

THE EFFECT OF POTASSIUM SORBATE AND PACKING CONDITIONS ON THE QUALITY OF RICOTTA CHEESE

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ABSTRACT

Ricotta cheese was made from sweet or salted Ras cheese whey coagulated with heat and direct acidification with acetic citric or lactic acid to pH 5.8-5.9 at 87.88°C and with the addition of potassium sorbate as preservative and packaged under vacuum. Cheese made using lactic had a higher yield, compared with other acid coagulant. Cheese treated with acetic acid with added potassium sorbate and packaged under vacuum had the higher total solids and protein content than that in the other treatments, either made from sweet or salted whey. In addition, cheese made by using acetic coagulant and treated with potassium sorbate and packaged under vacuum had a higher fat content. Finally, cheese treated with acetic acid and potassium sorbate and packaged under vacuum had a higher scoring points. However, cheese made by using heat coagulant and potassium sorbate as chemical preservative and packaged under vacuum had a lower total count bacteria.

INTRODUCTION

Fresh Ricotta is a white, soft, moist and unripened grainy cheese which resembles Cottage cheese in its appearance. It is fairly plain or may have semi-sweet flavour when made from fresh sweet or salt whey. Traditionally, Ricotta cheese has been prepared by heating whey or whey and milk blends to 40 to 45°C, adding salt and continuing heating until the temperature reached 80 to 85°C. At this point suitable food grade acidulants is added to reduce the pH 6.1-6.0 and induce coagulation of the proteins (Shahani, 1979; Mathur and Shahani, 1981 and Modler, 1988).

Several precipitants for Ricotta cheese manufacture have been suggested in the literature. These include citric acid, acetic acid, lactic acid whey powder and cheese starter. Several factors should be considered when choosing correct precipitant, these include availability, cost, curd characteristics, yield and flavour (Weatherup, 1986 and Modler and Emmoms, 1994). In this part of study, potassium sorbate was used as chemical preservative and cheese was packaged under vacuum in an attempt to increase storage periods.

MATERIALS AND METHODS

Ras cheese whey was obtained from Dairy plant in Mansoura city. The chemical composition of Ras cheese whey is indicated in Table (1).

Table (1): Chemical composition of Ras cheese whey.

Whey type	Chemical composition				
	TS%	TP%	FAT%	Acidity%	pH
Sweet whey	7.53	1.78	0.4	0.25	4.45
Salted whey	13.17	1.25	0.5	0.22	5.85

Food grade acids i.e., lactic, acetic and citric were used as acidulant Table (2) shows the amount of acid solutions (30%) (Weatherup,1986) lactic, acetic and citric required to give whey of pH value 5.8 -5.9, in either sweet or salted cheese whey

Table (2): Amount of acidulants required to adjust the pH value of sweet and salted to 5.8 -5.9.

Whey type	Amount of acidulants (ml of 30% sol./liter whey)		
	Lactic acid	Acetic acid	Citric acid
Sweet whey	1.75	1.25	1
Salted whey	1.5	1	1

Ricotta cheese was manufactured according to methods described by Weatherup(1986). Ras cheese whey with pH 4.45 -5.85 was used. This was placed in a cheese vat and neutralized to pH > 6.5 by the addition of sodium hydroxide solution (40 % w/v). A pilot test was made to estimate the volume of acidulants required to adjust the pH value of the whey to 5.8 -5.9. The whey was used alone or mixed with skim milk powder as mentioned blow cheese making. The whey was heated to 65°C to destroy the residual rennet, which would causes premature coagulation of casein . The appropriate quantity of skim milk was then added. The mixture was heated to 87 -88°C and acidulants were added. Agitation was stopped immediately after the addition of acidulants, as prolonged agitation at this stage prevents cured floatation and make it difficult to the whey. The cured was left in whey for 10-12 min before commencement of draining. Traditionally, the curd is ladled from the surface of the whey .This was found to be cumbersome, and it was more convenient to run off the whey. Fine crud particles were removed from the whey using a muslin filter .After drainage ,the curd was packaged and held at 4°C.

Total solids, ash, fat, total protein, soluble nitrogen non protein nitrogen 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) ,salted as determined by Kosikowski (1966). Total bacteria count were determined using the media described in (Difco1971). Mould and yeasts counts were determined using malt extract agar medium (Pitt, 1979). Lipolytic and Proteolytic bacteria were enumerated as described by Chalmers (1962). Organoleptic properties were evaluated by whey the score system scoring flavor (40 points), body and texture (30 points) and appearance (30 points) according to Hassan (1996).

REULTS AND DISCUSSION

Data presented in Table (3) indicate that the cheese made by acetic acid coagulation either treated with or without potassium sorbate and packed with or without vacuum gained the highest total solids content either fresh or during storage periods. Also, a among acetic acid treatments, the cheese treated with potassium with or without vacuum had the highest total solids content compared with other treatments. Moreover, cheese made by heat,

acetic and lactic treatment was deteriorated after 7 days of storage periods. While, these made by acetic acid was deteriorated of after more 17 days of storage periods either with or without potassium sorbate addition .

Results in Table (3) show that the cheese made by acetic acid coagulation treated with potassium sorbate achieved the higher fat content . while, cheese made by citric acid coagulation treated with potassium sorbate had the lower fat content. Also among acetic acid the cheese treated with potassium sorbate contained the highest fat content compared with other treatments.

It could also noticed from the results in Table (4) that the cheese made by acetic treated with potassium sorbate had the higher total nitrogen content, compared with the other acid coagulates. however among acetic acid the cheese treated with the potassium sorbate contained the highest total nitrogen content, compared with other treatments .

Data presented in Table (4) show that the cheese made by acetic acid treated with potassium had the highest soluble nitrogen content, compared with other acid coagulation . moreover , among acetic acid the cheese treated with potassium sorbate contained the higher soluble nitrogen content, compared with other acetic acid treatments.

Results illustrated in Table (4) show that the cheese made by lactic acid coagulates, especially at zero time. While, during storage periods the cheese made by acetic acid treated with potassium sorbate contained the highest non protein nitrogen. Also, among acetic acid the treated with potassium sorbate achieved the highest non protein nitrogen content compared with other treatments.

Acidity illustrated in Table (5) show that the cheese made by heat coagulation treated with potassium sorbate had the highest acidity and lowest pH value, compared with other acid coagulates. Also, among treated with potassium sorbate had the higher acidity and lower pH value compared with other treatments

Table (5) show that the cheese made by acetic acid treated with potassium sorbate contained the highest ash content .while, cheese made citric acid treated with potassium sorbate and packed under vacuum had the lower ash content .Also, among acetic acid treated with potassium sorbate achieved the highest ash content compare with other treatments.

It can be observed from Table (5) that the cheese made by heat coagulation and treated with potassium sorbate had the highest salted content compared with other acid coagulant. Also, among treatment of heat coagulation cheese treated with potassium sorbate contained the highest salt content, compared with other treatments .

As shown in Table (5) the cheese treated with citric acid gone the highest cheese yield, compared with other acid coagulation .

Data presented in Table (6) show the effect added potassium sorbate and packed under vacuum. Lower microbiological properties was observed compared with treatment without added potassium sorbate and without vacuum. Generally, all cheese were free from coli forms. Also, cheese manufactured by heat coagulant had the lower total count of bacteria compared with other acid coagulant .

In addition, among heat coagulant treatments, the cheese treated with potassium sorbate and packed under vacuum had the lowest total count bacteria. In the same time, cheese made by heat coagulant had the highest proteolytic bacteria compared with other acid coagulant at zero time. While, during storage periods cheese made by heat coagulant treated with potassium sorbate and packed under vacuum had the lowest proteolytic bacteria. Also, the cheese manufactured by heat coagulant had the lowest lipolytic bacteria compared with other acid coagulant in fresh cheese.

Also, among heat coagulant treatments the cheese treated with potassium sorbate and packed under vacuum had the lowest lipolytic bacteria during storage periods. Generally, all cheese treatments were free from moulds and yeast at zero time. Also, among heat coagulant treatments the cheese treated with potassium sorbate and packed under vacuum had the lowest moulds and yeast during storage periods.

Moreover, cheese made by heat, acetic and lactic treatment was deteriorated after 7 days of storage periods. While, these made by acetic acid was deteriorated after more 17 days of storage periods either with or without potassium sorbate addition.

Data presented in Table (7) show that the cheese made by heat treatment had the highest organoleptic scores at zero time than acetic acid compared with citric and lactic acid. While, these scores differed during storage periods. So, cheese made by acetic acid acidification gained the highest scores during the third and fourth storage periods compared with other acid coagulant.

As can be observed in Table (8) cheese made from salted whey and made by acetic acid coagulation treated with potassium sorbate contained the highest total solids content either fresh or during storage periods compared with other acid coagulants. Addition, among the acetic acid treatments cheese treated with potassium sorbate had the highest total solids content compared with other acid treatments either fresh or during storage periods. Moreover, cheese made without added potassium sorbate and without vacuum deteriorated after 7 days of storage periods in all coagulant.

It is quite obvious from Table (8) that the cheese made from salted whey and made by heat coagulation treated with potassium sorbate contained the highest fat content compared with other acid coagulation either fresh or during storage periods. Also, among heat coagulation treatments the cheese treated with potassium sorbate had the highest fat content compared with other treatments.

It could be seen from Table (8) that the cheese made from salted whey and made by acetic acid treated with potassium sorbate had the highest total nitrogen content compared with other acid coagulation either fresh or during storage periods. While, among acetic acid treatments the cheese treated with potassium sorbate achieved the higher total nitrogen content compared with other treatments during storage periods.

Soluble nitrogen (S.N):

It is seen from Table (8) that the cheese made from salted whey and manufacture by lactic acid treated with potassium sorbate had the highest soluble nitrogen compared with other acid coagulation either fresh or during storage periods. Also, among the lactic acid treatments the cheese treated with potassium sorbate achieved the higher soluble nitrogen compared with other treatments.

Results in Table (8) show that the cheese made from salted whey and manufacture by lactic acid treated with potassium sorbate gained the highest non protein nitrogen. While, cheese made by acetic acid treated with potassium sorbate had the lowest non protein nitrogen content either fresh or during storage periods. In addition ,among the lactic acid treatments the cheese treated with potassium sorbate had the highest non protein nitrogen content compared with other treatments.

It appears from these results in Table (9) that there are no much differences being occurred in acidity of cheese between the different treatments. In the same time, the pH value of cheese made by direct acidification slightly decreased during storage periods . On the other hand, the cheese made by heat coagulation and packed under vacuum had the highest acidity and lowest pH value ,compared with other acid coagulation. Also, among heat coagulant treatments the cheese packed under vacuum gained the higher acidity and lower pH value, compared with other treatments.

Data presented in Table (9) indicates that no significant differences were observed in ash content of Ricotta cheese manufactured by direct acidification using acetic ,citric and lactic acids. Also, cheese made by acetic and citric acid had the highest ash content compared with other acid coagulant on zero time. While, during storage periods cheese made by acetic acid treated with potassium sorbate achieved highest ash content compared with other treatments .

Results in Table (9) show that no much differences could be observed in the salted content of Ricotta cheese all treatments. Also, cheese manufacture by heat coagulant had the highest salted content compared with other acid coagulant. In addition, among heat coagulant treatments the cheese treated with potassium sorbate gained the higher salted content compared with other treatments during storage periods.

Table (9) show the cheese made from salted whey and manufacture by lactic acid had the highest cheese yield compared with cheese control.

Results in Table (10) show that the addition of potassium sorbate ,salted and packing under vacuum had the lowest microbiological properties compared with other treatments and treatment without salted. Generally, all cheese treatment were free from *E coli*. In addition, cheese made from salted Ras cheese manufacture by heat coagulant had lower total count bacteria compared with other acid coagulant in zero time .

While, during storage periods cheese made by lactic acid treated with potassium sorbate and packed under vacuum had lower total count bacteria compared with other acid coagulant. Also, cheese made by heat coagulant had the highest proteolytic bacteria. While, acetic, citric and lactic acid had the lowest proteolytic bacteria in zero time.

In the same time cheese made by lactic acid treated with potassium sorbate and packed under vacuum had to lowest proteolytic bacteria compared with other treatment during storage periods. While, cheese made by acetic acid had lower lipolytic bacteria compared with other acid coagulant in zero time. While, during storage periods cheese made by acetic acid treated with potassium sorbate and packed under vacuum had lower lipolytic bacteria compared with other treatments.

Generally, all cheese were free from moulds and yeasts in zero time. While, cheese made by acetic acid treated with potassium sorbate and packed under vacuum had the lowest moulds and yeasts count compared with other treatments during storage periods.

Results in Table (11) show that the cheese made from salted Ras cheese whey and manufacture by heat coagulant gained the highest Organoleptic scores during zero time. While, the scores differed during storage periods. Cheese made by acetic acid achieved the higher scores during the second and third and fourth storage periods. specially the cheese treated with potassium sorbate and packed under vacuum compared with other treatments.

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دراسة تأثير إضافة سوريات البوتاسيوم كماده حافظه والتعبئة تحت تفريغ علي

الري كوتا ج بن خواص

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في هذا الجزء من الدراسة تم تصنيع جبن الريكوتا من شرش الجبن الرومي سواء الحلو أو المملح بواسطة التجبن الحراري أو الحراري الحمضي مع التخميض المباشر باستخدام حامض الخليك أو الستريك أو اللاكتيك لخفض الأس الايدروجيني للشرش إلي ٥,٨ - ٥,٩ علي درجة حرارة ٨٧ - ٨٨ م° وتم استخدام سوريات البوتاسيوم كماده حافظه وإجراء التعبئة تحت تفريغ وتم تحليل الجبن الناتج وكانت النتائج كالتالي. الجبن الناتج من التخميض بواسطة حمض اللاكتيك أعطي أعلى نسبة تصافي بالمقارنة مع الأحماض الأخرى سواء من الشرش الحلو أو المملح. بينما حصل الجبن الناتج من التخميض بواسطة حمض الخليك مع إضافة البوتاسيوم كماده حافظه والمعبأة تحت تفريغ علي اعلي نسبة للمواد الصلبة الكلية والبروتين بينما حصل الجبن الناتج من التخميض بواسطة حمض الخليك مع إضافة البوتاسيوم كماده حافظه والمعبأة تحت تفريغ علي اعلي نسبة للدهن. بينما حصل الجبن الناتج من التخميض بواسطة حمض الخليك مع إضافة البوتاسيوم كماده حافظه والمعبأة تحت تفريغ علي اعلي درجات للتكثيف الحسي. كذلك حصل الجبن الناتج المضاف لها سور بات بوتاسيوم والمعبأة تحت تفريغ علي أقل محتوى بكتري.

قام بتحكيم البحث

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Table (3):Effect of different coagulants, preservatives and packing conditions on some chemical properties of Ricotta cheese made from Ras cheese sweet whey

Cheese properties	Storage period (days)	Treatments															
		Heat				Lactic				Acetic				Citric			
		WSV	S	V	SV	WSV	S	V	SV	WSV	S	V	SV	WSV	S	V	SV
TS%	Fresh	27	27	27	27	24.5	24.5	24.5	24.5	27.71	27.71	27.71	27.71	22.63	22.63	22.63	22.63
	7	29.6	27.71	27.92	27.12	25.43	25.83	25.96	25.13	28.77	28.63	28.33	28.28	23.61	23.11	22.86	22.72
	14	0.00	31.63	29.33	29.15	0.00	27.00	26.74	26.16	29.83	29.63	28.88	28.62	0.00	23.70	23.28	22.81
	21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	30.40	0.00	29.41	0.00	0.00	0.00	0.00
FAT%	Fresh	10.99	10.99	10.99	10.99	9.9	9.9	9.9	9.9	11	11	11	11	7.71	7.71	7.71	7.71
	7	11.25	11.20	11.1	11.08	10.1	10	9.96	9.94	11.2	11.1	11.07	11.06	8	8	7.92	7.86
	14	0	11.27	11.22	11.19	0	10.1	10.01	9.98	11.3	11.2	11.17	11.14	0	8	7.97	7.91
	21	0	0	0	0	0	0	0	0	0	11.3	0	11.28	0	0	0	0

WSV : without sorbate and vacuum S : with sorbate V : with vacuum SV : with sorbate and vacuum

Table (4):Effect of different coagulants, preservatives and packing conditions on nitrogenous compounds of Ricotta cheese made from Ras cheese sweet whey

Cheese properties	Storage period (days)	Treatments															
		Heat				Heat				Heat				Heat			
		WSV	S	V	SV	WSV	S	V	SV	WSV	S	V	SV	WSV	S	V	SV
TN%	Fresh	1.76	1.76	1.76	1.76	1.47	1.47	1.47	1.47	1.9	1.9	1.9	1.9	1.49	1.49	1.49	1.49
	7	2	1.9	1.92	1.84	1.6	1.6	1.57	1.51	2	2	1.95	1.94	1.7	1.6	1.62	1.59
	14	0	2.1	2	1.92	0	1.7	1.63	1.59	2.1	2	1.99	1.98	0	1.7	1.67	1.65
	21	0	0	0	0	0	0	0	0	0	2.1	0	2.06	0	0	0	0
SN%	Fresh	0.42	0.42	0.42	0.42	0.67	0.67	0.67	0.67	0.83	0.83	0.83	0.83	0.58	0.58	0.58	0.58
	7	0.6	0.4	0.5	0.47	0.8	0.8	0.74	0.72	0.9	0.9	0.87	0.86	0.7	0.7	0.65	0.63
	14	0	0.5	0.57	0.53	0	0.8	0.81	0.79	1	0.9	0.91	0.9	0	0.7	0.7	0.69
	21	0	0	0	0	0	0	0	0	0	1	0	0.93	0	0	0	0
NPN%	Fresh	0.28	0.28	0.28	0.28	0.49	0.49	0.49	0.49	0.42	0.42	0.42	0.42	0.38	0.38	0.38	0.38
	7	0.4	0.4	0.36	0.33	0.6	0.6	0.56	0.53	0.5	0.5	0.47	0.46	0.5	0.5	0.43	0.43
	14	0	0.5	0.44	0.41	0	0.6	0.6	0.58	0.6	0.6	0.53	0.51	0	0.5	0.49	0.47
	21	0	0	0	0	0	0	0	0	0	0.6	0	0.55	0	0	0	0

WSV : without sorbate and vacuum S : with sorbet V : with vacuum SV : with sorbate and vacuum

Table (5):Effect of different coagulants, preservation and packing on contain chemical properties of Ricotta cheese made from Ras cheese sweet whey

Cheese properties	Storage period (days)	Treatments															
		Heat				Lactic				Acetic				Citric			
		WSV	S	V	SV	WSV	S	V	SV	WSV	S	V	SV	WSV	S	V	SV
Acidity%	Fresh	0.24	0.24	0.24	0.24	0.16	0.16	0.16	0.16	0.15	0.15	0.15	0.15	0.18	0.18	0.18	0.18
	7	0.33	0.31	0.3	0.29	0.28	0.25	0.23	0.22	0.22	0.21	0.22	0.21	0.25	0.23	0.22	0.21
	14	0.00	0.36	0.34	0.32	0.00	0.3	0.27	0.25	0.3	0.29	0.27	0.23	0.00	0.29	0.27	0.23
	21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.31	0.00	0.25	0.00	0.00	0.00	0.00
pH%	Fresh	6.05	6.05	6.05	6.05	6.42	6.42	6.42	6.42	6.42	6.42	6.42	6.42	6.34	6.34	6.34	6.34
	7	5.87	5.88	5.89	5.93	5.97	6.03	6.09	6.12	6.12	6.16	6.12	6.16	6.04	6.1	6.15	6.16
	14	0.00	5.84	5.86	5.87	0.00	6.89	5.98	6.03	5.89	5.93	6.01	6.09	0.00	5.93	6.01	6.08
	21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.88	0.00	6.03	0.00	0.00	0.00	0.00
Ash%	Fresh	2.64	2.64	2.64	2.64	3.38	3.38	3.38	3.38	3.463	3.46	3.46	3.46	2.39	2.39	2.39	2.39
	7	3.657	3.45	3.33	3.14	3.927	3.88	3.84	3.78	3.97	3.87	3.77	3.74	2.73	2.61	2.56	2.52
	14	0.00	3.83	3.73	3.53	0.00	4.37	4.24	4.15	4.123	4.00	3.97	3.82	0.00	2.84	2.73	2.67
	21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.24	0.00	4.00	0.00	0.00	0.00	0.00
Salted%	Fresh	0.877	0.877	0.877	0.877	0.876	0.876	0.876	0.876	0.876	0.876	0.876	0.876	0.876	0.876	0.876	0.876
	7	0.925	0.916	0.932	0.897	0.901	0.897	0.892	0.888	0.898	0.895	0.888	0.887	0.903	0.895	0.892	0.888
	14	0.00	0.948	0.935	0.925	0.00	0.928	0.907	0.898	0.916	0.901	0.894	0.892	0.00	0.902	0.895	0.893
	21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.915	0.00	0.898	0.00	0.00	0.00	0.00
Yield %	Fresh	5.00	5.00	5.00	5.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.50	7.50	7.50	7.50

WSV : without sorbate and vacuum S : with sorbet V : with vacuum SV : with sorbate and vacuum

Table (6):Effect of different coagulants, preservatives and packing on microbiological properties of Ricotta cheese made from Ras cheese sweet whey

properties	Storage Period (days)	Treatments															
		Heat				Lactic				Acetic				Citric			
		WSV	S	V	SV	WSV	S	V	SV	WSV	S	V	SV	WSV	S	V	SV
TCx10 ³	Fresh	6	6	6	6	23	23	23	23	20	20	20	20	21	21	21	21
	7	29	28	32	20	36	29	30	28	34	33	38	33	45	38	53	35
	14	0	40	40	31	0	45	45	33	64	60	43	42	0	50	98	48
	21	0	0	0	0	0	0	0	0	0	89	63	55	0	0	0	0
Protox10 ²	Fresh	2	2	2	2	2	2	2	2	0	0	0	0	0	0	0	0
	7	6	4	10	4	12	6	11	5	13	10	10	6	20	6	16	8
	14	0	23	15	9	0	16	21	40	92	36	28	13	0	13	45	22
	21	0	0	0	0	0	0	0	0	0	48	49	23	0	0	0	0
Lipo x10 ²	Fresh	0	0	0	0	3	3	2	3	1	1	2	1	2	2	2	2
	7	4	5	6	4	6	9	11	13	4	7	15	12	15	14	18	12
	14	0	12	12	7	0	22	23	21	15	12	29	22	0	26	53	25
	21	0	0	0	0	0	0	0	0	0	35	37	31	0	0	0	0
E coli x10 ²	Fresh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
M&Y x10 ²	Fresh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	7	9	5	10	6	36	24	28	23	20	13	14	12	33	23	26	13
	14	0	10	15	10	0	33	37	32	27	21	23	20	0	33	35	22
	21	0	0	0	0	0	0	0	0	0	28	80	30	0	0	0	0

WSV : without sorbate and vacuum S : with sorbet V : with vacuum SV : with sorbate and vacuum

Table (7):Effect of different coagulants, preservatives and packing on organoleptic properties of Ricotta cheese made from Ras cheese sweet whey.

properties	Storage Period (days)	Treatments															
		Heat				Lactic				Acetic				Citric			
		WSV	S	V	SV	WSV	S	V	SV	WSV	S	V	SV	WSV	S	V	SV
Flavor (40)	Fresh	32	32	32.1	32	30	30	30	30.1	30.5	30.5	30.5	30.5	29.5	29.5	29.5	29.5
	7	32.2	33.3	33.3	31.3	31.5	30.5	29.1	30.3	30.3	33	31.4	29.5	31.5	31.7	30	29.7
	14	0	31.2	33.4	31	0	31	29.5	29.6	30.6	33.3	29.5	30.1	0	32	32.5	30.2
	21	0	0	0	0	0	0	0	0	0	0	29	29.4	0	0	0	0
Body & texture (30)	Fresh	26.4	26.4	26.4	26.5	24.1	24	24.1	24	24.5	24.4	24.6	24.5	24.6	24.5	24.5	24.5
	7	26.1	26.4	24.5	23.8	23.5	24.5	23.5	23.4	24.2	24.2	23	25.3	24.5	24.5	23.5	25.8
	14	0	24.6	24.5	23.5	0	25.4	24	21.3	24.3	24.4	22.5	26.4	0	25.5	23.5	25.9
	21	0	0	0	0	0	0	0	0	0	0	23	22.3	0	0	0	0
Appearance (30)	Fresh	24.1	24.1	23.9	24.1	21.5	21.4	24.1	21.4	24.5	24.6	24.4	24.5	24.4	24.5	24.5	24.6
	7	25.4	24.6	24.4	24.1	21.4	25.7	23.5	23.9	23.1	25	24.2	25.1	24.9	24.8	25.3	25.5
	14	0	25.2	24.8	24.4	0	24.2	24	22.9	23.5	25.3	23.5	22.2	0	25.6	23.8	26
	21	0	0	0	0	0	0	0	0	0	0	23.8	25	0	0	0	0
Total (100)	Fresh	82.5	82.5	82.4	82.6	75.6	75.4	75.5	75.4	79.5	79.5	79.5	79.5	78.5	78.5	78.5	78.6
	7	83.7	84.3	82.2	79.2	76.4	80.6	76.6	77.6	77.6	82.2	78.6	79.9	81	81	78.8	80.9
	14	0	81.1	82.7	79.1	0	80.6	77.5	73.8	78.4	83	75.5	78.7	0	83.1	79.8	82.1
	21	0	0	0	0	0	0	0	0	0	0	75.8	76.7	0	0	0	0

WSV : without sorbate and vacuum S : with sorbet V : with vacuum SV : with sorbate and vacuum

Table (8):Effect of different coagulants, preservatives and packing on some chemical properties of Ricotta cheese made from Ras cheese salted whey.

Cheese properties	Storage period (days)	Treatments															
		Heat				Lactic				Acetic				Citric			
		WSV	S	V	SV	WSV	S	V	SV	WSV	S	V	SV	WSV	S	V	SV
TS%	Fresh	31.1	31.3	31.3	31.3	31.32	31.32	31.32	31.32	31.73	31.73	31.73	31.73	32.13	32.13	32.13	32.13
	7	32.82	32.00	31.87	31.92	32.46	31.95	31.73	31.87	32.42	32.96	32.33	32.33	33.66	32.98	32.72	32.55
	14	33.51	32.81	32.31	32.67	33.21	2.62	32.12	32.58	34.00	33.55	33.11	32.87	34.22	33.63	33.11	32.85
	21	0.00	33.62	32.62	33.23	0.00	33.33	32.63	33.13	0.00	34.15	33.71	33.48	0.00	34.05	33.62	33.13
FAT%	Fresh	11	11	11	11	8.81	8.81	8.81	8.81	8.8	8.8	8.8	8.8	9.9	9.9	9.9	9.9
	7	11.28	11.22	11.16	11.06	9.12	8.98	8.91	8.92	9.12	9.08	8.96	8.93	10.03	10	9.98	9.95
	14	11.35	11.32	11.29	11.25	9.33	9.04	9.02	8.97	9.16	9.13	9.01	8.97	10.12	10.08	10.06	9.98
	21	0	11.38	11.36	11.32	0	9.12	9.08	9.1	0	9.19	9.1	9.02	0	10.16	10.12	10.03
TN%	Fresh	1.82	1.82	1.82	1.82	1.85	1.85	1.85	1.85	1.9	1.9	1.9	1.9	1.85	1.85	1.85	1.85
	7	1.85	1.84	1.84	1.85	1.9	1.88	1.87	1.87	2.04	2.02	2	1.97	1.95	1.92	1.91	1.89
	14	1.92	1.89	1.86	1.89	1.94	1.92	1.91	1.9	2.08	2.06	2.04	2.02	1.99	1.97	1.95	1.93
	21	0	1.96	1.91	1.94	0	1.97	1.95	1.94	0	2.12	2.1	2.08	0	2	1.99	1.97
SN%	Fresh	0.55	0.55	0.55	0.55	0.67	0.67	0.67	0.67	0.42	0.42	0.42	0.42	0.64	0.64	0.64	0.64
	7	0.6	0.58	0.56	0.56	0.81	0.78	0.75	0.72	0.57	0.55	0.51	0.49	0.73	0.72	0.69	0.68
	14	0.65	0.6	0.58	0.57	0.84	0.83	0.79	0.78	0.61	0.59	0.55	0.53	0.78	0.76	0.73	0.72
	21	0	0.64	0.6	0.60	0	0.88	0.85	0.83	0	0.63	0.61	0.59	0	0.8	0.78	0.76
NPN%	Fresh	0.49	0.49	0.49	0.49	0.53	0.53	0.53	0.53	0.35	0.35	0.35	0.35	0.51	0.51	0.51	0.51
	7	0.52	0.51	0.5	0.55	0.62	0.6	0.59	0.58	0.48	0.43	0.41	0.39	0.58	0.58	0.56	0.54
	14	0.56	0.53	0.52	0.61	0.66	0.64	0.62	0.6	0.52	0.47	0.44	0.42	0.64	0.62	0.6	0.58
	21	0	0.58	0.54	0.66	0	0.67	0.65	0.65	0	0.51	0.49	0.46	0	0.66	0.65	0.63

Table (9): Effect of different coagulants, preservatives and packing on acidity, pH, ash, salted and yield content of Ricotta cheese made from Ras cheese salted whey.

Cheese properties	Storage period (days)	Treatments															
		Heat				Lactic				Acetic				Citric			
		WSV	S	V	SV	WSV	S	V	SV	WSV	S	V	SV	WSV	S	V	SV
Acidity%	Fresh	0.25	0.25	0.25	0.25	0.17	0.17	0.17	0.17	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18
	7	0.3	0.28	0.29	0.27	0.23	0.27	0.22	0.21	0.24	0.29	0.21	0.2	0.21	0.22	0.21	0.2
	14	0.35	0.34	0.34	0.33	0.29	0.29	0.29	0.24	0.29	0.3	0.28	0.25	0.23	0.29	0.28	0.26
	21	0.00	0.37	0.38	0.37	0.00	0.31	0.32	0.25	0.00	0.32	0.31	0.29	0.00	0.32	0.31	0.29
pH%	Fresh	6.02	6.02	6.02	6.03	6.36	6.36	6.36	6.36	6.34	6.34	6.34	6.34	6.34	6.34	6.34	6.34
	7	5.92	5.96	5.96	6.01	6.06	6.01	6.09	6.15	6.08	5.93	6.13	6.21	6.16	6.10	6.13	6.21
	14	5.86	5.87	5.87	5.88	5.93	6.93	5.93	6.06	5.93	5.89	5.98	6.03	6.08	5.93	5.98	6.03
	21	0.00	5.84	5.81	5.83	0.00	5.88	5.87	6.02	0.00	5.87	5.88	5.93	0.00	5.87	5.88	5.93
Ash%	Fresh	7.59	7.59	7.59	7.63	9.57	9.57	9.57	9.57	9.83	9.83	9.83	9.83	9.83	9.83	9.83	9.83
	7	7.89	7.8	7.77	7.85	9.87	9.76	9.67	9.84	10.02	9.98	9.96	9.95	10.06	10.01	9.96	9.92
	14	7.97	7.95	7.87	8.24	9.98	9.93	9.83	10.2	10.25	10.21	10.1	10.01	10.19	10.1	10.03	10.01
	21	0.00	8.14	7.97	9.26	0.00	10.02	9.96	10.34	0.00	10.53	10.34	10.15	0.00	10.2	10.17	10.16
Salted%	Fresh	6.74	6.72	6.72	6.716	5.24	5.24	5.24	5.243	4.67	4.67	4.67	4.667	5.52	5.52	5.52	5.524
	7	6.9	6.97	6.79	6.834	5.53	5.62	5.52	5.539	4.99	4.90	4.89	4.85	5.94	5.90	5.90	5.855
	14	6.99	6.99	6.81	6.962	5.60	5.65	5.53	5.622	5.00	4.97	4.95	4.908	5.99	5.96	5.96	5.89
	21	0.00	6.99	6.9	6.995	0.00	5.69	5.53	5.665	0.00	5.03	5.00	4.955	0.00	5.98	5.98	5.939
Yield %	Fresh	5.40	5.40	5.40	5.40	8.75	8.75	8.75	8.75	7.50	7.50	7.50	7.50	8.00	8.00	8.00	8.00

WSV : without sorbate and vacuum S : with sorbet V : with vacuum SV : with sorbate and vacuum

Table (10):Effect of different coagulants, preservatives and packing on microbiological properties of Ricotta cheese made from Ras cheese salted whey

properties	Storage Period (days)	Treatments															
		Heat				Lactic				Acetic				Citric			
		WSV	S	V	SV	WSV	S	V	SV	WSV	S	V	SV	WSV	S	V	SV
TCx10 ³	Fresh	4	4	4	4	12	12	12	12	16	16	16	16	14	14	14	14
	7	28	26	27	25	36	26	28	25	42	22	35	20	30	24	25	23
	14	90	60	80	52	84	52	58	27	86	45	46	43	32	33	44	31
	21	0	65	90	58	0	56	60	30	0	56	58	48	0	44	56	36
Protox10 ²	Fresh	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	7	14	10	11	7	6	6	6	6	10	8	9	4	20	17	19	5
	14	21	15	16	10	14	12	13	11	26	23	25	12	32	22	29	11
	21	0	23	24	19	0	16	18	15	0	28	32	18	0	32	25	24
Lipo x10 ²	Fresh	5	5	5	5	3	3	3	2	1	1	1	1	2	2	2	2
	7	23	6	18	11	17	4	11	4	8	6	13	4	28	13	19	8
	14	41	28	33	23	30	13	16	8	22	15	17	13	33	19	22	14
	21	0	33	43	28	0	18	20	22	0	22	23	20	0	25	26	18
E coli x10 ²	Fresh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
M&Y x10 ²	Fresh	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0
	7	20	18	38	15	12	6	10	8	14	8	12	4	15	7	8	6
	14	53	21	40	19	22	17	19	15	29	14	18	9	27	16	18	15
	21	0	25	45	25	0	25	29	22	0	20	23	18	0	30	33	25

WSV : without sorbate and vacuum S : with sorbet V : with vacuum SV : with sorbate and vacuum

Table (11):Effect of different coagulants, preservatives and packing on organoleptic properties of Ricotta cheese made from Ras cheese salted whey.

Cheese Properties	Storage Period (days)	Treatments															
		Heat			Lactic				Acetic				Citric				
		WSV	S	V	SV	WSV	S	V	SV	WSV	S	V	SV	WSV	S	V	SV
Flavour (40)	Fresh	30.5	30.4	30.5	30.7	29.4	29.6	29.4	29.5	28.5	28.5	28.5	28.5	28.2	28.1	28	28.1
	7	31.5	31.8	32.1	32.3	32.2	31.1	30.3	29.8	33	31.2	32.5	28	31.1	28.5	33.3	28.3
	14	30.3	29.2	29.4	30.8	29.2	29.1	31.3	31.3	30.2	30.2	30.9	32	30.3	29.2	31.7	30.5
	21	0	29.6	33	31.4	0	33.2	31.7	31.8	0	20.3	31.8	32.3	0	31.5	31.2	32.1
Body& Texture (30)	Fresh	25.9	25.8	25.9	25.8	24.4	24.5	24.4	24.4	24.5	24.6	24.5	24.5	25	24.9	25	24.9
	7	26.5	25.4	25.6	24.3	26.2	23.5	24.8	23.8	26.2	25.5	24.8	24.8	25.2	24.4	25	26.4
	14	25.5	24.1	22.7	23.8	24.8	24.2	24.5	24.6	26.5	24.5	24.3	24.7	25.1	24.5	26.6	24
	21	0	24.5	25.8	25.3	0	24.4	25	25.2	0	16.5	25	25.1	0	25.5	24.5	24.4
Appearance (30)	Fresh	23.1	23.2	23.1	23.5	23	23	23.1	22.9	24.1	23.9	23.9	24	23.5	23.5	23.5	23.5
	7	26	24.2	24.6	24.8	26	23.1	25.3	24.6	27	24.2	24.7	25	24.5	24.5	25.3	25
	14	25.8	24.9	23.9	24	25.2	24.2	24.3	24.5	25.2	24.4	23.1	24.8	24.9	24.5	24.5	25.6
	21	0	25.5	24.6	25	0	24	24.2	25	0	16.3	24	25	0	24.6	24.5	25.3
Total (100)	Fresh	79.3	79.2	79.3	79.8	76	77.1	76.9	76.8	77.1	77	76.9	77	76.7	76.5	76.5	76.5
	7	84	81.7	82.3	81.3	84.5	77.7	80.2	78.2	86.3	80.9	81.9	77.8	80.9	77.4	83.5	79.7
	14	81.6	78.2	75.8	78.7	79.2	77.5	80.1	80.4	81.6	79.2	78.3	81.4	80.3	78.1	82.8	80.1
	21	0	79.6	83.5	81.7	0	81.6	80.9	82	0	53	80.8	82.4	0	81.5	80.2	81.8

WSV : without sorbate and vacuum S : with sorbet V : with vacuum SV : with sorbate and vacuum