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**Sudan University of Science and Technology**  
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# **Chemical Characteristics of Honey Bee Products and their Effect on Diabetic Patients**

**BY**

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Thesis submitted for the degree of Ph.D.

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2003/1424

## **Acknowledgement**

I would like to express my great thanks to ALLAH , for helping me to accomplish this work in this opportunity. I would like also to extend my deepest gratitude to Prof. Dr. Mohammed S. Ali El Sarrag, Department of Crop Protection, Faculty of Agriculture , University of Khartoum for his invaluable help, continuous encouragement and kind supervision and support. My sincere gratitude to be offered to my Co-supervisor Dr. . Ahmed Elawad Elfaki. Dept. Of Food Science and Technology, College of Agricultural Studies, Sudan univ. of Science and Technology for his masterly teaching, continuous encouragement and careful support. My sincere thanks to Dr. Bushra Elbashir, Nutrition Department, Ministry of Health for his kind help .

Deep thanks are extended to Miss Samia Mahdi Ahmed, Department of Clinical Biochemistry, Sudan University of Science and Technology for her kind assistance in conducting the medical examinations. My unlimited special thanks and gratitude to the diabetic patients (volunteers) who participate in this study. I wish to acknowledge all members and technical staff in Alkhalia Investment Company for their cooperation and their valuable assistance. I should thank the staff of the Sudan University of Science and Technology for their help .

I would like to express my obligatory thanks to my family for their warm support, valuable advice, encouragement during the course of this

research Finally I am unable to express my true feeling and grateful to all those who supplied me with references or offered various helps .

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# Abbreviation

HMF :	Hydroxy Methyl Furfural .
IDDM	insulin- dependent diabetes,
NIDDM	non-insulin- dependent diabetic
GDM	Gestational diabetes mellitus
IGT	Impaired glucose teterance
WHO	World health Organization
AAS	Atomic absorption spectrophotometer
ATP	Adenosine triphosphate
NO	Nitric oxide
OGTT	Oral glucose tolerance test
HDL	High Density lipoprotein
LDL	Low Density lipoprotein
CVD	Cardiovascular diseases
FDA	Food and Drug Administration
DM	Diabetes mellitus

## Definitions

Insulin resistance—a condition in which the body does not respond to insulin properly, a common cause of NIDDM

Intensive diabetes management—a method of treatment for diabetes that attempts to maintain near-normal glycaemia by using all available resources

Ketoacidosis (diabetic coma)—a severe condition caused by lack of insulin and elevated counter regulatory hormones; marked by high blood glucose levels and ketones in the blood and urine and occurring almost exclusively in persons with IDDM

Meal-planning approaches- educational tools used to teach meal planning and to implement the nutrition prescription; simple tools for initial or survival skills and more complex tools for ongoing self-management training.

Microvascular disease-diseases of the small blood vessels, including retinopathy, nephropathy, and neuropathy.

Neuropathy-disorders of the nerves; peripheral neuropathy affects the nerves controlling sensation in the feet, hands, and joints and autonomic neuropathy affects nerve function controlling various organ systems such as the gastrointestinal system, cardiovascular nerves, and sexual function.

## Abstract

The water content of honey bee products honey 17.76 %, royal jelly (d.m.) 14.91% , pollen (d.m.) 14.54% while in propolis (d.m.) 6.36% the lowest value was detected in propolis ( dry matter ) while the highest in honey .Ash content of honey bee products in honey 0.296 % , royal jelly (d.m.) 5.51% , propolis 17.23% and pollen (d.m.) 1.88% the lowest value was detected in honey while the highest in propolis (dry matter) .

The carbohydrate content of honey bee products in honey 81.59% , royal jelly 20.02% , propolis 25.49 % in pollen 46.4% the lowest value was detected in royal jelly while the highest in honey .

Glucose, Fructose detected in honey only .The ratio of fructose / glucose in this study was ( 43.19/39.5) = 1.09 while sucrose not detected at all .

Crude fiber of honey bee products the lowest value was detected in honey and royal jelly ( ND) while the crude fiber in propolis (dry matter) 2.29%) and pollen ( 6.59 %). Total lipid on honey bee products in honey 0.0016% , royal jelly 34.71% , propolis 43.78% and in pollen 15.62% the lowest value was detected in honey while the highest in propolis (dry matter) .Crude proteins of honey bee products in honey 0.32%, royal jelly 24.83 % , propolis 1.23%, in pollen 14.95% the lowest value was detected in honey while the highest in royal jelly . Hydroxy methyl furfural ( H.M.F.) was determined in honey only (H.M.F) in honey was 1.73 mg/kg Total polyphenols concentration of honey bee products , in honey 0.31% , royal jelly 0.41%, propolis 4.82% and in pollen 1.4%. The amino acids contents of honey bee products show that, the glutamic acid aspartic acid proline leucin, the major constituent amino acids of honey bee product. Carotenoids in honey bee products was ( 60.52, 382.26, 303.63, 604.23, ) mg / 100 gram respectively . Vitamin C was ( 25.33, 75.06, 59.8, 321.1) mg / 100 gram respectively. Vitamin B1 was( 0.079, 1.503, 1.586, 0.695 ) mg / 100 gram respectively, and vitamin B2 was( 0.160, 1.96, 0.215, 0.940) mg / 100 gram respectively.

The results of minerals indicated that, , potassium (123.33 ppm), iron (122.65 ppm), calcium (75.1ppm), sodium (73.59ppm) are the

major minerals in honey. Data also showed that, iron (305.9 ppm), zinc (300.7 ppm), magnesium (91.20ppm) and calcium (81.23ppm) are the major minerals of royal jelly. Potassium (624.66ppm), iron (514.82ppm), magnesium (210.3ppm), and calcium (137.7ppm) are the major minerals of propolis. The major minerals of pollen are, iron (204 ppm), calcium (110.6 ppm), magnesium (43.10ppm), and sodium ( 41.88ppm).

Enzymes invertase , diastase and glucose oxidase has been measured on honey bee products results showed that, invertase anzymes in honey and pollen are 19.16and 1.40U/kg respectively. diastase in honey ( 7.33G.U). Glucose oxidase activity was in honey (420mg/hr) and pollen (18.05mg/hr . Honey is the rich source of the enzymes .

Diabetic patients (265) attending clinics in Sudan and Kingdom of Saudi Arabia were recruited randomly for this study.

Data showed that, 81.9% of the patients they replied that, there were an improvement of polyuria, 16.9% had no change and 1.2% of the patients, their polyuria get worse. In this study 57.1% their polydipsia is improved, 40.3% showed no change and 2.6%, think that there polydipsia becoming worse.

Using honey bee products improve the general health of the majority (91.2%) of the patients, in term of symptoms free and think or feeling they are more active, 7.7 % they found no improvement and the general health of 1.1% of the patients is becoming worse after using the honey products .

In this study 43.4% showed improvement in their sexual life after using honey bee product, 54.0% either replied there was no change concerning impotence.

Generally results indicated that, patients having the diseases in the last 5 years their symptoms improved better than patients having the diseases for more than 10 year. The data in this study illustrated that, patients taking tablets, their polyuria, and polydipsia improved better than those taking insulin or not taking any medicine.

Data showed that 55.6% and 50% of patient taking tablets or not taking any medicine their impotence improved, whereas only 18% of patients taking insulin their impotence improved.

## **-Effect of honey bee products on blood glucose level on diabetic patients**

**In this study the mean ( $\pm$  SD) of fasting blood glucose level of all patients was 218.1( $\pm$  75.0) mg/100 ml of blood in the first week. In the second week both the fasting and postprandium blood glucose were increased ( $P = 0.9$ , not significant), from the third week both start to decrease till the end of the survey. In week three the mean fasting blood glucose significantly ( $P < 0.05$ ) dropped to  $193.0 \pm 105.2$  and the postprandial was drop to  $243.74 \pm 139.47$  mg/100 ml of blood and both (fasting and postprandial blood glucose levels) continued to drop significantly ( $P < 0.001$ ), the fasting blood glucose drop to  $167.5 \pm 33.76$  in week.**

**The fasting blood glucose level of patients taking honey, was significantly decreased ( $P < 0.05$ ) in week four compared to the initial value (from  $219.5 \pm 68.6$  to  $195.8 \pm 90.0$ ) and continued to drop significantly ( $P < 0.001$ ) to  $141 \pm 63.7$  mg per 100 ml of blood in week 12. Results also show that the postprandial blood glucose level dropped significantly from  $307.5$  mg/100 ml to  $203.3$  mg/100 ml in week 12.**

**Data showed no significant association between the effect of all the constituents assessed of honey bee products and the reduction of fasting or postprandium blood glucose levels of patients involved in this study.**

# **CHAPTER ONE**

## **Introduction**