



شبكة المعلومات الجامعية

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ





شبكة المعلومات الجامعية



شبكة المعلومات الجامعية

التوثيق الالكتروني والميكرو فيلم

جامعة عين شمس

التوثيق الالكتروني والميكروفيلم

قسم

نقسم بـلله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأفلام قد اعدت دون أية تغيرات



يجب أن

تحفظ هذه الأفلام بعيداً عن الغبار

في درجة حرارة من 15 – 20 مئوية ورطوبة نسبية من 20-40 %

To be kept away from dust in dry cool place of
15 – 25c and relative humidity 20-40 %



شبكة المعلومات الجامعية



بعض الوثائق الأصلية تالفة



شبكة المعلومات الجامعية



بالرسالة صفحات

لم ترد بالأصل

**INVESTIGATION OF THE EFFECT OF
VARIOUS GRAIN MEALS ON DOUGH
AND BREAD QUALITY**

B1.824

A Thesis

Presented to the Graduate School
Faculty of Agriculture, Kafr El-Sheikh, Tanta University
in Partial Fulfillment of the Requirements for the
Degree of

DOCTOR OF PHILOSOPHY

in

FOOD TECHNOLOGY

BY

ADEL MOKHTAR ASFOUR

1998

**INVESTIGATION OF THE EFFECT OF VARIOUS GRAIN
MEALS ON DOUGH AND BREAD QUALITY**

Presented By
ADEL MOKHTAR ASFOUR
For the Degree of
DOCTOR OF PHILOSOPHY
in
FOOD TECHNOLOGY

Examiners' Committee

Approved

Prof. Dr. Abd El-Rahman M. Khalaf Allah

*Professor of Food Science and Technology
Faculty of Agriculture
Cairo University*

Khalaf Allah A. M.

Prof. Dr. Kamal A. Amaar

*Professor of Food Science and Technology
Faculty of Agriculture, Kafr El-Sheikh
Tanta University*

K. A. Amaar

Prof. Dr. Kamal Metwally El-Nemr

*Professor of Food Science and Technology
Faculty of Agriculture, Kafr El-Sheikh
Tanta University*

K. El-Nemr

Prof. Dr. Abd El-Rahman M. Harras

*Professor of Food Science and Technology
Faculty of Agriculture, Kafr El-Sheikh
Tanta University*

Harras

Date : / / 1998

Advisors' Committee :

Prof. Dr. Abd El-Salam Fahmy

*Professor of Food Science and Technology
Faculty of Agriculture, - Kafr El-Sheikh
Tanta University*

Prof. Dr. Kamal Amine Ammar

*Professor of Food Science and Technology
Faculty of Agriculture, - Kafr El-Sheikh
Tanta University*

Prof. Dr. Kamal Metwally El-Nemr

*Professor of Food Science and Technology
Faculty of Agriculture, - Kafr El-Sheikh
Tanta University*

Dr. Abd El-Baset Abd El-Aziz Salama

*Associate Professor of Food Science and Technology
Faculty of Agriculture, - Kafr El-Sheikh
Tanta University*

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

وَقُلْ رَبِّ زِدْنِي عِلْمًا

صِرَاحُ اللَّهِ وَالْعَظِيمِ

Acknowledgements

I would like to express my gratitude to late Dr. Abd El-Palam Fahmy, Professor of Food Science and Technology, University of Tanta, for preparing the manuscript and supervising this research for one year.

I like to express my gratitude to Dr. Kamel Amine Ammar, Professor of Food Science and Technology, Tanta University, for his incessant supervision for my research and for his valuable suggestions and guidance during the progress of the whole work.

I wish also to express my great appreciation to Dr. Kamel El-Nemr, Professor of Food Science and Technology, Tanta University, for his guidance, encouragement and continuous supervision throughout the work and the writing of the thesis.

My gratitude also goes to Dr. Abd El-Baset Abd El-Aziz Salama, Lecturer of Food Science and Technology, Tanta University, for his valuable instruction and help during the work.

My deep thanks and gratitude goes to Dr. Abd El-Fatah Mansour, Professor of Pomology, Mansoura University, for his help and valuable advice.

Deep gratitude and sincere thanks are due to Dr. Hamida Mousa, Lecturer of Food Science and Technology, Alexandria University for her help and effort throughout this study.

My gratitude and deep thanks are due to the members of Food Science and Technology Department, for their encouragement during the work.

I am deeply grateful and my deep thanks are due to Engineer Kamal Ghoniem, Chairmann of Holding Company of Rice and Mills, and Accountant Hussein Shahin, Chairman of Alexandria Flour Mills and Bakeries Co. for their encouragement and help.

My gratitude is also due to Engineer Afifi Fiam, Headmaster of Alexandria Flour Mills and Bakeries Co., and all other friends in Alexandria Flour Mills and Bakeries Co. for their help.

Contents

	Page
1. INTRODUCTION	1
2. REVIEW OF LITERATURE	12
2.1. Flour and bread characteristic	12
2.2. The chemical composition of flours	13
2.2.1. Wheat flour	13
2.2.2. Triticale flour	17
2.2.1.1. Milling properties of triticale	24
2.2.3. Maize flour	27
2.2.4. Soy meal	30
2.3. Biological value	32
2.3.1. Wheat protein	32
2.3.2. Triticale protein	35
2.3.3. Maize protein	38
2.3.4. Soy meal	42
2.3.5. Protein efficiency ratio (PER)	43
2.3.5.1. In vitro digestibility	44
2.4. Baking quality and properties of bread made from supplemented wheat flour	45
2.4.1. Triticale flour	45
2.4.2. Maize flour	49
2.4.3. Soy meal	50

	Page
2.5. The effect of substitute flours on the rheological and physicochemical properties	52
2.5.1. Farinograph	52
2.5.2. Amylase activity measurements	55
2.5.2.1. By amylograph	55
2.5.2.2. By falling number	57
2.6. Role of salt in bread making	58
2.7. Role of yeast in bread making	59
2.8. Role of mixing time on dough and bread	61
2.9. Effect of fermentation time on dough and bread	63
2.10. Effect of acidity and pH on bread quality	65
2.11. Objective assessment of the texture	66
2.11.1. Struct-o-graph measurements	68
3. MATERIALS AND METHODS	69
3.1. Materials	69
3.1.1. Wheat flour	69
3.1.2. Substituting flours	69
3.1.2.1. Triticale flour	69
3.1.2.2. Maize flour	70
3.1.2.3. Defatted soy meal	70
3.1.3. The ingredients used in the baking formula	70
3.1.3.1. Yeast	70
3.1.3.2. Salt	70
3.1.3.3. Acetic acid	70

	Page
3.2. Methods	71
3.2.1. Physical properties	71
3.2.1.1. Properties of triticale grains	71
3.2.1.1.1. Cleaning test	71
3.2.1.1.2. Test weight	71
3.2.1.1.3. Thousand kernel weight	71
3.2.2. Physicochemical tests	72
3.2.2.1. Falling number	72
3.2.2.2. Amylograph test	72
3.2.2.3. Pelshenke test	73
3.2.3. Chemical composition of flours	74
3.2.3.1. Mineral determinations	74
3.2.3.2. Amino acid composition	74
3.2.4. Nutritional and biological value of protein	75
3.2.5. Protein digestibility	76
3.2.6. Rheological properties	77
3.2.6.1. Farinograph test	77
3.2.7. Technological methods	78
3.2.7.1. Laboratory preparation of bread	78
3.2.7.1.1. Pan bread making	78
3.2.7.1.2. Balady bread	78
3.2.7.2. Loaves properties	81
3.2.7.3. Sensoric evaluation of produced loaves	81

	Page
3.2.7.4. Effect of bread making conditions on the resulted loaves	82
3.2.7.4.1. Effect of mixing time	82
3.2.7.4.2. Effect of fermentation time	82
3.2.7.4.3. Effect of salt ratio	82
3.2.7.4.4. Effect of pH	83
3.2.8. Struct-o-graph measurments	83
3.2.9. Statistical analysis	85
4. RESULTS AND DISCUSSION	86
4.1. Commerical characteristics of tritcale varieties cultivated in egypt	86
4.2. Physical properties of wheat and tritcale flour	88
4.3. Physicochemical properties of wheat and tritcale flour	91
4.4. Chemical composition of wheat and, tritcale flour and their blends	94
4.5. Amino acid composition of wheat and tritcale flour	97
4.6. Biological value and protein efficiency ratio (C-PER) for wheat and tritcale flour	99
4.7. Protein digestibility of wheat, tritcale, and composite flours	101
4.8. Effect of adding tritcale flour on dough properties	101
4.9. Effect of adding maize flour on dough properties	105