

Effect of *Allium sativum* (Garlic) Extract on Blood Coagulation and Fibrinolysis

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Abstract

The present study was aimed to evaluate the effect of *Allium sativum* (Garlic) extract on coagulation of blood and fibrinolysis of blood clot. Capillary tube method was used to estimate the clotting time of blood. 20 healthy human volunteers were included in this study and acted as self control. The variation in the clotting time of blood in presence of various doses of garlic extract was estimated. The results of the present study showed that anticoagulant property of the extract. It was also found the fibrinolytic activity of the extract may be by preventing or prolonging the time required for clot formation by altering the coagulation mechanism.

Keywords: *Allium sativum*; Garlic; Anticoagulant property; Fibrinolysis; Coagulation; Blood clot

Introduction

Garlic (*Allium sativum*) is a popular vegetable with a variety of medicinal properties. Garlic bulbs are edible, inexpensive and are readily available. These are used as traditional dietary and medicinal purposes like anti-infective agents. The Garlic Porridge is a kind of herbal diet which lowering blood pressure and blood lipid, soften blood vessel. The tonic diet is given for nourishing and moistening the lung, nourish blood soothing the liver and lower the blood pressure. Garlic also found to be used as antiprotozoal activity against *Entamoeba histolytica*, candidiasis. Cloves are known to possess antimicrobial, anticancer, antioxidant, antidiabetic, antiemetic, antihypertensive, hypoglycemic, hypolipidemic, and immunomodulatory [1-3]. Garlic consumption is an alternative thrombolysis medicine, which has been used for many years in different cultures [4]. Allicin, one of the garlic components, could have therapeutic effects, including anti-microbial effect, immunostimulating

properties, improve fibrinolytic activity, inhibit platelet aggregation and adhesion and also reduce blood pressure [4].

Fibrin is an insoluble protein that can be dissolved by the proteolytic enzymes, plasmin which could be activated by circulating plasma precursor plasminogen, which is activated by tissue-type plasminogen activator (tPA) [5,6]. Regulation of the fibrinolytic enzyme system is due to activity of Plasminogen activator inhibitor-1 (PAI-1) and plasminogen activator inhibitor-2 (PAI-2). Unwanted accumulation of fibrin in the arterial can decrease fluidity of blood circulation and cause cardiovascular diseases (CVD) such as myocardial infarction and stroke [7]. Current medication such as coumarin and warfarin are the cost-effective fibrinolysis treatment [8]. Urokinase which was derived from human urine has been broadly employed for thrombolytic therapy, but it has low specificity to fibrin and high cost [8]. The present study aimed to investigate the effect of

garlic extract on coagulation of blood using *in vitro* models.

Materials and Methods

Preparation of Extract

Fresh *Allium sativum* cloves (garlic bulbs) were procured from local market and the outer skin of the garlic *cloves* was peeled and crushed in a garlic press. The paste of the garlic cloves were done by using mixer. The mass or paste of the garlic was pressed manually to get an oil or extract and was collected in a container and obtained crude extract was used directly for the evaluation.

Effect of Garlic Extract on Coagulation of Blood

A total of 20 adult healthy volunteers (with average age of 18 ± 1 years) were taken for the study. After taking consent from the subjects, the clotting time (CT) was estimated using the capillary tube method [9]. In the second setup, different volumes of crude extract of garlic (0.1, 0.2, 0.3ml) and blood sample (1ml) was mixed and was used for the evaluation of clotting time using same subject and noted the CT time.

Effect of Garlic Extract on Fibrinolysis of Clotted Blood

To evaluate the effect of garlic extract on Fibrinolysis, the above mentioned same subjects were used. Blood samples were collected in a container without addition of any anticoagulants. After formation of fibrin clot, the garlic extract was added to the clot at different volumes and noted for the observations with proper mixing.

Statistical Analysis

All the results of the study were expressed as mean \pm SD. Paired t test was used to compare results. $P < 0.05$ is considered as statistical significance in the present study.

Results and Discussion

The volume of extract obtained with 100grams of *Allium sativum* is 8.5ml. The extract was found to be as viscous, yellow in color. The effect of garlic extract on coagulation of blood and Fibrinolysis of blood clot was showed in Table 1. The results of the study clearly showed the increase in the clotting time of blood and were found as dose dependent. Mixture of equimolar volumes of blood and extract causes the blood remains maintains as it fluid property without any clot formation.

The formed clot was found to be partially dissolved with addition of garlic oil and was found to be volume dependent.

S.No	Volume of garlic extract (ml)	Clotting time in minutes
1	0 (Control)	4.5 ± 0.52
2	0.1	$7.7 \pm 0.65^*$
3	0.2	$10.4 \pm 0.70^*$
4	0.3	$18.8 \pm 1.34^{**}$

Table 1: Effect of garlic extract on coagulation of blood Data was expressed as mean \pm SD (n=20), * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ vs control

Blood coagulation or clot formation had been takes place in different stages i.e. platelet plug formation and formation of clot. The results showing the increased CT indicates the prevention of platelet/clotting factor activation. The fibrinolytic enzyme prevents formation of fibrin clots in circulatory system [9]. Some medicines like urokinase and streptokinase are widely used to inhibit homeostatic disorders, particularly thromboemboli [10]. Fibrinolytic effects of garlic have been extensively studied *in vivo*. One Indian study showed that intake of garlic in a regular diet could remove fibrin clots and reduce the incidence of CVD [11]. Almost all human researches on fibrinolytic activity of garlic have been found to have positive effect in fibrinolysis [12-14]. Another study showed antiplatelet garlic activity and inhibiting platelet thromboxane formation [15]. The essential oils in garlic and onion act by interfering with thromboxane synthesis [16]. It has been shown that a minor component (4-10%) of natural' garlic oil is responsible for inhibition of platelet aggregation which provides for anticoagulant activity [17].

Conclusion

The results of the present study suggest the anticoagulant property of garlic extract by preventing or prolonging the time required for clot formation by altering the coagulation mechanism. It was also found the fibrinolytic activity with garlic extract.

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