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Effect of Ginger Rhizomes Extracts on Keeping Quality and Oxidative Stability of UF-White Soft Cheese

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ABSTRACT

The present study was carried out to estimate the effect of ginger rhizomes (*Zingiber officinale*) extracts on the oxidative stability, chemical composition, microbiological and sensory properties of UF-soft cheese being made with aqueous or ethanolic ginger extracts (1%) compared to control cheese and cheese contained 0.02% of butylated hydroxy anisole (BHA). Resultant cheeses were stored in brine solution 6% at 7±1°C up to 90 days. Results showed that, addition of ginger rhizomes extracts had increasing significant effect (P≤0.05) on fat/DM%, soluble nitrogen (SN/TN%) and non protein nitrogen (NPN/TN%). On the other hand, titratable acidity, total protein%, salt in moisture% and total volatile fatty acids (TVFAs) were decreased with addition of aqueous or ethanolic ginger extracts compared to control cheese and cheese treated with BHA as synthetic antioxidant. Cheese containing 1% ethanolic extract showed the highest oxidative stability. Also, ginger extracts reduced the total bacterial count than the control and BHA treatment. However, yeast and mould counts showed opposite trend and they were not detected in all treated samples up to 60 days of storage. Also, results showed that, cheese samples containing ginger ethanolic extract (1%) showed better organoleptic characteristics than other treatments. From the previous it is advanced to use ginger extract in manufacture of white soft cheese at the rate of (1%).

Keywords: Ginger rhizomes, Butylated hydroxy anisole, UF-soft cheese and natural antioxidant.

INTRODUCTION

Antioxidants are major ingredients that protect the quality of oils and fats by retarding oxidation (Jang *et al*., 2012 and Abdulla *et al*., 2007). There are some serious problems concerning the safety and toxicity of synthetic antioxidants related to their metabolism and possible absorption and accumulation in body organs and tissues (Ajila *et al*., 2007). Therefore, the using of natural antioxidants is highly desirable. Natural anti-oxidative compounds are found in numerous plant materials such as oil seeds, cereal crops, vegetables, fruits, leaves, breaks and roots, spices and herbs (Yean and Phillip, 2004). Many studies showed that natural antioxidants as flavonoids and other phenolic phytochemical present in plants are associated with reduced chronic disease risk (Bandyopadhyay *et al*., 2008). Natural products (without any synthetic antioxidant) and health food have to be give a lot of interests for enhancing overall well-being, in the prevention of diseases and also in the incorporation of health-promoting substances into the diet as natural food additives (Prassad *et al*., 2012). Some studies referred to that ginger has been used in herbal medicine practice for the treatment of arthritis, rheumatologic conditions and muscular discomfort (Grant and Lutz, 2000). Liang (1992) showed that Ginger has also been suggested for the treatment of various other conditions, including Atherosclerosis, migraine headaches, rheumatoid arthritis, high cholesterol, ulcers, depression, and impotence. In addition to these medicinal uses, ginger continues to be valued around the world as an important cooking spice and is believed to help against common cold, flu-like symptoms, and even painful menstrual periods. The recent research activities are focused on finding natural sources of antioxidants as consumers are more conscious about their diet, white, synthetic antioxidants are being restricted due to their carcinogenicity. So there is growing trend in searching for antioxidants of natural origin. Medicinal plants is one a good sources rich in natural antioxidants and phenolics which progressively applied in dairy food manufacturing in order to improve nutritional and therapeutic properties (Shori and Baba 2011a&b; Karaaslan *et al*., 2011; Martins *et al*., 2014 and Bertolino *et al*., 2015).

Soft cheese is one of the most common appreciated cheese in middle eastern countries. This type of cheese is produced their by enzymatic or acidic coagulation of fresh milk (buffalos' or cow's milk) or reconstituted skim milk powder with oils, (Ramadan *et al*., 2014). Also it can be made with the addition of starter culture to cheese milk.

The present study is planned to improve the keeping quality and oxidative stability of UF-white soft cheese affected using ginger extract as a natural antioxidant.

MATERIALS AND METHODS

Materials:

Fresh ginger rhizomes (*Zingiber officinale*) were obtained from local market in Zagazig City, Egypt. Retentate of buffalo's milk (40% solids), was obtained from Obour Land Company for food industries. Freeze dried FD-DVS YF-L812® cultures containing *Lactobacillus delbrueckii* subsp. *bulgaricus* and *Streptococcus thermophilus* and microbial rennet, CHY-MAX® Powder Extra NB (Activity ≈ 2235 IMCU/g, Dosage: 0.022 g ≈ 50 IMCU/ L milk, were obtained from Chr. Hansen's, Copenhagen, Denmark. Sodium chloride and calcium chloride were obtained from El-Gomhoria Company, Cairo. Butylated hydroxy anisole (BHA) obtained from Sigma (St. Louis, Mo, USA).

Methods:

Preparation of ultrafiltrated milk retentate:

Fresh standardized buffalo's milk (6% fat) was pasteurized at 75˚C for 5 second, cooled to 37˚C and separated to skim milk and sweet cream, then the skim milk ultrafiltrated at 50˚C using an APV unit at pressure of 2 Mpa and the cream was added to the resultant retentate at the dairy processing unit, Food Science Department, Faculty of Agriculture, Zagazig University.

Preparation of aqueous and ethanolic ginger rhizomes extracts:

Fresh ginger rhizomes was washed, peeled, cut into small pieces and dried at 55^{o} C for 24 hr. in the oven and

converted to powder using grinder. 10 g of ginger rhizomes powder was extracted with 100 ml of distilled water or ethanol 80 % as described by Rehman, *et al.,* 2003.

Cheese manufacture:

Buffalos' milk retentate containing 0.02% $CaCl_2$ and 4% NaCl was divided into four equal portions. The first portion without any additives (control). The Butylated hydroxyl anisole (BHA) as synthetic antioxidant was added to the second portion at ratio of 0.02%. Aqueous and ethanolic ginger extracts were added to the third and fourth portion respectively at a ratio of 1%. White soft cheese was made by the method of (Renner and Abd El-Salam 1991). The resultant cheese treatments were stored in brine solution 6% at 7±1°C for 90 days, cheese samples were analyzed when fresh and after 30, 60 and 90 days of storage period.

Chemical Analyses:

White soft cheese was chemically analyzed for total solids, fat, salt in moisture, titratable acidity, total protein, soluble nitrogen and non protein nitrogen contents were determined as described in the AOAC (2007). Total volatile fatty acids (TVFAs) were estimated according to Kosikowski (1986).

Oxidative stability tests:

Cheese fat was extracted from the samples according to Abd El-Fattah (2006). Peroxide and acid values of white soft cheese fat were determined according to AOAC (2007). Thiobarbituric acid content (TBA) of cheese fat was determined according to Keeny (1971).

Microbiological Examination:

Cheese samples were examined for total bacterial count, coliform and yeast & mould counts according to American Public Health Association (APHA, 2005).

Sensory properties of cheese:

The sensory properties of cheese samples were assessed by 10 panel members of the Food Sci., Dept., Fac. Agric., Zagazig, Univ. for flavour (50) body and texture (40) and appearance (10) according to Scott (1981).

Statistical analysis:

Statistical analysis was done by treating data with SAS (2003) software programs (SAS Institute Inc., Cary, NC) ($P \leq 0.05$).

RESULTS AND DISCUSSION

Gross chemical composition of UF-white soft cheese:

Data in Table (1) show that, UF-white soft cheese containing aqueous or ethanolic ginger extracts had the highest moisture content followed by cheese treated with BHA (0.02%) and control cheese respectively throughout the ripening periods. The moisture content of all cheese treatments were decreased during storage period. The decrease in moisture content of the resultant cheeses along the storage period may be due to the whey explosion resulting from acid development during storage period. Similar results were reported by Salem *et al*., (2010). Also, it could be observed that the fat/dry matter content of experimental cheese samples increased up to the end of storage period, depending on the loss of moisture. Cheese fortified with ginger extracts showed slightly higher in fat/DM % up to the end of storage compared to cheese samples containing BHA and control cheese. Similar results are found by Abd El-Aziz *et al*., (2012). Also, table (1) shows that, salt in moisture of all cheese treatments were increased with the progress in storage period. This could be attributed to the loss in water as a result of water exudation during storage period which in turn lead to a more salt concentration. There is no significance between cheese samples treated with ginger extracts, but observed significance ($p \leq 0.05$) between control and other treatments. This results are in accordance with that obtained by Salem *et al*., (2010). The same table shows that, titratable acidity increased gradually until the end of storage period for all treatments. The control cheese samples had higher titratable acidity than all other cheese treatments during storage period. Cheese containing ginger extracts showed lower titratable acidity. This may be due to antimicrobial activity of these extracts (Prasad and Pushpa 2007; Monagas *et al*., 2009 and Elsohaimy 2014). Similar results were obtained by Abd El-Aziz *et al*., 2012 and Ruben *et al*., 2013. Also, the TP% of cheese samples increased gradually up to the end of storage period and there were significant ($p \leq 0.05$) differences in TP% along with the storage period.

Table 1. Chemical composition of UF-soft cheese affected by addition of ginger extract.

Properties	Storage period (days)	Control	BHA (0.02%)	Ginger extract (1%)		Significant
				Aqueous extract	Ethanolic extract	
Moisture %	Fresh	64.50^{a}	66.34^{a}	66.15^{a}	66.20^{a}	***
	30	62.13^{c}	64.96^{a}	64.00^{b}	64.15^{b}	***
	60	60.30^{c}	63.70^{a}	63.12^{b}	63.25^{b}	***
	90	58.86^{d}	62.83^{a}	62.16^{c}	62.41^{b}	***
Fat / D.M. %	Fresh	45.76^{b}	45.81^{b}	46.20^{a}	46.32^{a}	***
	30	46.80^{b}	46.97^{ab}	47.05^{ab}	47.16^{a}	*
	60	47.66^{c}	47.85^{b}	48.64^{a}	48.75^{a}	***
	90	51.45^{c}	51.73^{ab}	51.60^{bc}	51.84^{a}	**
Total Protein %	Fresh	12.53^{a}	12.10^{c}	12.31^{b}	12.26^{b}	***
	30	12.67^{a}	12.35^{c}	12.48^{b}	12.40^{c}	***
	60	12.84^{a}	12.60^{c}	12.72^{b}	12.65^{c}	***
	90	13.24^{a}	13.00^{c}	13.15^{b}	13.08^{bc}	***
Titratable acidity (as lactic acid %)	Fresh	0.24^{a}	0.24^{a}	0.23^{a}	0.22^{a}	NS
	30	0.82^{a}	0.81^{a}	0.77^{b}	0.73^{c}	**
	60	1.41^{a}	1.40^{a}	1.34^{b}	1.27^{c}	***
	90	1.92^{a}	1.90^{a}	1.77^{b}	1.65^{c}	***
Salt / moisture %	Fresh	8.65^{a}	8.30^{b}	8.20^{c}	8.25^{bc}	***
	30	9.76^{a}	9.50^{b}	9.38^{c}	9.42^{bc}	***
	60	10.12^{a}	9.92^{b}	9.81^{c}	9.84^{c}	***
	90	10.55^{a}	10.41^{b}	10.30^{c}	10.33^{c}	***

^{A,b,c} **Means in the same row with different superscripts differ significantly at ($P \leq 0.05$)**

Ripening indices of cheese:

Table (2) shows that, SN/TN% and NPN/TN% of all cheese treatments gradually increased up to the end of storage period. This increase may be due to the break down occurred by the proteolytic enzymes. On the other hand, cheese samples containing ginger extracts was higher significantly ($p \leq 0.05$) proteolysis compared to cheese treated with BHA or control cheese. Cheese treated with ginger ethanolic extract was slightly higher proteolysis followed by cheese treated with ginger aqueous extract, cheese treated with BHA and control cheese respectively. This may be due to the proteolysis activity of ginger extract Hashim *et al*. (2011); Huang *et al.* (2011) and AbdEl-Aziz *et al.* (2012). Also, results indicated that TVFAs increased gradually of all cheese sample treatments with the progress of storage period. No significant differences ($p \leq 0.05$) TVFAs between control cheese and cheese containing BHA, while cheese sample containing ginger extracts had slightly decreased TVFAs compared to control cheese during storage period. The decrease of TVFAs in cheeses treated by ginger extracts may be attributed to ginger extract has high content of essential oil which is a mixture of monoterpenic and sesquiterpenic compounds, contains the volatile compounds responsible for the characteristic ginger flavor (Zancan *et al*., 2002). Similar results were obtained by Abd El-Aziz *et al*., (2012).

Table 2. Ripening indices of UF-soft cheese affected by addition of ginger extract.

Properties	Storage period (days)	Control	BHA (0.02%)	Ginger extract (1%)		Significant
				Aqueous extract	Ethanolic extract	
S.N. / T.N. %	Fresh	6.15^{b}	5.93^{c}	6.25^{a}	6.31^{a}	***
	30	11.24^{c}	11.05^{d}	11.41^{b}	11.57^{a}	***
	60	19.30^{c}	19.18^{d}	19.86^{b}	20.16^{a}	***
	90	25.72^{c}	25.66^{c}	26.00^{b}	26.32^{a}	***
N.P.N / T.N. %	Fresh	4.03^{c}	3.95^{d}	4.16^{b}	4.23^{a}	***
	30	7.72^{c}	7.70^{c}	7.95^{b}	8.15^{a}	***
	60	12.10^{c}	12.00^{d}	12.37^{b}	12.55^{a}	***
	90	12.43^{c}	12.40^{c}	12.60^{b}	12.81^{a}	***
T.V.F.A. (NaOH 0.1N /100 g)	Fresh	11.25^{a}	11.30^{a}	11.28^{a}	11.32^{a}	***
	30	21.30^{a}	21.34^{a}	21.10^{b}	21.06^{b}	***
	60	27.42^{b}	27.53^{a}	27.21^{c}	27.14^{c}	***
	90	32.05^{a}	32.13^{a}	31.90^{b}	31.76^{c}	***

[A,b,c] Means in the same row with different superscripts differ significantly at ($P \leq 0.05$)

Oxidative stability of cheese:

Results presented in table (3) shows that, cheese made with aqueous or ethanolic ginger extracts had significant ($p \leq 0.05$) lower peroxide values compared with control and BHA cheeses at the end of storage period. The lower peroxide values of cheeses fortified with both ginger aqueous extract or ethanolic extracts may be due to antioxidant activity of ginger extracts. The peroxide values increased in different experimental cheeses as well as control with extended storage period up to the end of storage period. The obtained results are similar to those obtained by Omido *et al*., 2013 and Singh *et al*., 2013.

As storage period progress, the acid value increase gradually in all treatments as shown in table (3). This may be due to fat hydrolysis and liberation of free fatty acids, which cause gradual increase in rancidity during storage. The acid value of control cheese was higher significantly ($p \leq 0.05$) than that of experimental cheese. Control cheese had the highest acid value followed by BHA treated cheese and finally cheese fortified with aqueous and ethanolic ginger extracts respectively. The obtained results are similar to those reported by Abd El-Aziz *et al*., (2012) and Omido *et al*., (2013).

Table 3. Oxidative stability of UF-soft cheese affected by addition of ginger extract.

Properties	Storage period (days)	Control	BHA (0.02%)	Ginger extract (1%)		Significant
				Aqueous extract	Ethanolic extract	
Acid value (mg KoH / g fat)	Fresh	0.76^{a}	0.70^{b}	0.67^{b}	0.63^{c}	***
	30	1.05^{a}	0.94^{b}	0.86^{c}	0.81^{c}	***
	60	1.21^{a}	1.06^{b}	0.98^{c}	0.92^{d}	***
	90	1.43^{a}	1.27^{b}	1.20^{c}	1.14^{d}	***
Peroxide value meq/ kg)	Fresh	4.74^{a}	4.28^{b}	4.21^{c}	4.20^{c}	***
	30	9.13^{a}	8.36^{b}	8.30^{b}	8.23^{c}	***
	60	13.44^{a}	12.65^{b}	12.51^{bc}	12.40^{c}	***
	90	19.00^{a}	13.95^{b}	13.68^{c}	13.51^{d}	***
T.B.A. at 512 nm	Fresh	0.158^{a}	0.144^{b}	0.142^{b}	0.137^{c}	***
	30	0.165^{a}	0.157^{b}	0.148^{c}	0.145^{c}	***
	60	0.220^{a}	0.203^{b}	0.192^{c}	0.184^{c}	***
	90	0.280^{a}	0.265^{b}	0.250^{c}	0.243^{c}	***

[A,b,c] Means in the same row with different superscripts differ significantly at ($P \leq 0.05$)

The trend of the changes in Thiobarbituric acid values of all treatments was increased in all treatments with the progress in the storage period. The obtained results are similar to those obtained by Azzam, 2007. The ginger extract treatments were lower significantly ($p \leq 0.05$) in thiobarbituric acid compared to cheese treatments with synthetic antioxidant (BHA) and control cheese. Similar results were obtained by Bandyopadhyay *et al.* (2007).

Microbiological properties:

Data presented in Table (4) shows the total bacterial, coliform, yeast and mould counts of white soft cheese during storage period. The total bacterial counts decreased gradually in all treatments till the end of the

storage period. Addition of ginger extracts reduced the total bacterial count than the control and BHA treatments along the storage period. This reduction may be attributed to the inhibitory effect of ginger extract as antimicrobial agent. These results agree with Onyeagba *et al*., 2004 and Lopez *et al*., (2017). Coliform bacteria were observed with slightly numbers at the beginning of the storage period in cheese samples, then not detected with the progress of storage period. This results are in agreement with Ekwenye and Elegalam (2005). The absence of coliform bacteria could due to the efficient heat treatment and good sanitation conditions applied during manufacture and storage of cheese samples and the development of acidity in cheese. These results agree with the results of Monzano, *et al.,* (1992). Yeast and mould counts were not detected in all samples up to 60 days of storage except the control treatment which observed after 30 days of storage period this could be attributed to the inhibitory effect of ginger extracts. Also, it could be noticed that the yeasts and moulds were higher in control cheese compared with treated samples. These results agree with reported by Singh *et al*., (2005). Meanwhile counts of yeast, mould and coliform in all samples were in accordance to the legal Egyptian standards.

Table 4. Microbiological properties of UF-soft cheese affected by addition of ginger extract.

Properties	Storage period (days)	Control	BHA (0.02%)	Ginger extract (1%)		Significant
				Aqueous extract	Ethanolic extract	
Total viable count X 10^6 Cfu/g	Fresh	43^a	40^a	28^b	25^b	**
	30	28^a	25^a	13^b	10^b	***
	60	12^a	10^a	6^b	5^b	*
	90	7^a	$5a^b$	3^{bc}	2^c	**
Coliform group X10^2cfu/g	Fresh	2	1	1	1	
	30	1	ND	ND	ND	
	60	ND	ND	ND	ND	
	90	ND	ND	ND	ND	
Yeast & mould X 10^2cfu/g	Fresh	ND	ND	ND	ND	
	30	2	ND	ND	ND	
	60	6	ND	ND	ND	
	90	23	12	2	1	

[A,b,c] Means in the same row with different superscripts differ significantly at (P≤0.05)

Organoleptic properties:

The average score points of UF-white soft cheese are presented in table (5). The results showed that, organoleptic properties of all cheese treatments were improved by the progress of storage period until the end of storage period (90 days). On the other hand, there were significant differences (p≤0.05) between the control and all other treatments when fresh and during storage period. Cheese fortified with ginger extracts recorded the highest score points especially cheese made with ginger ethanolic extract. These may be due to proteolytic activity of ginger protease, which can improve the flavour and texture and also attributed to smell of gingerol and other volatile oils of ginger (Bandyopadhyay *et al.,* (2007) and Vafopoulou *et al.,* (1989).These results are in agreement with those reported by Abd El-Aziz *et al*,. 2012 & 2015 who found that, addition of ginger extract to soft cheese gained the highest scores and became more acceptable to panelists than control cheese during storage, Adesokan *et al.,* 2010 reported that addition of 5% ginger into Ogi cheese significantly improved its sensory properties. Finally, it was quite clear that cheese samples containing aqueous or ethanolic ginger extracts lead to reduce the undesirable changes in soft cheese compared to control cheese during storage period. The obtained results are similar to those reported by Bandyopahyay *et al*., (2008).

Table 5. Organoleptic properties of UF-soft cheese affected by addition of ginger extract.

Storage period (days)	Properties		Control	BHA (0.02%)	Ginger extract (1%)		Significant
					Aqueous	Ethanolic	
Fresh	Appearance	10	7.50	7.50	8.00	8.00	
	Body & texture	40	36.80	36.70	36.87	36.90	
	Flavour	50	44.70	44.75	45.81	45.85	
	Total	100	88.00^c	89.05^b	90.68^a	90.75^a	***
30	Appearance	10	8.25	8.27	8.32	8.36	
	Body & texture	40	36.83	36.80	35.96	35.92	
	Flavour	50	43.63	43.87	47.65	47.80	
	Total	100	88.71^c	88.94^b	91.93^a	92.08^a	***
60	Appearance	10	8.30	8.32	8.40	8.45	
	Body & texture	40	37.00	37.10	36.50	36.35	
	Flavour	50	44.70	44.76	47.85	49.63	
	Total	100	90.00^d	90.28^c	92.75^b	94.43^a	***
90	Appearance	10	8.00	8.35	8.42	8.50	
	Body & texture	40	37.20	38.15	38.50	38.75	
	Flavour	50	45.00	45.25	48.10	49.50	
	Total	100	90.20^d	91.75^c	95.02^b	96.75^a	***

[A,b,c] Means in the same row with different superscripts differ significantly at (P≤0.05)

CONCLUSION

It is notable that ginger aqueous or ethanolic extracts improved the oxidative stability and organoleptic properties of cheese up to 90 days compared to cheese contained BHA or control cheese. Therefore, it is preferred to ginger extract as natural antioxidant in manufacture of soft cheese with high quality.

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تأثير إضافة مستخلص الزنجبيل على خواص الجودة والثبات التأكسدي للجبن الأبيض الطري المصنع بالترشيح الفائق

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أجرى هذا البحث بهدف زيادة الثبات التأكسدى للجبن البيضاء الطرية المصنعة بالترشيح الفائق للبن الجاموسى والمخزن على درجة حرارة 7 ± 1° م لمدة 90 يوم وذلك باستخدام المستخلص المائى والمستخلص الكحولى لريزومات الزنجبيل بنسبة 1% من وزن مركز اللبن (retentate) ومقارنتها بجبن الكنترول المصنع بدون إضافة مواد مضادة للأكسدة وكذا عينات الجبن المحتوية على 0.02% من مضادات الأكسدة الصناعية البيوتيليتيد هيدروكسى انيسول. وقد أظهرت النتائج الآتي:1- اضافة مستخلص الزنجبيل سواءا المائى أو الكحولى بنسب 1 % أدى الى زيادة معنوية ($p\leq0.05$) في كل من نسبة الرطوبة والدهن بالنسبة للمادة الجافة وكذلك النيتروجين الذائب (SN/TN%) والنيتروجين الغير بروتينى (NPN/TN%) مع وجود انخفاض معنوى في الحموضة والبروتين الكلى (TP%) والأحماض الدهنية الكلية الطيارة (TVFA) في الجبن المعامل بمستخلصات الزنجبيل أو ال BHA خلال فترة التخزين (90 يوم) مقارنة بالكنترول.2- تلاحظ انخفاض معنوى ($p\leq0.05$) فى قيم رقم البيروكسيد ورقم الحموضة وحمض الثيوباربتيوريك في عينات الجبن المحتوية على مستخلصات الزنجبيل وبخاصة المستخلص الكحولى وذلك خلال فترة التخزين مقارنة بجبن الكنترول المصنع بدون إضافة مواد مضادة للأكسدة ، وكذا عينات الجبن المحتوية على 0.02% من مضادات الأكسدة الصناعية البيوتيليتيد هيدروكسى .3- بالنسبة للخواص الميكروبيولوجية فقد أدى اضافة مستخلص الزنجبيل سواءا المائى أو الكحولى الى انخفاض معنوى في العدد الكلى للبكتريا مقارنة بالكنترول. بالإضافة الى اختفاء بكتريا القولون بعد 30 يوم من التخزين مع عدم ظهور خمائر وفطريات الا بعد 90 يوم من التخزين مما يدل على تأثير مستخلص الزنجبيل المضاد للفطريات والخمائر.4- بالنسبة للخواص الحسية للجبن فقد تلاحظ انخفاض فى القوام والتركيب مع تحسن تدريجي في المظهر والنكهة مع اضافة مستخلص الزنجبيل وبخاصة المستخلص الكحولى حيث حصلت على أعلى درجات التحكيم الحسي مقارنة بباقي المعاملات. وبذلك يمكن التوصية بإضافة مستخلص الزنجبيل سواءا المائى أو الكحولى بنسبة 1% وبخاصة المستخلص الكحولى عند تصنيع الجبن الأبيض الطرى بالترشيح الفائق مما يحسن من جودتها وثباتها التأكسدى.