

The study of phenolic compounds of Graviat urban herb (*Geum urbanum* L.) by the method  
HPLC

I.L. Drozdova

(FKBOU VO "Kursk State Medical University", Kursk)

The study of phenolic compounds of the *Geum urbanum* L. above-ground part by HPLC

IL Drozdova

The chair of pharmacognosy and botany, Kursk State Medical University (Kursk, Russia)

SUMMARY

The article presents the results of a study of the component composition of phenolic compounds of the herb urban gravelate (*Geum urbanum* L.) of the Rosaceae family by HPLC. 13 substances (flavonoids, phenolcarboxylic acids, coumarins, glycosides of simple phenols, tannins) have been identified. 7 phenolic compounds in the herb urban gravelata were discovered for the first time.

Key words: urban gravel, *Geum urbanum* L., phenolic compounds, high performance liquid chromatography, HPLC.

RESUME

The results of a study of phenolic compounds in the *Geum urbanum* L. above-ground part family Rosaceae by HPLC are presented. By means of these methods 13 substances have been revealed (flavonoids, phenolcarboxylic acids, coumarins, glycosides simple phenols, tanning substances). 7 phenolic compounds have been revealed from *Geum urbanum* L. above-ground part for the first time.

keywords: *Geum urbanum* L., phenolic connections, high performance liquid chromatography, high performance liquid chromatography, HPLC.

Introduction

Currently, herbal preparations occupy an increasingly important place in the treatment of various (including socially significant) diseases [1]. A significant part of modern medicines of natural origin is based on phenolic compounds and has a wide range of pharmacological effects: vasoconstrictive, cardiotoxic, anti-inflammatory, antimicrobial, choleric, hepatoprotective, antioxidant, antitumor, immunomodulatory and others. The official recognition of the growing role of medicinal plants in health care in most developed countries of the world is facilitated by high requirements for the quality, safety and efficacy of medicinal plant materials and standardized herbal preparations [2]. According to the World Health Organization (WHO), the basis of the nomenclature of modern official herbal preparations in many cases are traditional medicinal products, and the developers of modern standardized preparations around the world are turning to the experience of traditional medicine, including in order to search for promising biologically active substances of natural origin. In the industrial phytopharmacy of many countries, one of the basic principles of traditional medicine is actively used today - the "area principle", i.e. the use of local raw plant resources with the maximum affinity for the body of local residents [2]. Therefore, the search for new domestic available sources of medicinal plant raw materials in the current conditions of import substitution is relevant. and the developers of modern standardized drugs all over the world are turning to the experience of traditional medicine, including in order to search for promising biologically active substances of natural origin. In the industrial phytopharmacy of many countries, one of the basic principles of traditional medicine is actively used today - the "area principle", i.e. the use of local raw plant resources with the maximum affinity for the body of local residents [2]. Therefore, the search for new domestic available sources of medicinal plant raw materials in the current conditions of import substitution is relevant. and the developers of modern standardized drugs all over the world are turning to the experience of traditional medicine, including in order to search for promising biologically active substances of natural origin. In the industrial phytopharmacy of many countries, one of the basic principles of traditional medicine is actively used today - the "area principle", i.e. the use of local raw plant resources with the maximum affinity for the body of local residents [2]. Therefore, the search for new domestic available sources of medicinal plant raw materials in the current conditions of import substitution is relevant. the use of local raw plant resources with the maximum affinity for the body of local residents [2]. Therefore, the search for new domestic available sources of medicinal plant raw materials in the current conditions of import substitution is relevant. the use of local raw plant resources with the maximum affinity for the body of local residents [2]. Therefore, the search for new domestic available sources of medicinal plant raw materials in the current conditions of import substitution is relevant.

One of the promising representatives of the domestic flora, which have long been used in folk medicine, are plants of the Graviat genus (*Geum* L.) of the Rosaceae family. The genus includes about 60 species, in the flora of Russia - 9 wild-growing species, in Central Russia - 4 species, of which the most widespread urban gravelate (*Geum urbanum* L.) is a perennial herbaceous plant with a significant

raw material base. It is distributed in all regions of the European part, in the Caucasus, in the Far East. It grows in all regions of Russia as a common plant in shrubs, forest edges, and gardens [3, 4, 5]. Gravitat city was included in the I-III editions of the Russian Pharmacopoeia, included in the 10th edition of the French Pharmacopoeia [6]. In Russia, at present, urban gravilate is used only in traditional medicine. Rhizomes with roots are used as an astringent and anti-inflammatory agent, the herb is used for diarrhea. This species is used for diseases of the digestive and respiratory systems, skin, nephrolithiasis, cystitis, hypovitaminosis, in collections - for diabetes mellitus. The plant improves the general condition of the body during exhaustion, has a hemostatic effect, externally, a decoction of rhizomes with roots is used to rinse the mouth with tonsillitis, stomatitis and gingivitis [3]. In the experiment, an aqueous extract of the herb enhances the excitability of the myometrium, has anticoagulant properties, a decoction of rhizomes exhibits antimicrobial activity, and an infusion of leaves and flowers exhibits antiviral activity [4].

Literature data indicate that the chemical composition of urban gravilate was studied mainly by foreign scientists. It has been established that rhizomes with roots and grass contain phenolcarboxylic acids, coumarins, flavonoids, catechins, anthocyanins, phenylpropanoids, tannins, essential oil, polysaccharides, vitamins (carotenoids, riboflavin and ascorbic acid), amino acids, macro- and microelements [4, 7, eight].

Given that the pharmacological action of urban gravilate is due to a complex of biologically active substances, including phenolic nature, it was of interest to study the component composition of phenolic compounds of urban gravilate of domestic flora.

The aim of the work was to analyze the composition of phenolic compounds of the herb gravilata urban by high performance liquid chromatography (HPLC).

#### Objects and methods of research

The object of the study was the air-dry crushed grass of urban gravilate. Raw materials were harvested in the Kursk region during the period of mass flowering of plants.

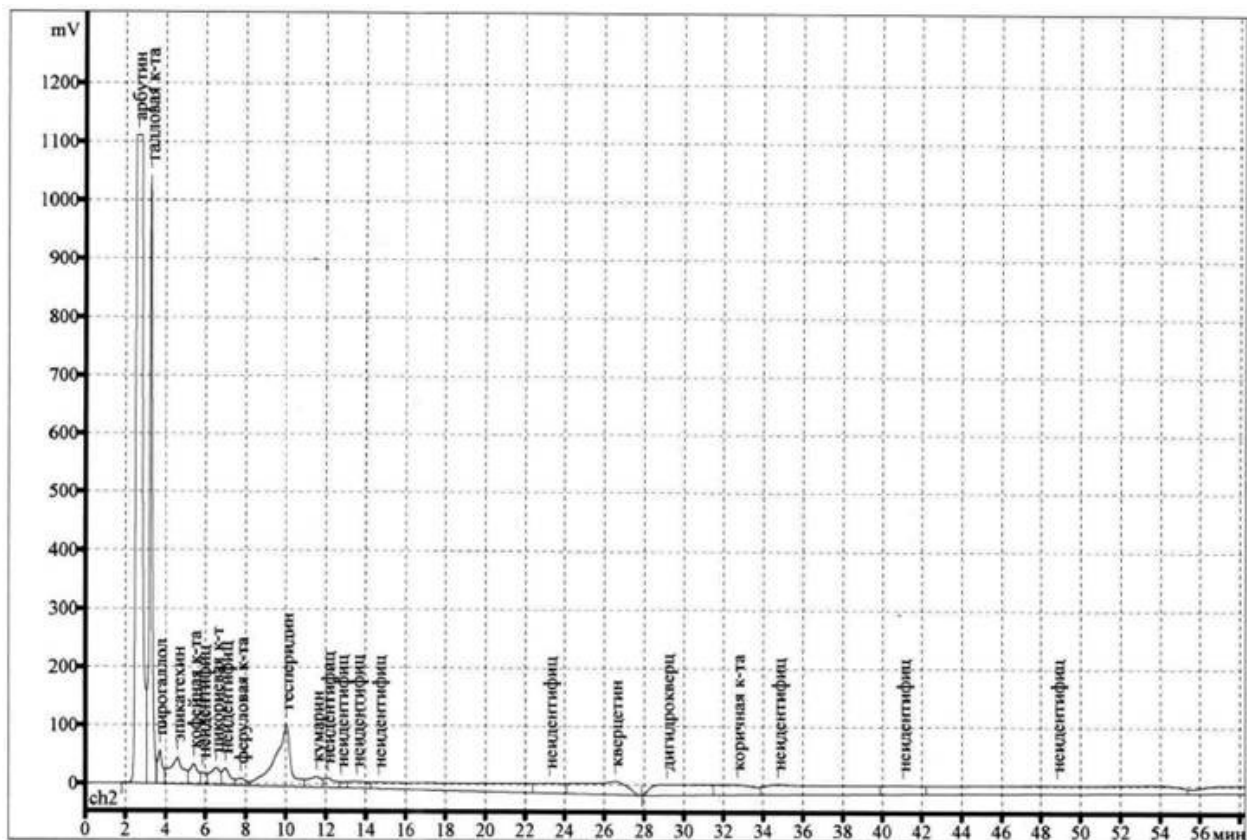
The HPLC method was used to study the component composition of the phenolic compounds of the urban gravilate herb. Medicinal plant materials were preliminarily crushed to a particle size passing through a sieve with a hole diameter of 2 mm (according to GOST 214-83). To study the component composition of phenolic compounds, 5.0 g of the raw material was placed in a 250 ml flask, 50 ml of 70% ethyl alcohol was added and heated in a boiling water bath for 1 hour from the moment of boiling. After cooling, the mixture was filtered through a paper filter into a volumetric flask with a capacity of 100 ml and the volume was brought up to the mark with 70% ethyl alcohol (test solution). In parallel, a series of 0.05% comparison solutions of samples of phenolic compounds in 70% ethyl alcohol was prepared. The analysis was carried out on a GILSON (France) high-performance liquid chromatograph (model 305) with a RHEODYNE-7125 (USA) manual injector, followed by computer processing of the results using the MultiChrome for Windows. Detection was carried out using a GILSON UV-VIS UV detector (model 151). Chromatographic column Kromasil C 18 (4.6×250 mm) with a particle size of 5 µm. The mobile phase is a mixture of methyl alcohol-water-phosphoric acid concentrated (400:600:5). The eluent flow rate was 0.80 ml/min, the working wavelength was 254 nm, the sample volume was 20 µl, and the column temperature was room temperature. The mobile phase was prepared using methyl alcohol (high purity grade), phosphoric acid (high purity grade), and purified water. To prepare solutions of standard samples, standards of phenolic compounds from Sigma (USA) and Fluka (USA) were used. [9, 10, 11]. The identification of the separated substances was carried out by comparing the retention times of the peaks obtained on the chromatogram of the sample with the retention times of standard solutions of phenolic compounds (RSO). The assessment of the quantitative ratio of the identified substances in the grass of the urban gravel was carried out by the method of internal normalization according to the area of the obtained peaks [12, 13].

#### Results and its discussion

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As a result of the research, 13 compounds of a phenolic nature were identified in the grass of urban gravilata, which are represented by flavonoids, phenolcarboxylic acids, coumarins, glycosides of simple phenols and tannins. The results of the analysis are presented in fig. 1 and in table. one.

Among the urban compounds identified in the herb gravilata are 4 flavonoids (hesperidin, quercetin, dihydroquercetin, kaempferol), incl. 3 aglycones and 1 glycoside. Derivatives of flavonol (flavon-3-ol) (quercetin, kaempferol) and flavononol (flavonon-3-ol) (dihydroquercetin) were found among aglycones. Hesperidin glycoside is chemically a flavanone bioside. The obtained results on the composition of flavonoids are consistent with the literature data: in other representatives of the Rosaceae family, the presence of quercetin derivatives was previously proven [14]. The identified phenolcarboxylic acids are represented by 5 compounds (gallic, caffeic, ferulic, chicory, cinnamic). In addition, among phenolic compounds with reliable samples, 1 substance of coumarin nature (coumarin), 3 substances, attributed to the glycosides of simple phenols and tannins (arbutin, pyrogallol, epicatechin). Using the method of internal normalization, it was found that of the flavonoid compounds in the studied form, kaempferol (5.45% of the total amount of phenolic compounds) and hesperidin (5.09%) are contained in the largest amount, gallic acid (8.87%) predominates among phenolcarboxylic acids. , arbutin is present in a significant amount (23.50%). Of the 13 identified compounds, 7 were found in the urban gravel for the first time. arbutin is present in a significant amount (23.50%). Of the 13 identified compounds, 7 were found in the urban gravel for the first time. arbutin is present in a significant amount (23.50%). Of the 13 identified compounds, 7 were found in the urban gravel for the first time.



Rice. Fig. 1. HPLC chromatogram of an alcohol-water extract from the herb urban gravilata.

Table 1

The results of the study of phenolic compounds of the herb gravilata urban method  
high performance liquid chromatography

Наименование РСО	Время удерживания, мин	Количественное соотношение в смеси, % от суммы
Арбутин*	2,62	23,50
Галловая кислота	3,25	8,87
Пирогаллол*	3,68	0,81
Эпикатехин	4,59	1,86
Кофейная кислота	5,41	0,88
Не идентифицированное соединение	5,87	0,38
Цикориевая кислота*	6,51	0,82
Не идентифицированное соединение	6,98	0,74
Феруловая кислота	7,76	0,37
Гесперидин*	10,02	5,09
Кумарин*	11,51	0,72
Не идентифицированное соединение	12,09	0,58
Не идентифицированное соединение	12,76	0,22
Не идентифицированное соединение	13,55	0,68
Не идентифицированное соединение	14,62	5,56
Не идентифицированное соединение	23,25	1,49
Кверцетин	26,55	3,24
Дигидрокверцетин*	29,13	3,05
Коричная кислота*	32,67	2,01
Не идентифицированное соединение	34,75	4,97
Не идентифицированное соединение	41,04	1,83
Не идентифицированное соединение	48,80	9,65
Кемпферол	62,63	5,45
Не идентифицированное соединение	76,71	17,23

\* – означает, что вещество в исследуемом растении обнаружено впервые

#### conclusions

Thus, the results of the experimental studies made it possible to draw the following conclusions:

1. Urban gravilate grass contains a complex of biologically active substances phenolic nature. The HPLC method established the component composition of phenolic compounds, which are represented by flavonoids, phenolcarboxylic acids, coumarins, glycosides of simple phenols and tannins. As a result, 13 substances were identified, 7 of which were found in the studied form for the first time.

2. It has been established that of the flavonoid compounds in the herb gravilata urban kaempferol and hesperidin predominate, gallic acid predominates among phenolcarboxylic acids, and arbutin is present in a significant amount. The data obtained make it possible to consider urban gravilate as a promising domestic source of phenolic compounds with versatile pharmacological activity.

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Author's address

Ph.D. Drozdova I.L., Dean of the Faculty of Pharmacy and Biotechnology, Professor of the Department of Pharmacognosy and Botany  
irina-drozdova@yandex.ru

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