EFFECT OF CAMELLIA OIL CONTAINING TEA SAPONINS ON MICE BLOOD AND ORGANS (LIVER, KIDNEY, SPLEEN AND HEART)

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Abstract: Tea seed oil containing tea saponin was used as the research object; mice divided randomly into six groups. A normal group (A) and rapeseed oil (B) as a control groups, tea saponin/camellia oil (C), low (D), medium (E) and high(F)-dose groups of tea oil containing tea saponin, dietary group for 90-days feeding experiment; mice weight was recorded every day. Total cholesterol (TC), triglycerides (TG), low and high-density lipoproteins (LDL, HDL), as well as AST, ALT and total protein (TP) were measured in serum, and Liver, kidney, spleen; heart pathologies were detected the last day of experiment. The study results showed that; Tea oil containing tea saponin increased TC, TG, and LDL. However, it was decreased HDL; ALT; AST and TP values compared with control groups; which medium and high doses group was a significant deference. It had no effects on liver, kidney, spleen and heart tissue compared with normal groups. It Depended to result's tea oil containing tea saponin had a toxic effect in some serum index, and had no toxic effected in organ's tissue. So it becomes safety when used dosage less, feeding for long time than used for this study.

Keywords: Tea saponin, camellia seed oil, toxicity, 90-days feeding experiment, organ's tissue.

I. INTRODUCTION

Camellia oil (Kamelliaeoleifelaabel seed oil) or common names; tea seed oil, tea oil, wild tea oils, etc. from Theaceae camellia (Theaceae) (Kamellia) (Kamelliaeoleifelaabel) were extracted from the plants of the kind of fatty oil. It was considered as a very old edible vegetable oil in China [1], it is a kind of rare natural high fuel. Camellia oil has similar characteristics and phase like olive oil, health care function and nutritional value. Tea saponin is a kind of polysaccharide extracted from YouChaShu seeds, belong to the type of carbohydrate glycoside compounds; it is composed of a saponin's yuan; sugar structure, and natural acid on the combination of these three components. It glycoside is beta of element, one of many derivatives. The combining method of the glycoside yuan is combined with natural acid dehydration of hydroxyl groups on forming ester [2]. Tea saponin is sour tasted is milky white or light yellow color; solid powder and stimulate the mucous membrane in the nose.

Food toxicology is the study of nature of exogenous chemicals in food source and formation, their beneficial effects, adverse reactions and the possible mechanism to determine the safety of food limit and evaluation of these material sciences [3]; [4] These evaluate safety tests of food thus to ensure human health and safety consumer [5] Food Toxicology was divided into toxicity; grave toxicity; sub grave toxicity and chronic toxicity tests in vivo and in vitro toxicity experiments [6]; [1]. Depending to previous studies; which used the similar methods to detect the tea saponin in tea oil cake and soy bean meal, and fruits [7], [8]; [9] and [10]. They were no longer found study used tea oil direct; due to that, this paper chose and focuses to the camellia tea oil to study his toxicity

1. Materials and methods

2.1 The experimental drug

A 96% of tea saponin of purple agent factory bought in Shanghai; Qiagenintegral protein, albumin kit, cereal third transaminase kits, aspirate aminotransferase kit, triglyceride kits, and total cholesterol kits are all built in and technology co., LTD.

2.2 The experimental animal

60 healthy Kunming mice, male sex, five weeks age, weight 25 to 30g, SPF (specific pathogen free), bought in Hubei province CDC, number of animals is as follows: No. 42000600002931. Mice feed was provided by the experimental animal research center of Hubei province and qualified number no. 4200050000068. Mice were fed by tea oil contenting tea saponin for 90 days; mice room conditions during the experiment temperature 18 to 24 C, relative humidity of 40% to 60%; all the experiment it did in College of Food Science and Technology; Huazhong University; Hubei Provence; Wuhan; China.

2.3 Experimental instrument


1.4 Animals groups;

Mice were divided into different cages, each containing 10 mice. They were marked, weighed, and fed with basic feed, with adaptive feeding and observed for seven days. The mice were then randomly divided into six groups of 10 mice, all meal
sex. A normal group (A), rapeseed oil (B) as a control groups, tea saponin/camellia oil (C), low (D), medium (E) and high (F)-dose group.

1.5 Dosing regimen:
All mice had free food and water in-take; Rats were given an intra-gastric administration every morning at 8:00–9:00 a once day. Normal control given standard saline; rapeseed groups were given rapeseed oil. The other groups were given the corresponding test substance (tea oil containing tea saponin) 255.382.5, 510 mg/kg.bw respectively. The mice were weighed every week and observed the activity of the mice, feeding, presence of poisoning and death every day, and drug dose was adjusted according to body weight.

1.6 Experiment procedure:
Mice were treated for 90 days and fasted one day before the end to the experiment. On the last day, they were weighed. They were after that fixed, and blood was collected was collected from the eyes. The whole blood was allowed to stand at room temperature for 0.5h, afterwards centrifuged at 3000 rpm for 10min, and serum was pipette for serum lipid concentration measured [11], [12], [13], [14] ,[15] determine the serum blood by the used automatic blood cell analyzer. After blood collection the heart, liver, spleen, and kidney were quickly taken, and the organs were washed with ice-cold saline; blotted on filter paper and weighed to calculate the organ's indexes according to the below formula:

\[
\text{Organ index} = \frac{\text{organ weight(g)}}{\text{animal weight(g)}} \times 100
\]

The organs were washed and dried, and three samples of each one were taken. These were quickly put into glass vials filled with formaldehyde 4%, cooled to 4 C°, for Histopathological examination [10, 11].

Statistical method
SPSS statistical software was used for data analysis. Student's t-test was used to compare treatment groups, bilateral P<0.05 were considered statistically significant.

II. RESULTS

3.1 Serum lipids
In comparison with a normal control group see Table 1, TC and TG- the important index reflecting the body lipid metabolism, and LDL-C increased significantly in the model control group. HDL-C decreased [13, 15]. Compared with the model group, all treatment groups had significantly a little higher TC, TG and LDL. HDL values were decreased compared to model [17; 18]; TG; TC had no significant difference (P > 0.05). A dose-related response for all measured parameters, which can explain camellia oil containing tea saponin on lipid metabolism in mice, did not have a significant impact.

3.5 Body weight

All the mice had a same diet throughout the study, and there was a difference between the treatment groups in a dose.

3.4 Organ indexes
Organ indexes were computed for the heart, liver, spleen, and kidney in Table 3; There were no significant differences between groups for any index. All groups liver we're bigger compared with others.

3.3 Serum AST, ALT and TP
According to the experimental result's Table 2. Serum, AST and ALT were significantly higher in the fat model group than in normal controls. It was a little increase in the treated groups. Serum TP in controls was lower than treatment groups, and higher concentration in a model than in controls.

3.4 Mice organ’s pathology
In the mice, anatomy observed by the naked-eye; it found that, the control groups and doses groups in mice liver, kidney, spleen and heart; all useless edema and hyperplasia, atrophy lesions, its comparable color is bright-color appearance, normal organ's form. All did not appear the phenomenon such as hypertrophy and atrophy, and it was no longer used to find any pathological changes. Finally based on the corresponding viscera, mainly by the formalin preserved and dying embedding tissue section used the optical microscope in each slice observation.

In Fig.1 Heart, kidney, liver and spleen tissue morphology: Fig.1.a Heart showed in control and treatment groups, the heart tissue was ordinary in all groups, also found no abnormal accumulation of precipitation or matter, no cavitations. Overall, the heart tissue in a doses group was no bad effects compared with normal groups.

In Fig.1.b kidney, tissue was observed that the experiment group performance was roughly same, clear renal tubular structure, complete epithelium, no crystals within the lumen, also did not find any inflammatory cells. Doses groups compared with control groups, they were no significant difference. Liver tissue morphology Fig.1.c showed that; the controls and tea saponin/ water groups were ordinary liver tissue of the form. The nucleus was big and neat veins surrounding liver tissue cells closely, and radiated, interstitial connective tissue and regular lobular no cavitations, also found no abnormal accumulation of precipitation or matter. Generally, the groups of treatments were a normal liver tissue, no toxic effects.

Last Fig.1.d showed the spleen tissue morphology; all groups were characterized by clear organizational structure, can see some big volume and irregular polygonal cells, scattered distribution in the edge area of the spleen cells, red pulp spleen Sonne and lymph follicle germinal center. All treatments groups compeered with control groups shown as were normal effects, and there was no significant difference. So as the general results, camellia oil containing tea saponin of all mice organ's heart, kidney, liver and spleen physiology without adverse
Effect of Camellia Oil Containing Tea Saponins on Mice Blood and Organs (Liver, Kidney, Spleen and Heart)

Table 1  Effects of tea saponins in camellia oil on blood lipids in mice

<table>
<thead>
<tr>
<th>Group</th>
<th>Design (mg/kg)</th>
<th>TC</th>
<th>TG</th>
<th>LDL</th>
<th>HDL</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Control water</td>
<td>2.17±0.34</td>
<td>1.28±0.04</td>
<td>0.95±0.02</td>
<td>1.06±0.08</td>
</tr>
<tr>
<td>B</td>
<td>Control rapeseed oil</td>
<td>2.19±0.09</td>
<td>1.48±0.28</td>
<td>1.38±0.07</td>
<td>1.06±0.08</td>
</tr>
<tr>
<td>C</td>
<td>Low tea saponin/oil</td>
<td>2.18±0.02</td>
<td>1.57±0.28</td>
<td>1.38±0.07</td>
<td>1.06±0.08</td>
</tr>
<tr>
<td>D</td>
<td>Medill tea saponin/oil</td>
<td>2.18±0.02</td>
<td>1.57±0.28</td>
<td>1.38±0.07</td>
<td>1.06±0.08</td>
</tr>
<tr>
<td>E</td>
<td>High tea saponin/oil</td>
<td>2.18±0.02</td>
<td>1.57±0.28</td>
<td>1.38±0.07</td>
<td>1.06±0.08</td>
</tr>
<tr>
<td>F</td>
<td>Control water</td>
<td>2.17±0.34</td>
<td>1.28±0.04</td>
<td>0.95±0.02</td>
<td>1.06±0.08</td>
</tr>
</tbody>
</table>

Table 2  Effects of tea saponins in camellia oil on ALT, AST, TP and HDL in mice

<table>
<thead>
<tr>
<th>Group</th>
<th>Design (mg/kg)</th>
<th>ALT</th>
<th>AST</th>
<th>TP</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Control water</td>
<td>118±2.3</td>
<td>154±2.3</td>
<td>154±2.3</td>
</tr>
<tr>
<td>B</td>
<td>Control rapeseed oil</td>
<td>118±2.3</td>
<td>154±2.3</td>
<td>154±2.3</td>
</tr>
<tr>
<td>C</td>
<td>Low tea saponin/oil</td>
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<td>E</td>
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<td>118±2.3</td>
<td>154±2.3</td>
<td>154±2.3</td>
</tr>
<tr>
<td>F</td>
<td>Control water</td>
<td>118±2.3</td>
<td>154±2.3</td>
<td>154±2.3</td>
</tr>
</tbody>
</table>

Table 3  Effects of tea saponins in camellia oil on visceral index in mice

<table>
<thead>
<tr>
<th>Group</th>
<th>Design (mg/kg)</th>
<th>Liver index %</th>
<th>Kidney index %</th>
<th>Spleen index %</th>
<th>Heart index %</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Control water</td>
<td>9.4±2.03</td>
<td>1.5±0.07</td>
<td>0.3±0.05</td>
<td>0.0±0.00</td>
</tr>
<tr>
<td>B</td>
<td>Control rapeseed oil</td>
<td>9.4±2.03</td>
<td>1.5±0.07</td>
<td>0.3±0.05</td>
<td>0.0±0.00</td>
</tr>
<tr>
<td>C</td>
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<td>9.4±2.03</td>
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<td>9.4±2.03</td>
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<td>0.0±0.00</td>
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<td>9.4±2.03</td>
<td>1.5±0.07</td>
<td>0.3±0.05</td>
<td>0.0±0.00</td>
</tr>
<tr>
<td>F</td>
<td>Control water</td>
<td>9.4±2.03</td>
<td>1.5±0.07</td>
<td>0.3±0.05</td>
<td>0.0±0.00</td>
</tr>
</tbody>
</table>

Table 4  Effects of tea saponins in camellia oil on food utilization ratio in mix

<table>
<thead>
<tr>
<th>Group</th>
<th>Design (mg/kg)</th>
<th>Weight increase(g)</th>
<th>Food intake (g)</th>
<th>Utilization ratio (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Control water</td>
<td>13±2</td>
<td>34±4</td>
<td>24±4</td>
</tr>
<tr>
<td>B</td>
<td>Control rapeseed oil</td>
<td>9±3</td>
<td>28±1</td>
<td>24±1</td>
</tr>
<tr>
<td>C</td>
<td>Low tea saponin/oil</td>
<td>0.9±2</td>
<td>24±3</td>
<td>24±3</td>
</tr>
<tr>
<td>D</td>
<td>Medill tea saponin/oil</td>
<td>0.9±2</td>
<td>24±3</td>
<td>24±3</td>
</tr>
<tr>
<td>E</td>
<td>High tea saponin/oil</td>
<td>0.9±2</td>
<td>24±3</td>
<td>24±3</td>
</tr>
<tr>
<td>F</td>
<td>Control water</td>
<td>13±2</td>
<td>34±4</td>
<td>24±4</td>
</tr>
</tbody>
</table>

Note: a comparison with the normal group, with significant difference (P < 0.05), upon examination, the data are statistically significant.

Where:
A: Control water, B: Control rapeseed oil, C: Tea saponin/water, D: Low tea saponin/oil, E: Medill tea saponin/oil, F: High tea saponin/oil.

III. DISCUSSIONS

90 days feeding experiment as long-term chronic toxicity experiment of the experimental stage, by analyzing the experimental results of toxicity reaction, viscera damage and histopathological changes in all aspects of the indicators to reflect the camellia oil containing tea saponin and chronic toxicity effect. Fed through 6 groups of mice by filling the stomach and record the overall observation. Experimental results showed that in the process of the whole lavage, mice without any death, serious malaise or coma such as special cases, and no obvious discomfort or symptoms such as refusing to eat. The appearance of the mouse performance is normal. The weight of mice showed normal speed growth, prove that camellia oil containing tea saponin have little impact on weight and food utilization in mice. The experiment results showed that the content of TP had a significant difference in all the groups. AST and ALT in each group were no significant differences between groups; so that tea saponin in camellia oil was not cause damage to liver cells, so the analysis of its effect on mice liver non-toxic. TC and TG is one of the important indices for detecting small body lipid metabolism. The analysis of experimental results, this a few indicators within the group or there was no significant difference between groups, the results prove that camellia oil containing tea saponin in mice don't disruptive effects of lipid metabolism.

CONCLUSIONS

Our study confirms the dose-dependent effect of tea camellia oil containing tea saponin to explain the chronic toxicity in it. To sum up, the deep-seated toxicity it was not study that it means, amounts of the tea saponin which used in this experiment not
strong toxic, but less than this amount; it becomes a non toxic. Feeding on mice in a high dose 90 days each viscera and other feature and growth are not a significant impact; 90 days feeding just belong to against it’s a phase of chronic toxicity test; long-term deep-seated toxicity test and Specific target organs of toxicity and mechanism of cytotoxicity need further study; Hope that through more deepen the study of camellia oil containing tea saponin. Applying a low amount of tea saponin less than used in this study, fully find the utilization value of camellia oil, and correctly guide the people health and safety of diet and life.

**ABBREVIATIONS**


**REFERENCES**


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