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Effect of Adding Water Extract and Essential Oil of Sweet Basil on Quality and Different Properties of Soft Cheese

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ABSTRACT

Soft cheese was made from ultrafiltrated-milk, retentate fortified with sweet basil leaves extracts (SBLE) or sweet basil oil (SBO) as a functional food ingredients with high antioxidative activity. Six cheese treatments, namely those being made by UF-retentate fortified with 1,3 and 5% SBLE (T_1,T_2 and T_3) and with SBO (T_4, T_5 and T_6), and stored at 4ºC ±1°Cfor 8 weeks. Examination of the resultant cheese treatments were then analyzed for the total Phenolic content and the antioxidative activity following the DPPH and FRAP methods. Chemical, microbiological, rheological and sensory properties were also detected. The resultant soft cheese treatments supplemented with either SBLE or SBO contained higher total phenolic content (TPC), radical scavenging activity (RSA), ferric reducing antioxidant power (FRAP), total volatile fatty acids (TVFAs), pH values, texture parameters and organoleptic properties. Fortification with sweet basil, on the other hand, decreased the total bacterial count, moulds & yeasts, soluble nitrogen (SN), tyrosine, tryptophane, and peroxide value (PV). The examined cheese treatments were further of higher healthy benefits, and of extended shelf life, when they were fortified with either SBLE or SBO up to 5% or 800 ppm, respectively. Cheese treatment being made by adding of 3% of SBLE and 400 ppm of SBO were of preference organoleptic properties.

Keywords: Sweet basil, UF- Soft cheese**,** Antioxidants, Total phenolic, Shelf life.

INTRODUCTION

Cheese is the most desirable and consumed dairy products worldwide. It could be made in a wide varieties, types and forms (Fox *et al*., 2000). Soft cheese is normally made by the conventional method from buffloe or cow mik, or their mixture, and recently from ultrafiltrated milk (UFmilk). It is usually kept in the presence or absence of brine, and consumed either fresh or stored at low temperature for different intervals. Using Ultrafiltration technology in making it increases the yield and its nutritive values, and reduce the cost of production. Furthermore, following UF technology, shortens the time required for its making, and minimizes the problem of waste disposal problems. Traditional and ultrafiltration (UF) techniques used in making of cheese are usually followed with storage at low temperature in the presence or absence of brine. UF technology was found to increase cheese yield and its nutritive values, and to decrease the production cost, and to solve the waste problems of whey disposal (Coker *et al*., 2005; Mehaia, 2006). UF-soft cheese was also characterized with mild flavor, due to the presence of proteolytic enzymes inhibitors (El-Soda, 1997)..

Sweet basil (*Ocimumbasilicum L*.) known as reyhan is an ornamental or field crops in the Mediterranian region. It is of highly antioxidative activity. Makri and Kintzihigh(2008) mentioned that the basil extract contains high concentration of eugenol and phenolic compounds, the presence of which in basil oil is of antioxidative activity, and also of both anti-viral and anti-microbial effects. These properties make basil useful in prolonging the shelf life of many foods Guseinov*et al*., (19920, Guseinov*et al*., (1992*)* and Bozin, *et al*., 2006*).).* .A series of compounds with high antioxidant activity was identified in the basil extract, eugenol and phenolic found in larger quantities. (Makri and Kintzios 2008).

Sweet basil is extensively used as a flavoring agent and in medical therapy of of different diseases (Mondal*et al.,* 2009;Nerio*et al.,* 2010 and Rahimi*et al,*. 2010).

The important role of antioxidant in food is to inhibit the oxidative rancidity in oils and fats in food, and especially in dairy products (Politeo*et al*., 2007). These compounds could be divided into natural or synthetic and/or, due to their mechanism of action, as primary or secondary(Simic and Javanovic,1994. The primary, the phenolic compounds, which break the reaction chain by donating electrons or hydrogen to free radicals, converting them in thermodynamically stable products or reacting with free radicals to form the lipid–antioxidant complex. (Simic and Javanovic,(1994), Amarowicz*et al*., (2004) Politeo*et al*., (2007), Tomaino*et al.,* (2005) and Politeo*et al.,* (2007).

From the above discussion, the main objectives of the present work were to make UF soft cheese enriched with basil extract or its oil, and to elucidate their effects on the physic-chemical, microbiological and sensory properties, as well as the functional and healthy properties of the resultant cheese treatments. Also, prolongation of shelf time of treated with basil cheese, in addition to the evaluation of antioxidant activity in the resultant fresh and during cold storage cheese for 8 weeks were carried out in order to provide a more consumer acceptability and palatability of the examined cheese.

MATERIALS AND METHODS

Buffalo's milk retentatewas obtained from the Dairy Industry Units, Animal Production Research Institute, Ministry of agriculture, Giza, Egypt. Sweet basil (*Ocimumbasilicum*L.) was obtained from Horticultural Research Institute Department of Medical and Aromatic Plant. Agricultural Research Center, Giza, Egypt. Commercial rennet powder:Valirren 150-microbial cheese rennet was obtained from valley Research, Inc., USA. (1:150000Mcu/g).

Leaf basil were dried at 50°C for 24 hr in hot air oven, 10g of basil was ground and infused in 100 ml hot

water, stirred for 2h/37ºC and kept in the refrigerator at 5±2°C overnight. Filteration was then done through a four-layer of cloth cheese. The extract stored in dark bottles at -3°C less than one week. Basil extract (pH6.3, Total solid 8.40 % , Total phenolic content TPC 890 mg Gallic acid/100gm, RSA 91 % and FRAP 85 mmol/l).

Preparation of basil oil was caried out as described by Bernath,(1990). The essential oil was isolated by hydro distillation for 3 h., and stored under argon in a sealed vial at -20ºC before use. Buffalo's milk retentate was divided into seven equal portions. Control treatment was made without the addition of basil extract or oil. Fortified with sweet basil at the rate of 1, 3 and 5% from cheese weight for treatments T_1, T_2, T_3. In the second batch, treatments T4 T5 T6 were fortified with the leaves extract with basil oil (SBO) of 0.020, 0.040 and 0.080 %, respectively. For the treatments T_4, T_5, T_6, respectively. and well mixed with a blender. Mixes of all treatments were heated at 65 ºC for 30 min and immediately cooled to 45 ºC. Calcium chloride and sodium chloride were added concentration of 0.02% and 3% respectively with stirring until completely dissolved then rennet concentration 3grm/100L milk at 37ºC with stirring for 1 min,dispensed into plastic containers and kept at 37ºC±2ºC until a proper coagulum was formed, and transferred to the refrigerator at 5ºC±1ºC until 8weeks.

Total solids, fat, titratable acidity and total nitrogen (TN) contents of soft cheese samples were determined according to AOAC(2007. The protein content was calculated by multiplying the percentage of TN by 6.38. The pH value was measured using digital pH meter (HANNA, Instrument, Portugal) with glass electrode. The soluble nitrogen (SN/TN) was estimated as described by Innocente(1997), and lactose by the method mentioned by Barentt and Abdel-Tawab, 1957).

Spectrophotmetric method of Vakaleris and Price (1959) was used for detecting tyrosine and tryptophane contents in cheese treatments. The lipids were extracted from cheese samples using a method described by Kristensen*et al.* (2001). Peroxide value (PV) of extracted lipids was by the method mentioned by Egan *et al.* (1981).Total volatile fatty acids (TVFAs) value was determinedaccording to the method described by Kosikowski(1982). Results were expressed as ml of 0.1N NaOH/100gcheese.

Total phenolic compounds were determined according to (Zheng& Wang, 2001) by using Folin-Ciocalteu reagent, and the total phenolic content TPC was calculated by a standard curve prepared with Gallic acid, and expressed as milligrams of Gallic acid equivalents GAE/100gm.

Free radical scavenging activity (RSA) of the samples was measured using the method of (Brand-Williams*et al.*, 1995).

Antioxidant activity was measured using the ferric antioxidant power (FRAP) assay of (Benzie & Strain, 1996).

Parameters such as firmness, cohesiveness and springiness were detected using the method of Kaminarides and Stachtiaris, (2000).

For examining the microbiological quality of soft cheese, 10g were weighed out and transferred to a sterile blender with 90 ml of 0.1% peptone and mixed thoroughly for 3 min to prepare the cheese homogenate. These were then checked for the total bacteria count, coliform count and the presence of molds and yeasts, as well as the spore forming bacteria. Total bacterial count was counted using standard plate count agar (APHA, 1994). Molds & yeasts were determined according to Standard Methods for Examination of Dairy Products (APHA, 1994). Coliform bacteria were enumerated according to Harrigan and McCance (1996) using Violet Red Bill Agar (VRBA). The plates were incubated at 37°C for 48 hr. *Staphylococcus spp*. and *Salmonella spp*. were detected according to methods recommended by (ICMSF, 1996).The count of aerobic spore forming bacteria was carried out as described by Luck (1981).

Ten trained panelists from the staff members of the Dairy Science Department, Agricultural Research Center, Giza, Egypt, took part in a quality rating score card for evaluation of flavor (30 points) and body and texture (60 points) and appearance (10 points) (Bodyfelt*et al.*, 1998).

The data obtained were statistical analyzed according to statistical analyses system user's guide (SAS, 1996).

RESULTS AND DISCUSSION

Data in Table (1) illustrate the chemical composition of soft cheese as affected by different levels of the sweet basil leaves extract. The obtained results indicated that there was insignificant difference ($P > 0.05$) in the fat content between all treatments, while there was a slight increase in an ash content by increasing the level of SBEL. Slight decrease was also observed in the protein ($p<0.05$) of the soft cheese with the increase of SBLE and SBO levels, as well as the length of storage period. No variation in the composition of different treatments and control was due to the addition of quite low levels of SBLE and SBO to affect changes in the composition of soft cheese.

The effect of different levels of basil extract or basil oil on total phenolic content (TPC) of the resultant treatments of the examined cheese are illustrated in Table (2). Highly significant ($P< 0.001$) increase was demonstrated in TPC in cheese samples supplemented with basil oil than with basil extract or control, and this was proportional to the concentration of added oil or extract. The rate of increase in total phenolic content TPC in fresh cheese samples supplemented with 1%,3%, 5% basil extract was 475,560 and 630, in T_1,T_2, T_3 , respectively, while it was 510, 640 and 765, respectively, in SBO treatments (T_4,T_5, T_6), in the same order during cold storage, The total phenolic content TPC gradually decreased significantly($P< 0.001$) by prolonging the storage period, and as the supplementing level with basil extract or basil oil increased. This might be attributed to the transformation of PC, which is highly unstable compounds and undergoes numerous enzymatic and chemical reactions during food storage as stated by Legrand (2005).

Table (1): Chemical composition of UF-soft cheese (%) fortified with different levels of sweet basil leaves extract (SBLE) or sweet basil oil (SBO) during storage at 5±1°C.

Cold storage period (week)	Treatments						
	Control	Sweet Basil Leaves Extract (SBLE)			Sweet Basil Oil (SBO)		
		T_1	T_2	T_3	T_4	T_5	T_6
				Total Solids (%)			
0	$33.97^{a,c}$	$33.99^{bc,c}$	$34.05^{c,c}$	$34.07^{d,c}$	$34.08^{bc,c}$	$34.09^{b,c}$	$34.10^{b,c}$
4	$34.30^{a,b}$	$34.35^{bc,b}$	$34.32^{c,b}$	$34.29^{d,b}$	$34.27^{bc,b}$	$34.28^{b,b}$	$34.28^{b,b}$
8	$34.69^{a,a}$	$34.68^{bc,a}$	$34.70^{c,a}$	$34.79^{d,a}$	$34.64^{bc,a}$	$34.65^{b,a}$	$34.65^{b,a}$
				Fat (%)			
0	$13.58^{a,a}$	$13.57^{a,a}$	$13.57^{a,a}$	$13.56^{a,a}$	$13.60^{a,a}$	$13.61^{a,a}$	$13.62^{a,a}$
4	$13.65^{a,a}$	$13.64^{a,a}$	$13.63^{a,a}$	$13.62^{a,a}$	$13.66^{a,a}$	$13.68^{a,a}$	$13.69^{a,a}$
8	$13.78^{a,a}$	$13.78^{a,a}$	$13.74^{a,a}$	$13.75^{a,a}$	$13.78^{a,a}$	$13.80^{a,a}$	$13.81^{a,a}$
				Protein (%)			
0	$12.82^{a,c}$	$12.82^{b,c}$	$12.81^{c,c}$	$12.80^{cd,c}$	$12.81^{d,c}$	$12.80^{e,c}$	$12.79^{f,c}$
4	$12.97^{a,b}$	$12.93^{b,b}$	$12.91^{c,b}$	$12.90^{cd,b}$	$12.87^{d,b}$	$12.85^{e,b}$	$12.84^{f,b}$
8	$13.17^{a,a}$	$13.12^{b,a}$	$13.10^{c,a}$	$13.09^{cd,a}$	$13.07^{d,a}$	$13.02^{e,a}$	$13.02^{f,a}$
				Lactose (%)			
0		$3.51^{a,b}$	$3.52^{a,c}$	$3.52^{a,c}$ $3.52^{a,c}$	$3.51^{a,a}$	$3.52^{a,a}$	$3.51^{a,a}$
4		$3.37^{a,b}$	$3.40^{a,c}$	$3.44^{a,c}$ $3.46^{a,c}$	$3.44^{a,a}$		$3.46^{a,a}$ $3.48^{a,a}$
8		$3.29^{a,c}$	$3.35^{c,b}$	$3.39^{c,a}$ $3.42^{a,c}$	$3.38^{a,a}$		$3.40^{a,a}$ $3.45^{a,a}$
				Ash (%)			
0	$4.26^{ab,c}$	$4.27^{ab,c}$	$4.28^{ab,c}$	$4.28^{a,c}$	$4.27^{ab,c}$	$4.27^{ab,c}$	$4.25^{b.c}$
4	$4.33^{ab,b}$	$4.34^{ab,b}$	$4.35^{ab,b}$	$4.36^{a,b}$	$4.35^{ab,b}$	$4.32^{ab,b}$	$4.31^{b,b}$
8	$4.47^{ab,a}$	$4.46^{ab,a}$	$4.48^{ab,a}$	$4.49^{a,a}$	$4.48^{ab,a}$	$4.47^{ab,a}$	$4.45^{b,a}$

$T_{1,2,3;}$:Treatments with1%,3%, 5%Basil extract respectively.$T_{4,5,6;}$: Treatments with0.02%, 0.04%, 0.08% Basil oilrespectively. The means with the same letter at any position were not significant differ (P>0.05).

Table (2): Total phenolic content (equivalent mg Gallic acid/100gm) of UF-soft cheesefortified with either different levels of sweet basil leaves extract (SBLE) or sweet basil oil (SBO) during storage at 5±1°C.

Cold storage period (weeks)	Treatments						
	Control	Sweet Basil Leaves Extract (SBLE)			Sweet Basil Oil (SBO)		
		T_1	T_2	T_3	T_4	T_5	T_6
0	$205^{f,a}$	$475^{e,a}$	$560^{c,a}$	$630^{b,a}$	$510^{d,a}$	$640^{c,a}$	$765^{a,a}$
4	$156^{f,b}$	$421^{e,b}$	$509^{c,b}$	$550^{b,b}$	$453^{d,b}$	$542^{c,b}$	$604^{a,b}$
8	$110^{f,c}$	$370^{e,c}$	$433^{c,c}$	$480^{b,c}$	$390^{d,c}$	$443^{c,c}$	$488^{a,c}$

$T_{1,2,3;}$ 1%,3%, 5%: Treatments withBasil extract respectively. $T_{4,5,6;}$: Treatments with0.02%, 0.04%, 0.08% Basil oil respectively. The means with the same letter at any position were not significant differ (P>0.05).

The effects of different levels of basil extract or basil oil on the radical scavenging activity (RSA) of the resultants cheese treatments are illustrated in Table(3). Supplementing the retentate with basil extract or basil oil increased significantly the radical scavenging activity RSA in the resultant cheese treatments by increasing the added concentration of basil extract or basil oil. It is obvious that the radical scavenging activity (RSA) of fresh cheese with the added 1%,3% and 5% basil extract increased by 47.56, 55.28 and 63.33, respectively, however, treatments T_4, T_5andT_6 supplemented with basil oil were of RSA 43.14, 60.61 and 70.79, respectively, in fresh soft cheese. The corresponding rates after 8 weeks of storage were 21.41, 27.81 and 39.21 in the case of using basil extract, and were 27.82, 35.14 and45.89, in the same order, when basil oil was used. RSA values gradually decreased significantly during cold storage for all cheese treatments. Data presented in Table (3) showe that adding basil oil or basil extract resulted in significant and fast increase in the value of RSA, compared with the control. Meanwhile, the treatments T_6, T_3 and T_5, respectively, characterized with significantly higher values of RSA than the other treatments.

Results presented in Table(3) show that supplementing retentate with basil extract or basil oil proportionally increased the ferric reducing antioxidant power (FRAPS) values of the resultant fresh cheese by increasing the added concentration. This could be due to the RSA FRAP assay, which permits the overall estimation of water – soluble compounds influencing the total antioxidant. The rate of increase of FRAP values in fresh UF cheese samples supplemented with basil oil or basil extract wasT_6,T_3,T_5,T_2,T_4 andT_1, respectively. It is noteworthy to mention that the reducing power of control cheese samples was more affected by storage rather than the fortified samples. After 60 days, The FRAP values of cheese samples T_6, T_3 and T_5, in the same order, were significantly by more than 44,40 and 37 of the corresponding value of other cheese treatments.

Results of Fig.(1) show that the control had the highest T.A% when fresh, while all treatments with sweet basil oil or basil extract were in a proportional relationship with the concentration of extract or oil added, which resulted in lower value of T.A% and higher pH value than the control. Generally, prolonging of the cold storage period of UF-soft cheese caused a significant increase ($p<0.001$) in T.A% and significant reduction ($p<0.001$) in pH value.

Table (3):Radical Scavenging activity (RSA) and Ferric reducing antioxidant power FRAP (mmol FeSo4/l) of UF-soft cheese fortified with either different levels of sweet basil leaves extract (SBLE) or sweet basil oil (SBO) during storage at 5±1°C.

Cold storage period (weeks)	Control	Treatments					
		Sweet Basil Leaves Extract (SBLE)			Sweet Basil Oil (SBO)		
		T_1	T_2	T_3	T_4	T_5	T_6
		Radical Scavenging Activity (RSA)					
0	$37.41^{g,a}$	$47.56^{e,a}$	$55.28^{d,a}$	$63.33^{b,a}$	$43.14^{f,a}$	$60.61^{c,a}$	$70.79^{a,a}$
4	$26.81^{g,b}$	$35.45^{e,b}$	$45.24^{d,b}$	$55.56^{b,b}$	$31.23^{f,b}$	$51.57^{c,b}$	$58.08^{a,b}$
8	$17.33^{g,c}$	$21.41^{e,c}$	$27.81^{d,c}$	$39.21^{b,c}$	$28.82^{f,c}$	$35.14^{c,c}$	$45.89^{a,c}$
		Ferric Reducing Antioxidant Power FRAP (mmol FeSo4/l)					
0	$23^{f,a}$	$40^{e,a}$	$54^{d,a}$	$67^{b,a}$	$42^{e,a}$	$63^{c,a}$	$74^{a,a}$
4	$12^{f,b}$	$25^{e,b}$	$41^{d,b}$	$55^{b,b}$	$29^{e,b}$	$52^{c,b}$	$61^{a,b}$
8	$6^{f,c}$	$17^{e,c}$	$29^{d,c}$	$40^{b,c}$	$20^{e,b}$	$37^{c,c}$	$44^{a,c}$

$T_{1,2,3;}$ 1%,3%, 5% : Treatments withBasil extract respectively. $T_{4,5,6;}$: : Treatments with0.02%, 0.04%, 0.08% Basil oil respectively. The means with the same letter at any position were not significant differ (P>0.05).

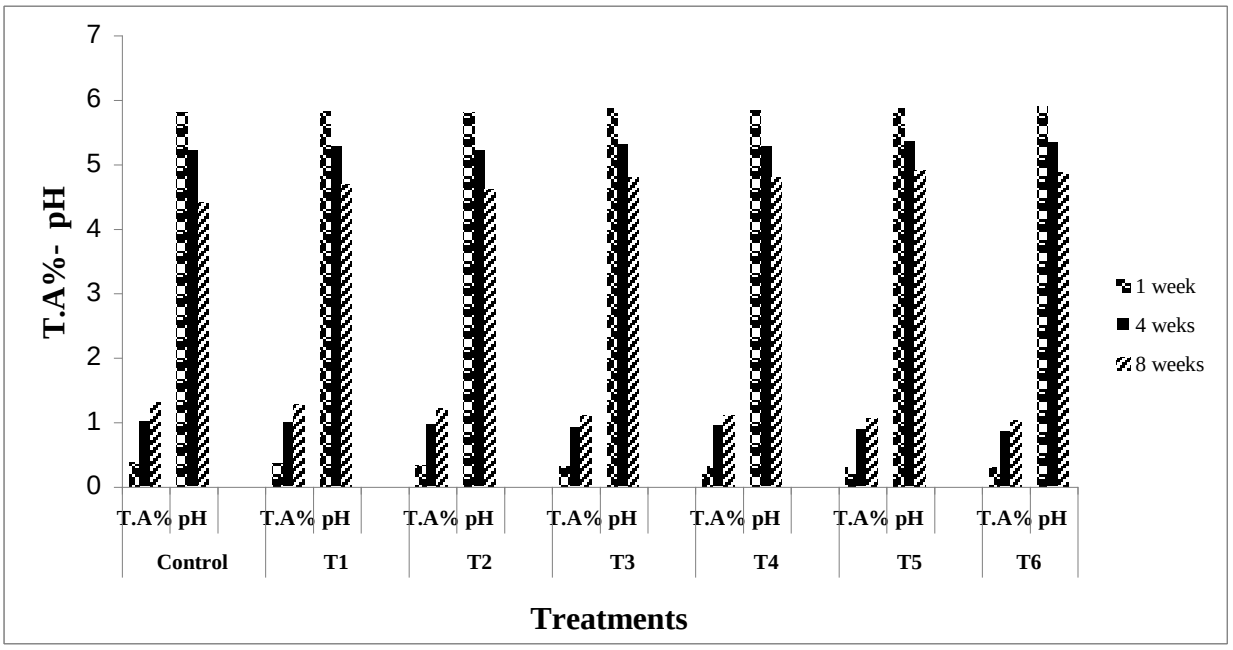

Fig.(1):Titratable acidity % and pH valueof UF-soft cheese fortified with either different levels of sweet basil leaves extract (SBLE) or sweet basil oil (SBO).

Data presented in Table (4) show the moulds & yeasts counts and TBC in UF-soft cheese fortified with either sweet basil leaves extracts (SBLE) or sweet basil oil (SBO) during 8weeks at (5±1°C). Molds and yeasts began to develop after 4 weeks in control cheese, however, they were not observed in sweet basil extract being treated with 3 , 5, and with 0.04 , 0.08 % sweet basil oil, throughout the storage period. *Staphylococcus spp*., *Salmonella spp*.and sporformers could not be detected in all cheese treatments, either when fresh or during the storage period .The basil oil was found to be active against Gram-positive, Gram-negative bacteria, and fungi, with minimal bactericidal effect, as mentioned by Sinha and Gulati (1990), Lawrence ,(1988) & Prasad *et al*.,(1986), who stated that *O. basilicum* oils were more effective against Gram-positive Gram negative bacteria. Meanwhile, Ficker*et al.*, (2003) and Prasad et al. (1986) Deans and Ritchie (1987) concluded that the basil extract was one of the most powerful fungicide. Coliforms were not detected in all cheese treatments, either when fresh or during the storage period. This might be due to the high hygienic condition during the preparation and the development in cheese during storage period.

Table (4):Mold &Yeast counts and Total bacterial counts (log CFU/g) of UF-soft cheese fortified with either different levels of sweet basil extract (SBE) & sweet basil oil (SBO) formulas during 8weeks at (5±1°C).

Cold storage period (weeks)	Control	Treatments					
		Sweet Basil Leaves Extract (SBLE)			Sweet Basil Oil (SBO)		
		T_1	T_2	T_3	T_4	T_5	T_6
		Mold &Yeast counts (log CFU /g)					
0	ND	ND	ND	ND	ND	ND	ND
4	$2.6^{a,b}$	$2.2^{c,b}$	ND	ND	$2.1^{b,b}$	ND	ND
8	$3.8^{a,a}$	$3.1^{c,a}$	ND	ND	$2.9^{b,a}$	ND	ND
		Total bacterial counts (log CFU /g)					
0	$1.9^{a,c}$	$1.8^{c,c}$	$1.7^{d,c}$	$1.6^{e,c}$	$1.7^{b,c}$	$1.6^{d,c}$	$1.5^{e,c}$
4	$3.3^{a,b}$	$2.9^{b,b}$	$2.5^{d,b}$	$2.2^{e,b}$	$2.6^{c,b}$	$2.4^{d,b}$	$2.1^{e,b}$
8	$4.2^{a,a}$	$3.3^{b,a}$	$2.7^{d,a}$	$2.3^{e,a}$	$3.1^{c,a}$	$2.6^{d,a}$	$2.3^{e,a}$

$T_{1,2,3;}$ 1%,3%, 5%: Treatments with Basil extract respectively. $T_{4,5,6;}$: Treatments with0.02%, 0.04%, 0.08% Basil oil respectively. The means with the same letter at any position were not significant differ (P>0.05).

Texture attributes of UF-soft cheese samples fortified with sweet basil oil or basil extract during storage are presented in Fig. (2). After 1 week, Fortification with basil extract resulted in a gradual increase ($p<0.001$), in the hardness and cohesiveness, however, insignificant values of springiness was detected. Cheese hardness, on the other hand, increased, while cheese cohesiveness decreased in UF- soft cheeses by prolonging of the cold storage period.

The pH of cheese directly affects the texture of curd by influencing the solubility of the caseins, cheeses of higher pHvalues are softer than more acid cheeses Fathollahi*et al.,(*2010).

Lucey*et al.*, (2003) reported that various Rheological parameters of Cheddar cheese were found to be more highly correlated with the level of insoluble Ca, than with the extent of primary proteolysis during ripening.

Fortification with SBLE and SBO affected protein proteolysis (WSN/TN ratio, tyrosine and tryptophane) occurred in the treated soft cheese (Table, 5). Cheese fortified with sweet basil extract or oil (SBEL or SBO) caused a slight decrease in the WSN/TN, tyrosine and tryptophane contents, with the increase od added concentration. Furthermore, as the storage period progressed the SN/TN%, tyrosine and tryptophane markedly increased as a result of the proteolytic activity of the residual microbial rennet in cheese curd, and the proteinases enzymes in milk. Another reason could also be due to the antimicrobial and antioxidant properties of sweet basil (Bozin*et al.*, 2006).

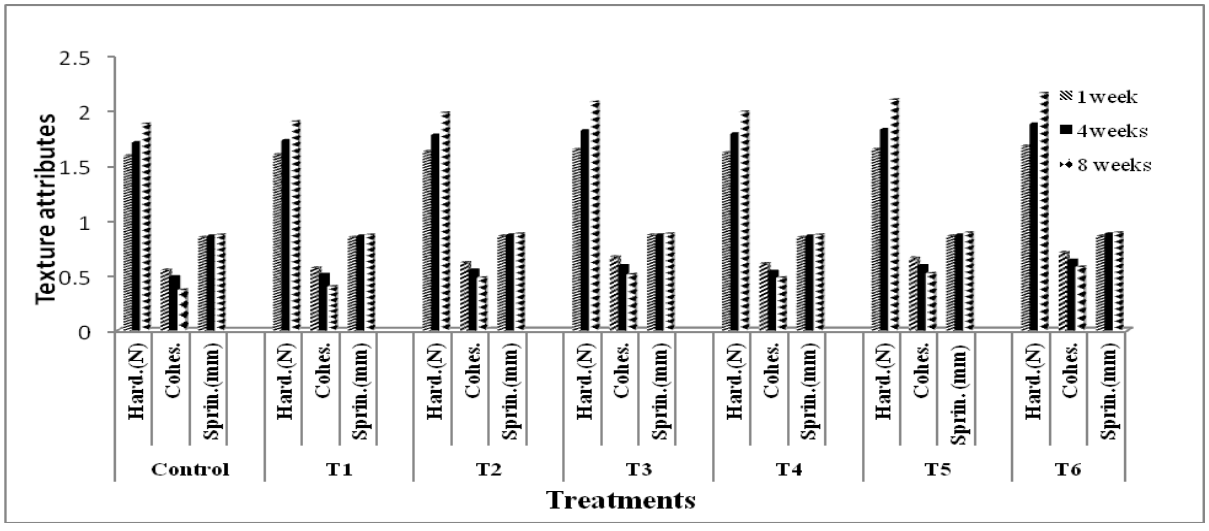

Fig.(2):Texture attributesof UF-soft cheese fortified with either different levels of sweet basil leaves extract (SBE) or sweet basil oil (SB

Table (5): Protein proteolysis of UF-soft cheese fortified with either different levels of sweet basil leaves extract (SBLE) or sweet basil oil (SBO) during storage at 5±1°C.

Cold storage period (weeks)	Treatments						
	Control	Sweet Basil Leaves Extract (SBLE)			Sweet Basil Oil (SBO)		
		T_1	T_2	T_3	T_4	T_5	T_6
				SN/TN (%)			
1	$14.64^{a,c}$	$14.63^{b,c}$	$14.60^{c,c}$	$14.59^{d,c}$	$14.59^{d,c}$	$14.56^{d,c}$	$14.56^{e,c}$
4	$23.81^{a,b}$	$22.74^{b,b}$	$22.49^{c,b}$	$22.21^{d,b}$	$22.21^{d,b}$	$22.07^{d,b}$	$21.77^{e,b}$
8	$29.74^{a,a}$	$27.57^{b,a}$	$27.05^{c,a}$	$26.85^{d,a}$	$26.83^{d,a}$	$26.64^{d,a}$	$26.16^{e,a}$
				Tyrosine (mg/100 g cheese)			
1	$22.75^{a,c}$	$22.73^{b,c}$	$22.69^{c,c}$	$22.65^{d,c}$	$22.70^{d,c}$	$22.61^{d,c}$	$22.59^{e,c}$
4	$75.12^{a,b}$	$63.76^{b,b}$	$62.85^{c,b}$	$62.12^{d,b}$	$58.92^{d,b}$	$58.41^{d,b}$	$57.55^{e,b}$
8	$100.02^{a,a}$	$86.63^{b,a}$	$85.76^{c,a}$	$83.23^{d,a}$	$77.11^{d,a}$	$76.72^{d,a}$	$75.98^{e,a}$
				Tryptophane (mg/100 g cheese)			
1	$38.49^{a,c}$	$38.40^{b,c}$	$38.33^{c,c}$	$38.30^{d,c}$	$38.32^{d,c}$	$38.29^{d,c}$	$38.08^{e,c}$
4	$54.92^{a,b}$	$51.57^{b,b}$	$50.64^{c,b}$	$50.17^{d,b}$	$50.48^{d,b}$	$50.22^{d,b}$	$49.87^{e,b}$
8	$82.72^{a,a}$	$77.84^{b,a}$	$75.83^{c,a}$	$73.65^{d,a}$	$74.12^{d,a}$	$71.20^{d,a}$	$68.91^{e,a}$

$T_{1,2,3;}$ 1%,3%, 5%: Treatments withBasil extract respectively. $T_{4,5,6;}$: Treatments with0.02%, 0.04%, 0.08% Basil oil respectively. The means with the same letter at any position were not significant differ (P>0.05).

Results shown in Table (6) indicated that peroxide value (PV) inUF- soft cheese samples was affected by addition of sweet basil oil or extract .In addition, PV considerably developed at a higher rate in control soft cheese than in all treatments, through the storage period. Peroxide values of all UF- soft cheese treatments increased throughout the storage period.

At the end of storage period, control treatment exhibited the highest PV of 1.20 (meq oxygen/kg fat). UF-soft cheese treatments incorporated with 1,3,5 % of sweet basil extract recorded, 0.71, 0.70, 0.69 of PV, respectively, at the end of storage period, while UF- soft cheese treatments fortified by200, 400, 800 p.p.m of sweet basil oil were of 0.69, 0.68, 0.65 of PV, respectively, after 8 weeks of storage. Furthermore, T_6 treatment was of the lowest PV, followed by T_5,T_3treatments. These results are in harmony with those obtained by Bozin, *et al*., 2006), who reported tha sweet basil possesses many antioxidant properties.

Data in Table (6) Show that making UF- soft cheese with basil extract or basil oil proportionally increased the TVFAs content, although the increase in TVFAs was more pronounced ($p<0.05$) in UF- soft cheese with basil oil. This could be attributed to the mechanism of action, in which the basil essential oils classified as a primary antioxidant, which removes or inactivates the free radicals produced during the oxidation reaction, through the donation of hydrogen atoms, interrupting the reaction in chain. (Doprado, 2008).

However, the TVFAs content of UF- soft cheese with basil oil or basil extract significantly decreased at week 8 ($p<0.05$). while the control treatment was of more lipolytic activity.

Table (6): Peroxide value and total volatile fatty acids (%)ofUF-soft cheese fortified with either different levels of sweet basil leaves extract (SBLE) or sweet basil oil (SBO) during storage at 5±1°C.

Cold storage period (weeks)	Treatments						
	Control	Sweet Basil Leaves Extract (SBLE)			Sweet Basil Oil (SBO)		
		T_1	T_2	T_3	T_4	T_5	T_6
				P.V (mEq/kg)			
1	$0.61^{a,c}$	$0.51^{b,c}$	$0.49^{b,c}$	$0.45^{b,c}$	$0.48^{b,c}$	$0.46^{b,c}$	$0.42^{b,c}$
4	$0.80^{a,b}$	$0.60^{b,b}$	$0.59^{b,b}$	$0.58^{b,b}$	$0.60^{b,b}$	$0.59^{b,b}$	$0.57^{b,b}$
8	$1.20^{a,a}$	$0.71^{b,a}$	$0.70^{b,a}$	$0.69^{b,a}$	$0.69^{b,a}$	$0.68^{b,a}$	$0.65^{b,a}$
				T.V.Fatty acids			
1	$1.65^{e,a}$	$1.78^{d,a}$	$2.51^{c,a}$	$2.89^{b,a}$	$1.84^{d,a}$	$2.87^{b,a}$	$3.11^{a,a}$
4	$1.37^{e,b}$	$1.58^{d,b}$	$2.20^{c,b}$	$232^{b,b}$	$1.61^{d,b}$	$2.49^{b,b}$	$2.67^{a,b}$
8	$1.26^{e,c}$	$1.39^{d,c}$	$1.60^{c,c}$	$1.70^{b,c}$	$1.48^{d,c}$	$1.71^{b,c}$	$1.84^{a,c}$

$T_{1,2,3;}$ 1%,3%, 5%:Treatments withBasil extract respectively. $T_{4,5,6;}$: Treatments with0.02%, 0.04%, 0.08% Basil oil respectively. The means with the same letter at any position were not significant differ (P>0.05).

As can be seen from Table (7) the results of organoleptic properties revealed that the addition of SBLE, SBO had significant effect on the flavor, body texture and total score. With regard to the appearance of soft cheese treatments, without any exception, they were as good as the control, when fresh or along with the storage period (P> 0.05).It could also be noticed that SBO soft cheese significantly gained the highest body and texture scores than those given for SBLE or the control. On the other hand, treatmentT_6 scored the lowest flavor, because of the use of essential oils as antioxidant substances in food products is still limited due to the alteration they promote in flavor, making it necessary to determine the concentrations of oils that guarantee the product acceptability (Bozin*et al.,* 2006). By prolonging the cold storage period, the sensory evaluation scores tended to significantly decrease (P< 0.001) in all treatments.

Table (7): Sensory attributes of UF-soft cheese fortified with either different levels of sweet basil leaves extract (SBLE) or sweet basil oil (SBO) during storage period at 5±1°C..

Cold storage period (week)	Treatments						
	Control	Sweet Basil Leaves Extract (SBE)			Sweet Basil Oil (SBO)		
		T_1	T_2	T_3	T_4	T_5	T_6
				Appearance (10)			
0	$10^{a,a}$	$10^{a,a}$	$10^{a,a}$	$10^{a,a}$	$10^{a,a}$	$10^{a,a}$	$10^{a,a}$
4	$9^{a,b}$	$9^{a,b}$	$9^{a,b}$	$9^{a,b}$	$9^{a,b}$	$9^{a,b}$	$9^{a,b}$
8	$7^{a,c}$	$8^{a,c}$	$8^{a,c}$	$8^{a,c}$	$8^{a,c}$	$8^{a,c}$	$8^{a,c}$
				Flavor (30)			
0	$30^{a,a}$	$30^{a,a}$	$30^{a,a}$	$30^{a,a}$	$30^{a,a}$	٣٠^{a,a}	$28^{b,a}$
4	$27^{a,b}$	$27^{a,b}$	$28^{a,b}$	$27^{a,b}$	$28^{a,b}$	$27^{a,b}$	$25^{b,b}$
8	$25^{a,c}$	$26^{a,c}$	$26^{a,c}$	$25^{a,c}$	$26^{a,c}$	$25^{a,c}$	$20^{b,c}$
				Body and Texture (60)			
0	$60^{d,a}$	$60^{c,a}$	$60^{bc,a}$	$60^{bc,a}$	$60^{bc,a}$	$60^{ab,a}$	$60^{a,a}$
4	$55^{d,b}$	$56^{c,b}$	$56^{bc,b}$	$57^{bc,b}$	$56^{bc,b}$	$57^{ab,b}$	$57^{a,b}$
8	$50^{d,c}$	$53^{c,c}$	$54^{bc,c}$	$54^{bc,c}$	$54^{bc,c}$	$55^{ab,c}$	$55^{a,c}$
				Total (100)			
0	$100^{c,a}$	$100^{ab,a}$	$100^{a,a}$	$100^{ab,a}$	$100^{a,a}$	١٠٠^{a,a}	$98^{b,a}$
4	$91^{c,b}$	$92^{ab,b}$	$93^{a,b}$	$93^{ab,b}$	$93^{a,b}$	$93^{a,b}$	$91^{b,b}$
8	$82^{c,c}$	87^{abc}	$88^{a,c}$	$87^{ab,c}$	$88^{a,c}$	٨٨^{a,c}	$83^{b,c}$

$T_{1,2,3}$; 1%,3%, 5% ;Treatments withBasil extract respectively. $T_{4,5,6;}$: Treatments with 0.02%, 0.04%, 0.08% Basil oil respectively. The means with the same letter at any position were not significant differ (P>0.05).

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تأثير إضافة المستخلص المائى والزيوت الاساسية لنبات الريحان على جودة وخواص الجبن الطرى

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درس تأثير أضافة الريحان سواء المستخلص المائى بنسب (١, ٣, ٥%) أو زيت الريحان بنسب (٢٠٠, ٤٠٠, ٨٠٠ جزء فى المليون) على الجبن الطرى المصنع من اللبن المركز بالترشيح الفائق كغذاء وظيفى وصحى مع حفظ المنتج على درجة حرارة الثلاجة (٥±١°م) لمدة ٨ أسابيع وأجريت الاختبارات الكيميائية ،الميكروبية ،الريولوجية والحسية بالاضافة إلى تقدير الفينولات الكلية ونشاط مضادات الاكسدة.

وقد أظهرت النتائج المتحصل عليها تميز الجبن الطرى المدعم بالريحانسواء المستخلص المائى أو زيت الريحان بارتفاع محتواه من الفينولات الكلية، مضادات الاكسدة، الاحماض الدهنية الطيارة، قيم الـpH وتحسين الخواص الريولوجيةوالحسية مع إنخفاض فى قيم الاعداد البكتيرية ،الخمائر والفطريات، النيتروجين الذائب، التيروسين، التربتوفان ورقم البيروكسيد.

ومما سبق يمكن أستنتاج ان الجبن الطرى يمكن زيادة خواصه الوظيفية وفوائده الصحيةوزيادة مده حفظه بتدعيمه بالريحان سواء المستخلص المائى حتى نسبة ٥% أو بزيت الريحان حتى نسبة ٨٠٠ جزء فى المليون أما من الناحية الحسية فإنه من الافضل التدعيم بنسبة ٣% بمستخلص الريحان و٤٠٠ جزء فى المليون بزيت الريحان.