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USING ACIDULANTS IN MAKING RICOTTA CHEESE FROM SWEET AND SALTED WHEY .

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ABSTRACT

Ricotta cheese was made from sweet or salted whey produced from Ras cheese whey by heat coagulant and direct acidification. Acetic ,citric or lactic acid were used to adjust the pH to 5.8- 5.9 at 87 -88°c. Cheese made using lactic acid had a higher yield compared with other acid coagulant. Also, cheese treated with acetic acid had the highest total solids and protein content than that from other treatments, either made from sweet or salted whey. In addition ,cheese made by using heat coagulant had the highest fat content, either made from sweet or salted whey. On the other hand, cheese treated with acetic acid had a higher scoring points. Moreover, cheese made by using heat coagulant had lower total bacterial count (T.C), proteolytic and lipolytic bacterial counts either made from sweet or salted whey. However, cheese made by using acetic acid had the lowest counts of moulds and yeasts (M&Y).

Keywords; Ricotta cheese ,whey, acetic acid, citric acid ,lactic acid and heat coagulant.

INTRODUCTION

Ricotta cheese or recooked cheese has a long Mediterranean and Latin history. It is particularly popular in southern Italy. where it is produced in forms from various milk and milk fraction. Traditionally ,Ricotta is manufactured from Mozzarella or Edam whey. However, other types of milk fractions can be used including whey from other cheese varieties, whole milk, partially skimmed milk or combination of these materials (kosikowski,1982).

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

Several different precipitants for Ricotta cheese manufacture has 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 the correct precipitant, these include availability, cost, curd characteristics, yield and flavour (Weatherup, 1986 and Modlerand Emmoms, 1994)

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 from acid solutions (30%) (Weatherup,1986) of lactic, acetic and citric required to give whey pH value of 5.8 -5.9, with different whey type.

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 has the mentioned blow proportions in 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 melted media (Difco1971). Mould and yeasts counts were determined using malt extract agar medium (Pitt1979). 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).

RESULTS AND DISCUSSION

Table (3) shows the effect of coagulants (heat ,lactic, acetic and citric) on the chemical Components of resultant Ricotta cheese made from sweet or salted whey. The results indicated that some of the resultant cheeses was deteriorated at the end of storage period, specially, when cheese made from the sweet whey, and this might be due to the absence of salted during cheese making. Moreover, in all treatment the total solids contents markedly increased in the cheese made from salted whey. compared with that from sweet Ras cheese whey. either when fresh or during all storage period .In addition ,the total solids content increased during storage in all treatment, either made from sweet or salted Ras cheese whey. Data in the same table also indicate that cheese resulted from Acetic acid contained the highest total solids content, either made from sweet or salted whey. On the other hand, the cheese resulted from citric acid contained the lowest total solids content either made from sweet or salted whey.

Data presented in Table (3) show that fat content increased during storage at all treatments either made from sweet or salted cheese whey. Sweet whey treated with acetic acid also had the highest fat content. while cheese treated with citric acid had the lowest content. On the other hand, the salted whey treated with heat coagulant had higher fat content. However , the cheese made by the lactic acid coagulant had lower fat content.

Table (3): Effect of coagulants on chemical Composition of Ricotta cheese made from sweet or salted whey .

Components	Storage period (days)	Treatments							
		Heat		Lactic		Acetic		Citric	
		sweet	salted	sweet	salted	sweet	salted	sweet	salted
TS %	Fresh	27	31.3	24.00	31.32	27.71	31.73	22.63	33.63
	7	29.61	31.3	25.43	32.46	28.77	33.42	22.61	33.66
	14	0.0	32.6	0.00	33.31	29.83	34.00	0.00	34.22
	21	0.0	33.5	0.0	0.00	0.0	0.00	0.0	0.00
FAT %	Fresh	11.0	11.0	9.9	8.8	11.0	8.8	7.7	9.9
	7	11.5	11.2	10.1	9.1	11.2	9.1	8.0	10.0
	14	0.0	11.3	0.0	9.3	11.3	9.2	0.0	10.1
	21	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TN %	Fresh	1.8	1.8	1.5	1.9	1.9	1.9	1.5	1.9
	7	2.0	1.9	1.6	1.95	2.0	2.0	1.7	2.0
	14	0.0	1.9	0.0	2.00	2.1	2.1	0.0	2.02
	21	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SN %	Fresh	0.4	0.6	0.7	0.7	0.8	0.4	0.6	0.6
	7	0.6	0.72	0.8	0.8	0.9	0.6	0.7	0.7
	14	0.0	0.79	0.0	0.9	1.0	0.6	0.0	0.8
	21	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NPN %	Fresh	0.3	0.5	0.5	0.5	0.4	0.4	0.4	0.5
	7	0.4	0.58	0.6	0.6	0.5	0.5	0.5	0.6
	14	0.0	0.6	0.0	0.7	0.6	0.57	0.0	0.67
	21	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

It could be noticed from the result in Table (3) that the total nitrogen content increased during storage period at all treatments either made from sweet or salted whey. Also, the cheese treated with acetic acid contained the highest total nitrogen content either made from sweet or salted whey. Meanwhile, sweet Ras cheese whey treated with citric acid had the lowest total nitrogen content, while, the salted whey with heat coagulation contained the lowest total nitrogen. This increase might be due to the increase of the total solids content during storage periods.

Its clear from Table (3) that the soluble nitrogen content increased during storage period in all treatments either made from sweet or salted whey. It could also he observed that the cheese treated with acetic acid had higher soluble nitrogen content, compared with other acid coagulants, specially made from sweet whey. On the other hand, the cheese treated with lactic acid and cheese made by heat coagulant contained the highest, and the lowest SN, at the same order.

Data in Table (3) show that the non protein nitrogen content increased during storage period in all treatments ,either made from sweet or salted whey. The cheese treated with heat coagulant had the lowest non protein nitrogen content, compared with other treatments made from sweet Ras cheese whey. Slight differences among treatments in the non protein nitrogen content were observed in the resultant cheese being whey when fresh, but these values were differented during storage period.

It appears from the results in Table (4) that slight differences occurred in acidity of the resultant cheese from different treatments. In addition, the pH of cheese made by direct acidification slightly decreased, compared with these made by heat coagulant. Also, the sweet whey treated with acetic acid characterised with the highest pH value and the lowest acidity. On the other hand, the salted whey treated with lactic acid was of the highest pH value and the lowest acidity. This might be due to the variation in the amount of acid used and its type.

Results in Table (4) show that ash content increased during storage period in all treatments, either made from sweet or salted whey. Also, the cheese treated with acetic acid was of the highest ash content compared with other acid coagulants either made from sweet or salted whey .This might be due to the increase in the total solids content of cheeses .

Data presented in Table (4) show that the salted content increased during storage period in all treatments either made from sweet or salted whey. Also, the cheese made with heat coagulant had the lowest salted content, compared with other acid coagulants either made from sweet or salted whey.

Table (4) show that the yield of Ricotta cheese made by direct acidification with different coagulants. It is appared that the resultant cheese had the highest yield compared with other acid coagulants either made from sweet or salted whey and control cheese (heat coagulant) .

Table (4): Effect of coagulants on chemical Composition of Ricotta cheese made from sweet or salted whey.

Components	Storage period (days)	Treatments							
		Heat		Lactic		Acetic		Citric	
		sweet	salted	sweet	salted	sweet	salted	sweet	salted
Acidity %	Fresh	0.24	0.25	0.16	0.17	0.16	0.18	0.18	0.18
	7	0.33	0.3	0.28	0.23	0.22	0.24	0.25	0.21
	14	0.00	0.35	0.00	0.29	0.3	0.29	0.00	0.23
	21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
pH %	Fresh	6.05	6.02	6.42	6.36	6.42	6.34	6.34	6.34
	7	5.87	5.92	5.97	6.06	6.12	6.08	6.04	6.16
	14	0.00	5.86	0.00	5.93	5.89	5.93	0.00	6.08
	21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ash%	Fresh	2.64	7.59	3.377	9.57	3.463	9.83	2.39	9.83
	7	3.657	7.89	3.927	9.87	3.97	10.02	2.73	10.06
	14	0.00	7.97	0.00	9.98	4.123	10.25	0.00	10.19
	21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Salted %	Fresh	0.877	6.738	0.876	5.243	0.876	4.667	0.876	5.524
	7	0.925	6.903	0.901	5.534	0.898	4.994	0.903	5.936
	14	0.00	6.989	0.00	5.595	0.916	5.004	0.00	5.993
	21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Yield %	Fresh	5.00	5.40	7.00	8.75	7.00	7.50	7.50	8.00

Data in Table (5) illustrated that the cheese treated with heat coagulant had the lowest total bacteria count compared with other acid coagulants either made from sweet or salted whey. On the other hand the cheese treated with heat coagulant contained the highest Proteolytic bacteria, compared with other acid coagulants at zero time. While, sweet whey treated with heat coagulant had the lowest proteolytic bacteria, compared with the other acid coagulants during storage periods. Meanwhile, salted whey treated with lactic acid had the lowest proteolytic bacteria compared with the other acid coagulants during storage periods. Also, sweet Ras cheese whey treated with heat coagulant had the lowest lipolytic bacteria, compared with other acid coagulant. However, salted whey treated with acetic acid had the lowest lipolytic bacteria, compared with the other acid coagulant. It was also noticed that the moulds and yeasts could not be detected in all treatments in fresh cheese, while after seven days the moulds and yeasts could be detected in small numbers in all treatments either made from sweet or salted whey .Sweet whey treated with heat coagulant had the lowest moulds and yeasts, compared with other acid coagulant, while salted whey treated lactic acid had the lowest moulds and yeasts, compared with other acid coagulant. As with the presence of *E. coli*, it could not be detected in either of the examined cheese.

Data presented in Table (6) show that the cheese made by heat treatment had the highest organoleptic scores at zero time. However, different scores were detected during storage period so that, the cheese made by acetic acidification gained the highest scores during the third storage period compared with the other resultant cheese either made from sweet or salted whey .

Table (5): Effect of coagulants on microbiological quality of Ricotta cheese made from sweet or salted whey.

Properties	Storage period (days)	Treatments							
		Heat		Lactic		Acetic		Citric	
		sweet	salted	sweet	salted	sweet	salted	sweet	salted
TCx10^3	Fresh	6	4	23	12	20	16	21	14
	7	29	38	36	34	29	42	45	30
	14	0	90	0	84	64	86	0	52
	21	0	0	0	0	0	0	0	0
Protox10^2	Fresh	2	1	2	0	0	0	0	0
	7	6	14	12	6	13	10	20	20
	14	0	21	0	14	92	26	0	32
	21	0	0	0	0	0	0	0	0
Lipo x10^2	Fresh	0	5	3	3	1	1	2	2
	7	4	23	6	17	4	8	15	28
	14	0	41	0	30	15	22	0	33
	21	0	0	0	0	0	0	0	0
E coli x10^2	Fresh	0	0	0	0	0	0	0	0
	7	0	0	0	0	0	0	0	0
	14	0	0	0	0	0	0	0	0
	21	0	0	0	0	0	0	0	0
M&Y x10^2	Fresh	0	0	0	0	0	0	0	0
	7	9	20	36	12	20	14	33	15
	14	0	53	47	22	27	29	46	27
	21	0	0	0	0	0	0	0	0

Table (6) : Effect of coagulants on organoleptic properties of Ricotta cheese made from sweet or salted whey.

Properties	Storage Period (days)	Treatments							
		Heat		Lactic		Acetic		Citric	
		Sweet whey	Salted whey	Sweet whey	Salted whey	Sweet whey	Salted whey	Sweet whey	Salted whey
Flavour (40)	Fresh	32.0	30.5	30.0	29.4	30.5	28.5	29.5	28.2
	7	32.2	31.5	31.5	32.2	24.5	33.0	31.5	31.1
	14	0.0	30.3	0.0	29.2	24.5	30.2	0.0	30.3
	21	0.0	0.0	0.0	0.0	79.5	0.0	0.0	0.0
Body & Texture (30)	Fresh	26.4	25.9	24.1	24.4	30.3	24.5	24.6	25.0
	7	26.1	26.5	23.5	26.2	24.2	26.2	24.5	25.2
	14	0.0	25.5	0.0	24.8	23.1	26.5	0.0	25.1
	21	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Appearance (30)	Fresh	24.1	23.1	21.5	23.0	30.6	24.1	24.4	23.5
	7	25.4	26.0	21.4	26.0	24.3	27.0	24.9	24.5
	14	0.0	25.8	0.0	25.2	23.5	25.2	0.0	24.9
	21	0.0	0.0	0.0	0.0	78.4	0.0	0.0	0.0
Total (100)	Fresh	82.5	79.3	75.6	76.0	79.5	77.1	78.5	76.7
	7	83.7	84.0	76.4	84.5	77.6	86.3	81.0	80.9
	14	0.0	81.6	0.0	79.2	78.4	81.6	0.0	80.3
	21	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

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إنتاج جبن الريكوتا باستخدام الأحماض من الشرش الحلو و المملح

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في هذه الدراسة تم تصنيع جبن الريكوتا من شرش الجبن الرومي سواء الحلو أو المملح بواسطة التجبن الحراري أو الحراري الحمضي مع التحميض المباشر باستخدام حامض الخليك أو الستريك أو اللاكتيك لخفض pH الشرش إلي ٥,٨– ٥,٩ علي درجة حرارة ٨٧– ٨٨ °م وتم تحليل الجبن الناتج وكانت النتائج كالتالي .الجبن الناتج من التحميض بواسطة حمض اللاكتيك أعطي أعلي نسبة تصافي بالمقارنة مع الأحماض الاخري سواء من الشرش الحلو أو المملح .بينما حصل الجبن الناتج من التحميض بواسطة حمض الخليك علي اعلي نسبة للمواد الصلبة الكلية والبروتين , كذلك حصل الجبن الناتج من التجبن الحراري علي اعلي نسبة دهن . بينما حصل الجبن الناتج من التحميض بواسطة حمض الخليك علي أعلي درجات للتحكيم الحسي . كذلك حصل الجبن الناتج من التجبن الحراري علي اقل محتوي من العد الكلي للبكتريا والبكتريا المحللة للبروتين والبكتريا المحلله للدهن بينما الناتج من التحميض بواسطة حمض الخليك حصل علي اقل عدد للفطريات والخمائر .