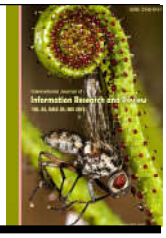
IJIRR

International Journal of Information Research and Review
Vol. 03, Issue, 05, pp. 2369-2374, May, 2016



Research Article

ANALYSIS SOME CHEMICAL AND MICROBIOLOGICAL PROPERTIES OF (AL-ZHAZHI) CHEESE AT THE COUNTRYSIDE OF SORAN CITY IN KURDISTAN-NORTH IRAQ

***[1,2]Holem Hahsmrasul Balaky**

[1]Department of Chemistry, Faculty of Science, soran University, Kurdistan Region, Iraq
[2] KSU, Department of Bioengineering Sciences, Faculty of Agriculture, Kahramanmaras, Turkey

ARTICLE INFO

Article History:

Received 22nd February 2016
Received in revised form
26th March 2016
Accepted 17th April 2016
Published online 30th May 2016

Keywords:

(Al-Zhazhi),
Microbiological Properties,
Chemical Properties,
Analysis

ABSTRACT

The aim of the study was to analysis chemical traits and microbiological content in Al-zhazhi cheese; collected from different place in soran city-Kurdistan-north Iraq The study also included the effect of storage freeze for 30 days on the quality of Al-zhazhi cheese. The average valuesof the chemical analysis were protein 23.80%, fat 20.95%, moisture 54.17%, total solid 45.72%, acidity 0.18% and PH4.73, that study found that some changes in chemical properties after storage all parameter were increased, whereas moisturecontent 46.52% was decreased after storage. Also there were significant ($p<0.01$),($p<0.05$) changes in acidity 0.32% and PH 3.61 before and after storage.Regarding microbial content, it was noticed that there is some relations between storage and microbial content. the total aerobic bacteria was1.98×10^5cfu/gsignificantly decreased after storage .staphylococcus aureus was totally disappoint in some samples were as increased in some other sample .furthermore, Psychrotrophic bacteria was2.72×10^3cfu/g significantly increased after storage ($p<0.01$),($p<0.05$). In addition, this result showed that the chemical properties that conformity for each analysis data after storage during freeze.However, high rate of Staphylococcus aureus and Psychrotrophic in (Al-zhazhi) sample, after storage during freeze suggesting a lack of sanitary conditions during production. Assess time of storage especially during freeze significantly ($P < 0.01$) ($P < 0.05$), affected the analysisof chemical and microbiological properties on (Al-zhazhi) cheese.

INTRODUCTION

It is considered one of the Kurdish semi-soft cheeses in Kurdistan NorthIraq and other places in Kurdistan. It is called Aushari cheese and also locally known as Al-zhazhi. The cheese is characterized by having a special taste and special hot flavor by consumers. The type of cheese is made particularly by local people in the villages who have large herds of sheep and goats and large quantity of milk(Al-Rekabi, 1981).SoftCheese is the first dairy products that have emerged since the dawn of history, record Aaragiwn of the ancient Sumerians and Alabablin as evidenced by the cheese industry on the walls of their temples before more than 300 years as well as is the case in the temples of the pharaohs in Egypt before more than 4000 years.Also Turkey is about 15 million, 1 million and 518 thousand tons/year, Consumption of milk and other dairy products is associated with numerous health benefits, most consumed dairy products in Turkey (Kamber, 2008).

****Corresponding author: [1,2]HolemHahsmRasulBalaky,***
[1]Department of Chemistry, Faculty of Science, soran university, Kurdistan Region, Iraq.
[2]Department of Bioengineering Sciences, Faculty of Agriculture, Kahramanmaras, Turkey.

Cheese food item contain a lot of protein and a good source of vitamins and calcium ready Increasing demand globally for nutritional value the ability to save for a long time and good ability for digestible So is the food item is very suitable (Kosikowski, 1983) (Meyer, 1973)(El-shibiny*et al*. 1984). Al-zhazhicheese one of the types of soft cheese that is most often consumed cheeses in rural parts of Turkey (Kamber, 2008) and these cheeses are often manufactured in family corporations according to traditional methods, however, it is produced in well-equipped factories, as well (Bakırcı*et al*., 2008); (Kamber, 2008). Thischeeses product from cow, sheep or goat's milk by acidification of milk or yoghurt in Turkey, Pesta Al-aushariche curd take place by heating of yoghurt, so this cheese aroma is so different from milk curd (F. Durlu*et al.,* 2013).In the countryside of Erbil and Duhok, cheese are made from raw milk of goats, sheep or mixed one. It's held like balls until it becomes a cheese. Then it's transferred into special equipment's to discard the excess. Then some salt added and left for a while to be stored later. Cheese has been stored in sheep or goats skin during the early, which was added some herbals as a preserves. Some time it was stored in caves or digged holes, this shows that the storage was differ with location as well as time. Most women in the countryside are

able to make cheese as they inherited from their ancestors. (Dalaly*et al,* .1976).Moreover, there are other factors in the cheese industry, including moisture content, fat content, acidity and PH. The moisture content in terms of the importance of maintaining the quality of a food industry, high moisture will work on microbiology undesirable growth which determine the quality of food products including processed cheese (Kosikowski, 1982).The influence of freezing on chemical properties of white cheese samples during freeze period for days, that observed the decrease of moisture content and high fat content with acidity (El-shibiny*et al*. 1984) (Alichandis*et al*., 1981). Al-zhazhiis important dairy products because they have low fat or non-fat contained excess amounts of casein and whey proteins and cheap products of low revenues for people. In general Al-zhazhi (Cokelek) and lor cheeses are very similar in appearance to each other; although they are completely different from each other.it is obtained by heat treatment from acidified whole-fat milk or medium-skimmed milk while Al-zhazhi contains casein and serum proteins in its structure because of the applied heat treatment to milk. This cheese is produced in various ways and called different names in some parts of Turkey. Example, it is known as "Al-zhazhi" or "Aushari' in south of Iraq and ‘’Cokelek’’ in North of turkey with other different names “Eksimik” in Western Anatolia, “Trakya” in the Black Sea, and “SütKoptu”, “Akkatik”, “Kesik”, “Torak”, “Urda” or “SütKirmasi” in parts of the Mediterranean and Eastern Anatolia (Tarakçı*et al.,* 2003), (Kamber and Çelik, 2007).

There are several types of cheeses having various structure, shape and taste due to numerous factors especially in our country which is the centre of East and West Culture. Many factors affect the cheese variety. the type of the milk (cow’s, sheep’s and goat’s milk cheese), the method of clotting (acid, coagulating enzyme cheese), the process in which whether milk is exposed to heating process or not (raw or pasteurized cheese), its fat ratio (whole, low-fat, non-fat), its structure (very hard, hard, soft cheese), its salt ratio (salted, unsalted cheese), its additives (several herbs and spices, salts for melting and cheese made by supporting its mould growth) and its ripening period (fresh, semi-ripened and ripened cheese) (Üçüncü*et al.,* 2004) (Durlu*et al*., 2007).The aim of this study was analysis some chemical and microbiological contents of Al-zhazhicheese samples from different village places around in soran city and to assess their freezing effects on cheese (Al-zhazhi).

MATERIALS AND METHODS

Materials

It was obtained models of Soft Cheese (AL-ZHAZHI)10 samples (250 g) were randomly collected between (November 2015 till February 2016), from different village'sSoran city. The samples were transported in sterile plastic bags to the laboratory under aseptic and refrigerated conditions to conduct of chemical and microbiological analysis was performed within 2 to 4 hours of purchase.

(AL-ZHAZHI) manufacture

Al-zhazhiraw material is different from that another soft cheese. It is obtained by boiling of milk, yogurt (drink yogurt), its production method is easy and it has a low salt proportion. There are variousAl-zhazhithey are those having regional characteristics. The samples were collected from different local places around soranterritory; this old and traditional method for makingAl-zhazhicheese was followed.

Firstly, after make yogurt from goat and sheep the milk. The milk was then shaking to separate the cream from butter milk, the buttermilk was heated heat to approximately (45-46), within a quarter of an hourand salted until clotting aggregated and the aggregated part was slitter and lor crud was made, according to traditional custom and habits. Secondly, they are added different herbs (Be Zaw, Kurada, Kangir) mixed with it and then they are kept and stored in animal skins (goat skin) in cool or low temperature places and then buried (underground) or sometimes transported to caves for a certain period (60-70) days to complete (Al-zhazhi) called this type of soft cheese it is most consumed dairy products and famous in the villages of Kurdistan northern Iraq.

Chemical Procedure

Protein content was determined by using keldahl according to the method of (AOAC, 1990). Total solids (TS) were determined by the according method (AOAC ,1990).Fat content was measured by the Gerber method (AOAC , 1984).The moisture content in the samples drying in a way that electric oven type (Memmert) and PH-meter, pH values according method(Ling, 1956). Determine acidity by using the calibration alkali (0.1 NaOH) (AOAC, 1990).

Microbiological analysis

Total number of aerobic bacteria, Using Nutrient agar Nutrient Agar, and incubated it at 37 C^o for 48 hours (Colle*et al*., 1996). TheStaphylococcusaureusperiod the storage period were enumerated according to (Stiles, 1977) and (Oxoid Manual, 1982). Psychotropic bacteria were enumerated on plate count agar (Plate count Agar) and incubated at 7°C ± 1°C for 10 days (A.P.H.A, 1985).

Statistical analysis

All of the statistical calculation performed using SPSS statistical software and the obtained values were presented as the mean, standard error, standard deviation, minimum, and maximum and evolution of significance was performed by analysis of variance followed by spearman correlation between the some chemical and numbers of microorganism’s properties of cheese (Al-zhazhi) samples before storage. The significance levels of $P< 0.05$, $P< 0.01$ were used for determining statistical difference. Colony counts were converted to log cfu g^{-1} and means.

RESULTS AND DISCUSSION

The results of Chemical composition of theAl-zhazhisamples before and after storage during freezing at 30 days are shown in Table 1 and Microbial analysis is presented in Table 2.

Table 1. Results of the Chemical analysis of (AL-ZHAZHI) cheese after and before during freeze-storing at 30 days

g/100 g Al-zhazhiof cheese (n=15)						
Storage Time	Beforestorage	After storage at 30 days	Beforestorage	After storage at 30 days	Beforestorage	After storage at 30 days
Chemical Parameter	Mean± S.D	Mean ±S.D	Minimum	Minimum	Maximum	Maximum
Protein %	23.80± 1.67	26.59±1.32	21.56	24.50	26.41	28.20
Fat %	20.95± 2.01	24.01±2.25	18.05	20.35	24.52	27.00
Moisture %	54.17± 2.38	46.52±2.72	50.09	43.19	57.72	50.76
Total Solid %	45.72± 2.34	54.27±2.94	42.28	49.24	49.91	57.22
Acidity %	0.18± 0.06	0.32±0.03	0.11	0.29	0.28	0.39
PH	4.73± 0.23	3.61±0.41	4.30	2.92	4.99	3.98

Table 1. Results of the Microbioligal analysis of (AL-ZHAZHI) cheese after and before during freeze-storing at30 days (log cfu g^{-1})

g/100 gAl-zhazhiof cheese (n=15)						
Storage Time	Before storage	After storage at 30 days	Before storage	After storage at 30 days	Before storage	After storage at 30 days
Microbial Parameter	Mean± S.D(cfu/g)[a]	Mean ±S.D(cfu/g)[a]	Minimum[a]	Minimum[a]	Maximum[a]	Maximum[a]
Total Aerobic bacteria[a]	2.80×10^5 ±20.26×10^5	1.98×10^5±17.94×10^5	4.4×10^4	4.0×10^4	4.8×10^5	3.9×10^5
Staphylococcus[a]	15.90×10^2±14.7×10^2	1.21×10^2±15.71×10^2	–[b]	–[b]	3.6×10^2	4.1×10^2
Psychotropic[a]	2.04×10^3 ±15.10×10^3	2.72×10^3±20.60×10^3	2.1×10^2	4.0×10^2	3.6×10^3	47×10^3

a,cfu: colony forming unit
b,(-): Not detected

Table 3. The Correlation between the some chemical and Microbial properties of (AL-ZHAZHI) samples before storage

	Protein	*Moisture*	*T.S*	*FAT*	*PH*	*Acidity*	*TAB*	*S.aureus*	*psychrotrophic*
Protein	1	-	-	-	-	-	-	-	-
Moisture	-0.178	1	-	-	-	-	-	-	-
T.S	0.154	-0.991(**)	1	-	-	-	-	-	-
FAT	-0.425	0.194	-0.129	1	-	-	-	-	-
PH	-0.097	-0.273	0.365	0.076	1	-	-	-	-
Acidity	-0.046	0.446	-0.473	0.295	-0.816(**)	1	-	-	-
TAB	-0.349	-0.179	0.236	0.200	0.513	-0.430	1	-	-
S.aureus	0.145	-0.360	0.417	0.003	0.457	-0.274	-0.017	1	
Psychrotrophic	-0.291	-0.089	0.143	0.198	0.454	-0.370	0.983(**)	-0.083	1

T.S=Total solid, TAB=Total aerobic bacteria, S=Staphylococcus, Cold-loving bacteria= Psychrotrophic
**P< 0.01
Correlation is significant at the 0.01 level (2-tailed).
Number of Sample: 15

Table 4. The Correlation between the some chemical and Microbial properties of (AL-ZHAZHI) samples after storage during 30 days

	Protein	*Moisture*	*T.S*	*FAT*	*PH*	*Acidity*	*TAB*	*S.aureus*	*psychrotrophic*
Protein	1	-	-	-	-	-	-	-	-
Moisture	-0.058	1	-	-	-	-	-	-	-
T.S	-0.155	-0.660(**)	1	-	-	-	-	-	-
FAT	-0.390(**)	0.697(**)	-0.247	1 -	-	-	-	-	-
PH	-0.293(*)	0.256	-0.579(**)	0.122	1 -	-	-	-	-
Acidity	0.102	-0.151	0.389(**)	-0.049	-0.814(**)	1	-	-	-
TAB	-0.850(**)	-0.062	0.454(**)	0.418(**)	0.034	0.043	1	-	-
S.aureus	-0.773(**)	-0.607(**)	0.607(**)	-0.767(**)	-0.543(**)	0.692(**)	0.786(**)	1	-
psychrotrophic	0-.098	-0.155	-0.342(*)	0.184	0.203	0.059	-0.061	-0.286	1

T.S=Total solid, TAB=Total aerobic bacteria, S=Staphylococcus, Cold-loving bacteria= Psychrotrophic
*P< 0.05: **P< 0.01
Correlation is significant at the 0.01 level (2-tailed).
Correlation is significant at the 0.05 level (2-tailed).
Number of Sample: 15

As for the chemical analysis, it was the average moisture value of Al-zhazhicheese increased before storage was found between 50.09 and 57.72, and value of Mean was 54.17± 2.38in samples but after storage the average of moisture value was decreased to 43.19 and 50.76 of and value of mean was 54.17±2.38.This change or difference in moisture content during storage that is shown table 1 and 2 this decline may be due to the crystallization of water and separated from the rest of the componentsAl-zhazhicheese when solvent. This result was agreement with (Alichandis*et al*., 1981) alsothis finding it was higher than 40.31% was found by (Donia Suleiman *et al.,* 2013). The Fat content of Al-zhazhicheese before storage was found varying between 18.05 and 24.52 with an average value of Mean 20.95% in Al-zhazhisamples but after storageat 30 daythe average of fat was increase of varying between 20.35 and 27.00with an average value was 24.01±2.25and that the gradual rise in the fat content after storage could be due to the decrease in moisture content (Table 1 and 2),this finding was agreement with (Filchakova*et al.*1979)Also this study of the average fat was lower than 22.08 % that was found by

(Tarakçıet *al* 2003) and were higher, and were in agreement with data from (Kavazetal. 2012) and (Kirdaret *al* 2012). This Protein values were finding before storage between 21.56 and 26.41.and the average of protein level was found as Mean ± S.D 23.80 % but after storage the protein values was changed in some analysis and increase between24.50 and 28.20the average of protein level was found as Mean ± S.D26.59this finding was agreement with 21.66 % by (Tarakçıet *al* 2003) and were higher than with 17.9% reported by (Bahri PATIR *et al* 2007)and also this was similar to that reported by (Kurt and Caglar, 1988) (16.91–31.16 g/100 g), but this study it was lower than the value (26.35-39.12 g/100 g) found by(Cakıret *al.,* 2009).It found between this study and previous studies that caused the discrepancy in cheese productionofAl-zhazhicheese. The average Total Solid (T.S) was found as 45.72± 2.34in the samples ofAl-zhazhithe values were between 42.28 and 49.91, The total solid contents of the cheese samples during after storage by freezing at 30 days, the total solid values increased were between 49.24 and 57.22 and the average of total solid 54.27±2.94% in samples (Table 1). This finding was agreement with (Arzuet *al.,* 2012) similar results were obtained by (El-Owni and Hamid, 2008)This changes or increase in total solid contents could be due to continuous loss of moisture from the curd (Al-zhzhi) as a result of lactic acid developments which cause curd contraction. (Aly and Galal, 2002),(Abdol-Elsalamet *al*., 1993)However,that the increase in total solid could be due to salt absorption and / or water diffusion of some soluble components between brine and sample of cheese mixture.

This pH values before storage were between 4.30and 4.99, the average pH was 4.73± 0.23% .But after storage by freezing at 30 days, the PH values decreased were between 2.92 and 3.98, and the average PH was 3.61±0.41% in samples (table 1) it may reason could be due to the inhibition of bacteria activity during freezing because of separation of water and some dissolved materials during thawing this finding was agreement with (Alichandiset *al.* 1981) Similar deviations were reported by (Ates-Öksüztepeet *al*.2007) And also this findingwas lower than previously reported values as 4.87 from 25 samples of cokelek (Al-zhazhi) (Ağaoğluet *al*.1996). This can be explained by different quality of raw material used in production of Al-zhazhicheese.The values acidity content of Al-zhazhicheese samples before storage were between 0.11 and 0.28, theaverage of acidity was 0.18± 0.06% but after storage The values acidity increased were between 0.29and 0.39, and the average acidity was 0.32±0.03 in samples (Table 1).These studies were similar to those obtained from the studies of (Ates-Öksüztepeet *al.,* 2007), (Table 1). These findings are lower than the values reported by otherresearchers (Tarakçıet *al*., 2003, (Ağaoğluet *al.,* 1996), (Küçüköneret *al*., 1998), such difference can occur due to the different raw material and the difference in production method.

The results of microbiological analyses of Al-zhazhiCheese, (Table. 2) illustrates that the effect of freezing on the total number bacteria in Al-zhazhicheese.it is obvious that the total number of bacteria growth was reduced after freeze-storing the cheese. It was the values total number of bacteria of Al-zhazhisamples before storage was 4.4×10^5cfu/g and 4.8×10^5cfu/g, the average of total number aerobic bacteria were 2.80×10^5cfu/g and then the valuestotal number of bacteria was decreased after 30 days during storage to 3.9×10^5cfu/g and 4.0×10^5cfu/g,the average of total number aerobic bacteria were 1.98×10^5 cfu/g , it can be seen that the inhibition of bacteria was not significant. This is due to the bacteria protection by fat and protein.This result were agreement with (Alichandiset *al*., 1981) and this wassimilar to that reported by (Kavazet *al*., 2012),but lower than those reportedby (Kurt and Caglar, 1988).In this study Staphylococcus aureuswas detected in 6 samples before storage of Al-zhazhicheese but detected in 5 samples after 30 days during storage. Therange of minimum values of Staphylococcus aureus before storage and after 30 days during storage wasnot detected. Because the results number of staphylococcus aureus showed that many of the sample were free from bacteria and the samples which contained bacteria the number of the bacteria was very low did not exceed $10^{2,}$ but the maximum values before storage and after 30 days during storagewas 3.6×10^2cfu/g, and 4.1×10^2cfu/g, of Staphylococcus aureus, and then the average of Staphylococcus aureus decrease in from 15.90×10^2cfu to1.21×10^2cfuLog cfu/g in sample (Table 2) it was recorded after storage 30-days of samples. This finding agreement with (Önganer and Kirbag, 2009) and this was similar by(Ayşe, 2012), Personal contamination and environment during production and storage may produce high counts of Staphylococcusaureus plays role in causing cheese spoilage.

The average number of Psychrotrophic (Cold-loving bacteria) before storage were between 2.1×10^2 cfu/g and 3.6×10^3cfu/g, the average of Psychrotrophic bacteria was 2.04×10^3cgu/g But after storage by freezing for 30 days, the number values of Psychrotrophic was increased to 4.0×10^2 cfu/g and 47×10^3 cfu/g, the average of Psychrotrophic bacteria was 2.72×10^3cgu/g, that is the high number of lipase-producing psychrotrophic bacteria may affect the levels of lypolysis in cheeses. This finding agreement with (Tarakçı *et al*., 2003) (Tarakçıet *al*., 2004) and this was difference by (Arzuet *al*., 2012). The Pearson's correlation coefficient analyses between chemical and microbial before storage and after storage during 30 days in (Al-zhazhi) samples. There was a significant negative correlation between total solid and moisture r =-0.991 ($p<0.01$), also a negative correlation was observed between acidity and PH r = -0.816 ($p<0.01$) and significant positive correlation were between found Total aerobic bacteria and Psychrotrophic count r =0.983($p<0.01$), (Table.3).

However, the correlation coefficient analyses between chemical and microbial after storage during for 30 days in (Al-zhazhi) samples. There was a significant negative correlation between total solid and moisture content r = -0.660 ($p<0.01$). A significant negative correlation was also found between fat and protein content r =-0.390 ($p<0.01$), and observed a significant positive correlation was between fat and moisture r = - 0.697 ($p<0.01$), significant negative correlation were observed between PH and protein r = -0.293($p<0.05$), also PH and total solid was significant positive correlation r = -0.579 ($p<0.01$).There was a significant positive correlation was found between the acidity content and total solid r = -0.389 ($p<0.01$), but a significant negative correlation was observed of acidity content with PH r = -0.814($p<0.01$).The total aerobic bacteria were negatively correlated with protein r = -0.850 ($p<0.01$), but a significant positive correlation was also observed between total aerobic bacteria and total solid and fat r = -0.454 ($p<0.01$), and r = 0.418 ($p<0.01$).A significant negative correlation was

found between S.aureus with (protein, moisture, fat and PH) r = -0.773($p<0.01$), r = -0.607($p<0.01$), r = -0.767($p<0.01$) and r = -0.543($p<0.01$), respectively. Also the S.aureus with (total solid, acidity and total aerobic bacteria count) were observed positively correlated as r = -0.607($p<0.01$), r = -0.692($p<0.01$), and r = -0.786($p<0.01$). A significant negative correlation was found between Psychrotrophic count and total solid content r = -0.342($p<0.05$). A big variation was observed between samples before storage and after storage by freezing for 30 days which could be related to the production and storage under condition not suitable for food microbiology and chemistry.

Conclusion

These products Al-zhazhicheese are often the only dietary source of animal protein for people with high incomes in our country. In this study that observe was the chemical analyses properties that conformity 80% for each analysis data after storage during freeze. to some extent, the microbiological content of these products does not comply with criteria of the (WHO) because the presence of high rate of Staphylococcus aureus and Psychrotrophic (Al-zhazhi) sample, suggesting a lack of sanitary conditions during production.in addition to practicing good manufacturing Practices during Al-zhazhiproduction and storage, examples of which include proper chilling and packaging, enforcement of Hazard Analysis and Critical Control Points (HACCP) are required to ensure safety of these products.

REFERENCES

A.P.H.A., 1985.American public Health Agricultural Chemists, "standard method for the examination of dairy products'' 15thed New York.

AbdEl-salam,M.H.Alichaniclis, E. and Zerfidis , G.K. 1993. Domiati and f. eta type cheese. In:Cheese chemistry Physics and microbiology (Edited by P.F.Fox) P.310–335. London Champan and Hal.

Ağaoğlu S, Ocak E veMengel Z. Van 1996. veyöresindeüretilençökeleklerinmikrobiyolojik, kimyasal, fizikselveduyusalnitelikleriüzerindebiraraştırma. Ankara ÜniversitesiVeterinerFakültesiDergisi; 44 (1-6): 7–12.

Alichandis, E., Polychroniadou, A., Tzanetakis, N., Vafopoulou, A. 1981. Telme cheese from deep-frozen cured .*journal Dairy of science*.(2)64 :732-739

Aly, A.S. and E.A. Galal, 2002 .Effect of milk pre-treatment on keeping quality of Domaiti cheese.Pak.J. Nutr., 1: 132-136.

AOAC, 1984.Official methods of analysis, 14th ed. Association of Official Analytical Chemists, Washington, DC, USA.

AOAC, 1990.Official methods of analysis, 15th ed. Association of Official Analytical Chemists, Washington, DC, USA.

Arzu, K., Ayla, A., and Đhsan, B., 2012.Comparison of quality characteristics of Çökelekand Lorcheeses.*African Journal of Biotechnology*, PP. 6871–6877

AtesÖksüztepe G, Patır B, Dikici A, Bozkurt ÖP, Calicioglu M (2007). Microbiological and chemical quality of Cökelek marketed in Elazig. FıratÜniv.SaglıkBil.Dergisi 21:27-31

Ayşe, D. and ÇARDAK, 2012. Microbiological and chemical quality of Çökelek cheese, Lor cheese and Torba (strained) yoghurt. *African Journal of Microbiology Research*, pp. 7278-7284

Al-Rekabi., H. Nehma,. 1981. Analysis characteristic Aushari cheese in the Kurdistan region and the possibilities of development. Journalsalahaddin science technology.SeriesA.4: 147

Bahri PATIR, Abdullah DİKİCİ, Ö., Pelin BOZKURT, Mehmet ÇALICIOĞLU., 2007.Microbiological and Chemical Quality ofCokelek Marketed in Elazığ .F.Ü. Sağ. Bil.Derg. Pp. 21 (1): 27 – 31

Bakırcı, Đ., Tarakçı, Z., Coskun, H.,2008 . A study on herby Lor produced in Van province and its region. In V. Milk and Milk Products Symposium, Traditional Dairy Products, MPM publications, Mert press, Ankara, Turkey. pp. 195-204.

Cakir, I., Coskun, H., Akoglu, IT., IsleyenMF.,Kiralan, M., Bayrak, A., 2009. Introducing a traditional dairy product Keş: Chemical, microbiological and sensorial properties and fatty acid composition. *Journal Food Agriculture and Environment*, 7:116-119.

Collee. J.G., Franser, A. G.,Marmion, B.P., and Simmons, A. 1996. Machie and Maccartncy Practical medical microbiology 4th Ed, Churchill living stone London

Dalaly, B K.;abdel-Motta B,L.andFaraq M .K. , 1976 the manufacturing and composition of aushari cheese. *Dairy International technology*. Vol. 4 1, No. 2

Donia S., Rafiq. M., S. Amin.S., Al Badawi, 2013.Study of Chemical and Microbial Sensory Local Cheese pesta cheese (Al awshari) In Sulaimaniya.*Journal of Tikrit University of Agricultural Sciences* n. (2), ISSN-1813-1646

Dosh. N., Abdullah. 1994. Influence of coefficients of manufacturing in characteristics of local white cheese.,Master thesis .*journal MosulScience Technology*.

Durlu-Özkaya,F.and I. Gün, 2007. "Traditional Turkish Cheeses," *International Symposium on Historical Cheeses of Countriesaround the Archipelago MediterraneoProceedingBook*, Thessaloniki, 6-8 December, pp. 65-88.

Durlu-Özkaya,F. 2013. "Milk and Dairy Technology," In: F. Durlu-Özkaya, S. Coşansu and K. Ayhan, Eds., *HerYönüyleGıda*, Sidas Media Ltd.Sti., 401 p.

El-Owni, O.A and O.I. Hamid 2008. Effect of storage period on wight loss, chemical composition, microbiloigical and sensory characteristics of Sudanese white cheese (GibnaBayeda). *Paks. J. Nutr*. 7:75-80.

El-shibiny, S., Abd El-salam, M. H., Mahfouz, M. and El-Alamy, H.A. 1984. Effect of coagulation method on composition and quality of milk (karish) cheese made by Ultrafiltration technique .*Egyptian Journal Dairy Science*. 12(2):243-251.

Filchakova, N., Noiseeva, N., Mishuchkova.E. L., L. A., Semashko, E. V. 1979.Quality of processed cheese during cold storage.*Journal Dairy of Science*.41 (9) pp4853 Holl LTD, London.

Kamber, U. 2008. The traditional cheeses of Turkey: cheeses common to all regions. Food Rev. Int. 24: 1-38.

Kamber, U. and Çelik, T.H. 2007. Some microbiological andchemical characteristics ofGorcolacheese. *Y.Y.Ü Veterinerlik Fak. Derg*. 18: 87-92.

Kavaz, A., Arslaner, A., Bakirci I , 2012.Comparison of quality characteristics of Çökelek and Lor cheeses. *Afr. J. Biotechnol.* 11:6871-6877.

Kirdar, S. S. 2012. A survey on chemical, biochemic al and microbiological characteristics of a traditional dairy product in Mediterranean Region: Kes. *Journal Animal Vet nary Advanced* . 11:330-334.

Kosikowski, F.V. 1982. Cheese and Fermented milk Foods. Edwards Brothers.Inc.Ann Arbor, Michigan, USA.

Küçüköner E veTarakçıZ. V. Gelenekselsütürünleri In: SütveSütÜrünleriSempozyumu. Tekirdağ: Türkiye May 21-22 1998.

Kurt A, Caglar A 1988. Pesküteninkim yasalvemikrobiyolojiközellikleriüzerinebiraraştırma. Gida. 13:341-347.

Ling, E.R. 1956. A Text book of Dairy Chemistry, Vol.2. Practical, 3rd Ed. Chapan and

M. Üçüncü, "Cheese Technology from A to Z," Cilt: I, Meta Basım, Bornova/İzmir, 2004.

Meyer, A. 1973.Processed Cheese Manufacture. Food Trade Press, LTD, London

Önganer, A.N. andKirbag, S. 2009. Microbiological quality of Çökelek cheeses as a fresh consuming in Diyarbakır. Erciyes Univ. Fen Bil. Ens. Derg. 25:24-33

Oxoid.The Oxoid Manual. 50th ed, Hampshire: Published byOxoid Limited,1982.

Stiles, M. E. 1977.Reliability of selective media for recovery of staphylococci from cheese. *Journal of Food Protection*. ; 40: 11-16.

Tarakçı,Z., Coşkun H., Tunçtürk Y. 2004.Some properties of fresh and ripened herby cheese, a traditional variety produced in Turkey.*FoodTechnolgy and biotechnology*.42: 47-50.

Tarakçı, Z., Yurt, B., Küçüköner, E. 2003. A study on the making of Darende Dumas Çökelek and its some properties. *GıdaDerg*. 28: 421-427

****