Original Research

Experimental Study on Anticoagulant and Fibrinolysis Activities of Garlic (Allium sativum)

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Abstract

An experimental study was carried out to evaluate the efficacy of garlic on the risk factors of coronary heart disease. For this purpose alcoholic extract of garlic was administered orally to a group of albino rabbits for two weeks. The results of this study showed that garlic possesses significant short term anti-coagulant and thrombolytic actions. It also possesses short term insignificant hypcholesterolemic action.

Keywords: Garlic, Allium sativum, Anticoagulant, Fibrinolytic, Cholesterol, Krimija Hridroga

Introduction:

Charaka describes a very fatal heart condition which occurs in a patient who is already suffering from Tridosha heart disease when further indulges in excessive intake of jaggery, sesame etc develops a condition known as Krimija Hridroga. In this condition a granthi (thrombosis) occurs in one part of the rasa channels of the heart leading to Samkledam of the heart looking as eaten (infarction) by worms. The patient gets a very severe heart pain as being cut by sharp object which if not managed emergently may lead to death of the patient. This condition very much resembles with myocardial infarction. Sushruta also mentions that vitiation in rasa leads to the production of the heart diseases.

Blood has a unique quality that it must not clot when it is inside the blood vessels but should start clotting immediately when it comes out of the vessel mainly to seal the breach. Grossly it can be said when blood clots inside the vessels, it forms a thrombosis. The main factors in initiation of thrombosis are high levels of blood cholesterol (particularly LDH) which start accumulating in the intima of the artery making internal surface of the artery uneven which attracts the deposition of platelets. This phenomenon invites blood clotting system into action leading to formation of the thrombosis which on becoming sufficient large blocks the flow of blood leading to the death of affected tissue which is known as infarction.

Consequences of the thrombosis depend upon the artery involved. For example if thrombosis occur in coronary artery it leads to myocardial infarction which a fatal condition; if it occurs in mid cerebral artery then it may lead to hemiplegia and if occur in big arteries of extremities then it may lead to gangrene and so on.

Fat including cholesterol belongs to Kapha which by accumulating in the form of thrombosis (Granthi) in rasa vaha srotas of the heart blocks the pathway of Pitta leading to myocardial infarction. Kapha is supposed to enhance coagulation (syandana). On the other hand Pitta is responsible for digestion and all types of enzymatic activities in the body and is responsible for bleeding (raktaopita) also which indicate towards its anticoagulant action. Hence Pitta increasing drugs may have anticoagulant and fat removing action.

Lashuna is a well known condiment being consumed daily in the most of the houses of Indian continent. In Ayurveda it is very much praised for alleviating Vata disorders but it increases Pitta so much so that it is contraindicated even in Vata if it is associated with Pitta.

Taking all these points into consideration Singh and Chaturvedi (1971) postulated that garlic may have anticoagulant and other beneficial action to combat risk factors of heart attack. Hence this study was carried out to evaluate the efficacy of alcoholic extract of garlic on the risk factors of coronary heart disease.

Materials and Methods

Healthy albino rabbits of the same colony, age, color and weighing 1.225 kg to 1.500 kg were used for this study. Routine diet of the laboratory animals was given once daily and water was ad libitum. Blood was collected from the vein of the dorsal aspect of the ear of rabbits in the morning hours.

Dose of Garlic: To decide the dose, the crude garlic was initially given in the dose of 5gm/Kg of body weight orally in a single dose. A fine paste of the peeled garlic was prepared and 4 ml distilled water per gram was added to the paste to make into fluid mixture. It was filled in a syringe and given to the animals orally through rubber tube for two days. This dose was tolerated well by the animals, then it was increased to 6 gm/Kg but animal lost their appetite. Therefore on the next day the dose was reduced to 4 gm/Kg body weight/day which was well tolerated by the animal and their appetite become normal. Thereafter from the next day onward it was increased to 5gm/Kg and it was also tolerated well. Hence the dose of crude garlic was decided 5gm/kg/day and was adopted in all the experiments for calculating the dose of alcoholic extract.

Alcoholic Extract of Garlic

It was difficult to administer crude garlic to the animals so alcoholic extract of the garlic was prepared as alcoholic extract almost contains all the active principles and also reduces the quantity of the dose. 95% alcohol was used to prepare alcohol extract of the drug by cold percolation method. 1.5 kg of crude garlic yielded 427 gm of extract, thus the dose of alcohol extract of garlic was decided as 1.425 gm/Kg/day.
**Blood Investigation:** Whole blood coagulation (Lee-White method) time, prothrombin time (Quick’s One Stage), euglobulin lysis time, clot retraction test and serum cholesterol were measured before and after the treatment.

**Results and Discussion**

Effects of alcoholic extract of garlic on the various blood investigations carried out during the experiments are presented in tabular form along with statistical data. The effects on each parameter along with their implication are being discussed as hereunder.

**Whole Blood Coagulation Time:** Alcoholic extract of garlic significantly increased the blood clotting time by 61.9% with one week’s treatment (Table-1, Figure-1). Blood coagulation time determines the time required by blood to clot spontaneously in a glass tube under standard conditions. Increase in the value of this test shows enhancement in anticoagulation activity of a drug such as heparin. Hence it can be said that alcoholic extract of garlic possesses significant anticoagulant activity.

**Prothrombin Time:** The alcoholic extract of garlic significantly increased the prothrombin time by 15.2% after one week of the treatment but this increase came down to 5.2% after two weeks of the treatment which was also not statistically significant though the value was still higher than before treatment value (Table-2, Figure-1).

**Euglobulin Lysis Time:** One week’s treatment with alcoholic extract of garlic caused significant increase of 83.34% in euglobulin lysis time of the animals (Table-1, Figure-2). Increase in euglobulin lysis time indicates increase in fibrinolysis activity of the drug which helps in lysis of thrombus. On the basis of this finding it can be inferred that alcoholic extract possesses fibrinolysis activity.

**Clot Retraction Test:** The alcoholic extract of garlic caused increase in the clot retraction by 33.3% after one week of the treatment but it was not statistically significant (Table-1). This increase showed that the drug possesses insignificant action of decreasing the platelet functions. This type of result was also possible due to increase in fibrinolysis activity shown by the drug as mentioned above.

**Serum Cholesterol:** Alcoholic extract of garlic decreased the serum cholesterol by 21.3% after one week’s treatment but this increase reduced to 2.2% after two weeks treatment. Both the decreases in serum cholesterol in both the cases were statistically insignificant (Table-3).

### Table-1

<table>
<thead>
<tr>
<th>Test</th>
<th>Mean ± S.D.</th>
<th>%age change</th>
<th>t</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood clotting time in seconds</td>
<td>313.4 ± 48.79</td>
<td>507.4 ± 160.06</td>
<td>61.9</td>
<td>0.592 &lt;0.05</td>
</tr>
<tr>
<td>Euglobulin lysis time in units</td>
<td>36.74 ± 3.68</td>
<td>67.36 ± 28.38</td>
<td>83.34</td>
<td>0.6 &lt;0.05</td>
</tr>
<tr>
<td>Clot retraction test in %</td>
<td>37.2 ± 6.72</td>
<td>49.6 ± 12.13</td>
<td>33.3</td>
<td>0.53 &gt;0.05</td>
</tr>
</tbody>
</table>

### Table-2

<table>
<thead>
<tr>
<th>Prothrombin time (seconds)</th>
<th>Before Treatment</th>
<th>After one week of Treatment</th>
<th>After two weeks of Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean ± S.D.</td>
<td>6.97 ±0.556</td>
<td>8.03 ± 0.750</td>
<td>7.33 ± 0.373</td>
</tr>
<tr>
<td>%age change</td>
<td>15.2</td>
<td>5.2</td>
<td></td>
</tr>
<tr>
<td>t</td>
<td>2.781</td>
<td>1.318</td>
<td></td>
</tr>
<tr>
<td>P</td>
<td>&lt;0.05</td>
<td>&gt;0.05</td>
<td></td>
</tr>
</tbody>
</table>

### Table-3

<table>
<thead>
<tr>
<th>Serum cholesterol mg%</th>
<th>Before Treatment</th>
<th>After one week of Treatment</th>
<th>After two weeks of Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>52.2</td>
<td>41.08</td>
<td>51.07</td>
</tr>
<tr>
<td>S. D.</td>
<td>± 9.8</td>
<td>± 15.41</td>
<td>± 11.07</td>
</tr>
<tr>
<td>Percentage decrease</td>
<td>21.3</td>
<td>2.2</td>
<td></td>
</tr>
<tr>
<td>t</td>
<td>1.49</td>
<td>0.08</td>
<td></td>
</tr>
<tr>
<td>P</td>
<td>&gt;0.05</td>
<td>&gt;0.05</td>
<td></td>
</tr>
</tbody>
</table>
Singh and Chaturvedi: Anticoagulant and Fibrinolysis Activities of Garlic

Figure-1
Significant Effect of Garlic on Blood clotting and Prothrombin Time

![Bar chart showing the comparison of blood clotting time and prothrombin time before and after treatment with garlic.](Image)

Figure-2
Significant Effect of Garlic on Euglobulin Lysis Time

![Bar chart showing the comparison of euglobulin lysis time before and after garlic treatment.](Image)
Conclusions

- The alcoholic extract of garlic significantly increased the blood coagulation time by 61.9% with one week’s treatment.
- The alcoholic extract of garlic significantly increased the prothrombin time by 15.2% after one week of the treatment.
- The alcoholic extract of garlic significantly increased the euglobulin lysis time by 83.34% after one week’s treatment, which indicated its fibrinolysis activity.
- The alcoholic extract of garlic caused insignificant decrease in the serum cholesterol with one week’s treatment but this increase became minimal after two weeks of the treatment.
- On the basis of the results of this research work it can be concluded that the alcoholic extract of garlic possesses significant short term anticoagulant and fibrinolysis actions.

Bibliography:

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