شبكة المعلومات الجامعية

التوثيق الإلكتروني والميكروفيلم

بسم الله الرحمن الرحيم

HANAA ALY

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

HANAA ALY

شبكة المعلومات الجامعية

التوثيق الإلكتروني والميكروفيلم

جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات

يجب أن

تحفظ هذه الأقراص المدمجة بعيدا عن الغبار

HANAA ALY

Faculty of Specifice Education
Mass Communication Department

Effect of Date Palm Pollen (*Phoenix dactylifera)* on Blood Glucose and Lipids in Induced Diabetic Rats

Study for Obtaining Master Degree in Specific Education

Prepared by

Manal Milad Abdel-Shaheed

Teacher at Industrial Technical Institute in Shubra
Ministry of Higher Ed.

Supervision

Prof. Dr.
Eveleen Said Abdalla

Prof. of Nutrition, and Food Sciences
Home Economics Dept.
Ex. Vice Dean for Post- Graduate Studies & Researches and for Community Affairs & Environment
Faculty of Specific Ed.
Ain Shams University

Prof. Dr.
Ayman Fathy Khalil

Prof. of Nutrition, and Food Sciences
Home Economics Dept.
Faculty of Specific Ed.
Ain Shams University

Prof. Dr.
Eshak Mourad El-Hadidy

Prof. Dr. of Food Technology and Nutrition. National Expert in Food Safety.
Food Technology Research Institute. Agricultural Research Center.

2021

ACKNOWLEDGMENT

First of all, I would like to give my thanks to **God**, for his help completing this study. This thesis would not have been possible without the assistance from many people who gave me their support in different ways.

I would like to express my deep thanks and appreciation to ***Prof. Dr. Eveleen Said Abdalla,*** Prof. of Nutrition, Home Economics Dept. Ex. Vice Dean for Post- Graduate Studies & Researches and for Community Affairs & Environment Faculty of Specific Ed. Ain Shams University for her close supervision and her encouragement, guidance through the study, advise and help in providing all facilities during the working period and revision of the manuscript of this thesis. So, her continuous interest and encouragement were necessary to implement this investigation.

My gratitude is also, extended to ***Prof. Dr. Ayman Fathy Khalil,*** Prof. of Nutrition, and Food Science Home Economics Dept. Faculty of Specific Ed. Ain Shams University for his direct supervision, his endless help, constructive criticism, advice and guidance during the different phases of this investigation and revision of the manuscript of this thesis.

Great thanks for ***Prof. Dr. Eshak Mourad El-Hadidy***, Prof. Dr. of Food Technology and Nutrition. National Expert in Food Safety. Food Technology Research Institute. Agricultural Research Center for his supervision of this study. His advice, help, encouragement and sincere guidance throughout the practical work and his careful reviewing of the manuscript and valuable comments are greatly appreciated. Also, for providing facilities needed for completing this work which give the opportunity to finish this thesis. My deep thanks and gratitude are extended to him.

Also, my thanks to ***Prof. Dr. Efat Mahdi Syed Ahmed,*** Prof. Dr. of Food Technology and Nutrition. Head of the Horticultural Crops Technology Research Department and ***Prof. Dr. Walaa Ibrahim Mohamed Anees***, Prof. of Nutrition, and Food Science Home Economics Dept. Faculty of Specific Ed. Ain Shams University for they accept to discuss my thesis.

Dedication

I would like to dedicate this work to the soul of my mother and father for their lovely support throughout my life .They provided me with lots and lots of tender and sacrifices.

Great thanks from my heart also extend to my dear husband Maged and children: Martin and Marise for their great efforts with me throughout the period of study. They have had effective impact on overcoming the troubles and difficulties that I faced, may God give them all the best rewards.

LIST OF CONTENTS

Subjects	Page
1- INTRODUCTION.	1
2-REVIEW OF LITERATURE:	3
2.1. Diabetes Mellitus	3
2.1.1. Definition of Diabetes Mellitus and Types	3
2.1.2. Type 2 Diabetes Mellitus and Insulin Resistance	7
2.1.3. Symptoms of Diabetes Mellitus	7
2.1.4. Causes of Diabetes Mellitus	8
2.1.5. Complications of Diabetes Mellitus	9
2.1.6. Control of Diabetes Mellitus	11
2.1.7. Standards care of Nutritional Care for Diabetes	13
2.2. Plants and Herbs Reported with Antidiabetic Activity	15
2.2.1. Functional Foods	16
2.3. Date Palm Pollen, Description, Taxonomy	18
2.3.1. Chemical Composition of Date Palm Pollen	21
2.3.2. Vitamin and Mineral contents of Date Palm Pollen	22
2.3.3. Amino Acids and Fatty Acids content of Date Palm Pollen	23
2.3.4. Antioxidant contents and total phenolic compounds	24
2.3.5. Phytochemical in Date Palm Pollen	25
2.3.6. Health Benefits of Date Palm Pollen	27
3.MATERIALS AND METHODS:	32
3.1. Materials:	32
Plants (Date Palm Pollen)	32
Chemicals and Kits for chemical analysis	32
3.2 Methods:	32
Chemical Constituents of Date Palm Pollen	32
Minerals Content of Date Palm Pollen	32
Ethanol Extract preparation	33
Identification of Effective compounds in extraction (Date Palm Pollen)	34
Biological Experiment:	35
Basal Diet Contents	36
Experimental Animals	37
Experimental Design	38
Biochemical analysis	40
4. RESULTS AND DISCUSSION.	48
5. RECOMMENDATIONS.	77
6. ENGLISH SUMMARY.	78

7. REFERENCES. **8. ARABIC SUMMARY.** **9. ARABIC ABSTRACT.**	81

LIST OF TABLES

Tables	Subjects	Page
1	Standard diet compositions of experiment	36
2	Salt mixture composition	36
3	Vitamin mixture composition	37
4	Chemical constituents of Fresh Date Palm Pollen	49
5	Mineral contents of Fresh Date Palm Pollen	50
6	Antioxidant compounds on dry weight basis	51
7	Identification and Quantitation of Polyphenols Compounds in Ethanolic Extract of Date palm pollen	52
8	HPLC analysis of flavonoid compounds (mg/100g) in ethanolic extract of Date Palm Pollen	55
9	Effect of date palm pollen and its extracts at different ratios on Initial Weight, Final Weight, and Feed intake, Feed Efficiency ratio and body weight gain % for Diabetic rats	57
10	Effect of date palm pollen and its Ethanolic Extracts at different ratios on organs weight / body weight % of Diabetic rats	59
11	The Effect of Different Ratios of Date palm pollen and its Ethanolic Extracts on serum glucose of different diabetic groups	63
12	Effect of Different Ratios of Date palm pollen and its Ethanolic Extracts on Serum Lipids Profile of different diabetic groups	67
13	Effect of different ratio of Date Palm Pollen and its Ethanolic Extracts on Liver Function of Diabetic rats	71
14	Effect of different ratio of Date Palm Pollen and its Ethanolic Extracts on kidney Function of Diabetic rats	73

LIST OF FIGURES

Figure	Subjects	Page
1	Male Date palm pollen Photo	18
2	Male Date palm pollen Photo	18
3	Polyphenolic Compounds of Date Palm Pollen	53
4	Flavonoid Compounds of Date Palm Pollen	56
5	Effect of different ratios of Date palm pollen and its Ethanolic Extracts on Feed intake (FI) of different diabetic groups	58
6	Effect of different ratios of Date palm pollen and its Ethanolic Extracts on Body Weight Gain (BWG%) of different diabetic groups	58
7	Effect of different ratios of Date palm pollen and its Ethanolic Extracts on Feed efficiency ratio (FER) of different diabetic groups	58
8	Effect of different ratios of Date Palm Pollen and its Ethanolic Extracts on relative organs weight % of Liver for different diabetic groups	60
9	Effect of different ratios of Date Palm Pollen and its Ethanolic Extracts on relative organs weight % of Kidney for different diabetic groups	60
10	Effect of different ratios of Date Palm Pollen and its Ethanolic Extracts on relative organs weight % of Spleen for different diabetic groups	63
11	Effect of different ratios of Date Palm Pollen and its Ethanolic Extracts on relative organs weight % of Heart for different diabetic groups	61
12	Effect of different ratios of Date Palm Pollen and its Ethanolic Extracts on relative organs weight % of Pancreas for different diabetic groups	61
13	The Effect of Different Ratios of Date palm pollen and its Ethanolic Extracts on serum glucose of different diabetic groups	64

14	The Effect of Different Ratios of Date palm pollen and its Ethanolic Extracts on serum glucose of different diabetic groups (after 10 days) of supplemented with DPP	64
15	The Effect of Different Ratios of Date palm pollen and its Ethanolic Extracts on serum glucose of different diabetic groups (after 20 days) of supplemented with DPP	65
16	The Effect of Different Ratios of Date palm pollen and its Ethanolic Extracts on serum glucose of different diabetic groups (after 30 days) of supplemented with DPP	65
17	Effect of Different Ratios of Date Palm Pollen and its Ethanolic Extracts on Serum Cholesterol of different diabetic groups	68
18	Effect of Different Ratios of Date Palm Pollen and its Ethanolic Extracts on Serum Triglyceride of different diabetic groups	68
19	Effect of Different Ratios of Date Palm Pollen and its Ethanolic Extracts on Lipoprotein Fractions (HDL) of different diabetic groups	68
20	Effect of Different Ratios of Date Palm Pollen and its Ethanolic Extracts on Lipoprotein Fractions (LDL) of different diabetic groups	69
21	Effect of Different Ratios of Date Palm Pollen and its Ethanolic Extracts on Lipoprotein Fractions (VLDL) of different diabetic groups	69
22	Effect of Different Ratios of Date Palm Pollen and its Ethanolic Extracts on Liver Function (AST) of different diabetic groups	71
23	Effect of Different Ratios of Date Palm Pollen and its Ethanolic Extracts on Liver Function (ALT) of different diabetic groups	72
24	Effect of Different Ratios of Date Palm Pollen and its Ethanolic Extracts on kidney Function (Uric acid) of different diabetic groups	74
25	Effect of Different Ratios of Date Palm Pollen and its Extracts on Kidney Function (Creatinine) of different diabetic groups	74
26	Effect of Different Ratios of Date Palm Pollen and its Extracts on kidney Function (Urea) of different diabetic groups	75

LIST OF ABBREVIATIONS

ADA	**American Diabetic Association**
ALT	**Alanine Amino Transferase**
AST	**Aspartate Amino Transferase**
BUN	**Blood Urea Nitrogen**
BWG	**Body weight Gain**
DPP	**Date Palm Pollen**
DM	**Diabetes Mellitus**
FER	**Feed Efficiency Ratio**
FI	**Food Intake**
GDM	**Gestational Diabetes Mellitus**
GPD	**Glutamic Acid Decarboxylase**
GPT	**Glutamic Pyruvic Transaminase**
HDL - C	**High Density Lipoprotein - Cholesterol**
HPLC	**High Performance Liquid Chromatography**
IDDM	**Insulin Dependent Diabetes Mellitus**
IDF	**International Diabetes Federation**
LDL - C	**Low Density Lipoprotein - Cholesterol**
Mg / dl	**Milligram per Deci Liter**
MNT	**Medical Nutrition Therapy**
MUFA	**Mono-Unsaturated Fatty Acids**
NIDDM	**Non - Insulin Dependent Diabetes Mellitus**
PUFA	**Polyunsaturated Fatty Acids**
PP	**Palm Pollen**
ppm	**Part per million**
ROS	**Reactive Oxygen Species**
TG	**Triglycerides**
UN	**Urea Nitrogen**
UA	**Uric Acid**
VLDL-C	**Very Low Density Lipoprotein - Cholesterol**
Wt.	**Weight**

ABSTRACT

The present study aimed to: Studying the Effect of Date Palm Pollen (*Phoenix dactylifera* L.) on blood glucose and lipids in induced diabetic rats. Date Palm Pollen (DPP) was analyzed chemically. It was applied on 36 rats (180±10g). They were divided into 6 groups (each 6 rats): 1- Normal control group (-), Alloxan (150mg/Kg body weight) was used for 30 rats for inducing Diabetes Mellitus. 2- Diabetic control group (+). Diabetic groups (3, 4) were supplemented with (0.5%,1.0%) date palm pollen, respectively. Diabetic groups (5, 6) had (100, 200 Part per million) date palm pollen extracts, respectively. At the end of experiment (30 days) rats were fasted overnight, anesthetized and serum blood samples were analyzed for serum glucose, lipids profile and liver and kidney functions. Liver and kidney were removed for relative organ weight. Statistically analysis was made for results obtained. Results showed that Date palm pollen has high content of protein, calcium and iron (30.87 g/100g, 510.82 and 236.50 mg/100g), respectively. Also, serum glucose decreased significantly in diabetic groups (3, 4, 5 and 6, respectively) (179.47, 137.80, 156.77, 145.47 mg/100mL, respectively). Lipid profile, kidney and liver functions were improved significantly ($P<0.05$) in diabetic groups which had DPP or its extracts. It is concluded that supplementation with date palm pollen 1% and 200 ppm of its extract are more effective compared with controlling Diabetes Mellitus, also improved kidney and liver functions. Diabetics are advised to eat date palm pollen, which play an important role in diabetes mellitus management.

Keywords: Date palm pollen, Polyphenols, Flavonoids, Diabetes Mellitus, Serum glucose, Lipid profile

1- INTRODUCTION

Diabetes mellitus (DM) is considered a metabolic disorder which has a huge economic and physiological burden all over the world, and causes different acute and chronic complications ranged from frequent urination, increased hunger and thirst to serious problems such as diabetic ketoacidosis, cardiovascular disease, kidney disorders, foot ulcers, eye damages and finally death **(Ayatollahi *et al*., 2019).**

Diabetes mellitus is known as noncommunicable disease (NCD) which has emerged as one of the leading global health problems associated with insulin leading to either hyperglycemia. Type 2 diabetes mellitus is associated with a combination of resistance to insulin action and inadequate compensatory insulin secretory response **(American Diabetes Association, 2019).**

The global diabetes prevalence in 2019 is estimated to be 9.3% (463 million people), rising to 10.2% (578 million) by 2030 and 10.9% (700 million) by 2045. The prevalence is higher in urban (10.8%) than rural (7.2%) areas, and in high-income (10.4%) than low-income countries (4.0%). One in two (50.1%) people living with diabetes do not know that they have diabetes. The global prevalence of impaired glucose tolerance is estimated to be 7.5% (374 million) in 2019 and projected to reach 8.0% (454 million) by 2030 and 8.6% (548 million) by 2045. **(Saeed *et al*., 2019).**

Diabetes is a growing health problem in Egypt; Diabetics often have chronic health conditions. Egypt is the ninth country with the number of diabetics worldwide, where 8.9 million adults from 20 to 79 years in 2019 registered to have diabetes. Prevalence of diabetes in Egypt was 7.5 million in 2013 and expected to jump up to 13.1 million by 2035 (**Metwally and Aly, 2020).**

Much attention has been paid to health promotion related to photochemical activity, and the isolation of novel bioactive phytochemicals which derived from special medicinal plants in the past few years. Date palm (*Phoenix dactylifera* L.) is one of the most important fruit crops in the Middle East and North Africa that produce edible and delicious dates. Date palms are spread across Iraq, Iran, Saudi Arabia, Egypt, Tunisia, Algeria, Libya, United Arab Emirates (UAE), Bahrain, and Oman **(Alalwan *et al.*, 2020).**

Date palm pollen (DPP) *(Phoenix dactylifera* L.*)*, belongs to the *Arecaceae family*, is widely cultivated in Egypt and is considered the male reproductive cells of palm flowers and commonly used in the Middle East, the ancient Chinese and Egyptians used palm pollen as a medicinal agent. The date palm pollen (DPP) was used in folk and traditional medicine **(El-Kholy *et al*., 2019).**

AIM OF THE STUDY

The aim of this study was to determine the effects of Date Palm Pollen (DPP) (*Phoenix dactylifera* L.*)* on blood glucose and lipids in induced diabetic rats.