ЎЗБЕКИСТОН РЕСПУБЛИКАСИ
ОЛИЙ ВА ЎРТА МАХСУС ТАЪЛИМ ВАЗИРЛИГИ

ФАРҒОНА ДАВЛАТ УНИВЕРСИТЕТИ

FarDU. ILMIY XABARLAR-

1995 йилдан нашр этилади
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— 3-2021 —

НАУЧНЫЙ ВЕСТНИК. ФерГУ

Издаётся с 1995 года
Выходит 6 раз в год

Муассис: Фарғона давлат университети.

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Муҳаррирлар: Ташматова Т.
Жўрабоева Г.

Мусаҳҳиҳ: Шералиева Ж.

Таҳририят манзили:
150100, Фарғона шаҳри, Мураббийлар кўчаси, 19-уй.
Тел.: (0373) 244-44-57. Мобил тел.: (+99891) 670-74-60
Сайт: www.fdu.uz

Босишга рухсат этилди:
Қоғоз бичими: - 60×84 1/8
Босма табоғи:
Офсет босма: Офсет қоғози.
Адади: 50 нусха
Буюртма №
ФарДУ нусха кўпайтириш бўлимида чоп этилди.
Манзил: 150100, Фарғона ш., Мураббийлар кўчаси, 19-уй.

Фарғона,
2021.

МУНДАРИЖА

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УДК: 547.587.26

АНОР ПЎСТЛОҒИ ТАРКИБИДАН ГАЛЛ КИСЛОТАСИНИ ОЛИШ УСУЛЛАРИ

СПОСОБЫ ПОЛУЧЕНИЯ ГАЛЛОВОЙ КИСЛОТЫ ИЗ КОЖУРЫ ГРАНАТА

METHODS FOR OBTAINING GALLIC ACID FROM THE COMPOSITION OF POMEGRANATE PEEL

[1]Askarov Ibroxim Raxmonovich, [2]Isakov Khayotullo, [3]Abdulloev Obidjon Shaxabidinovich, [4]Turakhonov Shohruh Odiljonovich.

[1]Askarov Ibroxim Raxmonovich – *Doctor of Chemistry, Professor of Andijan State University.*

[2]Isakov Khayotullo - *Doctor of Technical Sciences, Professor of Andijan State University.*

[3]Abdulloev Obidjon Shaxobidinovich – *PhD, Andijan State University*

[4]Turakhonov Shohruh Odiljonovich - *Andijan State University.*

Аннотация

Мақолада анор пўстлоғи таркибида учрайдиган полифеноллар ва галл кислотасининг олиниши ҳақида маълумотлар келтирилган.

Аннотация

В статье представлена информация об извлечении полифенолов и галловой кислоты, которые содержатся в кожуре граната.

Annotation

This article provides information on the extraction of polyphenols and gallic acid, which are found in the pomegranate peel.

Таянч сўз ва иборалар: *анор пўстлоғи, полифеноллар, антиоксидантлар, флавоноидлар, алкалоидлар, танин, сульфат кислота ва фенолли бирикмалар.*

Ключевые слова и выражения: *кожура граната, полифенолы, антиоксиданты, флавоноиды, алкалоиды, дубильные вещества, серная кислота и фенольные соединения.*

Keywords and expressions:*pomegranate peel, polyphenols, antioxidants, flavonoids, alkaloids, tannins, sulfuric acid and phenolic compounds.*

Substances with antioxidant properties produced by nature from different species of plants are of great importance in protecting human health. In recent years, research and studies by scientists have proven the importance of consuming natural fruits in prevention of cancer and cardiovascular disease. Pomegranate fruit juices and extracts from various parts of the plant, such as vegetables and teas rich in natural antioxidants, have been found to have strong antioxidant effects [1].

Pomegranate peel contains large amounts of phenolic compounds, such as hydrolyzable tannins (punicalin, punicalagin, ellagic acid and gallic acid), flavonoids (anthocyanins and catechins) and nutrients responsible for its biological activity [2]. Pomegranate peel, commonly regarded as agro-industrial waste, is a potential source for antioxidants. Its peel can be more useful in the form of food supplements. Due to the versatility and nutritional properties of pomegranate peel, there is interest in new methods of use in many industries. Its extracts have been used as natural additives to increase shelf life [3]. Pomegranate peel makes up about 49-55% of fruit weight, depending on the condition of the fruit [1]. The peel contains 3.2-8.6% gallic acid, belongs to the category of polyphenols and it is a light yellow crystalline powder. Gallic acid (also known as bile acid or gallic acid) is an organic acid found in the roots, fruits, and bark of honey, cocoa, mango, mushrooms, walnuts, oak, pomegranate, tea, and other plants and trees.

Gallic acid forms a blue and black solution in an aqueous solution of iron (III) chloride. The alkaline bismuth salt of gallic acid can be used as a preservative as well as in the pharmaceutical industry. Gallic acid

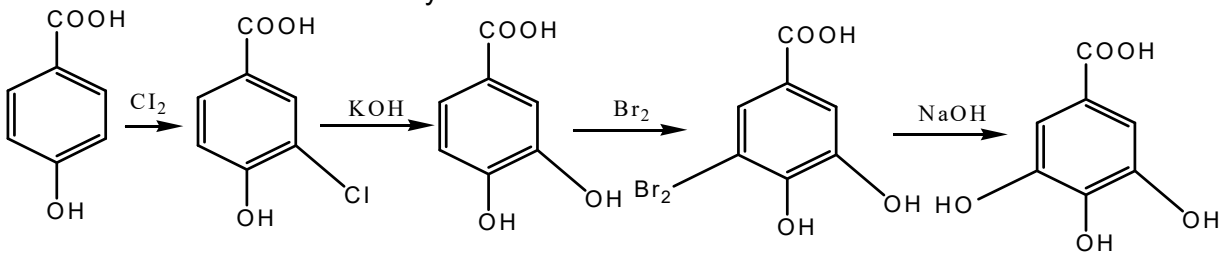
can be used to produce a variety of fuels, blue-black inks (gall acid and iron ions to form a blue-black precipitate). Some compounds of gallic acid are also used as a regulator of plant growth and development. In addition, it is an ultraviolet absorbent, flame retardant, semiconductor photoresist material, and an aluminum alloy organic coating and a diluent for water-based drilling mud [1-3]. It can be compared with lignosulfonate, from which it is widely used as a developer and analytical reagent for the detection of inorganic acids, dihydroxyacetone, alkaloids, metals, etc., and in the food, biology, medicine and chemical industries.

Extraction and purification of gallic acid from pomegranate peel grown in Iraq, a study aimed at studying the chemical composition of pomegranate peel, conducted research on the extraction and purification of gallic acid. When gallic acid extraction was carried out in an ethanol / water mixture (40:60) at a temperature of 60–70 ºC, the yield was 0.59% [2,3].

In another experiment, an aqueous extract of pomegranate peel was prepared by a conventional method [4]. According to this method, the pomegranate peel is dried and separated and then ground into a powder. The powder is dipped in methanol and distilled water (1:10) to prepare solutions, and the methanol and aqueous extracts are stored at 4 ° C. The authors found that in the separation of gallic acid, the efficiency of production was 6.8% when methanol was obtained as the solvent, while its efficiency was 4.8% when the solvent was water [5].

A group of scientists conducted experiments on varieties of pomegranate fruit of the variety "SEFRI" obtained from 3 BeliMellal, Settat and Berkane regions of Morocco. The fruit is cleaned by hand and the separated fruit peel and seeds are washed in distilled water. Peeled peels and fruits are dried in an air-circulated 40° C oven (Binder, BD 56 Germany). The samples were ground under laboratory conditions and passed through a 0.25 μm sieve. The dried sample was then stored at 20° C until use. 10 g of fruit peel and seeds are mixed with 60 ml of methanol in a magnetic mixer at room temperature for 24 hours. The methanol extraction mixture was then filtered. The residue in the filter section was washed again with 50 ml of methanol and added to the resulting filtrate. The obtained filtrates were driven under vacuum at a temperature of 40° C [6,7].

When the composition of pomegranate peel was analyzed, it was found that large amounts of other acids of phenol are present. For example, gall, ellagic, vanilla, caffeine and other substances have been found [8-10]. When researchers studied the different chemical composition of pomegranate varieties, they found that the amount of substances in it differed from each other [8,9]. For example, the equivalent of 7.8 mg / g of gallic acid was found in the extracts of the bark of Tunisian varieties [10,11]. The average content of gallic acid in samples of pomegranate peels of different Italian varieties was 8.4 mg / g [12,13]. The main phenolic compounds were identified in the peel extracts of Egyptian pomegranate: gallic acid was 2.5 mg / g [14]. When scientists studied 6 pomegranate varieties in China, the amount of gallic acid was 1.34 mg / g. When pomegranate peels collected from other regions of China were studied by LI and others, Gallic acid was detected at a rate of 2.59 mg / g [15]. In the laboratory, the synthesis of gallic acid is derived from p-hydroxybenzoic acid in stages.



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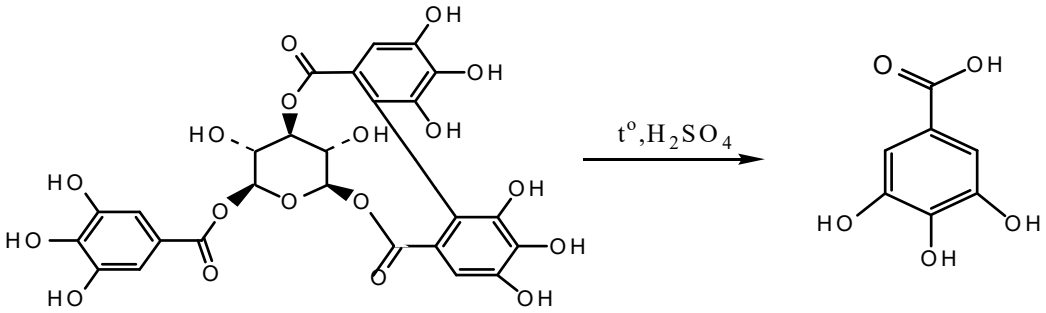
The literature shows methods for obtaining gallic acid from many plants. Method 1: 75 g of the crushed part of the sorrel root is heated in a water bath, filtered in a Büchner funnel, the root is extracted again with water, filtered and washed with hot water. Add a little concentrated sulfuric acid to the aqueous extract and heat again in a water bath at 60-700 C. Gallic acid was then extracted from the hydrolyzate 4 times with ether. The ether extract is distilled to 50 ml, evaporated in a water bath and the resulting product is recrystallized 2 times in hot water. The result is 5 g of pure acetic acid [16,17].

Method 2: 50 g of crushed walnut shell or its raw fruit is extracted by heating in a water bath with methanol, after filtering the walnut shell is extracted 2 more times with methanol, methanol extracts are combined, pumped in a water bath and placed in a separating funnel. The flask is washed with hot water, which is also placed in a separating funnel, extracted 3 times with chloroform and ethyl acetate. The extract is dried with sodium sulphate or magnesium sulphate and distilled in a vacuum until 40-50 ml of solution is left, and the product in the flask is placed in a porcelain cup, carbon dioxide or nitrogen is added, and the remaining solvent in the water bath is discarded. The resulting product is dried in vacuum desiccators and ground in a porcelain mortar. The result is 6-7 g of substance [16].

Method 3: 5 g of tannin is heated in a water bath for 10 hours with 10 ml of sulfuric acid. The hydrolyzate is then extracted with ether 4-5 times in a separating funnel and the ethereal extract is dried with sodium sulfate and distilled in an ether water bath. The resulting product is dissolved in hot water and left in the refrigerator to crystallize gallic acid, and the precipitated gallic acid is filtered and dried in a desiccator.



The result is a substance with a yield of 1.5 g. The taste of pomegranate juice is determined by the presence of nutrients, the composition of which varies depending on the variety and area of growth. Gallic acid is extracted from pomegranate peel. The main focus is on the drying technology of pomegranate peel, as it is necessary to preserve the carboxyl and hydroxyl groups in it while drying. Pomegranate peel is dried using air drying, freeze-drying, vacuum, muffle furnaces and other methods to remove moisture from the skin. After the pomegranate peels had been dried, gallic acid was extracted from them in various ways. Compared to 100 g of pomegranate peel, 1.7 g was obtained when air-dried, 4.0-4.78 g when frozen-dried, and 5.25 g when vacuum-dried [16-17].

As a result of the research, an improved technology for the extraction of gallic acid from pomegranate peel was proposed. 10 g of crushed pomegranate peel or its raw fruit was kept at room temperature for 1 day with 100 ml of methanol. The next day the temperature was slowly raised from 20^0 C to 60^0 C and after 3 hours the temperature was extracted by heating in a water bath to 70^0 C. After the pomegranate peel is filtered, it is extracted 2 more times with methanol, the methanol extracts are combined, driven into a water bath and placed in a separating funnel, and the tube is washed with hot water and placed in the separating funnel. The mixture was extracted 3 times with chloroform and ethyl acetate. The extract was dried with sodium sulfate. In a vacuum, 40–50 ml of the solution was distilled and the product in the flask was placed in a porcelain bowl, carbon dioxide or nitrogen was added, and the remaining solvent in the water bath was

discarded. The resulting product was dried in a vacuum desiccator and crushed in a porcelain mortar. The result was a substance with a yield of 9.2 mg / g. Based on the results obtained, an analysis of the results obtained by the scientists below is shown in Table 1.

Table 1

Analysis of gallic acid in pomegranate peels grown in different regions of the world

№	Pomegranate varieties grown in different regions of the world	The amount of gallic acid obtained from pomegranate peel (mg / g).	№	Pomegranate varieties grown in different regions of the world	The amount of gallic acid obtained from pomegranate peel (mg / g).
1	Egypt	2.5	4	China(6)	1,34-2,59
2	Tunisia	7.8	5	Italy	8.4
3	Iraq	0.59	6	in practice	9,2

Comparing the mg / g content of gallic acid in the peels of pomegranate varieties grown in some countries above, our experiments showed that the content of gallic acid in the peels of pomegranate varieties grown in our country is much higher. Currently, experiments are being carried out on highly effective methods of obtaining tannins and gallic acids from pomegranates.

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