

CHEMICAL AND BIOLOGICAL EVALUATION OF PALM OIL, PALM KERNEL OIL AND GHEE

By

MONA AHMED ABDEL HAMEED KATRY
B.Sc. Agric. Sci. (Food Science), Fac. Agric., Cairo Univ., 2007

THESIS

**Submitted in Partial Fulfillment of the
Requirements for the Degree of**

MASTER OF SCIENCE

In

**Agricultural Sciences
(Food Science)**

**Department of Food Science
Faculty of Agriculture
Cairo University
EGYPT**

2014

APPROVAL SHEET

**CHEMICAL AND BIOLOGICAL EVALUATION
OF PALM OIL, PALM KERNEL OIL AND GHEE**

**M.Sc. Thesis
In
Agric. Sci. (Food Science)**

By

MONA AHMED ABDEL HAMEED KATRY
B.Sc. Agric. Sci. (Food Science), Fac. Agric., Cairo Univ., 2007

APPROVAL COMMITTEE

Dr. MOHAMED KAMAL EL SAYED YOUSSEF.....
Professor of Food Science, Fac. Agric., Assiut University

Dr. SAAD AHMED SAAD HALLABO.....
Professor of Food Science, Fac. Agric., Cairo University

Dr. SAMY MOHAMED GALAL ABDEL AZIZ.....
Professor of Food Science, Fac. Agric., Cairo University

Dr. MOHAMED KHAIRY EL SAYED MORSI.....
Professor of Food Science, Fac. Agric., Cairo University

Date: / /

SUPERVISION SHEET

**CHEMICAL AND BIOLOGICAL EVALUATION
OF PALM OIL, PALM KERNEL OIL AND GHEE**

**M.Sc. Thesis
In
Agric. Sci. (Food Science)**

By

MONA AHMED ABDEL HAMEED KATRY
B.Sc. Agric. Sci. (Food Science), Fac. Agric., Cairo Univ., 2007

SUPERVISION COMMITTEE

Dr. MOHAMED KHAIRY EL-SAYED
Professor of Food Science, Fac. Agric., Cairo University

Dr. SAMY MOHAMED GALAL
Professor of Food Science, Fac. Agric., Cairo University

Dr. MOHAMED KAMAL ABD EL-RAHMAN
**Researcher Professor, National Nutrition Institute, Ministry of Health
and Population, Cairo, Egypt**

Name of Candidate: Mona Ahmed Abd El-Hameed Katry

Degree: M.Sc.

Title of Thesis: Chemical and Biological Evaluation of Palm oil, Palm Kernel Oil and Ghee

Supervisors: Dr. Mohamed Khairy El- Sayed

Dr. Samy Mohamed Galal

Dr. Mohamed Kamal Abdel El-Rahman

Department: Food Science

Branch:

Approval: / /

ABSTRACT

The influence of high fat diets (HFD) containing single fat; palm oil (PO), palm kernel oil (PKO), or ghee on feed efficiency, lipid profile, kidney function and histopathological status of liver and heart of rats were studied. Male adult albino rats were fed on basal diet contained 10% corn oil or HFD that contained either of PO, PKO, corn oil or ghee and 1% cholesterol for twelve weeks. Results showed that feeding rats on HFD containing PO or PKO significantly increased serum total cholesterol, triglycerides and VLDL-C levels compared with those of rats that were fed on basal diet or HFD containing corn oil or ghee. The highest LDL cholesterol level and the lowest total antioxidant capacity level were recorded in rats that were fed on PKO diet. Results indicated that PO and PKO caused significant increase in cholesterol level in liver cells compared to ghee and corn oil. The histopathological examination showed that feeding rats on HFD diet containing ghee for 12 weeks caused minimum damage to liver cells .Feeding rats on PKO diet caused undesirable histopathological changes in heart cells.

Keywords: Ghee, lipid profile, palm oil, palm kernel oil, cholesterol.

CONTENTS

	Page
INTRODUCTION	1
REVIEW OF LITERATURE	4
1. Effect of palm oil and palm kernel oil on lipid profile and lipoproteins	4
a. defenders.....	4
b. protesters.....	9
2. Effect of milk fat, or ghee on lipid profile and lipoproteins	15
MATERIALS AND METHODS	18
1. Materials.	18
a. Oils and fats.	18
b. Kits for biochemical analysis.....	18
c. Experimental animals	19
d. Experimental design.	19
e. Collection of blood samples.....	22
f. Preparation of tissue homogenate.....	22
2. Methods	22
a. Chemical properties and composition	22
b. Nutritional assessment.....	25
c. Biochemical analyses.....	25
d. Histopathological examination.....	41
e. Statistical analysis	42
RESULTS AND DISCUSSION.....	43
1. Chemical properties and composition.....	43
2. Effect of fat type in high fat diet on feed efficiency ratio	44
3. Effect of fat origin in the high fat diets on relative weight of liver, heart, kidney, spleen and testis of rats.	47
4. Effect of fat type in high fat diets on serum lipid profile and liver cholesterol	49
5. Effect of fat type in high fat diets on serum albumin, globulin, total protein, creatinine and urea.	56

6. Effect of type of fat of high fat diets on Serum aspartate aminotransferase (AST), alanine aminotransferase (ALT) and alkaline phosphatase (ALP)	62
7. Effect of type of fat of high fat diets on serum glucose and total antioxidant capacity	66
8. Histopathological studies	69
CONCLUSIONS	75
SUMMARY	76
REFERENCES	81
ARABIC SUMMARY	

LIST OF TABLES

No.	Title	Page
1.	Composition of basal diet.....	20
2.	Composition of salts mixture	21
3.	Composition of vitamins mixture.....	21
4.	Acid value and peroxide value of corn oil, palm oil, palm kernel oil and ghee	43
5.	Fatty acids composition of the investigated oils and fats.	44
6.	Feed efficiency ratio (FER), weight gain and feed intake of rats fed on basal diet or high fat diet for 12 weeks	46
7.	Relative weight of liver, heart, kidney, spleen and testis of rats fed on basal diet or high fat diets for 12 weeks (g/100g body wt)	48
8.	Serum lipid profile and liver cholesterol of rats fed on basal diet or high fat diet for 12 weeks.....	51
9.	Serum albumin, globulin, total protein and A/G ratio of rats fed on basal diet or high fat diet for 12 weeks.....	57
10.	Serum creatinine and urea of rats fed on basal diet or high fat diet for 12 weeks.....	60
11.	Serum aspartate aminotransferase (AST), alanine aminotransferase (ALT) and alkaline phosphatase (ALP) of rats fed on basal diet or high fat diet for 12 weeks	63
12.	Serum glucose and total antioxidant capacity of rats fed on basal diet or high fat diet for 12 weeks	67

LIST OF FIGURES

No.	Title	page
1.	Serum triglycerides of rats fed on basal diet or high fat diet for 12 weeks.....	52
2.	Serum total cholesterol of rats fed on basal diet or high fat diet for 12 weeks.....	52
3.	Serum high density lipoprotein cholesterol of rats fed on basal diet or high fat diet for 12 weeks.....	53
4.	Serum low density lipoprotein 1 cholesterol of rats fed on basal diet or high fat diet for 12 weeks.....	53
5.	Serum very low density lipoprotein 1 cholesterol of rats fed on basal diet or high fat diet for 12 weeks.....	54
6.	Cholesterol in liver of rats fed on basal diet or high fat diet for 12 weeks	54
7.	TC/HDL ratio of rats fed on basal diet or high fat diet for 12 weeks.....	55
8.	LDL/HDL ratio of rats fed on basal diet or high fat diet for 12 weeks.....	55
9.	Albumin of rats fed on basal diet or high fat diet for 12 weeks.....	58
10.	Globulin of rats fed on basal diet or high fat diet for 12 weeks.....	58
11.	Total protein of rats fed on basal diet or high fat diet for 12 weeks.....	59
12.	Albumin/Globulin ratio of rats fed on basal diet or high fat diet for 12 weeks.....	59
13.	Creatinine of rats fed on basal diet or high fat diet for 12 weeks.....	61
14.	Urea of rats fed on basal diet or high fat diet for 12 weeks.....	61
15.	Aspartate aminotransferase of rats fed on basal diet or high fat diet for 12 weeks.....	64