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SERUM GLUCOSE AND LIPID LEVELS IN DIABETIC ANIMAL MODELS FED WITH THE METHANOLIC EXTRACT OF THE AERIAL PARTS OF *TURNERA APHRODISIACA*

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Abstract

Evaluating the biopharmacological activity of the methanolic extract of the aerial part of *Turnera aphrodisiaca* by assessing the hypoglycemic, hypolipdimic effect by determination of serum glucose level, cholesterol, "triglycerides" and lipoproteins in both types : high and low density. Seventy Swiss rats was used in this research and were divided in to seven groups : 1- control group fed with sterilize water for 28 days, 2- control diabetic animal models fed with sterilize water for 28 days, groups 3, 4, 5 and 6 diabetic animal models were fed with the methanolic extract of the aerial part of *Turnera aphrodisiaca* in a gradual dose treatment ranging from 25-100 mg/kg body weight as once daily for 28 days, the seventh group is a diabetic animals model treated with 84 mg/kg body weight standard hypoglycemic chlorpropamide once daily for 28 days. Serum level for glucose, cholesterol, "triglycerides" and lipoproteins in both types : high and low density were estimated after 14-28 days of fading, and there was a statistical hypoglycemic and hypolipidemic action in a dose dependant manner of the methanolic extract of *Turnera aphrodisiaca* in comprise with control diabetic animals. It could be concluded that *Turnera aphrodisiaca* may antagonizing the metabolic aberration and thereby restore the normal metabolism by tilting the balance from high lipids to high carbohydrate metabolism and this is the main action of the plant and its uses in folk medicine.

Key words: Antidiabetic properties, *Turnera aphrodisiaca*, serum glucose, lipid level, methanolic extract

Introduction

Hyperglycemia is a clinical syndrome usually referred as "Diabetes Mellitus", with changes in the metabolic process of different components such as fats, starch mainly carbohydrates together with proteins, due to many changes in chromosomal and gene changes together with circumstances factors, who is actively leads to decrease in the secretion of insulin or loss of its activity, meanwhile, necrosis and deterioration of pancreatic "B-cell" associated with vascular changes and alteration (Davis *et al*., 1996). Millions of people suffering of metabolic disorder all around the world specially in industrial countries (Stryer, 2000). The clinical diabetes centers mostly treat their patients by providing enough amount of insulin in the blood stream. Before the discovery of insulin in 1922, usually diabetic patient applied a diet programs and using plant therapy according to the folk use of such plants (Gray *et al*., 1999). Some plants were studied for its hypoglycemic activity in different clinical labs all over the world and mostly in third world countries (Kameswara *et al*., 1999). The WHO reports (Health Organisation. 1994) mostly revealed on the foundation of a pharmacologically active components which regulate the production and secretion of insulin, affecting the sensitivity of tissue towards insulin, reducing the degeneration of Beta cell, enhancing the generation of Beta cell, or interfering with pathways that alter the diabetes complication. Cholesterol, is considered as an important lipid which have great effect in controlling and forming the biological cellular membrane, also the process of the development of brain in childhood and play a role in most of the animals primary organic function (Verg`es, B. 1996; Shirwaikar *et al*., 2004). Although the importance of lipids

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in all the body cells, the excessive amounts of lipids in the blood considered as a distressing factor which causes lots of medical syndrome called hyperlipidemia which is recognized as a metabolic syndrome with high level of cholesterol, triglyceride, low density lipoprotein, very law density lipoprotein with decreases in the level of high density lipoproteins. Hyperlipidemias may lead to changes in the oxidation process of fatty acid with the production of ketosis in the blood , diabetic condition which could be due to increases in the resistance to insulin. Such condition could cause risk of heart diseases and angina attack with myocardial ischemic clinical syndrome leading to high level of deaths (Chait *et al., 1996*; Shirwaikar *et al.*, 2004). *Turnera aphrodisiaca* from a family Turneraceae is also traditionally called "Damiana". The plant is widely applied and used in traditional medicine as a CNS stimulant, erogenous, water secretion properties, improve constipation, nerve stimulant and in improvement of menstrual cycle and pregnancy (Hocking *et al.*, 1955). Different uses of *Turnera aphrodisiaca* was claimed by the British herbarium like general depressive syndrome, stress indigestion, stress stultification and insufficient sexual intercourse (British Herbal Pharmacopoeia, 1983). Strychnine together with *Turnera aphrodisiaca* and phosphorus "as a stimulant were recommended in beneficial for improvement of sexual intercourse (Osol *et al.*, 1997). The *Turnera aphrodisiaca* leaves infusion was used folk medicine in syndromes affect digestive and respiratory process (Caceres A., 1996) and in treatment of syphilis infection caused by gonorrhea microorganism (Koch, (1986; Boericke, 1988). Studies on *Turnera aphrodisiaca* plant constituents revealed the presence of different chemical compounds such as type of cyanide forming tetraphylline Beta glycoside (Spencer *et al.*, 1981), different types of flavenoids (gonzalitosin, arbutin, damianin, tricosan-2-one and hexacosanol), also studies indicate presence of fixed oil like Beta the presence of fixed oil sitosterol "with the presence of volatile oil that contain alpha and beta pinene (Dominguez *et al.*, 1976; - Auterhoff *et al.*, 1968; Fryer 1965). *T. aphrodisiaca* water extraction revealed a reduction in the glucose level in diabetic animal models (Perez *et al.*, 1984; Aguilara *et al.*, 1998). The watery extraction of the plant posses an improvement in sexual intercourse in inactive male mice animal model (Alemzadeh *et al.*, 2010). In this work, the reduction of the lipid parameter upon the fading with *Turnera aphrodisiaca* in diabetic animals model is considered as one of the most valuable findings.

Materials and Methods

Plant material and extraction

Aerial part methanolic extract *Turnera aphrodisiaca* obtained from the local shop in Baghdad and authenticated by specialist in the Iraqi Herbarum Botany Directorate in Baghdad. The aerial parts of *Turnera aphrodisiaca* were shade until dryness , coarsely powdered and stored in a refrigerator until the experiment time . The powder was dissolved in methanol for 2 days, filtration through a filter paper Whatman no.1, evaporation by rotatory evaporator. The obtained extract instantly prepared at time (Syed *et al.*, 2005).

Chemicals used:

Almost the chemical reagents used in this study were bought from Sigma company in USA.

Animal models and diabetes induced by alloxan:

Seventy Wister rats model were bought from the science college animal house in Baghdad University with a weight range of 160-240g . The animals were maintained at a controlled temperature with a mid day cycle of exposure to light with providing enough pellets and water. This work were conducted according with ethical guidelines approved by the Animal Care . Alloxan solution was obtained by dissolving 0.9 gram in 6 ml sterilized water achieving a 150 mg/ml concentration and injected as a single dose (150mg/kg b.w.) intraperitoneal to the animal models for diabetes induction. Two days later, the serum glucose level of the animal models were estimated and the one above 200 mg/100ml was used in the study as a diabetic animals.

Experiment animals design:

Seventy rodent rats were randomly divided in to seven groups with ten in each group. . Group I, II and VII were administered saline, diabetic, and standard drug (chlorpropamide 84mg/kg) control respectively. Group III, IV, V and VI were treated with the methanolic extract of the aerial part of *Turnera aphrodisiaca* (25, 50, 75 and 100 mg/kg daily orally). Serum blood glucose, lipoproteins, cholesterol and triglycerides were estimated after 14-28 days after treatments.

Mearurment of biochemical parameters:

Fasting blood glucose level was estimated by O-toluidine method by (Sasaki *et al.*, 1972). The biochemical estimation method for cholesterol level, triglyceride lipoprotein in both classes in blood serum is explained in (Trinder 1969; Lothar 1998; Jacobs *et al.*, 1990).

Statistical Analysis

Student-t-test was applied to analyze the results obtained which is expressed as Mean ± SEM, P value of 0.05 or less 0.001 was statistically significant.

Results

Diabetic rodents fed with the alcoholic extract from

the aerial part of *Turnera aphrodisiaca for* two weeks elucidate a reduction in the elevated level (P<0.001) of the biochemical parameters in blood serum (glucose, triglycseride, cholesterol and low density lipoprotein), while the high density lipoprotein was elevated (P<0.001) in comprise to that in control rodents, as shown in Fig. 1. The reduction in the serum parameters was in a dose dependent manner, the best results obtained in the dose of 100 mg/kg body weight which was even much better than the values obtained in control and chlorpropamide groups. Same results but of high level of significances and more apparent were obtained in the values of biochemical parameters in diabetic rats fed with alcoholic extract from the aerial part of *Turnera aphrodisiaca* for four weeks in a dose dependent manner scheme as shown in Fig. 2. Generally the levels of biochemical parameters measured after two and four weeks of fading with different doses of the alcoholic extract of the aerial part of *Turnera aphrodisiaca* were compared to each other and a statically reduction (P<0.001) were noticed in the values of glucose, triglyceride, cholesterol and low density lipoprotein in rodents serum together with elevation in the of high density lipoproteins mainly in the rodents fed for four weeks with the different doses of the extract and the positive standard group fed orally with chlorpropamide.

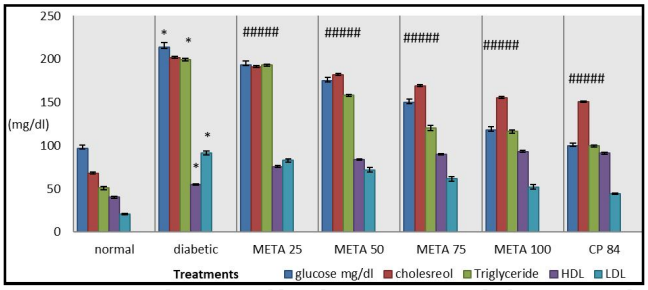

Fig. 1: Serum glucose and lipid parameters in diabetic animals after two weeks of fading with the extract of *Turnera aphrodisiaca* and positive standard Chlorpropamide.

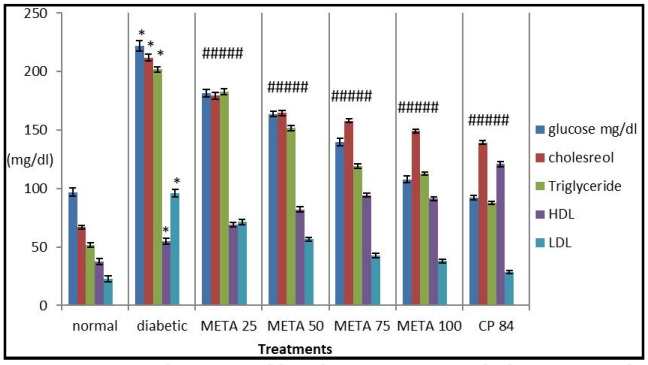

Fig. 2: Serum glucose and lipid parameters in diabetic animals after four weeks of fading with the extract of *Turnera aphrodisiaca* and positive standard Chlorpropamide.

Results were represented as mean ± SD, no. 8. *represent P < 0.0001 in comparison to negative control, #= P < 0.001 in comparison to positive control, according to Student t-test. META : methanolic extract of *Turnera aphrodisiaca*, CP: chlorpropamide.

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Discussion

Tte drug markets provide lots of diabetes treated and antihyperlidimic medicines, therapeutic remedies from the herbal remedy plants have been applied with great benefits to treat these disorder and its ramifications with relatively lesser side effects. According to WHO recommendation, antihyperglycemic from natural herbs with folk uses as of most importance findings . Therefore it may be better to consider these species in assessing of their general toxic profile and formulation of antidiabetic drugs. Even in the era of highly advanced bio medicine, herbal medicines are area of focus for researchers around the world to complement modern drugs and as sources for development of novel drugs. The mechanism of most of the herbs used has not been scientifically determined. Many traditional plants and their derived bioactive compounds used for treatments of diabetes through various mechanisms of actions (Mahabir *et al*., 1997), and, there has been increased the scientific beneficial uses in traditional medicine research that has been reported to be used traditionally to manage diabetes. This is due to increase efficacy of the derived new agents of traditional plants, which leads to the developing of looking forwards towards folk medicine, also presence of serious adverse effect, expensive price together with minimal available in new antidiabetic agents in countryside peoples in third developing nations (Mohammed *et al*., 2013). The usual mutual metabolic syndrome is diabetes mellitus " in conjugation with elevation of serum lipids level with the simultaneous presence of obesity, elevation in blood pressure. Increases in lipids profile can lead to both clinical trial and laboratory diabetic syndrome due to its complication (Bierman *et al.*, 1975). Induction of diabetic state is achieved by lab through using alloxan which damage the pancreatic B cell that releases insulin thereby insulin will be insufficient for the utilization of tissues glucose (Omamoto *et al*., 1981). In this research, the aerial methanolic extract of *Turnera aphrodisiaca* lower serum suger in diabetic animal models through the evocative hypoglycemic sulfonylureas that proceeds

insulin release by closing pot. ATPase channels that lead to depolarize the cell membrane, also it energize cal. entrance that facilitate the insulin releases. The obtained data of this study was controversaly to the results obtained by (Eddouks *et al.*, 2005), in which the hypoglycemic effect seems to be independent on insulin secretion. Large amounts of fatty acids in serum of diabetic animals model caused by alloxan promote the changes of extra fats to cholesterol and phospholipids in the liver. These two substances along with excess triglycerides formed at the same time in the liver may be discharged into the blood in the forms of lipoproteins (Bapanna *et al*., 1997). The abnormal high concentration of serum lipids in the diabetic subject is due, mainly to the elevation in the metabolism of free fats from the peripheral adipose fat storages, whereas insulin depress the activity of lipase enzyme that hormone is conscious to it. Hypercholesteremia with hyper triglyceridemia is predominant in lab animal models injected with alloxan to create diabetic syndrome (Sharma *et al*., 1996), the elevation of lipids parameter is due to the stimulated activity of lipolytic hormones in adipose tissues (Goodman, Gilman 1985). Such stimulation will approve the metabolizing of starch and glycogen and further increase the usage of glucose in peripheral tissues. Explanation of the action of *Turnera aphrodisiaca* could be due to the suppression of self fat synthesis in the tissues which could be due to one of the active component (s) that posses the action. Iberian metabolic process in diabetic animal models may provide more transformation of triglyceride together with phospholipids and meanwhile, *Turnera aphrodisiaca* might counteract the Iberian metabolism to the write pathway and achieving the normal equipoise in lipids and carbohydrates metabolic process Final conclusion from the research shows that the aerial part alcoholic extract of *Turnera aphrodisiaca* reduce the serum level of glucose and other lipids parameters like cholesterol, triglyceride and low density lipoproteins which is the risk factor for heart and coronary complications (Das, 2003). The reduction in the lipid parameter upon the fading with *Turnera aphrodisiaca* in diabetic animals model is influential finding in the folklore traditional therapy.

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