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LIST OF ABBREVIATIONS

ALT	Alanine amino transferase
AST	Aspartate amino transferase
BL	Bitter lupine
BLO	Bitter lupine oil
BUN	Blood urea nitrogen
BW	Body weight
CS	Chemical score
DM	Diabetes mellitus
EAAI	Essential amino acid index
FER	Feed efficiency ratio
FI	Food intake
GC	Gas chromatography
GAD	Glutamic acid decarboxylase
GPT	Glutamic pyruvic transaminase
GOT	Glutamyl oxaloacetic transaminase
HDL – C	High density lipoprotein – cholesterol
HPLC	High performance liquid chromatography
HC	Hypercholesterolemic
IAA	Insulin autoantibodies
IDDM	Insuline dependent diabetes mellitus
IDF	International diabetes federation
ICA	Islet cell antibodies
LDL – C	Low density lipoprotein – cholesterol
MODY	Maturity onset diabetes of the young
Mg / dl	Milligram per deseliter
NIDDM	Non insulin dependent diabetes mellitus
PER	Protein efficiency ratio
QA	Quinolizidine alkaloids
RBBL	Removed bitterness bitter lupine
RBSL	Removed bitterness sweet lupine
RBF	Renal blood flow
SPSS	Statistical package for the social science
STZ	Streptozotocin
SL	Sweet lupine
SLO	Sweet lupine oil
TG	Triglycerides
Univ	University
U N	Urea nitrogen
UA	Uric acid
VLDL – C	Very low density lipoprotein – cholesterol
Wt.	Weight

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ABSTRACT

"Comparative study between sweet and bitter lupine and their impact on diabetic rats"

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ABSTRACT

Lupine *(Lupinus albus)* contains ingredients that possess a variety of health enhancing effects including anti-diabetic effects.The aim of this research was to study the effect of (sweet and bitter lupine) before and after remove of bitterness and comparison between them on diabetic rats at concentrations (5% , 10%) ,(70) rats were divided to two main groups. First main group (7 rats) were fed on standard diet (SD) (negative control). Second main group (63 rats) were injection with streptozotocin [STZ, 45 mg/kg] for hyperglycemic (diabetic) and then divided to 9 subgroup (n= 7) for each subgroup (1): fed on (SD) only (positive control). (2): fed on (SD) + 5% sweet lupine(SL). (3): fed on (SD) +10% (SL). (4): fed on (SD)+ 5% bitter lupine (BL).(5): fed on (SD) +10% (BL). (6): fed on (SD) + 5% removed bitterness sweet lupine (RBSL) (7): fed on (SD) + 10% (RBSL). (8): fed on (SD) + 5% removed bitterness bitter lupine (RBBL). (9): fed on (SD) + 10% (RBBL). Results were statistically analyzed, the results showed that the highest levels of BL, SL, RBSL and RBBL respectively, showed a significant reduction in serum glucose, total cholesterol and triglycerides. Moreover, decreased uric acid, urea nitrogen and creatinine compared with diabetic control. The results showed that the better result to concentrate (10%) then (5%) from BL, SL, RBSL and RBBL respectively.

Keywords: Sweet and Bittre lupine; Diabetic rats; Glucose, Total lipids .

INTRODUCTION

1- Introduction

Diabetes is a chronic disease that occurs when the pancreas does not produce enough insulin, or when the body cannot effectively use the insulin it produces. Hyperglycemia, or raised blood sugar, is a common effect of uncontrolled diabetes and over time leads to serious damage to many of the body's systems, especially the nerves and blood vessels, The number of people living with diabetes has nearly quadrupled since 1980 to 422 million adults **(WHO,2016)** .

Egypt is one of the 19 countries and territories of the IDF MENA (Middle East and North Africa) region. 415 million people have diabetes in the world and more than 35.4 million people in the MENA Region; by 2040 this will rise to 72.1 million. There were over 7.8 million cases of diabetes in Egypt in 2015 **(IDF, 2015).** 347 million people worldwide have diabetes **(Danaei et al., 2011)**.

People with diabetes have an increased risk of developing a number of serious health problems. Consistently high blood glucose levels can lead to serious diseases affecting the heart and blood vessels, eyes, kidneys, nerves and teeth. In addition, people with diabetes also have a higher risk of developing infections. In almost all high-income countries, diabetes is a leading cause of cardiovascular disease, blindness, kidney failure, and lower limb amputation **(IDF,2015)**

Diabetes mellitus (DM) is a major worldwide health problem predisposing to markedly increased cardiovascular mortality. Other serious morbidities and mortalities are related todevelopment of nephropathy (kidney damage), neuropathy (nerve damage), and retinopathy (blindness) **(Memisogullarr et al.,2003) .**

Diabetes types, diabetes type I, which was formerly known as insulin-dependent diabetes is produced pancreas very small amount of insulin, or it may not produce insulin at all, diabetes type II, which was formerly called diabetes non-dependent on insulin and occurs as a result because thebody is unable to use insulin effectively **(Who, 2016).**

The most diffused pathological condition, characterized by stable hyperglycemia, is known today as type-2 diabetes (accounting for about 90% of all diabetes cases). Nowadays, type-2 diabetes is considered an epidemic disease, especially in the Western countries, where the incidence in the population is estimated to range from 2% up to 4% , Hyperglycemia is recognized to be the central feature of all unbalances in the metabolism of carbohydrates, lipids, ketones and amino acids **(ADA ,2004)**.

Lupins are members of the family Fabaceae. White lupin, native from West Asia and the eastern Mediterranean region of southern Europe, is an annual, erect, branched, bushy more or less pubescent herbaceous plant. Today white lupin is a traditional minor pulse crop, grown around the Mediterranean and the Black Sea, and in the Nile valley. It is also cultivated elsewhere in Africa, North and South America **(Lim, 2012) .**

There are two basic types of lupins, bitter and sweet varieties. These two forms of plant species differ in the alkaloid contents **(Hirai et al., 2000).** There is a growing interest in the cultivation of lupines all over the world due to their features that are desirable in agronomy and animal nutrition. However, the nutritive value of lupines depends on the relative content of alkaloids **(Erdemoglu et al.,2007)**

White lupin seeds are consumed as a popular snack and used as pickles. The seeds are also roasted and used as coffee substitute; or ground into flour in making bread, biscuits, pasta products and a variety of other food products However, the mature bitter lupin seeds should be subjected to prolonged

washing to remove the bitter alkaloids before consumption **(Lim, 2012) .**

Lupins are protein-containing legumes that have been present in Andean and Mediterranean diets since ancient times. Some lupin species exhibit antioxidant capacity related mainly with the presence of phenolic compounds 20.Because lupins belong to the Leguminosae family; they
may also have potential for their content of phytoestrogens such as isoflavones. Isoflavones belong to the group of flavonoids. Currently, isoflavones have been associated with beneficial effects in humans, such as prevention of cancer, cardiovascular diseases, osteoporosis and menopausal symptoms **(Adlercreutz and Mazur.,1997) .**

Many studies reported that lupin seeds had a higher antioxidant activity than other legumes and the determining of the antioxi-dant activity from lupin seeds will be worthwhile for the study **(Martinez-Villaluenga et al., 2009).** The antioxidant properties of bitter and sweet lupin seeds and their oils were also studied. The results showed that the bitter and sweet lupin seeds consist of 8% and 12% of oil, respectively. BLO and SLO contained high concentration of oleic acid (46.28 and 48.72%), followed by linoleic acid (21.55 and 20.90%), linolenic acid (7.69 and8.95%), and palmitic acid (7.39 and 7.5%). The total tocopherol content of BLO and SLO were 184.70 and317.01 mg/100 g oil **(Hassen et al., 2013).**

Legumes contain a rich variety of phytochemicals, including phytosterols, natural antioxidants and bioactive carbohydrates which if consumed in sufficient quantities may help to reduce tumour risk **(Mathers, 2002).** Epidemiological and intervention studies indicated that legume consumption is inversely associated with the risk of coronary heart disease15, type 2 diabetes mellitus and obesity, and results in lower LDL cholesterol and higher HDL cholesterol **(Bazzano et al., 2011).**

During research activities on lupin seed proteins, we undertook a series of research activities aimed at unraveling the specific hypoglycemic role of one of the lupin proteins, termed γ-conglutin. Lupin γ-conglutin is a homo-tetrameric glycoprotein in which the monomeric unit consists of two disulphide linked heterogenous subunits of about 30 and 17 kDa (**Duranti et al., 2008)** . From the viewpoint of γ-conglutin biological activity, orally-administered pure γ- conglutin was found to effectively decrease plasma glucose in glucose overloaded rats in a dose-dependent manner **(Magni et al., 2004).**

Lupine contains phenolic compounds and carbohydrates that may affect human health or results in a reduced risk of disease **(Saffan and salma,2005).** Legumes contain a rich variety of phytochemicals, including phytosterols and bioactive carbohydrates , which if consumed in sufficient quantities may help to reduce tumour risk. Epidemiological and intervention studies indicated that legume consumption is inversely associated with the risk of coronary heart disease, type 2 diabetes mellitus **(Villegas et al.,2008)**.

2. AIM OF THE STUDY:-

The aim of this study was carried out to determine the effect of (bitter and sweet Lupine) before and after remove of bitterness and comparison between them on rats infected with diabetes.

REVIEW OF LITERATURE

3-Review of literature

3.1 Diabetes Mellitus:

3.1 .1Definition and description of diabetes mellitus

Diabetes is a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both. The chronic hyperglycemia of diabetes is associated with long-term damage, dysfunction, and failure of different organs, especially the eyes, kidneys, nerves, heart, and blood vessels, Several pathogenic processes are involved in the development of diabetes. These range from autoimmune destruction of the pancreatic β-cells with consequent insulin deficiency to abnormalities that result in resistance to insulin action. The basis of the abnormalities in carbohydrate, fat, and protein metabolism in diabetes is deficient action of insulin on target tissues. Deficient insulin action results from inadequate insulin secretion and/or diminished tissue responses to insulin at one or more points in the complex pathways of hormone action **(American Diabetes Association, 2014) .**

Diabetes mellitus (DM) is probably one of the oldest diseases known to man. It was first reported in Egyptian manuscript about 3000 years ago (**Ahmed, 2002).**

Diabetes mellitus is a metabolic disorder characterized by chronic hyperglycemia associated with absolute or relative deficiency in insulin secretion or function. Lack of insulin, whether absolute or relative, affects the metabolism of carbohydrates, proteins and fat, and causes a significant disturbance of water and electrolytes homeostasis **(Macleod,**