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EFFECT OF SKIM MILK CLOTTING AGENTS ON KARIESH CHEESE PROPERTIES WITH SPECIAL REFERENCE TO CALCIUM

BY

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ABSTRACT

Skim buffaloes milk was heated to 90°c and cooled to 40°c, then divided into 3 equal portions. The first portion (T_1) was acid clotted (starter), the second portion (T_2) was clotted using acid (sarter) and rennet (enzyme) while the third portion (T_3) was clotted by rennet alone (enzymatically).

The obtained results revealed that the total solids and protein in (T_1) and (T_2) were slightly higher than (T_3) while during storage the total solids (T.S.), ash and titratable acidity (T.A.) increased gradually in all treatments. The calcium was highly affected by processing method. It was higher in both T_3 and T_2 more than T_1. During storage it increased in all treatments .The microbiological analysis indicated that the total bacterial (T.C.); and proteolytic counts increased slightly in T_2 and highly in T_3. Lactic acid bacterial count (L.A.B.) increased in T_1 and T_2. while not detected inT_3. During storage all microbial counts increased in all treatments. Coliforms were not detected in all samples. With regared to the organoleptic properties, it was clear that T_1 gained the highest scores either when fresh or during storage followed by T_2 thenT_3.

INTRODUCTION

Kariesh cheese is one of the popular cheese varieties consumed in Egypt specially in countryside owing to its high protein, low fat and reasonable price (Abd El-Ghany 2002).

The modern industry in Egypt modified the method slightly for making Kariesh cheese by using ulterafiltered reconstituted milk and keeping the acid coagulation as a bases for its production (Abd El-Salam *et al* 1984) (Fahmi 1960) used combined acid and rennet coagulation in the production of Kariesh cheese and reported that it gave cheese smooth with texture being more accepted than the coarse texture of cheese made by the traditional method.

It is known that Kariesh cheese is considered one of the most rich products in calcium and phosphorus. These elements are essential in the bones&teeth formation Jay Bee P, (2001). It is also rich in sodium and potassium, which play an important role in the formation of body liquids and.muscles. The

nutritional value of Kariesh cheese particularly those related to calcium are affected greatly with methods of milk coagulation.

Hence this study was carried out to produce Kariesh cheese using different methods of coagulation to study the effect of these methods on the chemical&microbial and organoleptic properties of the resultant cheeses with emphasis on its calcium content.

MATERIALS AND METHODS

1-Experimental procedure:

Kariesh cheese processing:

Fresh buffaloes' milk was obtained from Dairy Dep., Fac. Of Agri, Cairo Univ., Giza,Egypt.

Milk was skimmed using mechanical separator, and heated to 90°c for 1mint. and cooled to 40°c. The heated milk was divided into 3 equal portions.2% yoghurt starter was added to the first portion (T_1), 1% yoghurt starter in addition to 1.5g. animal powder rennet Hanasens Laboratories A/S, Gompenhagen, Denmark) dissolved in pre-boiled cooled water /100Kg skim buffaloes' milk were added to the second portion (T_2), and rennet dissolved in pre-boiled cooled water was added to the third portion (T_3) in rate of 3g. animal powder rennet/100Kg skim buffaloes' milk. Then Kariesh cheese was manufactured as described by Fahmi (1960), with scataring 5% sodium chloride between layers. The cheeses were packed in poly amide/poly ethylene bags and sealed under vacuum and stored in the fridge at 8± 1°c for 3 weeks and analysed weekly..

2-Chemical analysis:

Fresh Kariesh samples were analyzed for titratable acidity (T.A.), pH, total solids (T.S.) and total nitrogen (T.N.) described by Ling (1963). Ash was determined according to A.O.A.C (1990). The calcium was determined according to Natallianes and Whitaney (1964).

3-Microbiological analysis:

Coliforms, total bacterial, proteolytic and lactic acid bacterial counts were determined as described by American public Health Association (1992); Difico(1984); Chalmers (1962) and Elliker et al (1956)respectively.

4-Organoleptic properties:

It was evaluated using the scale suggested by Nelson and Trout (1981).

RESULTS AND DISCUSSION

A-Chemical composition.

Data presented in Table (1) illustrate the chemical composition of Kariesh cheese as affected by processing methods.

The total solids and T.N. contents of Kariesh cheese processed with starter (T_1) and starter&rennet (T_2) were slightly higher than that without starter (T_3), which are mainly due to the added starters.

During storage T.S, T.N, T.A and ash increased gradually in all treatments. The pH values of all cheeses were opposite to that found for T.A. These results were in agreement with that reported by Mohamed and El Safty (1986) and Ibrahim *et al.*, (1990).

Table (1): Effect of skim milk clotting materials on the chemical composition of the resultant kariesh cheese, (The results are the averages of 3 replicates).

Component * %	Storage period (weeks)	Treatments (T)		
		1	2	3
T.S	Fresh	28.27	27.15	26.54
	1	30.08	28.99	27.14
	2	31.41	30.38	29.77
	3	32.18	31.21	30.59
T.N	Fresh	3.02	2.94	2.85
	1	3.05	2.97	2.89
	2	3.10	3.02	2.94
	3	3.16	3.08	2.99
Ash	Fresh	3.32	3.18	3.04
	1	4.16	3.89	3.71
	2	4.81	4.35	4.02
	3	5.03	4.56	4.21
T.A	Fresh	1.42	1.22	0.97
	1	1.58	1.39	1.08
	2	1.67	1.58	1.17
	3	1.81	1.66	1.29
pH	Fresh	4.78	4.97	5.22
	1	4.67	4.84	5.13
	2	4.51	4.75	5.02
	3	4.47	4.69	4.98

On fresh weight basis

T1: Coagulation with (2% yoghurt starter only)

T2: Coagulation with (1% yoghurt starter+1.5g. rennet powder dissolved in pre-boiled cooled water/ 100 Kg. buffaloes' skim milk)

T3: Coagulation with (3g. rennet powder dissolved in pre-boiled cooled water/ 100 Kg fresh skim buffaloes' milk)

g. : gram. **Kg .** : kilogram

B-Calcium contents

Table (2) shows the calcium contents of Kariesh cheese. It was affected highly by curdling methods. The Kariesh cheese produced using starter culture (acid coagulation) contained the lowest calcium contents in both of fresh and

stored cheese. This is due to that the acid produced by starter caused the liberation of calcium from casein as it changed from colloidal phase to soluble one, so it goes out with the leakage whey. In the T_2 (acid &enzyme coagulation). The liberation of calcium was lower than that of T_1 owing to the use of rennet in combination with acid to coagulate milk. In T_3 (enzyme coagulation), the retained calcium was the highest.These results are in agreement with Mohamed and El Safty (1986), Zedan (2002),who reported that Kariesh cheese which is coagulated by lactic acid retained less in calcium contant than that made using coagulated enzymes.In acid coagulation,the calcium salts are removed from the casein which is preciptated as free casein at its isoelectric point.While, in rennet coagulation casein is precipitated as calcium para caseinate which in calcium content.

Table (2): Effect of the different coagulants of skim milk on the calcium contents of kariesh cheese

Storage period (weeks)	(Calcium (mg./100 g.dry matter)*					
	1		2		3	
	Ca mg/100g cheese	Ca mg/100g dry matter	Ca mg/100g cheese	Ca mg/100g dry matter	Ca mg/100g cheese	Ca mg/100g atter
Fresh	8.14	28.29	12.20	44.93	14.74	55.57
1	9.71	32.24	15.37	53.02	17.10	63.00
2	11.00	35.02	16.50	54.31	20.00	67.18
3	12.80	39.77	17.50	56.07	21.20	69.30

* average of 3 replicates

T1: Coagulation with (2% yoghurt starter only)

T2: Coagulation with (1% yoghurt starter+1.5g. rennet powder dissolved in pre-boiled cooled water/100Kg. buffaloes' skim milk)

T3: Coagulation with (3g. rennet powder dissolved in pre-boiled cooled water/100Kg. buffaloes' skim milk)

C-Microbiological analysis

Data in Table (3) show the microbiological examination of Kariesh cheese processed by different coagulants. Generally, it is worth mentioning that all cheeses were free of coliforms either when fresh or during storage due to the severe heat treatment and intensive hygienic measurements during processing. These results were in agreement with those obtained by Zedan (2002) who found that the coliforum was absent owing to the intensive hygienic conditions during cheese processing.

It seems that fresh T_1 samples had the lowest T.C. which increased slightly in T2, and increased highly in T_3.During storage, the T.C. increased particularly towards the end of storage period at a higher rate in T_3 followed by T_2 and then T_1.

The proteolytic bacteria, behaved in a manner similar to that of T.C.

As for lactic acid bacteria (L.A.B.) it was clear that T1 samples had the highest counts, while was absent in T_3. During storage period L.A.B increased particularly towards the end of storage at a higher rate in T_1.

Table (3): Some microbiological properties of kariesh cheese processed by different coagulants (average of 3 replicates).

Treatments (T)	Storage period (Wk)	Microbial groups			
		T C (10^5)	Proteolytic. (10^2)	L.A.B (10^2)	Coliforms (10^1)
1	Fresh	0.06	2.00	104.6	N.D.
	1	2.80	2.48	104.8	N.D.
	2	12.70	14.60	116.0	N.D.
	3	18.30	22.01	122.4	N.D.
2	Fresh	1.50	8.55	46.60	N.D.
	1	4.60	12.30	50.80	N.D.
	2	15.30	17.80	52.30	N.D.
	3	28.00	25.50	66.80	N.D.
3	Fresh	18.00	15.00	N.D	N.D.
	1	26.80	17.20	N.D	N.D.
	2	37.90	22.30	N.D	N.D.
	3	54.50	30.20	N.D	N.D.

T1: Coagulation with (2% yoghurt starter only)
T2: Coagulation with (1% yoghurt starter+1.5g. rennet powder dissolved in pre-boiled cooled water/100Kg buffaloes' skim milk)
T3: Coagulation with (3g. rennet powder dissolved in pre-boiled cooled water/100Kg. Buffaloes' skim milk)
N.D: Not detected

D-Organoleptic properties

Data presented in Table (4) illustrate the effect of the methods of Kariesh cheese milk coagulation. It is clear that the T_1 gained the highest scores either when fresh or throughout storage period then followed byT_2 and T_3 respectively. It was observed also that the total scores decreased gradually during storage and reached their minimum at the end of storage period in all treatments.

The results agreed with (Zedan, 2002) who found that total scores decreased gradually during storage and reached their minimum at the end of storage period.

Table (4): Organoleptic properties of kariesh cheese processed by different coagulants (average of 3 replicates).

Treat-ments No.	Storage period (Week)	Flavor (45)	Body&texture (30)	Acidity (10)	Appearance (15)	Total (100)
1	Fresh	42	28	9	13	92
	1	42	28	9	13	92
	2	41	28	9	13	91
	3	41	28	8	13	90
2	Fresh	42	28	8	14	92
	1	41	28	8	14	91
	2	40	28	8	14	90
	3	39	28	7	14	88
3	Fresh	40	26	7	14	87
	1	39	26	6	13	84
	2	38	26	6	12	82
	3	37	26	6	12	81

T1: Coagulation with (2% yoghurt starter only)

T2: Coagulation with (1% yoghurt starter+1.5g. rennet powder dissolved in pre-boiled cooled water100/Kg buffaloes' skim milk)

T3: Coagulation with (3g. rennet powder dissolved in pre-boiled cooled water100/Kg. buffaloes' skim milk)

REFERENCES

Abd El Ghany, Y.F.H (2002): A study on some Kariesh cheese constituents and manufacture aspects as related to its nutritive value. M.sc. Fac. Of Agric, Al-Azhar Unv., Egypt.

Abd El. Salam, M.H, El.Shibiny, S. and El- Alamy, H.A. (1984): Production of skim milk (Kariesh cheese) from ultrafiltered reconstituted milk ..Egyp.J.Dairy Sci,12:111-115.

Abouzaid, R.A.M. (2002):.Studies on milk calcium in dairy products Ph.D Thesis, Fac. Of Agri&Al Azhar University.

AOCA (1990): Official methods of analysis 15th Ed.Association of Official Analytical Chemists Inc., U.S.A.

APHA (1992): Standard methods for the examination of dairy products.Amer.Publ.Health Assoc.Inc.16thEd., Washington D.C.

Chalmers, C.H. (1962):Bacteria in relation to the milk supply. 4thEd Edward Arnold,London.

Difco Laboratories Incorporated (1984): Difco manual of dehydrated culture media and reagents for microbiological and clinical Laboratory procedure 10th Ed. Difco Laboratories Inc.Detroit.Michigan.U.S.A.

Elliker, P.P., Anderson, A.W..and Hannesson,, G. (1956):An agar medium for lactic streptococci and lactobacilli,J.Dairj Sci.39:141.

Fahmi, AH. (1960): Kariesh cheese.J.Agric. Sci., Cairo, Egypt, 131 (in Arabic).

Ibrahim, S.A, El-batawy M.A.and Fikry,S.A.(1990): Utilization of buttermilk in making Kariesh cheese Egyp.J.Dairy Sci,18:95-105

Jay Bee, P. (2001): All about milk products [Cited from www.Jay bee prcision.com/index htm.,Bristol New Hampshise,USA]

Ling, E.R .(1963) :A text book of dairy chemistry.vol.1,2,3rd.Ed.Chapman and Hall,Ltd.37 Esser Str;London W.C.Z.

Mohamed, A.A. and El Safty, M.S.(1986): Use of sweet whey to Reconstitute non-fat dry milk for manufacture Kariesh cheese. Egypt.J.Food Sci,14(1).

Natallianes, H.A. and Whitaney, R. Mcl. (1964): Calcein as an indicator for the determination of total calcium and magnesium and calcium alone in the same aliquot of milk.Journal of dairy Science (47)

Nelson, J.A and Trout, G.M. (1981): Judging Dairy products.14 th Ed.public Assoc. washington D.C.

Zedan, M.A. (2003): Effect of skim buffaloes, milk fortification with zinc salts on the properties of Kariesh cheese.Minufiya J.Agric.Res., 28(2):445-454.

تأثير المواد المستخدمة لتجبين اللبن الفرز على خواص الجبن القريش الناتج وبخاصة محتواها من الكالسيوم

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عومل اللبن الفرز الجاموسى معاملة حرارية إلى ٩٠ °م لمدة دقيقة ثم برد إلى ٤٠°م وتم تقسيمة إلى ٣اجزاء متساوية الجزء الأول (T_1) جبن بالبادي (تجبن حمضي)والجزء الثاني (T_2) جبن باستعمال البادي مع إنزيم الرنين(تجبن حمضي إنزيمي) و الجزء الثالث (T_3) تم تجينة بالإنزيم فقط (تجبن إنزيمي)

أشارت النتائج المتحصل عليها أن الجوامد الكلية والبروتين في كل من T_1 &T_2كانت أعلي قليلا من T_3 بينما زادت تدريجيا أثناء التخزين كل من الجوامد الكلية والرماد ورقم الحموضة في كل المعاملات ولقد تأثر الكالسيوم بشدة باختلاف طرق التجبن حيث كان محتواة اعلي في كل من T_3 & T_2 أكثر من T_1 وازداد في كل المعاملات أثناء التخزين .كما أشارت التحليلات الميكروبيولوجية أن المحتوى البكتيري الكلى ومحتوى البكتريا المحللة للبروتين ازداد قليلا في T_2 وبشدة في T_3 أما عد بكتريا حمض اللاكتيك فازداد في T_2 & T_3. وازدادت الأعداد الميكروبيولوجية جميعها في كل المعاملات وقد خلت كل العينات سواء الطازجة أو أثناء التخزين من بكتريا القولون.وفيما يتعلق بالخواص الحسية للجبن القريش فقد حازت T_1 أعلى درجات للتحكيم الحسي سواء في العينات الطازجة أو المخزنة تبعها T_2 وأخيرا T_3.