MANUFACTURE OF SOFT CHEESE WITH MULTIPLE HEALTH BENEFITS

By

MARWA MOHAMED EL-SAID

B.Sc. Agric. Sci. (Dairy Science), Fac. Agric., Cairo Univ., 2004

THESIS

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APPROVAL SHEET

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APPROVAL COMMITTEE

Dr. MOHAMED EL-HOSENY ABD EL-SALAM.....
Researcher Professor of Dairy Science, NRC, Giza

Dr. FAWZIA HASSAN RAGAB ABD RABO .....
Professor of Dairy Science, Fac. Agric., Cairo University

Dr. SANAA MOHAMED BADRAN .....
Assistant Professor of Dairy Science, Fac. Agric., Cairo University

Dr. EBTISAM IBRAHIM GHITA.....
Professor of Dairy Science, Fac. Agric., Cairo University

Date: / / 2011

SUPERVISION SHEET

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SUPERVISION COMMITTEE

Dr. EBTISAM IBRAHIM GHITA
Professor of Dairy Science, Fac. Agric., Cairo University

Dr. SANAA MOHAMED BADRAN
Assistant Professor of Dairy Science, Fac. Agric., Cairo University

Dr. HALA MOHAMED FAKHR EL-DIN
Researcher Professor of Dairy Science, NRC, Giza

Name of Candidate: Marwa Mohamed El-Said **Degree:** M.Sc.
Title of Thesis: Manufacture of Soft Cheese with Multiple Health Benefits.
Supervisors: Dr. Ebtisam Ibrahim Ghita
Dr. Sanaa Mohamed Badran
Dr. Hala Mohamed Fakhr El-Din
Department: Dairy Science **Approval : / /2011**

ABSTRACT

This study is an endeavor to elevate the health benefits of the soft cheese. Therefore, low fat soft cheese was manufactured by using the retentate results from UF-skim milk, adding some natural antioxidants such as parsley and green pepper as carotenoids sources, rosemary and thyme as phenols sources. Effect of some technological aspects such as heating, salting and renneting on the antioxidant activity of the supplemented retentates was studied by estimating total carotenoids, total phenols, RSA% and FRAP values. Also, the antioxidant activity, chemical composition and organoleptic properties of the resultant cheese along storage in the refrigerator for 30 days were evaluated. The results revealed that the technological processes had no great effect on the antioxidant activity of the supplemented retentate. Heat treatment increased and both salting and renneting slightly decreased the antioxidant activity. Storage period also slightly decreased the antioxidant activity of the supplemented cheese. Generally, it could be manufacture low fat soft cheese by using low fat retentate and adding natural antioxidants to obtain highly acceptable cheese with more health benefits.

Key words: natural antioxidant, low fat soft cheese, antioxidant activity, carotenoids, phenols.

DEDICATION

Firstly, I dedicate this humble work to whom my heart felt thanks, to my, father, mother, Ahmed my brother and Sara my sister for all the support they lovely offered.

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تصنيع جبن طرى ذو وظائف صحية متعددة

رسالة مقدمة من

مروة محمد السعيد إبراهيم
بكالوريوس فى العلوم الزراعية (علوم الألبان) - كلية الزراعة - جامعة القاهرة، ٢٠٠٤

للحصول على درجة

ماجستير

في

العلوم الزراعية
(علوم ألبان)

قسم علوم الألبان
كلية الزراعة
جامعة القاهرة
مصر

٢٠١١

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مقدمة من

مروة محمد السعيد إبراهيم
بكالوريوس فى العلوم الزراعية (علوم الألبان) - كلية الزراعة - جامعة القاهرة، ٢٠٠٤

لجنة الحكم

دكتور/ محمد الحسينى عبد السلام .....
أستاذ باحث علوم الألبان – المركز القومى للبحوث

دكتور/ فوزية حسن رجب عبد ربه.....
أستاذ علوم الألبان – كلية الزراعة – جامعة القاهرة

دكتور/ سناء محمد بدران .....
أستاذ مساعد علوم الألبان – كلية الزراعة – جامعة القاهرة

دكتور/ إبتسام إبراهيم غيته.....
أستاذ علوم الألبان – كلية الزراعة – جامعة القاهرة

التاريخ / / ٢٠١١

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مروة محمد السعيد إبراهيم
بكالوريوس فى العلوم الزراعية (علوم الألبان) - كلية الزراعة - جامعة القاهرة، ٢٠٠٤

لجنة الإشراف

دكتور/ إبتسام ابراهيم غيتة
أستاذ علوم الألبان – كلية الزراعة – جامعة القاهرة

دكتور/ سناء محمد بدران
أستاذ مساعد علوم الألبان – كلية الزراعة– جامعة القاهرة

دكتور/ هالة محمد فخر الدين
أستاذ باحث علوم الألبان – المركز القومي للبحوث

اسم الطالب: مروة محمد السعيد إبراهيم **الدرجة:** ماجستير

عنوان الرسالة: تصنيع جبن طرى ذو وظائف صحية متعددة

المشرفون : دكتور: إبتسام ايراهيم غيتة
دكتور: سناء محمد بدران
دكتور: هالة محمد فخر الدين

قسم: علوم الألبان **تاريخ منح الدرجة:** / /٢٠١١

المستخلص العربي

نظراً لأهمية الحصول على جبن ذو وظائف صحية متعددة أهتمت هذه الدراسة بتصنيع جبن طرى منخفض فى نسبة الدهن بإستعمال مركز الترشيح الفائق اللبن الفرز لما يحتوية هذا المركز من بروتينات الشرش ذات الأهمية الغذائية والصحية العالية والتى يتم فقدها فى الطرق التقليدية التى فيها يتم ترشيح الخثرة. وأيضا تم تدعيم هذا المركز ببعض المصادر الطبيعية لمضادات الأكسدة لما لها من أهمية صحية كبيرة مثل البقدونس والخضروات كمصادر للكاروتينويدات وحصى اللبان والزعتر كمصادر للفينولات . وتم أيضا دراسة تأثير بعض المعاملات التكنولوجية التى تطبق عند تصنيع الجبن مثل التسخين والتمليح والتنفيح على النشاط المضاد للأكسدة للمركزات المدعمة. كما تم تقدير هذا النشاط فى الجبن الناتج خلال تخزينه فى الثلاجة لمدة ٣٠يوماً. وأيضا تم تقدير التركيب الكيماوى والتقييم الحسى للجبن المدعم خلال فترة التخزين وأظهرت النتائج انه ليس للمعاملات تأثير كبير على النشاط المضاد للأكسدة حيث أدت عملية التسخين إلى زيادة النشاط بينما أدت عمليتى التمليح والتنفيح الى إنخفاض بسيط لهذا النشاط . كما إنه لم يكن لتخزين الجبن لمدة شهر فى الثلاجة تأثير كبير على هذا النشاط ونستخلص من هذه الرسالة انه بإضافة عصير كل من البقدونس أو الفلفل الأخضر أو مستخلص كل من حصى اللبان أو الزعتر إلى المركز منخفض الدهن ينتج جبن طرى مقبول حسياً وذو فوائد صحية متعددة.

الكلمات الدالة: جبن طرى منخفض الدهن - مضادات أكسدة طبيعية- كاروتينويدات- فينولات- النشاط المضاد للأكسدة.

CONTENTS

INTRODUCTION

Cheese is an important dairy product and an integral part of a healthful diet due to its substantial contribution to human health. Cheese is one of the oldest and health beneficial products. Recent advances in nutrition have highlighted the contribution of UF-soft cheese to nutrition and health owing to trap whey proteins into intermediate concentrated retentate, which act as a cysteine delivery system in inhibitory tumor growth and contain bioactive substances and immune stimulating properties.

Reduced fat dairy products are the most widely consumed, as the production of reduced and low fat cheese has significantly increased since 1980 (Koca and Metin, 2004). Hence dietary fat intake reduction is an effective means of decreasing the risk of obesity, coronary heart disease and many other health problems.

Products enriched with natural antioxidants will play a major role in the foreseeable future. In our daily routine we encounter many substances that can damage our health, therefore antioxidant supplementation is important. Our body possesses internal antioxidants that protect us but these declines with age, so incorporation antioxidants in our daily nutritional supplement would be a wise and healthy step. A diet rich in fruits, vegetables and some herbs is widely acknowledged for its protective effect on human health and reducing the risk of several degeneration diseases, Chuah *et al.* (2008) and Huber *et al.* (2009). Also, increasing consumer demand for

natural products led to greater interest in using natural antioxidants which could replace the use of chemical additives.

A number of studies have shown that β-carotene and other carotenoids have lipid soluble antioxidant activity. Carotenoids play an important potential role in human health by acting as biological antioxidants, protecting cells and tissues from the damaging effects of free radicals and singlet oxygen. Other health benefits of carotenoids that may be related to their antioxidants properties include enhancement of immune system function and inhibition of the development of certain types of cancers.

The majority of natural antioxidants are phenolic compounds and the most important groups as natural antioxidants are the flavonoids and phenolic acids. Phenolic antioxidants are likely produced as defense of mechanism against the oxidative stress of ultraviolet radiation and reactive oxygen species generated in the air. The antioxidant activity gives phenols a healthful connotation, as these natural antioxidants present in plants have positive effect upon the cardiovascular system. They prevent a negative phenomenon of thromobocyte sealing and oxidative of LDL cholesterol fraction and other lipid present in blood which accelerates sclerotic processes.

Parsley is a widely used as culinary, medicinal and aromatic plant. It has many therapeutic health benefits, extraordinary immunity enhancing, multi-vitamin and minerals. The activity of parsley's volatile oils qualifies it as a (chemoprotective food), a food that can help neutralize particular types of carcinogens. In addition to its

concentration of carotenoids such as beta carotene, that considers very powerful antioxidants.

Green pepper, among vegetables has become extremely popular for the abundance and kind of antioxidants they contain. It is a good source of vitamins C, E, provitamin A and carotenoids that are important nutritional antioxidants. Also, contains various phenolics, flavonoids and it is a rich source of some of the best nutrients available.

Rosemary have always been known as a versatile aromatic herbs and being used as a food flavoring and it is also known medicinally for its powerful antioxidant activity, antibacterial and antimutagenic properties (Oluwatuyi *et al.*, 2004). Its extract contains several beneficial substances such as monoterpenes, phenolic diterpenes and flavonoids which are renowned for their ability to slow down the production of free radicals and protect the body's cells from damage. Therefore, rosemary antioxidant extract is ranked high on the list of cancer- prevention and reduction foods.

Thyme also is one of the best known and most widely-used culinary herbs. It is a welcome flavor in salads, soups, chowders, sauces, breads, vegetable and meat dishes and even jellies and desserts. Thyme has a significant antioxidant protection of cellular membranes and it has a long history of use as a natural medicine in connection with chest and respiratory problems owing to its volatile oil components especially, thymol , named after the herb itself.

Vegetable oils are usually preferred for human health, where olive oil is mainly monounsaturated and contains several natural

antioxidants of the tyrosol series. Polyphenolic compounds present in olive oil including oleuropein, inhibit the adhesion of monocyte cells to the blood vessel lining, a process that is involved in the development of atherosclerosis. In addition, when people with high cholesterol levels removed the saturated fat from their diets and replaced it with olive oil, their total cholesterol level dropped by on average of 13.4% and their LDL cholesterol level dropped by 18%, Valavanidis *et al.* (2004).

Sunflower oil is one of the highest linoleic acid contents of all oils; it is considered antioxidant as it includes phenolic acids, tocopherols and sterols. Studies of adults suggested that a balanced diet in which small quantities of saturated fats are replaced with sunflower oil has dectable cholesterol- reducing benefits.

As, the interaction between food additives and nutrients within the food matrix is one of future interest. The focus of nutrition research shifted towards specific food ingredients contributing to nutrition and health.

Therefore, the present work was undertaken to develop a novel soft cheese like product with multiple health benefits. Pursing this goal, low fat retentate was supplemented with natural antioxidants such as parsley and green pepper juices as carotenoids source mixed with little of cream or vegetable oils to get the highest carotenoids antioxidants activity because they are lipid soluble antioxidants. In addition, low fat retentate was supplemented with some herbs as natural phenolics source which have being the higher antioxidant activity such as rosemary and thyme.