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STUDY OF THE CHEMICAL COMPOSITION OF TOMATO AND ITS USE IN THE TREATMENT OF VARICOSE VEINS

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Annotation
This article provides some information about varicose veins, synthetic drugs used in the treatment of varicose veins in modern medicine, and their effect on the body. It also describes one of the natural remedies used in the treatment of this disease in folk medicine–flavonoids and vitamins contained in raw (unripe) tomatoes. The results of a quantitative study are also described.

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Introduction. Varicose veins are swelling and dilation of the venous vessels and, as a result, the appearance of nodes in the venous vessels. The saddest thing is that the blood in these nodes is completely blocked, and suddenly the veins leading to the heart lead to these nodes and put an end to a person's life. Varicose veins are more common in the population on the legs, that is, the thighs and calves.

There are many causes of varicose veins, such as heredity, obesity, pregnancy, stress, hormonal effects, uncomfortable shoes, long walking in high heels, and constant standing [1].

In modern medicine, varicose veins are treated with ointments, salves, chemicals, and special bandages.

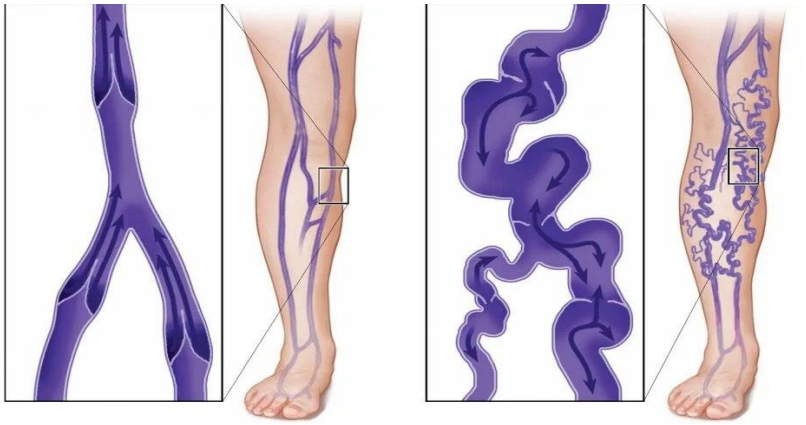
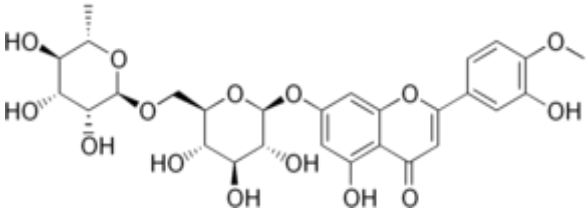


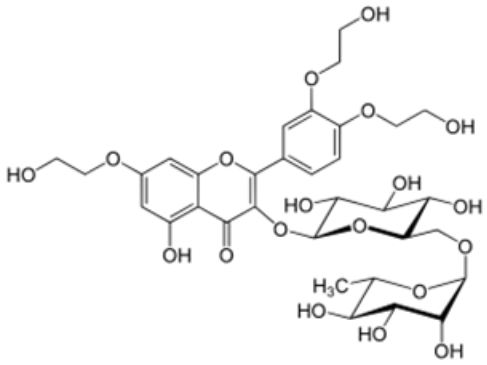
Figure 1. Appearance of vessels in a healthy patient and a patient with varicose veins

The main function of ointments or salves is to affect the skin, i.e. to relieve itching and pain and prevent swelling and bruising. Their chemical composition includes troxerutin, sodium heparin and dexpanthenol, which have regenerative and soothing properties of tissues. Applying bandages and dressings to varicose veins helps quickly return the vessels to normal.

Taking medications such as troxevasin, venoruton, detralex constricts blood vessels and removes blood clots. The main active ingredients in their chemical composition are flavonoids, which reduce vascular tone, thin the blood and reduce swelling. It also contains such additives as diosmin, hesperidin and thiamine [2].



troxerutin



diosmin

Figure 2. Active ingredients in drugs used to treat varicose veins.

In the most severe cases, hard blood clots that have appeared as a result of missed treatment are treated surgically.

In addition to the beneficial properties of the above drugs, there are also side effects on the body. For example: nausea, mood swings, heartburn, constipation, allergic skin rashes, itching, rhinitis, hematuria, collapse, and sometimes this can lead to anaphylactic shock [3].

There is a lot of information about the treatment of varicose veins in traditional medicine manuals. In particular, prof. I.R. Askarov recommended using natural products such as honey, garlic, chamomile, kerosene, carrot grass, tomato, nutmeg, wild chestnut and mint in the treatment of varicose veins [4,5].

One of the products used in the treatment of varicose veins in folk medicine is the tomato. Raw tomatoes are more effective in the treatment of varicose veins than ripe red tomatoes. Unripe (blue) tomatoes are effective in treating varicose veins. Based on this, raw tomatoes were taken as the object of the study.

The chemical composition of tomatoes is very rich: there are various vitamins (A, B_6, C, D, etc.), amino acids, biogenic elements, organic acids, carbohydrates, antioxidants, and flavonoids. Tomatos cover the body's need for water. The lycopene content in tomatoes is very important for reducing body temperature. Organic acids - salicylic, and ascorbic - prevent the formation of blood clots and purify the blood. Flavonoids have antioxidant properties. In addition, ascorbic acid and flavonoids contained in tomatoes, together have the property of quickly thinning the blood, preventing capillary rupture and increasing the elasticity of red blood cells. These properties are manifested in rutin and quercetin, and these substances have the activity of vitamin PP. When treating varicose veins, it is advisable to use tomatoes grown outdoors, mainly in natural sunlight. The concentration of active substances in the chemical composition of tomatoes ripening in a greenhouse is relatively small. In the prevention and treatment of varicose veins, it is necessary to add tomatoes, garlic and onions to the daily diet while following a diet. It is necessary to avoid fatty foods and eat foods rich in phytoncides and flavonoids [6].

The effect of this product on the body and skin of a patient with varicose veins was studied. Also, in order to study the spectrum of action, the composition of raw tomatoes was checked for the

presence of phenolic preservative compounds. Scientists who studied the composition of raw tomatoes and their works were presented [7,8,9].

Research results.

During the study of raw tomatoes, they familiarized themselves with the works of scientists who studied the chemical composition of this product. The amount of flavonoids in raw tomatoes was determined in the scientific laboratory of Andijan State University.

For this, an HLPC chromatogram of an extract of a 1 g sample was obtained (Fig. 7), based on the chromatography results, the amount of phenolic compounds in 100 g of the sample was calculated using the following formula and are presented in Table 1.

$$X = \frac{C_{phen} \cdot V_{extract}}{m_{sample}} \cdot 100\ g$$

Here X is the amount of phenolic compounds in 100 g of fruit, mg;

C_{phen} is the concentration of phenolic compound in the extract, determined by the HLPC method, mg/l;

$V_{extract}$ is the volume of the sample extract, l;

m_{sample} is the mass of the sample taken to prepare the extract.

Table 1. The amount of phenolic substances in raw tomato extract

Name of phenolic compound	Holding time, sec	Concentration, mg/l	Quantity in 100 g of sample, mg
Gallic acid	7,396	0,05	0,125
Rutin	19,045	1,612	4,030
Salicylic acid	22,402	2,095	5,238
Quercetin	23,854	0,065	0,163
Apigenin	26,11	0,047	0,118
Kempferol	Not found	0	0,000

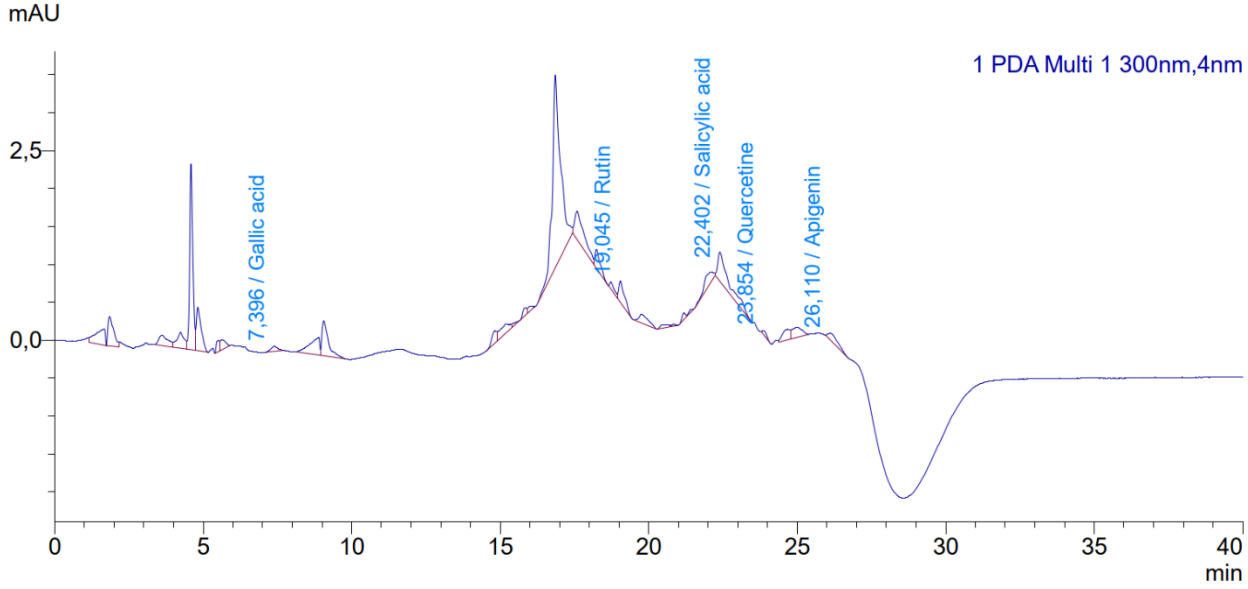


Figure 3. Chromatogram for determination of phenols in sample extract.

This table shows that raw tomatoes contain flavonoids and salicylic acid, which interact with each other and provide high efficiency of the product.



quercetin rutin

Figure 4. Active ingredients in raw tomatoes.



Figure 5. Unripe tomatoe.

Also, based on traditional medicine, the effect of raw tomatoes on a patient with varicose veins was studied. The following method was used in this process: In traditional medicine, both raw and red-ripe tomatoes can be used [10]. Depending on the size of the thigh and calf of the leg with varicose veins, the number of tomatoes is selected and cut into thin slices. Then it is carefully placed on the leg, tied with a tight bandage and not removed for 3 hours. After 3 hours, these links will be removed. After 3-4 hours, this procedure is repeated. For 2 weeks, such treatment is repeated, then a 1-week break and repeated again.

As a result of the above procedure, the patient in the initial stage of varicose veins experienced a significant reduction in swelling and bruising of the legs within 2 weeks. The pain disappeared. And this experiment was repeated after a 2-week break. Ultrasound revealed that the blood vessels behind the right knee were increased in diameter by 10-11 mm. After 1 month, it was found that the diameter of the vessels behind the right knee had increased to 8-9 mm (Fig. 5).

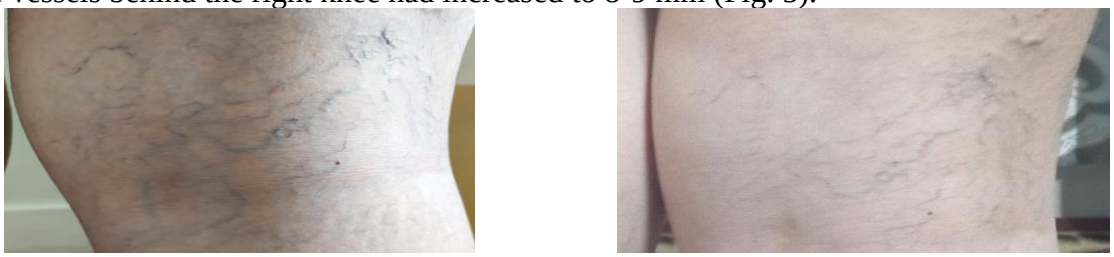


Figure 6. Changes in vessels in varicose veins in 1 month

Experimental part.

Reagents and equipment used. Gallic acid from Macklin (China), salicylic acid from Rhydburg Pharmaceuticals (Germany), quercetin, apigenin, kaempferol from Regal (China), rutin from natural sources and standard samples isolated by column chromatography, HPLC water, acetonitrile, acetic acid and sodium hydroxide were used in chemically pure grades. The object of the study was unripe tomato fruits TMK-22, collected in August 2024. The amount of phenolic compounds was determined by high-performance liquid chromatography LC-40 Nexera Lite (Shimadzu, Japan).

Preparation of standard solutions. Gallic acid (5.2 mg), salicylic acid (5.2 mg), rutin (5 mg), quercetin (5 mg), apigenin (5 mg), kaempferol (5 mg) were dissolved in 96% ethanol in an ultrasonic

bath for 20 minutes. and transferred to a 50 ml flask and made up to the mark with ethanol. 200 µl of each solution were taken and mixed, and a total of 4 different solutions were prepared by diluting them. Each solution was poured into a vial and used for analysis.

Preparation of plant extract. To extract phenolic compounds, 1 g of the test sample was weighed to the nearest 0.01 g, placed in a 50 ml conical flask and 25 ml of 96% ethanol were added. The mixture was extracted in an ultrasonic bath at 60 oC for 20 minutes. Then the mixture was cooled, filtered and the volume was brought up to 25 ml with ethanol in a measuring flask. 1.5 ml of the extract was centrifuged at 7000 rpm in a Mini-7 centrifuge (BIOBASE, China), filtered through a 0.45 µm syringe filter and used for analysis.

Chromatographic conditions. Determination of phenolic compounds. A standard solution, a Shim Pack GIST C18 sample extract (150 × 4.6 mm; 5 µm, Shimadzu, Japan) reversed-phase column and a gradient mobile phase consisting of acetonitrile (A) and 0.5% acetic acid in water (B) (Table 2) were used. The injection volume was set at 10 µL, the flow rate at 0.5 mL/min and the column thermostat at 40 C. The analytical signal (peak area) of phenolic compounds was recorded at 300 nm (Fig. 6).

Table 2. Software for the mobile phase gradient.

Time (minutes)	Acetonitrile (A), %	0.5% acetic acid (B), %
0	5	95
5	5	95
17	40	60
22	40	60
22,1	5	95
40	Termination	

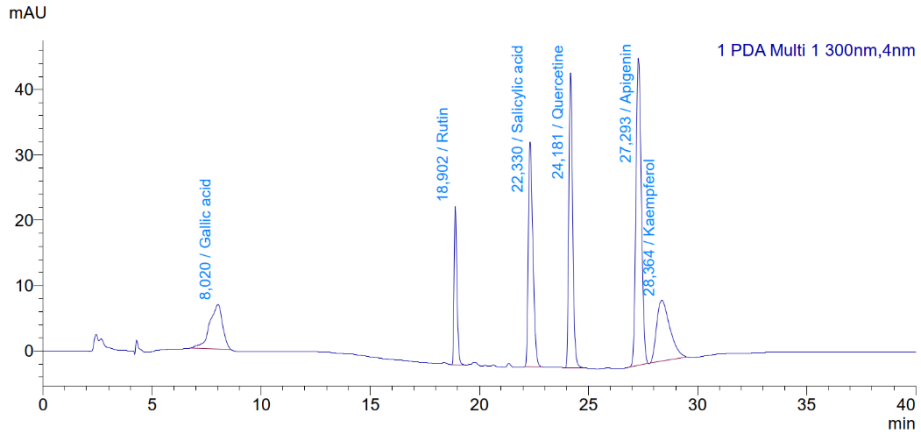


Figure 7. Chromatogram of standards at 300 nm.

Conclusion. In experiments conducted to determine the amount of phenolic substances in raw tomatoes, 5 phenolic substances and their amounts were determined. It was noted that the amount of these substances decreases in the series salicylic acid-rutin-quercetin-gallic acid-apigenin.

When eating raw tomatoes, a patient with varicose veins experienced changes in the vessels, bruises and swelling returned. When the composition of raw tomatoes was checked, it was found that they contained polyphenols. As a result of studying the effect of raw tomatoes on varicose veins, it was found that the diameter of the dilated vessels decreased by an average of 2 mm. The results of the studies showed that the presence of flavonoids in raw tomatoes, especially salicylic acid and rutin, causes a pronounced venotonic, i.e. veneactive, effect of this product.

References

1. Babajanov A.S., Toirov A.S., Ruziboyev S.A., Axmedov A. I. Oyoq venalari varikoz kasalligi va uni davolash usullari. T.: “Qamar media”. – 2022. -B. 126.
2. Mahsumov M.N.,.Odilov M.A, Aliyev X., Musayeva N.A. Farmakalogiya asoslari. T.: “Ilm ziyo.” -2007. -B. 382.
3. Машковский. М.Д.. Лекарственные средства. М.: “Новая волна. ”– 2012. -С. 550.
4. Asqarov I.R. Tabobat qomusi. T.: "Mumtoz so’z". – 2019. -B. 1142.
5. Asqarov I.R. Sirli tabobat. T.: "Fan va texnologiyalar nashriyot-matbaa uyi".
6. Химический состав пищевых продуктов. Справочник. Книга 1. М.: “Агропромиздат”. – 1987. -С. 222.
7. Esra Capanoglu, Jules Beekwilder, Andrea Matros, Dilek Boyacioglu, Robert D. Hall, Hans Peter Mock. // Plant Foods Hum Nutr. “Correlation of Rutin Accumulation with 3-O-Glucosyl Transferase and Phenylalanine Ammonia-lyase Activities During the Ripening of Tomato Fruit” (2012) 67:371–376 DOI: 10.1007/s11130-012-0321-1.
8. Li-hao Wang Lin Shi, De-hong Tan , Xue-song Zhong, Mei-qi Jia, Xue Ke, Yu-mei Zhang, Tong Cui. // Food Chemistry. “Review on toxicology and activity of tomato glycoalkaloids in immature tomatoes”. 447 (2024) 138937https://doi.org/10.1016/j.foodchem.2024.138937.
9. E. D. Felix, T. Mahendran. // Tropical Agricultural Research & Extension. “Physico – chemical properties of mature green tomatoes (lycopersicon esculentum) coated with pectin during storage and ripening”. 12(2):2009. 109-112.
10. Asqarov I.R. Fitoterapiya. T.: "Fan va texnologiyalar nashriyot-matbaa uyi". 2023. -B. 1120.