Efficacy of Clove Oil in Modulating Radiation-Induced Some Biochemical Disorders in Male Rats

A. S. Nada

National Centre for Radiation Research and Technology (NCRRT), Atomic Energy Authority, P.O. Box: 29, Nasr City
E-mail: Ashnada59@hotmail.com
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ABSTRACT

The current study was conducted to evaluate the possible modulating efficacy of prolonged oral administration of clove oil against gamma irradiation-induced some biochemical disorders in male rats. Clove oil was orally administrated in a concentration of 200 mg/kg body wt daily for 21 days before irradiation at a single dose of 7 Gy and for 7 days post exposure. Transaminases (AST & ALT), alkaline phosphatase (ALP), lipid profile; cholesterol, triglycerides (T.G) and low density lipoprotein (LDL) as well as serum glucose level were determined. Also, liver reduced glutathione (GSH) content and lipid peroxidation were estimated in addition to the hepatic concentration levels of some trace elements (Fe, Cu, Zn, and Se). Rats exposed to ionizing radiation revealed transaminases disorders, lipid abnormalities, elevation in serum glucose, ALP activity as well as liver TBARS. A sharp drop in glutathione was recorded. Also, radiation induced alteration in hepatic trace element contents. The obtained data show that rats treated with clove oil before and after whole body gamma irradiation exhibited significant amelioration in liver marker enzymes, serum glucose and lipids as well as noticeable improvement in liver glutathione contents. Clove oil was also effective in minimizing lipid proxidation and trace element alteration induced by irradiation. It could be concluded that clove oil exerts a beneficial protective role against gamma irradiation.

Keywords: Clove oil, gamma rays, trace element, antioxidants, rats.

INTRODUCTION

Oxidative stress has been implicated in various human degenerative diseases, such as atherosclerosis\(^1\), cancer\(^2\), parkinsons diseases\(^3\) and Alzheimers disease\(^4\). All types of ionizing radiation generate ions which can lead to the formation of free radicals and reactive oxygen species (ROS). Thus,
ionizing radiation is a pro-oxidant \(^5\). Increased oxidative damage has been demonstrated after radiation exposure in various *in vivo* and *in vitro* studies \(^6\). Oxidative damage is related to the development of several diseases. An improved antioxidant defense may therefore protect against these diseases. Recent studies have demonstrated that dietary plant contains several hundred different antioxidants \(^7\). Herbs spices have a traditional history of use, with strong roles in cultural heritage, and in the appreciation of food and its link to health. Demonstrating the benefits of foods by scientific means remains a challenge, particularly when compared with standards applied for assessing pharmaceutical agents \(^8\). Diet can modify the patho-physiological processes of various metabolic disorders and can be an effective preventive strategy for various disease processes most of which are known to involve oxidative damage. Both nutrient and non-nutrient components of the diet have been recognized for their antioxidant and other potential benefits. Plant foods contain phytochemicals such as flavonoids, phenolic acids, etc, which show biological activity \(^9\). Clove oil is an essential oil from the dried flower buds, leaves and stems of the tree *Syzygium aromaticum* (Estern Hemisphere) or *Eugenia caryophyllata* and *Eugenia aromaticum* (Western Hemisphere) \(^10\). Clove oil is used as a topical application to relieve pain and to promote healing and also finds use in the fragrance and flavouring industries. The main constituents of the essential oil are phenylpropanoids such as carvacol, thymol, eugenol and cinnaldehyde \(^11\).

The biological activity of clove oil has been investigated in several purposes, including antioxidant properties \(^12, 7\). Free radical scavenging ability \(^13, 14\), it has antifungal activity \(^11\), metal chelation \(^15\), neuroprotection \(^16, 17\), antidiabetic \(^18\), local anesthetic activity \(^19\), it has been reported as an antihistaminic \(^20\), anti-inflammatory \(^21\), antilipidperoxidation \(^22\), reno and cardioprotective agent \(^23\), hepato-protection \(^24, 25\), in addition to sexual activity \(^26\). Also, many investigators demonstrated the radio-protective properties of clove oil or extract against oxidative stress induced by gamma irradiation \(^27-30\).

In view of these considerations, the present study was carried out to evaluate the possible protective effect of clove oil against radiation-induced some biochemical disorders in male rats.

**MATERIAL AND METHODS**

**Experimental animals**

Male albino rats (Sprague Dawely Strain) weighing \((120 \pm 15 \text{ g})\) were obtained from the Egyptian holding company for Biological Products and
Vaccines. Animals were kept under good ventilation and illumination condition and allowed balanced standard diet and free access to tap water.

**Radiation Processing**

Whole body $\gamma$-irradiation was performed using 137Cesium biological irradiator source, Canadian $\gamma$-Cell-40, located at the NCRRT, Egypt. Animals were exposed to a single dose of whole body gamma –rays at a dose level of 7 Gy.

**Experimental design**

After adaptation period of one week, animals were divided into four groups, each of eight rats, Group 1, control, non-irradiate rats. Group 2, rats received clove oil 200 mg /kg body wt daily for 28 successive days. Group 3, rats were exposed to 7 Gy whole body gamma-irradiation as a single dose. Group 4, rats received treatment (clove oil) as group 2 for 21 days, then exposed to gamma-irradiation 7 Gy, followed by treatment with clove oil for 7 days after irradiation. Rats were sacrificed after 7 days of $\gamma$-irradiation.

**Biochemical analysis:**

Serum AST & ALT were determined according to Reitman and Frankel\(^{(31)}\), serum alkaline phosphatase ALP was determined according to King and Armstrong\(^{(32)}\), serum cholesterol, T.G. and LDL were measured according to Allian et al.\(^{(33)}\), Fossati and Principe\(^{(34)}\) and Demacker et al.\(^{(35)}\), respectively, serum glucose was determined according to the method of Trinder\(^{(36)}\). The lipid peroxidation products were estimated in the liver as TBARS according to Yoshioka et al.\(^{(37)}\) and GSH content was estimated according to Tietz\(^{(38)}\).

**Instrumentation**

Fe, Cu, Zn, Ca, Mg, Mn and Se were determined in clove plants and liver tissue samples after digestion in concentrated pure nitric acid and hydrogen peroxide in 5:1 ratio\(^{(39)}\). Sample digestion was carried out with acids at elevated temperature and pressure by using microwave sample preparation Lab. Station, MLS-1200 MEGA, Italy. The selected elements were then estimated by using SOLAR System Unicam 939, Atomic Absorption Spectrometer, England, equipped with deuterium background corrections and supplied with vapour system unit (Hydride Kit) for the estimation of volatile metals. All solutions were prepared with ultrapure water with specific resistance of 18 $\Omega \cdot\text{cm}^{-1}$, obtained from ELGA, Ultra Pure Water Station Deionizer Feed Water England. The biochemical assay was achieved by using Spectrometer Unicam 5626 U.V/VIS., England.
Statistical analysis

Student's t-test was applied for the statistical analysis of collected data to determine the probable level of significance. The differences were considered significant at $P < 0.05^{(40)}$.

RESULTS

The data collected from irradiated animals revealed that whole body gamma irradiation at a single dose (7 Gy), resulted in a significant elevation in transaminases (ALT & AST), alkaline phosphatase (ALP), lipids (cholesterol, T.G. and LDL) as well as glucose and lipid peroxidation, while a sharp drop in glutathione contents were recorded. The elevation in liver marker enzymes recorded percentage change from the control value corresponding to 30, 70 and 43 for ALT, AST and ALP, respectively (Table 1). Significant increase in serum lipid metabolites were observed (Table 2), recording percentage change from the control value of 82, 167 and 39 for cholesterol, TG & LDL, respectively. Radiation exposure also induced elevation in glucose level and TBARS levels by 46 and 45% of control value, respectively. While, depletion in glutathione recorded -34% (Table 3). The prolonged oral administration of clove oil (200 mg/kg b.wt) for 28 consecutive days induced non-significant changes in the parameters subjected to the present study (group 2).

On the other hand, supplementation of rats with clove oil for 21 days before irradiation and 7 days post-irradiation (group 4), induced significant amelioration in the levels of the above mentioned parameters when compared to the irradiated rats (group 3). These improvements were manifested by modulation of the radiation induced increase in ALT, AST, and ALP from 30, 70 and 43% to 8, 17 and 9.5% from control levels, respectively; furthermore, ALT and ALP were normalized. Clove oil also, promoted normalization of lipid abnormalities induced by irradiation. It turned the values of cholesterol, TG and LDL from 82, 167 and 39% to 42, 40 and 15% of control values, respectively and normalized LDL. Moreover, clove oil attenuated the increase in glucose level from 143% to 118% and minimized the elevation in lipid peroxidation from 45% to 11%. Clove oil remarkably promoted the glutathione contents from -34% to -17% of its control level.
Table (1): Effect of clove oil on liver marker enzymes (serum ALT, AST, ALP activities) in different animal groups

<table>
<thead>
<tr>
<th>Groups</th>
<th>ALT U/L</th>
<th>AST U/L</th>
<th>ALP U/L</th>
</tr>
</thead>
<tbody>
<tr>
<td>1- Control</td>
<td>29.4±0.54</td>
<td>45.75±1.824</td>
<td>168±1.98</td>
</tr>
<tr>
<td>2- Clove oil</td>
<td>28.5±0.803</td>
<td>47.88±0.90</td>
<td>170.13±1.81</td>
</tr>
<tr>
<td>% change</td>
<td>-3.1</td>
<td>4.6</td>
<td>1.2</td>
</tr>
<tr>
<td>3- Irradiated</td>
<td>38.3±1.57*</td>
<td>77.63±2.02*</td>
<td>240±2.68*</td>
</tr>
<tr>
<td>% change</td>
<td>30.3</td>
<td>69.6</td>
<td>42.9</td>
</tr>
<tr>
<td>4- Irradiated + clove oil</td>
<td>31.75±0.98#</td>
<td>53.38±1.46*#</td>
<td>183.8±1.95#</td>
</tr>
<tr>
<td>% change</td>
<td>7.99</td>
<td>16.6</td>
<td>9.5</td>
</tr>
</tbody>
</table>

Each value represents the mean ± SE of 8 observations.
* Significant difference compared to the value of control
# Significant difference compared to irradiated rats
% change from control value

Table (2): Effect of clove oil on serum lipid metabolites (mg/dL) in different animal groups

<table>
<thead>
<tr>
<th>Groups</th>
<th>Cholesterol</th>
<th>T.G.</th>
<th>LDL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1- Control</td>
<td>51.38±0.99</td>
<td>44.75±0.86</td>
<td>28.13±0.79</td>
</tr>
<tr>
<td>2- Clove oil</td>
<td>50.5±1.04</td>
<td>43.38±0.91</td>
<td>27.12±0.77</td>
</tr>
<tr>
<td>% change</td>
<td>-1.8</td>
<td>-3.02</td>
<td>-0.1</td>
</tr>
<tr>
<td>3- Irradiated</td>
<td>93.4±1.68*</td>
<td>120.13±1.42*</td>
<td>38.63±0.87*</td>
</tr>
<tr>
<td>% change</td>
<td>81.7</td>
<td>167</td>
<td>39.3</td>
</tr>
<tr>
<td>4- Irradiated + clove oil</td>
<td>72.75±1.18##</td>
<td>63.0±1.414*#</td>
<td>32.3±1.10#</td>
</tr>
<tr>
<td>% change</td>
<td>41.5</td>
<td>40</td>
<td>14.8</td>
</tr>
</tbody>
</table>

Legends are as in Table (1)

Table (3): Effect of clove oil on serum glucose level, liver GSH and liver MDA in different animal groups

<table>
<thead>
<tr>
<th>Groups</th>
<th>Glucose (mg/dL)</th>
<th>GSH (mg/g)</th>
<th>TBARS (nmol/ g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1- Control</td>
<td>97.9±4.90</td>
<td>35.3±1.58</td>
<td>179.4±3.74</td>
</tr>
<tr>
<td>2- Clove oil</td>
<td>95.3±5.97</td>
<td>36.6±2.77</td>
<td>174.5±4.63</td>
</tr>
<tr>
<td>% change</td>
<td>-3.1</td>
<td>0.04</td>
<td>-2.7</td>
</tr>
<tr>
<td>3- Irradiated</td>
<td>142.9±6.13*</td>
<td>22.6±2.33*</td>
<td>259.9±5.40*</td>
</tr>
<tr>
<td>% change</td>
<td>46</td>
<td>-34.3</td>
<td>45.3</td>
</tr>
<tr>
<td>4- Irradiated+ clove oil</td>
<td>118.0±5.20*</td>
<td>29.0±2.28*#</td>
<td>199.13±5.60#</td>
</tr>
<tr>
<td>% change</td>
<td>20.5</td>
<td>-17.1</td>
<td>11.2</td>
</tr>
</tbody>
</table>

Legends are as in Table (1)

Radiation induced alteration in hepatic trace element contents. Iron and zinc were significantly increased by 137 and 43%, respectively, while copper and selenium were decreased by -20 & -14%, respectively (Table 4). Treatment with clove oil before and after irradiation restored the levels of hepatic
metalloelement compared to the irradiated animals. Clove oil attenuates the retention of iron and zinc from 137 and 43% of the control to 109 and 11%, respectively. It also restored the depletion in copper and selenium from -20 and -14% to -14 and 15% of the control, respectively.

Table (4): Effect of clove oil on the hepatic levels of trace elements (Fe, Cu and Zn \( \mu g/g \) fresh tissue) and Se (ng/g) in different animal groups

<table>
<thead>
<tr>
<th>Groups</th>
<th>Fe</th>
<th>Cu</th>
<th>Zn</th>
<th>Se</th>
</tr>
</thead>
<tbody>
<tr>
<td>1- Control</td>
<td>77.9±3.3</td>
<td>3.78±0.05</td>
<td>29.3±2.32</td>
<td>131.0±3.94</td>
</tr>
<tr>
<td>2- Clove oil</td>
<td>77.13±5.60</td>
<td>3.73±0.25</td>
<td>31.13±2.4</td>
<td>139.0±3.90</td>
</tr>
<tr>
<td>% change</td>
<td>-0.99</td>
<td>-1.4</td>
<td>6.3</td>
<td>6.1</td>
</tr>
<tr>
<td>3- Irradiated</td>
<td>185.8±5.60*</td>
<td>3.01±0.18*</td>
<td>41.8±3.96*</td>
<td>113.0±5.1*</td>
</tr>
<tr>
<td>% change</td>
<td>137.2</td>
<td>-20.4</td>
<td>42.7</td>
<td>-13.7</td>
</tr>
<tr>
<td>4-Irradiated+clove oil</td>
<td>163.0±4.14#</td>
<td>3.24±0.41#</td>
<td>32.4±2.8#</td>
<td>150±4.3#</td>
</tr>
<tr>
<td>% change</td>
<td>109</td>
<td>-14.3</td>
<td>10.6</td>
<td>14.5</td>
</tr>
</tbody>
</table>

Legends are as in Table (1)

Results in Table 5 showed considerable concentrations of Fe, Cu, Zn, Mn, Ca, Mg and Se in clove plant.

Table (5): Concentration levels of Fe, Cu, Zn, Mn, Ca, Mg (\( \mu g/g \)) and Se (ng/g) in clove plant

<table>
<thead>
<tr>
<th>Element</th>
<th>Concentration</th>
<th>Element</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fe</td>
<td>65.3±4.51</td>
<td>Ca</td>
<td>6271±16.1</td>
</tr>
<tr>
<td>Cu</td>
<td>4.90±0.17</td>
<td>Mg</td>
<td>6124±299</td>
</tr>
<tr>
<td>Zn</td>
<td>17.93±1.60</td>
<td>Se</td>
<td>205±12.8</td>
</tr>
<tr>
<td>Mn</td>
<td>563.7±24.0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Each value represents the mean of 3 sample ±SD

DISCUSSION

The present data revealed elevation in the level of liver marker enzymes (ALT, AST and ALP) in irradiated animals which reflect hepatocellular damage. This may be ascribed to the irradiation-induced damage to hepatic parenchymal cells as well as extrahepatic tissues with a subsequent release of the enzymes into the blood stream \(^{41}\). It may also, be attributed to the structural damage of radiosensitive organs such as spleen, lymph nodes, mature lymphocytes \(^{42, 43}\). Treatment with clove oil significantly attenuate these enzyme levels in
irradiated animals, this can be attributed to the presence of antioxidants in clove oil which contain phenolic compounds. Clove contains volatile oil that includes eugenol, acetyl eugenol, sequiterpenes (α and β caryophyllenes) and small quantities of esters, ketones and alcohol. Clove also contains tannins, sitosterol and stigmasterol. Clove has been reported to possess a potent antioxidant activity in vitro, which reduces the oxidative stress in the body. Many investigators demonstrated the hepatoprotective properties of clove against chemical stress as well as against physical stress. Also, the present data revealed significant elevation in lipid metabolites and acceleration in lipid peroxidation contents. This hyperlipidemia occurring due to exposure to ionizing radiation resulting in accumulation of cholesterol, triacylglycerols and phospholipids. Our results are in agreement with those of Markevich and Kolomitseva; Zahran et al.; Abady et al. and Nada, who reported an increase of lipid metabolites in plasma of irradiated rats. They attributed the hyperlipidemic condition to the stimulation of cholesterol synthesis in the liver after gamma irradiation. Bok et al. attributed this hypercholesterolemia to the increase in activation of HMG CoA reductase enzyme, the key regulatory enzyme in the reduction of the overall process of cholesterol synthesis. The increase in serum TG might result from inhibition of lipoprotein lipase activity, leading to reduction in the uptake of triacyl glycerols. While others attributed the hyperlipidemia induced by radiation to the degeneration effect on hepatic cells and biomembranes, resulting in releasing of structural phospholipids, and to mitochondrial dysfunctions. Treatment with clove oil significantly improved these hyperlipidemia conditions. Clove oil might lower the plasma free fatty acid, T G and cholesterol levels, and simultaneously reduced the hepatic fatty acid oxidation. These changes might be attributed to a suppression in the hepatic fatty acid synthase, glucose-6-phosphate dehydrogenase and also it may have been partly due to the decreased hepatic -3-hydroxy-3- methyl glutaryl Co-enzyme (HMG CoA) reductase and acyl CoA: cholesterol acyl transferase (ACAT) activities as documented by Abbady, Shyamala et al. and Younies, they reported that clove oil improved the levels of cholesterol, T.G. and phospholipids in serum of hyperlipidemic rats.

In the present study, irradiation induced elevation in TBARS, as an indication for lipid peroxidation. Extensive lipid peroxidation results in membrane disorganization by peroxidizing the highly unsaturated fatty acids,
which in turn alters the ratio of other polyunsaturated fatty acids leading to a
decrease in the membrane fluidity which may be sufficient to cause cell damage
\(^{58}\). Diplock et al.\(^ {59}\) attributed the increase in lipid peroxidation to the fact that
hexose monophosphate shunt (HMP) in rat liver is strongly inhibited, so that the
NADPH levels inside the cell is decreased. While, Zhang et al.\(^ {60}\) and Chen et al.
\(^ {61}\) attributed the acceleration in lipid peroxidation contents to the
peroxidation of the membrane unsaturated fatty acids due to free radical
propagation concomitant with inhibition of bio-oxidative activities. Clove oil
play an important role in the preventing the generation of ROS. It has
modulatory effect on iron–induced lipid peroxidation due to their polyphenolic
contents, strong reducing power and superoxide radical scavenging activity\(^ {15}\).
Lee and Shibamato\(^ {22}\) identified some aroma chemicals such as eugenol,
thymole and benzyl alcohol in the clove buds extract and examined them for their
inhibitory effect on TBARS formation. Clove aroma compounds exhibited the most
potent antioxidant activities in suppression of lipid peroxidation.

The present results indicated that rats exposed to gamma irradiation
caused an increase in serum glucose level. The hyperglycemic condition
induced by irradiation could be attributed to the inhibition of insulin secretion,
diminished utilization of glucose by irradiated tissue or to increase blood amino
acids level which is considered as an important source for glucose formation
through the processes of deamination and transamination\(^ {62}\). Also, the increased
glucose level may be related to endocrine abnormality induced by irradiation
that promote the secretion of biologically active peptides which has well
documented relation to carbohydrate metabolism by promoting gluconegesis
in liver\(^ {63}\). On the other hand, significant improvement in blood glucose
tolerance in rats treated with clove oil was observed. Clove oil is a known
antioxidant and is reported to prevent hyperglycemia in streptozotocin induced
diabetic rats\(^ {17}\). It is known that certain inorganic trace elements such as
vanadium, zinc, chromium, copper, iron, selenium, etc, play an important role in
the maintenance of normoglycemia by activating the beta cells of pancreas.
Table 5 displayed considerable amounts of trace element contents in clove
plant, the importance of these trace elements in disorders related to radiation is
also demonstrated\(^ {64}\). The possible mechanism for hypoglycemic effect of clove
oil might be attributed to the presence of eugenol and ferulic acid which
possesses pancreatic beta cell regenerative effect as well as antioxidant
properties. It might also be attributed to the prevention of protein glycation and
cortisol inhibiting potency\(^ {18,65}\).
GSH protects cells against irradiation–induced toxicity by detoxifying electrophiles, preventing oxidation of SH groups of proteins and by scavenging free radicals\(^{(66)}\). The present results revealed depletion in GSH contents of irradiated animals. The depletion in GSH may attributed to the enhanced utilization of the antioxidant system as an attempt to detoxify the free radicals generated by irradiation or to the diminished activity of glutathione reductase due to the deficiency or inactivation of glucose -6-phosphate dehydrogenase, the main supplier for NADPH which is necessary to change oxidized glutathione to its reduced form\(^{(67)}\). While Dahm et al.\(^{(68)}\) attributed the decrease in liver GSH to the inhibition of GSH efflux across hepatocytes impaired cellular membranes. Clove oil treatment, significantly prevented loss of hepatic reduced glutathione and increased its concentration. This could be attributed to the presence of phytochemicals contents which increases the induction of antioxidant status enzymes\(^{(69, 12)}\). It might also be attributed to the presence of essential trace element dependent enzymes such as Cu, Zn, Mn, SOD, catalase and selenoproteins\(^{(64)}\). These data confirm the previous results of Azab\(^{(27)}\) and Youneis\(^{(30)}\), they observed elevation in total antioxidant enzymes after treatment with clove oil.

The present data revealed alteration in the hepatic metalloelement contents. Copper and selenium were decreased while iron and zinc were increased. Previous irradiation studies have revealed marked alteration in trace elements metabolism\(^{(70-73)}\). The depression in the levels of hepatic Cu and Se may be attributed to excess utilization of these metalloelement dependant enzymes such as Cu, Mn SODs and selenoprotein enzymes\(^{(74-75)}\), the metalloelement depression attributed to the radiolytic loss of essential metalloelement cofactors which account for the loss of both Cu and Mn SODs following irradiation. While, Fee and Valentine\(^{(76)}\) and Sorenson\(^{(64)}\) attributed this metalloelement depression to the de novo syntheses of Cu-Mn SODs and catalase which prevent the formation of \(\cdot \)O and hydroxyl radicals associated with irradiation. The increase in the level of iron may be attributed to the inability of bone marrow to utilize the iron available in the diet and released from destroyed cells or may correspond to the time of recovery of erythrocyte functions in the irradiated animals\(^{(77)}\), while Kotb et al.\(^{(71)}\) suggested that accumulation of iron may result from disturbances in biological function of red blood cells. Radiation also induced accumulation in hepatic zinc. The protective effect of zinc against radiation hazards has been reported\(^{(78, 79)}\). The antioxidant role of zinc could be related to its ability of induce metallothionein (MTs)\(^{(80)}\).
There is an increasing evidence that MT can reduce the toxic effect of several types of free radicals including superoxide, hydroxyl and peroxyl radicals. Nada et al. suggested that redistribution and acceleration of zinc metabolism have stimulated the defense mechanism against radiation damage. On the other hand, treatment with clove oil minimized the alteration in hepatic trace element contents induced by irradiation. Regarding the main principal constituents of clove plants, considerable concentration of essential trace element were identified (Table 5). These essential trace elements are involved in multiple biological processes as constituents of enzymes including superoxide dismutase (Cu, Zn & Mn-SODs), oxide reductase, glutathione (GSPx, GSH, GST), metallothionein (MT), etc. These enzymes play an important role in preventing accumulation of pathological concentration of oxygen radicals or help in repairing damage caused by irradiation injury. Clove oil play an important role in the preventing the generation of ROS. It has modulatory effect on iron – induced lipid peroxidation in liver. Clove oil is a good source of vitamins A, C, E and coline. It also has decent levels of vitamins like riboflavin, niacin, thiamine, vitamin B6, vitamin K, betaine and folate. In conclusion, the results of this study demonstrated that clove oil has a potent radioprotective action upon radiation induced some biochemical disorders in rats. Our results showed that the antioxidant effects of clove oil may be due to its significant ability to inhibit lipid peroxidation, strong reducing power and superoxide radical scavenging activity. This antioxidant activity is probably due to the polyphenol as well as trace element contents. Further investigations are underway to determine the exact phytoconstituents that are responsible for its radioprotective and antioxidant activity.

REFERENCES


فاعلية زيت القرنفل في تحسين بعض الاختلالات الكيميائية التي يحدثها الاشعاع في ذكور الجرذان

أحمد شفيق ندا

قسم البحوث الدورانية الإشعاعية - المركز القومي لبحوث وتقنية الإشعاع

يشمل نتائج هذه الدراسة تقييم الدور الوقائي لزيت القرنفل ضد التغيرات البيوكيميائية التي تحدث نتيجة لل تعرض الأشعة لذكور الجرذان (120-150 جرام). قسمت الحيوانات إلى أربعة مجموعات، الأولى المجموعة الضابطة، الثانية جرذان تعرضوا لزيت القرنفل (200 ملغ/كجم) من وزن الفأر لمدة ثمانية وعشرون يوماً عن طريق الفم، المجموعة الثالثة تعرضت للإشعاع بجرعة مقدارها 7 جرائد، والثانية بعد سبعية أيام من التسقيع، أما المجموعة الرابعة فقد تعرضت لزيت القرنفل (200 ملغ/كجم) لمدة 21 يومًا ثم تعرضت للإشعاع (7 جرائد). تم تناول زيت القرنفل لمدة أسبوع لتصبح 28 يومًا كالمجموعة الثانية.

وقد تم قياس مستوى إنزيمات الدنا الناقل الأميني (ALT & AST) ، إنزيم الفوسفاتاز الخلوي (ALP) وكذلك مستوى الدهون (الكوليسترول والدهون الثلاثية والكوليسترول منخفض الكثافة) ومستوى الجلوكوز في مصل الدم وكذلك تم قياس إنزيم الجلوقناثيون المختزل (GSH) والتغيرات التي تحدث في نواتج الأكسدة القوية للدهون (المواد المتفاعلة مع حمض الليثوستيرول) في نسيج الكبد بالإضافة إلى تقييم التغيرات التي تحدث في مستوي بعض العناصر الشحية في نسيج الكبد (الحديد، النحاس، زنك، سيلينيوم).

وتشير النتائج أن الجرذان التي تعرضت للإشعاع (7 جرائد) قد أظهرت ارتفاعًا في المعايير البيوكيميائية التي تحت دراستها بعضاً الجلوقناثيون الذي انخفض انخفاضاً ملحوظاً كما أحدث التعرض الإشعاعي تغيرات في مستوي بعض العناصر الشحية في نسيج الكبد. بينما تشير النتائج أن الجرذان التي تعرضت لزيت القرنفل قبل وبعد التعرض الإشعاعي قد أظهرت تحسناً ملحوظاً في الدهون والجلوكوز، السيلينيوم، والكالسيوم، بالإضافة إلى انخفاض نسبة الكولسترول في مصل الدم.

وبناءً على ما سبق يمكن افتراض أن زيت القرنفل له دور وقائي ضد الإشعاع المحفز لبعض الاعتقادات البيوكيميائية والجهاز التأكسدي وقد تمثل ذلك في الاحصاءات الفوقية تأكد للدهون والمحافظة على التركيز الطبيعي للجلوقناثيون المختزل هذا بالإضافة إلى ضبط بعض الإنزيمات الكبدية وخفض مستوى الدهون والجلوكوز في الدم وكذلك تأزمن العناصر المعدنية في نسيج الكبد.