetable fat. 4- The highest purification peracetage was for the replacement treatments, which is buffalo skim milk modified with 3% of vegetable fat, as it was given (17) for a starter with numbers (101) (it is a mixture of starter bacteria with bifido bacteria).

Keywords: braided cheese, skim buffalo milk, soils, sensory evaluation

Introduction

It is one of the types of Iraqi cheese, the manufacture of which is spread in the south of Iraq in Basra. This type of cheese is made from the skim buffalo milk, the so-called milk under cream ,This type of cheese is characterized by the acidic and salty taste that the consumer desires. It is made locally by adding starter, which contains wide types of microorganisms, and these organisms lead to a decrease in the ph of milk. Then the temperature is gradually raised to 50°C and then stirred to reach the required acidity, then it is kneaded and pulled in the form of threads and with quick skillful movements, and then it is braided in the form of a braid. The type of cheese requires attention due to the lack of research about it, as well as the lack of resources and the difficulty of manufacturing that requires expertise and high skill to deal with the curd. It contains a moisture content of 40% and is classified among the semi-dry cheeses (Tamime 2006).The manufacture of braided cheese depends on the use of a local milk starter, where a large amount of it is added to the warm buffalo milk for a short period, or a small amount of the starter is added, where it is incubated for a while until obtaining a stretchable curd (pH 5.3) and the temperature is gradually raised with stirring in a calm manner, A temperature that can be tolerated by the factory that collects the formed curd, presses it and withdraws it according to the skill of the factory for the purpose of getting rid of the whirl, and the service is done inside the hot whirl. After reaching a certain degree of elasticity, it is nailed and placed in ice water for the purpose of giving it the necessary hardness, and then transferred to the brine solution for the purpose of salting and preservation (Bayer 1980).

Therefore, the current study aimed to the following

• Make the most of the skim buffalo milk and try to replace the fat in it

Studying the rheological traits of processed cheese, which are represented by examining the elasticity, hardness, and cohesion immediately after manufacturing and during storage.

1- Materials: Use buffalo milk and skim buffalo milk at an average of 3% of vegetable fat and use the starter consisting of (Starter 330 and consists of (Streptococcus Salivarus Subsp thrmophilus and produces EPS and low content of Lactobacillus delbueckilssp) and Buddy 101 and consists of (Streptococcus thermophiles. Bifidobacterium lactic)

Materials and methods

Manufacturing braided cheese

Making braided cheese according to the method described by Albayer (1980), which includes the following:

Receiving the raw buffalo milk and filtering it from the impurities and skimming it from the fat completely. The acidity of the used milk was 0.16% ,It was pasteurized at a temperature of 62-63°C for 30 minutes and cooled to 45°C. A starter was added at an average of 0.03 g/l at a temperature of 45°C.

3 kg was used for each industrial meal and left until coagulation occurred during (4-5) according to the type of starter added, and the mixture was incubated at a temperature until it reached pH 5.2.The process took about (4-5) hours. The temperature was gradually raised with slow stirring until it reached a temperature of 50 °C. At the same time, the curd was collected and served inside

the bruise (pulled and stretched) inside the hot brine in the form of a braid and was placed in water at a temperature of 9-11 Then it was preserved in salted whey and brine and in plastic bags under vacuum

Estimation The pH of cheese is estimated according to the method described in Ling (2008)

Ash percentage estimate:

Determination of humidity: the percentage of moisture was estimated according to the method mentioned in AOAC (2005)

Determination of Acidity % Acidity was determined according to the method described in A.O.A.C (1980)

Estimated Fat Percentage:

The percentage of fat components in cheese was estimated by the Babcock method, according to the American public

Health Associatio) (1978)

Estimation of carbohydrates in cheese: their proportion was estimated mathematically according to what was mentioned by Ngoddy and Ihekoronye (1985)

Tissue estimation assays: The texture of cheese parameters was estimated using a tissue analyzer type (CT3, 4500 Brookfield engineering lab) with a carrying force of 5 kg, according to what Joon et al, (2017). mentioned

Sensory calendar for cheese:

Sensory tests of braided cheese samples were conducted in the Department of Dairy Science and Technology - College of Food Sciences - Al-Qasim Green University by a number of specialized professors, according to the sensory evaluation form created by Al-Dahhan (1977).

The overall composition of braided cheese

Moisture content:

Table(1) shows the moisture content of the treatments of braided cheese made from skim buffalo milk. The results of moisture for the treatments preserved with whey on the first day were the moisture percentages for treatment C of skim buffalo milk that were treated with different types of primers (330 and 101) for the day, respectively. 53.33 and 55.6)As for the treatment T made from skim buffalo milk modified by 3% of vegetable fat and added to it the valleys with numbers (330 and 101) (50.20 and 48.16), respectively. The results agree with what Al-Hadithi 2015 found for the moisture content of braided cheese made from skim milk, which amounted to 50.44%.and after raising the moisture content of low-fat cheese, one of the important strategies is to improve its properties that lead to making the moisture in the non-fat solid material equal to or higher than that of full-fat cheese(2001 , oberg & Welker)After fourteen days of storage in the salted whirl, a decrease in the moisture content was noticed. The moisture content of treatment C was skim buffalo milk that was treated with different types of deserts (330 and 101) if it was (51.55 and 52.23), as for the treatment T made from skim buffalo milk average of 3% of vegetable fat and added to it the pestles with the numbers (330 and 101)

it was (49.95 and 47.23), then the moisture percentage in these treatments was less than the results obtained on the first day of manufacturing, where the moisture percentage is 40%, and it was classified among the semi-dry cheeses (Tamime 2006).This is consistent with what was mentioned by El-Alfy et al (2010) who indicated that adding the starter farms to soft white cheese milk led to an increase in the quantitative solids content of the product. The results of the statistical analysis indicate a significant difference ($P \leq 0.05$)

Moisture percentage at the time of manufacture directly and after 14 days of storage between treatments, preserved in salted whey

Protein:

As it is evident from Table (1) that the percentage of protein gradually increased during the storage period in the salted whey, where the percentage on the first day of manufacture for the C treatment of buffalo skim milk that was treated with different types of primers with numbers (330 and 101) was (22.4 and 22.85).) As for the treatment T, buffalo ferment milk modified with 3% of vegetable fat, which was treated with different types of starter with numbers (330 and 101) were (19.85 and 22) and after storage for fourteen days of preservation in salted whey, there was an increase in the percentage of protein in the treatments Which was mentioned previously, where the result was c treatment for protein percentage (23.85 and 24.25) As for treatment T, buffalo ferment milk modified with 3% of vegetable fat, which was treated with different types of starter with numbers (330 and 101) were (20.30 and 23.49)). The results are consistent with what was found by Nikjooy et al 2015, who observed a high protein content during the storage period due to a decrease in moisture and an increase in total solids content associated with a decrease in the moisture content of cheese during storage.This result is close to what was found by Bekele (2019), who found that the protein content in soft cheese ranged between 16.29_17.49%.This was explained by the fact that the addition of precursors leads to an increase in the protein content in cheese due to its role in increasing the acidity of the cheese and then increasing the whey exudation and decreasing the moisture content of the cheese, which leads to an increase in the proportion of quantitative solids. Including protein, the results of the statistical analysis indicate that there is a significant difference ($P \leq 0.05$) in the percentage of ash between processing directly and after 14 days of storage between treatments preserved in salted whey.

fat

Table (1) shows the percentage of fat in cheese for the different treatments mentioned previously, where the percentage of fat immediately after processing for braided cheese for treatment for the first day of manufacturing C that was treated with different types of pudding (330 and 101) was (0.5 and 0.4)As for the treatment T, buffalo ferment milk modified with 3% of vegetable fat, which was treated with different types of primers with numbers (330 and 101) (15 and 17), but after fourteen days of preservation in salted whey.Where there was an increase in the percentage of fat, the results for treatments C that were treated with different types of seedlings (330 and 101) were (0.7 and 0.4), while treatment T was buffalo skim milk modified by 3% from vegetable fat that

was treated with different types of starter with numbers (330 and 101) were (16 and 18.96).The results agree with Wajda Al-Badrany (2016), who observed a high percentage of fat for soft, reduced-fat cheese during the storage period .The results also agree with what was found by Mohammed (2017), who noticed a high percentage of fat in cheddar cheese during the storage period. The reason for the increase in the percentage of fat with the advancing age of ripening is due to the decrease in the percentage of moisture and therefore the increase in the percentage of fat (Neamat Allah 1996.and Ezzat 199 , Ammaretal 1993. and also an approach to what Sant 'Ana et al (2013) for soft cheese with added prefixes 17.44%.The results of the statistical analysis indicate that there is a significant difference ($P \leq 0.05$) in the percentage of protein between processing directly and after 14 days of storage between treatments kept in salted whey.

Ash

The results in Table (1) show the percentage of ash in the different cheese treatments mentioned previously, as this percentage was immediately after manufacturing for the first day of manufacturing. The results were treatment C, which was treated with different types of starters with numbers (330 and 101) were (1.99 and 2.24)As for the treatment T of buffalo skim milk modified with 3% of vegetable fat that was treated with different types of starter numbers (330 and 101) was (1.90 and 1.53) which is close to what was found by Abdel-Moneim et al (2012) which estimated the percentage of ash in cheese Mozzarella made from cow's milk 2%After fourteen days of preservation in salted water, there was an increase in the results. The ash percentage of treatment C that was treated with different types of starter with numbers (330 and 101) was (2.1 and 2.29)), while treatment T was buffalo skim milk modified by 3%. of vegetable fat that was treated with different types of starter with numbers (330 and 101) were (2 and 2) These results are consistent with what was found by Al-Badrany (2016), who noted that the ash percentage in soft cheese increased during the resulting storage. The results of the statistical analysis indicate that there is a significant difference ($P \leq 0.05$) in the percentage of ash between processing directly and after 14 days of storage among the treatments kept in salted whey.

carbohydrates:

Table (1) shows the different percentages of carbohydrates that were mentioned previously, where the percentages of carbohydrates were on the first day of manufacturing for the treatment C (21.78 and 21.85), and the treatment T was buffalo skim milk modified by 3% of vegetable fat that was treated with different types of starters with numbers (330). and 101) were (10.3 and 11.1)After storage for fourteen days for treatments C, it was (21.8 and 20.83), while treatment T was buffalo skim milk modified with 3% of vegetable fat that was treated with different types of starter with numbers (330 and 101) were (9.5 and 8.2).It is noticed from the results that there is a decrease in the percentage of carbohydrates with the progression of the storage period for all treatments. The reason for this decrease is due to the activity of microorganisms that convert lactose sugar into lactic acid.The results of the statistical analysis indicate that there is a significant difference ($P \leq 0.05$) in the percentage of carbohydrates between processing directly and after 14 days of storage between treatments preserved in salted whey.

Total acidity:

The results in Table (1) show the Titperacetagen Acidity values (calculated on the basis of lactic acid)for the treated cheese, the acidity in treatment C was made from skim buffalo milk that was treated in the starter of the numbers (330 and 101), as the acidity percentage was C (0.66 and 0.88).As for treatment T, skim buffalo milk modified with 3% of vegetable fat, which was treated with different types of starter with numbers (330 and 101) were (0.75 and 0.62).but after fourteen days of storage, the result of treatment C that was treated in the starter with numbers (330 and 101) was (1.52 and 1.44).As for treatment T, skim buffalo milk modified with 3% of vegetable fat, which was treated with different types of starter with numbers (330 and 101) were (1.62 and 1.53), respectively. The acidity of cheese increases during the storage period and this depends on the activity and growth of the organisms that may be present in cheese as we mentioned so that bacterial growth continues during the storage period

Part of it turns into lactic acid, and the amount of acidity increases depends on the type of cheese manufactured and the type of starter used. The starter converts lactose into lactic acid during the percentage of milk in the early stages of cheese manufacturing (Fox) et al 2000

pH:

The results in Table (1) show the pH values of the different cheese treatments previously, as the pH values after the first day of manufacturing, treatment C, which was treated with different types of soils (330 and 101) were (5.23 and 5.14). As for treatment T modified buffalo skim milk with 3% of vegetable fat that was treated with different types of primers with numbers (330 and 101) were (5.33 and 5.33). After storage for a period of fourteen days of storage in salted whey, the pH values decreased, as the pH values of treatment C were made from buffalo skim milk that was treated with different types of primers with numbers (330 and 101) were (4.95 and 5.8). As for treatment T, buffalo skim milk was modified by 3% of vegetable fat, which was treated with different types of starter with numbers (330 and 101) were (5.20 and 5.11). In cheese gradually and continues to decrease to a minimum. This decrease is due to the production of lactic acid by bacteria, as well as the production of other acids due to the high acidity.The addition of the precursors that work to tolerate the sugar lactose and convert it into lactic acid and reduces the pH.

Table (1) Chemical composition of braided cheese preserved in salted whey for different treatments (C and T)

Treatment	start	Storage Period(day)	Moisture %	Protein %	Fat %	ph	Total acidity	Carbohydrates%	Ash %
C	330	1	53.33	22.4	0.5	5.23	0.66	21.78	1.99
		14	51.55	23.85	0.7	4.95	1.53	21.8	2.1

	101	1	55.6	22.85	0.4	5.14	0.88	21.85	2.24
		14	52.23	24.25	0.4	5.8	1.44	20.83	2.29
T	330	1	50.20	19.85	15	5.33	0.75	10.3	1.90
		14	49.95	20.30	16	5.20	1.63	9.5	2
	101	1	48.16	22	17	5.33	0.62	11.1	1.53
		14	47.23	23.49	18.96	5.11	1.53	8.2	2

Where C = cheese, control treatments, skim buffalo milk, and T = buffalo milk modified with 3% from vegetarian, which was treated with different types of deserts represented by numbers (330 and 101).
330 = Streptococcus Salivarus Subsp thrmophilus produces EPS and low content of Lactobacillus delbueckilssp
101 = Streptococcus thermophiles. Lactobacilus acidphilus. Bifidobacterium lactic

Rheological tests

compressibility

Hardness is a measure of the amount of force required to apply pressure to a sample of cheese that extends over a certain area by applying a certain weight.As indicated (Van Hekken et al 2007) Table (4-5) shows the results of the hardness test for cheese that was kept under vacuum and compared with the first day of manufacture, where the tests were the first day.Where treatment C was made from skim buffalo milk and treatment T was buffalo milk modified with 3% of vegetable fat. It is clear that there are clear differences in the amount of force applied to the cheese samples of the different treatments, which indicates the difference in its hardness depending on its chemical composition, the type of milk used in its manufacture, and the type of substitute for fat used It is noticed that the hardness of the cheese of the control treatment was less than that of the hardness of the cheese of the other treatments. The highest hardness for the first day of manufacturing, as the treatment C that was treated with different types was (330 and 101) was (140 and 119.8).This is consistent with what Romeih et al (2002) found when studying cheese that there is a high hardness of cheese made from skim milk.Compared to cheese made from whole milk and cheese with replacement treatments, the reason for the high hardness of low-fat cheese is due to its high casein content. Also, the fat in full-fat cheese performs the lubrication process and can penetrate into the protein matrix to make the cheese softer (Koca and Metin 2004).And the treatment of buffalo milk modified with 3% of vegetable fat that was treated with different types of deserts (330

and 101) was (54.5 and 119.1) But after fourteen days of preservation in salted whey, the result of treatments C was (33.7 and 119.8), and treatment T of buffalo milk modified by 3% of vegetable fat that was treated with different types of deserts (330 and 101) was (51.7 and 112.9) as well. The process of curd formation is affected by the acidity resulting from adding the starter, which affects the pH of the cheese, and the hardness of the cheese increases with the decrease in the pH Where the high acidity leads to an increase in whey exudation, and then a decrease in the moisture content of the cheese and an increase in its hardness (Lucey et al,, 2003)

The results of the statistical analysis indicate that there is a significant difference ($P \leq 0.05$) in compressibility between manufacturing directly and after 14 days of storage between treatments stored in salted whey.

Flexibility check:

Food texture is defined as the sum of the physical properties that arise from the structural elements of that food that are sensed by the consumer and are related to the re-formation, decomposition, or breakdown and flow of that food under the influence of a force. It is actually measured by the functions of mass, time and distance (Bourne 2003).Meullenet et al 1997) also defined springiness or elasticity as the degree to which the sample returns to its original shape after applying pressure on it between the tongue and the upper surface of the mouth.

The tissue properties of cheese are determined by the interaction of the structural properties of the protein template and the lipid droplets involved in it (Lobarto-Calleros and Co 2007).Also, the acceptability of low-fat cheese to the consumer can be improved either by partial or total substitution of the fat with different fatty substitutes that mimic the functional properties of the fat (Drake et al 1999). The process of removing fat affects all the texture and texture properties of cheese, such as hardness, gum, elasticity, and others (Awad et al 2005).

Cohesiveness

Adhesion is one of the important properties of cheese texture and shows its acceptance from the consumer's point of view. Cohesion is defined as the forces of internal bonds, which maintain the ideal of the product for the consumer, and it is expressed as the extent to which the material is deformed when exposed to the cause of deformation before it ruptures, and this depends on the nature of the protein material (Mousavi et al 2019).Tunick (2000) indicated that the three-dimensional protein network is the most responsible for the cohesion feature.The results shown are shown, as the results were taken during two stages, the first day of manufacturing, where the treatments C that were treated with different types (330 and 101) were (0.75 and 0.75), while treatment T was skimm buffalo milk modified with 3% of vegetable fat that was treated with different types of starters The numbers (330 and 101) were (0.53 and 0.76) After fourteen days, the percentage of cohesion decreased in all treatments C (0.61 and 0.80), while treatment T modified buffalo fermented milk with 3% of vegetable fat that was treated with different types of primers with numbers 0.34) (and 0.76) except for the treatment that was In it, the buffalo milk fat was replaced by another fat, which may be due to the rise due to the chemical composition of vegetable and animal fat.The results of the statistical analysis indicate that there is a significant

difference ($P \leq 0.05$) in the cohesion between processing directly and after 14 days of storage between treatments stored in salted whey.

Table (2) Rheology tests parameters that were preserved in salted whey

flexibility	:Cohesiveness	hardness	cheese age	Starter	treatments
4.6	0.75	140.8	1	330	skim buffalo milk
3.0	0.61	33.7	14		
3.7	0.75	119.8	1	101	
3.7	0.80	119.8	14		
2.7	0.53	54.5	1	330	Modified buffalo skim milk with 3% vegetable fat
2.0	0.34	51.7	14		
4.0	0.76	119.9	1	101	
4.0	0.76	112.9	14		

Table (2): the hardness values for the different cheese treatments after processing during storage for fourteen days, the elasticity values for the different cheese treatments after processing and during storage, which amounted to fourteen days, and the cohesion values for the different cheese treatments after processing and during storage for fourteen days, the treatment with starters = 330 (streptococcus Salivarus Subsp thrmophilus and produces EPS and low content of Lactobacillus delbueckilssp
101 = Streptococcus thermophiles. Lactobacilus acidphilus. Bifidobacterium lactic

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