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QUALITY OF BRINZA LIKE CHEESE MANUFACTURED FROM DIFFERRENT TYPES OF MILK

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ABSTRACT

Brinza like cheese was produced from different types of milk, goat's, buffalo's, cow's and reconstituted milk. The obtained cheeses were stored in 12% brine solution at 7±2°C for two months. Cheese samples were analyzed for chemical composition, microbiological and sensory evaluation when fresh and monthly during storage. The obtained results indicated that moisture content, total protein on dry matter (TP/DM), pH decreased gradually during storage: On the other hand, fat/DM, salt, titratable acidity,soluble nitrogen on total nitrogen (SN/TN), non protein nitrogen on total nitrogen (NPN/TN) and total volatile fatty acids (TVFA) contents in cheese increased significantly up to the second month of storage. Total bacterial, proteolytic bacterial, lipolytic bacterial and moulds as well as yeast counts increased throughout the first month followed by a slight decrease towards the end of storage period. Brinza like cheese made from goat's milk gained high scores in sensory evaluation. There were no significant differences between Brinza like cheese manufactured from goat's milk and other milk types. The study recommended that goat's milk can be used in manufacturing of Brinza like cheese.

Key words: Brinza cheese, goat's milk, brined cheeses.

INTRODUCTION

White-brined cheeses (also known as white-pickled cheeses) are the most popular varieties of cheeses manufactured in North East Mediterranean area and the Balkans (Davis, 1976).

Brinza is a sheep milk cheese made mainly in Slovakia. Brinza cheese is creamy white in appearance, known for its characteristic strong smell and taste. The cheese is white, tangy, crumbly and slightly moist, the fat in DM content is around 45%. It has characteristic odour and flavour with a notable taste of butyric acid. The overall flavour sensation begins slightly mild, then goes strong and finally fades to a salty finish (Kogenev,1967).

The goats number in Egypt valued about 4350000 head according to (FAO, 2013). Value of gross production of whole goat's milk in Egypt has been compiled by multiplying gross production in physical terms by output prices at farm gate about 11 million American dollars (FAO,2012).

Therefore, this work was aimed to study the quality and characteristics of Brinza like cheese made from goat's, buffalo's, cow's milk and reconstituted milk.

MATERIALS AND METHODS

Materials

Fresh buffalo's milk (fat 7.00% - SNF 9.68%) and cow's milk (fat 3.60% - SNF 8.75%) which were used in Brinza cheese making were obtained from the Department of Food Science, Faculty of Agriculture, Zagazig University, Egypt. Fresh goat's milk (fat 4.10% - SNF 9.01%) was obtained from El-Serw Animal Production Research Station, Animal Production Research Institute, Agriculture Research Center, Egypt. Imported Brinza cheese made from ewe's milk was purchased from

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supermarket in Boland and analyzed after 2 months from production during its shelf life. Fat filled milk powder Bonimilk 28/24 Pal/MF (with refined plam oil) was purchased from Importer Marketing and Trading International Co. 48 Thawra St. Dokki, Giza, Egypt. Chemical composition of milk powder is (fat 28% max. – moisture 4% max.–protein (n x 6.38) 24%, approx. –lactose 32% approx.–minerals/ashes 6.50%). Starter culture YF-L812 containing *Streptococcus thermophilus* and *Lactobacillus delbrueckii* subsp. *bulgaricus* (1:1) thermophilic yoghurt culture YO- Flex® freeze- dried lactic acid culture for Direct Vat Set (DVS) Chr. Hansen's Laboratories (Denmark).Microbial rennet powder from *Murcormeihei* (Hannilase) was obtained from Chr. Hansen's Laboratories (Denmark). The yoghurt culture and the microbial rennet powder were obtained from Mifad- Misr Food Additives Company, Badr city, Cairo, Egypt. Rennet powder was diluted with distillated water to a standard rennet solution before using. Analytical grade calcium chloride was obtained from El-Gomhouria Company, Egypt. Commercial food grade salt was obtained from El-Nasr Saline's Company, Egypt.

Methods

Experimental

Brinza like cheese was made from different types of milk being goat's, buffalo's, cow's milk and reconstituted milk. Fat filled milk powder was reconstituted to 12.50% total solids in water (30°C) and mildly agitated by only gentle mechanical stirring to form a homogeneous reconstituted milk. All cheese milk types were standardized to 3.5% fat using milk separator.

Cheese making

Each milk was heated at 70°C for 15 sec., cooled to 40°C. Immediately added 0.02% $CaCl_2$ solution and then 2% lactic acid starter culture was added to the milk 30 min before adding the rennet. Cheese was produced according to Kogenev (1967) and pickled in 12% brine solution in plastic jars at refrigerator temperature (7±2°C) for 2 months. Cheese samples were analyzed when fresh, after one month and two months of storage period.

Microbiological examination

Total bacterial count was determined using plate count agar according to Houghtby *et al.* (1992). Proteolytic bacterial counts were determined using skim milk agar as described by Frank *et al.* (1992). Lipolytic bacterial counts were determined according to the method described by Luk (1981). Mould and yeast counts were enumerated according to Marshall (1992).

Chemical analyses

Moisture contents, pH value and nitrogen fractions (TN, SN and NPN) were determined according to AOAC (2000). The Gerber method was used to determine fat content of milk (IDF, 1991).The modifications suggested by Hefnawy (1988) were applied during determination of fat in reconstituted milk cheese because it contains refined palm oil. The titratable acidity was determined according to Ling (1963). Salt content was determined according the method described by Reddy and Marth (1993). Total volatile fatty acids (TVFA) were determined as described by Kosikowski (1978) and expressed as ml of 0.1 N NaOH/100 g cheese. Actual cheese yield was determined by dividing the weight of cheese by the weight of milk used to make cheese, multiplied by100.

Gas chromatographic (GC) analysis of free fatty acids (FFA)

Free fatty acids were extracted by the method described in AOAC (2000). The methyl esters were prepared by weight 10 mg sample in a 2 ml test tube (with screw cap). The sample was dissolved in1ml hexane. Then 10 ml of 2N potassium hydroxide in methanol (11.2 g in 100ml) was added. The tube was closed and vortex for 30 seconds. The analysis was carried out by gas chromatography Ultra trace GC DSQ (Thermo scientific USA). TR-FAMe capillary column (Thermo scientific USA) (30 m length 0.22mm ID 0.25 micron thickness). For analysis fatty acid methyl esters, Cis/trans isomers, 70% cyanopropyl polysil phenylene siloxane was used. Helium was employed as carrier gas, with constant flow 0.8ml/min. The temperature of injector was set at 200°C. The injection volume of 1 µl was used. The operating condition were as follow: oven temperature was held at 40°C

for 1 min and then increased by 10°C/min to 180°C and held for 2min increased again by 4°C/min to 210°C and held for 3 min., increased again to 250 at 10°C /min and finally isotherm at 250°C for 10 min. Scan mode was full scanning mass 50-650. Mass detector was used. Results were expressed as percent of relative area (Dabbou *et al.*, 2009).

Organoleptic properties

Cheese was organoleptically evaluated when fresh and after 1, 2 months of storage at the refrigerator temperature 7±2°C by staff members of Food Science Department, Faculty of Agriculture, Zagazig University. The panel scores for appearance (10), body and texture (40) and flavour (50) according to Scott (1981).

Statistical Analysis

The obtained data was analyzed by simple one way classification (Snedecor and Cochran, 1982) using Statistical Package for Social Studies (SPSS) software (SPSS, 1998) system. Significant differences were determined by Duncan's Multiple Range test (Duncan, 1955).

RESULTS AND DISCUSSION

Actual Yield of Cheese

Cheese yield is of basic importance to cheese manufacturers as slight differences in yield translate to large sums of money or profit, especially for the small goat milk cheese makers. Results of cheese yield are listed in Table 1. Goat's cheese had no significant difference at $P<0.05$ with cow's cheese but buffalo's cheese scored the highest actual yield. While the reconstituted milk cheese showed the lowest yield. However, there were high significance differences ($p<0.01$) in the yield of cheese made by using buffalo's milk and other treatments and that may be due to its high content of total solids compared with other milk types .

Gross Chemical Composition

Moisture content

The moisture content of Brinza like cheese made from different types of milk are presented in Tables 1. It could be observed that there were slight differences in cheeses moisture contents. Moisture contents decreased gradually up to the end of the storage period in all cheese samples. These results are in agreement with those of Omar and El-Zayat (1987). A gradual decrease in moisture content was observed during pickling. This could be due to the biochemical changes and acidity development. Also, the decrease in moisture content of cheeses during the first period of ripening may be due to the penetration of salt into the cheese and synersis which occurred as a result of decreasing pH. Similar results were obtained by (Abd El-salam *et al.*, 1993; Salem *et al.*, 2010 as well as Hamad and Ismail, 2012). The moisture contents of Brinza like cheese made from different types of milk showed significant variations ($p<0.05$) with cheese made from reconstituted milk in all ripening periods. There were no significant differences at ($P<0.05$) between buffalo's, goat's and cow's Brinza like cheese in all storage periods.

Protein content

The protein content (on dry matter basis) of Brinza like cheese made from different types of milk are shown in Table 1. TP/DM content of cheese from all treatments decreased with the advanced of storage period. This could be due to protein degradation, partial exclusion, and formation of water soluble components subsequent to their losses in pickling solution. Magakyan and Stepanyan (1962) stated that 10-15% of protein breakdown products were lost in brine during storage and ripening of brined cheese and this decreasing in TP/DM due to the proteolytic activity. Mladenov (1973) used brine solution containing 10-12% salt in cheese storage and found that contents of protein degradation products increased during storage period. Talib *et al.* (2009) reported that decrease in protein content during pickling as a result of protein degradation leading to the formation of water soluble compound and some of which lost in the leading to the formation of water soluble compound and some of which lost in the pickling solution leading to increase of nitrogen content in whey.

Fat content

With respect to Fat/DM content in Brinza like cheese made from different types of milk, it could be noticed that there were no significant differences in fat/DM contents of cheese made from buffalo's, goat's and cow's milk in fresh cheese. However, Brinza like cheese made from reconstituted milk had significant lower fat/DM content in all ripening periods (Table 1).

Table 1. Gross chemical composition of Brinza like cheese made from different types of milk during storage for two months at 7±2°C

Parameter	Cheese age	Imported cheese	Brinza like cheese made from				F test
			Goat's milk	Buffalo's milk	Cow's milk	Reconstituted milk	
Moisture (%)	Fresh	--------	62.97^{a}	62.02^{a}	63.33^{a}	58.57^{b}	**
	1 month	--------	60.23^{a}	59.55^{a}	59.88^{a}	57.23^{b}	*
	2 months	59.73^{a}	59.55^{a}	59.03^{a}	59.72^{a}	56.94^{b}	**
Protein on dry matter (%)	Fresh	--------	42.92^{a}	43.78^{a}	41.44^{b}	40.20^{b}	**
	1 month	--------	41.99^{a}	42.29^{a}	40.97^{b}	39.75^{c}	**
	2 months	42.23^{a}	41.15^{a}	41.73^{a}	40.58^{ab}	39.37^{b}	*
Fat on dry matter (%)	Fresh	--------	39.97^{a}	40.56^{a}	40.33^{a}	37.71^{b}	**
	1 month	--------	41.69^{a}	42.72^{a}	42.37^{a}	39.75^{b}	**
	2 months	49.30^{a}	43.43^{c}	44.77^{b}	44.69^{b}	41.8^{d}	**
Salt (Nacl) (%)	Fresh	--------	3.26	3.43	3.30	3.19	NS
	1 month	--------	5.35	5.61	5.26	5.46	NS
	2 months	3.60^{c}	5.70^{ab}	5.93^{a}	5.52^{b}	5.77^{ab}	**
Acidity (as lactic acid) (%)	Fresh	--------	0.35	0.32	0.35	0.30	NS
	1 month	--------	0.77	0.75	0.76	0.72	NS
	2 months	1.30^{a}	0.95^{b}	1.00^{b}	0.92^{b}	0.90^{b}	**
pH value	Fresh	--------	5.31	5.54	5.37	5.65	NS
	1 month	--------	5.11^{b}	5.30^{ab}	5.18^{b}	5.39^{a}	*
	2 months	4.38^{b}	4.88^{a}	4.83^{a}	5.00^{a}	5.05^{a}	**
Actual yield (%)	Fresh	--------	26.84^{b}	30.31^{a}	26.33^{b}	22.00^{c}	**

Means of triplicate followed by the same superscript are not significantly different at P<0.05
NS = Not significant (P>0.05) * = Significant (P<0.05) ** = High significant (P<0.01)

Table 2. Some ripening indices of Brinza like cheese made from different types of milk during storage for two months at 7±2°C

Parameter	Cheese age	Imported cheese	Brinza like cheese made from				F test
			Goat's milk	Buffalo's milk	Cow's milk	Reconstituted milk	
Soluble nitrogen SN/ TN	Fresh	--------	15.55^{a}	13.33^{b}	12.82^{b}	14.72^{a}	**
	1 month	--------	19.92^{a}	17.07^{c}	16.94^{c}	19.42^{b}	**
	2 month	24.20^{a}	23.75^{a}	18.66^{d}	23.05^{b}	20.89^{c}	**
Non protein nitrogen NPN/ TN	Fresh	--------	3.36^{a}	2.50^{b}	2.14^{c}	3.55^{a}	**
	1 month	--------	7.32^{b}	4.47^{d}	5.79^{c}	8.25^{a}	**
	2 months	9.75^{b}	10.73^{a}	7.46^{d}	8.59^{c}	9.33^{b,c}	**
Total volatile fatty acids (TVFA) (ml 0.1N NaOH/100)	Fresh	--------	10.95^{a}	9.2^{b}	9.5^{b}	7.33^{c}	**
	1 month	--------	18.35^{a}	14.25^{b}	12.5^{c}	12.25^{c}	**
	2 months	30.35^{a}	28.25^{a}	19.25^{c}	22.00^{b}	17.56^{c}	**

Means of triplicate followed by the same superscript are not significantly different at P<0.05
NS = Not significant (P>0.05) * = Significant (P<0.05) ** = High significant (P<0.01)

Fat/DM content in cheeses increased up to the second month of storage. The increase in fat content might be due to the decrease in moisture content and consequently increasing the total solids and/or attributed to the decrease in solids-not fat content as a result of protein degradation and its partial loss in brine solution during ripening as reported by Fayed (1982). Similar results were reported by El-Sheikh *et al.* (2001). Ismail and Osman (2004) and Desouky and El-Shaer (2014) illustrated that Fat/ DM contents of Domiati cheese made from goat's milk treatments, significantly increased as ripening period progress reaching maximum values at the end of the ripening period.

Salt content

All Brinza like cheese samples had no significant differences in salt contents of fresh cheese and after one month of storage. Meanwhile after two months of storage, Brinza like cheese made from buffalo's milk scored the highest salt contents. Imported Brinza cheese made from ewe's milk had significant the lowest salt content compared with other cheese samples.

Present results illustrated that salt contents of Brinza like cheese increased after two months. These results are in agreement with those reported by Akın *et al.* (2003) who found that salt contents in white pickled cheese increased during the ripening period because of diffusion of salt from the surfaces into the cheese.

Titratable acidity (TA%) and pH value

The changes in pH value of cheese followed an opposite trend to change in titratable acidity. Data in Table 1 shows that pH value gradually decreased during storage this may be due to lactic acid formation from residual lactose in cheese and the growth and activity of cheese microflora (Ayyad, 2003). The cheese acidity increased gradually during storage period suggesting protein degradation during storage in all treatments in accordance with Salama *et al.* (1982), Ahmed and Abd El-Razik (1998).

Ripening Indices of Brinza Like Cheese

Protein breakdown

Soluble nitrogen contents (as a percentage of total nitrogen, SN/TN (%) and NPN/TN (%) of Brinza like cheese samples during storage are shown in Table 2.The goat's and reconstituted milk cheese had significant ($P>0.05$) higher SN/TN% and NPN/TN% compared with other treatments in fresh cheese. Moreover the goat's Brinza like cheese showed significantly higher rate of proteolysis than other treatments at the end of the storage period. Brinza like cheese made from buffalo's milk scored the lowest significant rate.

The increase in soluble nitrogen contents in all cheese samples throughout storage period may be due to the breakdown of protein occurred by proteolysis.

SN/TN and NPN/TN contents in all cheese samples increased with the progress of the ripening period. Similar results were found by Ismail *et al.* (2010).

Total volatile fatty acids (TVFA)

Total volatile fatty acids (TVFA) content of the cheese samples were increased throughout the ripening time in all cheese samples. These results are in agreement with the results reported by El-Shibiny *et al.* (1974) for Domiati cheese. Goat's milk cheese had the highest level of TVFA when fresh (10.95) and increased after 2 months to (28.25) ml 0.1N NaoH/100 g of cheese. The corresponding value in cow's milk cheese was (9.50 and 22.00) when fresh and after two months respectively. Reconstituted milk cheese showed the lowest level of TVFA (7.33 and 17.56) ml 0.1N and NaoH/100 g of cheese. These results could be explained on the basis that goat's milk fat contains higher levels of short chain fatty acids than cow's and buffalo's milk. It could be noticed that the level of TVFA contents of cheese from different treatments increased gradually during pickling, similar results were obtained by Aly *et al.* (1996).

Patterns of free fatty acids in ripened Brinza like cheese

Lipids in foods may undergo hydrolytic or oxidative degradation. However, in cheese, oxidative changes are very limited due to the low oxidation/reduction potential, about −250 mV (McSweeney and Sousa, 2000) and (Collins *et al.*, 2003). However, triglycerides in all cheese varieties undergo hydrolysis by the action of

endogenous and/or exogenous lipases, which resulted in the liberation of fatty acids in cheese during ripening. The triglycerides of ruminant milk fat are rich in short-chain fatty acids, that when liberated, have low flavour thresholds that contribute significantly to the flavour of many cheese varieties. Lipolytic agents in cheese generally originate from the milk, the coagulant (in the case of rennet paste) and the cheese microflora (starter, nonstarter and adjunct microorganisms). Moreover, goat's milk is characteristic for the presence of small fat globules with an easily oxidizable weaker membrane. The milk fat contain a higher percentage of short-chain FA, such as caproic, caprylic, and capric acids, which give a typical flavour characteristic of goat's milk cheese (Park, 2001).

The results listed in Table 3 show that the patterns of the free fatty acids extracted from Brinza like cheese made from; goat's, cow's, buffalo's and reconstituted milk compared with the ripened imported Brinza cheese. The per cent of volatile fatty acids in the imported Brinza cheese was the highest followed by goat's milk Brinza like cheese then cow's milk Brinza like cheese followed by buffalo's milk Brinza like cheese. Reconstituted milk Brinza like cheese had the lowest level of volatile fatty acids.

Goat's milk Brinza like cheese had the highest caproic ($C_{6:0}$) and caprylic ($C_{8:0}$) acids. This may be due to the reason of goaty (papery) flavour of this cheese. Imported cheese had the highest content of myristic acid and scored higher content in TVFA then goat's milk Brinza like cheese, cow's milk Brinza like cheese and reconstituted milk Brinza like cheese. Reconstituted milk Brinza like cheese had the highest level of palmitic acid and also its had the highest level of oleic acid. This may be due to its structure which contain refined palm oil.

Microbial Examination

Total bacterial count

Differences in total bacterial counts of cheese made from different types of milk are presented in Table 4. The obtained results indicated that total bacterial count increased throughout the first month followed by a slight decrease towards the end of storage period. The general trend of obtained results agree with those reported by Metwally (1995). The significant high counts of total bacteria were found in fresh goat's cheese.

Proteolytic bacterial count

Table 4 shows the differences in proteolytic bacterial counts of Brinza like cheese. Data showed that there were significant differences in all treatments. Proteolytic bacterial counts increased gradually in all treatments up to the first month of storage period followed by a slight decrease towards the end of the storage period. The obtained data showed that the goat's and buffalo's milk cheeses had the highest proteolytic bacterial count in all storage periods. Similar results were stated by El-Zayat and Omar (1985).

Lipolytic bacterial count

Table 4 shows the differences in lipolytic bacterial counts of Brinza like cheese. Data showed that the Lipolytic bacterial counts increased gradually in all treatments up to the first month of storage period followed by a slight decrease towards the end of the storage period.

Mould and yeast counts

The differences in mould and yeast counts of Brinza like cheese are shown in Tables 4. The obtained data showed that mould and yeast counts increased gradually in all treatments up to the first month of storage period followed by a slight decrease towards the end of storage period. The Brinza like cheese made from reconstituted milk scored the highest counts after two months of storage.

Sensory evaluation of Brinza like cheese

Flavour is the sensation produced by a material taken in the mouth, perceived principally by the senses of taste and smell, and also by the general pain, tactile, and temperature receptors in the mouth. Flavour also denotes the sum of the characteristics of the material which produces that sensation.

The mean sensory scores for appearance, flavour, and body and texture of Brinza like cheese samples are presented in Table 5. After two months of storage goat's, buffalo's and cow's Brinza like cheese gained the highest total scores with no significant differences among them.

Table 3. Free fatty acids (FFA% as relative area percentage) of two months Brinza like cheese made from different types of milk

Fatty acid			Brinza like cheese made from				Imported cheese
			Goat's milk	Buffalo's milk	Cow's milk	Reconstituted milk	
Saturated fatty acid	Volatile fatty acids	Butyric ($C_{4:0}$)	2.18	3.00	2.60	0.81	3.92
		Valeric ($C_{5:0}$)	-	0.01	-	0.02	0.01
		Caproic ($C_{6:0}$)	2.94	1.86	1.80	1.35	2.78
		Caprylic ($C_{8:0}$)	2.66	1.02	1.06	0.43	2.65
		Capric ($C_{10:0}$)	8.98	2.35	3.56	2.30	9.50
	Total volatile fatty acids		16.76	8.24	9.02	4.91	18.86
	Non volatile fatty acids	Lauric ($C_{12:0}$)	3.04	1.71	2.80	1.52	4.96
		Myristic ($C_{14:0}$)	11.11	9.60	10.50	5.88	12.65
		Pentadecanoic ($C_{15:0}$)	2.15	2.70	2.63	1.05	-
		Palmitic ($C_{16:0}$)	21.49	30.40	24.29	37.64	23.55
		Margaric ($C_{17:0}$)	1.47	3.42	1.92	1.04	Trace
		Stearic ($C_{18:0}$)	11.38	10.18	13.86	7.15	9.22
		Arachidic ($C_{20:0}$)	Trace	0.10	0.05	0.26	-
		Behenic ($C_{22:0}$)	0.16	0.015	0.10	0.02	-
		Lignoceric ($C_{24:0}$)	0.06	0.14	0.07	0.35	Trace
	Total non volatile fatty acids		49.86	56.66	56.23	54.91	50.38
Total saturated fatty acid			66.62	64.90	65.25	59.82	69.24
Unsaturated fatty acid	(MUSFA)	Palmitoleic ($C_{16:1}$)	2.81	3.52	2.34	1.17	3.40
		Oleic ($C_{18:1}$)	27.67	27.88	28.91	32.23	26.45
		Erucic acid ($C_{22:1}$)	-	0.07	0.03	0.14	0.11
	(PUSFA)	Linoleic($C_{18:2}$)	2.75	2.65	2.50	6.27	2.15
		Linolenic($C_{18:3}$)	-	0.89	0.88	0.26	1.50
		Arachidonic($C_{20:4}$)	0.14	0.19	0.09	0.11	0.15
Total unsaturated fatty acid			33.38	35.10	34.75	40.18	33.46
Total of FFA			100	100	100	100	100

MUSFA = Mono Unsaturated fatty acid PUSFA = Poly Unsaturated fatty acid

Table 4. Microbiological examination of Brinza like cheese made from different types of milk (Log cfu /g)

Parameter	Cheese age	Brinza like cheese made from				F test
		Goat's milk cheese	Buffalo's milk	Cow's milk	Reconstituted milk	
Total bacterial counts	Fresh	8.29^{a}	8.16^{ab}	8.04^{bc}	7.89^{c}	**
	1 month	8.44	8.32	8.35	8.29	NS
	2 months	7.95	8.05	7.90	8.00	NS
Proteolytic bacterial counts	Fresh	4.84^{a}	4.68^{a}	4.41^{b}	4.34^{b}	**
	1 month	5.62^{a}	5.57^{a}	5.33^{b}	5.00^{c}	**
	2 months	4.21^{a}	4.17^{a}	3.96^{b}	3.88^{b}	**
Lipolytic bacterial counts	Fresh	4.14	3.90	3.98	4.05	NS
	1 month	4.49	4.41	4.34	4.48	NS
	2 months	3.86^{a}	3.66^{b}	3.56^{b}	3.66^{b}	**
Total mould and Yeast counts	Fresh	3.85	3.86	3.88	3.95	NS
	1 month	4.49	4.41	4.36	4.57	NS
	2 months	3.28^{ab}	3.19^{b}	3.16^{b}	3.40^{a}	*

Means of triplicate followed by the same superscript are not significantly different at P<0.05
NS = Not significant (P>0.05) * = Significant (P<0.05) ** = High significant (P<0.01)

Table 5. Organoleptic properties of Brinza like cheese made from different types of milk

Cheese age	Parameter	Brinza like cheese made from				F test
		Goat's milk	Buffalo's milk	Cow's milk	Reconstituted milk	
fresh	Appearance (10)	8^{b}	9^{a}	9^{a}	7^{c}	**
	Body and texture (40)	37^{a}	37^{a}	36^{a}	34^{b}	**
	Flavour (50)	45^{a}	44^{ab}	46^{a}	42^{b}	*
	Total (100)	90^{ab}	89^{ab}	92^{a}	83^{c}	**
1 month	Appearance (10)	9^{a}	9^{a}	9^{a}	8^{b}	**
	Body and texture (40)	37	37	37	36	NS
	Flavour (50)	47^{a}	45^{b}	47^{a}	43^{c}	**
	Total (100)	93^{a}	91^{a}	93^{a}	87^{b}	**
2 months	Appearance (10)	9^{a}	9^{a}	9^{a}	8^{b}	**
	Body and texture (40)	38^{a}	37^{ab}	38^{a}	36^{b}	*
	Flavour (50)	48^{a}	47^{a}	48^{a}	44^{b}	**
	Total (100)	95^{a}	93^{a}	95^{a}	88^{b}	**

Means of triplicate followed by the same superscript are not significantly different at P<0.05
NS= not significant (P>0.05) * = Significant (P<0.05) ** = High significant (P<0.01)

On the other hand, cheese made from reconstituted milk gained the lowest total scores.

From the previous results, it can be conclusively stated that the goat's milk constitutes make it an interest food and the resultant cheese had a good body and texture (soft, smooth and lubricity texture) and pleasant creamy goaty flavour.

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جـــــودة الجبـن شـــــبيه البـرنـزا المصنـع باسـتخـدام ألبـــان مختلفـــة

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جبن البرنزا هو جبن أبيض مملح يتم إنتاجه في منطقة حوض البحر الأبيض المتوسط والبلقان، تم إنتاج جبن شبيه بالبرنزا من أنواع مختلفة من الحليب (حليب الماعز، الجاموس، البقر والحليب المعاد تركيبه)، تم تخزين الجبن الناتج في محلول ملحي ١٢% على درجة حرارة ٧ ± ٢م لمدة شهرين، وقد تم تحليل عينات الجبن لدراسة التركيب الكيميائي، الميكروبيولوجي والتقييم الحسي وهي طازجة، بعد شهر وشهرين من التخزين، وأشارت النتائج أن محتوى الرطوبة، البروتين منسوبا للمادة الجافة (TP/DM) و pH انخفضت تدريجياً حتى نهاية التخزين، أما الدهن منسوبا للمادة الجافة (Fat/DM)، الملح، الحموضة الكلية TA(%)، النيتروجين الذائب في الماء منسوبا للنيتروجين الكلي (SN/TN)، النيتروجين غير البروتيني منسوبا إلى النيتروجين الكلي(NPN/TN) والأحماض الدهنية الطيارة الكلية (TVFA) في الجبن تزيد بشكل كبير حتى الشهر الثاني من التخزين، وعند دراسة ميكروبيولوجيا عينات الجبن تحت الدراسة أظهرت النتائج أن العدد الكلى للبكتيريا (TPC)، البكتريا المحللة للبروتين (PPC) ، والبكتيريا المحللة للدهن (LPC) وأعداد الفطريات والخمائر زادت خلال الشهر الأول من التخزين وتلي ذلك انخفاض طفيف في نهاية فترة التخزين، وأوضحت النتائج أن الجبن الشبيه بالبرنزا المصنع من حليب الماعز سجلت درجات عالية في التقييم الحسي وأوضحت النتائج أنه لا توجد فروق معنوية بين الجبن الشبيه بالبرنزا المصنعة من حليب الماعز والألبان الأخرى وأوصت النتائج انه يمكن استخدام حليب الماعز في تصنيع الجبن الشبيه بالبرنزا.

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