BIOCHEMICAL STUDIES ON SOME ANTIOXIDANT COMPOUNDS IN WHEAT AND BUCKWHEAT

By

MARWA MAMDOUH EL-SAYED ALI EL-GAZZAR
B.Sc. Agric. Sci. (Agricultural Biochemistry), Fac. Agric., Cairo Univ., Egypt, 1999.
M.Sc. Agric. Sci. (Agricultural Biochemistry), Fac. Agric., Cairo Univ., Egypt, 2005.

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APPROVAL SHEET

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Approval Committee

DR. KHALED MAAMOUN TAHA ELMELEGY……
Professor of Biochemistry, Fac. Agric., Menoufia University.

Dr. Fouad Abdel-Rehim Ahmed….....……
Professor of Biochemistry, Fac. Agric., Cairo University.

DR. MAGDY ABDEL-ALEEM MOHAMED SHALLAN……
Professor of Biochemistry, Fac. Agric., Cairo University.

DR. SAYED ABD EL-KADER SAYED FAYED…...……..
Associate Professor of Biochemistry, Fac. Agric., Cairo University.

Date: / /2014

SUPERVISION SHEET

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SUPERVISION COMMITTEE

Dr. Magdy Abdel-Aleem Mohamed Shallan
Professor of Biochemistry, Fac. Agric., Cairo University.

Dr. Sayed Abd El-Kader Sayed Fayed
Associate Professor of Biochemistry, Fac. Agric., Cairo University.

Dr. Hoda Gharib El-Amry
Head of Research, Food Technology Research Institute, Agriculture Research Center.

Name of Candidate: Marwa Mamdouh El-Sayed **Degree:** Ph.D.
Title of Thesis: Biochemical studies on some antioxidant compounds in wheat and buckwheat
Supervisors: Dr. Magdy Abdel-Aleem Mohamed Shallan, Dr. Sayed Abd El-Kader Sayed Fayed and Dr. Hoda Gharib El-Amry
Department: Agricultural Biochemistry **Approval: 23/9/2014**

ABSTRACT

This experiment was designed to investigate the effect of different types of bread, wheat bran extract and buckwheat hull extract on lipid profile and oxidative stress of normal and hypercholesterolemic rats. Buckwheat grains had high contents of protein, fat, crude fiber and ash compared to that found in wheat grains. The predominate fatty acid in buckwheat was linoleic acid 38.81% while palmitic acid was the major fatty acid found in wheat. The predominate amino acid in buckwheat glutamic acid 14.951 g/100g protein. Also, glutamic acid was the major amino acid (24.827 g/100g protein) in wheat followed by proline (9.165 g/100g protein). Balady bread which prepared by substitute 20% from wheat flour by buckwheat whole meal flour was acceptable. Buckwheat bread (100% buckwheat flour) contain the highest amount of protein 15.33% and crude fiber 8.20% while high fiber bread recorded the highest amount of fat 3.80% and ash 2.35% compared to other types of bread. Buckwheat hull contained the highest amounts from total phenol, total flavonoid and tannins (1250.06, 1168.09 and 85.05 mg/100g sample, respectively). It is also clear that, buckwheat bread (100% buckwheat flour contain the highest amounts from total phenol, total flavonoid and tannins compared to other types of bread. Ferulic acid was predominate (80.45%) in wheat bran but protocatechuic acid was the highest phenolic acid (66.31%) found in buckwheat hull. Regarding to flavonoids derivatives, rutin was the major flavonoid found in buckwheat hull (1255.7µg/g). On the other hand, apigenin was found to be the only flavonoid detected in wheat bran. The highest antioxidant activity effect was recorded by buckwheat hull followed by buckwheat grains compared with other samples. Between all types of bread (buckwheat bread 100% buckwheat flour, balady bread 20% buckwheat flour, high fiber bread and balady bread 100% wheat flour) and buckwheat hull extract and wheat bran extract buckwheat bread 100% buckwheat flour showed the highest reduction in the values of plasma total cholesterol (TC), triglyceride (TG), low density lipoprotein (LDL-C), aspartate aminotransferase (AST), alanine aminotransferase (ALT), glucose, urea and creatinine and significant increase in high density lipoprotein (HDL-C) in rats fed on hypercholesterolemic diet supplemented with buckwheat bread 100% buckwheat flour compared to hypercholesterolemic control. Regarding to oxidative stress rats fed on hypercholesterolemic diet supplemented with buckwheat bread 100% buckwheat flour showed the highest decrease in plasma malondialdehyde (MDA) level and the highest increase in total antioxidant capacity (TAC) and activities of glutathione reductase (GR) and glutathione-S-transferase (GST) compared with other hypercholesterolemic treated groups. Therfore buckwheat bread (100% buckwheat flour) and balady bread supplemented with 20% buckwheat whole flour have the ability to protecting experimental animals fed hypercholesterolemic diet of oxidative stress and hypercholesterolemia.

Key words: wheat, buckwheat, chemical composition, antioxidant compounds, hypercholesterolemia

DEDICATION

I dedicate this work to whom my heartfelt thanks; to my husband ***Ferhad*** *and my daughter* ***Salma*** *for their patience and help, as well as to my parents and brothers for all the support they lovely offered along the period of my post-graduation.*

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Special deep appreciation is given to my father, my mother, my husband, my brothers and sisters. Also I feel deeply grateful to my dear daughter ***Salma****.*

LIST OF ABBREVIATION

AOAC	Association of Official Agricultural Chemists
AACC	American Association for Cereal Chemistry
ABTS	2,2\-azino-bis-(3-ethylbenzotiazoline-6-sulphonic acid
ALT	Alanine aminotransferase
ARC	Agricultural Research Center
AST	Aspartate aminotransferase
BB 100% WF	Balady bread 100% wheat flour
BB 20% BWF	Balady bread 20% buckwheat whole meal flour
BC	Before century
BD	Basal diet
BHT	Butylated hydroxytoluene
BWB 100% BWF	Buckwheat bread 100% buckwheat flour
BWHE	Buckwheat hull extract
BWP	Buckwheat protein
BWPE	Buckwheat protein extract
Ca	Calcium
CDNB	1-chloro-2,4-dinitrobenzene
Cu	Copper
DPPH	2,2-diphenyl-1-picrylhydrazyl
Fe	Iron
FLS	Fluorescent substance
FTRI	Food Technology Research Institute
GAE	Gallic acid equivalent
GR	Glutathione reductase
GST	Glutathione-S-transferase
HC	Hypercholestercolesterolemic control
HDL-C	High density lipoprotein cholesterol
HF – HC	High fat – high cholesterol
HFB	High fiber bread
HPLC	High-performance liquid chromatography
IDF	Insoluble dietary fiber
K	Potassium
LDL-C	Low density lipoprotein cholesterol
LPO	Lipid peroxidation
LSD	Least squares difference
MDA	malondialdehyde
Mg	Magnesium
Mn	Manganese

Na	Sodium
NC	Normal control
PBF	Protein buckwheat flour
RDA	Recommended dietary allowance
RE	Rutin equivalent
ROS	reactive oxygen species
rpm	Rotations per minute
S.P.S.S.	Statistical package for social science
SDF	Soluble dietary fiber
SOD	Superoxide dismutase
TAC	Total antioxidant capacity
TBARS	Thiobarbituric acid reactive substances
TBBE	Tartary buckwheat bran extract
TC	Total cholesterol
TG	Triglyceride
WBE	Wheat bran extract
WWB	Whole wheat bread
WWF	Whole wheat flour
Zn	Zinc

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