

## Effects of *Garcinia Cambogia* on blood viscosity: A randomized, double-blind, placebo-controlled study

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### الخلاصة:

أجريت هذه الدراسة لغرض تقييم تأثير الغارسينيا كامبوغيا على لزوجة الدم التحق عشرون متطوعا من الذكور الاصحاء أعمارهم بين ٢٠ و ٢٢ سنة في هذه الدراسة. هؤلاء المتطوعين وزعوا عشوائيا بالتساوي إلى مجموعتين، المجموعة (أ) أخذت أقراص غارسينيا كامبوغيا ، ومجموعة (ب) أخذت أقراص وهمي، وكانت مدة العلاج أسبوعين. تم قياس اللزوجة في الدم ، ومعبأة حجم الخلية والفبرينوجين ، والكوليسترول في الدم وأجريت في اليوم الأول ، وفي نهاية الأسبوع الأول والثاني من العلاج. وأظهرت النتائج بعد أسبوع واحد من غارسينيا كامبوغيا كان هناك انخفاض معنوي في اللزوجة في الدم و الفبرينوجين. أما بعد أسبوعين فإن الغارسينيا كامبوغيا تسبب في انخفاض كبير في اللزوجة في الدم ، والكوليسترول والفبرينوجين. استثناء هو حجم الخلية معبأة الذي لم يتغير معنويا. ويمكن أن نخلص إلى أن الغارسينيا كامبوغيا تؤثر بشكل إيجابي على لزوجة الدم. وإن كان من المستحسن إجراء دراسات سريرية أخرى، استخدام الغارسينيا كامبوغيا في العلاج والوقاية من الأمراض التي تتعلق باللزوجة الدم المرتفع واعدة.

### Abstract

**Background:** *Garcinia cambogia* is a herbal remedy extracted from pumpkin like fruit used for treatment of various health conditions. Hydroxycitrate, the principle ingredient of *Garcinia cambogia*, has been shown to be a powerful lipogenic inhibitor. Blood viscosity regarded as an important factor for many diseases. Many parameters are affecting the blood viscosity such as packed cell volume, fibrinogen and serum cholesterol.

**Aim of the study:** This study was conducted to determine the effects of *Garcinia cambogia* on blood viscosity profile.

**Methods:** This study was conducted in the Department of Pharmacology, College of Medicine, AL-Mustansiriya University from September to December 2009. Twenty healthy male volunteers aged between 20 and 22 years enrolled in this study. Those volunteers randomly assigned equally, in a double-blind manner into two group; group (A) take *Garcinia cambogia* oral tablets and group (B) take placebo tablets ,the duration of therapy was two weeks. Blood viscosity, packed cell volume, plasma fibrinogen, and serum cholesterol were performed at day one and at the end of 1<sup>st</sup> and 2<sup>nd</sup> week of treatment.

**Results:** This study showed that after one week treatment with *Garcinia cambogia* there was significant reduction in blood viscosity and plasma fibrinogen. Moreover two weeks treatment with *Garcinia cambogia* produced significant reduction in blood viscosity, plasma fibrinogen and serum cholesterol (P<0.05). An exception was the packed cell volume which is not altered (P>0.05).

**Conclusion:** It can be concluded that *Garcinia cambogia* favorably affect blood viscosity. Though further clinical studies are recommended, the use of *Garcinia cambogia* in treatment and prevention of diseases that related to high blood viscosity is promising.

**Keyword:** *Garcinia cambogia*, Blood viscosity,

### **Introduction**

*Garcinia Cambogia* is a yellowish pumpkin shaped tropical tree fruit native to the country of India. In 1965, researchers identified the hydroxycitric acid (HCA) as the principle acid found in the fruit and rind (1,2). Several studies have demonstrated that HCA is a competitive inhibitor of adenosine triphosphate citrate lyase, the enzyme that catalyzes the extramitochondrial cleavage of citrate to oxaloacetate and acetyl coenzyme A (3,4). This action of HCA should reduce the acetyl coenzyme A pool, thus limiting the availability of 2-carbon units required for fatty acid and cholesterol biosynthesis (4). In vitro and in vivo studies showed that HCA inhibits the actions of citrate cleavage enzyme, suppresses de novo fatty acid synthesis, increases rates of hepatic glycogen synthesis, and decreases body weight gain (5).

Blood is a wonderful and complex substance containing many chemical compounds to perform many functions. It constantly changes and adapts to meet the body requirements. Epidemiological case control and clinical studies have clearly shown a relationship between blood viscosity and classical cardiovascular risk factors (cholesterol, arterial blood pressure, smoking) (6,7). Impaired hemorheology has also been demonstrated in atherosclerotic disease such as ischemic heart disease and peripheral arterial disease, as well as in arterial hypertension and in venous disorders (8,9). Blood viscosity affected by many parameters such as hematocrite (packed cell volume), platelet aggregation, fibrinogen level & lipid profile (10).

The aim of this study was to determine the effects of *Garcinia cambogia* on blood viscosity and selected relevant parameters.

### **Subjects and methods**

This study was conducted in Department of Pharmacology, College of Medicine, Al-Mustansiriya University, Baghdad, Iraq from September to December 2009. Twenty healthy male volunteers (medical students) aged between 20 and 22 years (mean age 21 years) were enrolled in this double-blind manner study. The subjects initially evaluated and randomly assigned equally to one of the following groups:

**Group A:** received *Garcinia cambogia* oral tablets 500 mg twice daily (Balsam Pharma. Co., Syria)

**Group B:** received matching oral placebo (starch) tablets 100mg twice daily.

The treatment period was two weeks. All participants were in good health, without any significant clinical history of physical or mental illness and not taking any concomitant medication that was likely to interfere with the study. Written informed consent was obtained from all participants. The study was approved by Local Scientific Committee of the Institution.

Prior to the study the medical history of all participants were obtained and physical examination were done. After overnight fasting, 10 ml blood was collected from each participant and the blood sample was divided into in to 3 parts:

1. Two ml of the blood was placed in a tube that contained sodium citrate, as anticoagulant. Plasma was prepared via centrifugation at 2500 rpm for 10 minutes for determination of fibrinogen.
2. Three ml of blood was placed in test tube and left to stand for 15 minutes. The serum was prepared via centrifugation at 3000 rpm for 5 minutes. 2 ml of serum frozen at (-20°C) and subsequently used for determination of cholesterol.
3. Five ml of the blood was placed in a tube that contained heparin (35 U.I/mL), as anticoagulant, and used for determination of hematocrit (PCV) & blood viscosity.

The laboratory tests of blood viscosity measurement (11), hematocrit (PCV) (12) and plasma fibrinogen (12) as well as serum cholesterol (by commercially available enzymatic kit) were performed to each participant on the day 1 as baseline record and after one and two weeks of treatment.

The blood viscosity was measured by method of Dunkan (11). Accordingly, whole blood viscosity was determined using capillary viscometer (Schott gerate type 51720/111, 0.9 mm diameter, 17 cm length and 1 ml bulb size, Germany) in the shear stress of 208 seconds<sup>-1</sup>. All measurements were carried out at 37 c° by incubating the viscometer in water bath.

Actual viscosity = relative viscosity – DW viscosity

$$\text{Relative viscosity} = \frac{\text{Flow time of blood (sec)}}{\text{Flow time of DW (sec)}}$$

Viscosity of DW = 0.9615 mPa·s

All data were analyzed using the statistical package of social sciences (SPSS) version 15 for windows program on the computer. Data were given as mean ± standard deviation (SD). Student t-test was used to compare mean values between groups. Statistical significance was accepted as p value < 0.05.

### **Results**

Placebo did not show significant effect on blood viscosity, haematocrit (PCV), serum cholesterol and fibrinogen after two weeks of treatment. [Table.1]

**Table 1: Effects of placebo on blood viscosity and its parameters**

<b>Parameters</b>	<b>At baseline Mean ± SD</b>	<b>At 1 week Mean ± SD</b>	<b>At 2 week Mean ± SD</b>
<b>Blood viscosity (mPa·s)</b>	<b>4.22 ± 0.44</b>	<b>4.015 ± 0.25</b>	<b>4.13 ± 0.51</b>
<b>PCV (%)</b>	<b>43.4 ± 3.08</b>	<b>43.30 ± 3.130</b>	<b>43.1 ± 2.56</b>
<b>Cholesterol (mg/dL)</b>	<b>193 ± 15.90</b>	<b>196 ± 22.10</b>	<b>195 ± 18.14</b>
<b>Fibrinogen (mg/dL)</b>	<b>281 ± 113.4</b>	<b>290 ± 120.2</b>	<b>277.5 ± 116.8</b>

Regarding effects of *Garcinia cambogia*, it has been found that 1 week treatment with *Garcinia cambogia* 1 g/day significantly reduced blood viscosity and plasma fibrinogen compared to baseline value (P < 0.05). Further it caused reduction of PCV and plasma cholesterol but this reduction not reached statistical significance (P > 0.05) [Table - 2]. This effect significantly differed from the corresponding placebo effect.

It's interesting to find that 2 week treatment with *Garcinia cambogia* 1 g/day produced significant reduction in all blood viscosity parameters (P < 0.05) except PCV as compared to baseline and placebo values.

**Table 2: Effects of *Garcinia cambogia* 1g/day on blood viscosity and its parameters**

Parameters	At baseline Mean ± SD	At 1 week Mean ± SD	At 2 week Mean ± SD
Blood viscosity (mPa·s)	4.12 ± 0.31	3.88 ± 0.52*	3.67 ± 0.56*
PCV (%)	43.4 ± 3.08	42.7 ± 2.16	42.2 ± 2.05
Cholesterol (mg/dL)	196 ± 22.90	193.5 ± 26.59	190 ± 11.71*
Fibrinogen (mg/dL)	292 ± 101.4	277 ± 116.8*	271 ± 90.34*

\* significant changes p value < 0.05

### **Discussion**

The present study revealed significant reduction in blood viscosity after 2 weeks treatment with *Garcinia cambogia* 500mg twice daily. In addition there is significant reduction in both of plasma fibrinogen and serum cholesterol.

It's well known that *Garcinia cambogia* have antioxidant activities (13). In the present study statistically significant decrease in blood viscosity may pointed out a potential role of *Garcinia cambogia* as antioxidant in the reduction of blood viscosity. Many previous studies showed that antioxidants improve blood viscosity by ameliorating RBC rigidity, decreasing fibrinogen level and inflammatory mediators (14,15,16). Moreover the present study showed that treatment with *Garcinia cambogia* cause significant reduction in two parameters of blood viscosity, fibrinogen and plasma cholesterol, and so this leads to further reduction in blood viscosity.

Increased fibrinogen levels are well recognized as a consequence of inflammatory process (17). Interestingly in this study fibrinogen was significantly reduced and this may be related in part to the anti-inflammatory effects of hydroxycitric acid which is the main components of *Garcinia cambogia* (13).

In the present study *Garcinia Cambogia* produced pronounced effect regarding the reduction in serum cholesterol after 2 weeks of treatment. This finding agree with previous studies which stated that *Garcinia cambogia* limits the synthesis of fatty acids in the liver and muscles and thus arrest lipogenesis by inhibiting the enzyme ATP-citrate lyase (18,19). So with no further synthesis, the existing fatty acids are gradually metabolized, resulting in reduction of serum cholesterol.

### **Conclusion**

It can be concluded that *Garcinia cambogia* favorably affect blood viscosity. Though further clinical studies are recommended, the use of *Garcinia cambogia* in treatment and prevention of diseases that related to high blood viscosity is promising.

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