Effect of Turmeric & Ginger on Lipid Profile in Male Rats Exposed to Oxidative Stress

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ABSTRACT
The present study aimed to investigate the effect of turmeric & ginger on lipid profile of male rats exposed to oxidative stress induced by hydrogen peroxide H2O2 at a concentration of 1% given with consumed drinking water to male rats. Methods: 200 mg/kg from turmeric & ginger were used, and the animals were treatment for 30 days. Results: the results showed a significant increase in cholesterol, triglycerides, low density lipoprotein (LDL), very low density lipoprotein (VLDL), whereas it explained a significant decrease in high density lipoprotein (HDL) of male rats exposed to oxidative stress when compared with control group. the results showed a significant decrease in cholesterol, triglycerides, (LDL), (VLDL), whereas it explained a significant increase in (HDL) of rats treated with turmeric & ginger at dose 200 mg/kg when compared with male rats exposed to oxidative stress.

Keywords: Turmeric, Ginger, lipid profile, oxidative stress.

INTRODUCTION
Turmeric (Carcuma longa) is extensively used as a spice, food preservative and colouring material in India, China and South East Asia. It has been used in traditional medicine as a household remedy for various diseases, including biliary disorders, anorexia, cough, diabetic wounds, hepatic disorders, rheumatism and sinusitis. For the last few decades, extensive work has been done to establish the biological activities and pharmacological actions of turmeric and its extracts1. Ginger (Zingiber officinale) is a member of the family of plants that includes cardamom and turmeric. The strong aroma of ginger is the result of pungent ketones including gingerol, the extract that primarily has been used in research studies. It is categorized as a food additive by the us food and drug administration2. Ginger is example of botanicals which is gaining popularity amongst modern physicians and its underground rhizomes are the medicinally useful part3. Ginger rhizome has been used in traditional herbal medicine. Ginger has enormous health promoting potential effects in number of ailments including degenerative disorders (arthritis and rheumatism), digestive health (indigestion and constipation), cardiovascular disorders, diabetes mellitus and cancer. Also it has anti-inflammatory properties, which are beneficial in controlling the process of aging. Moreover, it has antimicrobial potential, which can help in treating infectious diseases and helminthiasis4,5. Many studies were carried out on ginger and its pungent constituents, fresh and dried rhizome. Among the pharmacological effects demonstrated are anti-platelet, antioxidant, anti-tumour, anti- rhinoviral, anti-hepatotoxicity and anti-arthritic effect6. The exposure to stress situations can stimulate numerous pathways, leading to increased production of oxygen free radicals generate a cascade producing lipid peroxidation. Lipid peroxidation is one of the main events induced by oxidative stress. Lipid peroxidation can produce a range of enzymatically damaging consequences. Extensive lipid peroxidation is shown to cause membrane disorganization, by peroxidizing mainly the polyunsaturated fatty acids and phospholipids leading to alterations in the ratio of polyunsaturated fatty acids to other fatty acids. Thus, lipid peroxidation is considered as a serious consequence of free radical toxicity leading to profound changes in the membrane structure and function that may even cause cellular death7. The study aimed to investigate the capacity of turmeric and ginger in preventing oxidative stress induced by hydrogen peroxide H2O2 at a concentration of 1% given with drinking water to male rats.

MATERIALS AND METHODS
Experimental design
The study was carried out on twenty four mature male rats (Rattus norvegicus), aged as 10-12 weeks and weighing between 180 - 200 gm were procured from Department of Biology, College of Science, University of Thi Qar, Iraq. The animals were housed in a well ventilated 12 hrs light and 12 hrs dark cycles. The animals were divided into four equal groups, each group consist of8 rats:
The first group (control group) was treated with free drinking water, for 30 days.

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Table 1: Effect of Turmeric & Ginger on lipid profile in male rats exposed to oxidative stress.

<table>
<thead>
<tr>
<th>Animal groups</th>
<th>Cholesterol</th>
<th>T.G</th>
<th>HDL</th>
<th>LDL</th>
<th>VLDL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mg/dl</td>
<td>Mg/dl</td>
<td>Mg/dl</td>
<td>Mg/dl</td>
<td>Mg/dl</td>
</tr>
<tr>
<td>First group</td>
<td>87.83±0.94a</td>
<td>63.00±1.23a</td>
<td>52.16±1.37a</td>
<td>27.16±0.94a</td>
<td>13.83±0.47a</td>
</tr>
<tr>
<td>Second group</td>
<td>238.66±4.55b</td>
<td>177.00±1.77a</td>
<td>36.33±1.56c</td>
<td>48.66±0.33b</td>
<td>21.66±0.40a</td>
</tr>
<tr>
<td>Third group</td>
<td>221.16±2.50b</td>
<td>84.83±1.55b</td>
<td>44.16±1.74b</td>
<td>42.16±0.54b</td>
<td>18.83±0.54b</td>
</tr>
<tr>
<td>Fourth group</td>
<td>99.50±2.24c</td>
<td>76.50±0.84c</td>
<td>40.00±1.18b</td>
<td>37.66±0.42c</td>
<td>16.16±0.54c</td>
</tr>
<tr>
<td>LSD</td>
<td>12.0</td>
<td>8.0</td>
<td>3.0</td>
<td>4.0</td>
<td>2.0</td>
</tr>
</tbody>
</table>

Values are means ± S.E.
Different letters refer to significant differences at (p<0.05).
Same letters refer to no significant differences at (p<0.05).

The second group was treated daily with 1% hydrogen peroxide and 99 ml of drinking water for 30 days.
The third group was treated daily with (200mg) of turmeric dissolved in (200ml) of drinking water(1ml hydrogen peroxide and 99 ml of drinking water) for 30 days.
The fourth group was treated daily with (200mg) of ginger dissolved in (200ml) of drinking water(1ml hydrogen peroxide and 99 ml of drinking water) for 30 days.

Blood collection
After 30 days of treatment, the animals were sacrificed. Blood samples were collected by cardiac puncture, 5mL of blood were drawn from each animal of experimental groups, and put in tubes without EDTA, centrifuged at 3000 rpm for 15 minutes, and then serum was separated and kept in the refrigerator at -20°C until the time of assay.

Measurement of serum lipid profile
The used reagents were supplied by Biolabo (France), and serum total cholesterol was measured according to Allan and Dawson8 and Serum TG was measured according to Tietz et al.9. While serum HDL was measured according to Lopes-Virella10, and measurement of LDL and VLDL according to Friedwald et al.11. LDL and VLDL concentration was measured as follows:

LDL = total cholesterol – (HDL + VLDL)  
VLDL = serum TG / 5

Statistical analysis
Statistical analyses were done utilizing the computer data processing (SPSS, version 14). A probability value (P<0.05) was considered to be statistically significant, and used to calculate least significant difference (LSD) values for the comparison of means following.

RESULTS
The results showed a significant increase (p<0.05) in the level of cholesterol and TG of the male rats exposed to oxidative stress when compared with control group (table 1), while the rats treated with turmeric & ginger at dose 200 mg/kg showed a significant decrease (p<0.05) in the level of cholesterol and TG of the male rats when compared with male rats exposed to oxidative stress (table 1). There was a significant decrease (p<0.05) in the serum level of HDL of the male rats exposed to oxidative stress when compared with control group(table1). While, male rats treated with turmeric & ginger at dose 200 mg/kg showed a significant increase (p<0.05) in the level of HDL of the Turmeric & Ginger when compared with male rats exposed to oxidative stress (table1). The results indicated a significant increase (p<0.05) in plasma LDL, VLDL of the male rats exposed to oxidative stress when compared with control group (table1), while, male rats treated with turmeric & ginger at dose 200 mg/kg showed a significant decrease (p<0.05) in plasma LDL, VLDL compared with male rats exposed to oxidative stress and control group (table1).

DISCUSSION
Stress is called pressure, is a common phenomenon that is often experienced by individuals in their daily lives. Among the conditions that can lead to stress conditions is a heavy workload, conflicts in relationships, serious financial problems and so on12. Stress is known to bring negative impact on the mind and body. Exposure to repeated or prolonged stress can lead to excessive exposure to stress hormone that increases the risk of various health problems13. The herbal drugs have been prescribed widely because of their effectiveness, fewer side effects and relatively low cost14. Several studies revealed the benefits of medical plants like Turmeric or Ginger which showed reduction hyperlipidemic effect. In the present study, the male rats exposed to oxidative stress showed very highly significantly increase the level of cholesterol, TG, LDL and VLDL levels accompanied by a very highly significantly decrease in serum HDL level when compared with control group. A similar result reported that male rats exposed to oxidative stress used hydrogen peroxide in a dose of 1% had a negative effect in lipid profile levels when compared with normal rats15. Treatment of rats with turmeric and ginger exhibited remarkably ameliorated effects in all lipid profile parameters, turmeric significantly lower cholesterol, TG, LDL-C, VLDL-C levels and improved HDL-C level as compared with diabetic untreated rats. Moreover, the improvement effect of turmeric & ginger in cholesterol and TG levels in rats when compared with untreated diabetic rats16,17. Turmeric is effective in inhibiting lipid synthesis, storage, and stimulating fatty acids degradation, these effects mediated by regulating the activities of several key enzymes and the expression of transcription factors that regulate lipid metabolism18. Turmeric in hypolipidemic activities could be mediated through cholesterol catabolism by the stimulation of hepatic cholesterol- 7α-hydroxylase activity, and this step converts cholesterol to...
bile acid, which is important pathway in the degradation of cholesterol\textsuperscript{19}. The reduction in hypolipidemic activities of ginger may be explained by Han et al.,\textsuperscript{20} who found that increased the faecal excretion of cholesterol, suggesting that Ginger may block absorption of cholesterol in the gut. Moreover, Nammi et al.\textsuperscript{21} mentioned that the hypocholesterolemic effect of ginger may be attributed to inhibition of cellular cholesterol synthesis, results in augmenting the LDL receptor activity, leading to the elimination of LDL from plasma thus modifying lipoprotein metabolism.

**CONCLUSION**

This study demonstrated the role of turmeric and ginger significantly reduction in hyperlipidemic effect in male rats exposed to oxidative stress. Therefore, it recommended that dietary turmeric and ginger could be excellent adjuvant support in the therapy of hyperlipidemic and prevent its complications.

**REFERENCES**