Manufacturing functional like-butter Product and studying its Chemical, Microbiological and physical Properties

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Abstract

This study was carried out to determine whether like-butter product can be a carrier for probiotics by observing the survivability of selected probiotic strains during cold storage. The effects of using probiotic adjunct cultures (*Lactobacillus acidophilus*) the like-butter product on microbiological counts, sensory characteristics, chemical characteristics, and some chemical characteristics and compositions including (Acid Degree Value ADV, Peroxide Value PV, Amino acid tyrosine, Diacetyl, cholesterol, protein, pH, titratable acidity, carbohydrates) during storage for 5 weeks were investigated. The like-butter product with *Lactobacillus acidophilus* maintained the probiotic characteristics, in that the level of viable cells of the probiotic was 10^7 cfu/ g until 5 weeks of storage. The highest scores in sensory assessment were obtained on the first day of storage.

Keywords: Like-butter product, healthy properties, Chemical physical properties, probiotic.

Introduction

Butter product is a dairy item that is significant for both human health and the economy. And have shown to have more than health advantages. These include having a high concentration of lauric acid, which is necessary to decrease the fungi-induced inflammation, as well as being a good source of vitamin A, which is essential for the thyroid and adrenal glands. Additionally, it contains plenty of lecithin, a nutrient crucial to the metabolism of cholesterol, as well as vitamins E, D, A, and K. Additionally, butter products contain a variety of nutrients, many of which are essential for maintaining healthy cholesterol (38 and 34) .

Products made with butter have been produced for centuries (27). It is believed that the damage caused by saturated fatty acids to human health may be caused consumption to decline (35). However, milk fat contains essential fatty acids that are part of the human diet. Vitamins that are lipid-soluble and act as antioxidants for human health include retinol, carotenoids, and tocopherols. The composition of milk's fatty acids affects the physical, chemical, and quality characteristics of dairy products as well as human health. Fatty acids like butyric acid, oleic acid, and conjugated linoleic acid (CLA) have been studied for their positive effects on human health (25). According to some researchers; probiotic strains produce bioactive fatty acids that can change the fatty acid composition of dairy products (25). Additionally, butter products containing probiotic bacteria improve sensory qualities.

Lactic acid bacteria are specifically cultivated in cream. Because bacteria are the only organisms responsible for the taste and flavor of cultured butter products, the formation of the microbial composition for their production is a crucial issue (21). There isn't much information in the scientific literature about the possibility of using probiotic cultures in the fermentation of cream during the production of cultured butter products. From the perspective of temperature mode selection and combining processes for cream's biological and physical maturation, this issue necessitates special attention. The vital component of fermented, cultured milk products with probiotic properties is maintaining the probiotic cultures' viability and preserving them in sufficient quantities to impart functional properties to a product (33 and 11). Determining the circumstances in which probiotic cultures maintain viability while also developing excellent organoleptic properties and conventional physical-chemical parameters is a pertinent task (18).

Because it is the primary representative of the intestinal microflora and carries out regulatory tasks within the population of intestinal bacteria, *Lactobacillus acidophilus* is referred to as a "classical probiotic." Many of its strains produce highly active hydrogen peroxide, which has a strong veridical effect on the human immunodeficiency virus. In order to create other lactobacilli, representatives of L. acidophilus are also used as antioxidants and stimulants. These microbes exhibit antitumor and immunomodulation properties (2 and 3).

L. acidophilus is added to monocultures in various parts of the world, or it is combined with various types of lactic acid bacteria in the formulation of cultured milk products (8). Proved the viability and possibility of

combining the cultivation of acidophilus and mesophilic lactic acid lactococci, which allows for the production of a product containing a sizable number of viable cells from both groups of microorganisms.

Lactic acid and aromatic ingredients give cultured butter products their distinctively rich, aromatic bouquet (diacetyl and volatile organic acids) (18). These lactic acid bacteria metabolites must be present in the cultured butter product in order for it to function better than other types of butter products and have a longer shelf life. By preventing the growth of putrefactive bacteria, lactic acid and diacetyl have antibacterial effects on microflora (8).

Currently, cultured butter products are made in two ways: by converting highly fattening cream and whipping cream using both intermittent and continuous action butter product makers. A benchmark for cultured butter is the classic composition butter produced by whipping the cream, which was first exposed to the fermentation by adding a sour composition under specific temperature conditions. Thus, favorable conditions are created for the development of a distinctive taste that combines distinct creamy and fermented milk flavor (18, 13).

The objectives of this study were: (a) to verify the viability of probiotic bacteria therapeutic like-butter product that can be used for healthy and sick people by adding bacteria *Lactobacillus acidophilus* during storage to the healthy properties of the like-butter product (b) to study the chemical and microbiological properties of like-butter product samples during 5 weeks of storage.

Material and Methods

Bacterial activation and preparation of lactic acid bacteria *Lactobacillus acidophilus*

The probiotic was prepared by transferring 1 ml of activated *Lactobacillus acidophilus* (North Hollywood CO.) to the 9 ml skim milk prepared at 12% and incubated at 37 °C until coagulation appeared with the activation process repeated three times in a row before using it and each time according to (31). *Lactobacillus acidophilus* was making a glass slide and dyeing it under the microscope to identify its purity.

Estimation of the total number of bacteria in like-butter product

The total number of bacteria used over the study period was calculated as weighing 1 g of like-butter product, then serial decimal dilutions were made according to the poured plate method mentioned by (26) using MRs and incubated at 37 °C for 48 hours in anaerobic conditions and after the end of the incubation period, the number of developing colonies was calculated using a colony counting device and multiplying the number by the reciprocal of the dilution.

Like-butter product manufacturing

A cream with a fat content of 35% was used from the dairy factory, College of Agriculture, University of Baghdad. The cream was shaken80% fat, and after modification 65% (fat) like-butter product was obtained. After the like-butter product was pasteurized by slow pasteurization and cooled at room temperature, it was divided into three parts, leaving the like-butter product of the first section for self-fermentation (without starter culture) a temperature of 35 For 24 hours, which is followed in the manufacture of like-butter product in the dairy factory, College of

Agriculture, University of Baghdad. This experiment was considered a control treatment. In the second section, casein and whey proteins were added at 18% and 4%, respectively, along with emulsifying salt (1% di sodium phosphate), and the mixture was homogenized with slow pasteurization and incubated at 35 °C for 24 hours. This treatment represents (T1). As for the third section, after the pasteurization process, the bacterium *Lactobacillus acidophilus* was added with an initial percentage of 10% of the weight of the like-butter product (T2), then it was left for self-fermentation at 15 degrees for 48 hours and placed in sterile packages and stored at a refrigerator temperature of 5 degrees Celsius for 5 weeks. During the storage period, some indicators were followed up from the post-manufacturing period weekly.

Acid Degree Value

According to the Burea of Dairy Industry (BDI) method reported by (6). Acid Degree Value was calculated from the following equation

$$ADV = \frac{(\text{Ml KOH for sample - ml KOH for blank}) \times N}{\text{Sample weight (g)}} \times 100$$

Peroxide Value (PV)

The value of the peroxide for the fat was estimated according to the method mentioned by (30).

Mixture of chloroform and glacial acetic acid is prepared in a ratio of 2:1 and 30 ml is taken from it and added to the sample and stirred circularly for the purpose of dissolution.

Put in a water bath for 20-30 minutes prepare 5% of liquid potassium iodide in two flasks (for sample and plank).

Add the mixture to the two flasks, and then add 12.5 distilled water + 0.5 ml of starch until the color turns black or dark brown.

Sweep with 0.002 N sodium thiosulfate until the color disappears and record the reading

We calculate the value of peroxide according to the following equation:

$$PV = \frac{[\text{titration of sample} - \text{titration of blank})] \times 0.01N \times 1000}{\text{Sample weight (g)}}$$

Measurement of the amino acid tyrosine

Tyrosine was measured as an indication of proteolysis by a method (36).

The percentage of protein

It was estimated by the Microkeldal method, the percentage of fat by the Kerber method, the percentage of moisture in the furnace (32). And the percentage of ash in the incineration furnace according to the methods presented in (1).

Estimation of total fat percentage: Fat %

Followed Babcock's method as reported by (30).

Determination of Total Ash

Was estimated according to the method mentioned in (30).

Moisture

Was estimated according to the method mentioned in (30).

Cholesterol estimation

The cholesterol concentration in the samples was estimated according to the method mentioned by (22), which is to add 1.9 ml of ethyl alcohol to 0.1 ml of fat with good shaking, then put it in the centrifuge at a speed of 3000 rpm for 15 minutes, then

adds 0.25 ml to it. From the previously prepared ferric chloride solution (prepared by dissolving 0.1 g of undiluted ferric chloride in 100 ml of ethyl acetate), then 2 ml of concentrated sulfuric acid was added, shaken well, and then left to cool. The optical absorption was read at a wavelength of 560 nm for all samples. Standard cholesterol was prepared according to (10). modified method, which used the kit supplied by the French company Biolabo SA, or it was prepared by adding 1 ml of Reagent solution and adding to it 10 microliters of Standard solution and incubating for 5 minutes in a water bath at a temperature of 37 ° C.

And read the light absorption at a wavelength of 500 nm in a spectrophotometer and extracted the yolk fat cholesterol according to the following equation:

$$\text{Cholesterolconcentration} = \frac{\text{Read absorption form}}{\text{Standard cholesterol absorption reading}} \times 2$$

Determination of carbohydrates

The carbohydrates method mentioned by (29) was used for the determination of carbohydrates in separated protein models.

Sensory evaluation

It was carried out immediately after processing over the storage period and was done by a number of specialized professors in the Department of Food Sciences - College of Agriculture - University of Kufa and gave evaluation scores of 25 for each characteristic of colour, texture, smell, and taste based on what was stated in (23).

Results and Discussion

The chemical composition and microbiological and some chemical properties of the cream used in the manufacture of the like-butter product.

Table (1) shows the percentages of fat, protein and moisture, as well as the pH of the fat, the titratable acidity value, the pH, total of psychrotrophic and coliform bacteria, and the total of yeasts and molds in the pasteurized cream prepared for the manufacture of a like-butter product before adding the starter, and these percentages were within the permissible normal limits where the value of the ADV was less than 2.0 mEq/100 g of fat, which is the limit at which the cream is rejected as the rancid flavor becomes clear to many consumers according to the global gradient adopted for the Bureau of Dairy Industry (BDI) method, as well as for the numbers of colon bacteria if they do not exceed 10 cfu/ g and yeasts and molds are less than 100 cfu/ g so this cream is considered within the standard specifications allowed for the manufacture of like-butter product.

Table 1. The chemical and microbial composition of the cream used in the manufacture of like-butter product.

yeasts and molds	coliform bacteria	Psychrotrophic bacteria	total bacteria	Titratable acidity	pH	ADV	moisture%	Protein%	%Fat
17	6	$11x10^2$	$33x10^2$	0.18	6.0	1.60	63.0	2.0	35.0

Chemical composition of types of like-butter product immediately after manufacture

Figure (1) shows the total composition of the types of like-butter product immediately after manufacturing, represented by the product made from cream that was left for self-fermentation for 24 hours at a temperature of 20 °C and then manufactured according to the traditional method used to manufacture like-butter product in the dairy factory, College of Agriculture, University of Baghdad, represented by the control treatment (C) The like-butter product manufacture from cream with a fat content of 63.21, 17.13 protein and 5.05 lactose and left to ferment at a temperature of 20°C for 24 hours, represented by the T1 treatment, and a like-butter product made from a cream that was inoculated with 10% bacteria and left to ferment at temperature of 17 ° C for 24 hours before manufacturing, represented by the T2 treatment, where it is noted from the table that the percentage of fat in the treatments C, T1, T2 is 80.0, 63.21, 63.04%, respectively.

It is noticed from the results that the percentage of fat in the like-butter product of the control treatment is within the normal limits according to what was stated in (38), but that there is a decrease in this percentage for the like-butter product of two treatments T1 and T2 and this is due to many possibilities, including their according to the like-butter product, as well as the bacteria used in the type of treatment T2 of the like-butter product may play a role in reducing the percentage of fat through its consumption, or that this type of like-butter product has added to it a certain amount of bacteria starter during aging, which led to an (28). Who noticed when making low cholesterol like-butter product that there was a decrease in the percentage of fat accompanied by a slight increase in the percentage of protein and moisture, while the percentage of protein in the like-butter product of treatments C, T1, and T2 amounted to 1.41, 17.03, and 17.08%, respectively. And the moisture percentage was 17.29, 14.54, and 14.83% for the previous treatments, respectively, due to the action of the lactic acid bacteria *Lb.acidophilus* present in T2 of the like-butter product, which is characterized by its ability to produce acid by converting the lactose sugar present in milk to lactic acid.

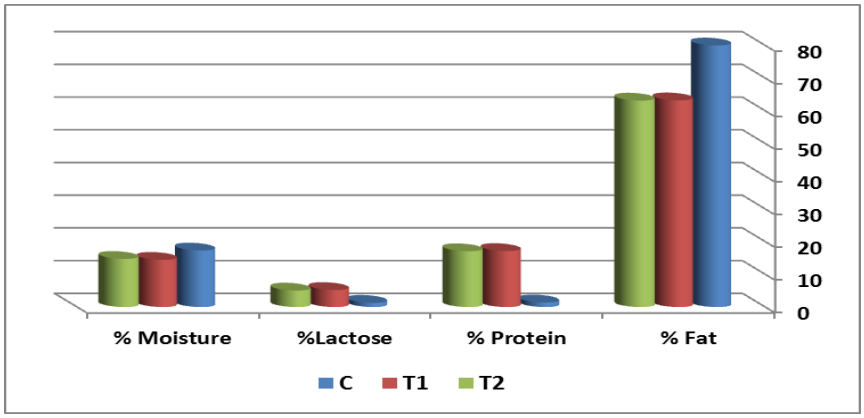


Figure 1. Chemical composition of C, T1, and T2 of like-butter product immediately after manufacture.

Acid Degree Value (ADV)

Fat decomposition is considered one of the most serious spoilage factors that threaten the dairy industry, and the enzyme lipase is the first accused of causing this decomposition, especially the enzyme secreted by the psychrotrophic bacteria and spore-producing bacteria, especially the genus Bacillus, Clostiridium and Sporolactobacilli, as the enzymes secreted by these bacteria are resistant to high temperatures (15).

The study included an important aspect, which is the rancidity of like-butter product fat, and the decomposition of fat is one of the measures used to determine the storage validity of dairy products and as a guide to the degree of consumer acceptance of them. Figure (2) shows that at zero time, the values for treatments C, T1, and T2 were 1.121, 1.010, and 0.922 mEq/100 gm of fat, respectively. These values are universally accepted according to the gradient adopted for the BDI method, which states that the ADV values do not exceed 2.0 mEq/100 gm of fat, as the rancid flavor of the like-butter product becomes perceptible in some people (6).

After a week of cold storage, an increase in the ADV value of treatment C like-butter product was noticed, reaching (1.576 mEq/100 gm fat), while the like-butter product of treatments T1 and T2 showed very little or almost no development, so the values reached 1.287 and 1.131 mEq/100 gm (fat, respectively), the reason for this is due to these two types of like-butter product, which were made from a cream to which the bacterium *Lb. acidophilus* was added. This bacterium is characterized by its ability to produce compounds that are secreted into the medium, some of which act as an anti-growth of bacteria that contribute to lipolysis, especially psychrotrophic bacteria (15).

As well as limiting the activity of its lipolytic enzymes, which is characterized by its resistance to the temperatures used in the pasteurization treatment as well as sterilization (5), while the like-butter product of treatment C does not contain these bacteria, as well as treatment T1, which encouraged the growth of Psychrotrophic bacteria whose numbers exceeded those in the like-butter product of treatment T2, which enters into Like-butter product as pollution after manufacturing or its enzymes that resisted the pasteurization heat to which the cream was exposed, which led to its contribution to raising the ADV value of this type of like-butter product during storage.

Continuing the storage process and in the second week, it was noticed that there was a

development in the values of ADV, which amounted to 1.673, 1.482 and 1.201 mEq/100 gm fat for the like-butter product of treatments C, T1, and T2, respectively. From the results, it is clear that the like-butter product of the control treatment has become rejected according to the global gradient adopted for the BDI method, while the like-butter product of the two treatments T1, T2 is still within the acceptable limits. This is due to the aforementioned reasons in which the bacteria play the main role. After three weeks of storage, the values of ADV reached 1.902, 1.518, and 1.259 mEq/100 gm fat for the like-butter product of treatments C, T1and T2. The sequence of results notes that the foam of the two treatments (T1, T2) is still within the

acceptable limits, as is the case for the values of the fourth and fifth weeks of cold storage. The ADV values in the fifth week for the like-butter product of the two treatments T1, T2 are 1.734 and 1.425 mEq/100 gm fat, which are universally accepted proportions. These results were in agreement with what was found by (5). This encourages and opens future prospects for the introduction of bacteria in the like-butter product manufacturing process, especially with regard to the issue of extending the shelf life of like-butter product as far as lipolysis is concerned.

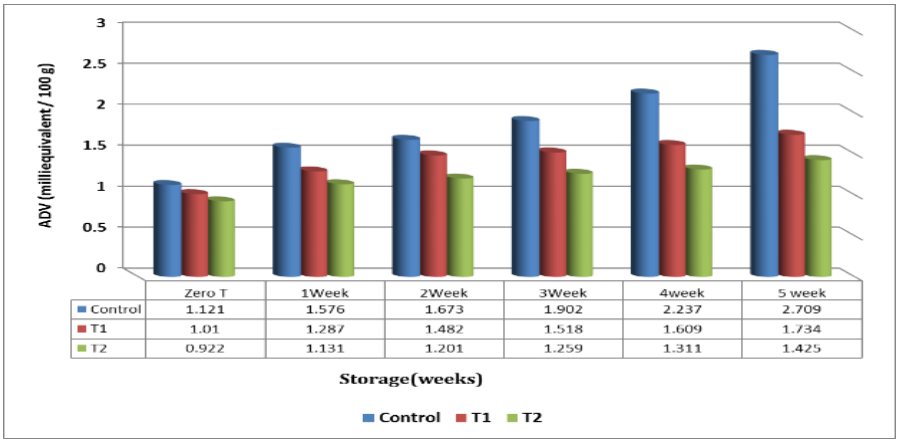


Figure 2. Acid Degree Value in the like-butter product samples of treatments C, T1, and T2 during storage at a temperature of (5±1 °C).

Peroxide Number Value (PV)

Figure (3) shows the PV peroxide number values for the three types of like-butter product, C, T1, and T2, immediately after manufacturing, as well as storing at a temperature of (5±1 °C) for 5 weeks. The PV values immediately after manufacturing reached 1.322, 1.211, and 1.210 mmol/1000 g fat for treatments C, T1, and T2 respectively. From the results, it is noted that the highest value was in the like-butter product of treatment C and the lowest in the like-butter product of the two treatments (T1, T2), and this is naturally due to the role of the bacteria that were used in the manufacture of like-butter product in the T2 treatment, which is characterized by its ability to produce antioxidant compounds and prevent the development of fatty oxidation by preventing the formation of free radicals or the production of substances that bind to free radicals and prevent their growth, which is also what the whey proteins do in the TI treatment.

These results were in agreement with what was found by (33). However, after a week of storage, an increase in PV values is observed, but the increase is at the froth of treatment C and least in the scum of treatment T1 and then scum of treatment T2, and the same is the case in the second, third and fourth weeks. It is noted in the fifth week that the values of the PV of like-butter product of treatment C reached ten times the PV value of the two treatments (T1, T2) 7.332, 2.961, and 1.712 mmol/1kg fat of treatments C, T1, and T2,

respectively, which indicates that the bacteria have an effective role in preventing the development of values (PV) for like-butter product of treatment T2. These results were in agreement with what was found by (5).

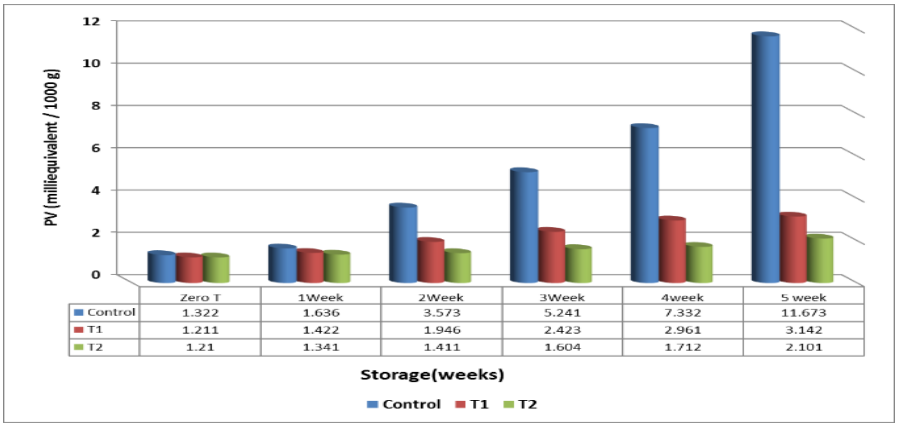


Figure 3. Peroxide Value in the like-butter product samples of treatments C, T1, and T2 during storage at a temperature of (5±1 °C).

Proteolysis

The proteolysis of the butyrate of the three treatments was followed up by estimating the amino acid tyrosine as evidence for it. The results shown in Figure (4) indicate that the values of tyrosine immediately after processing are 30, 22, and 22 µg /g like-butter product for treatments C, T1, and T2, respectively. From the results, it is clear that the highest value was in the like-butter product of treatment C and the lowest value was in the like-butter product of treatment T1, followed by that of treatment T2, and this indicates the role of the bacteria added to the froth of treatment T2, which have a clear activity in limiting the growth of proteolytic bacteria, especially the cryophilic bacteria responsible for proteolysis during storage at refrigerator temperature.

Previous research indicates that the action of proteolysis in like-butter product is due to these bacteria because their proteases are of the type resistant to high temperature and even the temperature of sterilization (5). while the natural milk proteases and accordingly the psychrotrophic bacteria are the main responsible for proteolysis and since lactic acid bacteria are characterized by their antagonism with psychrotrophic bacteria and working to reduce their like-butter product growth in (5), as well as what was observed in the current research, the results of which will be clarified later, so the proteolysis in the treatment to which the bacteria starter was added is less than it is for the C treatment this is in addition to the bacteria producing bacteriocins, reducing acidity, and making the atmosphere unsuitable for the work of proteolytic enzymes, as well as eliminating the bacteria originally producing these enzymes. Contaminated bacteria in it and its lack of bacteria and the low values of proteolysis in the like-butter product of the two treatments (T1, T2). Therefore, these results are a strong indication of the role of bacteria in reducing the proteolysis of like-

butter product and an encouraging factor for their use in other dairy products with high protein content such as cheese these results were in agreement with what was found by (5).

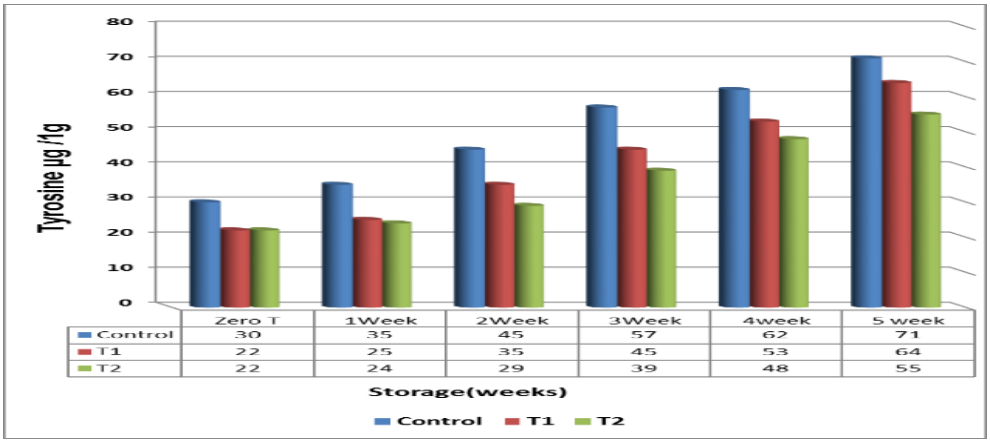


Figure 4. Tyrosine concentration in (µg/g of like-butter product) in the like-butter product samples of treatments C, T1and T2 during storage at (5±1 °C).

Cholesterol

Figure (5) shows the ability of *Lb. acidophilus* bacteria to reduce cholesterol in the like-butter product of the T2 treatment compared to that of the control treatment C immediately after processing and during storage at a temperature of (5±1 °C), where the proportion after processing was 190.5, 160.7, and 75.17 mg/g. Like-butter product in treatments C, T1, and T2, respectively. It is noted from the results that the percentage of cholesterol in the control like-butter product is a normal percentage, which is close to the result mentioned by (38). The cholesterol value in the like-butter product of the two treatments (T1, T2) was less than the value of the control treatment, which indicates that there was a decrease in their initial value compared to the control treatment. The result of this study was in agreement with the result of a similar study conducted by (17) when he manufactured the therapeutic yoghurt using *Lb. acidophillus* and found the amount of decrease in the value of cholesterol 48 hours after the development of this bacterium was 92.5% in the culture media (MRs). During the storage stages, there was a slight decrease in the values of cholesterol in the T2 treatment like-butter product. In which these bacteria play a role, despite the fact that the storage temperature is not optimal for the growth of such bacteria to reach the percentage of decrease in the fifth week, 190.5, 160.7, and 50.75 mg/g.

This encourages or opens new horizons for manufacturers to produce low or cholesterol-free like-butter product. These results were in agreement with what was found by (5).

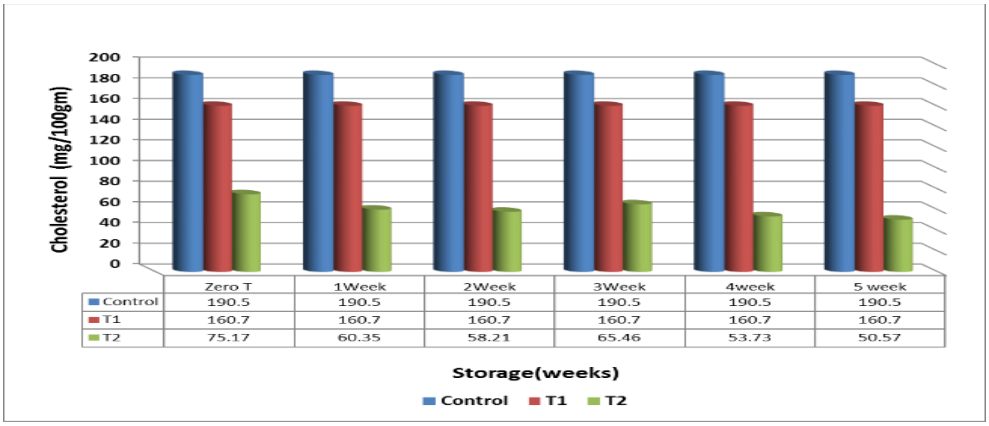


Figure 5. Cholesterol concentration in like-butter product samples of treatments C, T1, and T2 during storage at a temperature of (5±1 °C).

The percentage of protein

Figure (6) shows the ability of Lb. *acidophilus* bacteria to reduce protein in like-butter product from the T2 treatment compared to the control C treatment without adding protein that was added to T1, T2 immediately after treatment and during storage at a temperature of (5 ± 1 °C), where the ratio after treatment was 2.7, 19.1, and 19.0 mg/100g like-butter product in treatments C, T1, and T2 respectively. It is noted from the results that the percentage of protein in the control like-butter product is the same as the percentage of natural like-butter product, which is close to the result mentioned in (1). The protein value in like-butter product in the two treatments (T1, T2) is less than the value of T1 due to lactic acid bacteria. The result of this study was in agreement with the result of a similar study conducted by (5).

When he made therapeutic yogurt using a pound *Lb. acidophillus* and the amount of decrease in the protein value 48 hours after the development of these bacteria was found to be 92.5% in the culture medium (MRs).

During the storage phases, there was a slight decrease in protein values in T2 processed like-butter product. Where these bacteria play a role, although the storage temperature is not ideal for the growth of these bacteria to reach the percentage of decline in the fifth week 3.8, 18.7, 18.6 mg/100g.

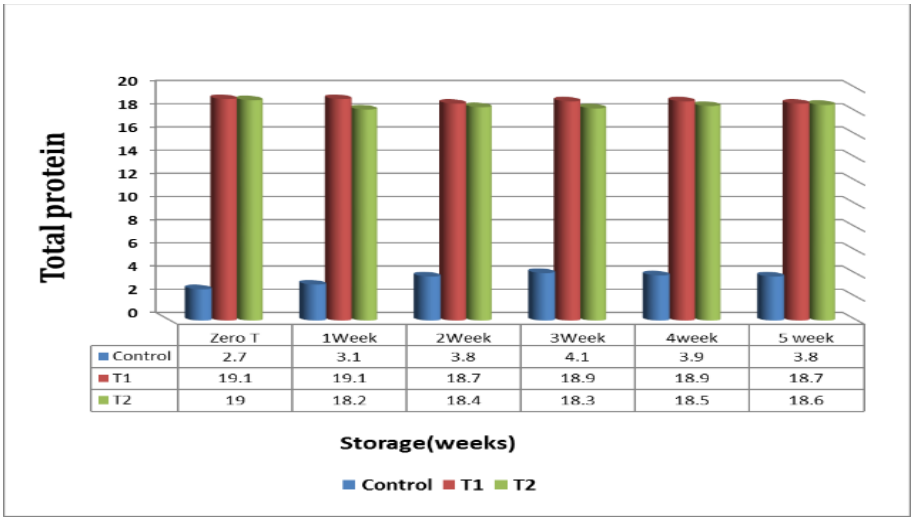


Figure 6. Total protein in like-butter product samples of treatments C, T1, and T2 during storage at a temperature of (5±1 °C).

Moisture

Results in Fig. 7 show the moisture of Like-butter product treatments during storage periods of 5 weeks. Results revealed that moisture content at zero time was followed by 1 week, 2 week, and 3 weeks to control, which were (16.25, 16.10, 16.17, and 17.14) % respectively. All Like-butter product treatments reduce their moisture content gradually along with storage periods. After 35 days, the lowest moisture content was in the 4 week Like-butter product treatment (13.36%), followed by the 5 week which was (13.41%).

Moisture is commonly used as an indicator of quality in dairy products. Moisture was estimated for like-butter product (zero-time, 1 week, 2-week, 3-week, 4 week, and 5 weeks) .

Like-butter product samples that did not add probiotics (Control-T1) lost their moisture during storage periods. The moisture of the fortified like-butter product with probiotic bacteria T2 ranged from 13.91 to 13.30 compared with control, while the moisture of the control ranged between 16.25 to 16.10, and for the T1 treatment the moisture was within the range of 13.41 to 13.10.

This decrease in the moisture of the like-butter product supplemented with the probiotic T2 may be attributed to the ability of the probiotic bacteria to ferment lactose and produce lactic acid, which in turn led to a decrease in the moisture of the like-butter product supplemented with the probiotic T2. These results were in agreement with the results of the study (39), which produced yoghurt, fortified with probiotics, where the moisture was decreased.

The results of the study are also in agreement with (20). Where the pH values of the like-butter product samples decreased during storage and

the chemical composition was closely related to the moisture, with lower moisture showing an increase in the chemical composition values. On the

second day, fermentation by probiotic bacteria in the cream resulted in slightly lower moisture values compared to the control. During storage, reduce moisture slightly in all like-butter product samples fortified with probiotic bacteria.

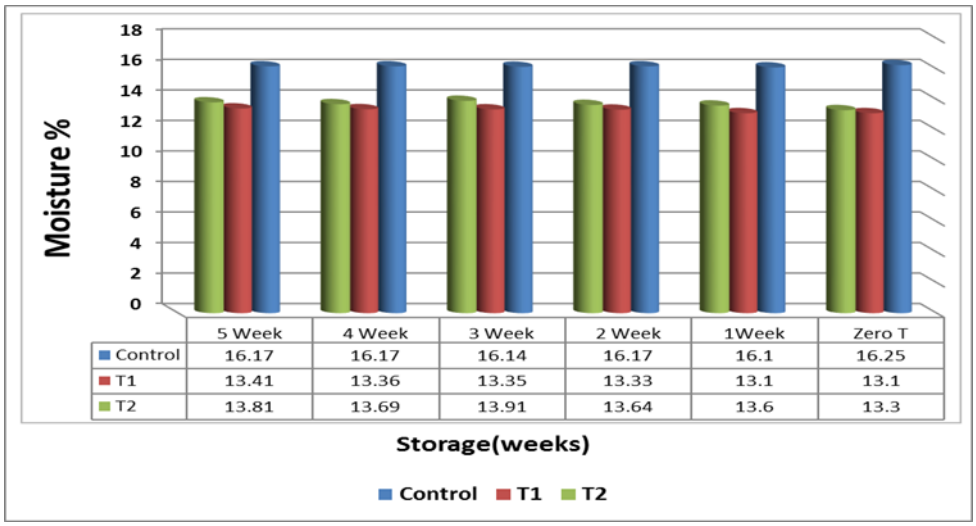


Figure 7. Moisture in like-butter product samples of treatments C, T1, and T2 during storage at a temperature of (5±1 °C).

Ash

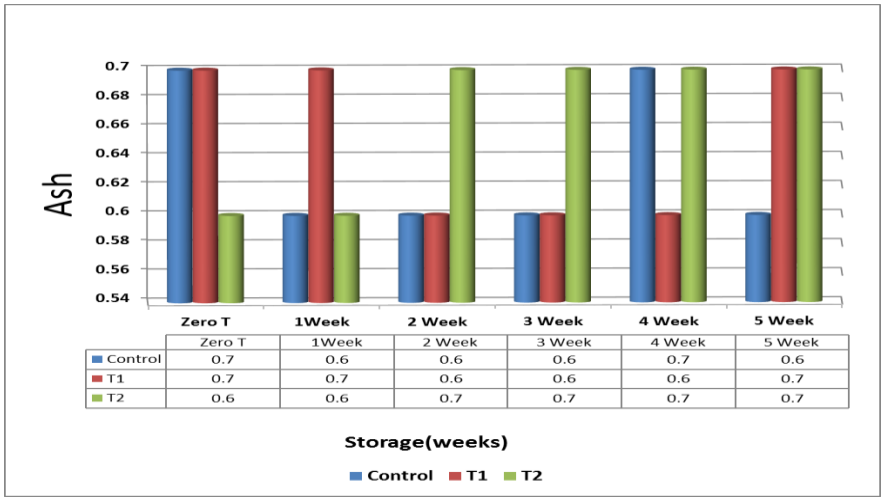
Figure (8) shows the ability of Lb. *acidophilus* bacteria to decrease ash in like-butter product from the T2 treatment compared to the control C treatment without adding protein. The protein was added to T1, T2 immediately after treatment and during storage at a temperature of (5 ± 1 °C), where the ratio after treatment was 0.7, 0.7, and 0.6 like-butter product in treatments C, T1, and T2, respectively. It is noted from the results that the ash in the control like-butter product is the same as the percentage of natural like-butter product.

Like-butter product samples that did not add probiotics (Control-T1) to their ash during storage periods. The ash of the fortified like-butter product with probiotic bacteria T2 ranged from 0.6 to 0.7 compared with control, while the ash of the control ranged between 0.6 to 0.7. For the T1 treatment, the moisture was within the range of 0.7 to 0.6.

This decrease in the ash of the like-butter product supplemented with the probiotic T2 may be attributed to the ability of the probiotic bacteria to ferment lactose and produce lactic acid, which in turn led to a decrease in the ash of the like-butter product supplemented with the probiotic T2. A gradual decrease in the percentage of ash occurs when the percentage of fat rises for all

treatments, with variation from one treatment to another.

These results were in agreement with the results of the study (39), which produced yogurt fortified with probiotics, where the ash was increased. The reason for this is the gradual increase in the percentage of fat. These results were in agreement with the results of the study (37).



	Zero T	1Week	2 Week	3 Week	4 Week	5 Week
Control	0.7	0.6	0.6	0.6	0.7	0.6
T1	0.7	0.7	0.6	0.6	0.6	0.7
T2	0.6	0.6	0.7	0.7	0.7	0.7

Figure 8. Ash in like-butter product samples of treatments C, T1, and T2 during storage at a temperature of (5±1 °C).

Fat

Results in Fig. 9 show the fat of like-butter product treatments during storage periods of 5 week. In dairy products, fat is commonly used as an indicator of quality Fat was estimated as like-butter product (zero-time, 1 week, 2-week, 3-week, 4-week, 5 weeks) .

For like-butter product samples that did not add probiotic (Control-T1) to their fat during storage periods, the fat of the fortified like-butter product with probiotic bacteria T2 ranged from 63.20 to 62.65 compared with control, while the fat of the control ranged between 79.20 to 77.64, and for the T1 treatment, fat was within the range of 63.10 to 62.76.

This decrease in the fat of the like-butter product supplemented with the probiotic T2 may be attributed to the ability of the probiotic bacteria to as for the rest of the treatments, the percentage of fat increased due to lack of moisture during storage periods, which amounted to 5 weeks, which in turn led to a decrease in the fat of the like-butter product supplemented with the probiotic T2. These results were in agreement with the results of the study (39), which produced yogurt fortified with probiotics, where the fat was decreased.

The results of the study are also in agreement with (20). pH values of the like-butter product samples decreased during storage, and the chemical composition was closely related to the fat, with lower fat showing an increase in the chemical composition values. On the second day, fermentation by probiotic bacteria in the cream resulted in slightly lower fat values compared to the control. During storage, reduce fat slightly in all like-butter product samples fortified with probiotic bacteria. These results were in agreement with what was found by (5).

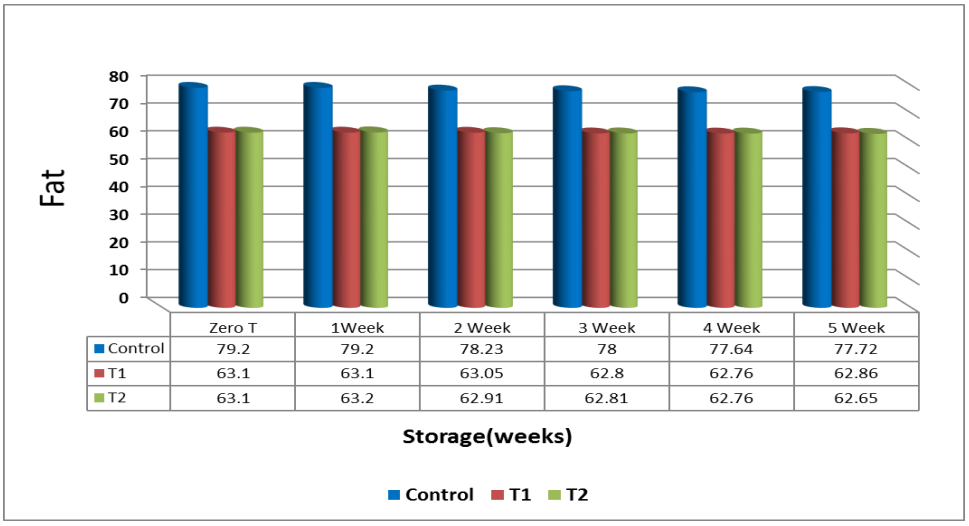


Figure 9. Fat in like-butter product samples of treatments C, T1, and T2 during storage at a temperature of (5±1 °C).

Determination of carbohydrates

Results in Fig. 10 show the carbohydrates of Like-butter product treatments during storage periods of 5 weeks.

Like-butter product samples that did not add probiotics (Control-T1) on their carbohydrates during storage periods. The carbohydrates of the fortified like-butter product with probiotic bacteria T2 ranged from 4.0 to 4.35 compared with control, while the carbohydrates of the control ranged between 1.0 to 1.59 and for the T1 treatment, the carbohydrates were within the range of 4.0 to 4.38.

This decrease in the carbohydrates of the like-butter product supplemented with the probiotic T2 may be attributed to the ability of the probiotic bacteria to fat analysis, which reduces the percentage of fat. As for the rest of the treatments, the percentage of carbohydrates increased due to lack of moisture during storage periods, which amounted to 5 weeks, which in turn led to a decrease in carbohydrates of the like-butter product supplemented with the probiotic T2 In contrast to treatment T1, which increased the amount of carbohydrates because there were no probiotic bacteria.

The results of the study are also in agreement with (20). The pH values of the like-butter product samples decreased during storage, and the chemical composition was closely related to the fat, with lower fat showing an increase in the chemical composition values. On the second day, fermentation by probiotic bacteria in the cream resulted in slightly lower fat values compared to the control. During storage, reduce fat slightly in all like-butter product samples fortified with probiotic bacteria. These results were in agreement with what was found by (5).

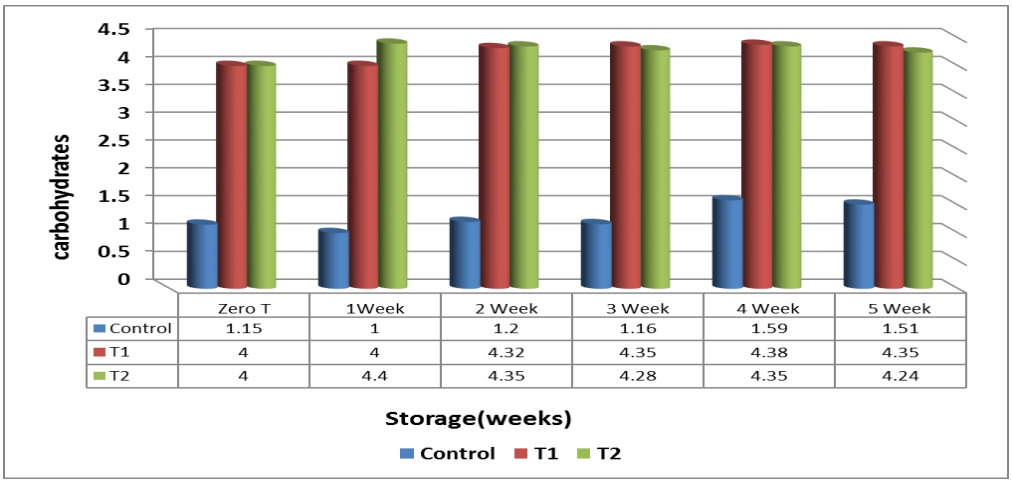


Figure 10. carbohydrates in like-butter product samples of treatments C, T1, and T2 during storage at a temperature of (5±1 °C).

Sensory evaluation:

What was previously mentioned about acidity production and the patterns taken by the degree of fat acidity, the degree of fat oxidation, proteolysis and cholesterol reduction were naturally reflected in the degree of sensory evaluation and the extent of consumer acceptance of like-butter product. Table (2) shows sensory evaluation degrees that gave 25 degrees for each of the traits from the results of the previously mentioned color trait; we find that treatment T1 is superior to control of the storage period, and this is consistent with the values of ADV responsible for the appearance of the rancid flavor in the like-butter product. Therefore, it can be said that like-butter product made from cream inoculated with bacteria and incubated at a temperature of 18 °C for 24 hours before manufacturing proved to be highly worthy in the sensory evaluation. The consumer also showed low values of cholesterol, as it became completely free in the second week of storage and had the highest storage validity among the treatments, so it is recommended to adopt treatment, followed by T2 in the post-manufacturing stage, as well as during the storage period of 5 weeks. As for the tissue characteristic we find that the tissues of the control treatment have outrun the tissues of treatments (T1, T2) immediately after manufacturing (5).

Likewise, in the first week of storage, but in the other weeks, starting from the second week upwards, this characteristic declined in the control treatment clearly, which is the week in which the like-butter product became. rejected in terms of lipolysis and proteolysis and an increase in the values of the peroxide number, which led to the deterioration of its tissues, making it rejected in When the two treatments (T1, T2) outrun in the second week or more, this is confirmed by the fact that the two types of like-butter product (T1, T2) were within the acceptable limits according to the approved global gradient for the values of lipolysis. As for the characteristics of taste, flavor and smell, it is noted that T2 is issued, followed by treatment T1 over treatment control from the immediate post-manufacturing stage, as well as the length

product like-butter product in the future (5). this treatment in the manufacture of a

Table 2. Sensory evaluation in like-butter product C, T1 and T2 during storage at a temperature of (5 + 1 °C).

	Ttreatments	storage period (Week)					
		Zero T	1Week	2Week	3Week	4Week	5Week
Color %25	Control	21.50	20.00	20.00	20.00	18.00	17.00
	T1	23.75	23.80	23.80	22.50	22.00	21.50
	T2	23.50	23.60	23.60	22.00	23.25	21.00
Tissue %25	Control	23.25	20.75	18.50	16.25	15.00	14.00
	T1	19.00	19.00	18.75	18.75	17.50	17.00
	T2	22.50	22.75	21.50	21.50	21.50	21.00
Taste %25	Control	20.00	20.50	18.00	15.00	12.50	12.00
	T1	25.00	22.50	22.50	22.00	21.25	21.00
	T2	25.00	23.00	22.50	22.00	21.50	21.00
Flavor and smell %25	Control	19.50	19.00	18.00	12.50	10.00	10.00
	T1	25.00	25.00	22.50	22.50	22.00	21.00
	T2	24.00	23.00	22.00	22.00	22.00	21.00
Total %(100)	Control	84.25	80.25	74.50	63.75	55.50	53
Total %(100)	T1	92.75	90.30	87.55	85.75	82.75	80.50
Total %(100)	T2	95	92.35	89.60	87.50	88.25	84

Conclusion

Probiotic bacteria from the *L. acidophilus* strain were shown to be viable in like-butter product for a period of more than 5 weeks of storage. The concentration of protein and lactose added did not affect the viability of the probiotic strains, nor did it influence the aspects of oxidation of the product during storage for 5 weeks at 4°C. The lipid showed, in general, an increase in the saturated fatty acids, suggesting that lipid oxidation due to storage time may have the cause of the probiotic like-butter product.

The results of this study show that the storage period had significant effects on chemical properties such as (ADV, POV, Amino acid tyrosine, Diacetyl, cholesterol, protein, pH, titratable acidity, carbohydrates) and microbiological characteristics such as psychrotrophic, coliform bacteria

Muolds-yeast counts live cell counts of the probiotic strains decreased approximately one logarithmic cycle at the end of storage. Based on the results obtained, fresh like-

butter product can be recommended as a probiotic source for consumers in terms of viable counts *Lb. acidophilus* recommended for up to 30 days of storage to obtain a probiotic like-butter product.

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Conflict of interest

The authors declare no conflict of interest.

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