#### TECHNOLOGICAL STUDIES ON SOFT CHEESE Shendy, A.; M. A. Omar and M. E. Rakha Dairy Dept, Fac. of Agric., Al-Azhar University

### ABSTRACT

Soft cheese was manufactured by using the traditional method (as in making Domiati cheese) with adding salt to cheese before renneting and proposed method. Cheese was made by using cow milk, salted up to 8% and soaked in brine (14% NaCl) up to 16 hr. The resultant cheese was stored in brine at ambient or refrigerator temperature up to 90 days. The results indicated that the composition and properties of cheese were affected by the manufacturing method, salting method and storage conditions. The RCT and CT & syneresis of curd decreased and increased with increasing of salt concentration, respectively. There were not differences between the two methods in moisture and TS contents. The moisture and TS & salt contents decreased and increased with increasing the storage periods at ambient temperature of both methods in all treatments. The cheese stored at ambient temperature had lower moisture, pH & F/DM and higher TS, acidity, salt, fat, SN/TN & TVFA contents than that stored at refrigerator temperature in all treatments. However, the chemical compositions of both methods behaved the same trend. The TC decreased with increasing the storage periods in all treatments. The fresh samples had higher TC than that of other treatments. In addition, the samples manufactured by proposed method showed an increase of TC in the samples pickling at ambient temperature than that stored at refrigerator temperature in all samples. The coliform bacteria as well as yeast and moulds were not detected in both fresh and during storage periods in all treatments, except in the fresh sample manufactured by proposed method, which contained about 120 cell of yeast and moulds.

Generally, the soft cheese manufactured by the two methods had higher overall score at ambient or refrigerator temperatures stored on 90 days, the values were higher in the sample stored at ambient temperature than that of the samples stored at refrigerator temperature.

Keywords: Domiati cheese, Soft cheese, White cheese.

#### INTRODUCTION

Domiati cheese is the most popular pickled soft cheese in Egypt. The cheese is consumed either fresh or after ripening in salted whey for few months. The main problems associated with this type of cheese are the high content of salt and its poor microbiological quality. Another problem that faces the Domiati cheese manufacture is the high salt levels, which were originally applied, when cheese was usually manufactured from raw milk as a preservative to be added directly to the milk in order to prevent gassing and other problems during manufacture or pickling. These levels reached to 12% in summer and 8-10% in winter. Thereon, the high-added salt prolongs coagulation, deevelops salty taste, hinders protein degradation, and hence delays ripening. It also produces vast amount of salted whey, which is very difficult to utilize in some food products. Many trials have been carried out to improve the manufacturing process, ripening, yield and sensory properties of Domiati cheese. Chemical composition, microstructure, microbiology of cheese as well as consumer safety are also considered. Some attempts were

carried out recently to modify the method of Domiati cheese making. Trials were made to delay the salting process by soaking the curd in brine solutions (Sharara, 1961; EL-Koussy, 1966 and EL-Erian *et al.*, 1976). This helps in producing unsalted whey, which can be further consumed throughout other different channels. On the other hand, many trials have been carried out to improve and reduce Domiati cheese making time by accelerating and increasing the rate of drainage (Fahmi, 1950; Sharara, 1961; Shalichev *et al.*, 1970; Nofal *et al.*, 1981 and Salama, 2004).

## MATERIALS AND METHODS

Fresh cow's milk was obtained from Port Said Company for food industry "Riyada". Stabilizer (Lacta-825) was obtained from Misr food additives "Mifad", 22 Madinet El-Etehad, Maryoutia St., Faisal, Giza, Egypt. Starter (Mesophilic culture DVS culture, *Lactobacillus lactis* subsp. *Lactis* and *Lactococcus lactis* subsp.*cremoris*) and Rennet powder (Hanelase) were obtained from Chr. Hansen's laboratory, Denmark. It was imported by Egypt Burean for trade, 179, El-Tahrir St., Cairo, Egypt. Calcium chloride was obtained from Caso co., Italy. It was imported by El-Zawaowi co., El-Gesh St., Cairo, Egypt. Salt (Commercial Sodium Chloride) was obtained from Saudian Egyptian co. for salts and minerals, "S.E.C.O. salt", El-Fayom, Egypt.

Soft cheese manufactured from pasteurized cow's milk (3.6% fat and 2.98% protein) using the traditional method (Fahmi and Sharara, 1950). The salt was added up to 8% and cheese was soaked in brine (14% NaCl) up to 16 hr., while the proposed method was made as follow:-

The milk was heated at 73°C/15 S, cooled to 33-35°C and renneting was carried. After complete coagulation (45 min), the curd was cutted vertically and horizontally by American knives. Stirring the curd slowly for 20 min, hooping the curd in moulds and pressing by hydraulic presses for 15 min (5 min 1 bar and 10 min 2 bar), cutting into small cubes ( $6\times6\times6$  cm<sup>3</sup>) and soaking in brine 20% NaCl at 15-18°C for 8-16 hr. Finally, the cheese pickling in brine 14% NaCl and storage at ambient temperature ( $25\pm5$ °C) or refrigerator temperature ( $7\pm2$ °C) for 90 days. The resultant cheese samples were divided by 6 samples as the following:

- T1: Cheese was manufactured by traditional method with 8% salt as a control.
- T2: Cheese was manufactured by traditional method with 4% salt before renneting and soaking in brine 20% at 15-18°C for 8 hr after whey drainage.
- T3: Cheese was manufactured by traditional method without adding salt before and soaking in brine 20% at 15-18°C for 16 hr after whey drainage.
- P1: Cheese was manufactured by proposed method with 8% salt before renneting and soaking in brine 20% at 15-18°C for 4 hr after stirring and pressing.

- P2: Cheese was manufactured by proposed method with 4% salt and soaking in brine 20% at 15-18°C for 8 hr after stirring and pressing.
- P3: Cheese was manufactured by proposed method without adding the salt before renneting. After cutting, stirring and pressing, soaking in brine 20% at 15-18°C for 16 hr.

Cheese samples were analyzed chemically and microbiologically when fresh and after storage periods on ambient and refrigerator temperatures for 15, 30, 60 and 90 days. Moisture measurements were carried out by KERN, Germany. Total solids (TS), fat content, titratable acidity, soluble nitrogen (SN), total nitrogen (TN), were determined according to AOAC, 2000. In addition, pH value was measured by using pH meter (PTI-15, Aqua Chemical Co., England). Total volatile free fatty acids (TVFFA) were determined as described by Kosikowski, (1982).

Total bacterial count of cheese was determined according to American public Health Association, (1987). Coliform counts were counted using Violet Red Bile Agar medium as reported by Amircan Public Health Association (APHA), (1992). Yeast and moulds count were determined on Malt-Extract Agar medium as suggested by Harrigan and Mc Conce, (1966).

Rennet coagulation time (RCT) was measured, and the rennet stability was observed visually as described by Berridge, (1952) and Davies & white, (1958). Curd tension (CT) was determined by using the method described by Abd El-Salam *et al.*, (1991). Curd syneresis was measured as described by Hammad, (1976) at room temperature (25-30°C) by putting the whole curd on a perforated aluminum screen placed on the top of suitable size volumetric cylinder. The increase in the volume of the whey was recorded after 10, 30, 60 and 120 min. This was the index of curd syneresis.

The cheese samples were organoleptically for flavour (60 Points), body & texture (30 Points) and appearance (10 Points) according to the score card suggested by Naguib *et al.*, (1974). Samples were judged by the staff members of the Dairy Department, Faculty of Agriculture, AL-Azhar University.

## RESULTS AND DISCUSSION

In this present investigation, attempts have been made to judge the suitability varying levels of salt for milk. Soft cheese is made by traditional and proposed methods with combining different levels of salts (up to 8%) before renneting and stored in brine (14% salt) at ambient or refrigerator up to 90 days. The product obtained, was evaluated for its chemical composition, microbiological properties and sensory evaluation.

Data presented in Table 1 shows the mean values of some rheological properties (rennet clotting time, curd tension and syneresis) of salted and unsalted curd with varying levels of salt (up to 8%) before renneting. It could be seen from the obtained data that, the rennet clotting time (RCT) of curd decreased with increasing of salt concentration. In addition, there were not differences between the two methods. On the other hand, the curd tension as well as syneresis value increased with increasing of salt concentration.

Treatment	RCT	СТ	Syneresis								
Treatment	min	gm	10 min	30 min	60 min	120 min	Total (ml)				
T1	156	40.7	1.9	2.6	3.2	3.9	11.6				
T2	118	42.6	2.3	3.2	3.9	4.6	14				
T3	39	74.8	2.0	3.4	4.1	5.5	15				
P1	153	41.8	1.9	2.7	3.3	3.9	11.8				
P2	119	42.4	2.2	3.2	3.8	4.5	13.7				
P3	40	74.1	2.1	3.5	4.2	5.6	15.4				

Table 1: Rheological properties of different salted and unsalted curd.

T1: 8% salt T2: 4% salt + soaking in brine for 8 hr

T3: No salt + soaking in brine for 16 hr

P1: 8% salt + soaking in brine for 4 hr P2: 4% salt + soaking in brine for 8 hr P3: No salt + soaking in brine for 16 hr

The lower value of RCT in unsalted samples might be due to the higher acidity, which increased soluble Ca<sup>++</sup> and accelerated the renneting. The same trend was observed for unsalted curd as compared with salted curd by (Fahmi & Sharara, (1950) and Amer & Fahmi, (1970).

Data presented in Tables 2 and 3 illustrate the chemical composition of soft cheese manufactured by traditional and proposed methods with varying concentrations of salt during storage periods at ambient or refrigerator temperatures up to 90 days. The data showed that, the moisture content decreased with increasing the storage periods at ambient temperature of both methods in all treatments. These results in agreement with those reported by El-Irian *et al.*, (1976). In addition, the data revealed that, the cheese stored at ambient temperature had lower moisture that stored at refrigerator temperature in all treatments. On the other hand, the total solids content increased with increasing the storage periods at ambient temperature in all treatments. In addition, the cheese stored at ambient temperature had higher values than that stored at refrigerator temperature in all treatments. These results obtained by (El-Owni and Hamid, 2009). The same results obtained in both two methods.

The results showed that, the pH values were higher in cheese stored at refrigerator than that stored at ambient temperature in all treatments, whilst the tetratable acidity were lower in samples stored at refrigerator than that stored at ambient temperature in all treatments. These results were similar to the results obtained by Nofal *et al.*, (1981) and Salama *et al.*, (1982). On the other hand, the fresh samples had higher pH and lower acidity than that of other treatments.

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Regarding salt content, the data showed that the salt content increased with increasing the storage periods in all treatments. In addition, the cheese stored at ambient temperature had higher salts than that of cheese stored at refrigerator temperature in all treatments. On the other hand, the fresh samples had lower salt content than that of other treatments.

As compared with cheese stored at refrigerator, the salt content related to the total solids of cheese for the cheese kept at room temperature, the total solids are higher than that of cheese stored at refrigerator, so the salt content also is higher (Cakmakci & Kurt, (1993) and EL-Sissi & Neamat-Allah, (1996).

The fat content of cheese samples are ranged between 18.5 to 20% in fresh cheese and from 19 to 23% in other treatments, while the F/DM are ranged from 41.94 to 46.69% in fresh cheese and from 39.85 to 52.3% in other treatments. The fat contents of the cheese samples stored at ambient temperature were higher than those stored at refrigerator temperature. Similar results were obtained by Hofi *et al.*, (1976); Nuser, 2001 and EL-Owni & Hamid, (2009). In addition, the samples stored at refrigerator temperature had higher values of F/DM that that stored at ambient temperature.

The soluble nitrogen coefficient (SN/TN) and the total volatile fatty acids of cheese stored at ambient temperature had higher values than that of cheese stored at refrigerator temperature in all treatments. On the other hand, the fresh samples had lower values of SN/TN and TVFA than that of other treatments. . Similar results obtained by Hamed *et al.*, (1992) and EL-Owni & Hamid (2009). Generally, the results in Tables 2 and 3 observed that the chemical composition of both methods behave the same trend.

Data presented in Tables 4 illustrate the microbiological properties of soft cheese manufactured by traditional and proposed methods with varying concentrations of salt during storage periods at ambient or refrigerator temperatures up to 90 days. The data showed that the TC decreased with increasing the storage periods at ambient or refrigerator temperatures in all treatments. In addition, the fresh samples had higher values than that of other treatments. However, the samples manufactured by proposed method showed an increase of TC in the samples pickling at ambient temperature than corresponding samples were kept at refrigerator temperature in all samples.

On the other hand, the data showed that the counts of coliform bacteria as well as yeast and moulds were not detected in both fresh and during storage periods in all treatments, except the fresh sample manufactured by proposed method, it contain about 120 cell of yeast and moulds.

These data might be due to the severe of heat treatments of milk and the role of acidity during storage in preservation of the products, which associated with their ability to produce a range of antimicrobial compounds. These results are in agreement with those reported by Fayed *et al.*, (2001).

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Data presented in Table 5 illustrate the organoleptic properties of soft cheese manufactured by traditional and proposed methods with varying concentrations of salt during storage periods at ambient or refrigerator temperatures up to 90 days. The data showed that, there were small differences between the two methods of manufacture. However, flavour development was enhanced as the storage period progressed to reach maximum scores after 90 days. This might be attributed to the contribution of elevated pickling temperature in releasing the responsible bacterial enzymes for protein and fat hydrolysis of cheese forming more flavour components (Topcu and Saldamli 2006). The higher scores for flavour was more in cheese stored at ambient temperature than that samples stored at refrigerator temperature. In addition, body and texture as well as the characteristics of all cheese samples had almost similar scores during at both methods and both storage temperature.

Table 5: Effect of salting method and storage conditions on the organoleptic properties of soft cheese during pickling.

	Dimension	Α	mbient t	emperat	ure	Refi	rigerator	tempera	ture
Treatment	Ripening Period (Days)	F	B & T	Α	Total	F	B & T	Α	Total
	i enoù (Days)	60	30	10	100	60	30	10	100
	Fresh	32	30	10	72	32	20	10	72
	15	35	30	10	75	35	30	10	75
T1	30	45	30	10	75	40	24	10	74
	60	50	20	10	80	47	20	10	77
	90	55	20	10	85	47	20	10	77
	Fresh	32	30	10	72	32	30	10	ature   Total   100   72   75   74   77   72   75   77   72   75   75   77   72   75   77   72   75   77   72   75   73   73   73   73   73   73   73
	15	40	20	10	70	35	30	10	
T2	30	47	20	10	77	35	30	10	
	60	50	20	10	80	47	20	10	77
	90	50	20	10	80	47	20	10	77
	Fresh	32	30	10	72	32	30	10	72
	15	35	30	10	75	35	30	10	Total   100   72   75   74   77   72   75   77   72   75   77   72   75   77   72   75   73   65   65   73   73   73   73
Т3	30	47	20	10	77	40	25	10	75
	60	48	20	10	78	40	25	10	75
	90	50	20	10	80	47	20	10	77
	Fresh	32	20	10	62	32	20	10	62
	15	35	20	10	65	35	23	10	68
P1	30	45	20	10	75	40	23	10	72
	60	47	23	10	77	47	23	10	80
	90	52	23	10	85	47	23	10	80
	Fresh	35	23	10	68	35	23	10	68
	15	35	25	10	70	35	23	10	68
P2	30	40	23	10	73	40	23	10	73
	60	47	23	10	80	40	23	10	73
	90	50	23	10	83	40	23	10	73
	Fresh	32	23	10	65	32	23	10	65
	15	35	23	10	68	35	20	10	65
P3	30	47	23	10	80	40	23	10	73
	60	48	23	10	81	40	23	10	73
	90	52	23	10	85	40	23	10	73
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F: Flavour

B&T: Body and texture

A: Appearance

As shown in Table 5, the soft cheese manufactured by the two methods had higher overall score at ambient or refrigerator temperatures stored on 90 days, the values were higher in the sample stored at ambient temperature than that of the samples stored at refrigerator temperature.

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# دراسات تكنولوجية على الجبن الطري عبد المقصود شندي ، ممدوح أحمد عمر و محمد عزت رخا كلية الزراعة-جامعة الأزهر-قسم الألبان

تم صناعة الجبن الطري من اللبن البقري بطريقتن ، هما الطريقة التقليدية كما في الجبن الدمياطي وذلك باضافة الملح قبل التنفيح ، والأخرى طريقة مقترحة بتسخين اللبن إلى درجة ٢٣°م لمدة ١٥ ثانية ثم التبريد إلى ٣٣-٣٥°م ، ثم إضافة البادئ وكلوريد الكالسيوم حتى تمام التجبن ، ثم تقطيع الخثرة والتصفية ثم الضغط ، ثم التمليح باضافة الملح حتى ٨% ملح ، ثم النقع في محلول ٢٠% كلوريد الصوديوم حتى ١٦ ساعة ، ويتم تخزين الجبن الناتج من الطريقتين في محلول ملحي تركيزه ١٤% ملح على درجة حرارة الغرفة والثلاجة لمدة ٥٠

- \* المعامله الاولى : جبن دمياطي صنعت بالطريقَه التقليديه باضافه ٨ % ملح قبل التنفيح .
- \* المعامله الثانيه : جبن دمياطى صنعت بالطريقه التقليديه باضافه ٤ % ملّح قبل التنفيّح ، ثم النقع في محلول ملحى ٢٠% لمدة ٨ ساعات .
- \* المعامله الثالثه : جبن دمياطي صنعت بالطريقه التقليديه بعدم إضافه الملح قبل التنفيح ، ثم النقع في محلول ملحي ٢٠% لمدة ١٦ ساعة .
- \* المعامله الرابعه : جبن طرى صنعت بالطريقه المقترحه باضافه ٨ % ملح ثم النقع في محلول ملحى ٢٠ % لمدة ٤ ساعات .
- \* المعامله الخامسه : جبن طرى صنعت بالطريقه المقترحه باضافه ٤ % ملح ثم النقع في محلول ملحي. ٢٠ % لمدة ٨ ساعات .
- \* المعامله السادسه : جبن طرى صنعت بالطريقه المقترحه بعد إضافه ملح ثم النقع في محلول ملحى ٢٠% لمدة ١٦ ساعة .

وقد تم تحليل الجبن الناتج من الطريقتين كيماويا وميكروبيولوجيا وحسيا أثناء التخزين على درجة حرارة الغرفة والثلاجة لمة ١٥ ، ٣٠ ، ٢٠ ، ٩٠ يوم ، وقد أوضحت النتائج المتحصل عليها ما يلي :-

- ١- عدم وجود إختلافات بين طريقتي التصنيع لكلا من الرطوبة والجوامد الكلية .
- ٢- تناقص الرطوبة وزيادة كلا من الجوامد الكلية والملح بزيادة فترة التخزين على درجة حرارة الغرفة أو الثلاجة في كلا الطريقتين .
- ٢- محتوى الجبن المخزنة على درجة حرارة الغرفة من الرطوبة وقيم الـ pH ، الدهن/المادة الجافة أقل عنها في الجبن المخزنة على الثلاجة في جميع المعاملات .
- ٤- الجبن المخزنة على الثلاجة أعلى في كلا من الجوامد الكلية ، الحموضة ، الملح ، الدهن ، النتروجين الذائب إلى الكلي وكذلك الأحماض الدهنية الطيارة عنها في الجبن المخزنة على درجة حرارة الغرفة في جميع المعاملات .
  - موما الجبن المصنع بالطريقتين يسلك نفس الاتجاه بالنسبة للتركيب الكيماوي .
- ٦- محتوى الجبن الطازج أعلى في العدد الكلي للبكتريا ، ويتناقص العدد بزيادة مدة التخزين في جميع المعاملات .
- ٢- الجبن الناتج بالطريقة المقترحة والمخزنة على درجة حرارة الغرفة يحتوي على أعداد أكبر من البكتريا عنها في الجبن المخزنة في الثلاجة .
- ٨- جميع المعاملات لا تحتوي على أي من بكتريا القولون وكذلك الخمائر والفطريات فيما عدا الجبن الطازج والمصنع بالطريقة المقترحة والمخزنة حيث يحتوي على ١٢٠ خلية من الخمائر والفطريات.
- ٩- أظهرت نتائج التحكيم الحسي أن الجبن الناتج بالطريقتين قد حصل على أعلى درجات تحكيم بعد التخزين لمدة ٩٠ يوم سواء عند التخزين بالغرفة أو بالثلاجة .

١٠- الجبن المخزن على درجة حرارة الغرفة حصل على درجات تحكيم أعلى عن الجبن المخزنة في الثلاجة

بتحكيم البحث

اد / طه عبد الحليم نصيب اد / منير محمود العبد

كلية الزراعة – جامعة المنصورة كلية الزراعة – جامعة القاهره

	01							Ripenir	ng Perio	od ( day	s)									
Properties	Storage		Fresh			15			30			60			90					
	condition	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3				
Moioturo%	Ambient	57.16	56.71	55.89	52.13	50.13	52.33	50.90	49.23	51.14	48.74	48.40	47.69	48.25	48.20	46.57				
MOISIULE %	Refrigerator	57.16	56.71	55.89	56.86	56.81	57.83	59.85	56.85	59.49	59.37	57.83	59.81	59.90	58.95	59.85				
T 9%	Ambient	42.84	43.29	44.11	47.87	49.87	47.67	49.10	50.77	48.86	51.26	51.60	52.31	51.75	51.80	53.34				
1.576	Refrigerator	42.84	43.29	44.11	43.14	43.19	42.17	40.15	43.15	40.51	40.63	42.17	40.51	40.10	41.05	40.15				
<b>5</b> 4	Ambient	6.33	6.11	6.56	5.22	4.93	5.03	5.13	4.87	5.08	5.01	4.87	4.97	4.97	4.86	4.91				
рп	Refrigerator	6.33	6.11	6.56	6.26	6.08	6.32	6.21	6.00	6.18	6.17	5.99	6.18	6.11	5.91	6.17				
Τ Δ0/	Ambient	0.19	0.33	0.16	0.89	1.24	1.10	1.14	1.06	1.11	1.18	1.06	1.25	1.25	1.05	1.27				
1.A%	Refrigerator	0.19	0.33	0.16	0.21	0.32	0.19	0.27	0.36	0.31	0.30	0.38	0.31	0.33	0.39	0.34				
Salt%	Ambient	5.40	5.50	5.54	5.81	5.70	5.76	6.23	6.48	6.10	7.3	6.55	6.42	7.41	6.75	6.90				
Salt /o	Refrigerator	5.40	5.50	5.54	5.77	5.52	5.61	5.31	5.98	5.93	5.95	6.21	6.41	6.15	6.73	6.61				
Eat9/	Ambient	20	19	18.5	21	20	19	22	22	20	22	23	22	23	23	22				
Fal%	Refrigerator	20	19	18.5	21	20	19	21	21	20	20	20	21	19.5	19.5	21				
	Ambient	46.69	43.89	41.94	43.86	40.10	39.85	44.86	43.33	40.89	42.91	44.52	42.05	44.44	44.40	41.24				
F/DIVI	Refrigerator	46.69	43.89	41.94	48.67	46.30	45.05	52.30	48.60	49.39	49.22	47.42	52.25	48.62	48.23	52.30				
	Ambient	8.17	7.31	11.83	11.84	10.62	18.03	14.35	14.35	21.11	17.05	16.58	24.72	21.00	21.22	26.22				
31N/ 11N 70	Refrigerator	8.17	7.31	11.83	8.73	7.88	12.5	9.31	9.00	13.85	10.00	10.05	13.85	10.55	11.11	15.33				
	Ambient	9.2	9.3	8.7	13.4	13.5	14.1	16.5	15.9	17.2	18.1	19.4	21	21	22	23				
IVFA	Refrigerator	9.2	9.3	8.7	11.1	11.2	10.9	12.4	12.1	12.30	14.5	14.7	14.8	16.1	16.3	16.2				
T.S = Total solids SN/TN = Soluble nitrogen/Total nitrogen																				

Table2: Effect of salting method and storage conditions on the chemical properties of soft cheese during pickling (Traditional method).

T.A = Titratable acidity

F/DM: Fat / Dry Matter

TVFA = Total volatile fatty acids

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							Rip	pening	Period	(days)						
Properties	storage	Fi	resh			15			30			60			90	
•	condition	P1	P2	P3	P1	P2	P3	P1	P2	P3	P1	P2	P3	P1	P2	P3
Moisturo%	Ambient 57.92 56.7	56.77	55.88	56.13	55.13	50.24	54.13	49.34	47.89	48.57	48.23	46.75	47.30	47.73	46.02	
Moisture /8	Refrigerator	57.92	56.77	55.88	58.74	57.53	57.73	59.79	58.79	58.88	59.89	59.13	58.89	60.09	59.11	59.0
T C0/	Ambient	42.08	43.23	44.12	47.67	49.87	49.76	45.87	50.66	52.11	51.43	51.77	53.25	51.70	52.27	53.98
1.3%	Refrigerator	42.08	43.23	44.12	41.26	42.47	42.27	40.21	41.21	41.12	40.11	40.87	60 9   P2 P3 P1   48.23 46.75 47.30 4   59.13 58.89 60.09 55   51.77 53.25 51.70 52   51.77 53.25 51.70 52   6.41 6.21 6.39 6   1.15 1.10 1.25 1   0.20 0.23 0.22 0   7.16 7.13 7.54 8   6.20 6.67 6.64 6   22 21 23 2   21 20 20 42.94 39.43   43.64 43.64 43.64 43.64 43.64   51.38 48.64 50.11 44.95 51.38 23.07   14.96 13.88 16.16 1 16.16 1	40.89	41.00	
ъН	Ambient	6.54	6.55	6.54	5.64	5.30	5.23	5.18	5.37	5.21	5.08	5.17	5.02	90   P1 P2 P3   5 47.30 47.7346.0   9 60.09 59.11 59.0   5 51.70 52.27 53.9   2 39.91 40.8941.0 2   2 39.91 40.8941.0 5.00   6.39 6.39 6.11 1.12   1 1.25 1.11 1.11   3 0.22 0.23 0.33   8 7.54 8.11 8.17   7 6.64 6.51 6.77   20 20 20 20   3 43.64 43.0440.7   4 50.11 48.9148.7   3 23.07 21.2225.7   8 16.16 11.111.4.5   20 21 23   20 21 23   20 21 23   7 15.95 16.00	5.01	
рп	Refrigerator	6.54	6.55	6.54	6.45	6.55	6.49	6.44	6.44	6.31	6.41	6.41	46.75 47.30 47.7346.02   58.89 60.09 59.11 59.0   53.25 51.70 52.2753.98   41.12 39.91 40.8941.00   5.02 4.99 5.00 5.01   6.21 6.39 6.39 6.11   1.10 1.25 1.11 1.10   0.23 0.22 0.23 0.32   7.13 7.54 8.11 8.14   6.67 6.64 6.51 6.79   21 23 22.5 22   20 20 20 20   39.43 43.64 30.040 75			
Τ Δ%	Ambient	0.16	0.16	0.16	0.37	0.96	0.89	0.91	0.97	0.90	1.14	1.15	1.10	1.25	P1 P2 P3   7.30 47.7346.0 0.09 59.11 59.0   1.70 52.2753.9 9.91 40.8941.0 1.0   9.91 40.8941.0 5.00 5.01 5.03   3.99 6.39 6.1 1.125 1.11 1.10   0.22 0.23 0.33 7.54 8.11 8.14   3.64 6.51 6.71 22 20 20 20 3.64 43.0440.7   0.11 48.9148.7 3.07 21.2225.7 22 20 20 20 3.67 21.2225.7 22 20 20 20 3.64 3.0440.7 3.07 21.2225.7 22 20 20 20 20 3.64 3.0440.7 3.07 21.2225.7 22 20 20 20 20 20 3.07 21.2225.7 21.22 22 3.07 21.222 20 3.07 21.22 20 3.07 21.22 25.7 22	1.10
1.478	Refrigerator	0.16	0.16	0.16	0.16	0.16	0.18	0.18	0.18	0.19	0.20	0.20	0.23	0.22	0.23	0.32
Salt%	Ambient	5.50	5.54	5.40	5.53	5.81	5.64	6.50	6.18	6.87	7.42	7.16	7.13	0 60.09 59.11 59.0   5 51.70 52.2753.98 239.91 40.8941.00   4.99 5.00 5.01 6.39 6.11   1.25 1.11 1.10 0.22 0.32   7.54 8.11 8.14 6.64 6.51 6.79   23 22.5 22 20 20 20   8 43.04 40.75 5.01 48.91 48.78   3 23.07 21.225.78 16.16 11.11 14.52	8.14	
Sait /8	Refrigerator	5.50	5.54	5.40	5.61	5.56	5.90	6.16	5.61	6.21	6.48	6.20	6.67			
Fat%	Ambient	20	19	18.5	21	20	20	21	21	21	22	22	21	90   P1 P2 P3   47.30 47.7346.02 60.09 59.11 59.00   51.70 52.2753.96 39.91 40.8941.00   4.99 5.00 5.01 6.39 6.11   1.25 1.11 1.10 0.22 0.23 0.32   7.54 8.11 8.14 6.64 6.51 6.79   23 22.5 22 20 20 20   43.64 43.0440.75 50.11 48.91 48.76   50.11 48.91 48.72 57.11 14.11 4.52   20 20 20 20 20 23.07 21.22 5.78   50.11 48.91 43.04 40.75 50.11 48.91 48.76   23.07 21.22 5.78 16.16 11.11 14.52   20 21 23 15.95 16.00 16.59	22	
1 at 70	Refrigerator	20	19	18.5	19	20	19	19.5	21	19	20	21	20	20	90   P1 P2 P3   7.30 47.7346.02 00.09 59.1159.0   0.09 59.1159.0 5.01 5.01   1.70 52.2753.98 9.91 40.8941.00   4.99 5.00 5.01 5.01   5.39 6.39 6.11 1.25   1.25 1.11 1.10 0.22 0.23 0.32   7.54 8.11 8.14 8.64 6.51 6.79   23 22.5 22 20 20 20 3.64 8.04 8.75   0.14 43.0440.75 0.11 48.91 48.78 3.07 21.22 5.95 6.16 11.11 4.52   20 21 23 5.95 16.00 16.5	
E/DM	Ambient	47.52	43.95	41.93	44.05	40.10	40.19	45.78	41.45	40.29	42.77	42.94	39.43	43.64	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	40.75
T/DIVI	Refrigerator	47.52	43.95	41.93	46.05	47.09	44.95	48.49	50.95	46.20	49.86	51.38	48.64	50.11	48.91	48.78
	Ambient	13.43	10.76	11.47	17.24	16.66	16.75	20.00	21.64	20.23	21.73	48 6.20 6.67 6.64 6.51 6.79   2 22 21 23 22.5 22   0 21 20 20 20 20   .77 42.94 39.43 43.64 43.0440.75   .86 51.38 48.64 50.11 48.9148.78   .73 25.54 24.33 23.07 21.2225.78				
30710	Refrigerator	13.43	10.76	11.47	14.00	12.40	12.08	14.57	13.28	13.25	15.15	14.96	13.88	16.16	11.11	14.52
	Ambient	8.2	8.1	9.0	12.9	13.70	14.4	16.10	16.00	18.00	18.00	19.00	21	20	21	23
IVFA	Refrigerator	8.2	8.1	9.0	10.7	11.12	11.14	11.97	12.10	12.50	13.91	14.20	14.7	15.95	90   P2 P3   47.7346.0 59.1159.0   59.1159.0 59.1159.0   52.2753.9 40.8941.0   5.005.01 5.01   6.396.11 1.11   1.11 1.10   0.23 0.32   20.275 22   20 20   43.0440.7 43.0440.7   41.114.5 21.2225.7   21.2225.7 21.221   21 23   16.00 16.5	16.5

Table3: Effect of salting method and storage conditions on the chemical properties of soft cheese during pickling (Proposed method).

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Ripening Periods ( days )													
Treatment				Ambient			Refrigerator						
		Fresh	15	30	60	90	fresh	15	30	60	90		
	T.C	33x10 <sup>6</sup>	13.6x10⁵	2x10 <sup>4</sup>	3x10 <sup>3</sup>	1x10 <sup>3</sup>	33x10 <sup>6</sup>	1x10⁵	16x10 <sup>4</sup>	9x10 <sup>4</sup>	5x10 <sup>3</sup>		
T1	Coli	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil		
	Y&M	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil		
	T.C	32x10 <sup>6</sup>	29x10 <sup>4</sup>	3x10 <sup>4</sup>	8x10 <sup>3</sup>	9x10 <sup>2</sup>	33x10 <sup>6</sup>	8x10⁵	3x10⁵	56x10 <sup>4</sup>	4.5x10 <sup>4</sup>		
T2	Coli	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil		
	Y&M	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil		
	T.C	1.3x10 <sup>4</sup>	1x10 <sup>4</sup>	14x10 <sup>3</sup>	5x10 <sup>3</sup>	1x10 <sup>3</sup>	1.3x10 <sup>4</sup>	1x10 <sup>4</sup>	16x10 <sup>3</sup>	6x10 <sup>3</sup>	1x10 <sup>2</sup>		
Т3	Coli	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil		
	Y&M	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil		
	T.C	32x10 <sup>6</sup>	3.9x10⁵	1.1x10⁵	0.3x10⁵	3.2x10 <sup>4</sup>	32x10 <sup>6</sup>	1x10⁵	4x10 <sup>4</sup>	44x10 <sup>3</sup>	2x10 <sup>3</sup>		
P1	Coli	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil		
	Y&M	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil		
	T.C	4x10 <sup>4</sup>	3x10 <sup>4</sup>	2x10 <sup>4</sup>	3.9x10 <sup>3</sup>	45x10 <sup>4</sup>	3x10 <sup>4</sup>	1x10 <sup>4</sup>	4x10 <sup>3</sup>	9x10 <sup>2</sup>	6x10 <sup>2</sup>		
P2	Coli	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil		
	Y&M	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil		
	T.C	5.5x10⁵	1x10⁵	12x10⁵	25x10 <sup>4</sup>	3x10⁵	5.5x10 <sup>2</sup>	3x10 <sup>2</sup>	2x10 <sup>2</sup>	4x10 <sup>1</sup>	4x10 <sup>1</sup>		
P3	Coli	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil		
	Y&M	120	Nil	Nil	Nil	Nil	120	Nil	Nil	Nil	Nil		
TC = To	tal bacteri	al count. (	Coli = Coliform	count. Y&	M= Yeast and	Mould count							

Table 4: Effect of salting method and storage conditions on the microbiological properties of soft cheese during picklina.