

BIOLOGICAL AND BIOCHEMICAL STUDIES ON SOME SYNTHETIC COLOURS

BY

Hanaa Mostafa Abd El-fatah

Home Economice

(Nutrition and Food Chemistry)

Ein shams Uinversity 1986

641.1
H. M



Thesis

In Partial Fulfilment of the Requirements

for the Degree of M.Sc

(Biochemistry and Nutrition)

51530

Department of Biochemistry and Nutrition

Women's College

Ein Shams University

1994

**Biological And Biochemical Studies
On Some Synthetic Colours**

Supervisors

1 - Prof . Dr . Mohamed Fahmy Saddik



**Prof. of Food hygiene
Nutrition Institute
Cairo**

641.1
H-A

2 - Prof . Dr . Tahany El-Sayed Kholief



**Prof. of Biochemistry
Biochemistry and Nutrition
Departement Women's collage
Ain Shams University**



The authoress passed the following courses :

Advanced Biochemistry

Advanced Nutrition

Applied Statistical

Microbiology

German Language

Approval Sheet

Biological And Biochemical Studies On Some Synthetic Colours

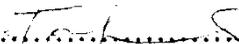
By

Hanaa Mostafa Abd-El fatah

Thesis submitted for the M.Sc. Degree in Biochemistry and Nutrition
has been approved by :

Prof. Dr. 

Prof. Dr. M. M. Abd El Fattah

Prof. Dr. 

Prof. Dr. Tahany I. Khalaf

committee in charge

Date : 12 / 12 / 1

ACKNOWLEDGEMENT

I wish to express my deepest thanks to Prof. Dr. Mohamed Fahmy Saddik, Professor of food hygiene, Nutrition Institute, Ministry of Health, not only for suggesting the work, but also for his advice and supervision.

The auther wishes to express her sincere gratitude to prof. Dr.Tahany El-sayed kholief, Professor of Biochemistry, Biochemistry and Nutrition Department, Women-s college, Ein Shams University for her continous encouragement and valuable criticism throughout the whole period of research.

Sincere thanks to Dr. Zakia Mostafa Abdel-kader, Assistant professor of Nutrition. I would like to offer my special thanks to Dr. Hanae Hussein, Assistant professor of Histology, Faculty of Medicine, Alexandria University for the histological interpretation in this study. Thanks also to Dr. Fathy Mohamed Hassan, Assistant professor of Nutrition.

Thanks to staff members of Biochemistry and Nutrition Department and Nutrition Institute, Ministry of Health for their support and co-operation.

Thanks to my family, my parents, my husband for their encouragement and help throughout the work.

CONTENTS

	Page
INTRODUCTION-----	1
Aim of the study-----	2
REVIEW OF LITERATURE-----	3
Natural colourig agents-----	3
Factors limiting the use of natural colourants-----	3
Effect of pH-----	4
Effect of oxygen-----	5
Effect of temperature-----	5
Effect of metals-----	5
Canthaxanthin-----	5
Beta-Carotene-----	8
Chemistry of Beta-Carotene-----	14
RDA and Recommendations-----	14
Chlorophyll-----	15
Synthetic colouring materials-----	16
Ponnceau 4R-----	21
Sunset yellow-----	24
Tartrazine-----	27
Green S-----	27
MATERIAL AND METHODS-----	31
1- Identification of Food Colourants-----	31
2- Food Colourant Samples-----	32
a- Natural Pigment-----	32
b- Synthetic Dyes-----	32

	Page
3- Diet Preparation	33
4- Animals and Experimental Design	35
5- Determination of Blood Glucose	36
6- Determination of Liver Glycogen	38
7- Determination of Total Lipids	41
8- Determination of Serum Cholesterol	42
9- Determination of Serum Phospholipids	44
10- Determination of Triacylglycerols	46
11- Determination of Serum Transaminases	48
12- Determination of Serum Lactate Dehydrogenase Activity	50
13- Determination of Serum Total Proteins	53
14- Determination of Serum Proteins Fractions	54
15- Histological Study	56
16- Statistical Analysis	57
RESULTS	59
Identification of food colourants	59
The effect of Canthaxanthin and Ponceau 4R	62
The effect of Beta-Carotene and Sunset yellow	74
The effect of Chlorophyll and Green S	89
DISCUSSION	105
Biological and Biochemical Studies	107
Histological Study	132
SUMMARY	134
REFERENCES	142
ARABIC SUMMARY	

LIST OF TABLES

	Page
Table (1-a) -----	60
Percentage of natural and synthetic (permitted and nonpermitted) colours in the collected samples	
Table (1-b)-----	60
Percentage of natural and synthetic (permitted and nonpermitted) identified colours	
Table (1-c)-----	61
Frequency of individual permitted synthetic : Red , Yellow and Green colours.	
Table (2)-----	63
The effect of Canthaxanthin and Ponceau 4R feeding on body weight , food consumption and food efficiency .	
Table (3)-----	65
The effect of Canthaxanthin and Ponceau 4R feeding on liver weight,liver weight /rat weight,serum glucose and liver glycogen.	
Table (4)-----	67
The effect of Canthaxanthin and Ponceau 4R feeding on total lipids,total cholesterol , phospholipids and triacylglycerols.	
Table (5)-----	70
The effect of Canthaxanthin and Ponceau 4R feeding on Aspartate transamiase (AST) , Alanine transaminase (ALT) and Lactate dehydrogenase (LDH) activities in serum.	

	Page
Table (6)-----	72
The effect of Canthaxanthin and Ponceau 4R feeding on serum total proteins and their electrophoretic fractions.	
Table (7)-----	77
The effect of β -Carotene and Sunset yellow FCF feeding on body weight gain , food consumption and food efficiency .	
Table (8)-----	80
The effect of Beta-Carotene and Sunset yellow FCF feeding on liver weight , liver weight/body weight , serum glucose and liver glycogen.	
Table (9)-----	82
The effect of β -Carotene and Sunset yellow FCF feeding on total lipids , total cholesterol , phospholipids and triacylglycerols.	
Table (10)-----	85
The effect of β -Carotene and Sunset yellow FCF feeding on Aspartate transamiase (AST) , Alanine transaminase (ALT) and Lactate dehydrogenase (LDH) activities in serum.	
Table (11)-----	87
The effect of Beta-Carotene and Sunset yellow FCF feeding on total proteins and their electrophoretic fractions.	
Table (12)-----	91
The effect of Chlorophyll and Green S feeding on body weight gain, food consumption and food efficiency.	

	Page
Table (13)-	93
The effect of Chlorophyll and Green S feeding on liver weight, liver weight / rat weight , serum glucose and liver glycogen.	
Table (14)—	96
The effect of Chlorophyll and Green S feeding on total lipids, total cholesterol , phospholipids and triacylglycerols.	
Table (15)—	98
The effect of Chlorophyll and Green S feeding on Aspartate transaminase (AST), Alanine transaminase (ALT) and Lactate dehydrogenase (LDH) activities in serum.	
Table (16)—	100
The effect of Chlorophyll and Green S feeding on serum total proteins and their electrophoretic fractions.	

LIST OF FIGURES

	Page
Fig (1)— — — — —	64
The effect of 200 mg (Canthaxanthin and Ponceau 4R) feeding on body weight , food consumption and food efficiency .	
Fig (2)— — — — —	64
The effect of 400 mg (Canthaxanthin and Ponceau 4R) feeding on body weight , food consumption and food efficiency .	
Fig (3)— — — — —	66
The effect of 200 mg (Canthaxanthin and Ponceau 4R) feeding on serum glucose and liver glycogen	
Fig (4)— — — — —	66
The effect of 400 mg (Canthaxanthin and Ponceau 4R) feeding on serum glucose and liver glycogen.	
Fig (5)— — — — —	68
The effect of 200 mg (Canthaxanthin and Ponceau 4R) feeding on total lipids,total cholesterol , phospholipids and triacylglycerols.	
Fig (6)— — — — —	68
The effect of 400 mg (Canthaxanthin and Ponceau 4R) feeding on total lipids,total cholesterol , phospholipids and triacylglycerols.	
Fig (7)— — — — —	71
The effect of 200 mg (Canthaxanthin and Ponceau 4R) feeding on Aspartate transamiase (AST) , Alanine transaminase (ALT) and Lactate dehydrogenase (LDH) activities in serum.	

	Page
Fig (8)-----	71
The effect of 400 mg (Canthaxanthin and Ponceau 4R) feeding on Aspartate transamiase (AST) , Alanine transaminase (ALT) and Lactate dehydrogenase (LDH) activities in serum.	
Fig (9)-----	73
The effect of 200 mg (Canthaxanthin and Ponceau 4R) feeding on serum total proteins,albumin and total globulins.	
Fig (10)-----	73
The effect of 400 mg (Canthaxanthin and Ponceau 4R) feeding on serum total proteins,albumin and total globulins.	
Fig (11)-----	75
Liver of normal control.	
Fig (12)-----	75
Liver of rat fed 200 mg Ponceau 4R (section 1) .	
Fig (13)-----	76
Liver of rat fed 200 mg Ponceau 4R (section 2) .	
Fig (14)-----	76
Liver of rat fed 400 mg Poceau 4R.	
Fig (15)-----	78
The effect of 200 mg (Beta-Carotene and Sunset yellow FCF) feeding on body weight gain , food consumption and food efficiency .	
Fig (16)-----	78
The effect of 400 mg (Beta-Carotene and Sunset yellow FCF) feeding on body weight gain , food consumption and food efficiency .	

	Page
Fig (17)— — — — —	81
The effect of 200 mg (Beta-Carotene and Sunset yellow FCF) feeding on serum glucose and liver glycogen.	
Fig (18)— — — — —	81
The effect of 400 mg (Beta-Carotene and Sunset yellow FCF) feeding on serum glucose and liver glycogen.	
Fig (19)— — — — —	83
The effect of 200 mg (β -Carotene and Sunset yellow FCF) feeding on total lipids , total cholesterol , phospholipids and triacylglycerols.	
Fig (20)— — — — —	83
The effect of 400 mg (β -Carotene and Sunset yellow FCF) feeding on total lipids , total cholesterol , phospholipids and triacylglycerols.	
Fig (21)— — — — —	86
The effect of 200 mg (β -Carotene and Sunset yellow FCF) feeding on Apartate transamiase (AST) , Alanine transaminase (ALT) and Lactate dehydrogenase (LDH) activities in serum.	
Fig (22)— — — — —	86
The effect of 400 mg (β -Carotene and Sunset yellow FCF) feeding on Apartate transamiase (AST) , Alanine transaminase (ALT) and Lactate dehydrogenase (LDH) activities in serum.	
Fig (23)— — — — —	88
The effect of 200 mg (Beta-Carotene and Sunset yellow FCF) feeding on serum total proteins , albumin and total globulins.	

Fig (24)— — — — —	88
The effect of 400 mg (Beta-Carotene and Sunset yellow FCF) feeding on serum total proteins , albumin and total globulins.	
Fig (25)— — — — —	90
Liver of rat fed 200 mg Sunset yellow FCF	
Fig (26)— — — — —	90
Liver of rat fed 400 mg Sunset yellow FCF	
Fig (27)— — — — —	92
The effect of Chlorophyll and Green S feeding on body weight gain, food consumption and food efficiency.	
Fig (28)— — — — —	94
The effect of Chlorophyll and Green S feeding on serum glucose and liver glycogen.	
Fig (29)— — — — —	97
The effect of Chlorophyll and Green S feeding on total lipids , total cholesterol , phospholipids and triacylglycerols.	
Fig (30)— — — — —	99
The effect of Chlorophyll and Green S feeding on Aspartate transaminase (AST), Alanine transaminase (ALT) and Lactate dehydrogenase (LDH) activities in serum.	
Fig (31)— — — — —	101
The effect of Chlorophyll and Green S feeding on serum total proteins , albumin and total globulins.	