The Effect of Basil and Cloves in Lowering Blood Pressure in Rats Suffering from High Blood Pressure

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ABSTRACT

The aim of this study was to conduct the possible antihypertensive effects of basil (Ocimumbasilicum) and cloves (Syzygiumaromaticum) in high blood pressure rats. The rats (n=30) were divided into two main groups, the first main group (n=6 rats) fed on basal diet as a control negative group. The second main group (n=24 rats) received high sodium diet for 8 weeks to induce hypertensive in rats. After these periods, the high sodium diet group was divided into (4) subgroups (n=6 rats for each), the first subgroup fed on high sodium diet as a control positive group. Subgroups (2, 3 and 4) were fed on high sodium diet supplemented with basil (200mg/kg per day), cloves (200mg/kg per day) and (basil 100mg/kg + cloves 100mg/kg per day) respectively. Results: the results cleared that, basil, cloves and mixture of them reduced systolic and diastolic blood pressure in addition to significant decrease in the mean values of total lipid profile, glucose. Serum Glutamic Oxlacetic Transaminase(SGOT) and Serum Glutamic Pyruvic Transaminase (SGPT) in all treated groups, compared to positive control groups, while high-density lipoprotein (HDLC) increased.

Keywords: basil; cloves; high sodium diet; hypertensive rats; experimental hypertension

INTRODUCTION

Heart disease, stroke, and renal failure are leading causes of death with hypertension being the predominant risk factor (Mozaffarian and Benjamin, 2016). High blood pressure is one of the most important risk factors for cardiovascular disease, myocardial infarction, stroke, congestive heart failure, end-stage renal disease, and peripheral vascular disease (Whelton., 1994). Basil is a delicious herb that goes well in a variety of foods. It is widely available throughout the world. Basil has antioxidant, antimutagenic, antitumorogenic, antiviral, and antibacterial properties. Extract of basil has been shown to lower blood pressure (John, 2016). Basil is a versatile herb. It is rich of nutrients, from large amounts of vitamin K and calcium, to its high antioxidant oils, basil offers a collection of health-enhancing avails ranging from protection against DNA damage to fight against stress (Anwar et al., 2010). A diversity of pharmacological effects has been attributed to clove oil. Among these effects are antibacterial, antifungal antispasmodic flavoring agent in foods, pharmaceuticals, and herbal medicine and clove cigarettes. Recently we have reported that the clove oil (eugenol) exhibits antihypertensive and spasmylytic activities in anaesthetized rats(Gertsch et al., 2008).

MATERIALS AND METHODS

Materials:
- Casein, vitamins, minerals, cellulose and choline chloride were purchased from El-Gomhoreya Company, Cairo, Egypt.
- Thirty female albino rats (Sprague Dawley Strain) were obtained from Helwan farm.
- Cloves and basil were purchased from local market, Cairo, Egypt.

Methods:
The Biological Assay.

Thirty male Swiss albino mice (200-210 g), obtained from Small Animal House were maintained individually in polypropylene cages on basal diet (Lackman et al., 1990) for 1 wk, for adaptation. The vitamin mixture was prepared according to (Reeves et al., 1993) and the salt mixture was prepared according to (A. O. A. C., 1975). After this period, the thirty male albino rats were divided into two main sections, the first section (n=6 rats) fed on basal diet and kept as a negative group. The second section (n=24 rats) received a high-salt (8%) diet for 8 weeks to induce hypertension in rats (Jian-Wei et al., 2008). Systolic and diastolic blood pressure was measured weekly by a tail cuff method, after 3 weeks, when hypertension was established. The second group (n=24 rats) divided into four groups of 6 rats: (1) negative control group, (2) a group treated with basil (200mg/kg per day), Doses of basil were selected in reference to doses normally used in man, and doses used in previous experiments (Inoko et al., 1994). (3) A group treated with clove (200mg/kg per day), (Tohti et al., 2006) and (4) a group treated with (100 gm basil+ 100 gm cloves /kg per day). At the end of the experiment, the blood samples were collected for centrifuged and serum was separated to estimate some biochemical parameters, i.e. serum cholesterol (Allain et al., 1974), triglycerides (Foster and Dumns., 1973), HDL-c (Lopes – Virella et al., 1977), LDL-c and VLDL-c (Friedwald et al., 1972). Serum Glutamic Oxlacetic Transaminase(SGOT) and Serum Glutamic Pyruvic Transaminase (SGPT) (Reitman and Frankel., 1957). Data was presented as means ± SD statistically analyzed using one way ANOVA test, p<0.05 was used to indicate significance (Steel and Torri., 1980).

Blood pressure measurement.

Systolic blood pressure (SBP) and diastolic blood pressure (DBP) were measured by the tail-cuff method (NIBP200A Small Animal Tail Blood Pressure System) in a wake rats. Each value was the average of three consecutive readings.

RESULTS

1-Blood pressure systolic blood pressure (SBP) and diastolic blood pressure (DBP).

Data in table (1) showed that, untreated hypertensive rats had markedly higher SBP and DBP than the negative control group (Table 1). In the

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treatment groups, the blood pressure, which was initially the same as that of the hypertensive controls, decreased progressively over the cycle of the treatment (P<0.05), sans obvious difference between treatment groups, and it was still significantly greater than in negative control group (Figure 1).

Table 1. Effect of basil and clove on blood pressure (SBP) and diastolic blood pressure (DBP).

<table>
<thead>
<tr>
<th>Parameters</th>
<th>SBP (mm/Hg)</th>
<th>DBP (mm/Hg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control (-)</td>
<td>141±2</td>
<td>70±3</td>
</tr>
<tr>
<td>Control (+)</td>
<td>204±4</td>
<td>103±3</td>
</tr>
<tr>
<td>Basil (200mg/kg)</td>
<td>187±4abc</td>
<td>93±4abc</td>
</tr>
<tr>
<td>Clove (200mg/kg)</td>
<td>180±8abc</td>
<td>88±6abc</td>
</tr>
<tr>
<td>(Basil 100mg+Clove 100mg)</td>
<td>183±3abc</td>
<td>87±4abc</td>
</tr>
</tbody>
</table>

Abbreviations: (DBP), diastolic blood pressure; (SBP), systolic blood pressure.

![Figure 1](image.png)  
Figure 1. Effect of basil, clove and mixture of them on (SBP) and (DBP) blood pressure in hypertensive rats, compared with positive control rats and negative control rats. P<0.05, all treated groups vs. positive control rats

2- Effect of basil and clove on lipids fractions of hypertensive Rats.

Data in table (2) showed that. The mean values of serum cholesterol, triglycerides, LDL-c and VLDL-c (mg/dl) significantly increased P< 0.05 for control positive group, in comparison with control negative group, while HDL-c value (mg/dl) for control positive group decreased than that of the control negative group. Addition of basil or clove or mixture of both resulted in a significant reduction in cholesterol values. Rats which received high salt diets and treated with basil or clove or mixture of both had lower mean values of triglycerides, LDL-c and VLDL-c compared with control positive group.

On the other hand, the same treated groups of rats had higher mean values of HDL-c than that of the control positive group. The best result for lipid fractions was noticed in the group of rats treated with clove, followed by group that treated with mixture of (basil +clove) and finally group of rats treated with basil (Table 2). Our results are in agreement with many studies which showed that basil leaf extract prevented the development of high total cholesterol and LDL cholesterol in rats fed a high cholesterol diet (Suanarunsawat et al., 2011).

3- Effect of basil and clove on liver function.

Data in table (3) showed that, the rats in control negative group had a significant lower mean values than that of control positive group (hypertensive rats) as the following (46.047 ± 4.035 and 21.440 ± 2.677 u/l vs. 76.810 ± 4.833 and 43.648 ± 3.460 u/l, respectively). In a rat study, clove reduced levels of cytochrome P450 enzymes (Kumari ., 1991).

Table 2. Effect of basil and clove lipids fractions of hypertensive rats.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Cholesterol</th>
<th>Triglycerides</th>
<th>HDL-c</th>
<th>LDL-c</th>
<th>VLDL-c</th>
</tr>
</thead>
<tbody>
<tr>
<td>Groups</td>
<td>mg/dl</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control (-)</td>
<td>84.682±5.377</td>
<td>41.256±2.179</td>
<td>44.488±4.228</td>
<td>31.944±0.815</td>
<td>8.250±0.435</td>
</tr>
<tr>
<td>Basil (200 mg/kg)</td>
<td>125.839±5.188</td>
<td>68.638±4.071</td>
<td>31.877±3.164</td>
<td>80.234±1.957</td>
<td>13.727±0.814</td>
</tr>
<tr>
<td>Clove (200 mg/kg)</td>
<td>113.615±4.834</td>
<td>59.927±4.246</td>
<td>37.132±3.491</td>
<td>64.498±0.980</td>
<td>11.985±0.849</td>
</tr>
<tr>
<td>Mixture(basil 100mg+clove 100mg)</td>
<td>115.292±1.620</td>
<td>64.150±0.963</td>
<td>31.853±1.002</td>
<td>70.608±1.736</td>
<td>12.829±0.192</td>
</tr>
</tbody>
</table>

- Values are expressed as mean ± SD.  
- Significant at p<0.05 using one way ANOVA test.
- Values which have different letters in each column differ significantly, while those with have similar or partially are not significant
Treatment with CCl4 significantly increased the activities of transaminases Serum Glutamic Oxaloetic Transaminase(SGOT) and Serum Glutamic Pyruvic Transaminase (SGPT), and alkaline phosphatase (ALP). These activities were significantly decreased by basil extract. Clove administration has tendency to retrieve levels of AST, ALT(Gallala et al., 2012). When basil or clove was added to the high sodium diet of hypertensive rats a significant decrease of AST and ALT values were noticed in comparison to control positive group. The best results were for group of rats fed on clove (200mg/kg). (Lahon and Das. 2011)reported that the basil (ocimum sanctum) alcoholic leaf extract shows significant hepatoprotective activity and synergism with silymarin. A study published in the Journal of Medicinal Food found that when sickly rats were given basil extract over a period of five days, they experienced significant improvements in producing detoxifying enzymes, higher antioxidant defenses and a reduction of fat buildup in the liver that can cause liver disease (Manikandan et al., 2007). Holy Basil seems to be effective in preventing toxin-induced damage to the liver in doses of 100-200mg/kg bodyweight (Ubaid. 2001). These protective effects are due to a supposed membrane stabilizing effect of Holy Basil constituents (Lahon and Das, 2011).

Table 3. Effect of basil and cloves on liver function.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>SGOT</th>
<th>SGPT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Groups</td>
<td>(u/l)</td>
<td>(u/l)</td>
</tr>
<tr>
<td>Control (-)</td>
<td>46.047 ± 4.035</td>
<td>21.440 ± 2.677</td>
</tr>
<tr>
<td>Control (+)</td>
<td>76.810 ± 4.833</td>
<td>43.648 ± 3.460</td>
</tr>
<tr>
<td>Basil (200mg/kg)</td>
<td>67.395 ± 2.820</td>
<td>34.627 ± 2.964</td>
</tr>
<tr>
<td>Clove (200 mg/kg)</td>
<td>57.051 ± 4.238</td>
<td>31.413 ± 2.601</td>
</tr>
<tr>
<td>(basil 100mg+clove 100mg)</td>
<td>64.991 ± 4.038</td>
<td>31.850 ± 2.185</td>
</tr>
</tbody>
</table>

Values are expressed as mean ± SD. Significant at p<0.05 using one way ANOVA test. Values which have different letters in each column Differ significantly, while those with similar or partially are not significant.

CONCLUSION

In conclusion, consumption of dried basil and cloves at certain levels 200mg/kg in this study may be useful for treatment of hypertensive because their lowers lipid profile and liver functions. Further studies are recommended to determine the medicinal effect of other different fractions of dried basil and cloves. Also should be noted to the importance of antioxidants in of these herbs and their relation to the treatment of hypertensive and improving the lipids and liver enzymes.

REFERENCES


Tأثير الريحبى والقرًفل في خفض مستوى ضغط الدم لدى الفئراى التي تعبًي هي ارتفاع ضغط الدم
محمد يوسف عبد الحويد هحوود واهيوت هحود الدردير
قسم الاقتصاد المنزلى – كلية التربية – جامعة قناة السويس

أجريت هذه الدراسة لمعرفة تأثير كلا من الريحان والقرفل في خفض مستوى ضغط الدم لدى الفئران المصابة بارتفاع ضغط الدم. وقد استخدم في هذه التجربة عدد (70) فئران تم تقسيمهم إلى مجموعتين رئيسيتين، المجموعة الرئيسية الأولى وعددها (30) فئران تم تثبيتها على الغذاء الاصلي أو المجموعة الثانية عدددها (40) فئران اجريت عليه الغذاء المعزز. بعد انتهاء فترة التدريجية، تم تقسيم المجموعة الرئيسية الثانية إلى 4 مجموعات فرعية عند الفئران في كل مجموعة (7) فئران ككل. فئة واحدة على الغذاء الاصلي في محتوى من الصوديوم كمجموعة موجبة بينما تغذى المجموعة الجديدة (42) على الغذاء الغني بالمدشر والقرفل المجهف. ولهذا تجب المجموعة (433) ملمجاي السكر وكميات من السكر. وقد اثبت النتائج أن المجموعة التي تم تظهير الفئران والقرفل والخليل منها في حدث انخفاض في مستوى ضغط الدم الانتقائي والإسطرلي لدى الفئران. بالإضافة إلى انخفاض ملحوظ في متوسط القلم من إجمالي الدهون والجلوكوز، اسبارتاتي ترانسفيراز الأمينية (ALT) وترانسفيراز الأمينية (HDLC) في جميع المجموعات المعالجة، مقارنة مع المجموعة الموجبة، في حين أن البروتين الدهني علية الكثافة (HDL) قد أزداد.