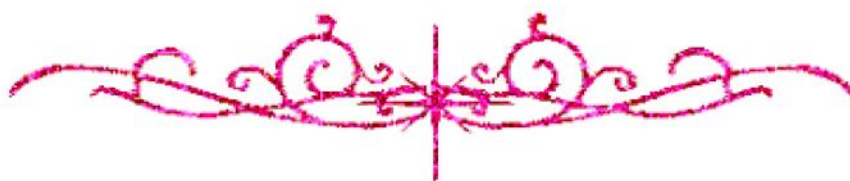


hossam maghraby



شبكة المعلومات الجامعية

بسم الله الرحمن الرحيم



hossam maghraby



شبكة المعلومات الجامعية



شبكة المعلومات الجامعية التوثيق الالكتروني والميكروفيلم



hossam maghraby



شبكة المعلومات الجامعية

جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات



يجب أن

تحفظ هذه الأقراص المدمجة بعيدا عن الغبار



hossam maghraby



شبكة المعلومات الجامعية



بعض الوثائق الأصلية تالفة



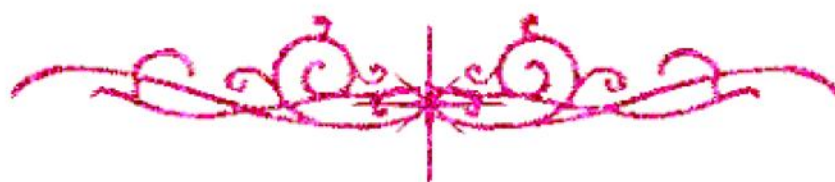
hossam maghraby



شبكة المعلومات الجامعية



**بالرسالة صفحات
لم ترد بالأصل**



بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

TECHNOLOGICAL STUDIES ON SMOKED CHEESE

By

Kholoud Ibrahim Blassy

B.Sc. Suez Canal University, (1985)

M.Sc. Suez Canal University, (1991)

Dissertation

B17721

**Submitted in Partial Fulfilment of the Requirements
For the Degree of Doctor of Philosophy in
Agriculture Sciences (Dairying)**

Supervised by

Prof. Doctor

Abd El-Rahman A. Mohamed

**Prof. of Dairy Science,
Faculty of Agriculture
Suez Canal University**

A. A. Mohamed

Prof. Doctor

Ekram Hassan El-Bagoury

**Prof. of Dairy Science,
Faculty of Agriculture
Suez Canal University**

Dr. E. Bagoury

Prof. Doctor

Amin Gouda Mohamed

**Prof. of Dairy Science
Faculty of Agriculture
Suez Canal University**

A. Gouda

To

**Department of Dairy Science
Faculty of Agriculture
Suez Canal University**

Gori's M. Ali



1999

APPROVAL SHEET

Name of Candidate: Khoulod Ibrahim Mohammed Blassy

Title of Thesis: Technological Studies on Smoke cheese

Thesis

Submitted for the Degree of Doctor of Philosophy

In

Agricultural Sciences

(Dairy Sciences)

Faculty of Agriculture – Suez Canal University

Approved by:

Prof. Dr. A. A. Mohamed

Prof. Dr. E. Bagoury

Prof. Dr. A. E. A. Haggan

Prof. Dr. H. A. A. El Gazar

(Committee in charge)

Date: 9/1/ 1999

CONTENTS

	Page No.
INTRODUCTION	1
REVIEW OF LITERATURE	4
A. Smoking	11
B. Manufacture of Mozzarella cheese	13
1. Use of different starter cultures for manufacture of Mozzarella cheese	16
2. Use of different types of milk clotting enzymes for manufacture of Mozzarella cheese	20
3. Use of ultrafiltration for manufacture of Mozzarella cheese	25
4. Rheological properties of Mozzarella cheese	
MATERIALS AND METHODS	30
A. Materials	30
1. Source of milk	30
2. Rennet	30
3. Coating materials	30
4. Smoking materials	31
5. Starters	31
6. Salt	31
B. Methods	31
1. Manufacture of traditional Mozzarella cheese	32
2. Mozzarella cheese making from UF retentates	33
3. Sampling	34
4. Chemical analysis	36
5. Rheological test	
RESULTS AND DISCUSSION	
PART I:	
Effect of using different methods of smoking on some chemical and rehological properties of high and low moisture Mozzarella cheeses during storage at different temperatures	38
Experimental	40
Section A: Effect of using different smoking methods on some chemical and rheological properties of high moisture Mozzarella cheese	40
Results and Discussion	40
1. Chemical composition	58
2. Rheological properties	

	Page No.
Section B:	
Effect of using different smoking methods on some chemical and rheological properties of low moisture Mozzarella cheese	
Results and Discussion	68
1. Chemical composition	68
2. Rheological properties	86
PART II	
Some Technological studies on mozzarella cheese	
Experimental	96
Section A: Effect of using different milk clotting enzymes on some chemical and rheological properties of low moisture mozzarella cheese	
Results and Discussion	
1. Chemical composition	97
2. Rheological properties	108
Section B: Effect of using different starter cultures on some chemical and rheological properties of low moisture Mozzarella cheese	
Experimental	118
Results and Discussion	119
1. Chemical composition	119
2. Rheological properties	131
Section C: Effect of using different volume concentration ratio (VCR) retentate on some chemical and rheological properties of low moisture mozzarella cheese	
Experimental	141
Results and Discussion	143
1. Chemical composition	143
2. Rheological properties	154
	163
SUMMARY	167
REFERENCES	
ARABIC SUMMARY	

ACKNOWLEDGMENT

The author gratefully presents her sincere and deep appreciation to the supervision committee, Prof. Dr. Abdel – Rahman Abedel Fattah Mohamed; Prof. Dr. Amin Gouda; and Prof. Dr. Ekram El-Bagoury, Dairy Sci. Department, Faculty of Agriculture, Suez Canal University. The author owes all of them a great deal of thank and gratitude for their helpful support in suggesting the problem, supervising and guiding right through this course of investigation as well as writing the manuscript. The author also wishes to express her deep thank and gratitude to all staff members and colleagues of the Dairy Dept., Suez Canal University.

Appreciation should be also extended to staff of Domty Dairy Plant for kind help and assistance.

INTRODUCTION

INTRODUCTION

Smoking of foods is one of the oldest methods of preservation. Today, foods are smoked for sensory quality rather than for traditional preservation effect. It has been traditional to smoke certain varieties of cheese. According to market requirements not all the cheese of particular variety may be smoked. The traditional method of smoking ; dry smoke, is done by hanging the cheese in a smoke charged atmosphere, but without the necessity for high temperature. So, hard woods are employed to provide the smoke. The other method is to employ liquid condensed smoke which may be added into the milk or sprayed on the curds before pressing or after moulding. It may be added like spices along with the salt, or added by enclosing the cheese in a permeable membrane and immersing the cheese in a solution of smoke liquor.

Smoke has a preservation effect as well as imparting a distinctive flavour to the cheese. So the smoking process imparts a characteristics color, flavour, odor and texture to food product. Surface color is one of the major attributes affecting the consumer acceptance of smoked cheese. Therefore exposing the cheese to smoke until the desired accumulation of smoke attained on the surface, after proper smoking, it has a golden-dark (range from golden yellow to dark brown), tanned surface appearance and a pleasing odor.

Traditional smoking brings fat to the surface of the cheese, evaporating moisture and incorporates smoke vapors containing phenolic substances, which aid in giving the preservative effect as well as imparting a savoury flavour to the cheese. The fat on the surface is also a deterrent to mould growth if the cheese is kept dry.

Smoking produces a variety of compounds, aldehydes, phenols, and acids. These compounds are mold inhibitors to maintain a high quality in smoked cheese for long periods.

Two main categories of Mozzarella cheese are most popular, according to US Federal Standards, it would be as follows :

	Moisture	F/DM%
Mozzarella (high moisture)	> 52-<60	> 45
Mozzarella (low moisture)	> 45-<52	> 45

Texture plays an important role in the quality of cheese, but the textured measurements of cheese are complicated and confusing.

Rheological characteristics of cheeses in general and Mozzarella cheese in particular are important as a means of determining body and texture for quality and identity as well as a means of studying its structure as a function of composition, processing techniques, and storage conditions. Textural characteristics are namely firmness, hardness, cohesiveness, adhesiveness, elasticity, gumminess chewiness, springiness fibrousness and fibrousness. Stretchability, meltability and oiling-off properties are essentially to measure for smoked Mozzarella cheese.

Rheological properties, specially, melting and stretchability of Mozzarella cheese are a determined factors for its quality. Any factor which affecting the rheological properties i.e., type of starter culture, type of rennet are expected to affect the Mozzarella cheese characteristic.

Ultrafiltrated cheese milk is well established as a profitable method of making a limited number of cheese varieties. However, the balance between advantages and disadvantages of making UF cheese needs to be evaluated in each case. The commercial production of Mozzarella cheese via a UF process has recently been undertaken, the product has been claimed to be physically and chemically the same as Mozzarella made by conventional methods (Lander, 1984). The common advantages are the increase of cheese yield, saving in time, equipment, space and labor without detrimental effects on cheese color, meltability and stretchability.

This study aims to investigate the effect of type of smoking i.e., dry and liquid smoke on the properties of low and high moisture Mozzarella cheese. Also, some factors affecting the quality of low moisture Mozzarella cheese i.e., type of rennet, type of starter culture and UF cheese milk concentration were studied. The resultant Mozzarella cheeses were stored at different temperatures and analysed for chemical and rheological properties.