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IMPROVING THE QUALITYOF LOWFAT UF-WHITE SOFT PICKLED CHEESE

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ABSTRACT

Buffalo's skim milk retentate was used to manufacture a good quality low fat UF-white soft pickled cheese with two different fat replacers namely Slendid® 200 or Glucomannan and heat shocked culture. The resultant retentate was divided to six treatments as follows:

The first one was standardized to 45% Fat/DM and used for full-fat (FF) UF-white cheese and served as (control, Tr1). The other five treatments were mad from retentatestanderized 20% Fat/DM, one of them was served as (control,Tr2) while the other four treatments were used for the application of two kinds of fat replacer

Tr3 and Tr4 by adding 0.2 g/liter milk of Slendid® 200 (SL) or Glucomannan (GM); Tr5 and Tr6 by adding 0.2g/liter milk of Slendid® 200 or Glucomannan with heat shocked of *Lb. helviticus and Lb. bulgaricus*. All cheeses were then pickled in previously pasteurized brine solution 4% Naclat 5 ± 1 º C for 30 days. Fresh and stored cheese were chemically analyzed and sensory evaluation. Also. Micro structure of cheeses were determined. The obtained results revealed that decreasing the fat content of cheese had an obvious effect on the chemical composition, cheese yield of the resultant cheese where it increased the moisture content, total protein and pH values and decreased cheese yield, acidity, cheese ripening, total volatile fatty acids and cholesterol content compared with full-fat cheese (Tr1) when fresh and after 30 days of storage. Micro-structure of low fat shown that casein and fat globles were more dispersed in the cheese texture than that of (Tr1).

Addition of fat replacer (FR) increased the chemical properties, cheese yield, ripening indices, TVFA content. In respect of total cholesterol content, Glucomannanwith heat shocked stimulate the reduction of cholesterol ascompared with Slendid® 200 after 30days of pickling . Also, data showed that, Slendid® 200 increased the openness of cheese texture the end of pickling as compared with Glucomannan. Moreover, data showed that the Sensory scores full-fat cheese was awarded best when fresh and after 30 days of pickling as compared with low fat which have inferior quality cheese. However, Fat replacer improved the organoleptic properties of low fat cheese when fresh and after 30 days of pickling, especially its body and texture.

Keywords: Low Fat white cheese, Slendid® 200, glucomannan, heat shocked culture Chemical composition, Micro structure.

INTRODUCTION

fat cheeses include process modifications, use of enzymes and special starter Since the 1980, the eating habits of consumers in North America and Europe have changed. Largely influenced by health-related concerns, there has been pressure to reduce the amounts of fat, sugar, cholesterol, salt and certain additives in diet Tammie et al., (1999).

Fat consumption by western populations has been shown to be associated with an increased risk of obesity, coronary heart disease, elevated blood pressure and tissue injury diseases associated with lipid oxidation Katsiari *etal*., (2002).

However, fat contents responsible for many desirable functional, textural, and sensory properties in cheese and its decrease alters physical and flavor properties and lowering cheese quality. Low and reduced fat cheeses have certain disadvantages stipulated by reduction in proportion of moisture in non-fat substances (NFs), level of proteolysis activity, amount of free oil and increased proportion intact casein (Sheehan &Guinee, 2004).

Various techniques used to improve quality of low and reduced cultures bacteria and use of fat replacers Mistry, (2001).

Recently, the demand for white soft cheese has been increased in Egypt and some local dairy factories manufactured it in commercial scale. The economic advantage of rapid development of more intense cheese flavor in shorter period of time would be substantial.Flavors characteristics can occur partially by bacteria and enzymes through different metabolic pathways Kamaly et al., (1989).

Adding lactic acid bacteria to cheese is an effective way to acceleratecheese ripening. The higher numbers of desired lactic acid bacteria in cheese may cause over production of acid in the final cheese, this problem was solved by using physical methods such as heat shocking El-Soda, (1993).Heat-shocked lb-Helveticas and Lb. bulgaricus were used to accelerate ripening by increasing proteolysis and cheese flavor without introducing bitter taste in the resultant cheese.

Fat replacers, which are water-dispersible, improve the sensory and functional properties of low-fat cheese by bulking effect associated with moisture retention and give a sense of lubricity and creaminess Romeih et al., (2002). It divided into 2 groups: Fat substitutes and fat mimetic, fat substituted are non polar, fat soluble compounds, providing sensory and functional properties of fats to food. While fat mimetic are polar, water soluble substances used to partially replace some of sensory and functional characteristics of fat. Fat mimetic binding water and thereby improving texture and yield of low fat cheese Mistry, **(**2001). According to a composition, fat mimetic consist mainly of microparticulated protein or carbohydrate based materials Kavas *etal*., (2004).

Slendid® 200 is high methoxyl ester pectin extracted from citrus and standardized by sucrose. It is related to the group gums, gels and thickness.

Glucomannan is considered to be one of the major components of hemicelluloses in the cell walls especially from *saccharomyces cerevisiae*. The dietary supplementation with glucomannan oligosaccharides

from yeast cells had a significant impact with respect to changing the bacterial ecology in the gut, which are considered to be healthier Corrigan *etal*., (2011).Also glucomannan improved the nutritional value and the rheological properties of the final product as related to the high viscosity, thickening ability, water binding and emulsion stabilizing capacity.

Therefore the objective of the present study was to evaluate the quality of low-fat UF-white pickled cheese. Which is most popular cheese in Egypt, made with two different fat replacers: Slendid®200 or Glucomannan. The cheese made withfat replacer or fat replacer plus heat shocked culture were compared with full-fat (was standardized to45% F/DM) and low fat (was standardizedto 20% F/DM) were served as control after 30 day of pickling.

MATERIALS AND METHODS

Materials:

Fresh raw buffalo's milk ware obtained from the herd of MahalletMousa Animal Station,kafer El-Shikh Government and processed at the pilot plant of the Laboratory of the Dairy Technology Department, Animal Production Research Institute, Ministry of Agriculture.

Starter cultures consisting of *lactobacillus delbrueckii subsp. bulgaricus and lactobacillus delbrueckii subsp. helveticus* DSUZ 20082 were obtained from Chr. Hansen´s Denmark, were heat shocked as described by Bartels *et al*., (1987a) with some modifications by Spangler *et al*., (1989) the culture was subculture for 12 hr at 37ºc in 11.5%reconstituted skim milk power at least twice before use.

Powder calf rennet from Fromase 2200 Tl Granulate DSU, France, was used in cheese making of terdilution (10g/100 ml/water).

The fat replacer: Slendid ®200 a high methoxyl ester pectin extracted from citrus and standardized by sucrose was obtained from (kelco, Co., Denmark) Glucomannan a represent carbohydrate, especially poly saccharides that contain mannose sugar residues was obtained from (Alemed-Al-Mokatem- Cairo,).

Preparation of milk retentate:

Full-cream whole milk (containing 6% fat) was separated to obtained cream 60% fat by using a batch type cream separator (Model 107 AK; Alfa lavel, lund, Sweden) and skim milk contained less than 0.2% fat, which heat treated to 72ºc/15 sec. The obtained skim milk was concentrated to concentration factor (CF=3).

The resultant retentate was divided to six treatments as follows:

1-Control 1: full fat white soft cheese made from UF-milk standardized to 45% Fat/DM (Tr1).

2-Control 2: low fat cheese made from UF-milk standardized to 20% Fat/DM without any additives (Tr2).

3- Low fat cheese from UF-milk (20% Fat/DM) with 0.2% Slendid (Tr3).

4-Low fat cheese from UF-milk (20% Fat/DM) with 0.2% Glucomannan (Tr4).

5-Low fat cheese from UF-milk (20% Fat/DM) with 0.2%Slendid + heat shockedculture (Tr5).

6-Low fat cheese from UF-milk (20% Fat/DM) with 0.2% Glucomannan +heat shocked culture (Tr6).

Low-Fat UF- white pickled cheese manufacture:

Low-fat white soft cheese was made from all treatments as described by (Rrnner and Abd El-Salam 1991). The fat replacers were added to the cheese milk retentate according to the manufactures recommendation at 30ºc and mixed using a high speed blender for min. The resultant parts were heat treated to 72ºc/15 sec., and cooled to 40ºC, salted with 3±0.1% Nacl, the incubated with 0.02% heat-shocked *lactobacillus delbrueckii subsp. Helveticus* CSUZ 20082+*Lb. bulgaricus* at a rate of (2 : 1%) (w/w). This was followed by the addition of 0.02% (v/v)Cacl2 solution to each part on and 0.03% (v/v) of powder rennet was dissolved in water, then added to retentate at 40ºC and kept in plastic box. After coagulation, resultant cheese were pickled in previously pasteurized brine solution 4% Nacl and covered plastic cups were stored at 5±1.0 for 30 days. Fresh and stored cheeses were chemically analyses and sensory evaluation.Also, samples were taken for micro-structure examination.

Chemical analysis:

The moisture, titratable acidity (TA) and fat contents were determined according to the method described by Ling (1963). pH value was measured in triplicate using an electric pH meter with combined glass electrode (Jenway 3305, Eng.). Total nitrogen (TN), soluble nitrogen (SN) and Non Protein Nitrogen (NPN) of milk and cheese were determined by semi-micro Kjeldahlmethod IDF, (1993) and ash contents (using thermolyne, type 1500 Muffle furnace) according to AOAC (2000). Total volatile fatty acids (TVFA) were determined by the direct distillation methods as described by Kosikowski(1978). Total cholesterol was determined according to the method described by Pantulu *et al*., (1975).

Cheese microstructure:

The Electon microscopic analysis was performed in the Egyptian Mineral Resources Authority Central Laboratories Sector. The scanning Electron microscope (SEM) for white soft cheese (full fat and low fat) was carried out using SEM (FEL Company , Netherlands) . Model Quanta 250 FEG (Field Emission Gun) attached with EDX Unit (Energy Dispersive X-ray Analyses) , with accelerating voltage 10 KV. During SEM analysis , samples were freeze-fractured in liquid nitrogen to approximately 1-mm Pieces and the pieces were then mounted onaluminum stubs with silver paint, dried to critical point and coated with gold for 300 s in sputter coater (SCD 005 Sputter Coater) and scanned uder low vacuum conditions with pressure chambers 60 pa. Karami *et al*., (2009).

Sensory evaluation:

Buffalos'cheese samples were judged by 15 panelists from the staff members of Dairy Science and Technology Department**,** Animal Production Research Institute (APRI) using Scale of; 10 points for

Appearance and color,40 points for body and texture and 50 points for flavor and taste by (Nelson and Tourut, 1956).All cheese samples were evaluated when fresh (one day) and during storage 15, 30 and 45 days at 6±1ºc .

RESULTS AND DISCUSSION

Utilization of Slendid-type®200 or glucomannanas fat replacers in lowfat UF- white pickledcheese:

Milk Composition:

The average composition of standardized Low-Fat, whole and skim milk retentat produced are presented in Table (1). It is clear that the reduction in the fat content of milk affected its total solids (T5%). The dry matter was found to be higher in the skim milk retentate followed by full fat milk and the lowest was in the skim milk and the casein/fat ratio increased as the fat content in the milk decreased. There were no effect on the total acidity and pH value milk**.**

Chemical composition and cheese yield:

Reduction offat level in cheese or the use of fat replacers (FR) in the manufacture of UF-white pickled cheese influenced gross composition and yield (Table, 2). Decreasing the fat contentof cheese milk by approximately 50% was affected on these Para meters, the Full-Fat cheese (Tr1) had a higher total solids content than cheese. Produced from low-fat milk (Tr2). These differences may be attributed to their total protein contents moreover, cheeses with FR had a lower total solids content than the Full-Fat (Tr1 and low-fat (Tr2) respectively, this is due to the water-binding capacity of FR affected the moisture and moisture in nonfat substance (MNFS) contents resulting in a higher level of moisture in the cheese made with FRcompared with FF or LF control cheeses. Similar results were reported by Michaelidou *et al*., (2003).

Table (1) Chemical composition% of Ultra-filtered milks used for the manufacture low fat (20% F/DM) white pickled cheese.

Components %	Whole milk	Skim milk	Skim milk Retentate
Total solids	14.90	8.63	25.95
Fat	6.00	0.2	0.5
Total protein	4.3	5.3	20.3
Casein	3.9	2.22	ND
Casein / Fat	0.65	11.1	ND
Titratable acidity	0.165	0.165	0.36
pH	6.6	6.7	6.8

ND :not detected

Also, the data showed that using slinded or glucomannan did not affect the F/DM% compared to low fat cheese (Tr2) when fresh and after 30 days .

Similar finding were reported by Sahan et al., (2008)

Compared to full fat cheese, total nitrogen contents of Low-fat cheese had the lowest value, whereas cheese treated with either slendid (Tr3) and (Tr5) followed by treated with GM. Tr4 and Tr5, retained the highest TN% compare to Low Fat cheese after 30 days which could be attributed to the properties of these FR Drak et al., (1996).

Data presented in Table (2) show that cheese containing FR had lower ash content than the low fat cheese (Tr2) after 30 days. The differences in ash and total solids contents with Full-fat and Low-Fat cheese may have contributed to increased water binding capacity of the cheese matrix Romeih et al., (2002).

Also data in Table (2) show that fresh control samples (Tr2) had slightly lowertitratable acidity (TA) as compared to other treatments. After 30 days, TA increased in all treatments, the highest increment increase in TA was attained for Tr6, while, the lowest rate was recorded for (Tr2). On contrast, to the acidity (TA), the pH values decreased gradually towards the end of ripening. These results agree with those reported by (Kastiari and Voutsinas 1994) and Kastiari *etal*., (2002).

Cheese yield values are shown in Table (2) and these values are strictly related to the level of fat in cheese milk used.

So, the highest and lowest cheese yield was obtained in full fat and Low-Fat cheese, respectively. Cheese treated with FR had higher cheese yield than the control cheese (Tr2). This could be attributed to the effect of the used FR on retaining moisture in the curd. It is also, observable that, the highest yield was attained by using 0.2% GM (Tr4) or with heat shocked culture (Tr6). This is to its higher moisture. The trend of this result was agreed with the previous reports Kavas *et al*., (2004) and (Koca and Metin, 2004).

Table(2): Chemical composition% , pH values and Cheese Yield of Full fat, fresh and after 30 days at 5 ± 1.0ºClow fat UF-white pickled cheese (20% F/DM)made with or without fat replacers

Property	Treatments*											
%	Tr1		Tr2		Tr3		Tr4		Tr5		Tr6	
Stored period	1d	30d	1d	30d	1d	30d	1d	30d	1d	30d	1d	30d
Total solids	34.0	38.9	29.0	29.5	28.6	28.7	28.8	29.2	28.6	28.8	28.8	29.2
Fat /DM	45.00	44.60	19.79	19.50	19.85	19.36	19.80	19.39	19.90	19.33	19.77	19.37
Ash	3.37	3.81	3.16	3.58	3.08	3.24	3.09	3.26	3.09	3.25	3.09	3.26
pH	5.42	5.11	5.57	5.27	5.45	5.23	5.50	5.13	5.42	5.24	5.49	5.09
Acidity	0.75	0.89	0.68	0.77	0.71	0.81	0.74	0.86	0.72	0.83	0.75	0.90
Cheese yield	12.0	11.56	7.90	7.39	9.20	8.32	10.10	9.28	9.0	8.39	10.17	9.36

Tr1: Full - fat UF-white pickled cheese
Tr2: Low -fat UF-white pickled cheese
Tr3: Low -fat UF-white pickled cheese + 0.2% Slendid
Tr4: Low -fat UF-white pickled cheese + 0.2% Glucomannan
Tr5: Low -fat UF-white pickled cheese + 0.2% Slendid + heat shockedculture
Tr6: Low -fat UF-white pickled cheese + 0.2% Glucomannan +heat shocked culture

Addition of FR had remarkable effect on total protein (TP) of the resultant cheese. Low –fat cheese had the lowest value of (TP), than cheese treated with FR. Highest value recorded with cheese treated with splendid (T3 and T5), followed by cheese treated with GM(T4 and T5), compare to low fat cheese after thirty days. This results could be attributed to the properties of FR Drak *etal*., (1996).

Data in Table (3) illustrated that the WSN and NPN levels continuously increased in all cheeses during ripening. This trend was observed in white pickled cheese with increasing fat level of cheese milk (FF). However control low white cheese (Tr2) contained less soluble nitrogen (SN) content and SN/TN ratio, than that the cheese treated with FR. It is worth to mention that, the SN content of Tr6 (0.2% GM + heat shocked cell) followed by Tr5 (0.2% SL + heat shocked cell) then Tr4 (0.2% GM) were much higher than the control (Tr2). These results are in conformity with these of other workers Michaelidou *et al.,* (2003)who found that protein break down occurred through the growth of cheese micro flora and for the proteolytic enzymes activity. While, El-Soda (1997) who mentioned that cheeses manufactured by the UF techniques were characterized by slow flavor development described as resisting ripening. This has been attributed to several factors; namely reduced level of residual rennet and/or the concentration of proteinase and peptidase inhibitors by UF. In addition the presence of ß-lactoglobulin as inhibitor for plasmin activity may be a contributing factor. Moreover, flavor development in buffalo‘s milk cheese is considerably slower than cow's milk cheeses (Fahmi and Sharara, 1950).

Table(3):Ripening indices (TN, WSN, WSN/TN, NPN/TN) of fresh and after 30 days at 5 ± 1.0ºC low fat UF-white pickled cheese (20% F/DM)made with or without fat replacers.

Property	Treatments											
%	Tr1		Tr2		Tr3		Tr4		Tr5		Tr6	
Stored period	1d	30d	1d	30d	1d	30d	1d	30d	1d	30d	1d	30d
TN%	2.50	2.75	1.99	2.16	1.93	2.09	1.93	2.09	1.93	2.10	1.93	2.09
TN/DM%	7.36	7.O7	6.87	7.32	6.74	7.30	6.68	7.15	6.76	7.27	6.69	7.17
SN%	0.27	0.334	0.190	0.234	0.190	0.228	0.190	0.231	0.189	0.239	0.189	0.244
SN/TN%	10.8	12.15	9.55	10.83	9.84	10.91	9.84	11.05	9.79	11.38	9.79	11.67
NPN%	0.042	0.050	0.034	0.038	0.032	0.037	0.033	0.037	0.036	0.039	0.037	0.042
NPN/TN%	1.678	1.818	1.706	1.965	1.699	1.767	1.714	1.892	1.862	1.885	1.920	2.006

See Table (2) for details of fat replacers and cheese treatments

It is clear from the data that TVFA values decreased with reduction fat content of all treatments, but slight affected with adding slendid or glucomannan whenfresh. TVFA values all treatments increased after 30 days, but the rate of increasing was higher in case of Full-cream control (Tr1) compared with Low-Fat white cheese. Moreover, the highest TVFA was attained by using 0.2% GM with heat shocked cells (Tr6); 0.2% SL + heat shocked (Tr5) and 0.2% GM (Tr4) respectively. Findings are in agreement with those reported with Badawi (1998) and Fenelon *et al*., (2001).

It is obvious from the data that control full fat cheese (Tr1) had the highest cholesterol content (58.75 mg/100g)when fresh compared the other treatments which had 29.37, 29.31, 29.10, 29.22 and 28.90 mg/100g for low fat cheese without FR (Tr2) or low fat with FR Tr3, Tr4, Tr5, and Tr6 respectively. The increase in cholesterol content may be due to decreasing the fat content in the pre-cheese milk used in low fat white pickled cheese treatments (table 4), after 30 days cholesterol content of all treatments were decreased, the lowest increaments in cholesterol was attained by using 0.2% GM with heat shocked cells (Tr6) or 0.2% GM (tr4) compared with the other treatments. Which might be attributed to the GM as a prebiotic stimulate Lactobacilli and bifidobacteria growth followed by reduced of cholesterol content. This result are in close

with those reported by Bayol et al., (1989).Who mentioned that cholesterol was reduced by substitution milk fat with butter oil .experimental studies indicated that prebiotic hepatic lipogensis and induces as a significant hypotriglyceridemic effect (Salem and El-Shibiny, 2003). Also Abd El-Malek (1999). Indicated that using beta-cyclodextrin from a particularly strong inclusion complex cholesterol this reaction from the basis several patented processes for extracting cholesterol from dairy fat Oaken Full *et al*. (1990a).

Table(4):Total Volatile Fatty Acids(TVFA) and Cholesterol content of fresh and and after 30 days at 5 ± 1.0°C low fat UF-white pickled cheese (20% F/DM)made with or without fat replacers.

Property	Treatments											
%	Tr1		Tr2		Tr3		Tr4		Tr5		Tr6	
Stored period	1d	30d	1d	30d	1d	30d	1d	30d	1d	30d	1d	30d
TVFA%	12.17	18.75	11.99	12.71	12.13	12.80	12.40	13.19	12.63	13.21	12.90	13.69
Cholesterol (mg/100g)	58.75	58.70	29.37	28.50	29.31	28.40	29.10	18.90	29.22	28.60	28.90	18.40

See Table (2) for details of fat replacers and cheese treatments

Cheese Microstructure

The submicroscopic structural changes in fresh, then after 30 days during ripening of white soft cheese (full fat and low fat).During cheese manufacturing an alteration in casein accurse due to the effect of rennet enzymes and acidifying of the milk followed by gel formation lumps which are modified into a finally granulated mass or chain. Casein micelles aggregate to form a protein network in which the fat globules are entrapped Ong et al,. (2013) Then major consistence of cheese para-casein fat and an aqueous face contribute each in a specific way to the structure.As for as para–casein is concerned the initial matrix of aggregated Para-casein micelles on average about 100 nm in diameter quickly disappears and more homogenous networks formed Esawy, (2002). Above PH 5.2 the casein practical size is order of 10 nm. the casein forms an open mesh like structure in which the original fat globules are entrapped. During cheese ripening some of the fat globules partially coalesce . The aqueous phase containing for example, dissolved salts , amino-acids peptides , etc. , in mainly inside the para-casein matrix only a relatively small amount is tightly bounded to the protein. Omar *et al.,* (2003) .The micro- structure of low fat UF- white pickled cheese is known shown in Fig (1)(fresh) casein network chains are clearly similar in all cheese. The micro structure shown that casein was dispersed in homogenous chain to give a loose external surface. Also fat globules were more dispersed in the cheese texture than that of control (Tr1). The degradation of casein micelles for 30 days shown in Fig (2) (storage period). Resulting in the disintegration of casein micelles after inter a uniform matrix and the penetration of the whey into the disintegrated casein mass , the small fat globules are embedded in the casein aggregates the protein matrix had a loose and porous structure cheese made with additive Slendid recovery more moisture other thancheese . Similar results were reported by Omar (1986) and Omar *et al.,* (2015).

Sensory evaluation:

The results of the sensory panel´s assessments of cheese quality during ripening are given in Table (5). The data show that the color and appearance, body, texture and flavor of white soft brined cheese were affected by reduction of fat level or the fat replacer type used in cheese making full-fat cheese (Tr1) was found the best treatment "gained score points at 30 days of the ripening period compared to the rest treatments either contained or free from fat replacer.

Whereas, lower score points for color and appearance in low fat-cheese (Tr2) than full-fat, which may be related to transparent surface due to the lack of fat. Similar observations were made by Rudan *et al.,* (1999).

Also, reduction of fat level owing to cheese dryness and firmness of its texture as well as had slighter brittle body and bitter flavor.

Addition of fat replacer improved the organoleptic properties of the resultants cheese especiallythe body and texture. Use of Slendid or Glucomannan in white cheese negatively influenced the scores for flavor cheese which might be attributed to starchy and bitter or grassy taste of G.M or SL which are oat-based hydrocolloidal suspension.

However, cheese treated with 0.2% GM (Tr4) gained the highest overall scoring points followed by 0.2%SL (Tr3).Similar results were observed by Volikakis *et al.,* (2004).

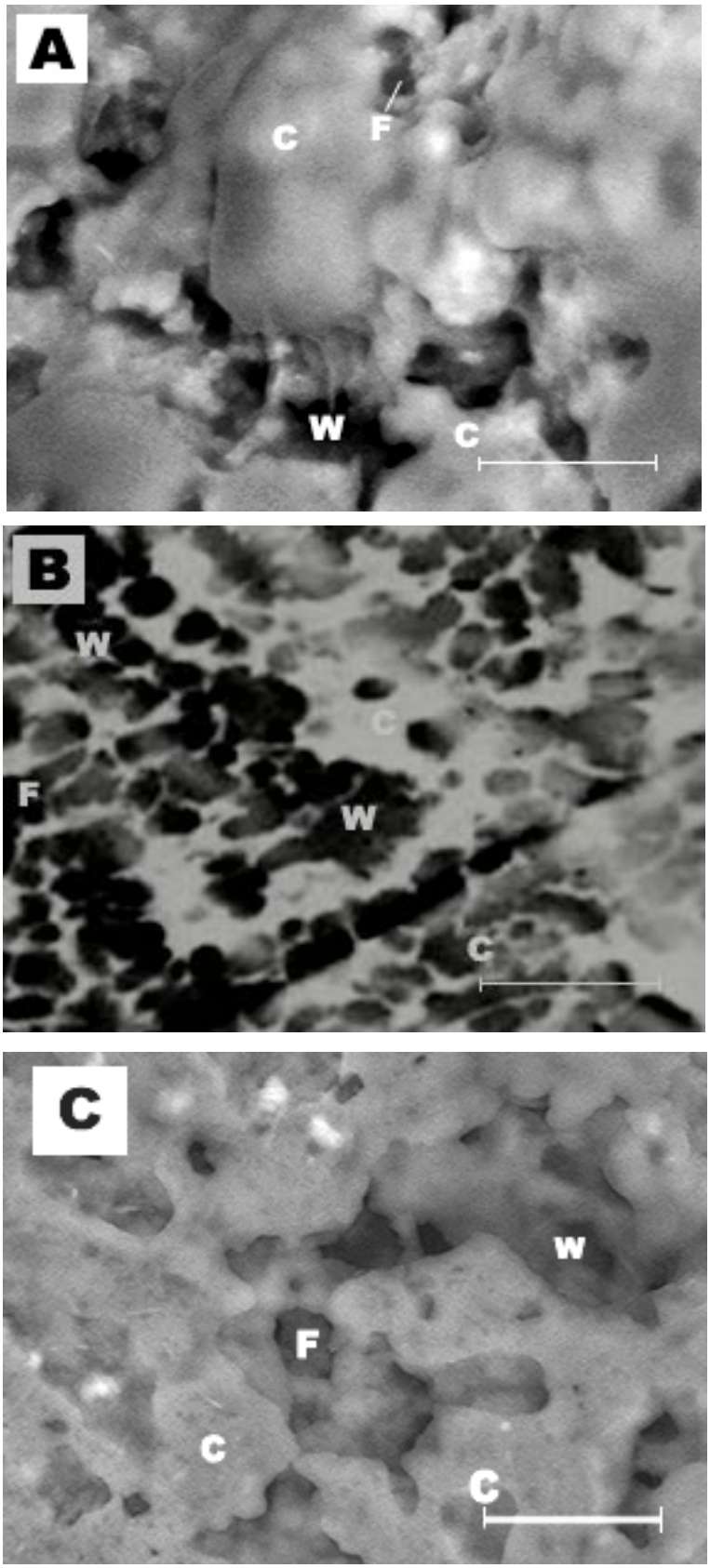


Fig: (1) SEM Images of (fresh) white soft cheese made from Retentate .
A : full fat cheese (Control 1) -
B : low fat cheese without add (control 2) –
C : low fat cheese + 0.2 % Slendid –
C: Casein – W: Whey – F : Fat gap – cj : curd juction
Bar = 2.5 nm

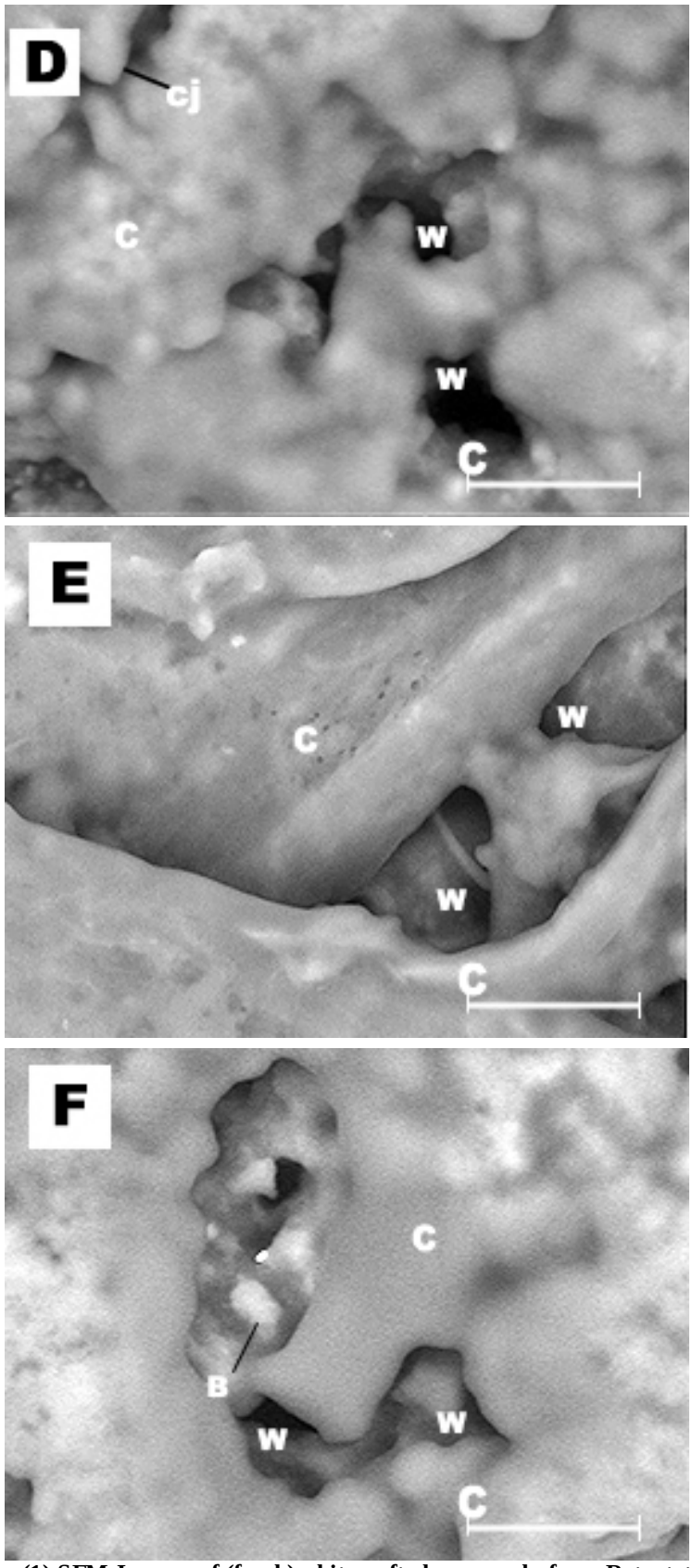


Fig: (1) SEM Images of (fresh) white soft cheese made from Retentate .
D : low fat cheese + .02 % Glucomannan –
E : low fat cheese + 0.2 % Slendid + heat shock culture –
F : low fat cheese + .02% Glucomannan + heat shock culture.
C: Casein – W: Whey – F : Fat gap – cj : curd juction
Bar = 2.5 nm

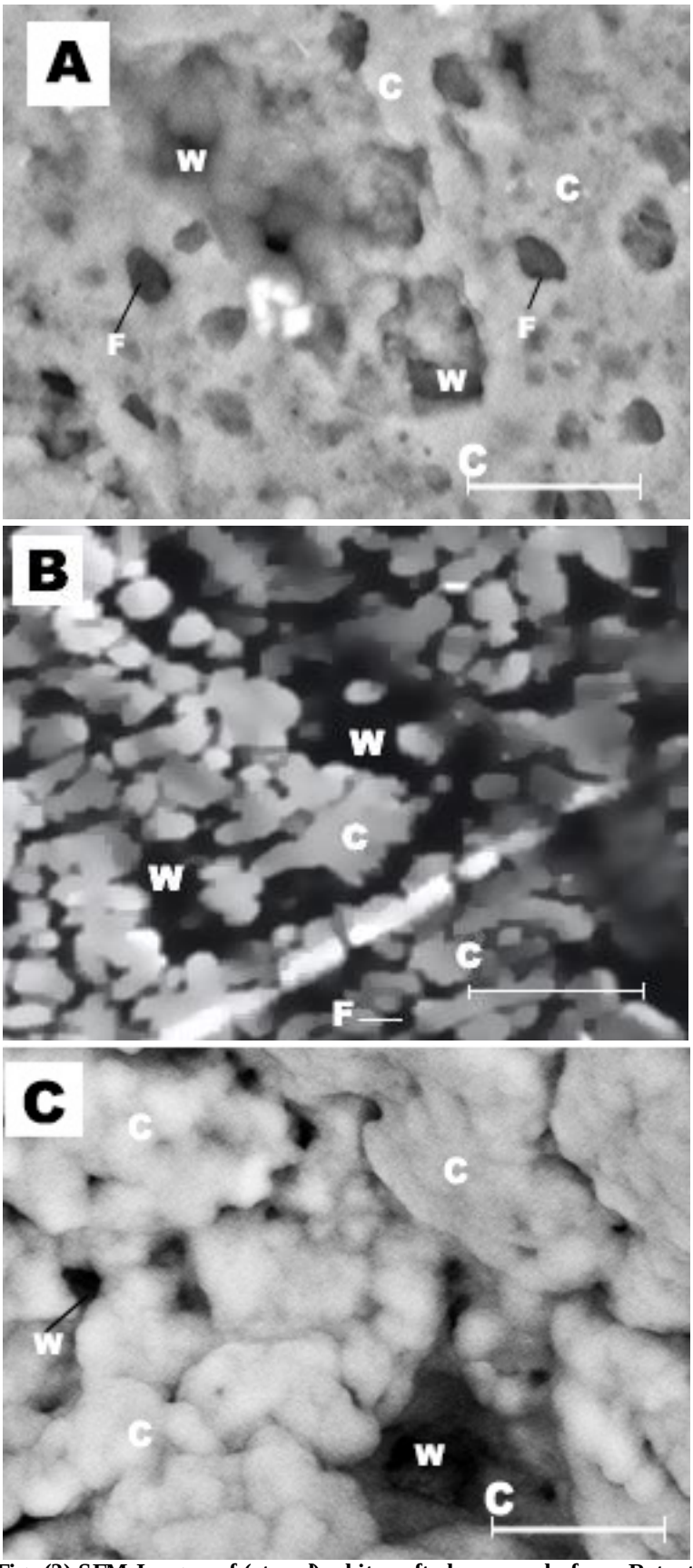
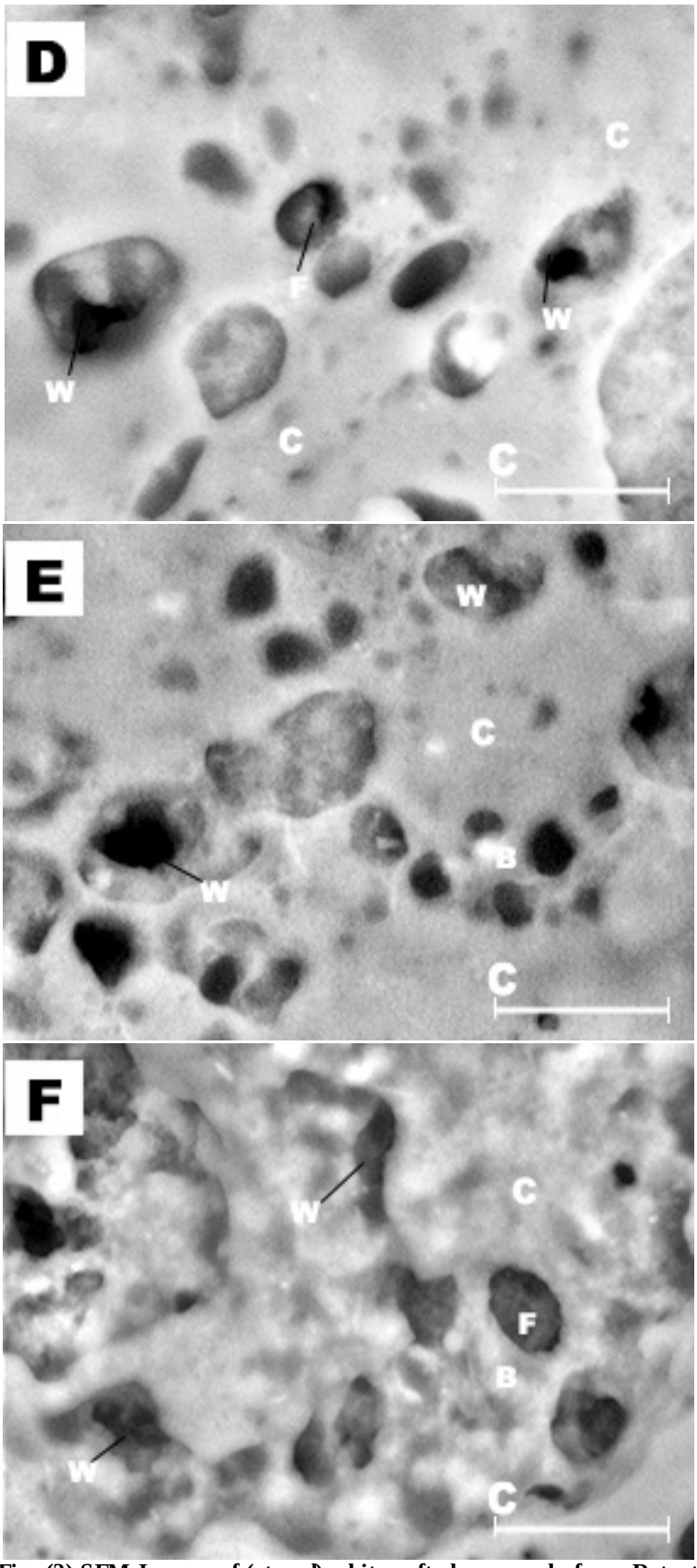


Fig: (2) SEM Images of (stored) white soft cheese made from Retentate .
A : full fat cheese (Control 1) -
B : low fat cheese without add (control 2) –
C : low fat cheese + 0.2 % Slendid –
C: Casein – W: Whey – F : Fat gap – cj : curd juction
Bar = 2.5 nm



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F : low fat cheese + .02% Glucomannan + heat shock culture
C: Casein – W: Whey – F : Fat gap – cj : curd juction
Bar = 2.5 nm

Table (5):Sensory evaluation of fresh and after 30 days at 5± 1.0°C low fat UF-white pickled cheese (20% F/DM)made with or without fat replacers.

Property	Treatments											
%	Tr1		Tr2		Tr3		Tr4		Tr5		Tr6	
Stored period	1d	30d	1d	30d	1d	30d	1d	30d	1d	30d	1d	30d
Falovur(50)	47.6	48.8	36.2	38.4	42.5	43.8	43.1	43.9	42.0	42.7	43.1	43.6
Body&Texture (40)	37.2	38.4	32.5	33.2	34.4	35.2	34.9	36.5	33.6	34.2	34.9	35.3
Appearance (10)	9.0	9.5	7.5	8.0	8.0	8.5	8.0	8.5	7	7.5	8.0	8.5
Total Scores (100)	93.8	96.7	76.2	79.6	84.9	87.5	88.1	89.9	82.6	84.4	85.0	86.4

See Table (2) for details of fat replacers and cheese treatments

CONCLUSION

From the foregoing, it can be concluded that decreasing the fat content of cheese had an obvious effect on the gross chemical composition, cheese yield, micro-structure and sensory evaluation whereas, the addition of Slendid or glucomannan improved the chemical composition, cheese yield, micro-structure and organoleptic properties of low fat UF-white pickled cheese (20% F/DM) after 30 days, especially its body and texture.

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تحسين جودة الجبن الابيض الطرى المنخفض الدهن المخزن والمصنع من لبن مركز (UF)

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- يهدف هذا البحث الى انتاج جبن أبيض مخزن ومنخفض الدهن من لبن فرز جاموسى مركز بالترشيح الفوقى (**UF**) باستخدام نوعين من بدائل الدهون وهما السلنديد والجلوكومنان بالاضافة الى بادئ الصدمة الحرارية.
- تم تصنيع ٦ معاملات من الجبن الابيض أحدهما من لبن فرز جاموسى مركز با**UF**ومعدل نسبة الدهن الى ٤٥% دهن / المادة الجافة كعينة مقارنة ١ والخمس معاملات الاخرى تم تصنيعها من لبن منخفض الدهن (٢٠% دهن/المادة الجافة أحداهما بدون اضافات كعينة مقارنة ٢) والاربع معاملات الاخرى أضيف اليها بدائل الدهون كالتالى:-
- المعاملة الثالثة والرابعة أضيف اليها البديل الدهن سلنديد أو جلوكومنان بمعدل ٠.٢%جم/لترلبن. المعاملة الخامسة والسادسة أضيف اليها البديل الدهنى سلنديد أو جلوكومنان بمعدل ٠.٢جم/لتر لبن + بادئ الصدمة الحرارية (***Lb. bulgaricus+Lb. helvitucus***) وتم تخزين الجبن الناتج بالثلاجة فى محلول ملحى معقم ٤%كلوريد صوديوم لمدة ٣٠ يوم على ٥ ± ١ºC ثم أجراء التحليل الكيماوى والحسى و التركيب الدقيق بواسطة الميكرسكو بالالكترونى.

أظهرت النتائج مايلى:-

أثر خفض نسبة الدهن:-

- كان لها تأثير واضح على التركيب الكيماوى وتصافى الجبن حيث زادت نسبة الرطوبة وقيم ال**pH** وانخفضت نسبة الحموضة وتصافى الجبن ودرجة التحلل البروتينى والدهن والكوليسترول مقارنة بالجبن الكامل الدهن (عينة المقارنة ١) الطازج والمخزن .
- أظهر الميكرسكوب الالكترونى أن الجبن المنخفض الدهن ذات تركيب بنائى غير متجانس مقارنة بالجبن الكامل الدهن (عينة المقارنة ١) .

أثر اضافة بديل الدهن :

- تحسين الخواص الكميائية وتصافى الجبن ودرجة التحلل البروتينى والدهن مقارنة بالجبن الكامل الدهن والاخر المنخفض الدهن (الخالى من الاضافات) أثناء فترة التسوية .
- بخصوص محتوى الكوليسترول وجد أن الجلوكومنان المعامل بالصدمة الحرارية يعمل على خفض نسبة الكوليسترول بالمقارنة بالسلنديد أثناء فترة التسوية .
- أظهرت صور الميكرسك وبالالكترونى الجبن المنخف الدهن والمعامل بالسلنديد ذات تركيب بنائي أكثر تجانسا عن الجبن المعامل بالجلوكومنان فى نهاية فترة التسوية .
- كانت الصفات الحسية للجبن المنخفض الدهن (الخالى من الاضافات) أقل كثيرا من الجبن الكامل الدهن وحسنت أضافة بدائل الدهون من الصفات الحسية للجبن الناتج خصوصا القوام والتركيب .
- كان الجبن الكامل الدهن أفضل المعاملات كيماويا وحسيا فيما عدا أرتفاع نسبة الكوليسترول وكذلك الجبن المضاف الية البديل الدهنى الجلوكومنان المعامل بالصدمة الحرارية يلى ذلك الجبن المعامل بالسلنديد والصدمة الحرارية ثم الجبن المعامل بالجلوكومنان فقط وأخيرا الجبن المنخفض الدهن والخالى من الاضافات .