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Studying The Effect Of Adding Different Starter Cultures To The Milk On Chemical, Sensory Properties And Yield Of Soft Cheese

Zainab Rumman Hussein AL-janabi and Dhia Ibrahim Al-Bedrani

College of Food Science, Al-Qasim Green University, Iraq.

Abstract

The current study was conducted to determine the effect of adding different types of traditional starters to the milk prepared for cheese industry on the chemical, organoleptic properties and yield percentage for soft cheese, where whole cow milk was used and it was divided into four treatments: C, the control treatment without adding, The treatments T1 to which the starters was added and consist of Streptococcus thermophillus, Lactobacillus delbrueckii ssp.bulgaricus and The treatments T2 to which the starters was added and consist of Lactobacillus acidophilus and Bifidobacterum Lactis, The treatments T3 to which the starters were added and consist of Lactococcus Lactis subsp.Lactis and Lactococcus lactis subsp. cremoris and Lactococcus lactis subsp. lactis biovar. diactylactis, The chemical tests were conducted, which included estimating the percentage of moisture, protein, fat, carbohydrates, salt, ash, and total acidity , pH, yield and conducting the organoleptic evaluation. The results showed that the moisture content decreased in the adding treatments, the percentage of solids represented by protein, fat, and ash increased, and the percentage of carbohydrates decreased compared to the control treatment. Also, acidity increased in adding treatments, and pH decreased in adding treatments compared with control treatments, where cheese clearance percentage decreased in starters adding treatments. The results also showed improved organoleptic properties of adding treatments compared to control treatments.

Keywords: Starter Cultures, Milk, Sensory Properties, Soft Cheese

Introduction

Soft cheese is known not only in our region but in all agricultural countries. It is very nutritious, cheap and has a distinct flavor. It is high in protein and fat. It is also characterized by a high level of moisture (50%) as a minimum, and a neutral pH compared to other types of mature cheeses (Nelson and his group, 2009). Soft cheese is made in Iraq in large quantities, mostly by farmers, but the procedures followed in manufacturing are weak and risky due to the use of raw milk with a high microbial load, unsanitary tools and conditions that increase the contamination of the cheese. Additionally, soft cheese is marketed in unsanitary conditions. Despite these conditions, soft cheese is consumed widely and without ripening (Ali et al, 2013), Studies of the description of traditional cheese indicate that cheeses made from raw milk contain a variety of LAB bacteria (Bernardeau et al, 2008). Depending on the geographical area, it may show a few interesting technological features that may have industrial applications upon optimization (Buckenhiiskes, 1993). Strains need to tolerate competition from other microorganisms in order to survive in their natural environment, so they often produce other antimicrobial substances called bacteriocins (Ayad et al, 2002). The cheese industry depends on the use of LAB in the form of specific or non-specific starter that rapidly acidifies the milk by producing lactic acid with a decrease in the pH, and thus affects a number of aspects of the cheese-industry process and the

composition and ultimate quality of the cheese (Briggiler Marco et al, 2007). LAB was one of the first microorganisms on earth to undergo a period of transition from anaerobic respiration to aerobic respiration. It produces the essential proteins needed for the respiration process and many enzymes involved in the fermentation pathways, thus it is well adapted to both aerobic and anaerobic conditions (Pessione, 2012).LAB bacteria have been widely used in the dairy and therapeutic food industry (Kim et al, 2002; Rather et al, 2014) as well as their health importance for increasing the numbers of microflora in the intestinal tract (Patel et al, 2010). An extensive study has been conducted on this bacterium due to its industrial importance and wide use in dairy products (Bolotin et al, 2004; Madigan et al, 2002).Based on the history of fermented foods (Wessels et al, 2004; FDA, 2012), these bacteria are generally recorded as safe (GRAS), their optimum temperature for growth is 28-31 ° C, so they are considered to be moderate thermophilic bacteria, and their production of lactic acid in milk ranges from 0.8- 1.0% (van de Guchte et al, 2002; Chandan, 2013). The present study aimed to evaluate the effect of adding different types of starter to the milk prepared for the manufacture of soft cheese on the physiochemical and organoleptic properties and the yield of soft cheese.

Materials and methods

1. Materials

Use raw cow's milk and use a starter consisting of strains of Streptococcus thermophilus and Lactobacillus delbrueckii ssp. bulgaricus, a second starters consisting of Bifidobacterium lactis and Lactobacillus acidophilus. The third starter is Lactococcus lactis subsp. lactis, Lactococcus lactis subsp. cremoris, and Lactococcus lactis subsp.lactis biovar. diacetylactis produced from the French company Danisco by direct addition and by adding percentage according to what is indicated by the producing company. The microbial rennet produced from the Danish company Chris Hansen was used.

Cheese manufacturing

Soft cheese was manufactured according to (Al-Dahan, 1983) by receiving a quantity of raw cow's milk, then filtering it from impurities and exposing to the pasteurization process at a temperature of 62.8 ° C for half an hour, then it was cooled and divided into four sections. The first section was used in the manufacture of control treatment C cheese without adding starters , while the other sections were added to different starters and were represented by the treatments (T1, T2 and T3), The starter of treatment T1,consisting of both Streptococcus thmopHillus and Lactobacillus delbrueckii ssp.bulgaricus, was added to treatment, and the initiator of Lactobacillus acidophilus and Bifidobacterum lactis was added to it .for treatment T3, the starter of Lactococcus lactis subsp.lactis and Lactococcus lactis. subsp. cremois and Lactococcus lactis subsp. diactylactis. was added .Milk of treatments T1, T2 and T3 were incubated at different temperatures for a full hour, depending on the type of starters used, as the treatment milk (T1) was incubated at a temperature of 45 ° C. The starter of treatment T1, consisting of both Streptococcus thmop Hillus and Lactobacillus delbrueckii ssp.bulgaricus, was added to treatment, and the initiator of Lactobacillus acidophilus and Bifidobacterum lactis was added to it. For treatment T3, the starter of Lactococcus lactis subsp.lactis and Lactococcus lactis was added. subsp. cremois and Lactococcus lactis subsp. diactylactis. of Milk treatments T1, T2 and T3 were Incubated at different temperatures for a full hour depending on the type of starters used, as the treatment milk (T1) was incubated at a temperature of 45 ° C. The treatment milk (T2) was incubated at 42 ° C and the treatment milk (T3) was incubated at a temperature of 35 ° C. After the incubation process ended, the Microbial Rennet (chymosin enzyme) was added after dissolving it with distilled water and according to the

instructions of the producing company. The four treatments were left for 45 minutes, until the coagulation occurred. Then the curd was cut longitudinally and crosswise and left for 10 minutes without moving, then the curd was stirred and drained, then salt was added to it at an average of 2-3% of the weight of the curd. The curd was filled in molds for the purpose of pressing for an hour, then the cheese was cut into small molds and kept in the refrigerator at 5 degree. CE for carrying out the necessary tests after 1, 7 and 14 days of storage.

Cheese chemical tests:

The percentage of moisture was estimated according to the method mentioned in Ling (2008) and the total nitrogen was estimated according to the method mentioned by Joslyn (1970). The percentage of lipid was estimated according to Kerber's method mentioned in Min and Ellefson (2010).The percentage of carbohydrates was estimated using the mathematical method by subtraction according to Ihokoronye and Ngoddy (1985). The proportion of ash was determined according to the direct firing method as reported in A.O.A.C (2005), the percentage of salt was determined according to the method developed by Newlander Atherton (1964), and the pH of the cheese was determined according to the method mentioned in Ling (2008).

Yield percentage :

The yield percentage was calculated by collecting the product of the weight of the resulting cheese mass to the weight of the milk used in cheese making (Mistry, Kosikowski 1999).

organoleptic evaluation of cheese:

organoleptic tests of soft cheese samples were conducted in the Department of Dairy Science and Technology - College of Food Sciences - Al-Qasim green University by a number of professors with specialization in accordance with the form of organoleptic evaluation created by Edam (1998).

Results and Discussion

1- The chemical composition of soft cheese

The results in Table (4-1) showed the chemical composition of soft cheese (control cheese C) and treatments cheese with added different types of starter : Streptococcus thermophilus and Lactobacillus delbrueckii ssp.bulgaricus in an amount of 0.028 g / L .They were incubated at 45 ° C, Lactobacillus acidophilus and Bifidobacterum Lactis at 0.0104 g / L and incubated at 42 ° C, Lactococcus lactis subsp.lactis and Lactococcus lactis subsp. cremoris and Lactococcus lactis subsp.lactis biovar.diactylactis at an amount of 0.0334 g / L and incubated at 35 ° C, represented by T1, T2 and T3, respectively. Immediately after manufacturing and during storage at (5 ± 1) ° C for a period of 14 days.

The percentage of moisture

The results in (Table 1)show the percentage of moisture for each of the control treatment cheese C and the different soft cheese treatments that added to which the starters T1, T2 and T3, where their value for the control treatment immediately after processing was 59.10%, and this result agree with Al-Badrani (2016) found for Soft cheese made from full fat milk(whole milk) of 59.00% indicates that this result differs from Awda et al (2019) found, amounting to 58.01%, and it is also within the limits of the Iraqi Standard Specification (1988) for the percentage of moisture in soft cheese, which stipulates that it must not be less than 50%, As for cheese

treatments that added to which starters, the moisture content reached 55.71, 57.16 and 54.76%, respectively. This result is similar to that found by Sant' Ana et al (2013), who indicated that the moisture content of soft Brazilian minas cheese with starter was 56%. The reason for the lower moisture of treatments T1, T2 and T3 compared to the control treatment may be due to the addition of the starters and these results agree with El-Alfy et al (2010) who indicated that adding the starter farms to the milk of soft white cheese increased the solids content. The overall product. It is noted from the results of the statistical analysis that there were significant differences at the level of (P <0.05) in the moisture content in the treatment T3 compared with the control treatment immediately after manufacturing. It is also noticed from the results that a slight decrease in the moisture percentage occurred with the advancement of the storage period and for all treatments, where the values after 7 days for treatment C were 58.63%, and treatments that added to which starters was 55.47, 56.87 and 54.34%, respectively. The reason for this may be due to the whey exuding from samples during storage on the one hand, and to the slight evaporation that occurred in moisture on the other hand, but after 14 days, the treatment C was 58.07% and treatments that added to which starters 55.08, 56.38 and 54.01%, respectively. These results agree with those found by Abd El-Salam et al (1993), who indicated that the moisture of feta cheese decreased from 60% to 55% during the 10-day storage period due to salting, acidity development during storage, and naturally whey exuding, The results of the statistical analysis showed that there were significant differences at the level of (p≤0.05) in treatment T3 compared with the control treatment after 14 days of storage.

Table 1: The chemical composition of the different treatments of soft cheese with added different types of starter and control treatment cheese immediately after manufacturing and during the storage period of 14 days

Treatments	Cheese age (day)	Components %							
		Moisture	Protein	Fat	Carbohydrate	Ash	Salt	pH	Total acidity
C	1	59.10	15.20	16.44	4.40	2.21	2.65	6.73	0.18
	7	58.63	15.50	16.65	4.05	2.30	2.87	6.68	0.21
	14	58.07	15.70	16.75	3.98	2.45	3.05	6.11	0.32
T1	1	55.71	16.92	17.76	3.97	2.69	2.95	5.98	0.57
	7	55.47	17.00	17.85	3.80	2.77	3.11	5.94	0.60
	14	55.08	17.15	18.04	3.60	2.89	3.24	5.67	0.72
T2	1	57.16	16.28	17.22	4.02	2.50	2.82	6.40	0.42
	7	56.87	16.37	17.31	3.90	2.60	2.95	6.31	0.48
	14	56.38	16.49	17.44	3.81	2.82	3.06	5.90	0.54
T3	1	54.76	17.18	18.08	3.95	2.86	3.17	5.33	0.70
	7	54.34	17.30	18.22	3.83	2.99	3.32	5.21	0.74
	14	54.01	17.47	18.36	3.58	3.12	3.46	5.0	0.82
LSD:	---	3.98 *	1.66 *	1.49 *	0.772 *	0.502 *	0.673 *	0.718 *	0.494 *

*** (p≤0.05) significant. Each number in the table represents an average of three replicates.**

Protein percentage

The results in (Table 1) show the percentage of protein in the control treatment C cheese and the cheese treatments that added to which starters T1, T2 and T3 as they were 15.20% after manufacture directly for treatment C, while treatments that added to which the different type starters 16.92, 16.28 and 17.18%, respectively. It is noted that the percentage of protein increases in the treatments to which different types of starter are added, with a decrease in the moisture content, thus increasing the total solids, including that protein. This result agrees with Kurdal and Gürtunca (1996) found, which found that the protein content in cheese was between 14.73_ 16.95%. It also agrees with Bekele (2019) found, who found that the protein content in soft cheese ranged between 16.29 - 17.49%, and he explained that adding the starter leads to an increase in the protein content in the cheese. However, these results differ slightly from what Sant' Ana et al found, 2013, who indicated that the protein content for soft Minas cheese, which was made by adding starter moderate temperature was 15.35%. Havranek et al, 2014 and Tratnik and Božanić, 2012) also indicated that high levels of protein in soft cheeses come not only from Casein but also from a small proportion of whey proteins sensitive to heat treatment (pasteurization) that leads to structural changes in them from on the one hand and its interaction with Casein, pasteurization leads to denaturation of about 4-6% of the total content of these proteins. It is noted from the results of the statistical analysis that there are significant differences at the level of ($P\leq0.05$) in treatment T1 and T3 compared with the control C treatment immediately after manufacturing. It is also noticed from the results that there was a slight increase in the percentage of protein during storage in the cheese of all treatments, so after 7 days it was for the control treatment C it was 15.50%. As for the cheese of the addition treatments, it was 17.00, 16.37 and 17.30%, respectively, but after 14 days it was for the cheese of treatment C. It is 15.70%, while treatments that added to which starters 17.15, 16.49 and 17.47%, respectively. The results of the statistical analysis showed that there were significant differences at the level of ($P\leq0.05$) in treatment T3 compared with the control treatment after 14 days of storage.

Fat percentage:

The results in (Table 1) show the percentage of fat in the cheese of the various previously mentioned treatments, where the percentage of fat immediately after processing for cheese in the control treatment C is 16.44%, and this result agrees with Al-Badrani (2016) found for Iraqi soft cheese of 17.00%. 17.76, 17.22 and 18.08%, respectively. This result is approaching from Khan(2004) results for Cheese to which the starters are added to it and amounted to 19.00%, as well as an approach to Sant'ana et al (2013) Cheese to which the starters are added to it17.44% and with that result is much larger than the result of Elsamani et al (2014), which pointed out that the fat percentage in the soft cheese reached 10.0%.It is noted from the results of the high proportion of fat for adding treatments compared with control and may return the reason for adding the starters. this is consistent with El-Alfy et al,(2010), who pointed out that the adding of the starters to the milk prepared for the manufacture of white cheese led to an increase in the content of the total solids of the resulting product, including fatty content. There are also differences in fats percentage between the additional treatments. This may result in several factors, including structural and structural treatments, the strength of gels and higher loss of cheese template that leads to the loss of fats in whey (Castillo, 2006). It is noted from the results of the statistical analysis that there are significant differences at the level of ($p\leq0.05$) in the fat percentage for the treatment T3 compared with the control treatment immediately after manufacturing. The results of the statistical analysis are observed at the presence of significant differences at the level of ($P>0.05$) in the percentage of fat treatment for T3 compared to the control treatment after direct manufacturing. It also notes the results of a simple high in the percentage of fat by providing the storage period and all treatments as these values reached after 7 days treatment C is 16.65% and 10.85 and 17.31 and 18.22%, respectively.The

reason for the reduction in moisture may be due to the evaporation of a part of it during the storage that leads to increased total solids, including fat but after 14 days were treated to control C is 16.75% and adding treatments 18.04 and 17.44 and 18.36% respectively. The results of the statistical analysis there are no significant differences at (P00.05) in all treatments after 14 days of storage.

The percentage of carbohydrates

The results in (Table 1)show the percentage of carbohydrates in the cheese of the various previously mentioned treatments, where the percentage immediately after manufacturing for the cheese of control treatment C was 4.40%, while for the cheese of adding treatment was 3.97, 4.02 and 3.95%, respectively. It is also noticed from the results that there is a decrease in the percentage of carbohydrates with the advancement of the storage period for all treatments. It was after 7 days of storage for control C treatment 4.05 and for addition treatments 3.80, 3.90 and 3.83%, respectively. After 14 days of storage for the C-treatment cheese, it was 3.98%. As for the added treatments, it was 3.60, 3.81 and 3.58%.The reason for the low carbohydrate content may be due to the continued activity of microorganisms under conditions of cold storage, which convert lactose into lactic acid, in addition to the loss of a portion of carbohydrates with the exuded whey during storage, and these results agree with Al-Badrani (2016).

Ash percentage

The results in (Table 4-1)show the percentage of ash in the various cheese treatments mentioned previously, where these percentages immediately after manufacturing for treatment C were 2.21%. This result is consistent with what Sant' Ana et al (2013) found, which indicated that the percentage of ash in soft cheese was 2.21%.As for the added treatments, they were 2.69, 2.50 and 2.86%, respectively, and these results agree with Bekele (2019) found, who found that the percentage of ash in cheeses to which the starters was added 1.20 to 2.40%.The results of the statistical analysis indicate that there are significant differences at the level of ($p \leq 0.05$) in the ash percentage in the T3 treatment compared to the control treatment immediately after manufacturing. It is also noticed from the results that there is an increase in the percentage of cheese ash, with the starter added compared to the control treatment. It is also noted from the same table that the percentage of ash increased during storage at a temperature of (5 ± 1), and for all treatments, as it reached after 7 days, for the cheese of treatment C it is 2.30%, and for the cheese of addition treatments 2.77, 2.60 and 2.99%, respectively. After 14 days have passed, the cheese of treatment C was 2.45%, and for cheese of addition treatments 2.89, 2.82 and 3.12%, respectively. This increase in the percentage of ash may be due to the loss of some moisture during storage, which led to an increase in the percentage of total solids, of which ash is one of the components. It is noted from the results of the statistical analysis that there are significant differences at the level of ($p \leq 0.05$) in the percentage of ash in the T3 treatment compared to the control treatment after storage for 14 days.

The percentage of salt

The results in (Table 1) show the percentage of salt for the aforementioned cheese treatments, as it was 2.65% after manufacturing, for control treatment C. As for the adding treatments, they were 2.95, 2.82 and 3.17%, respectively. The reason for the high salt content in treatments T1, T2 and T3 compared to the control treatment may be due to the addition of the starters, which led to a decrease in moisture and an increase in total solids, including salt. It is noted from the results of the statistical analysis that there are significant

differences at the level of (p≤0.05) in treatment T3 compared with the control treatment immediately after manufacturing .It is also noticed from the results that there was an increase in the percentage of salt as the storage period progressed, and for all treatments, as it reached after 7 days, the cheese of treatment C was 2.87 and the cheese of adding treatments 3.11, 2.95 and 3.32, respectively. After 14 days, the control treatments were 3.05% and the adding treatments were 3.24, 3.06 and 3.46%, respectively. It is evident from the results of the statistical analysis that there are no significant differences at the level (p≤0.05) between all treatments after 14 days of storage.

PH

The results in (Table 1) show the pH values of the various cheese treatments mentioned previously, where the pH values immediately after manufacturing for the control C treatment were 6.73, and this is consistent with what Al-Badrani (2016) found for soft cheese of 6.76. As for the addition treatments, they were 5.98, 6.40 and 5.33 respectively. This is in contrast to Nazim et al (2013) found, who indicated that the pH value of the soft cheese added to the starter was 4.82.The results of the statistical analysis indicate the presence of significant differences at the level of (p≤0.05) in the pH values of the treatment T1 and T3 compared to the control C treatment. It is also noted that the pH values of treatments that added to which starters are low due to the high acidity due to the starter that degrades the sugar lactose and converts it into lactic acid and reduces the pH. Kongo (2013), that in cheese-making, the increase in the acidity of milk depends on the production of lactic acid, which corresponds to a decrease in the pH, and this depends on the type of starters used. Kizilirmak Esmer et al (2009) also indicated that the lower pH values of soft cheeses with storage are caused by the conversion of lactose into lactic acid during the fermentation process, as well as the formation of carbonic acid from carbon dioxide dissolved in the acidic environment. It is also noticed that the pH values decreased for all treatments with storage, as after 7 days, for the control treatment C it was 6.68 and for the adding treatments, it was 5.94, 6.31 and 5.21, respectively. After 14 days, the cheese of treatment C is 6.11 and the adding treatments are 5.67, 5.90 and 5.0 respectively. It is noticed from the results of the statistical analysis that there are significant differences (p≤0.05) for treatment T3 compared to the control treatment. Kizilirmak Esmer et al (2009) also indicated that the lower pH values of soft cheeses with storage are caused by the conversion of lactose into lactic acid during the fermentation process, as well as the formation of carbonic acid from carbon dioxide dissolved in the acidic environment. It is also noticed that the pH values decreased for all treatments with storage, as after 7 days, for the control treatment C it was 6.68 and for the adding treatment, it was 5.94, 6.31 and 5.21, respectively. After 14 days, the cheese of treatment C is 6.11 and the addition treatment are 5.67, 5.90 and 5.0 respectively. It is noticed from the results of the statistical analysis that there are significant differences (p≤0.05) for treatment T3 compared to the control treatment.

Titration Acidity percentage

The results in (Table 1) show the Titration Acidity values (calculated on the basis of lactic acid) for the cheese of different treatments, as these values for treatment C were 0.18%. This result is comparable to what Al-Abadi (2014) found for soft cheese amounting to 0.19%. As for the adding treatment, they were 0.57, 0.42 and 0.70%, respectively. The results also showed that the T3 treatment to which the initiator was added, consisting of Lactococcus Lactis subsp. Lactis and Lactococcus lactis subsp. cremoris and Lactococcus lactis subsp. lactis biovar.diactylactis showed higher acidity in less time than treatment T1 to which the starters were added consisting of Streptococcus thermophilus and Lactobacillus delbrueckii ssp.bulgaricus, and this treatment gave higher acidity in less time than treatment T2 to which the initiator was added consisting of Lactobacillacillus

acidophilus Lactobacillus lacto bacillusophilus. The reason for this difference in the duration of acidity formation may be due to the addition of different precursors to milk in cheese making, and the average of acidity formation rapidly depends on the type of starters used (Kongo, 2013).It is also noticed that there is a clear effect of adding the starters on the titration acidity values of treatments that added to which starters compared to the control treatment, as well as there are differences in the titration acidity values between the cheese treatments to which the starters are added depending on the type and activity of the starters used. This is consistent with what Walstra et al (2006) found, who stated that the average of acidity formation in milk can vary depending on the activity of the added starters. Kizilirmak Esmer and his group (2009) and Babić (2009) also indicate that the acidity of milk increases with time and that the natural acidity Milk is caused by the acidic properties of proteins and the acidic salts of phosphates and citrate, with slight effects of albumin, globulin and carbon dioxide, and high levels of total acidity result from the high protein content. It is also noticed from the results of the statistical analysis that there are significant differences at the level of (p) 0.05) for the treatment T3 compared to the control treatment immediately after manufacturing. The high titration acidity values of the treatments to which the starters are added are observed due to the action of the starters to convert the sugar lactose into lactic acid. It is also noted from the results that the titration acidity values increased for all treatments with the advancement of the storage period, as it reached after 7 days for the control treatment C it is 0.21% and for the cheese of the addition treatments 0.60, 0.48 and 0.74%, respectively. After 14 days, the cheese of the control treatment C was 0.32%, and the cheese of the addition treatments were 0.72, 0.54 and 0.82%, respectively. The reason for this decrease may be due to the continuation of the activity of the starters bacteria under conditions of cold storage and the conversion of lactose sugar into lactic acid and other organic acids, which reduces the value of Pka inside the cell, which makes the cell membrane more permeable to substances such as lactate and acetate, which leads to a decrease in the pH value and an increase in the overall acidity of the product. (Yilmaz and Kurdal, 2014).It is also noticed from the results of the statistical analysis that there are significant differences ($p \leq 0.05$) in the value of the restorative acidity of the treatment T3 compared with the control treatment after 14 days of storage.

Cheese yield

The results in (Table 2) showed that the yield percentage for control treatment C cheese and cheese treatments that added to which starters, as they reached 12.60% after manufacturing directly for control treatment C cheese, and this agreement with Al-Badrani (2016) found, who indicated that the yield percentage for soft cheese made from milk Cows accounted for 12.50%.these agree with Sant Ana and his group (2013) and Elsamani et al (2014) found, who indicated that the yield percentage in soft cheese was 19.40% and 19.5%, respectively. As for the added treatments, they were 12.00, 12.30 and 11.80%. It is noticed from the results of the statistical analysis that there were significant differences ($p \leq 0.05$) between the yield percentage of the cheese of treatment T3 compared to the control treatment. It is also noted from the results of the statistical analysis that there are differences in the yield percentage between treatments that added to which starters, and this difference results from the different starters used. It is also noted that the treatment T2 containing the starters consisting of Lactobacillus acidophilus and Bifidobacterum Lactis was the highest in yield percentage of all the adding treatments, Treatment T1 It contains the starter Streptococcus thermophillus and Lactobacillus delbrueckii ssp.bulgaricus was lower in yield percentage than in treatment T2 and was less yield percentage in treatment T3 It contains the starter of Lactococcus Lactis subsp.Lactis and Lactococcus lactis subspsp. cremoris and Lactococcus lactis subsp. lactis biovar.diactylactis. It is also noticed that the precursors that gave high acidity had a low yield percentage in them, as the increase in acidity leads to an increase in whey exuding from

the cheese and thus reduces the yield . Cheese production is influenced by many other factors such as milk composition, casein content, milk pasteurization, type of coagulation, mold design, and production parameters (Valkaj et al, 2014).It is also noticed that the yield percentage during the storage period is low for all treatments, where after 7 days for treatments C was 12.10%, for adding treatments it was 11.48, 11.79 and 11.27%, respectively, while after 14 days it was for treatments C was 11.83% and for adding treatments. 11.19, 11.51 and 10.97%.The reason for this decrease in the yield percentage is due to the evaporation of a part of the moisture during the storage period, in addition to the automatic seepage of the grating leads to a lack of drainage. Economically speaking, cheese production is vital to cheese makers since slight differences in refinement lead to large differences in profits (Abd El-Gawad and Ahmed, 2011).

Table 2: The yield percentage for soft cheese, the control treatment, and other treatments, to which various types of starters are added immediately after manufacturing and during storage at a degree of (5 ± 1) m for a period of 14 days.

Treatments	Cheese age (day)		
	1	7	14
C	12.60	12.10	11.83
T1	12.00	11.48	11.19
T2	12.30	11.79	11.51
T3	11.80	11.27	10.97
LSD:	0.771 *	0.695 *	0.724 *

*** (p≤0.05) significant. Each number in the table represents an average of three replicates.**

organoleptic evaluation

Cheese sample were subjected to organoleptic evaluation by a group of professors in the College of Food Sciences with expertise and experience, The organoleptic evaluation form contains six characteristics through which it is possible to determine the quality of the cheese treatments that added to which starters and to know its compatibility with the cheese of the control treatment without adding a starter that was made from full-fat cow's milk, and these traits are color, flavor, texture, consistency, holes and bitterness. Table 4-6 shows the results of the organoleptic evaluation of samples of control treatment cheese C and cheese adding starter T1, T2 and T3 added immediately after manufacture and during storage at a temperature of (5 ± 1) for a period of 14 days. The results show that there are no significant differences (p≤0.05) in the averages of high degrees conferred on the color characteristic immediately after manufacturing between all treatments. It is also noticeable that the organoleptic evaluation degrees for this trait decreased with storage, as after 7 days it was given fewer degrees than on the first day, so the C treatment had a degree of 9.1, while the adding treatments were awarded 9.3, 9.0 and 9.2, respectively. Either after 14 days have passed, The degrees given to the color trait of the treatment C were 7.2 degrees. For the adding treatments, it was 7.6, 7.0 and 7.6 degrees. It is noticed that there is no significant at (p (0.05) between the different treatments after the 14-day storage period. (Delahunty and Drake, 2004)showed that the flavor of the cheese is a mixture of organoleptic stimuli of smell, taste and chemical structures, and this flavor is affected by the raw materials and processes used

during processing and production such as (pasteurization and naturalization) and chemical and biological changes that occur during ripening. The ripening of cheese (glycolysis, protein decomposition, lipolysis) leads to the transformation of cheese that on the first day is quite light in flavor and shows a slight difference between varieties, into a product having a complex and distinct flavor (McSweeney and Sousa, 2000).

Table 3: organoleptic evaluation of the control treatment for soft cheese and other treatments of soft cheese with different types of starters added immediately after manufacture and during storage at a degree (5 ± 1) m for a period of 14 days

Treatments	Cheese age (day)	color	flavor	Textures	Cohesion	Openings	Bitter	Total degrees of 60
C	1	10	8.1	8.4	8.75	10	10	55.25
	7	9.1	7.2	8.0	8.83	8.5	8.3	49.93
	14	7.2	6.5	6.3	8.50	7.8	6.7	43.00
T1	1	10	8.6	9.25	9.3	10	10	57.15
	7	9.3	7.60	8.5	9.1	8.2	8.6	51.30
	14	7.6	7.0	7.3	8.3	7.6	6.0	43.80
T2	1	10	8.58	9.75	9.16	10	10	57.76
	7	9.0	7.60	8.6	9.2	8.7	8.5	51.60
	14	7.0	7.2	7.3	8.7	7.4	7.2	44.80
T3	1	10	9.6	10	9.5	10	10	59.10
	7	9.2	9	8.5	8.8	8.5	8.9	52.90
	14	7.6	8.5	7.3	8.0	7.4	7.5	46.30
LSD:	---	1.082 *	1.225 *	1.176 *	0.892 *	1.261 *	1.705 *	5.419 *

*** (p≤0.05) significant. Each number in the table represents an average of three replicates.**

Biochemical pathways, with the help of enzymes from the starter bacteria, rennet, exogenous sources, and the milk itself, lead to the production of a large variety of flavor volatile compounds. While some compounds are necessary for the correct flavor of a variety of cheeses, the delicate balance between many compounds resulting from the ripening of cheese is responsible for the trait flavor of a variety of cheeses, and this is the basis of the theory of the balance of ingredients for the flavor of cheese (Mulder, 1952).The same table also shows the significance of the degree given to the flavor trait of the treatments to which the starter was added, as the degrees awarded immediately after manufacture for the control treatment C were 8.1 degrees and for the treatments T1, T2 and T3 they were 8.6, 8.58 and 9.6 degrees, respectively. It is noted from the results of the statistical analysis that there are significant differences at the level of (p≤0.05) between the degree of treatment T3 compared to compared to a control treatment C.By treatment control C, the increase in flavor compounds is due to the role of the enzyme secreted by the starters organism in the formation of the micro-peptides and amino acids that give the initial flavor in cheese (Urbach, 1997). It is also noticed that the highest degrees awarded to the flavor trait by the evaluators were for treatment T3 and less than for the two treatments T1 and T2, and the lowest degrees were for the control treatment C.As for the storage progression, the degrees granted to this trait decreased, as after 7 days for treatment C it was 7.2 degrees, while for the addition treatments it was 7.60, 07.6 and 9 degrees, respectively. As for 14 days, the grade C was 6.5 degrees.

As for the adding treatments, they were 7.0, 7.2 and 8.5 degrees, respectively. It is also noted that treatment T3 is superior in this capacity compared to all treatments after storage. (Delahunty and Drake, 2004)showed that the flavor of cheese is a mixture of sense stimuli of smell, taste and chemical structures, and this flavor is affected by the raw materials and processes used during processing and production such as (pasteurization and naturalization) and the chemical and biological changes that occur during ripening. The ripening of cheese (glycolysis, protein decomposition, lipolysis) leads to the transformation of cheese that on the first day is quite light in flavor and shows a slight difference between varieties, into a product having a complex and distinct flavor (McSweeney and Sousa, 2000). Biochemical pathways with the help of enzymes from the starter bacteria, rennet, exogenous sources, and the milk itself lead to the production of a large variety of flavor volatile compounds. While some compounds are necessary for the correct flavor of a variety of cheeses, the delicate balance between many compounds resulting from the ripening of cheese is responsible for the trait flavor of a variety of cheeses and this is the basis of the theory of the balance of ingredients for the flavor of cheese (Mulder, 1952).It is also noticed from the same table that the degrees given to the strength characteristic of the adding treatments were higher compared to the control treatment, as, immediately after manufacturing, the control treatment C was 8.4 degrees and the adding treatments were 9.25, 9.75 and 10 degrees, respectively. It is noticed from the results that the highest degrees were awarded to the treatment T3, which is 10 degrees, and the lowest was given to the treatment T2 and T1, and the lowest degrees were given to the treatment C, and it is noticed from the results of the statistical analysis that there are significant differences ($p \leq 0.05$) between the treatments T2 and T3 compared to the control treatment C, After 7 days, the degrees awarded for treatment C were 8.0 degrees and for addition treatments 8.5, 8.6 and 8.5 degrees. Either after the passage of 14 day, the degrees awarded for the trait of strength were the same for all the adding treatments, 7.3, and less than in the treatment C, which was awarded 6.3.As for the trait of cohesion, the same table showed the high degrees given to the treatments T1, T2 and T3 compared to the treatment C, as it was immediately after manufacturing for the control treatment C which was 8.75 degrees, while the adding treatments were 9.3, 9.16 and 9.5 degrees, respectively. It is also noticed that treatment T3 was excelled in the degree conferred to the trait of cohesion, followed by treatment T1, then treatment T2, all of which were higher than treatment C. It is noted from the results of the statistical analysis that there are no significant differences ($p \leq 0.05$) between all treatments. After 7 days of storage, it was awarded to the control treatment 8.83 degrees, for the adding treatments 9.1, 9.2 and 8.8 degrees. As for the adding treatments, they were 9.3, 9.16 and 9.5 degrees, respectively. It is also noticed that treatment T3 was excelled in the degree conferred to the trait of cohesion, followed by treatment T1, then treatment T2, all of which were higher than treatment C. As for the openings, the degrees that were awarded to them immediately after manufacturing were high for all treatments, as they were awarded 10 degrees , which indicates that they are good qualities. This indicates the absence of mechanical openings and the absence of contamination with gas-producing microorganisms such as coliform bacteria after manufacturing. As is evident from the table, the degrees that were awarded to the bitter taste, and the results indicated that the bitter taste did not appear in all treatments, where the degree awarded was 10 degree for all treatments, and there were no significant differences at the level of ($p \leq 0.05$) between the treatments. The bitter taste in cheese is formed due to the proteolytic enzymes secreted from bacteria or rennet enzymes, which leads to the breakdown of the protein into peptides, and if one or more of these peptides contain peripheral amino acids once, the bitter taste appears and is removed by breaking these peptides (Al-Sharaji et al, 2009). It is noticed that a small percentage of the bitter taste began to appear during storage for a period of 14 days, as the degrees awarded decreased from 10 to 6 degrees. It is noted from the results of the statistical analysis that there are no significant differences ($p \leq 0.05$) for all treatments. In general,

it is noted from the total degrees that treatment T3 excelled on all treatments immediately after manufacturing and after storage for a period of 14 days, as it attained the highest degrees of organoleptic evaluation. It is also noted from the total degrees that treatments that added to which starters have higher degrees than the total degrees that were awarded to the control treatments, and this indicates the consumer's preference for these treatments, as well as there are differences in the total degrees given to the adding treatments, where the treatments T3 obtained the highest total degrees, then treatment T2, then the transaction T1 and treatment C had the lowest degrees. The difference in the degrees of organoleptic evaluation that was recorded in this study is mainly due to the flavor, texture, and general acceptance of cheese samples due to the natural property of the additive precursors, and the formation of compounds such as CO2, diacetyl and electrodehyde that lead to the development of the distinctive textural and flavor traits of the cheese from aromatic and non-aromatic starters(Walstra et al, 2006; Papagiannni, 2012). The final aim of any foodstuff development is consumer acceptance of this substance. What complicates matters is that such acceptance of a food item depends on many factors that the producer cannot control (Cardello and Schutz, 2006).Nevertheless, ensuring that the product meets the perceptual requirements and expectations of consumers is an important step towards acceptance of the product (Lawless and Heymann, 2010; Tuorila, 2007).

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