

A STUDY ON THE RIPENING
OF RAS CHEESE MADE BY ULTRAFILTRATION

BY
MOHAMED MORSY ALY EL-SHIEKH

A thesis submitted in partial fulfillment
of
the requirements for the degree of
MASTER OF SCIENCE

in
Agriculture
(Dairy Science and Technology)

Food Science Department
Faculty of Agriculture
Ain Shams University

1989

37-3
M.M



29775



9

117

Approval Sheet
A STUDY ON THE RIPENING
OF RAS CHEESE MADE BY ULTRAFILTRATION

BY
MOHAMED MORSY ALY EL-SHIEKH
B.Sc. Agriculture, AL-Azhar Univ..1980

This thesis for M.Sc. degree has been
approved by :

Prof.Dr. G.A.Tawab G. A. Tawab
Prof. of Dairying .AL-Azhar Univ.
Prof.Dr. N.I.Saultan N. I. Saultan
Prof. of Dairying .Ain Shams Univ.
Prof.Dr. G.A.MAHRAN G. A. MAHRAN
Prof. of Dairying .Ain Shams Univ.

Date of examination : ..29.12.1989.....



3

A STUDY ON THE RIPENING
OF RAS CHEESE MADE BY ULTRAFILTRATION

BY

MOHAMED MORSY ALY EL-SHIEKH
B.Sc. Agriculture, Al-Azhar Univ., 1980

Under the Supervision of:

Prof. Dr. G. A. MAHRAN
Prof. of Dairying, Ain Shams Univ.

Prof. Dr. S. EL-SHIBINY
Prof. of Dairying, National Research Centre.

Dr. H. F. HAGGAG
Associate Prof. of Dairying, Ain Shams Univ.

ABSTRACT

The manufacture of Ras cheese from milk concentrated by ultrafiltration has not been studied thoroughly before and different manufacturing steps needs modification in order to obtain cheese with good quality. One of major difficult in making UF hard cheese were slow ripening than the traditional cheese. Therefore, the need for the acceleration of the ripening of UF Ras cheese was felt necessary. The obtained results have been presented and discussed in two parts as follows:

Part 1: Ample conditions for making Ras cheese by ultrafiltration.

In this part cow's milk was ultrafiltered to oncentration factor 2,3,4 and 5 respectively. Retentate of five fold

concentrate was mixed with equal amount of deionized water and ultrafiltration again . Also milk was acidified to pH 6.3 , ultrafiltered and diafiltered to concentration factor 5 .

The most important results showed that :

Ras cheese from two fold concentrated milk had a close composition and quality (flavour , body& texture) to traditional one .

Part 2: Accelerated ripening of UF Ras cheese .

In this part of study of different starters were used.

The most important results showed that :

Traditional and UF Ras cheese were ranked almost the same scores all through ripening period by using 1% mesophilic + 1% thermophilic starter .

ACKNOWLEDGEMENT

The auther would like to express his deepest gratitude and sincere appreciation to prof.Dr. G.A.Mahran, Food Sci. Dept.,Fac. of Agric., Ain Shams Univ., Prof. Dr. Safinaz El-Shibiny head of Food Tech.& Dairy Dept. National Research Center (NRC) and Dr.H.F.Haggag. Associate PROF.at the first Dept. for their supervision guidance and encouragement they kindly offered throughout the course of this work.

Iam very much indebtill to Dr. M.B.Mahfouz,Associate prof.at the second Dept. NRC, for every possible help be sincerely offered.

Gratiful acknowledgement should be extended to prof.DR. J.L.Maubois and to the staff of the Dairy Research Laboratory, National Institute of Agronomic Researches (INRA) in Rennes - France for their cooperation during carring out part of the expermental work.

C O N T E N T S

	Page
INTRODUCTION	1
REVIEW OF LITERATURE	4
Cheese manufacture by ultrafiltration	4
I. Hard cheese	4
A- Cheddar cheese	4
B- Ras cheese	9
II. Semi hard cheese	9
A- Mozzarella cheese	9
B- Gouda cheese	13
C- Edam cheese	14
D- Blue cheese	15
E- St.paulin cheese	17
Acceleration of cheese ripening	18
MATERIALS AND METHODS	23
Materials	23
Cheese making	26
Methods of Analysis	27
Moisture	27
Fat	27
Titratable acidity	27
pH value	27
Total nitrogen	28

	page
Soluble nitrogen	28
Total volatile free fatty acids	29
Calcium content	29
Salt content	31
Testing of cheese ripening	32
Lactose content	33
Soluble tyrosine and tryptophan contents	35
Organoleptic scoring of cheese	36
 EXPERIMENTAL	
Part I : Ample conditions for making Ras cheese by ultrafiltration	37
Part II: Accelerated ripening of Ras cheese	38
 RESULTS	
Part I	40
Part II	108
 GENERAL DISCUSSION	
Part I	148
Part II	160
 SUMMARY AND CONCLUSION	
Part I	164
Part II	168
REFERENCES	172
ARABIC SUMMARY	-

(1)

LIST OF TABLES

Table		Page
1	The total solids content (%) of milk, retentate, permeate and whey from Ras cheese manufacture	43
2	The fat content (%) of milk, retentate and whey from Ras cheese manufacture	46
3	The T.N content (%) of milk, retentate, permeate and whey from Ras cheese manufacture	48
4	The lactose content (%) of milk, retentate, permeate and whey from Ras cheese manufacture	52
5	The calcium content (mg/100 ml) of milk, retentate permeate and whey from Ras cheese manufacture	54
6	The acidity (calculated as % lactic acid) of milk, retentate, permeate and whey from Ras cheese manufacture	57
7	The pH value of milk, retentate, permeate and whey from Ras cheese manufacture	60
8	Changes in the moisture content (%) of traditional and UF Ras cheese during ripening	62
9	Analysis of variance of the moisture content of Ras cheese	64

Table		Page
10	Changes in the fat content (%) of traditional and UF Ras cheese during ripening	66
11	Analysis of variance of the fat content of Ras cheese	67
12	Analysis of variance of the fat/dry matter ratio of Ras cheese	67
13	Changes in the lactose content (%) of traditional and UF Ras cheese during ripening	69
14	Changes in the T.N content (%) of traditional and UF Ras cheese during ripening	71
15	Analysis of variance of the T.N content of Ras cheese	73
16	Changes in the S.N content (%) of traditional and UF Ras cheese during ripening	74
17	Analysis of variance of the S.N content of Ras cheese	76
18	Changes in the S.N/T.N ratio of traditional and UF Ras cheese during ripening	77
19	Analysis of variance of S.N/T.N ratio of Ras cheese	78

Table		Page
20	Changes in the calcium content (mg/100 g) of traditional and UF Ras cheese during ripening	80
21	Analysis of variance of calcium content of Ras cheese	82
22	Changes in the sodium chloride content (%) of traditional and UF Ras cheese during ripening	83
23	Analysis of variance of NaCl content of Ras cheese	84
24	Changes in the total volatile free fatty acids (ml 0.1 N NaOH/100 g.) of traditional and UF Ras cheese during ripening	86
25	Analysis of variance of TVFFA content of Ras cheese	88
26	Changes in the pH value of traditional and UF Ras cheese during ripening	89
27	Analysis of variance of pH value of Ras cheese	90
28	Changes in soluble tyrosine content (mg/100 g.) of traditional and UF Ras cheese during ripening	91

Table		Page
29	Analysis of variance of soluble tyrosine content of Ras cheese	93
30	Changes in soluble tryptophan content (mg/100 g.) of traditional and UF Ras cheese during ripening	94
31	Analysis of variance of soluble tryptophan content of Ras cheese	95
32	Changes in Formal Ripening Indices of traditional and UF Ras cheese during ripening	97
33	Analysis of variance of FRI of Ras cheese	99
34	Changes in Shilovich Ripening Indices of traditional and UF Ras cheese during ripening	100
35	Analysis of variance of SRI of Ras cheese	101
36	The score for flavour of traditional and UF Ras cheese	102
37	The score for body & texture of traditional and UF Ras cheeses	103
38	Effect of concentration factor on the yield of Ras cheese	106

Table		Page
39	Chemical composition of milk and retentate and permeate obtained from Ultrafiltration of milk	110
40	Total solids, fat, total N and lactose content of drained whey during Ras cheese manufacture from milk and different retentates	115
41	Acidity, pH value, calcium and sodium chloride content of drained whey during Ras cheese manufacture from milk and different retentates	116
42	Changes in the moisture content (%) of traditional and UF Ras cheese CF2 with different treatments	120
43	Analysis of variance of moisture content of traditional and UF Ras cheese CF2 with different treatments	122
44	Changes in the fat content (%) of traditional and UF Ras cheese CF2 with different treatments	123
45	Analysis of variance of fat content of traditional and UF Ras cheese with different treatments	124
46	Changes in the lactose content (%) of traditional and UF Ras cheese with different treatments	125

Table		Page
47	Analysis of variance of lactose content of traditional and UF Ras cheese CF2 with different treatments	127
48	Changes in the T.N content (%) of traditional and UF Ras cheese CF2 with different treatments	128
49	Analysis of variance of T.N content of traditional and UF Ras cheese CF2 with different treatments	130
50	Changes in the S.N content (%) of traditional and UF Ras cheese CF2 with different treatments	132
51	Analysis of variance of S.N content of traditional and UF Ras cheese CF2 with different treatments	133
52	Changes in the S.N/T.N. ratio of traditional and UF Ras cheese CF2 with different treatments	134
53	Analysis of variance of S.N/T.N. ratio of traditional and UF Ras cheese with different treatments	135
54	Changes in pH value of traditional and UF Ras cheese CF2 with different treatments	136

Table		Page
55	Analysis of variance of pH value of traditional and UF Ras cheese CF2 with different treatments	138
56	Changes in the salt content (%) of traditional and UF Ras cheese CF2 with different treatments	140
57	Analysis of variance of salt content of traditional and UF Ras cheese CF2 with different treatments	141
58	Changes in the calcium content (mg/100 g.) of traditional and UF Ras cheese CF2 with different treatments.	142
59	Analysis of variance of calcium content of traditional and UF Ras cheese CF2 with different treatments	143
60	Score points for flavour of traditional and UF Ras cheese from different treatments	144
61	Score points for body & texture of traditional and UF Ras cheese from different treatments	146