

The protective effect of geraniol biology essay

[Science](#), [Biology](#)



**ASSIGN
BUSTER**

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In this study, the conservative effects of intraperitoneally administered geraniol on the levels of elements Fe, Zn, Cu, Ca, Mn and Mg in liver tissue of rats exposed to oxidative stress by H₂O₂ have been investigated. In our study, 24 male were divided into 4 experimental groups

1. INTRODUCTION

Geraniol has antitumor activity against some cancer cells which is arise in organism 1-4. Tiwari et al. reported that the geraniol had powerful several pharmacological activities (such as antioxidant activity and anticancer potential 5-6. Metals play an essential roles to biological processes in organism 7-8. In several studies by Guo et al., it was reported that excessive increasing or decreasing trace element amounts are associated with oxidative stres 9. Free radicals is cause damage to parts of cells (such as DNA, proteins, carbohydrates and lipids) 10-11.

2. MATERIALS AND METHODS

Chemicals

HNO₃ (65%), HClO₄ (60%) and of H₂O₂ (30%) were obtained from Merck Chemical Company. Geraniol (98%) was obtained from Sigma Aldrich.

Laboratory animals

Male Wistar albino rats used in the experimental study were supplied from Firat University Medical School Experimental Research Centre (FÜTDAM) and

experimental study was performed in the same place. The temperature of the environment where laboratory animals were kept was held stable in the range 22-25 °C and the animals were monitored for 12 hours under light and 12 hours in dark. During experimental studies, a total of 24 four-months-old wistar albino male rats weighing 260 gr (260 ± 40 gr) in average were used. Criteria specified by NIH (National Institutes of Health) with respect to animal rights were strictly followed during the experiment. Four groups, namely K group, H group, G group and H+G group, were created in the experiment. Corn oil was given to K group. 50 mg/kg of geraniol and 20 mg/kg of H₂O₂ were administered to the rats. H₂O₂ solution was administered following its preparation in distilled water. Geraniol was administered after it was prepared in corn oil. Corn oil was also given to H group as standard. Abovementioned compounds were intraperitoneally injected to rats every other day for a period of 30 days. At the end of 30 days, the rats were decapitated and their liver tissues were removed by surgical procedure and allowed to stand at -20 °C until analysis.

Solubilizing liver tissue samples

1. 5 mL of HNO₃ and 1.5 mL of HClO₄ were added to 0.4-1.0 grams of liver tissue samples and they were allowed to stand for 3 hours; then, following administration of 2 mL of H₂O₂, solubilization procedures were carried out in closed system PTFE (polytetrafluorethylene) containers in a micro-wave oven. Digestion program in micro-wave oven was applied as 5 minutes at 250 W, 10 minutes at 800 W, and 5 minutes at 450 W. The resultant clear mixture was completed to 10 mL with a solution of 0.1 M HNO₃. Same methods were applied also for blank solutions not containing any tissue.

Analyzing liver tissue samples

Sample solutions prepared for analysis were analyzed for Zn, Cu, Fe, Ca and Mg by atomic absorption spectrophotometer (AAS) via calibration curve method provided that each group is tested separately, and dilution was performed for some elements and direct reading was performed for others. Mn analysis was carried out by inductively coupled plasma atomic emission spectroscopy (ICP-AES).

Statistical analysis

Statistical evaluation was performed by SPSS: 10 programs. Comparison between the groups was performed by Variance analysis (ANOVA) and Least Significant Difference (LSD) test was performed to compare the results from different groups. Results are expressed as means \pm standard error. Statistical significance was accepted ($p < 0.05$).

3. RESULTS AND DISCUSSION

Halliwell and Gutteridge demonstrated that metals are take an important task in the direction of excessive increase of oxidative stress under physiological stress. Some transition metals (such Fe and Cu) have been working as a strong oxidation reagent which leads to the formation of free radicals in the organism 13. The generation of free radicals is in organism is more closely associated with the exact participation of redox-active transition metals such as iron, copper 14-15. Metallic environmental toxicants exposure causes oxidative stress in organism 16. Metal level in analyzed liver tissue is given in Table 1.

Groups**Fe****Cu****Zn****Ca****Mn****Mg****K****92.77 ± 4.36a****2.82 ± 0.13a****35.65 ± 2.23a****95.56 ± 5.23a****2.10 ± 0.13a****63.50 ± 5.17a****H****149.18 ± 6.94d****2.79 ± 0.08a****29.28 ± 1.49b****110.52 ± 8.51b****1.22 ± 0.07c****58.37 ± 3.53a****G**

94. 59 ± 3. 91a

2. 29 ± 0. 22a

37. 83 ± 1. 59a

93. 90 ± 2. 57a

2. 08 ± 0. 33a

65. 75 ± 4. 12a

HG

115. 40 ± 7. 95c

2. 56 ± 0. 38a

32. 40 ± 2. 03a

104. 52 ± 6. 83a

2. 01 ± 0. 43a

61. 54 ± 3. 80a

Table 1. Liver tissue levels of some elements (ppm) (n = 6). a, c, d, b:

Different letters in the same columns indicate statistical differences (P <0.

01). It was seen in our study that addition of H₂O₂ increased the Fe level in

liver tissue (p <0. 01). Fe level in H+G group were observed to show values

similar to the K group due to effect of geraniol. We may conclude from the

results above that, geraniol eliminated negative radical effect of H₂O₂ at Fe

level. While organism increases iron stores, the tissue is exposed to higher

concentration of iron, causes oxidative damage 17-18. Excessive iron

accumulation will lead to organ toxicity, leading to cessation of growth in the

organism 19-20 . In a study by 21 Razazadeh and Athar (1997), in skin

tumorogenesis tissue samples obtained with 7, 12-dimethylbenz-[a]anthracene (DMBA) in mice, very high iron levels were observed. Iron excess can cause serious problems because increased organism iron stores is closely linked with some serious health problems like cancer (such as cancer) 22. Transition metal, iron, is capable of generating hydroxyl radicals, the most potent reactive oxygen species and contributing to oxidative stress. The imbalance of brain Fe metabolism was the initial cause for neuronal death 12. The transition metal, iron, is capable of generating hydroxyl radicals, the most potent reactive oxygen species. The imbalance of brain Fe metabolism was the initial cause for neuronal death 23. In our study, it was determined that Zn level was significantly lower in H₂O₂ than in K group ($P < 0.01$). Fe level was shown approach to level normal due to the effect of geraniol. We believe that geraniol can help to antioxidant system in reducing the harmful effects of H₂O₂. As in our study, there are studies in the literature investigating the association of Zn with oxidative stress. In a study by Çiftçi et al., it was stated that Zn level was lower in (7, 12-dimethylbenz-[a]anthracene) DMBA administered subjects than in the control group and oxidative stress of lipoic acid caused a positive effect on Ca level by increasing it 12. Rats fed zinc-deficiency was related with abnormal levels of tissue oxidative damage including, increased lipid levels 24-25. The Zn protective role can be reported to its antioxidant activity 26. Zinc deficiency causes increase in lipid peroxidation and free radical in cell structure 27. Some transition metals (such as Mn and Zn) are important co-factors in the activities of antioxidant enzymes (such as superoxide dismutase) 28-29. We observed that H₂O₂ group was significantly higher Ca level compared to K

group. Ca level in H+G group was shown to be close to the Ca level in K group. We believe that geraniol eliminates high Ca level that has increased as a result of oxidative stress. Studies in literature aimed to make relationship between Ca and oxidative stress have shown that level of calcium is higher in damaged tissues and organs relative to normal organs 30. Enzymes, which are active on calcium enzymatic antioxidant defense system as a result of increasing of the level of free calcium in the organism is activated. The organism of calcium increases due to it is possible to say that enzymes in defense system become active against the production of free radicals related to calcium by the increase of calcium level in the cell 31. The H₂O₂ group had significantly lower mean Mn levels compared to the other groups ($P < 0.01$). In analysis of tissue, Mn level of H+G in group was proved to be close to that in K group. Elements like Mn plays an important role for antioxidant defenses. Mn is essential part of many important enzyme (such as mitochondrial superoxide dismutases, glutamine synthetase, alkaline phosphatase, and arginase) 32-33. Studies have indicated that Mn lack in the metabolism of all mammalian cells leads disorders to mitochondrial structure and function, which might be due to reduced activity of Mn-SOD resulting in excessive increased lipid peroxidation and decreased antioxidant effect 34. Barandier et al reported that Mn might be involved spatial conformation of antioxidant enzymes (such as SOD and GPx), play an important task in the antioxidant defense capacity 35. Mn diet deficiency, animal is caused to disease (such as low liver MnSOD and high liver mitochondria lipid peroxidation) 36.

4. DISCUSSION

In our study, The applied H₂O₂ group had significantly higher mean Ca and Fe levels compared to the K group (P <0. 01). The applied H₂O₂ group had significantly lower Mn and Zn levels than the K group (P <0. 01). Ca, Fe, Zn, Mn levels were shown approach to level normal due to the effect of geraniol. According to our results, geraniol has eliminated impact negative of hydrogen peroxide on levels of elements. In the present study, it is thought that geraniol may a potential against oxidative stres.