

EXTENDED SHELF LIFE OF KAREISH CHEESE BY NATURAL PRESERVATIVES

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Abstract

Fifty kareish cheese samples were obtained and collected from 10 markets at Zagazig city. Another group of kareish cheese was made from buffalo's skim milk and mixed with 5, 10% propolis and 0.5% of garlic & ginger as essential oils.

The cheeses were analyzed fresh and during storage for their chemical composition, microbiological and organoleptic properties in all treatments. The collected samples showed a higher moisture content, higher coliform and moulds and yeast counts than the standards requirement. The treated cheeses showed no clear differences in chemical composition among the samples during fresh or storage period. The total bacterial count and yeast & mould decreased during storage in all treatment compared with the control cheese. Lipolytic bacteria counts were affected by propolis more than essential oils. Coliforms and proteolytic bacteria were not detected in fresh and during storage in all treatments.

Propolis and essential oils can be used to improve the quality of kareish cheese and can be used as natural preservatives to increase its shelf life up to 30 days of storage at 4°C ±2

Key words: Kareish cheese, Natural preservatives, Propolis, Garlic, Ginger

INTRODUCTION

Kareish cheese is one of the most popular cheese varieties consumed in Egypt especially in countryside owing to its high protein, low fat and reasonable price. It has a limited shelf life of 7-11 days, when immersed in whey. This may be due to sanitary problems during manufacture cheese (uncontrolled hygien) which increases microbial contamination. Yeast and mould play an important role in the spoilage of dairy products. It also may impair public health due to the presence of mycotoxins which cause carcinogenic health problems

There is an increasing demand for this kind of cheese for its pleasant organoleptic properties. The microbial quality and safety of kareish cheese is the major area of concern for producers and consumers. Therefore, there is a need to develop improve the kareish cheese quality, and increasing its shelf life. The use of 0.8% propionic acid and 0.8% sodium benzoate in the preservation of similar cheese for 8 days have been reported by Joseph and Akinyosoye (1997). The most accepted ways to extend the shelf life of the products is the use of bio-preservatives (Ismail,

2006 and Dabiza, 2006). Herbs and spices have been used for many centuries to improve the sensory characteristics and to extend the shelf life of foods. As a result, considerable research has been carried on the assessment of the antioxidants activity of many herbs, spices and their extracts when added to a variety of foods and food model systems. (Ismael et al. 2006).

Garlic and ginger have been widely known to improve lipid metabolism, promoting the circulation of blood, preventing cardiovascular diseases and immunopotentiating with anticancer activity (Lawson, 1993). Ginger is a great natural preservative and bactericide. Nigerian studies show that ginger extract is effective in killing salmonella. Indian studies reported that ginger extract inhibits the fungi that produce aflatoxin.

Propolis, a natural resinous bee product collected by honeybee workers, has gained popularity as an alternative medicine or food for health amelioration and disease prevention in

various parts of the world, including the United States of America, the European Union and Japan. Propolis has also antibacterial, antifungal and antiviral activities.

Consumers are demanding food with least chemical preservatives and artificial additives. This means that good hygiene and safe storage conditions will have to play an even more important role in quality and safety food. Scientists are putting increased efforts into the discovery and purification of natural compounds for use as safe alternatives to chemical preservatives.

So, the thrust of this study was to evaluate the potential of propolis, ginger and garlic extracts as preservatives and its efficacy on the storage quality of kareish cheese.

MATERIALS AND METHODS

Collected kareish cheese samples

50 samples of kareish cheese were collected from 10 different districts at Zagazig city (5 samples from each source)

Buffalo's skim milk and culture

Skim fresh buffalo's milk was obtained from Dairy Department, Faculty of Agriculture, Cairo Univ., Giza, Egypt. Pure culture of *Str. salavarius* sup sp. *Thermophilus* and *Lactobacillus delbruckii* sup sp. *bulgaricus* were obtained from Hansen Laboratories (Denmark). Animal powder rennet was obtained from Hansen Laboratories A/S, Copenhagen, Denmark. Sodium chloride was obtained from local market

Essential oils

Two types of essential oils namely garlic and ginger were purchased from local market (Cairo, Egypt) and stored at $7^{\circ}\text{C} \pm 1$. Appropriate dilutions were prepared 1:7 (v/v) in 95% reagent grade ethanol on the day of use (Ismael and pierson.1990).

Collection and Preparation of propolis

Propolis was collected from hybrid honey bee colonies at Fayoum governate .The collected propolis was kept dissociated in the refrigerator until further processing stock solution 10% (w/v) propolis. Aqueous solution was prepared by soaking grind propolis in distilled water for 7 days with periodical shaking. The extract was filtered through Zeiss filter to obtain sterile aqueous propolis solution 5% and 10% (w/v) prepared from the stock solution and used to varnish mass of Kareish cheese as reported by Dabiza(2006)

Manufacture of kareish cheese

Buffalo's skim milk was heated to 85°C for 15 sec and cooled to $38^{\circ}\text{-}40^{\circ}\text{C}$. Active starters of *S.thermophilus* and *L. bulgaricus* (2% w/w) and 5% sodium chloride (salt) were added and mixed well. Rennet powder was added at rate of (3g /100kg) milk. Then, the cheese was divided into 3 equal portions as follows:

- The first portion was kept untreated and served as control.
- The second and third portions (T1&T2) were varnished by 5% and 10% concentration of propolis in water solution respectively.
- The fourth and fifth portions (T3&T4) were mixed with garlic and ginger oils at ratio of 0.5% respectively.

The kareish cheese was manufactured as described by Effat et al. (2001). The cheeses were packed in plastic bags and stored at 4°C for 30 days and analyzed at zero time 7, 14, 21 and 30th day

Chemical analysis

Fresh kareish samples were analyzed for moisture titratable acidity (T.A) as described by ling (1963) and for fat, protein, and ash as described in (A.O.A.C, 2000).

Microbiological analysis

All samples were examined for total bacterial count (TBC), lipolytic bacterial count (LBC), proteolytic bacterial count (PBC), coliform and mould & yeasts according to American public health association (APHA, 1992).

All microbiological and chemical analysis was carried out in duplicate and the results as a mean for the five different samples.

Organoleptic properties

The organoleptic properties of kareish cheese were carried out according to El-Shafei et al. (2008). The samples were presented to the panelists in a random order.

The cheeses were evaluated organoleptically after zero time and after 7, 14, 21 and 30 days of storage at $4^{\circ}\text{C} \pm 2$. Panelists evaluated cheese for appearance (20 points), body and texture (45 points), and flavour (35 points). Overall acceptability (100 points) scores were obtained for all sensory attributes.

Statistical analysis

Each experiment was independent replicated three times completely randomized design. HPLC analyzed and enumerated were done in duplicate. The data were analyzed by ANOVA using the general models procedure of SAS (1989). Differences among means were tested for significance ($P < 0.05$) by Duncan's multiple range test.

RESULTS AND DISCUSSION

Properties of kareish cheese collected from different districts at Zagazig city

Table (1) reveals that moisture % of the samples ranged from 74.25 to 79.77% with the average 77.01% which is higher than that allowed by the Egyptian standards (2000). The high content of moisture in kareish cheese may be due mainly to the acid coagulation adapted in this type of cheese (Abou Donia et al.1975), in which acid casein curd has high water holding capacity (Abdel El -Tawab et al., 1988). The present data were nearly from that reported by (Abou-Dawood et al., 2005) .The average titratable acidity (TA %) of cheese samples was 2.11% and ranged between 1.72% and 2.50% which were higher than that reported by (Mohammed et al 2009).The salt content ranged from 1.5% to 4.0% with an average value of 2.75% which agrees with that of kareish cheese given by El-Gawish (2004).

The fat content ranged from 1.0 to 3.0 % with an average of 2.0% corresponding values for protein ranged from 15.1 to 18.90 with an average 16.35%

Microbiological quality

Table (2) reveals that the TBC of Kareish cheese ranged between 50 and 210×10^6 cfu/g. These results are less than those found by Kaldes (1997) but higher than those obtained by Abou-Dawood et al. (2005).The Table also show that the numbers of coliform bacteria were higher compared with other microbial groups. The numbers of coliform bacteria ranged between 40 to 290×10^3 cfu/g with an average of 150.5×10^3 cfu/g which is much higher than allowed by the Egyptian standards (2000) not more than 10 cfu/g. These counts were less than that reported by (Abou Dawood et al. (2005) but higher than those found by El- Gawish (2004).Salmonella was not detected in all samples. Similarly El-Gawish (2004) had not detected any salmonella in his Kareish samples. He attributed that to the high acidity of Kareish cheese.

Among the undesirable bacteria, the *Staph. aureus* was the most predominant. It was detected in all Kareish cheese samples with an average of 165×10^3 CFU/g. These counts were less than those found by Abou-Dawood et al. (2005) but higher than those reported by El-Gawish (2004). Data in the same table indicated that lipolytic and proteolytic bacteria were detected in 85% and 45% of the samples respectively. The lipolytic bacteria counts appear to be higher than proteolytic bacteria .

The average count of lipolytic bacteria was 81.2×10^2 cfu/g while that of proteolytic was 42×10^2 cfu /g. as shown in table (2). Moulds and yeasts were detected in all tested samples, the counts of moulds and yeasts ranged from 21 to 57×10^2 cfu/g with an average of 42×10^2 cfu/g, which is much higher than allowed by the Egyptian Standard (2000) mainly not more than 100 cfu/g. These results were less than reported by Kaldes (1997) and higher than that found by Abou-Dawood, et al. (2005). The microbiological quality of Kareish cheese in this study indicates insufficient of sanitation during manufacture and handing this type of cheese

Chemical composition of treated kareish cheese

Table (3) records the chemical composition of kareish cheese during cold storage of all samples. The moisture content of kareish cheese manufactured with different additives gradually decreased till the end of the storage period, with no significant differences among the samples except propolis treated cheese where these results are in agreement with that reported by Antony et al (2006). Slight differences were noticed among kareish cheese in ash, titratable acidity, fat and protein content throughout storage period indicating that, addition of essential oils and propolis had little effect on the composition of the resulted cheese. These results are in agreement with that reported by Antony et al (2006) and Ismail et al (2006).

Microbiological analysis

Table (4) reveals average of total bacterial counts (TBC) of each treatment of kareish cheese samples. The results show that the TBC was higher in the control sample than treated samples. During storage period, these counts decreased gradually and reached its minimum level at the end period of cold storage.

The lipolytic bacteria counts shown in Table (4) were affected with different treatments. Lipolytic bacteria were not detected in samples treated with propolis 10% and ginger 0.5% but it appeared in samples of control, propolis 5% and garlic 0.5%. Proteolytic bacteria and coliform were not detected in fresh and during storage period in all kareish cheese. These results are in agreement with Abou Dawood (2002) and Ismail et al. (2006).

One of the most important parameters to determine the quality and shelf life of kareish cheese is the count of yeast and mould. In addition to quality deterioration, microbiological counts have been used as indices for the end of shelf life of dairy products (Miur and Banks 2000). The counts of mould and yeast were lower than allowed according to Egyptian Standards (2000) being not more than 100 cfu/g. During storage period the yeast and mould increased gradually and reached its maximum level by the end of storage period for control. These results are in agreement with Diabiza (2006) who found that the addition of ginger decreased the total bacterial counts and mould & yeast.

Organoleptic properties:-

The data presented in table (5) revealed that the control kareish cheese gained the lowest score either fresh or throughout storage. Meanwhile the cheese processed with propolis 10% gained the highest score for all storage period. In general all cheese made with different types of essential oils had acceptable appearance and body & texture during storage period. These results are in agreement with those obtained by Ismail et al. (2006).

It could be concluded that propolis (5% or 10%), ginger and garlic 0.5% essential oils can be used for improvement of the quality of kareish cheese and it can increase the shelf life of kareish cheese for 30 days with imparting good flavour.

Table 1. Chemical composition of kareish cheese collected from different markets at Zagazig city.

Groups	Moisture %	Acidity %	Salt %	Fat %	Protein content %
1	79.94±2.5	1.74±0.4	1.8±0.3	1.2±0.2	17.6±3.2
2	74.76±1.4	2.21±0.2	3.7±0.2	2.8±0.6	15.5±2.2
3	79.90±3.1	1.82±0.5	3.4±0.6	1.4±0.1	15.3±2.5
4	75.92±2.4	2.33±0.4	1.6±0.2	2.7±0.4	16.0±2.8
5	79.72±2.3	1.99±0.6	2.8±0.8	1.8±0.3	15.5±1.8
6	74.84±1.8	2.48±0.8	3.8±0.6	2.3±0.4	17.8±3.4
7	79.22±2.6	1.78±0.3	1.7±0.1	1.5±0.1	16.7±2.6
8	77.78±3.3	2.47±0.4	2.9±0.4	2.2±0.7	15.6±1.4
9	74.81±3.5	1.96±0.2	3.9±0.8	1.5±0.2	17.6±2.9
10	73.09±2.1	2.32±0.8	1.9±0.2	2.6±0.8	15.6±1.2
Average	77.01±3.2	2.11±0.6	2.75±0.6	2.0±0.2	16.3±2.4

Table 2. Microbiological analysis of kareish cheese collected from different markets at Zagazig city.

Groups	Total bacterial count $\times 10^6$ cfu/g cheese	Lipolytic bacterial count $\times 10$	Proteolytic Bacterial count $\times 10$	Coliform $\times 10^3$ cfu/g cheese	<i>Salmonella</i>	<i>Staph. aureus</i> $\times 10^3$ cfu	Mould & Yeasts Counts $\times 10^2$ cfu
1	52±12	88±16	31±4	138±22	ND	150±18	27±3
2	74±18	72±12	43±8	270±28	ND	165±24	43±2
3	61±14	74±14	40±8	87±12	ND	147±22	51±6
4	83±18	85±18	50±12	193±18	ND	189±31	31±2
5	110±22	97±21	49±6	65±5	ND	146±20	49±4
6	109±20	65±10	40±4	282±32	ND	151±23	45±5
7	117±24	76±14	52±12	328±38	ND	169±26	37±3
8	67±12	89±16	54±14	95±14	ND	177±28	25±5
9	202±28	72±14	41±6	68±4	ND	183±32	53±6
10	75±15	84±18	79±18	79±8	ND	173±27	43±6
average	95 $\times 10^6 \pm 15$	81.2 $\times 10^2 \pm 12$	42 $\times 10^2 \pm 6$	150.5 $\times 10^3 \pm 22$	ND	165 $\times 10^3 \pm 24$	42 $\times 10^2 \pm 4$

Table 3. Chemical composition of kareish cheese as affected by certain additives during Storage period at 4°C±2

Treatments	Storage period days	Moisture %	Ash %	Titrateable acidity %	Fat %	Protein %
Control	1	76.80±2.2	3.10±0.2	0.96±0.08	1.00±0.02	16.50±2.2
	7	75.50±1.5	3.17±0.6	1.12±0.04	1.00±0.01	15.92±1.5
	14	74.64±0.8	3.22±0.2	1.23±0.06	1.10±0.01	15.70±1.3
	21	73.00±2.4	3.30±0.4	1.26±0.04	1.10±0.02	15.58±1.4
	30	72.10±5.0	3.36±0.1	1.35±0.02	1.0±0.00	15.50±1.2
T1 5% Propolis	1	75.42±4.2	3.12±0.6	1.00±0.05	0.90±0.04	16.70±2.4
	7	74.00±1.5	3.17±0.2	1.15±0.06	0.90±0.02	16.12±2.5
	14	72.85±0.5	3.25±0.2	1.28±0.02	0.95±0.01	15.90±1.2
	21	71.90±2.8	3.32±0.4	1.39±0.04	1.00±0.02	15.82±1.4
	30	70.98±5.4	3.40±0.8	1.48±0.03	1.00±0.02	15.68±1.2
T2 10% Propolis	1	74.62±2.3	3.10±0.1	1.06±0.08	1.10±0.03	16.82±1.8
	7	73.20±5.2	3.18±0.3	1.20±0.04	1.10±0.02	16.32±2.5
	14	71.70±4.4	3.28±0.4	1.28±0.02	1.20±0.04	15.98±1.2
	21	70.00±2.8	3.35±0.5	1.40±0.02	1.20±0.03	15.81±1.4
	30	68.92±6.2	3.42±0.4	1.52±0.05	1.10±0.01	16.70±1.1
T3 0.5% Garlic	1	77.12±0.4	3.40±0.2	1.00±0.06	1.20±0.03	16.70±2.0
	7	75.90±4.6	3.49±0.5	1.20±0.02	1.20±0.02	16.45±1.5
	14	75.00±2.8	3.61±0.4	1.33±0.08	1.25±0.02	16.20±1.4
	21	74.10±5.5	3.68±0.2	1.42±0.04	1.25±0.01	15.92±1.1
	30	73.30±0.5	3.75±0.6	1.57±0.04	1.30±0.01	15.80±1.2
T4 0.5% Ginger	1	76.80±2.2	3.39±0.3	1.10±0.03	1.10±0.04	16.68±1.4
	7	75.72±0.6	3.45±0.2	1.21±0.02	1.10±0.02	16.35±1.2
	14	75.00±2.8	3.52±0.4	1.35±0.05	1.20±0.02	15.98±1.2
	21	73.90±5.2	3.61±0.2	1.45±0.04	1.2±0.03	15.80±1.0
	30	72.00±6.4	3.72±0.1	1.60±0.01	1.3±0.02	15.72±1.4

Table 4. Some microbiological properties of kareish cheese with certain additives during cold storage at 4°C±2

Treatments	Storage period (days)	Total bacterial count X10 ⁶ cfu/g	Lipolytic bacterial count X10 ⁶ cfu/g	Proteolytic bacterial count X10 ³ cfu	Coliform CfU/g	Yeast & molds X10 ³ cfu
Control	1	45.00±4.0	ND	ND	ND	10.0±4.0
	7	39.00±5.0	ND	ND	ND	16.0±2.0
	14	25.00±2.0	ND	ND	ND	20.0±5.0
	21	22.00±2.0	ND	ND	ND	26.0±5.0
	30	18.00±1.0	ND	ND	ND	31.0±6.0
T1 5% Propolis	1	33.00±2.0	ND	ND	ND	10.0±2.0
	7	28.00±3.0	ND	ND	ND	9.0±1.0
	14	19.00±1.0	ND	ND	ND	9.0±2.0
	21	16.00±1.0	ND	ND	ND	7.0±1.0
	30	11.00±1.0	ND	ND	ND	3.0±1.0
T2 10% propolis	1	30.00±2.0	ND	ND	ND	10.0±2.0
	7	36.00±4.0	ND	ND	ND	7.0±1.0
	14	16.00±1.0	ND	ND	ND	5.0±2.0
	21	14.00±1.0	ND	ND	ND	3.0±1.0
	30	10.00±1.0	ND	ND	ND	2.0±1.0
T3 0.5% Garlic	1	40.00±5.0	ND	ND	ND	10.0±2.0
	7	32.00±4.0	ND	ND	ND	10.0±2.0
	14	26.00±2.0	ND	ND	ND	8.0±1.0
	21	19.00±2.0	ND	ND	ND	7.0±1.0
	30	14.00±1.0	ND	ND	ND	5.0±1.0
T4 0.5% Ginger	1	35.00±3.0	ND	ND	ND	11.00±2.0
	7	28.00±2.0	ND	ND	ND	8.00±2.0
	14	20.00±2.0	ND	ND	ND	6.00±2.0
	21	15.00±1.0	ND	ND	ND	4.00±1.0
	30	12.00±1.0	ND	ND	ND	3.00±1.0

Table 5. Organoleptic assessment of kareish cheese with additives during storage at $4^{\circ}\text{C}\pm 2$

Treatments	Storage period (days)	Appearance (20)	Body & texture (45)	Flavour (35)	Total (100)
Control	1	18	40	32	90
	7	18	40	32	90
	14	17	38	26	81
	21	15	37	24	76
	30	14	30	20	64
T1 5% Propolis	1	18	42	33	93
	7	18	42	33	93
	14	18	41	32	91
	21	17	41	32	90
	30	17	40	31	88
T2 10% Propolis	1	19	43	33	95
	7	19	43	33	95
	14	18	42	33	93
	21	18	42	32	92
	30	18	41	31	90
T3 0.5% Garlic	1	18	40	32	90
	7	18	40	32	90
	14	17	39	31	87
	21	17	39	30	86
	30	17	38	29	84
T4 0.5% Ginger	1	18	41	32	91
	7	18	41	31	90
	14	18	40	31	89
	21	17	40	30	87
	30	17	39	30	86

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أطالة مدة حفظ الجبن القريش المصنع باستخدام مواد حافظة طبيعية

سونيا عبد الحميد متولى

معهد بحوث تكنولوجيا الأغذية - مركز البحوث الزراعية - الجيزة

تم تجميع خمسون عينة من جبن القريش من مناطق مختلفة من محافظة الشرقية، تم تحليل جميع العينات كيميائيا و بيولوجيا لتقدير جودتها و مقارنتها بالمواصفات القياسية المصرية وقد وجد أن الرطوبة لعينات الجبن القريش كان محتواها عالي و كذلك احتوت على أعداد كبيرة من بكتريا القولون و الفطر و الخمائر و ذلك بالمقارنة بالمواصفات القياسية المصرية و لم توجد السالمونيلا تقريبا بالعينات.

و نظرا لأن الجبن القريش من المنتجات الغذائية سريعة الفساد ، لذا اهتمت هذه الدراسة برفع جودتها و أطالة مدة حفظها باستخدام المواد الحافظة الطبيعية الأمانة على صحة المستهلك حيث تم دراسة تأثير كل من صمغ العسل بنسبة ١٠-٥% و إضافة كل من زيت الثوم و زيت الجنزبيل بنسبة ٠,٥% و تم دراسة أثر هذه الإضافات على الخواص الكيميائية و الميكروبيولوجية و الحسية للجبن القريش المخزن على $4 \pm 2^{\circ}\text{C}$ لمدة ٣٠ يوم و قد اظهرت النتائج أن هذه الإضافات أطالة من فترة الحفظ وحسنت من جودة الجبن المضاف اليها ولقد حصل الجبن القريش المصنع بأضافة ١٠% من صمغ العسل على أعلى النتائج الحسية