

ABSTRACT

Mohamed Abd El-Mottale Atwa "Relation between specific technological treatments and dietary fibers of some cereals and legumes". Unpublished Doctor of Philosophy Dissertation, University of Ain Shams, Faculty of Agriculture, Dept. of Food Science, 2003.

It was aimed through the scope of the study to look forward about the effect of some technological treatments on the dietary fiber of some cereals and legumes and its products. The investigated treatments were cooking, drying, baking, and soaking. Soaking treatment was performed at 25°C for 9 hr in order to check out its effects on the total dietary fiber of faba bean and barley grains, while the cooking treatment was performed at 100°C for 20 min to see the effect on the total dietary fiber of whole lentil seeds and macaroni samples. Investigated corn and soybean samples were exposed to 230°C for 15 min with stirring as a drying treatment, finally, backing treatment was performed at 250°C for 30 min to study the effect of baking on the total dietary fiber of balady and french bread.

The major chemical constituents and fiber fractionations of some cereals and legumes, i.e. wheat, wheat products, corn, corn products, rice, oats, barley, soybean, faba bean, lentil, chickpea, beans, lupine, and peas were performed within the research at hand.

The effects of faba bean hulls, rice bran, and wheat bran as a sources of dietary fiber on weight reduction and blood analyses in rats at the end of the six-week experimental treatment period were tried within the scope of the study.

The effect of dietary fiber levels on plasma total cholesterol, high density lypoprotein (HDL), low density lypoprotein (LDL), very low density lypoprotein (VLDL),

weight gain, blood glucose levels and tryglycerides were studied.

Key words : Dietary fibers, cereals, legumes, soaking, cooking, drying, baking, cellulose, hemicellulose, lignin, soybean, corn, lentil, wheat bran, rice bran, faba bean, barley, chickpea, lupin, peas, rice, rats, glucose, weight reduction, triglycerides, cholesterol, bread, animal fat, diabetes, obesity, and heart diseases.

CONTENTS

	Page
1. INTRODUCTION	1
2. REVIEW OF LITERATURE	5
2.1. Cereals and legumes as a source of dietary fiber	5
2.2. Relation between technological treatments and dietary fiber of some cereals and legumes	15
2.3. Effect of dietary fiber on health benefits	26
2.3.1. Weight reduction	26
2.3.2. Control of diabetes	27
2.3.3. Cancer reduction	29
2.3.4. Effect of dietary fiber on serum cholesterol, cholesterol fractions, triglycerides and glucose in rats	31
3. MATERIALS AND METHODS	40
3.1. Materials	40
3.1.1. Food stuffs	40
3.1.2. Chemical reagent	40
3.2. Methods	41
3.2.1. Chemical methods	41
3.2.1.1. The major chemical constituents; moisture, fat, crude fiber, protein and ash contents	41
3.2.1.2. Total carbohydrates contents	41
3.2.1.3. Ash contents	42
3.2.1.4. Neutral detergent fiber	42
3.2.1.5. Neutral detergent detergent residue (NDR)	42
3.2.1.6. Total dietary fiber (TDF)	42
3.2.2. Technological methods	44

3.2.2.1. Soaking	44
3.2.2.2. Cooking	44
3.2.2.3. Drying	44
3.2.2.4. Baking	45
3.2.3. Biological experiment	45
3.2.3.1. Basal diet composition	45
3.2.3.2. Blood sampling	46
3.2.3.3. Determination of blood cholesterol and cholesterol fractions	46
3.2.3.4. Determination of blood glucose	48
4. RESULTS AND DISCUSSION	49
4.1. Major chemical constituents and fiber fractionation of some cereals and legumes ..	50
4.1.1. Major chemical constituents and fiber fractions of the investigated cereals and cereals products	50
4.1.1.1. Wheat grains	50
4.1.1.2. Whole wheat bread	50
4.1.1.3. Wheat bran	53
4.1.1.4. Macaroni	55
4.1.1.5. Wheat flour 72%	57
4.1.1.6. White wheat bread	59
4.1.1.7. Balady wheat bread	62
4.1.1.8. Rice sources, white and brown rice	62
4.1.1.9. Rice – by – products	64
4.1.1.10. Rice Husks	66
4.1.1.11. Yellow corn and corn flakes	69
4.1.1.12. Barley grains	73
4.1.1.13. Oat grains	75

4.1.2. Major chemical constituents and fiber fractionations of the investigated legumes	75
4.1.2.1. Soybean seeds	77
4.1.2.2. Lupin	79
4.1.2.3. White beans	81
4.1.2.4. Faba bean	83
4.1.2.4.1. Whole faba bean seeds	83
4.1.2.4.2. Dehulled faba bean	85
4.1.2.5. Chick pea	87
4.1.2.6. Cowpea seeds	90
4.1.2.7. Lentil seeds	92
4.1.2.7.1. Whole lentil seeds	92
4.1.2.7.2. Dehulled lentil seeds	94
4.1.2.8. Dried green peas	96
4.2. Correlation between specified technological treatments and the total dietary fibers of some cereals and legumes	98
4.2.1. Soaking treatment	98
4.2.2. Cooking treatment	101
4.2.3. Drying treatment	105
4.2.4. Baking treatment	105
4.3. Effect of dietary fibers on health benefits ...	113
4.3.1. Effect of faba bean hulls, rice bran as a sources of dietary fiber on weight reductions in rats	114
4.3.1.1. Effect of faba bean hulls on weight reduction in rats	114
4.3.1.2. Effect of rice bran on weight reduction in rats	117
4.3.1.3. Effect of wheat bran on weight reduction in rats	120

	Page
4.3.2. Influence of diets contained different levels of faba bean hulls, rice and wheat bran based on 10% animal fat on weight gain and final body weight	123
4.3.2.1. Influence as diets containing different levels of faba bean hulls based on 10% animal fat on final body weight	123
4.3.2.2. Influence of diets containing different levels of rice bran based on 10% animal fat on final body weight	126
4.3.2.3. Influence of diets containing different levels of wheat bran based on 10% animal fat on final body weight	131
4.3.3. Influence of faba bean hulls, rice bran and wheat bran as a sources of dietary fiber on triglycerides levels in rats fed 10% animal fat	131
4.3.4. Effect of tested dietary fibers for diet containing 10% animal fat and 1% cholesterol on low density lipoprotein cholesterol (LDLC) in rats	137
4.3.5. Effect of tested dietary fibers within diets containing 10% animal fat and 1% cholesterol on high density lipoprotein cholesterol (HDLC) in rats	142

4.3.6. Effect of tested dietary fibers within diets containing 10% animal fat and 1% cholesterol on plasma total cholesterol in rats	148
4.3.7. Effect of tested dietary fibers through diets containing 10% animal fat and 1% cholesterol on plasma (VLDL) ...	154
4.3.8. Effect of different sources of dietary fibers on blood glucose levels in rats	159
5. SUMMARY AND CONCLUSION	162
6. REFERENCES	178
ARABIC SUMMARY	

LIST OF ABBREVIATION

AACC	American Association of Cereal Chemists
ADF	Acid detergent fibers
AOAC	Association of official analytical chemists
AIN	American Institute of Nutrition
Aw	Water activity
C°	degree celsius (centigrade)
Cas/W	Casein with wheat
Cas/S	Casein with starch
Cp/W	Chick peas with wheat
CA	Citric Acid
Cn	Count Number
D DMH	day dimethyl hydrazine
DF	dietary fiber
DM	dry matter
FAO	Food and agriculture organization
FDA	Food and drug administration
Fig.	Figure
F	Fahrenheit
FCR	Fractional catabolic rates
GG	Guar gum
GLC	gas liquid chromatography
HPLC	high-performance liquid chromatography
HP	home-prepared
Hr	hour
HMC	hemicellulose
HTST	high temperature short-time
HI	Hydrolysis indices
HDL	high density lypoprotein
HF	high fiber
IDF	in soluble dietary fiber
LF	low fiber
LDL	low density lypoprotein protein

Mg	melligram
MIN	minutes
No.	number
NSP	non-starch polysaccharides
NDF	neutral dietary fiber
NRC	National Research Center
Nm	nanometer
NIDDM	non-insulin dependent diabetes mellitus
OB	oat bran
PSY	psyllium
PE	pectin
PDS	potentially oxidizable substances
PS	pectic substances
RSDR	relative standard deviation range
RS	resistant starch
RB	Rice bran
SDF	Soluble dietary fiber
SB	Sodium bicarbonate
S.D	Standard deviation
S.E	Standard error
SEC	Second
TDF	Total dietary fiber
TAG	Triacyl glycerol
TC	Total cholesterol
T	Absolute temperature
UPP	Uppsalla method
μ G	microgram (10^6 g)
μ L	microliter (10^6 L)
VLDL	very low density lypoprotein
WHO	World health organization