SOME FACTORS AFFECTING "BRIE" LIKE CHEESE PROPERTIES Essawy, E. A. Y.

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ABSTRACT

Effect of salting methods in manufacturing "Brie" like cheese from buffaloes, cows and concentrated milk by ultrafiltration were investigated. "Brie" like cheeses were manufactured from buffaloes milk and UF buffaloes and cows milk, while control was made from cows[,] milk by traditional method. All cheeses were ripened for 28 days at 10C° and 90% relative humidity. Cheese samples were analyzed fresh and weakly for chemical and microbiological analysis, texture profile and organoleptic properties. The results showed that the moisture contents of fresh UF "Brie" like cheese was higher than those of control "Brie" like cheese. On the other hand, protein/ DM and fat/DM content of UF "Brie" like cheese were higher than those of control cheese. pH increased faster in the control "Brie" like cheese and dry or brine salted "Brie" like cheese than UF "Brie" like cheese which showed high ripening indices. On the other hand, cheese made by dry salting had soluble nitrogen, non protein nitrogen, amino acid nitrogen (as percentage of total nitrogen), soluble tyrosine, soluble tryptophan, total volatile fatty acids and total carbonyl compounds ratios higher than those of brine salted cheese. Buffaloes milk cheese showed the highest hardness, cohesiveness, springiness, gumminess and chewiness value than those of cows milk cheeses, UF "Brie" like cheese and brine salted showed the lowest texture profile analysis than those of control "Brie" like cheese. UF (cows and buffaloes) "Brie" like cheese was lower in microbial (total bacterial counts, proteolytic bacterial counts, lipolytic bacterial counts and yeast & mould counts counts) than those of control "Brie" like cheese. Also, cheese made by brine salted had total bacterial counts, proteolytic bacterial counts, lipolytic bacterial counts and mould & yeast counts higher than those of dry salted. Concerning body & texture it was noticed that UF buffaloes, milk cheese (brine salted) showed firm body and firmer texture and typical "Brie" like cheese made from cows milk by the dry salting methods.

Keyword: Brie cheese, Ultrafiltration, Texture profile analysis.

INTRODUCTION

Brie cheese is a soft type cheese consumed usually ripened and it is the queen of cheeses in France. It was originated the 15th century and its production was limited in France for a long time but in recent years many countries tried to produce such cheese. Brie cheese is characterized by the presence of *Penicillium candidium* or *P. caseicaolum* on the surface of cheese. This gives this cheese type a different appearance. Meanwhile, the high biochemical activities of *P. caseicaolum* produces very specific aroma and texture properties (Banks 1995).

Its well recognized that buffaloes milk represents a large proportion of the fresh milk supply in Egypt. The nature of casein micelles and fat globules of milk is associated with speeder rate of rennet coagulation, higher rate of syneresis, more firm and dry curd with higher rheological properties compared with cows milk (Kfoury *et al.*, 1989). During ripening of cheese, the consistency changes in Brie cheese as softening process starts immediately below the rind and proceeds into the medal of the cheese. The cheeses can became so soft that it is impossible to measure the consistency by uniaxial compression (Molander *et al.* 1990).

Because of softening and texture development parallels with mould growth during usual ripening of mould surface-ripened cheese, it has been assumed by most in the past that proteolytic enzymes elaborated by penicillium and other ripening microflora cause the texture alterations in these cheeses (Knop and Peters 1971 and Lenior 1970, 1984).

UF surface mould ripened cheese should also be comparatively easy to develop since the softening of the interior of the traditional product depends mainly upon the migration of lactic acid to the surface and consequent rise in pH. This softening means that the presence of whey proteins is less likely to have significant effect on the texture of the cheese. In addition, there is migration of minerals from the interior of Camembert or Brie to the surface during ripening (Le Grat *et al.*, 1993). This may explain why it has been found so essential to control the mineral content of the retentate in the manufacture of this type of cheese (Lelievre and Lawrence 1988).

This paper relates the results of the possibility of making "Brie" like cheese under the Egyptian conditions from buffaloes, cows milk and their retentate as affected by salting methods.

MATERIALS AND METHODS

Materials:

Fresh buffaloes and cows milk were obtained from Food Technology Research Institute. Retentate was prepared at Dept. of Dairy Technology, Animal Production Res. Institute Dokki, Cairo, Egypt. Rennet powder (Hanelase) was obtained from Chr. Hansen's Lab., Denmark.

Starter cultures

Mesophilic multiple-species DL-culture DL-Mix M FZ 2-22 (MK); contain *Lactococcus lactis* subsp *lactis*, *Lactococcus lactis* subsp *cremoris*, *Lactococcus lactis* subsp *lactis biovr. diacetylactis* and *Leuconstoc mesenteroides* subsp *cremoris*. *Penicillium candidum* were obtained from IP Ingredient GmbH, Germany.

Methods of analysis:

Preparation of the experimental starter culture:

Freeze dried cultures were directly added to the vat; except *P. candidum* was in liquid culture of (0.005-0.01% of milk) (Engel *et al.*, 2001 a,b).

Experimental procedures

Four treatments of "Brie" like cheese were made by conventional method as reported by Scott (1981). Each treatment was made from 10kg milk or 5kg retentate as follows:

- T1 : Cheese made from cows[,] milk (control)
- T2 : Cheese made from cows milk retentate
- T3 : Cheese made from buffaloes, milk

T4 : Cheese made from buffaloes, milk retentate

Resultant cheese were dry salted on both flat surfaces (3% of their weigh) or brine salted (in saturated NaCl, solution, pH 5-5.3) for 1 hr at 14°C, and then drained, after 2 hours cheese was incubated at 12-14°C for 6-7 days. All cheese treatments were ripened for 21 days at 8-10°C and 90% relative humidity (RH). When the cheese develops a white felt mat of *P. caseicolum* mould, were packed in aluminum foil and kept at same temperature up to end of ripening. All treatment were sampled when fresh and after 15, 21 and 28 days of ripening for chemical, rheological and microbiological analysis.

Milk analysis:

Total solids, fat, total protein content and pH values were determined according to the methods described by Ling (1963).

Cheese analysis:

The moisture and salt contents of cheese were determined according to British Standards Institution (BSI, 1989). Fat and protein of resultant cheese samples were determined according to Ling (1963). pH was measured using pH meter (SGH).Water-soluble nitrogen (WSN), non-protein nitrogen (NPN) and amino acid nitrogen (AAN) of resultant cheese samples were determined according to AOAC (2000).

Total volatile fatty acids were determined as given by Kosikowski (1978). Soluble tyrosine and tryptophane contents were determined according to Vakauleris and Price (1959) and modified by Lin *et al.*, (1982). Total carbonyl compounds were determined as described by Basset and Harpar (1958).

Rheological properties:

Texture profile analysis test of "Brie" like cheese samples (which shape was 2×2×2 clyndrical) was done using a Universal Testing Machine (TMS-Pro) Food Technology Corporation, Sterling, Verginia, USA) equipped with 1000 N (250 lbf) load cell and connected to a computer programmed with Texture ProTM texture analysis software (program, DEV TPA With holding time between cycle two second). A flat rod probe (49.95 mm in diameter) to uniaxially compresse the "Brie" like cheese samples with the following parameters conduction to 50% of their original height. Each sample was subjected to two subsequent cycles (bites) of compressiondecompression.

Data were collected on computer and the texture profile parameters were calculated from DEV TPA texture analyzer and computer interface. Calculation described by Szczesniak et al (1963) and Bourne (1978) was used to obtain the following texture profile parameters (Hardness, Cohesiveness, Springiness, Gumminess and Chewiness)



Fig.(1). Generalized texture profile curve obtained from the Instron Universal Testing Machine (from Brennan *et al.*, 1975).

Microbiological analysis of cheese:

The total bacterial counts of "Brie" like cheese was determined according to the American Public Health Association (APHA 1992). Proteolyic bacterial counts were determined as described by Chabmer (1962). Lipolytic bacterial counts were determined according to Sharf (1970). Mould and yeast counts were determined using molt extract agar medium as described by Pitt, (1979).

Organolyptic properties of cheese:

The cheese samples were organolyptic evaluated. Maximum score points for flavour, body & texture as well as appearance were 50, 35, and 15 respectively according to the method of Scott (1981).

Statistical analysis

The results were analyzed statistical according to SAS System Users Guide (SAS Institute Inc., U.S.A. 1994)

RESULTS AND DISCUSSION

Chemical companion of milk and retentate.

Table (1) shows some chemical components of cows[,], buffaloes[,] and retentate used in the manufacture of "Brie" like cheese.

Table	(1):	Some	chemical	components	of	cows [,] ,	buffaloes,	milk	and
		retenta	ate.						

Milk source	Total solids %	Fat %	Protein %
Cows [,] milk	12.4	3.72	4.2
buffaloes [,] milk	17.8	5.21	7.6
Retentate (cows, milk)	37.94	16.35	17.21
Retentate (buffaloes, milk)	39.21	17.42	19.45

Chemical composition of "Brie" like cheese:

Data presented in Table (2) shows the effect of ultrafiltration, source of milk and salting methods on chemical composition of "Brie" like cheese. The moisture content of fresh UF "Brie" like cheese was higher than those of control "Brie" like cheese. These results are in agreement with those reported by Gazar (1998). There were no recorded difference in moisture contents in related with salting method overall ripening period, similar results were found by Metwally (1995). During ripening period, the moisture contents decreased in all "Brie" like cheese samples similar results were found by Degeidi et al., (2010) . Protein on dry matter content of UF "Brie" like cheese was higher than those of control cheese (Leliever and Lawrence 1988). Salting methods did not considerably affect the fat/DM and protein/DM contents of the resultant cheeses. Fat on dry matter content of control "Brie" like cheese or UF "Brie" like cheese didn't affect by salting methods. The fat/DM and protein/DM contents decreased during ripening period up to 28 days, this could be attributed to the decrease of moisture content, similar results were reported by (Mostafa et al., 2002). These results indicated that the salt content slightly increased during ripening. This could be due to the loss of moisture of cheese. The changes of these parameters in control "Brie" like cheese were less than UF "Brie" like cheese. Similar results were reported by Degeidi et al., (2010). PH values in all cheeses showed gradual increases during the ripening period. The pH increased rapidly in the contol "Brie" like cheese and the dry salted "Brie" like cheese than those of UF "Brie" like cheese and brine salted "Brie" like cheese. The increase in pH during the ripening period could be explained on basis that mould and yeast as the dominating microorganisms consume the lactate formed from lactose by lactic acid bacteria, thus increasing the pH of cheese. These results are in agreement with those of El Hofi and Esmeil (2000) and Farag (1987). **Ripening indices:**

A- Nitrogen compounds and soluble tyrosine & tryptophan:

Table (3) shows the changes in the soluble nitrogen (SN), non protein nitrogen (NPN) and amino acid nitrogen (AAN) as percentages of total nitrogen (TN), and soluble tyrosine & tryptophan. Results indicated that the ripening indices in all treatments increased during ripening period. The nitrogen compounds soluble tyrosine & tryptophan of UF "Brie" like cheese were higher than those of control cheese similar results were reported by (Gazar 1998). The obtained results showed that dry salted "Brie" like cheese contained slightly higher level of nitrogen compounds and soluble tyrosine & tryptophan content than those of brine salted "Brie" like cheese similar results were found by (Godinho and Fox 1981). Moreover soluble tyrosine & tryptophan contents increased gradually during ripening due to the degradation of peptides and the liberation of free amino acids during ripening as described by Dolezalek *et al.*, (1981) and Marcos *et al.*, (1979).

B- Total volatile fatty acids and total carbonyl compound:

Table (4) shows the changes in total volatile fatty acids (TVFA) and total carbonyl compound (TCC).

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It could be seen that making of "Brie" like cheese from both types of retentate enhanced the formation TVFA and TCC which were higher than those of control "Brie" like cheese. Moreover, salting methods did not remarkably affect the cheese TVFA and TCC contents during ripening. These results could be attributed to the stimulating effect of these additives on lipolysis and formation of volatile fatty acids which serve as precursors for the formation of carbonyl compounds through the β oxidation pathway of acids (Rabie 1989). Lamberet et al., (1982) found that the production of methyl ketones from caprylic and lauric acid by the mycelium of *P. candidum* increased during incubation time.

Rheological properties:

Table (5) shows The changes in rheological parameters which were determined by the texture profile analyzer in terms of hardness, cohesiveness, springiness, gumminess and chewiness of "Brie" like cheese samples. Buffaloes milk cheese showed the highest values for hardness, cohesiveness, springiness, gumminess and chewiness than those of cowsmilk cheese and its UF "Brie" like cheese. Brine salted UF cheese showed the lowest texture profile analysis than those of control Brie cheese, Similar results were reported by Le Grat *et al.*, (1993). The difference in texture profile analysis could be attributed to many factors, e.g. pH, soluble nitrogenous, mould strain and storage conditions Mpagana and Hardy (1985). Results indicated that the texture profile analysis value in all treatments decreased during ripening period, Similar results were found by Ahmed, (2011). Molander *et al.*, (1990) who found that the texture profile analysis value correlated well with the sensory evaluation, the firmness, the age, pH and proteolytic stat of the "Brie" like cheese.

Table (5): Texture profile analysis test of "Brie" like cheese made from different sources of milk and their retentate as affected by salting methods

				С	heese m	ade fro	m		
	Ripening		Cows	[,] milk			Buffalo	es [,] milk	
Contents	Period	Fre	Fresh*		entate)	Fre	esh	UF (retentate)	
	In days	Dry	Brine	Dry	Brine	Dry	Brine	Dry	Brine
		salting	salting	salting	salting	salting	salting	salting	salting
	Fresh	6.67	6.58	6.38	6.34	8.27	8.19	7.98	7.84
Hardness (g)	15	6.28	6.19	6.12	6.08	7.91	7.84	7.49	7.39
	21	5.83	5.67	5.73	5.63	6.38	6.26	6.08	5.94
	28	5.61	5.60	5.34	5.22	6.24	6.13	5.86	5.78
Cohesiveness	Fresh	0.31	0.30	0.29	0.29	0.42	0.40	0.39	0.37
	15	0.28	0.30	0.26	0.25	0.39	0.37	0.36	0.35
(ratio)	21	0.26	0.24	0.24	0.22	0.36	0.35	0.34	0.32
	28	0.25	0.23	0.22	0.20	0.35	0.34	0.33	0.30
	Fresh	0.085	0.088	0.092	0.092	0.18	0.17	0.16	0.150
Springiness	15	0.064	0.088	0.054	0.041	0.16	0.15	0.13	0.120
(mm)	21	0.044	0.051	0.050	0.045	0.13	0.12	0.099	0.096
	28	0.041	0.043	0.045	0.038	0.11	0.098	0.096	0.094
	Fresh	2.067	1.974	1.850	1.838	3.473	3.276	3.112	2.900
Gumminess	15	1.758	1.857	1.591	1.520	3.084	2.901	2.696	2.586
(g)	21	1.515	1.360	1.375	1.238	2.296	2.191	2.067	1.901
	28	1.402	1.288	1.174	1.044	2.184	2.084	1.933	1.734
	Fresh	0.175	0.173	0.170	0.169	0.625	0.556	0.497	0.435
Chewiness	15	0.112	0.163	0.086	0.062	0.493	0.435	0.350	0.310
(g/mm.)	21	0.066	0.069	0.068	0.055	0.298	0.262	0.204	0.182
	28	0.057	0.055	0.052	0.039	0.240	0.204	0.185	0.162

* control cheese (cheese made from cows milk)

Microbiological examinations:

Table (6) shows the microbiological properties of "Brie" like cheese. The total bacterial counts of UF "Brie" like cheese was lower than those of control "Brie" like cheese. Also, brine salted cheese contained slightly higher microbial counts than those of of dry salted cheese. Results illustrated that the total bacterial count and mould & yeast in the cheese of different treatments reached the maximum level after a ripening period of 15 days and then decreased as ripening advanced. It was also found that the lipolytic and proteolytic bacterial counts of all "Brie" like cheese decreased during ripening period samples similar results were found by (Metwally 1995).

Table (6): Microbiological ex	kan	ninati	ons d	of "Bri	ie" like ch	iees	e made fr	om
different sources	of	milk	and	their	retentate	as	affected	by
salting methods								-

		Cheese made from									
	Ripening		Cows	[,] milk		Buffaloes [,] milk					
Contents	Period	Fresh*		UF (ret	entate)	Fre	esh	UF (retentate)			
	In days	Dry	Brine	Dry	Brine	Dry	Brine	Dry	Brine		
		salting	salting	salting	salting	salting	salting	salting	salting		
Total bacterial	Fresh	8.28	8.34	8.18	8.26	8.20	8.21	8.11	8.17		
count	15	8.32	8.49	8.29	8.41	5.25	8.29	8.26	8.28		
(logx 10 ⁶ cfu/g)	21	8.18	8.29	8.13	8.26	8.08	8.06	7.97	7.98		
	28	7.99	8.08	7.83	7.88	7.92	7.83	7374	7.63		
Proteolytic	Fresh	5.91	5.96	5.82	5.85	5.85	5.80	5.96	5.79		
bacterial count	15	5.88	5.81	5.61	5.71	5.76	5.72	5.50	5.64		
(logx 10 ⁴ cfu/g)	21	5.57	5.46	5.34	5.54	5.46	5.36	5.27	5.36		
	28	5.27	5.23	5.23	5.25	5.04	4.77	4.69	4.95		
Lipolytic bacterial	Fresh	5.83	5.81	5.77	5.78	5.69	5.68	5.65	5.68		
count	15	5.69	5.61	5.60	5.65	5.59	5.56	5.46	5.47		
(logx 10 ⁴ cfu/g)	21	5.39	5.27	5.36	5.43	5.27	5.25	5.17	5.20		
	28	5.11	4.95	5.04	5.14	4.77	4.69	4.60	4.69		
Total mold & yeast	Fresh	5.21	5.42	5.19	5.33	5.10	5.32	5.13	5.29		
count	15	5.31	5.47	5.29	5.36	5.28	5.31	5.24	5.25		
(logx 10 ³ cfu/g)	21	5.26	5.31	5.24	5.29	5.15	5.03	5.05	5.09		
	28	5.11	5.27	4.94	5.15	5.02	4.81	4.87	4.98		

* control cheese (cheese made from cows milk)

Organoleptic properties:

The data in Table (7) show the effect of using UF and salting methods on the organoleptic properties of "Brie" like cheese. The highest total score was obtained for control "Brie" like cheese made from cows milk than those of UF "Brie" like cheese. The flavour of all cheeses improved with the progress of ripening period. This could be due to the accumulation of volatile fatty acids and carbonyl compounds. However, a typical "Brie" like cheese flavour was more pronounced in "Brie" like cheese made by the dry salting methods. Concerning body & texture it was noticed that buffaloes milk cheese showed firm body and firmer texture, while cows milk cheese showed smooth texture.

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This could be due to the higher moisture contents and the more rate of proteolysis in cows, milk cheese compared with buffaloes, milk cheese. The obtained results agreement with those reported by Farag *et al.*, (1992).

REFERENCES

- Ahmed, A. M., (2011). Fat content impact on the improvement of soft cheese produced by ultrafiltration. M. Sc. Thesis, Fac. Of Agric., Kafr El-Sheikh Univ., Egypt
- American Public Health Association (APHA) (1992). Standard methods for the examination of Dairy products .Inc. 16th ed. New York
- AOAC (2000). Official Methods of Analysis. Association of Official Analytical Chemists. 14th ed., Washington, D.C., USA.
- Banks, J.M. (1995). Cheese. Technology of Dairy Products, 2nd edu. Published by the author, 2-6 Boundary Row, London SEL 8HN, UK. ch. (3), 164
- Bassett, E.W. and Harpar, W.J. (1958). Isolation and identification of acidic and neutral carbonyl compounds in different varieties of cheese. J. Dairy Sci. 41: 1206.

Brennan, J.G.; R. Jowitt, and A. Williams (1975). An analysis of the action of the general foods texturometer. Journal of Texture Studies 6:83.

- Bourne, M. (1978). Texture profile analysis. Food Tech., 32, 62.
- BSI (1989). British Standards Institution. Methods for the chemical analysis of cheese. BS 770 Part 4.
- Chabmer, C.H. (1962). Bacteria in Relation to the milk supply. 4th ED, London pub. Edwared Annold.
- Degeidi, M. A.; Manal, K. A.; Mursy, M. A. and El-Batawy, M. A. (2010). Effect of using different types of milk on the properties of Brie like cheese using *Geotrichum candidum*. 11th Egyptian Conf. Dairy Sci & Techn. 293-308.
- Dolezalek, J.; Bezdeka, and Bachacenko, I. (1981). Lactose fermentation during cheese production and ripening. Shernik Viysok Skoly chemicko Technologicke, V. Praz, E., 51, 175-191.(C.F. Dairy Sci. Abst., 37; 5133).
- EL-Hofi, M.A. and Ismal, A.A. (2000). Utilization of purified and characterized lipase from papaya *(carica papaya)* in acceleration of Ras cheese slurry. Egyptian J. of Food Sci. 28 : 61-72
- Engel, E.; Nicklaus, S.; Septier, C.; Salles, C. And Qurer, J. L. (2001a). Evolution of the tast of a bitter Camembert cheese during ripening: Characterization of matrix effect. J. Agric. Food Chem., 49 : 2930-2939.
- Engel, E.; Toumier, C.; Salles, C. And Qurer, J. L. (2001b). Evolution of the composition of a selected bitter Camembert cheese during ripening: release and migration of taste-active compounds. J. Agric. Food Chem., 49 : 2940-2947.
- Farag A.A. (1987). Chemical and technological studies on blue cheese made from recombined milk. Ph. D. Thesis, Zagazig University, Zagazig (Egypt).

- Farag, A.A.; Aly. M.E. and EL-Alfe, M.B. (1992). Enhancement of Blue cheese flavour using sodium dodercylsulphate and lipase. Nahrung. 36 : 1-7.
- Gazer, E. F. (1998). Technnological studies on soft cheese. M. Sc. Thesis, Fac. Of Agric., Zagazig Univ., Egypt.
- Godinho, M. and Fox, P.F. (1981). Ripening of Blue cheese: Influence of salting rate on lipolysis and carbonyl formation. Milchwissenschaft, 36: 476-478.
- .Kfoury, M.; Mpagana, M. and Hardy, J. (1989). Effect of cheese ripening on rheological properties of Camembert and Saint-paulin cheese. Lait. 69 : 137-149
- Knoop, A.M. and Peters, K.H. (1971). Submikroskopicche strukture veranderunges in Camembert kase wharend der Reifung. Milchwissenschaft 26 : 193
- Kosikowski, F. V. (1978). Cheese and Fermented Milk Foods. Published by the Auther. Camel, Univ. Ithaca, New York, USA
- Lamberet, G.; Auberger, B.; Canteri, G. and Lenoir, J. (1982). Aptitude de *Penicillium caseicolum* a la degradation oxydative des acides gras. Rev. Lait Fr. 406 : 13-19
- Leliever, J. and Lawrence, R. C. (1988). Manufacture of cheese from milk concentrated by ultrafiltration. J. Dairy Research 55 : 465.
- Le-Grad, Y.; Lepienne, A.; Brule, G. and Ducruet, P. (1993). Migration du calcium et des phosphates inorganiques dans les from ages a pate molle de type Camembert au cours de l'affinage. Lait, 63; 317
- Lenoir, J. 1970. L'activite proteasique dans les fromages a pate molle de type Camembert. Rev. Lait. Franc. 275:231.
- Lenoir, J. (1984). The surface flora and its role in the ripening of cheese. Int. Dairy Fed. Bull. 171: 3
- Lin, Y.C.; Washman, C.J. and Vedemuthv, F.R. (1982). Vokaleris-Price and Hall methods for determining soluble tyrosine and tryptophan in bule cheese. J. Dairy Sci. 65: 707.
- Ling, E.R. (1963). "A text Book of Dairy Chemistry. Vol. 2,3rd edm, Chapman and Hall, London.
- Marcos, A.; Esteban, M.A.; Leon, F. and Fernandez-Salguer, J. (1979). Electrophoretic patterns of European cheeses: Comparison and Quantitation . J. Dairy Sci., 62 : 892-900
- Metwally, S.A. (1995). Studies on Camembert cheese. Ph. D. Thesis Zagazig Univ. Egypt.
- Molander, E.; Kristiansen, K.R. and Werner, H. (1990). Instrumental and sensoric measurement of Brie texture. Milchwissenshft. 45: 589-593
- Mostafa, M. B. M.; Metwally, S. A. and El-Demerdash, M. E. (2002). Effect of using heat and freeze-shocked starter on the quality and ripening of UF Edam cheese. J. Agric. Sci., Mansoura Univ., 27: 449.
- Mpagana, M. and Hardy, J. (1985). Compression and relaxation properties of soft cheeses. Effect of ripening. Sci. des Aliments, 5 : 91-96
- Rabie, A.M. (1989): Acceleration of blue cheese ripening by cheese slurry and exracellular enzymes of *Penicillium roqueforti*. Lait. 69: 305-314.

- Pitt, J.J. (1979). The genus penicillium and telemorphic states Eupenicillium and Talaromyces London. New York Acadamic Press. C.F. Moreau (1980).
- SAS Institute (1994). SAS/STAT usuers Guide: Statistics. Ver 6.04, Fourth Edition SAS Institute Inc., Cary, NC.
- Scott, R. (1981). Cheese making practice. Applied Sci Publisher Ltd. Londong.
- Sharf, J.M. (1970). Recommend methods for the microbilogical examination of food 2nd ed. An public Health Assoc. Inc., New York. N.Y. 10019.
- Szczesniak, A.; Brandt, M. and Freidman, H. (1963). Development of standard rating scales for mechanical parameters and correlation between the objective and sensory texture measurements. Food Tech., 22: 50
- Vakaleris, D. G. and Price, W. V. (1959). A rapid spectrophotometric method for measuring cheese ripening. J. Dairy Sci., 47:264.

بعض العوامل المؤثرة على خواص الجبن الشبية بالبراى ايهاب عبد الباقى يوسف عيسوى معهد بحوث تكنولوجيا الاغذية – مركز البحوث الزراعية

يهدف هذا البحث لدراسة مدى تاثير طرق التمليح المختلفة على خواص الجبن شبيهة البراى المصنع من اللبن الجاموسى والبقرى والمركز الناتج من الترشيح الفائق للالبان السابقة. حيث تم تصنيع الجبن الشبيهة البراى بالطريقة التقليدية من اللبن البقرى (كنترول) واللبن الجاموسى واللبن

حيث تم تصنيع الجبن الشبيهة البراى بالطريقة التقليدية من اللبن البقرى (كنترول) واللبن الجاموسى واللبن الناتج من الترشيح الفائق لألبان البقر والجاموس وتم التمليح بطريقتين التمليح الجاف والرطب. وخلال فترة التسوية التى بلغت ٢٨ يوم تم اخذ عينات من الجبن لدراسة التغيرات الكيميائية والريولوجية والبكتريولوجية والحسية حيث تم اخذ عينات من الجبن الطازج وعلى فترات ١٥ ، ٢١ ، ٢٨ يوم.

واتضح من النتائج ان طرق التمليح (الجاف – الرطب) لم تؤثر على محتوى الرطوية فى الجبن سواء الكنترول او المعاملات الاخرى، وان محتوى البروتين والدهن للمادة الجافة كان مرتفعا بالجبن المصنع من المركز الناتج من الترشيح الفائق عن الكنترول، قيم الـpH كانت مرتفعة بالجبن الكنترول عن المصنع من اللبن الناتج من الترشيح الفائق حتى نهاية التسوية، قيم النيتروجين الذائب والنيتروجين الغير بروتينى ونيتروجين الاحماض الامينية بالنسبة للنيتروجين الكلى والتيروزين والتربتوفان اعلى فى التمليح الجاف عن التمليح الرطب ، ارتفعت قيم الاحماض الدهنية الطيارة الكلية ومركبات الكربونيل الكلية فى المعنع من اللبن الناتج من الترشيح الفائق كان الدهنية العلي والتيروزين والتربتوفان اعلى فى التمليح الجاف عن

الجبن المصنع من اللبن الجاموسي كان اكثر صلابة من الجبن المصنع من اللبن البقرى واعطى خواص ريواطي خواص واعطى خواص ريولوجية اقل جودة من الكنترول ، عند استخدام مركز اللبن الجاموسي الناتج من الترشيح الفائق في صناعة جبن الشبيهة البراى تحسنت الخواص الريولوجية للجبن الناتج.

الاعداد الكلية للبكتريا والبكتريا المحللة للبروتين والدهون والخمائر والفطريات انخفضت في الجبن المصنع من المركز الناتج من الترشيح الفائق (بقرى وجاموسى) عن الجبن الكنترول ، كما ارتفعت قيم الاعداد البكتريولوجية عند التمليح الرطب عن التمليح الجاف.

تحسنت الصفات الحسية للجبن الناتج من اللبن الجاموسي عند استخدام الترشيح الفائق والتمليح الرطب حيث اصبح قوام وتركيب الجبن اكثر طراوة ونعومة وقربت صفاتة من الجبن الكنترول المصنع من اللبن البقري.

قام بتحكيم البحث

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كلية الزراعة – جامعة المنصورة مركز البحوث الزراعية

Essawy, E. A. Y.

		Ī	Cheese made from									
	Ripening		Cows	s [,] milk			Buffalo	oes [,] milk				
	Period	Fresh*		UF (rete	UF (retentate)		Fresh		entate)	L.S.D.		
Contents	In days	Dry salting	Brine	Dry salting	Brine	Dry salting	Brine	Dry salting	Brine			
			salting		salting		salting		salting			
	Fresh	57.05 ^{cd}	56.73 ^d	61.53ª	60.93 ^{ab}	52.84 ^e	52.41 ^e	57.42°	56.71 ^d	2.7421		
Moisture	15	54.85 ^c	54.21°	58.31ª	57.52 ^{ab}	50.23 ^{ef}	49.56 ^f	53.56 ^{cd}	52.41 ^{de}	2.4712		
%	21	53.20 ^c	° 52.68	57.32 ^a	56.71 ^{ab}	48.51 ^{de}	47.92 ^e	51.07 ^{cd}	50.21 ^{de}	1.9574		
	28	51.53 ^{bc}	50.93 ^{cd}	53.81ª	52.93 ^{ab}	48.01 ^e	47.37 ^{ef}	50.24 ^{cd}	49.83 ^{de}	2.0148		
Protein on dry	Fresh	42.28 ^f	42.82 ^e	44.56 ^{cd}	44.87 ^{cd}	45.08°	45.61 ^{bc}	46.21 ^{ab}	46.42ª	0.4687		
metter %	15	41.72 ^d	41.55 ^d	43.87 ^{bc}	44.23 ^b	43.96 ^{bc}	43.85 ^{bc}	45.83 ^a	46.61ª	0.5761		
	21	40.89 ^d	40.82 ^d	42.56 ^{bc}	43.54 ^{ab}	42.49 ^c	43.10 ^{bc}	45.43 ^a	45.63 ^a	0.4621		
	28	39.79 ^e	40.43 ^e	41.93°	42.83 ^b	42.58 ^{bc}	42.94 ^b	44.93 ^a	45.21ª	0.4215		
Fat on dry metter %	Fresh	44.64	44.70	44.83	44.92	45.66	45.75	45.86	45.97	ns		
-	15	43.86	44.02	44.61	44.73	45.45	45.51	45.73	45.76	ns		
	21	43.67	43.69	44.32	44.54	45.00	45.12	45.29	45.38	ns		
	28	42.88	43.08	43.82	44.02	44.81	44.85	45.01	45.12	ns		
	Fresh	1.66	1.59	1.64	1.57	1.79	1.57	1.63	1.57	ns		
Salt %	15	1.84	1.73	1.94	1.82	1.95	1.83	1.84	1.82	ns		
	21	2.09	2.12	2.15	2.02	2.21	2.15	2.31	2.04	ns		
	28	2.38	2.23	2.51	2.42	2.53	2.34	2.37	2.31	ns		
	Fresh	5.21	5.32	5.53	5.41	5.22	5.31	5.61	5.68	ns		
pH value	15	5.28 ^{cd}	5.41 ^{ab}	5.34 ^{bc}	5.26 ^{cd}	5.26 ^{cd}	5.21 ^d	5.45 ^a	5.52 ^a	0.0181		
	21	5.77 ^{abc}	5.67 ^{bcd}	5.81 ^{ab}	6.01ª	5.60 ^{de}	5.45 ^e	5.73 ^{bc}	5.72 ^{bc}	0.0184		
	28	6.44 ^{ab}	6.21 ^{abc}	6.71 ^a	6.52 ^{ab}	5.90 ^{cd}	5.71 ^d	6.23 ^{abc}	6.13 ^{bc}	0.0231		

Table (2): Chemical composition of "Brie" like cheese made from different sources of milk and their retentate as affected by salting methods.

* control cheese (cheese made from cows[,] milk)

**Different letters in the same row or column (a,b,c,....) means that multi comparisons are different from each other, letter a is highest mean followed by b,c,.... Etc.

Significant at 0.05 level

Ns = non significants

		Cheese made from									
	Ripening		Cows [,]	milk			Buffalo	es [,] milk		1	
Contents	Period	Fresh*		UF (retentate)		Fresh		UF (retentate)		L.S.D.	
	In days	Dry salting	Brine salting	Dry salting	Brine salting	Dry salting	Brine salting	Dry salting	Brine salting		
Soluble nitrogen	Fresh	13.28 ^{ab}	13.17 ^{ab}	14.31ª	14.21ª	10.59 ^d	10.32 ^d	11.31 ^{cd}	11.51°	0.724	
(% of TN)	15	18.66 ^{ab}	17.61 ^{bc}	19.81ª	19.52ª	15.03 ^d	13.94 ^e	17.35 ^{bc}	16.25°	0.771	
. ,	21	27.47 ^b	25.56°	29.35ª	28.16 ^{ab}	20.81 ^e	20.23 ^e	24.56 ^{cd}	23.19 ^d	1.023	
	28	34.11 ^b	31.25°	36.75 ^a	34.61 ^{ab}	27.42 ^{de}	26.56 ^e	30.65 ^{cd}	28.76 ^d	0.845	
Non protein	Fresh	5.50 ^d	5.67ª	6.31 ^{bc}	6.15 ^{cd}	7.58 ^{ab}	7.27 ^{ab}	8.01 ^a	7.87ª	0.645	
nitrogen (% of	15	8.38 ^{cd}	8.13 ^d	9.46 ^{abc}	9.19 ^{bc}	10.21 ^{ab}	9.93 ^{ab}	11.21 ^a	10.87ª	0.475	
TN)	21	17.26 ^{ab}	15.41 ^{cd}	18.51ª	16.83 ^{bc}	14.61 ^{de}	13.52 ^e	16.72 ^{bc}	15.31 ^d	1.156	
,	28	21.91 ^{ab}	19.31°	23.15 ^a	22.16 ^{ab}	18.06 ^{de}	17.42 ^e	20.21 ^{bc}	19.32°	0.741	
Amino acid	Fresh	2.39 ^b	2.41 ^{ab}	2.56 ^a	2.43 ^{ab}	1.82 ^{de}	1.74 ^e	1.93°	1.88 ^{cd}	0.712	
nitrogen (% of	15	4.26 ^b	3.92 ^{bc}	4.97ª	4.63 ^{ab}	3.21 ^{cd}	3.21 ^{cd}	3.94 ^{bc}	3.76°	0.401	
TN)	21	6.06 ^b	5.61 ^{bc}	7.31ª	6.81 ^{ab}	4.62 ^{cde}	4.16 ^{de}	5.31°	5.12 ^{cd}	0.398	
,	28	8.33 ^{ab}	7.82 ^b	8.92ª	8.45 ^{ab}	6.92 ^{cd}	6.59 ^d	7.31 ^{bc}	7.24 ^{bc}	0.541	
	Fresh	24.38 ^{bc}	23.92°	25.34 ^a	25.21ª	25.28ª	25.37ª	24.97 ^{ab}	24.64 ^b	1.243	
Soluble tyrosine	15	37.42 ^{ab}	35.26 ^b	40.32ª	39.32ª	29.69 ^d	29.91 ^d	32.41°	30.56°	1.326	
(mg/100g)	21	45.83 ^b	40.57°	49.74 ^a	46.31 ^{ab}	38.75 ^d	37.51 ^d	41.73°	38.91 ^d	0.984	
	28	52.46 ^b	49.25 ^{bc}	58.15ª	56.31ª	43.01 ^d	41.52 ^d	49.25 ^{bc}	47.21°	1.956	
	Fresh	12.62 ^{ab}	12.52 ^b	13.56ª	13.24ª	11.54 ^{cd}	11.36ª	12.12 ^{bc}	11.94°	0.947	
Soluble	15	17.48 ^{cd}	16.93 ^d	20.71ª	19.37ª	18.68 ^b	17.93°	19.02 ^{ab}	18.45 ^b	1.234	
tryptophan	21	25.95 ^{bc}	23.81°	29.74 ^a	26.85 ^b	23.18 ^{cd}	22.56 ^d	24.32 ^c	23.92°	1.331	
(mg/100g)	28	32.19 ^{bc}	29.71 ^{cd}	38.39 ^a	34.56 ^b	29.96 ^{cd}	28.71 ^d	32.15 ^{bc}	30.16°	2.986	

Table (3): Nitrogen fractions of "Brie" like cheese made from different sources of milk and their retentate as affected by salting methods

* control cheese (cheese made from cows milk) ** See Table (1).

Table (4): Total volatile fatty acids and total carbonyl compounds of "Brie" like cheese made from different sources of milk and their retentate as affected by salting methods

		Cheese made from									
	Ripening Period		Cows	[,] milk			1				
Contents		Fresh*		UF (retentate)		Fresh		UF (retentate)		L.SD.	
	In days	Dry salting	Brine salting	Dry salting	Brine salting	Dry salting	Brine salting	Dry salting	Brine salting		
Total volatile fatty acid	Fresh	10.81 ^{cd}	10.93 ^{bc}	11.35ª	11.21 ^{ab}	8.31 ^{fg}	8.21 ^{fg}	9.31 ^e	9.21 ^{ef}	0.845	
(ml 0.1 N	15	15.34 ^{bc}	14.93 ^{cd}	17.52 ^a	16.31 ^{ab}	13.25 ^{de}	13.02 ^{de}	16.21 ^{ab}	15.91 ^{bc}	1.245	
NaOH/100ml)	21	28.34 ^{ab}	27.15 ^{bc}	30.26ª	29.32 ^{ab}	24.21 ^{cd}	22.05 ^d	27.21 ^{bc}	26.56°	1.542	
	28	36.12 ^{cd}	35.13 ^{bc}	39.32ª	37.91 ^{ab}	30.15 ^{ef}	28.16 ^f	33.25 ^{cd}	32.16 ^{de}	2.471	
Total carbonyl	Fresh	13.25 ^{bc}	13.03 ^{bc}	14.56 ^a	14.25 ^{ab}	11.61 ^{de}	11.21 ^{de}	12.31 ^{cd}	12.02 ^{cd}	0.847	
compounds (mg/100g)	15	23.16°	22.56 ^{cd}	30.25ª	28.91 ^{ab}	20.25 ^{de}	19.56 ^e	22.56 ^{cd}	20.16 ^{de}	0.896	
	21	37.56 ^{bc}	35.16 ^{cd}	42.56 ^a	41.25 ^{ab}	31.71°	29.56 ^{ef}	35.91 ^{cd}	35.41 ^{cd}	1.024	
	28	53.12°	50.17 ^{de}	60.23ª	58.31 ^{ab}	45.12 ^f	39.17 ⁹	51.23 ^{cd}	50.81 ^e	3.021	

* control cheese (cheese made from cows[,] milk)

** See Table (1).

					Cheese m	ade from				
Dinoning			Cows	[,] milk						
Poriod	Properties	Fresh*		UF (retentate)		Fresh		UF (retentate)		L.S.D.
In dave		Dry Brine		Dry Brine		Dry Brine		Dry	Brine	
in uays		salting	salting	salting	salting	salting	salting	salting	salting	
	Appearance 15	14	14	12	12	13	13	12	12	ns
15	Body & texture 35	29a	28 ^{ab}	26 ^b	25 ^{bc}	25 ^{bc}	24 ^c	23 ^{cd}	22 ^d	0.854
	Flavour 50	40 ^a	39 ^a	37 ^{ab}	35 ^b	37 ^{ab}	35 ^b	32 ^c	36 ^b	0.742
	Total 100	83 ^a	81ª	75 ^{ab}	72 ^b	75 ^{ab}	72 ^b	67°	70 ^{bc}	0.655
	Appearance 15	14	14	13	13	12	12	13	12	ns
21	Body & texture 35	32 ^a	31ª	29 ^b	29 ^b	28 ^{bc}	27°	27 ^c	26 ^c	0.947
	Flavour 50	43 ^a	43 ^a	44 ^a	42 ^{ab}	39°	38 ^{cd}	38 ^{cd}	37 ^d	0.623
	Total 100	89 ^a	88 ^a	86 ^a	84 ^b	79°	77 ^{cd}	78 ^c	75 ^d	1.123
	Appearance 15	14	14	13	12	12	13	12	11	ns
28	Body & texture 35	34 ^a	33ª	32 ^{ab}	32 ^{ab}	30 ^b	31 ^{bc}	29 ^c	29 ^c	1.243
	Flavour 50	47 ^a	46 ^a	45 ^{ab}	44 ^b	41°	42 ^c	41°	40 ^c	1.543
	Total 100	95 ^a	93ª	90 ^b	88 ^{bc}	83 ^d	86°	82 ^{de}	80 ^e	2.103

Table (7): Organoleptic properties of "Brie" like cheese made from different sources of milk and their retentate as affected by salting methods

* control cheese (cheese made from cows milk)

** See Table (1).