

STUDY ON DIETARY FIBER OF SOME PLANT SOURCES

By

AFAF ABDEL MONEIM IBRAHIEM

B.Sc. Agric., (Food Science),
Faculty of Agriculture, Ain Shams University, 1976

A thesis submitted in partial fulfillment

of

the requirement for the degree of

MASTER OF SCIENCE

in

Agriculture

(Food Science & Technology)

Food Science Department
Faculty of Agriculture
Ain Shams University

1998

664.3
A-A

63871





APPROVAL SHEET

STUDY ON DIETARY FIBER OF SOME PLANT SOURCES

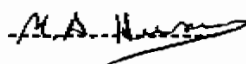
By

AFAF ABDEL MONEIM EBRAHIEM

B.Sc. Agric., (Food Science), Ain Shams University, 1976

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

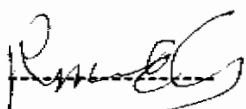
Prof. Dr. M.A. Hussein
Prof. of Food Industries
Fac. of Agric., Mansoura Univ.



Prof. Dr. R.M. Mahmoud
Prof. of Food Industries,
Fac. of Agric., Ain Shams Univ.



Dr. R.M. El Mahdy
Ass. Prof. of Food Industries,
Fac. of Agric., Ain Shams Univ.



Date of examination : 16/4/1998



STUDY ON DIETARY FIBER OF SOME PLANT SOURCES

By

AFAF ABDEL MONEIM EBRAHIEM

B.Sc. Agric., (Food Science),
Faculty of Agriculture, Ain Shams University, 1976

Under the Supervision of :

Dr. R.M. El Mahdy

Food Science Dept., Fac. of Agric.,
Ain Shams Univ.

Prof. Dr. F. Abd El Razik Ali

Head of Agri-industrialization Unit,
Desert Research Center

Dr. Y.A. Abd El-Daim

Food Science Dept., Fac. of Agric.,
Ain Shams Univ.



ACKNOWLEDGMENT

All praises are due to Almighty Allah; His Great Mercy has been guiding my efforts all along the course of my M.Sc. program. I have no doubt that Allah has blessed me with the help of my advisory committee, my professors and my fellow graduate students.

*I am greatly indebted to **Prof. Dr. R.M. El Mahdy** Prof. of Food Science Dept., Ain Shams University for his direct supervision, suggesting the subject, continuous help and his advice during the preparation of this manuscript.*

*My sincere appreciation and deep gratitude are extended to **Prof. Dr. F. Abd El Razik Ali** Head of Agri-industrialization Unit, Desert Research Center for his kind supervision, fruitful assistance and precious advice given throughout the study, preparation and completion of this thesis.*

*I am also grateful to **Dr. Y.A. Abd El-Daim** Assistant Professor at Food Science Dept., Ain Shams University for his supervision, valuable assistance and advice, and for his comments on the thesis manuscript.*

I should also thank the rest of the Department of Food Science, Ain Shams University for their contribution in my graduate education and enrichment.

Finally I want to express my acknowledgment to all staff members, the colleagues and workers in the Agri-industrialization Unit, Desert Research Center.

*Deepest gratitudes for **Dr. Alaa Eldin A. Hemid** (my husband), **Hadir and Sally** (my daughters) and **Mohamied** (my son) for their continuous help and encouragement through this work.*



ABSTRACT

Afaf Abdel Moneim Ibrahim, Study on Dietary Fiber of Some Plant Sources. Unpublished Master of Science, Department of Food Science & Technology, Ain Shams University, 1998.

Eight fiber sources considered as disposal portion were investigated and evaluated as supplemented ingredient in high fiber bread production. Bean husk considered the highest potential food fiber. It contained 84.4% total dietary fiber. Considering soluble dietary fiber percentage in total dietary fiber, Jew's mallow leaves is the ideal source followed by Jew's mallow stem's and Jew's mallow plants.

Sunflower heads and wheat bran were easy-to-mill while Jew's mallow stems was hard-to-mill.

The eight fiber sources demonstrated very wide differences in water holding capacity and oil holding capacity. This is according to chemical composition, physical structure and matrix structure formation during grinding. Volume expansion characteristic affect gastrointestinal function and is very important to be considered during baking process.

Incorporation of fiber sources with wheat flour dough increased water absorption reduced stability time, required longer mixing time, reduced the extensibility, increased the ratio value and reduced the total area of extensiograph.

Wheat bran and medium Jew's mallow stems are considered as excellent fiber sources due to the high over all acceptability values scored by panelists for bread baked with such sources.

Key words: Dietary fiber - Plant sources - Functional properties, Rheological properties - High fiber product.

CONTENTS

	Page
1. INTRODUCTION	1
2. REVIEW OF LITERATURE	4
2.1. Definition of dietary fiber	4
2.2. Chemical composition of dietary fiber	5
2.2.1. Hemicelluloses	6
2.2.2. Pectins	6
2.2.3. Gums	7
2.2.4. Cellulose	8
2.2.5. Lignins	8
2.3. Physicochemical and function properties of dietary fiber	9
2.3.1. Microbial degradation	9
2.3.2. Water-holding capacity	11
2.3.3. Ion exchange capacity	12
2.3.4. Binding of organic compounds and physiological effect	14
2.4. Sources of dietary fiber	20
2.5. Modification of dietary fiber	25
2.5.1. Grinding	25
2.5.2. Heating	26
2.6. High-fiber bakery products	30
2.6.1. Effect of fiber on dough properties	30
2.6.2. Effect of fiber on the quality of bakery products	33
2.6.3. Effect of fiber on product chemical composition	38

CONTENTS (Cont.)

	Page
3. MATERIALS AND METHODS	40
3.1. MATERIALS.....	40
3.1.1. Fiber sources	41
3.1.2. Wheat flour	41
3.2. METHODS	42
3.2.1. Physical methods	42
3.2.1.1. Particle size analysis	42
3.2.1.2. Density determinations and hydrated volume expansion	42
3.2.1.2.1. Direct determination of density	43
3.2.1.2.2. Hydrate density	43
3.2.1.2.3. The bulk density	43
3.2.1.2.4. Hydrate density expansion	43
3.2.1.3. Water-holding capacity	43
3.2.1.4. Oil-holding capacity.....	44
3.2.2. Rheological properties and bread making	44
3.2.2.1. Preparation of flour mixtures	44
3.2.2.2. Rheological tests	44
3.2.3. Baking procedure	44
3.2.4. Gross chemical analysis	45
3.2.4.1. Total dietary fiber	45
3.2.5. Taste panel evaluation	45
3.2.6. Statistical analysis	46
4. RESULTS AND DISCUSSION	47
4.1. Dietary fiber sources	47
4.1.1. Gross chemical composition	47
4.1.2. Total, soluble and insoluble dietary fiber contents	49
4.1.3. Particle size distribution	52

