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Evaluation of Antioxidant Effect of Phytosome ginger in Male rats with Diabetes Induced by Alloxan

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ABSTRACT

This study aims to evaluate the antioxidant effect in rats with Alloxan-induced diabetes. A total of 30 rats weighing 200-250g were separated to six groups, the primary group provided as the, control group, the following group as the untreated diabetic group, the third group was preserved with ginger, fourth group with ginger phytosome, the fifth group with a combination ginger and Glibenclamide, and the sixth group with ginger phytosome and Glibenclamide. Diabetes was induced in rat through intraperitoneal injection at a dosage of Alloxan (100 mg/kg) of animal mass. results demonstrated that rats with diabetic induced by alloxan exhibited an important reduction ($p < 0.001$) in antioxidant enzymes compared to the control collection, However, treatment with ginger phytosome caused a highly important improvement ($p < 0.001$) in antioxidant activity. Objective of this study, Evaluating the antioxidant effect of ginger and its phytosome in Alloxan-induced diabetic rats.

1. Introduction

Diabetes is a widespread and serious condition affecting people worldwide. it arises either from the pancreas inability to secrete a sufficient insulin or a reduce effective of insulin function. Diabetes is categorized into two primary types: (type 1 and type 2) [1]. The global prevalence is rising dramatically, with researchers estimating that the number of people with diabetes universal may range 552 million by 2030 [2]. It is important to limit this increase, which leads to complications in both large and small blood vessels. Medicinal plants are frequently used as effective alternative for managing diabetes and treating diabetes [3]. Ginger is considered one of the herbs that play a significant role in reducing blood sugar levels, as well as lower fats and enhance antioxidant enzymes [4]. Thses benefits are ascribed gingers natural compounds such as gingerol, shogaol, paradol, and others [5]. this study was showed to assess the outcome of ginger phytosome compared to regular ginger on the of antioxidant enzymes levels in alloxan induce diabetics rats.

2. Experimental Animals:

Thirty adult male rats were used in this study, sourced from the Animal house of the College of Veterinary Medicine at the University of Tikrit. The rats were aged 10 to 12 weeks and weighed 200 to 250 grams. The experiment was conducted over a one-month periods in the same facility. The rats were housed in standard plastic cages measuring 13 x 28 x 46 cm, equipped with adequate ventilation, lighting, the temperature maintained between 20 to 25°C, to ensure hygienic condition, the cage floors were lined with wood shavings, which were replaced two to three times per week, food and water were provide ad libitum.

Materials and methods : -

3.1. Ginger extraction:

The extraction yield percentage of ginger plant was determined for two sample, each weight of this sample (5g), from(250g) of ginger after 13 siphon cycles.

3.2 Phytosome ginger preparation:

A total 0.5 g of methanolic ginger extract was combined with 0.50 g of lecithin and 0.25g of cholesterol. The mixture was thoroughly blended using a vortex machine for 30 minutes, followed by incubated in a water bath at 40°C. dehydrated was carried out using a rotating vaporization, resulting in the formation of phytosomes [6].

3.3 The Drugs usage within the study:

Ash of Glibenclamide drug 100% cleanliness manufactured from the main Company for the Creation of Drugs and Therapeutic Materials in (Samarra).

3.4 Animal preparation process:

In this study, thirty adult male rats, with a weight rate (200-25g) and 6–10-week-old, were in good healthiness and were exposed to suitable and unchanging environmental conditions (25̊ C) and nutrition.

3.5 Study design:

Rats used in the study was divided into six groups of trials ‘, and the masses of each group were occupied into version as much as possible before the start of the study.

4.Groups

Group 1: (NC): five rats of This group of obtained vehicle solution (normal slain).

Group 2: Diabetic control (alloxan 100 mg/kg): Alloxan is given IP for the initiation of diabetes to this group.

Group 3: (Diabetic + ginger treatment): five diabetic rats obtained (ginger extract) (3g/kg body weight) for 30 days.

Group 4: Phytosomes Ginger treatment: five diabetics rats received phytosomes ginger with a dose of (0.5g/kg body weight) via oral gavage for 30 days.

Group 5: glibenclamide+ginger treatment (D+Gli): five diabetic rats preserved with ginger + Glibenclamide) (3g/kg body weight ginger) (5mg/kg Glibenclamide) body weight.

Group 6: Glibenclamide treatment + phytosome ginger (D+Gli): five diabetic rats preserved with phytosome ginger+ glibenclamide (0.5 g / 100 g) body weight orally.

5. Blood Collection:

Blood was collected from all groups of rats (both experimental and control) 24 hours after the end of the treatment periods. Blood sample were drawn from the heart using a 5 ml syringe. And collected serum separation tubes (SST). Approximately 5ml of blood was, the serum was separated by centrifugation at 1500 rpm then kept in the refrigerator at -20 c for 5 minutes.

6.Antioxidant activity:

1. Estimation of superoxide dismutase (SOD) activity:

Superoxide dismutase (SOD) is a metalloenzyme catalyzes the (conversion of superoxide anion to molecular oxygen and hydrogen peroxide), making it an important portion of the cellular defense mechanism against oxidation. The (Cayman Superoxide Dismutase Assay Kit) was used to measure enzyme action according to the method of [7]. Enzyme activity is measured by the reserve of nitroplutetrazolium by (superoxide anion ($O2^{\cdot}$), which is formed by (potassium superoxide dissolved in dimethyl sulfoxide), and the optical density is recite at 550 nm. The component of enzyme action is clear as the quantity of enzyme required toward degrade (50% of the superoxide dismutase radical).

2. Assessment of catalase (CAT) activity:

Catalase (CAT) plays a key role in detoxifying hydrogen peroxide (H2O2), a reactive oxygen species (ROS). The enzyme activity is determined using Cayman's catalase assay kit, as described in [8]. The assay relies on the enzyme's reaction with methanol in the presence of an optimal concentration of H2O2. This reaction generates formaldehyde, which is then measured calorimetrically using 4-amino-3-hydrazino-5-mercapto-1,2,4-triazole (purpled) as the chromogen. Purpled forms a bicyclic heterocycle with aldehydes, and upon oxidation, it changes from colorless to purple.

7. Statistical Analysis:

The Minitab software version 17.1 was used to analyze the data, and the ANOVAtest was used. The Duncun's multiple comparison of the means falls below the significant threshold ($P \leq 0.05$).

8.Result:

Table (1.1) and Figures (1.1,1.2) show the effect of ginger phytosome, ginger extract, ginger phytosome with Glibenclamide, and ginger extract with Glibenclamide on the levels of CAT, SOD, and in diabetic rats induced by (Alloxan). The diabetic group had a noteworthy difference ($p>0.001$) in the levels of CAT accompanied by an important decrease ($p>0.001$) in the stages of, SOD linked to the control group. While the diabetic group treated with ginger and ginger phytosome showed significant improvement in the levels of CAT, SOD ($p>0.001$). A important development ($p>0.001$) was experimental in the levels of CAT, SOD.

Groups	S O D U/ml	C A T KU
	Mean ± St. d	Mean ± St. d
Control	7.077 ± 0.566 b	125.2 ± 7.79 d
Diabetics	5.032 ± 1.357 d	80.1 ± 9.74 e
Ginger	8.754 ± 0.685 a	248.6 ± 67.5 a
Phytosome ginger	6.108 ± 0.592 c	177.5 ± 51.6 c
Ginger + Glibenclamide	6.118 ± 0.736 c	221.1 ± 36.5 b
Phytosome ginger +Glibenclamide	5.962 ± 0.712 c	168.7 ± 24.7 c

(Table1.1). SOD and CAT level in the experimental.

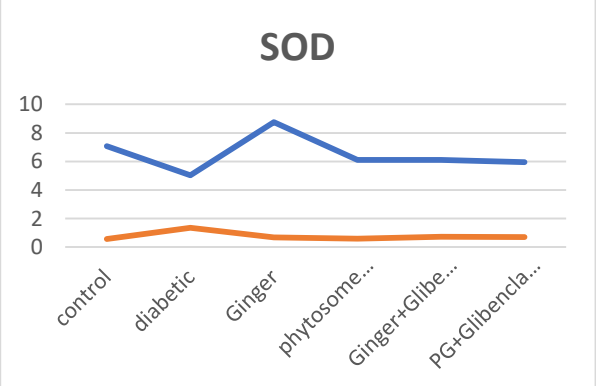

Figure (1.1): serum SOD(U/ml) level in control, diabetic rats treated with phytosome ginger, ginger or their treat group after 4 weeks of treatment.

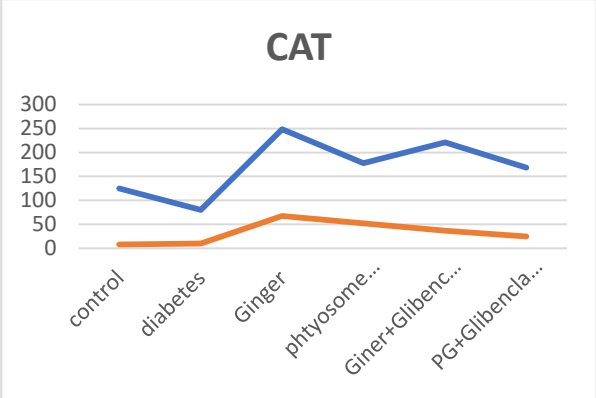

Figure (1.2): serum CAT(Ku)level in control, diabetic rats treated with phytosome ginger, ginger or their treat group after 4 weeks of treatment.

DISCUSSION

This study on alloxan-induced diabetic rats revealed an important increase in catalase (CAT) levels and a decrease in superoxide dismutase (SOD) levels in diabetic rats linked to the control group. Like results have been described in preceding studies, indicating that alloxan-induced diabetes (100 mg/kg) negatively affects CAT and SOD levels. This impact is primarily attributed to the overproduction of reactive oxygen species (ROS), which exacerbate the disease. Research has shown that hyperglycemia leads to an excess of free radicals, disrupting antioxidant enzyme activity. In this study, diabetic rats treated with both ginger phytosome and traditional ginger showed a statistically important increase in CAT stages and a reduction in SOD levels. Moreover, treatment with a combination of ginger phytosome and Glibenclamide further reduced oxidative stress markers compared to untreated diabetic rats. These findings emphasize the ability of ginger to enhance antioxidant enzyme activity and mitigate oxidative stress in alloxan-induced diabetic rats. Previous studies have also reported that incorporating 5% ginger into the diet for six weeks improved oxidative stress markers in diabetic rats.

9. Conclusions

1 .a dosage of alloxan, while as a exact dose for usages tops with an result on the oxidative enzyme.

3.phytosome ginger and ordinary ginger improves effect of oxidative enzyme which effect by alloxan.

10.Recommendations

We advise conducting studies to assess the biochemical effect of ordinary ginger only and how it can be applied in a beneficial context against oxidative enzyme.

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تقييم التأثير المضاد للأكسدة لفيتوسوم الزنجبيل في ذكور الجرذان المصابة بالسكري المحفز بواسطة الالوكسان

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الملخص

تهدف هذا الدراسة الى تقييم التأثير المضاد للأكسدة في الجرذان المصابة بداء السكري المحفز بواسطه الالوكسان ، تم استخدام 30 جرذا بوزن يتراوح بين 200-250 جرام، تم تقسيمها الى ست مجاميع :المجموعة الأولى كانت المجموعة الضابطه،والمجموعه الثانية مجموعه السكري الغير معالجه، والمجموعة الثالثة عولجت بالزنجبيل ،والمجموعة الرابعة عولجت فايتوسوم الزنجبيل، والمجموعة الخامسة عولجت بمزيج من الزنجبيل والجليبنكلاميد ،والمجموعة السادسة عولجت فايتوسوم الزنجبيل و الجليبنكلاميد ،تم تحفيز السكري في الجرذان عن طريق حقن داحل الصفاق بماده الالوكسان بجرعه 100 ملغ / كجم من وزان الحيوان ،أظهرت النتائج ان الجرذان المصابة بالسكري أظهرت انخفاض ملحوظ ($p<0.001$) في مستويات انزيمات المضادة للأكسدة مقارنه مع المجموعة الضابطة . أظهرت المعالجة فيتسوم الزنجبيل تحسن في نشاط مضادات الأكسدة.

الكلمات المفتاحية: الوكسان، مضادات الأكسدة، فايتوسوم الزنجبيل، الجليبنكلاميد، السكري.