Abstract
Liver fibrosis is a common serious disease in Egypt due to high incidence rate of infectious on liver diseases hepatitis. This study aims to extract Clove (*Syzygium aromaticum*) and its effect on liver fibrosis induced by CCl$_4$ in male rats. Adults male Wistar albino rats (140-180g) were randomly divided into six groups (10 rats each) as follows: group (1) normal rats act as control, group (2) rats oral administration of clove extract (CE) low dose (20 mg/kg) for 6 weeks, group (3) rats oral administration of clove extract (CE) high dose (40 mg/kg) for 6 weeks, group (4) rats those were subjected to injection intraperitoneal (IP) at a dose (5.0 mg/kg twice weekly) of CCl$_4$ for 6 weeks, group (5) rats CCl$_4$-induced liver fibrosis those were treated with oral (CE) low
dose (20 mg/kg/day) for 6 weeks and group (6) rats CCl₄-induced liver fibrosis those were treated with oral (CE) high dose (40 mg/kg/day) for 6 weeks. The results revealed that CE succeeded to decline the liver fibrosis–induced by CCl₄; there were evidenced by the significant reduction of Liver enzymes, urea, creatinine, total cholesterol, triglycerides, LDL, glucose coupled with marked improvement in serum albumin, total protein and HDL. So this study recommended to use clove in diets for it’s many benefits.

**Keywords** Clove, Antioxidant, Liver and kidney, Lipids profile, Rats

**INTRODUCTION**

Herbal medicinal products have been documented as a significant source for discovering new pharmaceutical molecules that have been used to treat serious diseases. Many plants species have been reported to have pharmacological activities attributable to their phytoconstituents such are glycosides, saponins, flavonoids, steroids, tannins, alkaloids, terpenes, *Gaber et al.*, 2020

Clove (*Syzygium aromaticum*) is an aromatic plant widely cultivated in tropical and subtropical countries. It is a herbal medicine and its active constituent *Syzygium aromaticum* L. *José et al.*, 2021), is also known as known by different vernacular names in different languages. It is known as qaranful (Arabic), Karamfil (Bulgarian) and Dingxiang (Chinese). It is an evergreen

2
tree with sanguine flowers belonging to the family *Myrtaceae* that grows in tropical climates and has been widely used in Chinese traditional medicines for over 2000 years (*Sahid et al., 2017* & *Bijoy and Suparna, 2021*).

Clove is rich in volatile compounds and antioxidants such as eugenol, beta-caryophyllene, and alpha-humulin. It has been employed for centuries as a food preservative and medicine because of its antimicrobial and antioxidant properties (*José et al., 2021*) also It is a common spice used as a flavoring and natural preservative in food industries due to its rich phenolic constituents like eugenol and eugenol acetate. These phenolic constituents possess enormous antioxidant activities, anti-glycation, antinociceptive and antimicrobial properties which enhance the bioactivities of clove spices. Several in vitro and in vivo assays have been conducted to ascertain the potential of clove spices as well as their cytotoxicity. Due to its beneficial effects, clove spices have been applied for use in agriculture as insecticides, anesthesia, antioxidants (*Solomon et al., 2021*).

Clove powder is used as a good dietary source of Mg, Na, Ca, K, P, S, Fe and Zn. Earlier reports in literature also revealed the presence of various macro and micronutrients in clove bud powder. *Prinewill–Ogbonna et al.*, (2019) revealed that macro nutrient sodium (Na) was (61.6 mg/100 g), K(111.6mg/100g) and Ca (117.5mg/100g) while phosphorus P(1.6mg/100g). *Pu et al., (2016)* reported according to Subramanian this was followed by calcium (5040mg/kg). Calcium (Ca) is important for regulating various cellular activities such as hormonal action, cellular
mortality, muscle function and blood clotting. It also helps in the absorption of dietary vitamin B, formation of teeth and bones. The liver is a critical organ in the human body that is responsible for an array of functions that help support metabolism, immunity, digestion, detoxification and vitamin storage among other functions. It comprises around 2% of an adult's body weight. The liver is a unique organ due to its dual blood supply from the portal vein (approximately 75%) and the hepatic artery (approximately 25%) (Arjun et al., 2022). Therefore, liver fibrosis is a dynamic pathological condition that can be slowed down in its initial phases. Without proper clinical management of fibrosis, progressive liver damage may lead to cirrhosis and ultimately to liver failure or primary liver cancer (Debanjan et al., 2020).

Chronic liver disease occurs worldwide irrespective of age, sex, region or race. Cirrhosis is a final outcome of variant liver diseases characterized by fibrosis and architectural distortion of the liver with the development of regenerative nodules and can have varied clinical manifestations and complications (Devadas et al., 2017).

This study aims to show the impact of feeding with clove extract on liver fibrosis in experimental rats.

Materials and methods

Materials

Plant materials

Clove (Syzygium aromaticum) was obtained from the local supplier (Abd El-Rahman Harraz, Bab El-Khalk zone, Cairo, Egypt).
Chemicals

Carbon tetrachloride (CCL$_4$), olive oil and ethanol were obtained from Sigma Aldrich (St. Louis, MO, USA).

Methods

Preparation of clove extract

Clove (Syzygium aromaticum) was dissolved in 95% ethanol (1:10 w/v); each 1g sample had been dissolved in 10ml of solvent and extracted on a shaker at 150rpm for 24h at room temperature. Mixtures were then filtered through a sterile layer of gauze to remove any solid plant materials and then through Whatman No. 1 filter paper. The filtrate was concentrated via an evaporation process which was carried out by using a rotary evaporator at 35–40°C, and then the extract was stored at −20°C until further use (Suleiman and Anas 2017).

Chemical methods

Determination of the gross chemical composition of clove

Moisture, ash, protein, crude fat and crude fiber were determined according to the method outlined by (A.O.A.C., 2010).

Carbohydrate content

The total carbohydrate content of the studied clove extract sample was calculated by difference 100 – (ash + protein+ fat + fiber) according to the method described in (A.O.A.C., 2010). The caloric value was calculated according to the methods of Seleet, (2010)

Determination of minerals content of clove
The total content of minerals was carried out using a mixture of perchloric acid/ nitric acids (HClO₄/ HNO₃) according to (Inductively Coupled Plasma Emission Spectrometry) the minerals, Calcium (Ca) and Potassium (P) were determined using the ICP (ICAP6200) according to (Isaac and Johnson, 2002). Sodium (Na) content was estimated using flame photometry (jenway PFP7) according to the procedure reported by (A.O.A.C., 2010).

Antioxidant of clove extract

Determination of total phenolic content (TPC)

The content of total phenolic compounds in the extracts was estimated according to Jayaprakasha et al., (2003).

Determination of clove extract radical scavenging activity (RSA)

The capacity of antioxidants in the extracts to quench DPPH radical was determined using the method of Nogala–Kalucka et al., (2005)

Experimental design

sixty adult male Wistar albino rats (Rattus norvegicus), weighing (140–180g) were obtained from the Animal Colony, National Research Centre, Giza, Egypt; the rats were kept in suitable plastic cages and maintained on free access to food and water for a week before starting the experiment for acclimatization; they received human care in compliance with the standard institution’s criteria for the care and use of experimental rats according to ethical committee of Faculty of Science, Al–Azhar University, Assuit, Egypt; however, this study was approved by the
same ethical committee. After the rats were acclimatized to experimental room conditions, they were divided randomly into six groups (10 rats each). Group (1): Comprised of normal healthy rats as a control group, group (2): Comprised of rats who were subjected to oral administration of (Clove extract) (CE) low dose (20 mg/kg/day) alone, group (3): Comprised of rats those were subjected to oral administration of (CE) high dose (40 mg/kg/day) alone, group (4): Comprised of rats those were subjected to injection (IP) at a dose of (5.0 mg/kg twice weekly) of CCL₄, group (5): Comprise of CCL₄-induced liver fibrosis rats those were treated with oral of low dose (20 mg/kg/day) CE and group (6): Comprise of CCL₄-induced liver fibrosis rats those were treated with oral of high dose (40 mg/kg/day) CE.

**Blood sampling**

At the end of the treatment period, rats fasted overnight, and following anesthesia with diethyl ether, 3–5 ml blood samples were withdrawn from the retro-orbital plexus using heparinized- sterile glass capillaries. Each blood sample was coolly centrifuged at 3000 rpm for 15 minutes and the serum was separated and stored at -80°C until biochemical determinations as soon as possible.

**Biochemical determinations**

Serum glucose was determined according to the method described by Young, (2001).

Serum triglycerides, total cholesterol, HDL-c and LDL-c were determined according to Cole et al., (1997). Artiss and

Serum proteins, albumin and globulin were determined according to the method described by Henry (1964) and Dumas (1971).

Serum ALT, AST, ALP, GGT and LDH were determined according to Schumann & Klauke, (2003). Moss and Henderson (1999), IFCC, (1983), Trinder, (1969) and Tietz et al., (1983); respectively.

Serum urea, uric acid and creatinine were determined according to the method described by Husdan and Rupoport, (1969), Trinder, (1969) and Chaney et al., (1960); respectively.

**Statistical analysis**

Statistical analysis was carried out according to Steel and Torrie, (1960).

**Results and discussion**

Gross chemical composition and caloric values of clove on a dry weight basis (g/100g)

**Table (1): Gross chemical composition and caloric values of clove on dry weight basis (g/100g)**
Carbohydrates were calculated by difference.

Mean of three replicates

The data in Table (1) revealed that moisture, ash, proteins, crude fat and crude fiber were 11.27%, 6.0%, 7.36%, 20.89% and 10.76% while, total carbohydrate and caloric value were 54.99% and 437.41K. ca/100g. The results agree with *Adebisi et al., (2021)* moisture, Crude fiber, ash and Total Carbohydrates (13.29±.01), (11.07±.01), (4.95±.10) and (61.92±.02); respectively. *Abd ulameed et al., (2022)* report that ash 7.23%, crude protein 7.53% and caloric values (437.41K.cal/100g). The clove data in this study are not in agreement with those obtained by *Al Jobair , (2022)* obtained that proximate analysis on clove were dry moisture (6.26 ± 0.1), ash (1.08 ± 0.01) crude protein (10.62 ± 0.1), crude fat 4.48%, crude fiber (15.48 ± 0.2), carbohydrate (65.31 ± 0.4). Variations in moisture contents, ash, protein, crude fiber, crude fat and carbohydrate due to several factors can these compositions such as climate and growing and postharvest management and processing conditions.
Minerals content of clove (mg / 100g)

Table (2): Minerals content of clove (mg/100g)

<table>
<thead>
<tr>
<th>Sample</th>
<th>Ca mg/100g</th>
<th>Na mg/100g</th>
<th>P mg/100g</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clove</td>
<td>8.05± 1.16</td>
<td>2.65± 0.96</td>
<td>2.23± 0.86</td>
</tr>
</tbody>
</table>

Mean of three replicates

The data given in Table (2) revealed that minerals content of clove recorded in Ca (8.05 mg/100g), Na (2.63 mg/kg) and P (2.25 mg/100g). These results agree with Prinewill–Ogbonna et al., (2019) reported that Ca (8.04 mg/100g), Na (2.44 mg/100g) and P (2.25 mg/100g).

Antioxidant of clove extract

Table (3): Clove extract yield (%), total phenolic content (TPC) and radical scavenging activity (RSA)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Yield (%)</th>
<th>TPC (mg/g)</th>
<th>RSA (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clove extract</td>
<td>16.3±0.12</td>
<td>45.4±0.41</td>
<td>75.4±6.1</td>
</tr>
</tbody>
</table>

The yield of 16.3%, total phenolic content (TPC) of 45.4mg/g and radical scavenging activity (RSA) 75.4% of the clove extract (CE) are shown in Table (3). The results agree with Bushra et al., (2016) who showed that CE exhibited an appreciable amount of total phenolics between 22.80 and 115.33 GAE mg/100g. Also, Mohamad et al., (2018) and Bastaki et al., (2017) showed that clove extract exhibited the highest
scavenging activity by inhibiting 77.2%. The reason is due to total phenolic acids are capable of removing free radicals, chelating metal catalysts; activating antioxidant enzymes, reducing \( \alpha \)-tocopherol radicals, and inhibiting oxidases. Mostly a direct relationship has been found between total phenolics and the antioxidant activity of plant extracts and fruits indicating that the phenolic compounds are the major contributor towards imparting antioxidant attributes to plants. The multiple biological activities of medicinal plants indicate their potential as a source of functional foods and nutraceuticals Singh et al., (2009).

Body weight gain

**Table (4): Effect of clove extract (CE) on body weight gain in rats (g/100g)**

The same column means with different superscript letters are significantly different at \( p \leq 0.05 \).

The effect of carbon tetrachloride (CCl\(_4\)) and clove extract (CE) on the rats' body weight is shown in **Table (4)**, the recorded results showed that rats treated with (CCl\(_4\)) had a significant decrease in body weight; while rats treated with clove extract alone showed a non–significant changes increase in body weight when all were compared with the rats of the control group. In addition, when rats treated with (CCl\(_4\)) companies with clove extract low and high dose showed a significant increase in body weight when compared with the animal group treated with CCl\(_4\) alone, reflecting the protective potential of the extract. After administration of the Syzygium
aromaticum extract to rats previously intoxicated by CCl₄, recording results showed increased body weight gain, the improvement of body weight gain suggested the beneficial effect of eugenol and there are some scientific reports supporting its effective body stimulant (Halder et al., 2011 & Anbu and Anuradha, 2012).

Effect of clove extract on the lipid profile of rats

Table (5): Effect of clove extract on the lipid profile of rats

The same column, means with different superscript letters are significantly different at (p≤0.05).
The obtained data showed that rats orally treated with CE (20 & 40 mg /kg ) for six weeks illustrated the non–significant change in total cholesterol, triglycerides, high dense lipoprotein–cholesterol and low dense lipoprotein–cholesterol; respectively. In contrast, the rats intoxicated with CCl$_4$ (0.5 mg/kg/weekly) only for a similar period showed a significant increase of total cholesterol, triglycerides, and low dense lipoprotein–cholesterol matched a significant decreased of high dense lipoprotein–cholesterol, when all were compared the control group. On the other hand, the rats treated with CCl$_4$ in combination with CE (20 & 40 mg /kg) showed a significant decrease in serum total cholesterol and triglycerides, matched with increased low density lipoprotein– cholesterol consecutively, when both were compared to the group with CCl$_4$ only Table (5). The current study revealed that CCl$_4$ disrupted lipid metabolism by increasing TC, TG, LDL–c
and lowering HDL–c and these findings matched with the previous work of (Shaban et al., 2022). Hypercholesteremia after CCl₄ administration may be attributed to hindering the β-oxidation of fatty acids (Mahmoodzadeh et al., 2017) and activation of the esterification process of lipid (Mesalam et al., 2021). On the same hand, hypertriglyceridemia is ascribed to the capability of CCL₄ to transfer the acetate into hepatocytes (Weber et al., 2003) and hinder the action of lysosomal lipase enzyme (Marimuthu et al., 2013). This study exposed elevation in the activity of transaminases after CCL₄ administration and that was allied to hyperlipidemia which interferes with liver function and also out flow of liver cytosolic content into the circulation due
to oxidative stress of CCL₄ that leads to imbalance between antioxidant and prooxidant system \( (Xu \ et \ al., \ 2021) \). These results were in accordance with the previous findings reported by \( (Haddar \ et \ al., \ 2021) \). Furthermore, clove \( (Syzygium \ aromaticum) \) extract significantly ameliorated hyperlipidemia and oxidative stress induced by CCL₄ resistance in rats \( (Sharma \ et \ al., \ 2012) \). The observed anti-lipidemic and antioxidant properties could be attributed to the presence of certain phytochemicals such as saponins and flavonoids which have been shown to possess antilipidemic and antioxidant activities. Eugenol, for example, isolated from \( Syzygium \ aromaticum \) was demonstrated to possess anti-lipidemic, antioxidant, and anti-inflammatory properties \( (Lakshmi \ and \ Manasa \ 2021 \ & \ Batiha \ et \ al., \ 2020) \). Hence, in hyperlipidemia conditions, consumption of S. aromaticum may help to reduce oxidative stress and even cleanse the blood vessels of lipid deposits, thereby slowing disease progression.

**Effect of clove extract on total protein, albumin, globulin and A/G ratio in rats.**
Table (6): Effect of (CE) on total protein, albumin, globulin and A/G ratio in rats.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Total protein (g/dl)</th>
<th>Albumin (g/dl)</th>
<th>Globulin (g/dl)</th>
<th>Ratio A/G</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Groups</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group (1) control</td>
<td>6.6±0.09&lt;sup&gt;A&lt;/sup&gt;</td>
<td>3.5±0.04&lt;sup&gt;A&lt;/sup&gt;</td>
<td>3.1±0.06&lt;sup&gt;A&lt;/sup&gt;</td>
<td>1.1±0.02&lt;sup&gt;A&lt;/sup&gt;</td>
</tr>
<tr>
<td>Group (2) CE (20 mg/kg)</td>
<td>6.8±0.10&lt;sup&gt;A&lt;/sup&gt;</td>
<td>3.83±0.32&lt;sup&gt;A&lt;/sup&gt;</td>
<td>3.0±0.06&lt;sup&gt;A&lt;/sup&gt;</td>
<td>1.1±0.06&lt;sup&gt;A&lt;/sup&gt;</td>
</tr>
<tr>
<td>Group (3) CE (40 mg/kg)</td>
<td>6.9±0.08&lt;sup&gt;A&lt;/sup&gt;</td>
<td>4.0±0.10&lt;sup&gt;A&lt;/sup&gt;</td>
<td>3.0±0.07&lt;sup&gt;A&lt;/sup&gt;</td>
<td>1.1±0.03&lt;sup&gt;A&lt;/sup&gt;</td>
</tr>
<tr>
<td>Group (4) CCL&lt;sub&gt;4&lt;/sub&gt; (0.5 mg/kg)</td>
<td>5.8±0.19&lt;sup&gt;C&lt;/sup&gt;</td>
<td>3.0±0.10&lt;sup&gt;C&lt;/sup&gt;</td>
<td>2.7±0.10&lt;sup&gt;C&lt;/sup&gt;</td>
<td>0.9±0.01&lt;sup&gt;C&lt;/sup&gt;</td>
</tr>
<tr>
<td>Group (5) CCL&lt;sub&gt;4&lt;/sub&gt;+ CE (20 mg/kg)</td>
<td>6.7±0.34&lt;sup&gt;D&lt;/sup&gt;</td>
<td>3.8±0.2&lt;sup&gt;D&lt;/sup&gt;</td>
<td>2.8±0.20&lt;sup&gt;D&lt;/sup&gt;</td>
<td>1.3±0.18&lt;sup&gt;D&lt;/sup&gt;</td>
</tr>
<tr>
<td>Group (6) CCL&lt;sub&gt;4&lt;/sub&gt;+ CE (40 mg/kg)</td>
<td>6.9±0.16&lt;sup&gt;D&lt;/sup&gt;</td>
<td>4.1±0.10&lt;sup&gt;D&lt;/sup&gt;</td>
<td>3.1±0.31&lt;sup&gt;D&lt;/sup&gt;</td>
<td>1.3±0.09&lt;sup&gt;D&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

The same column means with different superscript letters are significantly different at (p≤0.05).

The data revealed that rats orally treated with CE (20 & 40 mg/kg) for 6 weeks recorded non-significant changes in serum total protein and albumin levels. In contrast, the rats intoxicated with CCl<sub>4</sub> (0.5 mg/kg/weekly) only for a similar period showed a significant decrease, when all were compared to normal rats. Moreover, the rats treated with CCl<sub>4</sub> in combination with CE extract (20 & 40 mg/kg) significant increases in total protein and Albumin levels when all were compared to the corresponding...
values of CCl₄ treated rats Table (6). These results are consistent with the previously mentioned data of (Tsai et al., 2017). It is known the liver is the main organ involved in protein biosynthesis, chiefly albumin. Although CCl₄ induces hypoproteinemia, hyperalbuminemia was reported in our study and that may be due to the liver is not the only site of albumin creation, it can be synthesized in extrahepatic tissues such as the intestine, kidney pancreas, brain, and reproductive organs (Shevtsova et al., 2021). In harmony with our findings (Ojeaburu and Oriakhi, 2021) demonstrated significant elevation of serum albumin in CCl₄ rat model. Clove extract has been reported in previous studies as one of the strongest antioxidants, even higher than some synthetic antioxidants like BHT or butylatedhydroxyanisole (Misharina & Samusenko, 2008 and Wei et al., 2010). The strong activity of clove can be due to the presence of eugenol, the main constituent of this essential oil, which is known to have antioxidant activity and a protective effect against oxidative damage induced by CCl₄ (Wei et al., 2010).

Liver function:

Table (8): Effect of clove extract (CE) on serum ALT, AST, ALP, GGT and LDH (U/L) in rats
The same column means with different superscript letters are significantly different at \( p \leq 0.05 \).

The obtained data showed that rats orally treated with CE (20 & 40 mg/kg) for six weeks recorded non-significant changes in serum ALT, AST, GGT and ALP activities. In contrast, the rats intoxicated with CCl\(_4\) (0.5 mg/kg/weekly) only for a similar period showed a significant increase, when all were compared to normal rats. Moreover, the rats treated with CCl\(_4\) in combination with CE extract showed significant decreases in ALT, AST, GGT and ALP activities levels when all were compared to the corresponding
values of CCl$_4$ treated rats Table(7). In recent years and due to a lot of environmental stressors exogenous or endogenous, the liver becomes easily supposed to damage which may lead to acute or chronic liver disorders. CCL$_4$ is one of the hazardous poisonous chemicals that causes tissue destruction as it initiates secretion of reactive oxygen species (ROS) in all body tissues once a human or animal subjected to a single overdose or multiple low doses of it (Shahat et al., 2022). Clove (Syzygium aromaticum) supplementation was found to cause significant suppression of these activities, indicating its inhibitory effect on hepatotoxicity. Though clove essential oil has already been reported to effectively lower liver toxicity markers in CCl$_4$ induced hepatotoxicity (Al-Okbi et al., 2014), Many researchers report the plant extract contain chemical components can inter with the metabolism process and reported the role of certain flavonoids, triterpenoids and steroids in hepatoprotection against hepatotoxins. The presence of these certain compounds in Syzygium aromaticum is the reason of the protective effects of rat’s liver (Abd Al-azem et al., 2019).

Effect of clove extract on urea, creatinine and uric acid (mg/dl) in rats

Table (9): Effect of clove extract (CE) on urea, creatinine and uric acid (mg/dl) in rats.

The same column, means with different superscript letters are significantly different at (p≤0.05).
The results of this study showed that rats orally treated with CE for six weeks recorded a significant change in serum creatinine, urea and uric acid. In contrast, the rats intoxicated with CCl₄ (0.5 mg/kg/weekly) only for a similar period showed a significant increase in kidney function, when all were compared to normal rats. In addition, the rats treated with CCl₄ in combination with CE (20 & 40 mg/kg) showed significant decrease in serum creatinine, urea and uric acid when both were compared to that combination with CCl₄ only. Table (9). The present study revealed that chronic administration of CCl₄ caused marked impairment in renal function alongside significant oxidative stress in the kidney. Serum creatinine, urea and uric

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Urea (mg/dl)</th>
<th>Creatinine (mg/dl)</th>
<th>Uric acid (mg/dl)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group (1) control</td>
<td>54.3±2.2&lt;sup&gt;B&lt;/sup&gt;</td>
<td>0.64±0.9&lt;sup&gt;B&lt;/sup&gt;</td>
<td>5.1±0.17&lt;sup&gt;B&lt;/sup&gt;</td>
</tr>
<tr>
<td>Group (2)</td>
<td>49.7±4.2&lt;sup&gt;AB&lt;/sup&gt;</td>
<td>0.66±0.03&lt;sup&gt;B&lt;/sup&gt;</td>
<td>4.9±0.2&lt;sup&gt;B&lt;/sup&gt;</td>
</tr>
<tr>
<td>Group (3)</td>
<td>45.0±2.0&lt;sup&gt;B&lt;/sup&gt;</td>
<td>0.68±0.05&lt;sup&gt;B&lt;/sup&gt;</td>
<td>4.5±0.7&lt;sup&gt;B&lt;/sup&gt;</td>
</tr>
<tr>
<td>Group (4)</td>
<td>89.5±3.6&lt;sup&gt;C&lt;/sup&gt;</td>
<td>1.92±0.14&lt;sup&gt;C&lt;/sup&gt;</td>
<td>6.3±0.5&lt;sup&gt;C&lt;/sup&gt;</td>
</tr>
<tr>
<td>Group (5)</td>
<td>64.8±2.6&lt;sup&gt;A&lt;/sup&gt;</td>
<td>0.92±0.03&lt;sup&gt;A&lt;/sup&gt;</td>
<td>4.13±0.31&lt;sup&gt;A&lt;/sup&gt;</td>
</tr>
<tr>
<td>Group (6)</td>
<td>57.3±4.2&lt;sup&gt;A&lt;/sup&gt;</td>
<td>0.83±0.05&lt;sup&gt;A&lt;/sup&gt;</td>
<td>4.6±0.2&lt;sup&gt;A&lt;/sup&gt;</td>
</tr>
</tbody>
</table>
acid concentrations were significantly higher in CCl$_4$–treated rats. On the other hand, traditional use indicates that clove has several therapeutic properties (Dashti and Morshed, 2009). So the major component of this herb which has been shown to have a pharmacologic effect is a eugenol (Gang et al., 2001). The current results clearly indicated that clove oil treatment a significant decrease in kidney markers (urea, uric acid and creatinine) compared with the CCl$_4$ group. Moreover, it succeeded to induce an improvement in kidney function. Our results are in agreement with the works of (Abdel Wahhab and Aly, 2005).

Conclusion

In conclusion, this study demonstrates that the effect of (CE) on serum glucose level, lipids profile, liver enzymes activities and kidney functions of rats feeding on (CE) was investigated. The obtained results observed that (CE) caused a reduction in serum glucose levels and significantly decreased serum lipids profile. Treatment with (CE) at different levels caused improvement in liver and kidney enzymes activities compared the control group. Therefore, it is recommended to take it daily.

References:


toxicity in rats, Journal of Pure and Applied Microbiology, 13(1)


(2021): Putative abrogation impacts of ajwa seeds on oxidative damage, liver dysfunction and associated complications in rats exposed to carbon tetrachloride, Mol Biol Rep, 48(6): 5305–5318


Yang, S. H. (2022): Renoprotective and cardioprotective potential of moricandia sinaica (Boiss.) against carbon tetrachloride–induced toxicity in rats, Evidence–Based Complementary and Alternative Medicine, 1–12.


importuna polysaccharides alleviate carbon tetrachloride–
Induced hepatic oxidative Injury in mice, Front Physiol, 12.

Young, D.S. (2001): Effects of disease on clinical lab tests. 4th

تأثير التغذية بمستخلص القرنفل على التليف الكبد في فئران التجارب
سعاد محمد عمر 1، هند محمد علي 1، محمود عشري 2، أميرة محمود سيد 3
التغذية وعلوم الأطعمة، كلية التربية النوعية، جامعة أسوان، مصر
قسم الفسيولوجيا، كلية العلوم، جامعة الأزهر، مصر
بكالوريوس، التربية النوعية، قسم الاقتصاد المنزلي، جامعة أسوان، مصر

الملخص
تليف الكبد مرض خطير شائع في مصر بسبب ارتفاع معدل الإصابة بأمراض الكبد.
تهدف هذه الدراسة إلى استخلاص القرنفل ومعرفة تأثيره ضد تليف الكبد الناجم عن
رابع كلوريد الكربون في ذكور الفئران. تم تقسيم ذكور الفئران ويست البيضاء البالغة
(0.145-0.180 جم) بشكل عشوائي إلى ست مجموعات (10 فئران لكل مجموعة) على
النحو التالي: مجموعة (1) فئران طبيعية تعمل كمجموعة ضابطه، مجموعة (2) فئران
تتناول عن طريق الفم مستخلص القرنفل جرعة منخفضة (50 مجم / كجم) لمدة 6 أسابيع، مجموعة (3) فئران تتناول عن طريق الفم مستخلص القرنفل بجرعة عالية
(100 مجم / كجم) لمدة 6 أسابيع، مجموعة (4) مجموعة فئران تعرضت للحقن
بالبطن بجرعة (50 مجم / كجم مرتين أسبوعيا) من رابع كلوريد الكربون لمدة 6 أسابيع،
mجموعة (5) فئران حقنت برابع كلوريد الكربون عولجت بجرعة منخفضة عن طريق
الفرم (20 مجم / كجم / يوم) لمدة 6 أسابيع ومجموعة (6) فئران حقنت برابع كلوريد
الكربون عولجت بجرعة عالية عن طريق الفم (40 مجم / كجم / يوم) لمدة 6 أسابيع.
أظهرت النتائج أن مستخلص القرنفل نجح في تقليل تليف الكبد الناجم عن رابع كلوريد
الكربون؛ تم إثبات ذلك من خلال الإختبار الكبير في انزيمات الكبد والبسبوريا
والكريبتينات والكولستيروال الكلي والدهون الثلاثية و الكولستيروال منخفض الكثافة
والجلوكوز إلى جانب التحسن الملحوظ في الألبومين والبروتين والكولسترول عالي
الكثافة. لذا توصي الدراسة باستخدام القرنفل في الغذاء لما له من فوائد عديدة.

31
الكلمات المفتاحية
القرنفل، مضادات الأكسدة، وظائف الكبد والكلى، دهون الدم، الفئران.