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EFFECT OF TYPE OF MILK ON THE PROPERTIES OF TRADITIONAL FETA CHEESE.

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ABSTRACT

To study the effect of type of milk on the properties of Feta cheese, Feta cheese was processed individually from buffalo's milk, cow's milk and goat's milk. As well admixtures of (cow's + goat's) or (buffalo's + goat's) containing 25, 50 and75% of goat's milk were also processed in to cheese. Chemical, rheological, microbiological and organoleptic analysis of the cheese at various stages of ripening (60 days) were performed. Results showed that buffalo's milk had the shortest renneting clotting time (R.C.T), highest curd tension and lowest value of syneresis while cow's milk had the highest renneting clotting time (R.C.T), lowest curd tension and highest value of syneresis. Obtained results showed also that, fresh cheese made from buffalo's milk had a higher total solid, yield, fat, total protein, salt and ash contents than those from other milks. On the other hand fresh cheese made from cow's milk had a higher soluble nitrogen and acidity than those from other milks. Fresh cheese made from goat's milk had higher total volatile fatty acids (T.V.F.A). During ripening, total solids, fat, soluble nitrogen, salt, ash, T.V.F.A and acidity increased while yield, total protein and pH value decreased in all treatments. Results showed also that, cheese made from cow's and goat's milk (1:1) had the lowest total bacterial count either fresh or ripened compared with other treatments. Also, the cheese made from buffalo's and goat's milk (1:3) had the lowest proteolytic bacterial count either fresh or ripened. The lipolytic bacteria were found in small numbers in fresh cheeses, while during ripening, cheese made from cow's and goat's milk (3:1) had the lowest lipolytic bacterial count. Results showed that moulds and yeasts were not found in all treatments in fresh cheese, while cheese made from buffalo's and goat's milk (3:1) had the highest moulds and yeasts count during storage compared with other treatments. The total bacterial count, proteolytic bacteria, lipolytic bacteria and moulds and yeasts count slightly increased during ripening in all treatments. It was also noticed that the coliform bacteria were not detected either in fresh or ripened cheese. Fresh Feta cheese made from buffalo's milk had a higher scoring points than those from other milks. Results revealed that the addition of goat's milk to buffalo's or cow's milk led to less scoring points since Egyptian taste refuse the goat flavor. Ripening process led to increase the acceptability of Feta cheese made from different treatments.

Keywords: Feta cheese buffalo's , cow's 's, goat's milks .

INTRODUCTION

Feta cheese is a white cheese of high quality, manufactured from sheep’s milk or from a mixture of sheep’s and goat’s milk according to a specific technology, which is matured and stored in brine. It has a salty, slightly acid taste, and pleasant sensory properties that nowadays have a worldwide acceptance. The word ‘feta’ has a special meaning in the Greek language, and it is synonymous with the word ‘slice’ in English, ‘tranche’ in French, ‘pezza’ in Italian, and ‘schnitt’ in German. It has been a significant dairy product in the diet of the Greeks since the time of Homer. The cheese that was made by the Cyclops Polyphemus was undoubtedly the ancestor of

modern Feta, and there are many references proving the Greek origin of this cheese (Anifantakis, 1990, 1998; Anonymous, 1953; Courtine, 1972; Eekhof-Stork, 1976). For many centuries, Feta cheese was known only in the Balkan region. However ,during the 20th century, large Greek communities were established in various countries, mainly in Australia, USA, Canada and Germany, due to mass migration of Greeks, who retained their dietary habits. Moreover, during the last 30 years, new markets for Feta have evolved in the Middle East. Since the available quantities of traditional Feta cheese were not sufficient to meet the demand in different parts of the world, attempts have been made to substitute sheep's milk with cow's milk for the manufacture of Feta-type cheese.

The objective of the present study was to investigate the effect of type of milk on the rheological properties, chemical composition, microbiological properties and sensory evaluation of Feta cheese.

MATERIALS AND METHODS

Fresh buffalo's milk were obtained from Dairy department plant-Faculty of Agriculture- Mansoura University, while fresh cow's and goat's milk used in this study were obtained from El-Serw, Animal Production Research Station.

Type of milk	pH	Acidity %	T.S %	Fat %	Protein %	Lactose %	Ash %
Buffalo milk (B)	6.63	0.17	17.20	6.95	4.13	4.89	0.89
Cow's milk (C)	6.68	0.16	12.16	3.95	3.19	4.51	0.81
Goat milk (G)	6.79	0.14	12.89	4.50	3.24	4.59	0.74

Dansco Mesophilic starter was obtained from Ch. Hansen's laboratories, Denmark. It consists of 6 strains of lactic acid bacteria as follows:

1-*lactococcus lactis subsp. lactis*
2- *lactococcus lactis subsp. cremoris*.
3- *Streptococcus salivarius subsp. thermophilus*
4- *lactobacillus delbrueckii subsp. bulgaricus*.
5- *lactobacillus helveticus*
6- *lactobacillus casei subsp. casei.*

Local commercial animal liquid rennet was obtained from local market. Dry commercial food grade sodium chloride obtained from El-Nasr Saline's Company, Egypt, was used during this investigation.

Feta cheese was processed individually from buffalo's milk (B), cow's milk(C) and goat's milk(G). As well admixtures of (C + G) or (B + G) containing 25, 50 and 75 % of goat's milk were also processed in to cheese.

Feta cheese was made according to Anifantakis (1991), with small modifications concerning the percentage of starter, as well the kind and the percentage of rennet used as follows:

Fig . (1) Flow Chart of Feta Cheese processing

Methods of analysis:-

Total solids ,ash, fat, total protein, and acidity were determined according to Ling (1963) .pH values were measured using laboratory pH meter with glass electrodes pH-meter Jan way 3010 – England as described by (Van Slyke and Price 1979). Lactose values of milk and whey were measured using laboratory milkoscan. The salt content was determined according to Volhard's method as described by Kosikowski (1978). Total

volatile fatty acid was determined by the method described by Kosikowski (1982).

Rheological tests of milk, Rennet clotting time (RCT) was made according to Berridge (1952) and Davis and Whit (1958). While curd tension was determined according to Chandrasekhara *et al* ., (1957). Curd syneresis was followed as given by Mehanna and Mehanna (1989).

The keeping quality of Feta cheese during storage at 5±1˚C was assessed by counting the following microbial groups as recommended in Standard Methods. Total bacterial count (T.C) was counted by using the nutrient agar medium. The plates were incubated at 37 ˚C for 48 hours. Lypolytic bacterial count and proteolytic bacterial count were enumerated as described by Chalmers, (1962). Moulds and yeasts were counted by using potato dextrose agar medium (oxoide) as recommended by the American public Health Association (A.P.H.A) (1978). Coliform bacteria (*E. coil*) were counted by using Macconky agar.

Feta cheese was organoleptically scored according to International Dairy Federation (IDF) (1987). Scores were divided among three main organoleptic characteristics as follows 10 points for appearance 40 points for body and texture and 50 points for flavour.

RESULT AND DISCUSSION

Effect of type of milk on some rheological poetries of milk

The shortest renneting clotting time (RCT) was for buffalo's milk followed by goat's milk and the longest was for cow's milk, which in agreement with (Parkash and Jenness, 1968; Remeuf and Lenoir, 1986). The addition of buffalo's milk to goat's milk reduced the RCT of the blends, while the addition of cow's milk to goat's milk raised the RCT of the blends when compared with goat's milk alone.

It is clear from Table (1) that curd tension of buffalo's milk was the highest one and goat's milk was higher than cow's milk. These results are in agreement with Rao, *et al* (1964) and Abo - EL Naga, (1984).

On the other hand the addition of cow's milk to goat's milk reduced markedly the curd tension of the resultant blends, while the addition of buffalo's milk to goat's milk raised the curd tension of the blends when compared with goat's milk alone.

Curd syneresis was estimated by measuring the volumes of drained whey using cylinders after 10, 30 and 60 minutes. From the same Table admixing different types of milk had pronounced effect on syneresis. Contrary to curd tension curd syneresis of buffalo's milk scored the lowest value (23.59 gm) of whey after 60 minutes, while cow's milk scrod the highest value (33.95 gm). The addition of buffalo's milk to goat's milk decreased the curd syneresis, while the addition of cow's milk to goat's milk increased the curd syneresis, which in agreed with Emara (1990). A multitude of investigations showed that the extent of syneresis depends on factors like the composition of the milk, calcium equilibria, the casein concentration, the fermentation rate, temperature, the gel firmness at cutting time and the surface area of the curd grain (Huber *et al.* 2001 & Piyasena and Chambers 2003).

Effect of type of milk on the yield of Feta cheese:

Table (2) shows the effect of type of milk on the yield of the fresh cheeses and after 2 months of ripening. As it is expected the yield of fresh buffalo's milk cheese was the highest one (21.66 %), the lowest was for cow's milk fresh cheese (17.15 %). Goat's milk cheese recorded (18.30 %). Addition of buffalo's milk to goat's milk raised the yield of the cheese; on the other hand, the addition of cow's milk to goat's milk decreased the yield of the cheese, these results are in agreement with Mallatou**,** *et al* (1994)**.** After two months of ripening at refrigerator (5±1° C), the yield in all treatments were slightly decreased as a result of moisture evaporation, these results are in agreement with Ammar (1999), who reported that cold storage decreased Domiata cheese yield.

Table (2): Effect of type of milk on yield of fresh and ripened cheeses.

Treatments	C	B	G	C+G (1:3)	C+G (1:1)	C+G (3:1)	B+G (1:3)	B+G (1:1)	B+G (3:1)
Yield(%) of fresh cheese	17.15	21.66	18.30	18.10	17.75	17.50	19.50	20.15	21.25
Yield(%)of ripened cheese (60 day)	16.85	21.20	17.95	17.90	17.60	17.25	19.15	19.85	21.00

C: Cow's milk cheese B: Buffalo's milk cheese G: Goat's milk cheese

Chemical composition of drained whey:

Table (3) represents the chemical composition of whey released from different cheese treatments. Acidity values ranged between 0.32 and 0.39 %. This higher acidity is owing to the activity of starter during scalding of the curd. Total solids (T.S) of buffalo's milk whey treatment was the highest of 7.78 % among all treatments, which is due to the higher total solids of buffalo's milk. The lowest T.S (7.54 %) was for cow's milk whey treatment. The total solids (T.S) of goat's milk was slightly higher than cow's milk, which might be due to the higher whey proteins found in goat's milk. Values of fat in whey ranged between 0.32 and 0.65 %. The highest fat content of whey was for buffalo's milk treatment while, the lowest was for cow's milk. It is well known that buffalo's milk fat globules are of the largest size, and the goat's milk had the smallest size globule, which well captured into the net of casein micelles matrix. On the other hand, the highest fat content of buffalo's milk helped the escape of higher percent of fat into the whey, the addition of buffalo's milk to goat's milk led to increase the loss of fat into the whey.

Losses of whey protein ranged between 0.86 and 1.51%. The highest value (1.51%) was for buffalo's milk, which contains the highest protein percentage among other milks. The lowest value (0.86 %) was for cow's milk treatment. Whey resulted from goat's milk cheese contained higher whey protein (0.78%) as compared with cow's milk treatments, since goat's milk had higher whey protein content than cow's milk. The addition of buffalo's milk to goat's milk raised the protein content of whey. Lactose values of whey ranged between 5.20 and 5.30 %. Lactose value of buffalo's milk whey treatment was the highest of 5.30 % among all treatments; the lowest Lactose value was for cow's milk whey treatment (5.20 %).

Table (3): Chemical composition of whey released during Feta cheese making.

Type of whey	pH	Acidity %	TS %	Fat %	Protein %	Lactose %
C	5.9	0.33	7.54	0.33	0.86	5.20
B	5.6	0.37	7.78	0.65	1.51	5.30
G	6.2	0.30	7.61	0.36	0.78	5.22
C+G (1:3)	6.40	0.17	7.59	0.36	1.41	5.21
C+G (1:1)	6.40	0.17	7.60	0.32	1.40	5.25
C+G (3:1)	6.50	0.16	7.53	0.34	1.38	5.30
B+G (1:3)	6.50	0.16	7.65	0.37	1.45	5.24
B+G (1:1)	6.60	0.15	7.76	0.35	1.43	5.27
B+G (3:1)	6.70	0.14	7.80	0.39	1.48	5.28

C: Cow's milk whey B: Buffalo's milk whey G: Goat's milk whey

Effect of type of milk on the chemical composition of Feta cheese

Data in Table (4), show the effect of type of milk on the chemical compounds of the resultant Feta cheese. Results showed that, cheese made from buffalo's milk contained the highest total solids content. On the other hand, the cheese results from cow's milk contained the lowest total solids content. The addition of buffalo's milk to goat's milk raised the total solids of the blend cheese. The addition of cow's milk to goat's milk had no marked effect on TS of the blend milk cheeses. Also, date at the same table indicated that, the total solids contents increased during ripening in all treatments, these results are similar to those reported for industrially made Feta cheese (Katsiari, *et al* 1997).

The fat content of Feta cheese took the same trend of total solids. Data presented in Table (4), indicated that cheese made from buffalo's milk had highest fat content, while cheese made from cow's milk had the lowest value. It could also be observed that fat content increased during ripening of all treatments, this might be due to the increase of the total solids content during ripening. These results are similar to those reported for industrially made Feta cheese (Katsiari, *et al* 1997).

It is clear from Table (4), that the acidity of Feta cheese made from cow's milk was higher than those of Feta cheese made from other different kinds of milk. The addition of cow's milk to goat's milk raised the acidity of the blend milk cheeses. On the other hand the addition of buffalo's milk to goat's milk decreased the acidity of the blend milk cheeses. Results showed also that the acidity increased and the pH value decreased during ripening. This might be due to acid formation during storage, these results are in agreement with Prasad and Alvarez (1999). pH value is necessary for a mature Feta cheese to maintain its good quality during storage (Anifantakis, 1991 b).

Result in Table (4), showed that buffalo's milk cheese had the highest ash content followed by goat's milk cheese .The lowest values was for cow's milk cheeses. Also, the addition of buffalo's milk to goat's milk raised the ash content of the blend milk cheese. On the other hand the addition of cow's milk to goat's milk decreased the ash content of the blend milk cheeses. During ripening ash content increased in all treatments, these results are in agreement with those reported by Sousa, *et al* (2001).

Table (4): Effect of type of milk on chemical composition of Feta cheese during ripening.

Treatments	ripening periods	T.S %	Fat %	T.P %	S.N %	Salt %	Ash %	T.V.F.A	Acidity %	PH
C	Zero	41.40	18.70	15.42	0.35	6.2	7.69	4.40	2.52	4.83
	15days	42.90	18.85	15.25	0.39	6.71	7.88	7.61	2.83	4.69
	30days	43.51	18.92	14.95	0.42	7.35	8.57	9.55	3.05	4.56
	45 days	43.83	18.96	14.80	0.45	7.76	8.60	10.11	3.25	4.54
	60 days	45.11	19.12	14.51	0.49	8.15	8.63	12.90	3.56	4.49
B	Zero	45.80	23.76	16.71	0.30	6.35	7.91	5.20	2.33	4.99
	15days	46.71	23.95	16.50	0.32	6.86	8.11	8.35	2.65	4.83
	30days	47.53	24.19	16.35	0.35	7.25	8.95	9.49	2.90	4.69
	45 days	48.65	24.54	16.08	0.38	8.04	8.99	11.95	3.25	4.62
	60 days	49.91	24.85	15.78	0.44	8.52	9.11	14.75	3.46	4.57
G	Zero	42.16	20.35	15.88	0.33	6.30	7.78	7.40	2.44	4.92
	15days	42.95	20.57	15.53	0.36	6.82	7.99	10.33	2.72	4.78
	30days	43.56	20.99	15.21	0.40	7.20	8.77	14.86	2.95	4.63
	45 days	44.16	21.08	14.97	0.43	7.95	8.90	16.35	3.34	4.59
	60 days	45.97	21.33	14.76	0.47	8.43	8.99	20.97	3.77	4.52
C+G(1:3)	Zero	41.98	20.05	15.79	0.32	6.29	7.80	6.85	2.46	4.90
	15days	42.61	20.33	15.58	0.33	6.81	8.15	7.20	2.75	4.77
	30days	43.24	20.47	15.45	0.36	7.45	8.66	10.89	2.99	4.61
	45 days	44.15	20.68	15.18	0.40	7.98	8.86	13.12	3.38	4.53
	60 days	46.10	20.96	14.85	0.46	8.77	9.10	16.89	3.81	4.51
C+G(1:1)	Zero	41.85	19.69	15.58	0.33	6.27	7.74	5.51	2.50	4.84
	15days	42.46	19.76	15.50	0.35	6.65	7.98	8.15	2.79	4.84
	30days	42.89	19.80	15.34	0.39	7.10	8.50	9.95	3.02	4.74
	45 days	43.29	19.97	15.20	0.43	7.50	8.55	12.00	3.12	4.57
	60 days	44.65	20.48	14.91	0.49	8.41	8.94	14.21	3.50	4.52
C+G(3:1)	Zero	41.62	19.32	15.50	0.35	6.22	7.70	5.65	2.48	4.88
	15days	42.65	19.49	15.41	0.38	6.59	7.90	8.49	2.78	4.76
	30days	43.10	19.60	15.25	0.44	7.15	8.35	10.15	3.00	4.60
	45 days	43.98	19.91	14.98	0.49	7.60	8.60	12.30	3.37	4.54
	60 days	45.10	20.30	14.55	0.55	8.21	8.95	15.96	3.80	4.50
B+G(1:3)	Zero	43.20	21.11	15.96	0.32	6.27	7.83	6.98	2.42	4.95
	15days	44.11	21.29	15.79	0.35	6.61	7.98	10.46	2.73	4.78
	30days	44.65	21.43	15.60	0.39	7.15	8.60	13.87	2.95	4.63
	45 days	45.78	21.68	15.35	0.45	7.84	9.00	16.15	3.34	4.59
	60 days	46.89	21.97	15.10	0.52	9.15	9.51	19.65	3.77	4.52
B+G(1:1)	Zero	43.66	22.10	16.15	0.27	6.25	7.81	5.96	2.40	4.96
	15days	44.38	22.36	15.95	0.30	6.60	8.05	8.88	2.69	4.81
	30days	44.95	22.55	15.80	0.34	6.98	8.70	9.94	2.92	4.68
	45 days	46.05	22.85	15.49	0.37	7.54	9.05	11.86	2.32	4.64
	60 days	47.35	21.30	15.10	0.41	8.15	9.32	16.45	3.72	4.58
B+G(3:1)	Zero	44.99	23.05	16.58	0.30	6.30	7.88	5.45	2.35	4.98
	15days	45.60	23.20	16.40	0.32	6.45	8.10	8.56	2.66	4.81
	30days	45.98	23.42	16.31	0.37	6.91	8.56	11.10	2.92	4.67
	45 days	46.60	23.59	16.05	0.41	7.60	8.94	13.75	3.30	4.65
	60 days	47.95	24.10	15.80	0.46	8.95	9.50	15.10	3.70	4.60

C: Cow's milk cheese B: Buffalo's milk cheese G: Goat's milk cheese
T.VFA= expressed as ml 0.1 Na OH 100 g^{-1} cheese

Result in Table (4), showed that buffalo's milk cheese had the highest salt content followed by goat's milk cheese .The lowest values was for cow's milk cheeses. Also, the addition of buffalo's milk to goat's milk raised the salt

content of the blend milk cheeses. On the other hand the addition of cow's milk to goat's milk decreased the salt content of the blend milk cheese. In all treatments salt content increased during ripening, these results are in agreement with Mallatou, *et al* (1994)**.**

Effect of type of milk on the ripening indices:

It could be noticed from the results in Table (4) that cheese made from buffalo's milk had highest total protein content, while cheese made from cow's milk had the lowest value.

Also, the total protein content decreased during ripening in all treatments, these results are in agreement with Prasad and Alvarez(1999).

Soluble nitrogen, one of the most important indices of ripening which is known as ripening coefficient. Cow's milk cheese had the highest protein hydrolysis (soluble nitrogen) followed by goat's milk cheese .The lowest values was for buffalo's milk cheese. It is well known that buffalo's milk casein micelles are bigger and stronger than those of cow's or goat's casein micelles, and for this reason casein hydrolysis of buffalo's milk was slower than those of cow's and goat's milk. For all treatments as ripening period progressed, the soluble nitrogen values also increased, these results are in agreement with those reported by Sousa, *et al* (2001).

Table (4) shows that the highest values of T.V.F.A were for goat's milk cheeses, while the lowest were for cow's milk cheese and their blends. Results showed that, the values of T.V.F.A of different cheeses during two months of ripening, similar to other ripening indices, as the ripening period progressed, the values of T.V.F.A also increased, similar results were obtained by (El-Neshawy *et al*. 1988) in Domiata cheese with low fat and salt content during storage.

The microbiological properties of Feta cheese

Table (5) represents the microbiological properties of Feta cheese made from different types of milk through 60 days of ripening.

The Feta cheese made from goat's milk showed the highest total bacterial count either fresh or during ripening. On the other hand the cheese made from cow's and goat's milk (1:1) had the lowest total bacterial count either fresh and during ripening. The total bacterial count slightly increased during ripening in all treatments, these results are in agreement with Hamed *et al.,* (1992), stated that the total bacterial count gradually increased during cold storage of Domaita cheese.

It is clear from table (5) the cheese made from buffalo's and goat's milk (1:3) had the lowest proteolytic bacterial count either fresh and ripened compared with other treatments. The count of proteolytic bacteria slightly increased during ripening in all treatments, these results are in agreement with Hamed *et al.,* (1992), stated that the proteolytic bacteria counts gradually increased during cold storage of Domaita cheese.It was also noticed that the lipolytic bacteria were found in small numbers in fresh cheeses, while during ripening, cheese made from cow's and goat's milk (3:1) had the lowest lipolytic bacterial count compared with other treatments. The count of lipolytic bacteria slightly increased during ripening in all treatments, these results are in agreement with Hamed *et al.,* (1992), stated that the lipolytic bacteria counts gradually increased during cold storage of Domaita cheese.

Table (5): The microbial count (cfu/g) of Feta cheese during ripening.

Treatments	ripening periods	T.C bacteria $\times10^6$	Lipolytic bacteria $\times10^6$	Proteolytic bacteria $\times10^6$	Moulds and Yeasts $\times10^6$	Coliform bacteria $\times10^3$
C	Zero	51	2	6	N.D	N.D
	15days	63	5	7	N.D	N.D
	30days	70	6	9	3	N.D
	45 days	79	9	11	4	N.D
	60 days	83	10	14	6	N.D
B	Zero	45	3	4	N.D	N.D
	15days	54	4	6	N.D	N.D
	30days	60	6	6	3	N.D
	45 days	71	7	8	5	N.D
	60 days	84	9	11	6	N.D
G	Zero	60	4	7	N.D	N.D
	15days	70	7	9	N.D	N.D
	30days	80	8	10	2	N.D
	45 days	82	10	13	3	N.D
	60 days	89	11	15	5	N.D
C+G(1:3)	Zero	34	5	6	N.D	N.D
	15days	46	6	6	N.D	N.D
	30days	57	6	9	1	N.D
	45 days	61	8	12	3	N.D
	60 days	68	10	14	5	N.D
C+G(1:1)	Zero	24	3	5	N.D	N.D
	15days	33	3	6	N.D	N.D
	30days	41	5	9	2	N.D
	45 days	49	5	11	3	N.D
	60 days	54	7	15	5	N.D
C+G(3:1)	Zero	39	2	4	N.D	N.D
	15days	49	4	4	N.D	N.D
	30days	62	5	7	3	N.D
	45 days	67	6	9	5	N.D
	60 days	76	8	12	6	N.D
B+G(1:3)	Zero	53	3	3	N.D	N.D
	15days	62	5	4	N.D	N.D
	30days	71	6	6	4	N.D
	45 days	77	8	9	6	N.D
	60 days	86	11	12	9	N.D
B+G(1:1)	Zero	44	3	6	N.D	N.D
	15days	59	5	8	N.D	N.D
	30days	68	6	12	3	N.D
	45 days	73	9	13	5	N.D
	60 days	79	11	15	9	N.D
B+G(3:1)	Zero	51	5	7	N.D	N.D
	15days	67	7	8	N.D	N.D
	30days	81	9	11	5	N.D
	45 days	85	12	13	8	N.D
	60 days	89	14	16	11	N.D

Also, the results showed that moulds and yeasts were not found in all treatments in fresh cheese, while cheese made from buffalo's and goat's milk (3:1) had the highest moulds and yeasts count during ripening compared with other treatments. The count of moulds and yeasts slightly increased during ripening in all treatments, these results are in agreement with Hamed et al.,

(1992). It was also noticed that the *E.coli* were not detected either in fresh cheese or during ripenning. Coliforms and *Escherichia coli* decline after the first day of maturation due to the low pH conditions and lack of sugars (Litopoulou-Tzanetaki *et al*.,1992;Manolopoulou *et al*., 2003; Sarantinopoulos *et al*., 2002; Tzanetakis and Litopoulou-Tzanetaki, 1992).

Effect of type of milk on the sensory evaluation of Feta cheese

Data in Table (6) shows the sensory evaluation of Feta cheese made from different types of milk through 60 days of ripening.

Results showed that Feta cheese made from buffalo's milk was better than Feta cheese made from cow's and goat's milk. Total scoring points were 93 out of 100 for mature buffalo's milk cheese, 86 out of 100 for mature cow's milk cheese and 80 for mature goat's milk cheese. Goat's milk cheese gained the lowest scoring points. Egyptian people refuse the goaty flavor especially for young cheese.

Table (6): Effect of type of milk on sensory evaluation of Feta cheese during ripening.

Treatments	Ripening periods	Appearance (10)	Body and texture (40)	Flavour (50)	Total (100)
C	Zero	6	33	41	80
	30days	7	34	42	83
	60 days	7	35	44	86
B	Zero	8	35	44	87
	30days	8	36	45	89
	60 days	9	37	47	93
G	Zero	6	30	37	73
	30days	6	32	39	77
	60 days	7	33	40	80
C+G(1:3)	Zero	6	30	38	74
	30days	7	31	40	78
	60 days	8	34	40	82
C+G(1:1)	Zero	6	31	40	77
	30days	6	33	41	80
	60 days	7	34	43	84
C+G(3:1)	Zero	5	30	43	78
	30days	5	31	44	80
	60 days	7	33	45	85
B+G(1:3)	Zero	6	31	39	76
	30days	7	33	40	80
	60 days	7	34	42	83
B+G(1:1)	Zero	7	34	41	82
	30days	7	35	43	85
	60 days	8	35	45	88
B+G(3:1)	Zero	7	35	43	85
	30days	8	36	44	88
	60 days	8	37	45	90

The addition buffalo's milk to goat's milk increased the total scoring points of Feta cheese than cow's milk. Total scoring points were 84, 85, 82, 85,90,83 out of 100 for (C + G 1:1) , (C + G 3:1) , (C + G 1:3), (B + G 1:1) , (B + G 3:1) and (B + G 1:3) cheese respectively, these results are in agreement

with Mallatou*, et al.*(1994)**.** Organoleptic tests revealed an increase in the acceptability of Feta cheese during ripening.

CONCLUSION

In conclusion, results obtained in this study indicated that Feta cheese made from buffalo's milk and its blends was better than other treatments. From these results, Feta cheese can be manufactured from buffalo's milk with good properties.

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تأثير نوع اللبن على خواص الجبن الفيتا

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لدراسة تأثير نوع اللبن على خواص الجبن الفيتا تم تصنيع الجبن الفيتا من اللبن الجاموسى والبقري والماعز كل على حده كذلك تم تصنيعها من خلطات من (البقري +الماعز) و (الجاموسى+الماعز) والتي تحتوى على ٢٥ ,٥٠ , ٧٥ % لبن ماعز. وقد تم اجراء الاختبارات الكيميائية والريولوجية والميكروبيولوجية والحسيه على فترات مختلفة من التسوية (٦٠ يوم). وقد بينت النتائج قصر مدة التجبن وزيادة قوة جذب الخثرة وقلة كمية الشرش الناتجة في اللبن الجاموسى. بينما في اللبن البقرى تزداد مدة التجبن و كمية الشرش الناتجة وتقل قوة جذب الخثرة. و بينت النتائج أيضا أن الجبن الفيتا الطازج المصنع من اللبن الجاموسى يحتوى على نسب أعلى من المادة الصلبة الكلية و الدهن و البروتين و الملح والرماد عن الجبن المصنع من الألبان الأخرى بالإضافة إلى زيادة التصافي . بينما الجبن الفيتا الطازج المصنع من اللبن البقرى يحتوى على نسب أعلى من النيتروجين الذائب والحموضة. الجبن الفيتا المصنع من لبن الماعز يحتوى على نسب أعلى من الأحماض الدهنية الطيارة عن الجبن المصنع من الألبان الأخرى. أثناء التخزين يزداد كلا من المادة الصلبة الكلية, الدهن, النيتروجين الذائب, الملح, الرماد, الأحماض الدهنية الطيارة والحموضة بينما يقل كلا من البروتين الكلى ودرجة ال pH والتصافى . و أوضحت النتائج أيضا أن الجبن الفيتا الطازج والمسوى المصنع من اللبن البقرى والماعز بنسبة ١:١ تكون منخفضة في محتواها من العدد الكلى للبكتيريا وذلك بالمقارنة بالمعاملات الأخرى. أيضا الجبن الفيتا الطازج والمسوى المصنع من اللبن الجاموسى والماعز بنسبة ٣:١ تكون منخفضة في محتواها من البكتيريا المحللة للبروتين. البكتيريا المحللة للدهن توجد بأعداد صغيرة فى كل عينات الجبن الطازج بينما الجبن الفيتا المسوى المصنع من اللبن البقرى والماعز بنسبة ١:٣ تكون منخفضة في محتواها من البكتيريا المحللة للدهن. وبينت النتائج أن الفطريات والخمائر لا توجد فى كل عينات الجبن الطازج بينما الجبن الفيتا المسوى المصنع من اللبن الجاموسى والماعز بنسبة ١:٣ كانت مرتفعة في محتواها من الفطريات والخمائر وذلك بالمقارنة بالمعاملات الأخرى. العدد الكلى للبكتيريا وعدد البكتيريا المحللة للبروتين و البكتيريا المحللة للدهن و الفطريات والخمائر تزداد أثناء عملية التسوية.ولوحظ عدم وجود بكتيريا الكوليفورم (*E.Coli*) سواء فى الجبن الطازج أوالمسوى. وقد حصل الجبن الفيتا الطازج المصنع من اللبن الجاموسى على أعلى درجات التقييم الحسي عن الجبن المصنع من الألبان الأخرى. و أوضحت النتائج أن إضافة لبن الماعز إلى اللبن الجاموسى أو البقرى أدت إلى انخفاض درجات التقييم الحسي وذلك لأن المصريين لم يتعودوا على طعم لبن الماعز. عملية التسوية أدت الى زيادة درجات التقييم الحسي للجبن الفيتا فى كل المعاملات.