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Measurement the Level of Fats, Liver Enzymes and the Hypoglycemic Effect in Local Male Rabbits Treated with Alcohol Extract of*(Cympopogoncitratus)*

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Abstract
A wide variety of plants with potential therapeutic uses are collectively referred to as medicinal plants in the field of herbal medicine.The compounds found in these medicinal plants have great potential for use in the creation of new pharmaceuticals and other chemical compounds. Many different types of pharmaceuticals get their active ingredients from plants. Phytotherapy and medicinal plants are valuable because they lessen the negative effects of pharmaceuticals made in a lab. Maybe it's because the human body can absorb plants in their natural state, even at low quantities of active chemicals. We aimed to determine the effects of an alcohol extract from the lemongrass plant (Cympopogoncitratus) on the lipid profile (VLDL-c, LDL-c, HDL-c, TG, TC), liver functions (LDH, ALT, AST), and clucose level in adult male domestic rabbits, whose weights varied from 1750 to 800 g mg/cm^2, respectively. The levels of VLDL-c, LDL-c, TG, TCT, ALT, LDH, and clucose decreased significantly at the probability level (P ≤0.01), according to the data. The level of(HDL -c) in the overall treatment group treated with lemon extract was significantly higher than in the control group at the level of probability(P ≤0.01).

Key words:
Cympopogoncitratus, TC,LDL,AST,ALT,Glucose
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Introduction

The use of medicinal herbs and plants is an important means of treating many diseases, as most of the medicines known and currently used are from plantsources [(1)]. Recently, interest in the use of extracts of some plants in the treatment of many diseases has increased due to the fact that they give better results than manufactured chemicals and the lack of side effects[(2,3)]. Seed extracts, leaves, stems and roots of various medicinal plants have been used in folk medicinal applications in resistance to various types of germs and toxins of chemicals[(4)].

(Cympopogon*citratus*) is an antioxidant because of its many benefits, which has made it of great preventive and therapeutic importance and its introduction into pharmaceutical manufacturing instead of the use of chemical drugs. It has been used in the treatment of fever, diarrhea, digestive , neurological, respiratory, blood pressure, gas expulsion, colonitis, cold, flu and rheumatic pain [(5)]. The oil of this plant has been used in the treatment of eczema [(6)] and in the elimination of fungi and types of bacteria[(7)]

The importance of this plant is concentrated in its leaves, which contain lemon oil, which contains many compounds, the most important of which is citral, which ranges from 85-65% of the percentage of essential oils of the type *Cymbopogon citratus*[(8,9)]

2- Triglycerides

Triglycerides consist of fatty acid esters (with glycerol alcohol) to form glycerides, which are calledneutral fats because they are non-chargeable as they do not dissolve in water due to their inability to form hydrogenbonds[21] .Triglycerides are an important source of energy, producing many times the energy that can be obtained from carbohydrates. High calcirides lead to high blood pressure and are present in the blood in order to transport two-way sugar andanimal fats in the blood from the liver[22]

3-High Density Lipoproteins (HDL-c)

It consists of a high percentage of protein with close proportions of phospholipids) and cholesterol with a small amount of triglycerides(Triglycerides)where the percentage off at is equal to the percentage of proteins [23]and the low rates of these proteins lead to an increased risk of heart disease, as they are good lipoproteins because they work to remove cholesterol and return it to the liver until it is re-secreted[24]

4-Low-DensityLipoproteins (LDL-c)

Thistypeoffatcontains 20% proteinand 80% fat.Thisfatis smaller in sizecompared to VLDL and ishigher indensity. Itis themaincarrierofcholesterolfrom theliverto therequiredtissues.Itis themainsourceofatherosclerosis,so it iscalled bad cholesterol[25]

5- VeryLow-Density Lipoproteins (VLDL-c)

Theseproteins are manufacturedinsidetheliver,where theyare ofmediumsize, andthe proteincontent is inwatts.Asforfats,theyarehigh, aswell astriglycerides and phospholipids,whichareinternallysourced [26].Theyaresynthesizedinside theliverandadipose tissue. Theprocess ofsynthesizingthisfat is associatedwith highlevels oftriglyceridesynthesis [27].

Materials and methods

Plant Preparation

The lemongrass plant was prepared from the agricultural areas adjacent to the city of Samarra, where it was thoroughly washed with water to remove the dust and dirt stuck in it, then washed again with distilled water and dried at a temperature of (37)˚C, then it was ground by the electric grinder and kept in special bottles at room temperature until use.

Preparation of Alcohol Extract

(100) g of boiling plant powder was weighed and placed in opaque glass bottles, and (400) cm3 of ethanol was added to it and mixed well, then left for 3 days to soak at laboratory temperature, then the solution was filtered, then the solvent was evaporated with a rotary evaporator device (50)˚C under vacuum pressure, then the extract was placed in the drying oven (Oven) for two hours at a temperature of (45)˚C to get rid of the solvent permanently, then the extract was kept in glass bottles and in moisture-free conditions and kept in the refrigerator until it is used in the biochemical study [28].

Medicinal and Therapeutic Uses of Lemongrass

Man has known since time immemorial that plants can be used for food and medicine, as he tried to use the surrounding plants spontaneously without treatment or filtering of the active substance as medicines for many diseases. The lemongrass plant was used by the pharaohs to treat many diseases, and this plant is still used in folk medicine in many countries of the world, including China, Brazil, Cuba, India, Egypt, and others [10]. He pointed out [11] that the lemongrass plant has many medical uses, the most important of which is: it is a painkiller because it contains Myrcene , and as a treatment for neurological disorders, and an anxiolytic agent because of its sedative properties [12]. The trend today has also become widely used as a treatment in the field of herbal medicine due to the limited availability of chemical drugs and the development of therapeutic resistance [13].

Liver Enzymes

Many of the biochemical events necessary for life may take place in a cell's natural environment because of enzymes, which are complex protein molecules that catalyze chemical reactions in biological systems. Due to the fact that the majority of enzymes are found in cells at concentrations significantly higher than those found in serum, any deviation from the expected range for enzyme concentrations in normal serum must represent changes in the equilibrium between the cellular rate of enzyme production and its rate of release or leakage, which in turn must reflect disease or health factors. The typical process of a cell's metamorphosis involves some degree of leakage. Cell secretions and normal cell turnover, also called catabolism.[14]Aspartate amino transaminase (AST), alkaline phosphatase (ALP), and alanine amino transaminase (ALT) are three liver enzymes that may be measured in blood to identify liver failure [15]. Liver enzyme activity levels, particularly ALT become unbalanced as a result of liver disease consequences, according to laboratory investigations [16].

Lipid

Fats are natural compounds that do not have the ability to dissolve in water, but they dissolve in organic solvents. These fats are of great importance as they enter the structure of cell walls. They are one of the most important means of obtaining and storing energy , aswell as entering the structure of hormones, especially steroid hormones. Many elements such as carbon, oxygen and hydrogen are included in their structure, while others contain phosphorus and nitrogen[17], which include:

1-Cholesterol

Cholesterol belongs to the group of steroidal compounds and contains 27 carbon atoms [18] and is found in the liver, brain, spinalcord and sources of cholesterol are either an external source through diets containing it orinternal sources, which can be obtained by synthesizing it inside the body, such as the possibility ofmaking itinside theliver[19] Highcholesterolleadstohighpressure,atherosclerosisa nd heart disease[20]

conducted, the serum was split into six equal portions and kept in little Eppendrof tubes at a temperature of (-20 ˚)C.

According to the approach utilized in the ready-made test kit developed by the Tunisian business (Bimaghreb), the research aimed to estimate the blood levels of total cholesterol (TC), triglycerides (TG), and high-density lipoprotein (HDL-c).

Also determined using [29] was the blood level of low-density lipoprotein (LDL-c) using the following equation:

LDL-c(mg/dl) =Total cholesterol - HDL-c - VLDL-c.

Along with the following methods for estimating VLDL levels using the Friedwaid equation [30]:

VLDL-c(mg/dl)=TG / 5

Liver function including ALT, ASTandLDH wasmeasuredintheblood using the methodused in the test kit prepared by the French company(Biolabo).

Estimating the level ofblood glucose using the color enzyme methodused in the ready-made examination kit prepared by the Tunisian company (Bimaghreb).

Statistical analysis

Statistical analysis was performed on the findings using the One-way analysis of variance test using the statistical tool 11Ver. Minitab.The statistical significance of the differences in the totals was ascertained by comparing the means using the Duncun multiple range test at a probability level (P≤ 0.05).

Results and Discussion

Table(1) shows the(mean±S.D) for (TC, TG, HDL-c, LDL-c, VLDL-c) intheblood serums oflocalmalerabbitstreated with thealcoholextract oflemongrass.

Laboratory Animal Experiment Design

We used mature male domestic rabbits in our investigation since their weights varied from (800-1750)g In the breeding and study period from November 2023 to March 2024, it was subjected to different concentrations of the alcohol extract of the lemongrass plant. It was housed in plastic cages with plastic covers and maintained a clean and sterile environment with a temperature range of (22–25)˚ C and a lighting period of(10–14) hours of light and darkness. For twenty-eight days, the animals were given an oral dosage of the extract at a rate of 1 cm^3/kg / day.

We dosed the animals with the alcohol extract of the lemongrass plant in the following ways after randomly dividing them into five groups of four each:

Control group - C: She was given only food and distilled water.

Group I -G1: Dosed daily with (1 cm^3/kg/day) of 10 mg /$cm^3$of alcohol extract

Group II-G2: Dosed daily with (1cm^3/kg/day) of 20 mg /$cm^3$of alcohol extract

Group III-G3:. Dosed daily with (1cm^3/kg/day) of 30 mg /$cm^3$of alcohol extract.

Group IV-G 4: Dosed daily with (1cm^3/kg/day) of 40 mg /$cm^3$of alcohol extract.

Collection of blood samples

Following the completion of the dosing period, the animals were allowed to starve for twelve hours. Following this, ten centiliters of blood were drawn by puncturing the heart using a disposable medical syringe. Shipped in anticoagulant-free, sterile, disposable plastic tubes. The samples were centrifuged at 2500 cycles per minute for 10 minutes to separate the serum. Before the biochemical tests included in the research were

Table (1) shows the (Mean ± S.D.) for (T.C, T.G, HDL-C, LDL-C, VLDL-C) in the blood serums of local male rabbits treated with the alcohol extract of lemongrass).

Groups	T.C mg/dl	T.G mg/dl	HDL-c mg/dl	LDL-c mg/dl	VLDL-c mg/dl
C	41.00±9.56	52.24±11.35	54.12±13.08	58.101±6.120	13.72±3.160
G1	28.41±8.09	40.82±9.14	60.19±3.551	56.213±11.233	8.107±2.03
P≤	0.01	0.01	0.01	N.S	0.01
G2	21.63± 3.15	51.16±12.03	62.285±4.081	47.127 ±10.01	13.10±2.15
P≤	0.01	N.S	0.01	0.01	N.S
G3	33.17±7.17	36.47±7.21	56.719±10.274	44.163 ±9.12	6.017±1.176
P≤	0.01	0.01	N.S	0.01	0.01
G4	25.22±6.18	39.18±9.24	62.134±6.410	45.21±7. 14	10.165±2.169
P≤	0.01	0.01	0.01	0.01	0.01

whereas group G3 did not vary significantly from the control group.

When comparing the levels of HDL-c in rats given lemongrass extract to those in the control group, he noted that the former had a morally superior effect [34].

Furthermore, as shown in Figure (4), the levels of LDL-c decreased significantly (P < 0.01) for groups G2, G3, and G4, but there was no significant change for group G1 when compared to the control group.

Furthermore, for groups G1, G3, and G4, the level of VLDL-c decreased significantly at the probability level (P < 0.01), however group G2 did not exhibit a significant change when compared to the control group, as shown in Figure (5).

In comparison to the control group, the lemongrass treatment group had significantly lower levels of LDL-c and VLDL-c, as shown in [35].

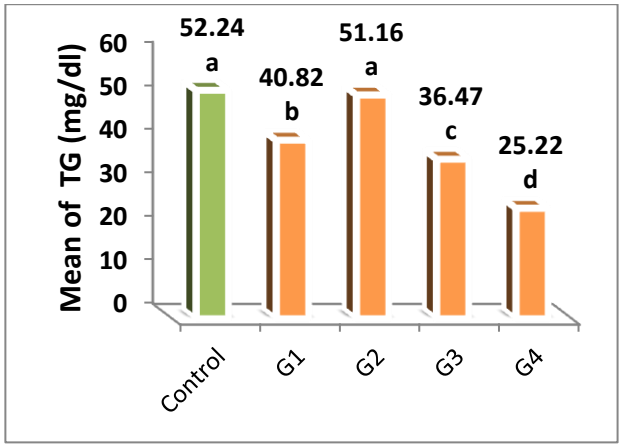
Table (1) shows that compared to the control group, groups G1, G2, G3, and G4 had significantly lower levels of total cholesterol at the probability level (P < 0.01), as shown in Figure (1).

Consistent with the findings of [31], which shown that the totals treated with the alcohol extract of lemongrass had lower cholesterol levels than the control group, the current findings demonstrate that this compound has similar effects.

Figure (2) shows that group G2 did not vary significantly from the control group, whereas groups G1, G3, and G4 all had a significantly lower TG level at the probability level (P < 0.01).

Results from [32,33] corroborated this, showing that rats given an alcohol extract of lemongrass had much lower triglyceride concentrations.

According to Figure (3), we also discovered that groups G1, G2, and G4 had a significantly higher level of HDL-c at the probability level (P < 0.01),



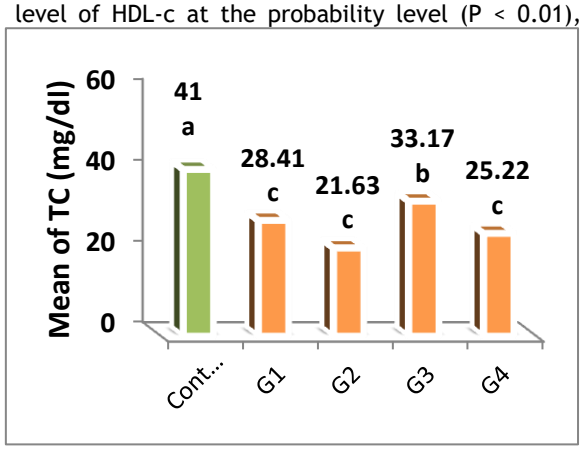
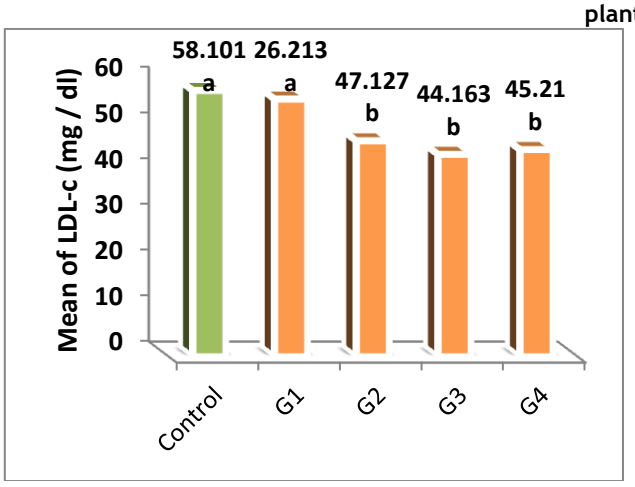


Figure (2) showsthratefor TG levels (mg/dl) inlocalrabbit malestreated withalcoholicextractoflemongrass plant

Figure (1)shows the rate for TC levels (mg/dL)In local rabbit malestreated withalcoholicextractof lemongrass plant



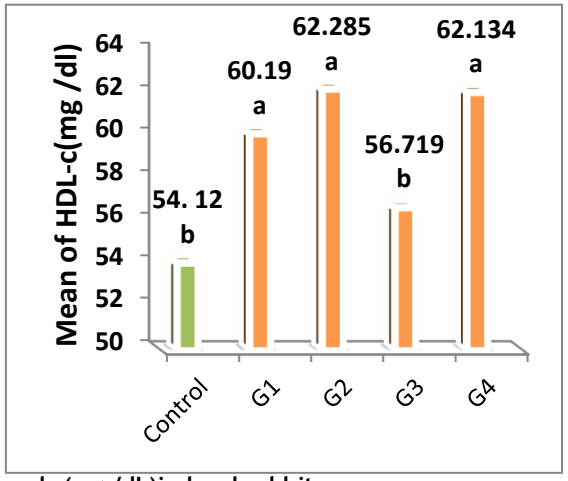


Figure (4) shows the rate for LDL-c levels (mg /dL)in local rabbit

Figure (3) shows theratefor HDL-c levels (mg/dL)in local rabbit males treated with the alcoholic extract of a plant Lemongrass males treated with the alcoholic extract of a plant Lemongrass

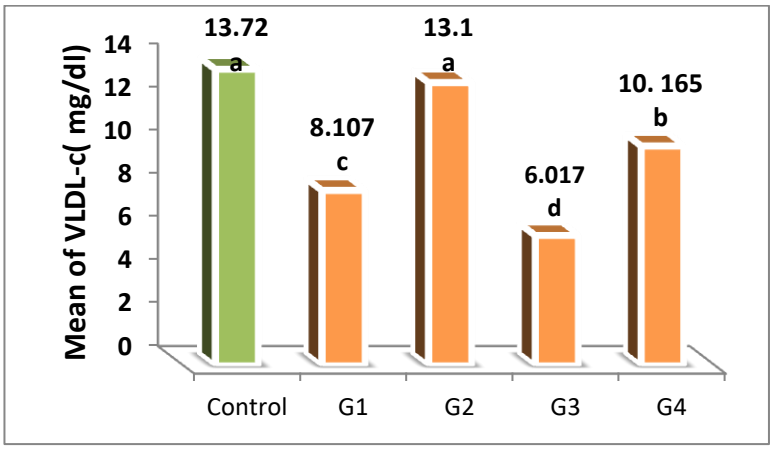


Figure (5) shows the rate of VLDL-c levels (mg /dL) in domestic rabbit males treated with the alcohol extract of lemongrass

gallbladder cholesterol production, lowering bile cholesterol saturation, and increasing stool fat output. Another function of flavonoids is to inhibit lipase. The lipase enzyme converts adipose tissue into saturated fatty acids, which are further converted into acetyl CoA, an enzyme that is a precursor to cholesterol. By blocking the action of lipase enzymes, flavonoids may reduce cholesterol levels and the synthesis of coenzyme A [37].

That many preparations or extracts of the lemongrass plant, including its leaves, stems, roots, or whole plant, may have the same anti-obesity effect, as can different methods of extraction, such as aqueous or ethanol, powder, dietary fiber, or essential oilthis approach naturally impacts the phytochemical content, which has benefits on obesity [38].

As shown in Table (2) (mean ± S.D.) for (AST, ALT, LDH, and glucose) in the blood serums of local male rabbits treated with alcohol extract of lemongrass.

Considering that secondary compounds obtained from plants, including saponins, sterols, and phenols, lower hyperlipidemia levels, the rising prevalence of obesity and fatty liver necessitates the use of chemically produced anti-hyperlipidemic medications, which are associated with significant adverse effects [36].

Plants have a significant role in the treatment of many illnesses due to their abundance of biologically active chemicals.

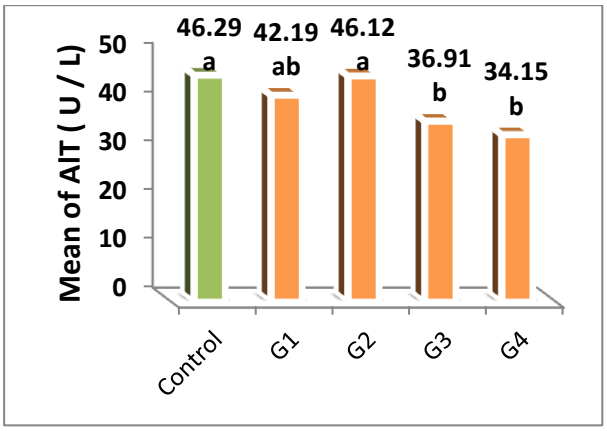
The pharmacological activity of the lemongrass ethanol extract against cholesterol was produced by the presence of secondary chemicals. There are substances having anticholesterol characteristics, according to research. These include flavonoids, steroids, tannins, and polyphenols. In vitro and in vivo studies have shown that flavonoids lower blood cholesterol levels. In vitro, it may block the action of the enzyme HMG CoA reductase, which controls the breakdown of cholesterol by increasing

Table(2)shows(Mean ± S.D)the level of Alt, AST, LDH, and glucose in local rabbit males and the treatment with alcohol extract of lemongrass).

Groups	AST U/L	ALT U/L	LDH U/L	Glucose mg/dl
C	37.42±8.331	46.290±9.100	1832.4±46.6	119.82±25.37
G_1	31.46±5.19	42.19±5.714	1715.0±63.6	98.371±12.812
P≤	0.01	0.01	0.01	0.01
G_2	30.16±4.841	46.121±10.4	1790.12±50.66	100.82±19.61
P≤	0.01	N.S	N.S	0.01
G_3	24.412±6.01	36.910±6.19	1610.41±40.87	95.623±19.381
P≤	0.01	0.01	0.01	0.01
G_4	37.11±7.721	34.15±4.316	1560.56±5.25	91.89±20.91
P≤	N.S	0.01	0.01	0.01

In addition to a significant decrease in the level of (LDH) at the level of probability($P \leq 0.01$) for the groups G1,G3 and G4, while the group G2 did not show a significant difference compared to the control group as in Figure (8).
A significant decrease in the level of glucose at the probability level ($P \leq 0.01$) of the groups G1, G2, G3 and G4 compared to the control group as in Figure (9).

As shown in the above table, we find a significant decrease in the level of (AST)at the level of probability($P \leq 0.01$) for the groups G1, G2 and G3, while the group G4 did not show a significant difference compared to the control group as in Figure (6).
As for the level of (ALP), it decreased morally at the level of probability($P \leq 0.01$) for the groups G1,G3 and G4, while the group G2 did not show a significant difference compared to the control group as in Figure (7).



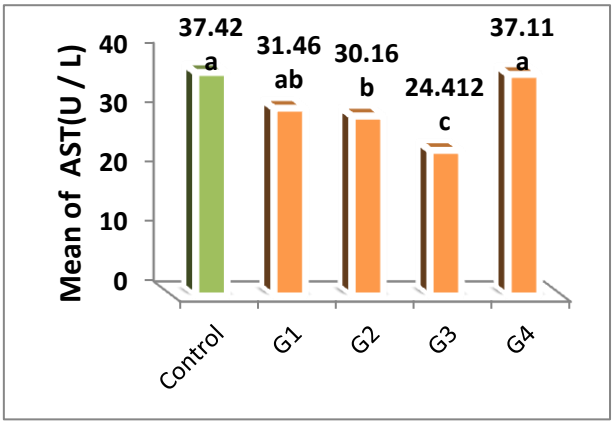
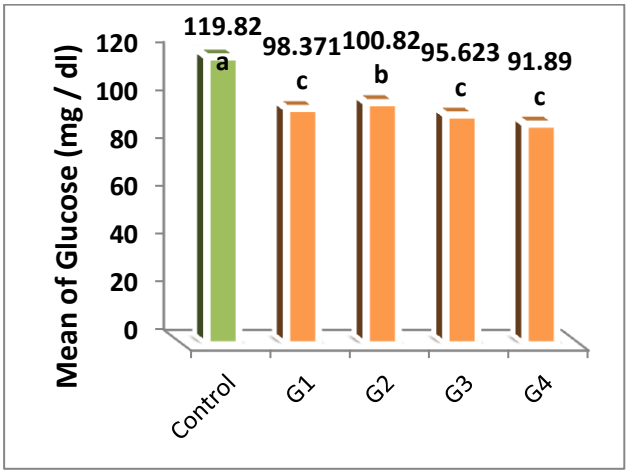


Figure (7) shows the rate for ALT levels (U/ L) in male local rabbits
Figure (6) shows the rate for AST levels (U /L) in malesLocal rabbits treated with the alcohol extract of the lemongrass plant treated with the alcohol extract of the lemongrass plant



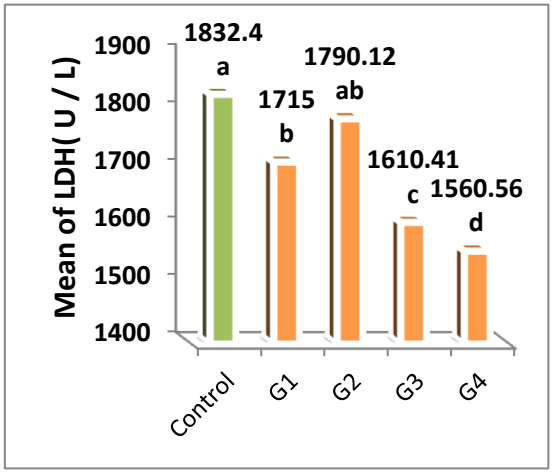


Figure (9) shows the rate of glucose levels (mg/ dL) in male Local
Figure (8) shows the rate of LDH levels (U/ L) in male local rabbits rabbits treated with alcohol extract of lemongrass planttreated with alcohol extract of lemongrass plant

with other cellular components [41]. When the liver is severely damaged, such in situations of drug overdose or viral hepatitis, the Alt level is increased. Another enzyme that is attached to liver cells is aspartate transaminase (AST), which is also called serum glutamate oxalate transaminase (SGOT) or aspartate aminotransferase. It is comparable to alt.Although high in situations of severe liver injury, [42]AST is not particular to the liver since it is also found in erythrocytes, cardiac muscle, and skeletal muscle.[43],Cymbopogoncitratus

In line with these findings, a study conducted on rats using an extract from the lemongrass plant found that the levels of ALT, AST, and LDH were reduced [39].
Biomarkers that may be used to assess the protective impact of medicinal plants include the activity of liver function enzymes.[40]Alanine aminotransferase, serum glutamate pyruvate transaminase, and Alt are all names for the same enzyme, which is present in the liver.It is detected in the blood when it seeps out of injured cells along

lemongrass may affect insulin levels, either by raising them [61] or by lowering them [60].

Conclusions

From our study, we conclude that there is a significant decrease in the level of fats, including (TC), (TG), (LDL-c),(VLDL-c) and a significant increase in the level of (HDL-c) in male local rabbits treated with alcohol extract of lemongrass plant compared to the control group. As for liver function, we find a significant decrease in the level of (AST), (ALT), (LDH) in addition to a decrease in the level of blood sugar in male local rabbits treated with alcohol extract of lemongrass plant compared to the control group.

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extract prevents serum aminotransferase and LDH leakage, which in turn preserves the plasma membrane structure. Simultaneously, the biochemical profile[44] shows that it boosts the liver's regeneration ability by lowering hepatic oxidative stress.The presence of reducing sugars, polysaccharides, and saponins in Cymbopogoncitratus gives the plant its antioxidant qualities; these, in turn, protect the rabbit liver. The findings of this study have led some to speculate[45] that the phenol content and activity of free radicals, which stabilize the membrane and preserve the proper function of hepatocytes, may be the primary mechanisms by which Cymbopogoncitratus extract protects the liver[46] .Phytoantioxidants such caffeic acid, isorentine-2-O-ramnoside, and chlorogenic acid are well-known. There have been reports that these phenolic chemicals may protect the liver.When the biochemical profile is reduced, it shows that the liver is protecting hepatocytes[47]. Reduced AST and ALT levels were seen in rats treated with Cymbopogoncitratus extracts [48].

As an alternative to synthetic chemical medications, natural products have become more popular for treating liver disease because of their safety and effectiveness. [49] The assessment of medicinal plants' potential toxicity to the liver and their ability to protect it involves pathological histological alterations in liver tissue, as well as the activities of AST, ALT, and LDH, among other associated indicators[50,51]

Based on our findings, Cymbopogoncitratus may include many bioactive components that give it its strong protective effects against liver damage.

Since he said that the lemongrass plant may safely lower blood sugar levels and is just as effective as typical pharmaceutical medications, low sugar is also in line with [52]. On top of that, lemongrass may control insulin levels and make the body more sensitive to insulin.

Since they noted that rats given an alcohol extract of lemongrass had a much lower blood sugar level, they also concur with [53, 54].

In addition to reducing the risk of developing type 2 diabetes, maintaining a steady blood sugar level is good for your health in general. Regulating blood sugar levels has an effect on one's disposition and vitality.[55] A prior research indicated that nondiabetic hyperglycemia may increase the risk of cardiovascular disease compared to a control group with lower glucose levels, showing that high glucose levels are associated with an increased risk of cardiovascular disease.[56]

There is encouraging evidence that lemongrass may inhibit alpha-glucosidase (AGI) [57] and reduce blood glucose levels (56).Research on both diabetic and non-diabetic animals has shown that bioactive components and extracts of lemongrass may considerably reduce blood glucose levels [54, 58]. Its ability to suppress oxidative stress and alpha-glucosidase (AGI) has been shown in several laboratory investigations. Insulin sensitivity was shown to improve after taking lemongrass in every study that looked at the topic[60]. A number of studies have shown that the bioactive properties of

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