STUDY OF THE COMPOSITION OF SOFT CHEESE MADE A MIXTURE OF SHEEP MILK AND CAMEL MILK THE STORAGE PERIOD USING THE ENZYME TRYPSIN AND CALCIUM CHLORIDE

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ABSTRACT

The aim of this study is to evaluate the composition of milk and soft cheese which produced from it , as well as the composition of whey that resulted from the production of cheese .The percentage of solid material was 11.7% and 17.3% in camel and sheep milks respectively , while the fat , ash and protein rates were (3 , 0.95 , 3.1)% for the camel milk and (5.2 , 0.61 , 4.9) % for sheep milk respectively . The maximum protein rate in cheese which manufactured from sheep milk at zero day storage was 25.27% while the minimum protein rate was 16.62% in the cheese manufactured from camel milk at 30 days storage , the maximum fat rate was 24.9% in fifth treatment which represented the cheese that produced from sheep milk alone at zero day storage while it was 18.51% for camel milk at the same storage period , these values decreased by increasing the storage time . Ash rates in the cheese of camel milk recorded the significant different from the other treatments which was (1.40 , 1.46 , 1.53 , 1.76 , 1.48) % at (0 , 7 , 15 , 21 , 30)% days storage respectively . maximum ash rate was 1.8 % in the cheese of sheep milk at zero day storage , while the value of total solid material was decreased for all treatments by increasing storage time which were at beginning of manufacturing (42.92 , 44.33 , 49.96 , 50.34 , 53.26)% for the treatments (M1 , M2 , M3 , M4 and M5) respectively then dropped to (34.16 , 36.33 , 41.83 , 43.1 ,48.74)% respectively at 30 days storage , finally the acidity rate recorded the minimum value in the first treatment at zero day storage which was 0.77% while it was 1.35% for the same treatment at 30 days storage while the maximum acidity rate was 1.92% in the fifth treatment at 30 days storage .

Keywords:(Soft cheese **,** Camel milk , Sheep milk , Trypsin enzyme)

INTRODUCTION

Camel's milk a difficult to manufacture in to cheese under the same conditions used in the cattle cheese industry, so FAO has developed a method to manufacture cheese from camels milk by using camifloc enzyme [Bio Serae Laboratories, Bram, France (CF)], And use calcium chloride (CFCC) [1].

The milk camels hard synthesized to cheese because of small size of fat globulin and casein Particles[2], also examined camels milk coagulation in northern Kenya using commercial calf powder, where they found that the time of coagulation of camel milk is very slowly than the milk of cows and the casein particles of camels milk coagulation from a less integrated and more flexible network with a clear change in the structure of original particles moreover, the effect of temperature and degree of acidity and calcium chloride on coagulation and time in camels milk decreases with low acidity with increased temperature and added calcium additive[3].

studied the characteristics of camels milk coagulation using bovine chymocin enzyme, where they found that coagulation time for camels milk was 2-3 times higher than that of cow milk coagulation using the same enzyme[4].

Many researchers have reported that the average moisture dry matter, lactose, protein, fat and ash for camels milk was (85-87%, 12-14%, 3-5, 2-5%, 2-3,5%, and 0.6-0.9%) respectively[5,6].

Also mention that the camels cheese industry is not common because of difficulties that include long coagulation time and weak thrombus[1,7] , found the pH, acidity, total solids, Ash, Fat and protein content in camel milk cheese was (5.83, 1.03, 35.72, 1.74, 16.34 and 16.12%) respectively[7].

Showed that the total solid, nonfat total solid, fat, total protein, casein and ash with chloride in cheese mad from camel milk was (28,38-30, 69,27.45-29.33, 0.5-1.6, 22.32-24.79, 16.24-19.64, 1.64-2.49 and 0.60-0.90%) respectively[8].

The fat contented of cheese made from camel milk with camifloc enzyme (Bram, France Bio Serae Laboratories) and $cacl_2$ with camifloc enzyme (CFCCBram, France Bio Serae Laboratories) was 11.5±3.9 and 11.75±3.4% respectively and they showed that the protein content in first kind (CF) was lowest than that of second kind (CFCC), The total solid

and ash contented in (CF) 40.38± 1.81 and 4.975 ± 0.519% respectively, but in (CFCC) kind was 41.23 ± 1.19 and 6.107 ± 0.933% respectively [9]. Showed that the sheep's_ milk have important feature than cow's milk in human nutrition and the protein, fat and energy in sheep's milk was highly than that in cow's milk[10,11] , showed that the return from sheep's cheese was highly because of its high total solid contented[12,13].

The target from this research objective is to rate the chemical composition of cheese made from camel and sheep milk and the mixture between themes in storage period.

MATERIALS & METHODS

Materials used

1- Sheep's milk : It was obtained from the sheep breeders in Mosul.
2- Camels milk : It was obtained from the camel breeders in Anbar and transfer it coolly to Mosul.
3- Trypsin_enzyme_obtained from one of the chemical sales offices in Erbil.
4- Calcium Chloride obtained from one of the chemical sales offices in Erbil .

Work methods

Soft cheese making as the method described by [14,] by take 5 Kg to per Transaction with added 0.5gm trypsin enzyme and 0.5gm $CaCl_2$ in each treatment.

Search Plan

Divide transaction into 5 transactions:

1- The first treatment (m1) include 100% camel milk.
2- The second treatment (m2) include 75% with 25% sheep's milk.
3- The third treatment (m3) include 50% camel milk with 50% sheep's milk.
4- The forth treatment (m4) include 25% camel milk with 75% sheep's milk.
5- The fifth treatment (m5) include 100% sheep's milk.

The treatment were storage at (zero,7,15,21 and 30 days).

important estimates

The estimates were took place in storage period (zero,7,15,21 and 30 days) and estimates of acidity, total solids, ash and fat as according to the method mentioned in [15], but protein was according to [16].

Statistical analysis

The resultant data were statistically analyzed for analysis of variance was performed by the SAS general liner methods [17] . Differences were considered significant at P≤0.05. Significant variations were determined by Duncan's multiple range test [18].

RESULT AND DISCUSSION

Effect of treatment on the milk chemical composition.

Table (1) showed significant differences between the treatments, the ratio of total solids where was less in first treatment representing camel milk only where was 11,7% , increased gradually whenever we have added sheep's milk. Where the increased of sheep's milk than that of camel milk gave rise in total solid percentage until we showed the highly percentage in the treatment number 5 representing sheep's milk only which were 17.3%. In other hands the ratio of fat where was less in first treatment representing camel milk only where was 3%, increased gradually whenever we have added sheep's milk until it became 5.2% in the treatment number 5 which representing sheep's milk only, as for the ratio of protein where was less in first treatment which was for camels milk only where was 3.1%, increased gradually whenever we have added sheep's milk until its reach 4.9% in the 5 treatment which used for sheep's milk only the reason of increase in total solids, Fat and protein when increased of sheep's milk compared to camels milk due to increase of total solids, Fat and protein in sheep's milk compared to camel milk comparable to the finding go the [1 , 19].

The ash ratio were uneven between treatment the highly ratio showed in the first treatment representing camels milk only. But the less ratio of ash found in treatment number3 representing the equal mixed from sheep and camels milk (50:50).

Table (1) : Effect of treatment on the milk chemical composition

Milk composition				Ttreatments
Protein%	**Ash%**	**Fat%**	**Total solids%**	
0.592 c±3.1	0.135 a±0.95	0.404 c±3	0.812 c±11.7	**M1**
0.608 bc±3.8	0.122 b±0.68	0.463 c±3.2	0.692 bc±14.1	**M2**
0.497 bc±4	0.120 c±0.5	0.228 bc±3.6	0.785 b±15	**M3**
0.566b±4.4	0.127b±0.72	0.450b±4.1	0.855a±16.5	**M4**
0.716a±4.9	0.109bc±0.61	0.323a±5.2	0.738a±17.3	**M5**

The different characters indicate significant differences between the coefficients (P<0.05).

"M1: Camel's milk(100%) , M2: Camel's milk: sheep's milk (75%: 25%) , M3: Camel's milk: sheep's milk (50%:50%) , M4 : Camel's milk: sheep's milk (25%: 75%) , M5 : Sheep's milk (100%)"

Effect of treatment on the whey got chemical composition.

Table (2) showed significant differences between treatments, the ratio of total solid were uneven between treatments we got at the highest possible level in the first treatment which represents camels milk 100%. Where it reached 5.9% while less ratio in the third treatment which represents a mixture between camel and sheep's milk (50:50) and reached 4.3%, in other hands the ratio of fat in whey got highly ratio in the first treatment which represents camels milk 100% where it reached 1.5% were uneven between other treatments until it's got a less ratio in the treatments number 5 which representing sheep's milk alone where was 0.5% . Reason of highly ratio in fat contents of whey got from cheese made from camel milk is due to its smaller size of fatty pellets in camel's milk in addition to fragility of casein micelles of cheese which makes her go out with whey this reason showed by [1]. Concerning of protein in whey at was the highest percentage we got were 1.1% which showed in 5 treatment representing sheep's milk 100%. The less ratio we got it from first treatment which representing camel's milk only which take ratio of 0.7% , this result was due to the increased protein stability in camel's milk compart to sheep's milk especially stability of α-casein in camel's milk this which showed by [20] .Finally for the ratio of ash in whey the ratio were uneven , the highest ratio were found in second treatment which represents a mixture between camel's milk and sheep's milk (20:75). The ratio were 0.58% while it was the least possible in third treatment which represents camel & sheep's milk (50:50) which rich to 0.38%.

Table (2) : Effect of treatment on the whey got chemical composition

Milk composition				Ttreatments
Protein%	**Ash%**	**Fat%**	**Total % solids**	
0.142c±0.7	0.158a±0.6	0.115a±1.5	0.412b±5.9	**M1**
0.130bc±0.85	0.140a±0.58	0.103a±1.3	0.417b±5	**M2**
0.116b±0.93	0.097b±0.38	0.093bc±0.7	0.318c±4.3	**M3**
0.138a±1	0.117b±0.52	0.112b±0.9	0.365ab±5.3	**M4**
0.127a±1.1	0.121a±0.57	0.085c±0.5	0.427a±5.6	**M5**

The different characters indicate significant differences between the coefficients (P<0.05).

"M1: Camel's milk(100%) , M2: Camel's milk: sheep's milk (75%: 25%) , M3: Camel's milk: sheep's milk (50%:50%) , M4 : Camel's milk: sheep's milk (25%: 75%) , M5 : Sheep's milk (100%)"

Effect of storage period on the protein ratio in cheese made from camel and sheep's milk and the mixture between.

From table (3) note that there were a significant differences between treatment throw storage period . First treatment which represent age of protein were 20.59% in the beginning of manufacturing and their began to decline during storage period at close rates until 21 days. Which arrived to 18.45% . While the delaine was more pronounced at 30 days. Which represent ratio in the beginning of manufacturing 22.24% and their began to decline during storage period until the storage period is reached 21 days. Which the difference was obvious in 30 days of storage period and the ratio were 18.38% , In third treatment which represent 50%camel's milk and 50% sheep's milk where the ratio was in the beginning of manufacturing 23.7% and their began to declare at 30 days of storage period and the ratio were 18.86% . The fourth treatment the ratio were 22.24% in zero time of storage period and reach to 18.07% after storage period 30 days. The ratio were 25.27% in the fifth treatment which represent 100% sheep's milk then it decreased to 20.84% after 30 days of storage period. From this results we showed that the protein ratio were decreased in the increasing of storage period . The difference is obvious after 30 days the reason for the decline is due to hydrolysis of proteins and its transformation to soluble nitrogen compounds [21] . But the difference of protein ratio throw treatment showed that the protein ratio were less in first treatment which represent camel's milk 100% which was 21.59% and increased withe increasing of sheep's milk added until its reach to 25.27% in the fifth treatment which represent content in sheep's milk 100% due to the increased protein content in sheep's milk comparison to camel's milk .

Table (3) : Effect of storage period on the protein ratio in cheese made from camel and sheep's milk and the mixture between

Ttreatments					Storage period (days)
M5	M4	M3	M2	M1	
Means ± SD	Means ± SD	Means ± SD	Means ± SD	Means ± SD	
a0.576±25.27	a0.438±22.24	a0.981±23.7	a0.593±22.24	a1.085±21.59	**Zero**
ab0.756±24.83	a0.727±21.26	ab0.479±22.83	ab0.369±21.36	ab1.085±20.12	**7**
b0.835±24.18	ab0.708±20.96	b0.512±21.92	ab0.889±20.73	a0.952±19.65	**15**
bc0.679±23.81	b0.356±20.15	b0.447±21.46	b0.624±20.19	bc0.414±18.45	**21**
b0.821±20.84	b0.643±18.07	c0.651±18.86	c0.605±18.38	c0.512±16.62	**30**

The different characters indicate significant differences between the coefficients (P<0.05).

"M1: Camel's milk(100%) , M2: Camel's milk: sheep's milk (75%: 25%) , M3: Camel's milk: sheep's milk (50%:50%) , M4 : Camel's milk: sheep's milk (25%: 75%) , M5 : Sheep's milk (100%)"

Effect of storage period on the fat ratio in cheese made from camel and sheep's milk and the mixture between.

Table (4) showed that were a significant differences in the fat ratio between the treatment throw the storage period . The first treatment which representing camel's milk 100% were the ratio 18.51% in the beginning of manufacturing and decline to 13.43% after 30 days of storage period . The second treatment the ratio 19.9% in the beginning of manufacturing and decreased to 14.38% after 30 days of storage the third and further and fifth treatment the ratio of fat were 21.81% , 23.25 and 24.9 % respectively and thin they decreased to 19.79 , 21.74 and 23.11% respectively after 30 days of storage period.

From this result we showed that the fat ratio were decreased in the first treatment which represent camel's milk only this lowest was decreased in the other treatments depended at the ratio of mixture between camel and sheep's milk , the higher the percentage of sheep's milk in the mixture caused decreasing decreasing in fat percentage were low this due to the lowest in fat ratio in cheese made from camel's milk and the smaller of fat globulin in camel's milk which caused draining by whey [22] , also the lowered in fat ratio due to the smaller of casein micelles in cheese made from camel's milk [1] .

Table (4) : Effect of storage period on the fat ratio in cheese made from camel and sheep's milk and the mixture between

Ttreatments					Storage period (days)
M5	M4	M3	M2	M1	
Means ± SD	Means ± SD	Means ± SD	Means ± SD	Means ± SD	
a1.002±24.9	a0.834±23.25	a0.928±21.18	a1.006±19.09	a1.026±18.51	**Zero**
ab0.992±24.26	ab0.664±22.39	a1.084±21.64	ab0.728±17.5	b1.084±16.72	**7**
b1.009±23.77	b0.937±22.3	a0.964±21.52	b0.998±16.61	bc0.968±15.81	**15**
b0.824±23.42	b0.356±21.78	ab0.861±20.03	bc0.834±15.76	bc0.837±14.54	**21**
b1.011±23.11	b1.042±21.74	b0.794±19.79	c0.598±14.38	c0.894±13.43	**30**

The different characters indicate significant differences between the coefficients (P<0.05).
"M1: Camel's milk(100%) , M2: Camel's milk: sheep's milk (75%: 25%) , M3: Camel's milk: sheep's milk (50%:50%) , M4 : Camel's milk: sheep's milk (25%: 75%) , M5 : Sheep's milk (100%)"

Effect of storage period on the ash ratio in cheese made from camel and sheep's milk and the mixture between.

Table (5) showed the percentage of ash in cheese made significant differences between the treatment throw storage , the first treatment which represent cheese made from camel's milk only the ratio of ash was 1.40% in the beginning of manufacturing and then it was increased throw storage period until it reach to 1.76% after 21 days of storage after that were decreased to 1.48% after 30 days of storage .

In the second treatment the ratio of ash were 1.31% in the beginning of manufacturing in the storage period , the ratio were decreased to 1.06% after storage at 30 days , but in the third treatment the ash ratio were 1.73% in the beginning of manufacture after (7 , 15 , 21 , and 30) days of storage was decreased to 1.61 , 1.54 , 1.49 and 1.38% respectively .

The forth treatment which representing cheese mode from camel's milk 25% mixed with 75% sheep's milk contended 1.58% ash in the beginning of manufacturing and then began to decline during 7 and 15 days reached 1.41 & 1.42% respectively , at lost the ash ratio in fifth treatment which representing cheese mod from sheep's milk only was 1.8% in the beginning of manufacturing and then began to decline in the storage period so it got to 1.55% after 30 days of storage , of these results showed ash content in camel's milk great differences comparison with sheep's milk this result due to retention of the largest quantity of total solid and ash in whey got from camel's milk comparison to sheep's milk [7] .

Table (5) : Effect of storage period on the ash ratio in cheese made from camel and sheep's milk and the mixture between

Ttreatments					Storage period (days)
M5	M4	M3	M2	M1	
Means ± SD	Means ± SD	Means ± SD	Means ± SD	Means ± SD	
a1.144±1.80	a0.069±1.58	a0.330±1.73	a0.109±1.31	c0.150±1.40	**Zero**
a0.133±1.74	b0.165±1.41	ab0.052±1.61	a0.092±1.27	bc0.091±1.53	**7**
a0.138±1.70	b0.112±1.42	b0.031±1.54	b0.083±1.19	b0.091±1.53	**15**
a0.099±1.67	a0.218±1.64	bc0.094±1.49	b0.037±1.14	a0.105±1.76	**21**
b0.223±1.55	ab0.168±1.49	c0.067±1.38	c0.101±1.06	bc0.097±1.48	**30**

The different characters indicate significant differences between the coefficients (P<0.05).

"M1: Camel's milk(100%) , M2: Camel's milk: sheep's milk (75%: 25%) , M3: Camel's milk: sheep's milk (50%:50%) , M4 : Camel's milk: sheep's milk (25%: 75%) , M5 : Sheep's milk (100%)"

Effect of storage period on the total solid ratio in cheese made from camel and sheep's milk and the mixture between.

Table (6) showed that there were a significant differences in total solids of cheese manufacturing , the first treatment the ratio of total solid were 42.92% in the beginning of manufacturing and their began to decline throw storage period reaching to 34.61% after 30 days of storage . So in the case in the second , third and forth treatment which represent a mixture of camel and sheep's milk where was the proportion of total solids in the beginning of manufacturing were (44.33 , 44.96 , and 50.34 %) respectively the ratio was then reduced to (36.33 , 41.83 and 43.12 %) respectively after 30 days of storage .

Either for treatment of the fifth was difference few in total solids throw storage period where the ratio was 53.26% in the beginning of manufacturing while the reservoir for 30 days became the ratio was 48.74% . This decline in total solid is due to decline of protein and fat throw storage , the decline in the total solids in cheese made from camel's milk due to the highly total solids in whey [7] .

While the high percentage of total solid in sheep milk cheese due to the high contact of total solids in sheep milk leading to increased yield in the cheese [12 , 23] .

Table (6) : Effect of storage period on the total solid ratio in cheese made from camel and sheep's milk and the mixture between

Ttreatments					Storage period (days)
M5	M4	M3	M2	M1	
Means ± SD	Means ± SD	Means ± SD	Means ± SD	Means ± SD	
a1.106±53.26	a1.001±50.34	a0.612±49.96	a0.781±44.33	a1.162±42.92	**Zero**
a1.013±52.44	ab1.099±47.83	ab1.012±48.12	ab0.834±41.91	ab0.967±40.67	**7**
ab1.034±51.82	b1.028±45.97	b0.894±46.71	b0.792±40.31	b0.894±38.87	**15**
b0.839±49.93	b0.973±45.16	bc1.127±44.52	bc1.005±38.13	b1.056±37.17	**21**
b0.971±48.74	c1.105±43.12	c1.131±41.83	c0.796±36.33	c0.964±34.16	**30**

The different characters indicate significant differences between the coefficients (P<0.05).
"M1: Camel's milk(100%) , M2: Camel's milk: sheep's milk (75%: 25%) , M3: Camel's milk: sheep's milk (50%:50%) , M4 : Camel's milk: sheep's milk (25%: 75%) , M5 : Sheep's milk (100%)"

Effect of storage period on the acidity ratio in cheese made from camel and sheep's milk and the mixture between.

Table (7) showed that there were significant differences in the ratio of acidity in all treatments , while the acidity ratio increased throw storage ,

in first treatment note that the ratio of acidity was 0.77% in the beginning of manufacturing and then it became to 1.35% at 30 days of storage , the same is true for the second , third , fourth and fifth treatments were also at the beginning of manufacturing (0.8 , 0.84 , 1.15 and 1.27%) respectively , while after storage of 30 days the ratio of acidity was increased to (1.53 , 1.65 , 1.8 and 1.92%) respectively .

This increasing in acidity due to the growth of bacteria in cheese throw the storage [24] .

Table (7) : Effect of storage period on the acidity ratio in cheese made from camel and sheep's milk and the mixture between

Ttreatments					Storage period (days)
M5	M4	M3	M2	M1	
Means ± SD	Means ± SD	Means ± SD	Means ± SD	Means ± SD	
d0.163±1.27	d0.025±1.15	d0.084±0.84	c0. 076±0.8	c0.032±0.77	**Zero**
cb0.114±1.65	c0.065±1.5	c0.103±1.3	bc0.086±1.12	c0.032±0.79	**7**
b0.150±1.78	b0.190±1.68	b0.138±1.47	b0.107±1.25	b0.109±0.95	**15**
b0.219±1.75	b0.142±1.62	c0.216±1.33	b0.150±1.18	b0.167±0.95	**21**
a0.225±1.92	a0.132±1.8	a0.155±1.65	a0.196±1.53	a0.0.69±1.35	**30**

The different characters indicate significant differences between the coefficients (P<0.05).

"M1: Camel's milk(100%) , M2: Camel's milk: sheep's milk (75%: 25%) , M3: Camel's milk: sheep's milk (50%:50%) , M4 : Camel's milk: sheep's milk (25%: 75%) , M5 : Sheep's milk (100%)"

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(REFERENCES)

1- Ramet J.P, (2001). The technology of making cheese from camel milk (Camelus dromedarius). FAO Animal Production and Health Paper 101 – 113.

2- Farah, Z. and Ruegg, M. (1991). The creaming properties and size distribution of fat globules in camel milk. Journal of dairy science. 74(9):2901-2904.

3- Farah, Z. and Bachmann, M.R. (1987). Rennet coagulation properties of camel milk. Milchwiss. 42 (11):689- 692.

4- Mohammed M.A; Larsson-Raznikiewicz M. (1989). Separation of camel milk casein fraction and its relation to coagulation properties of fresh milk. Milk. Sci. Int.. 44(5):278-280.

5- Mohamed, M.A., Mursal, A.I. & Larsson-Raznikiewicz, M. (1989). Separation of a camel milk casein fraction and its relation to the

coagulation properties of fresh milk. Milchwissenschaft 44: 278-280.
6- Ellouze, S. and Kamoun, M. (1989). Evolution de la composition du lait de dromadaire en fonction du stade de lactation. CIHEAM Options Méditerranéennes. Série A6: 307-311.
7- Ahmed NAA, El Zubeir IEM (2011) Effect of salt level on some physical and chemical properties and acceptability of camel milk cheese. J.Camelid Sci 4: 40–48.
8- Inayat S, Arain MA, Khaskheli M, Malik AH (2003) Study of the effect of processing on the chemical quality of soft unripened cheese made from camel milk. Pak J Nutr 2: 102-105.
9- El Zubeir IEM. Jabreel MSO (2008) Fresh cheese from camel milk coagulated with Camifloc. International Journal of Dairy Technology 61: 90-95.
10- El Zubeir IEM, Basher MAE, Alameen MH, Mohamme MAS, Shuiep ES (2012) The processing properties, chemical characteristics and acceptability of yoghurt made from non bovine milks. Livestock Research for Rural Development 24.
11- Saad MSA, El Zubeir IEM, Fadel Elseed AMA (2013) Effect of lactoperoxidase enzyme system and storage temperature on the keeping quality of sheep milk. Livestock Research for Rural Development 25.
12- Lopez,C, Dufur E (2001) The composition of the milk fat globule surface alters the structural characteristics of the coagulum. J.Colloid Interf Sci 233: 241-249.
13- Verdier-Metz I, Coulon JB, Pradel P (2001) Relationship between milk fat and protein contents and cheese yield. Anim Res 50: 365–371.
14- Ricki Carroll. Home Cheese Making. 3rd Edition. Storey Publishing,2002.
15- A.O.A.C.(2010).Official Methods of Analysis in:Association of official pnalgtical Chemists Washington,DC.
16- Ling, E. R.(1963). A Text - Book of Dairy Chemistry. Vol.2 ,Practical, 3rded., Champan and Hall, London, England.
17- SAS Version Statistical Analysis System (2001). SAS Institute Inc.Cary NC.
18- Duncan ,D.B. (1955). Multiple range and F.test Biometric,11:42 .

19- Pellegrini O, Remeuf F, Rivemale M, Barillet F (1997) Renneting properties of milk from individual ewes: Influence of genetic and non-genetic variables, and relationship with physicochemical characteristics. J Dairy Res 64: 355–366.
20- Shuiep ES, Giambra IJ, El Zubeir IEM, Erhardt G (2013). Biochemical and molecular characterization of polymorphisms of αs1-casein in Sudanese camel (*Camelus dromedarius*) milk. Int Dairy J 28: 88- 93.
21- Abd El-Salam MH, Alichanidis E, Zerfiridis GK (1994) Cheese: chemistry, physics and microbiology: Domiati and Feta-type cheeses. (2ndedn), Springer-Verlag, USA.
22- Mohamed MA, Larsson-Raznikiewicz M (1990) Hard cheese making from camel milk. Milchwissenschaft 45: 716-718.
23- Othmane MH, Fuentel L, San Primitivo F (2002) Test day milk, composition and udder morphology at West Balkan mountain sheep and their crosses with Chios breed. Bulg J Agric Sci 15: 93-99.
24- Derar AMA, El Zubeir IEM (2013) Evaluation of microbiological quality of white soft cheese manufactured from camel and sheep milk. Ann Food Sci Technol 14: 304-311.