Biochemical rationale for the use of Angelica archangelica L. in the monastery practice

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RESUME

Angelica (s. Angelica) Medicinal Angelica archangelica - medicinal and spicy flavoring plant grown for centuries in the gardens of the Orthodox and Catholic monasteries. In the Middle Ages angelica regarded as a universal antidote and a cure. Experiences of our ancestors showed the effectiveness of this plant for the treatment of infectious diseases, gynecological, gastrointestinal, and other diseases.

However, the composition of the plant is poorly understood. With this in mind, we carried out the identification of the components of essential oils and alcoholic extracts of roots and leaves of angelica by gas chromatography using a gas chromatography-mass spectrometer Thermo Finnigan. The total content of coumarins in angelica root was 1.09%. Coumarin compounds (derivatives imperatorin, etc.) were identified in leaf extract. The roots contain angelicin, methoxsalen, bergapten, osthol and oroselone with antiviral and antitumor activity. The high content of coumarin and more diverse range of it in the leaves of A. archangelica angelica raw materials can be considered as a promising source of coumarin compounds with antiviral, antiplatelet and antiischemic activity.

Keywords: angelica (s. garden angelica), Angelica archangelica, coumarins, terpenoids.

SUMMARY

Angelica (s. Angelica) medicinal Angelica archangelica is a medicinal and spice plant cultivated for many centuries in the gardens of Orthodox and Catholic monasteries. In the Middle Ages, angelica was considered as a universal antidote and panacea. Empirically, our ancestors came to the conclusion about the effectiveness of this plant for the treatment of infectious, gynecological, gastrointestinal and other diseases. At the same time, the composition of the plant has been insufficiently studied. Taking this into account, we have carried out the identification of essential oil components and alcoholic extracts of angelica roots and leaves by gas chromatography using a Thermo Finnigan gas chromatography-mass spectrometer. The total content of coumarins in angelica roots is 1.09%. Coumarin compounds have been identified in the leaf extract, about half of coumarins are represented by derivatives of the emperor. The roots contain angelicin, methoxalen, bergapten, ostol and oroselon, which have antiviral and antitumor activity. The high content of coumarins and their more diverse spectrum in the leaves of A. archangelica allows us to consider angelica raw material as a promising source of coumarin compounds with antiviral, antiplatelet and anti-ischemic activity. In angelica essential oil, cyclohexane sesquiterpenoids (elemene and elemol) were found, which are considered as potential antineoplastic agents in diseases of the brain and lungs. archangelica allows us to consider angelica raw material as a promising source of coumarin compounds with antiviral, antiplatelet and anti-ischemic activity. In angelica essential oil, cyclohexane sesquiterpenoids (elemene and elemol) were found, which are considered as potential antineoplastic agents in diseases of the brain and lungs. archangelica allows us to consider angelica raw material as a promising source of coumarin compounds with antiviral, antiplatelet and anti-ischemic activity. In angelica essential oil, cyclohexane sesquiterpenoids (elemene and elemol) were found, which are considered as potential antineoplastic agents in diseases of the brain and lungs.

Keywords: angelica (s. angelica) medicinal Angelica archangelica, coumarins, terpenoids.

One of the oldest medicinal plants introduced into culture is angelica

medicinal (s. angelica). The origin of the Latin name for angelica - Angelica archangelica is associated with the legend, according to which the Archangel Michael saved people suffering from the plague by giving them this plant. Angelica was credited with supernatural powers, using it to protect against infectious diseases and preserve intelligence. In Russia, A. archangelica was cultivated in pharmaceutical gardens at monasteries, peasant farms grew angelica for export to Western countries [1]. It was used as a spice herb.

Benedictine monks used angelica as a universal antidote - "Teriak". And only in the 21st century it was shown that the introduction of an aqueous extract of the root of A. officinalis to albino rabbits prevents degeneration of the retina, reduces changes in rheological parameters of blood and the accumulation of lead in bones, liver and kidneys when exposed to lead acetate. The activity of A. officinalis preparations is comparable to 2,3 dimercaptosuccinic acid (succimer, hemet), which effectively chelates heavy metals (mercury, lead, cadmium). On this basis, it is recommended to include angelica products in the diet of persons exposed to lead to prevent cognitive dysfunction, neurobehavioral disorders, hypertension and renal failure.

Currently, this plant is official in many European and Asian countries.

[2]. Angelica root and rhizome essential oil is used in aromatherapy, pharmaceutical, food and perfume industries. It is effective for colds, painful periods, rheumatic pains, acne and skin inflammation.

At the same time, the phytochemical assessment of A. archangelica ingredients and the mechanisms of their action on the human body are not sufficiently highlighted in the modern literature. In order to verify the validity of the use of angelica in monasteries with a wide range of diseases, we analyzed the composition of various angelica organs using modern analytical research methods.

This article summarizes the results of phytochemical studies of angelica composition, carried out by us in 2012–2014.

The component composition of essential oil and alcohol extracts was investigated using a Termo Finnigan gas chromatography-mass spectrometer with a Data System data processing system containing a library (Database NIST02) in the amount of 250,000 mass spectra. Capillary column - length 30 m, 0.25 mm - diameter, grafted phase - 5% dimethylphenylsilicone and 95% dimethylsilicone. Programmed heating of the chromatographic column: isotherm 50 ° C, 2 min., Temperature rise to 250 ° C, lifting rate 10o/ min. Injector temperature - 250 ° C. The identification was carried out on the basis of complete mass spectra using the Data System program included in the system of the gas chromatography-mass spectrometer. The similarity indices of the library and recorded spectra were no less than 89%.

The essential oil of angelica contains 4.19% of cyclic monoterpenes (pinene, karene, limonene, fellandrene, etc.). The monoterpene fraction is dominated by alcohols and acetates. Cyclohexane sesquiterpenoids are represented by elemen and elemol, which are considered as potential drugs for neoplastic diseases of the brain and lungs. Bicyclic sesquiterpenoids of the selinane series are represented by λ - and γ -selenene, cadinan sesquiterpenoids - α -, γ -cadinene, γ -murolene. Bizabolene derivatives with high anti-inflammatory activity have been found in the composition of the essential oil [3].

The total content of coumarins in angelica leaves was 3 times higher than in roots, 2.96% and 1.09%, respectively. Seven coumarin compounds - psoralen derivatives were identified in the leaf extract (Table 1), in the roots - five derivatives.

In the leaf extract, along with hydrocarbons, a number of furocoumarin compounds have been identified, of which the greatest pharmacological interest are: prangenin (oxyimperatorin), prangenin isomers, bergapten, methoxalen, ostol.

The discovered compounds have antiviral activity. In particular, prangenin (oxyimperatorin) inhibits the reproduction of the respiratory syncytial virus (RS-

virus), which is the most common cause of inflammatory reactions in children. Methoxalen is known as a photosensitizing agent used to increase the effectiveness of PUVA therapy: for psoriasis, vitiligo, lichen planus, fungal mycosis.

Of particular interest is the presence of ostol in the angelica, which regulates the synthesis of eotaxin. - a powerful chemoattractant involved in the mobilization of eosinophils into the respiratory tract. Ostol is considered as a potential treatment for allergic inflammation of the respiratory tract, prevention of osteoporosis, atherosclerosis and fatty liver. It is known that ostol in combination with aconitine inhibits the development of lung tumors by suppressing the expression of the transforming growth factor TGF- β one, which plays a key role in the processes of embryogenesis and carcinogenesis. It is classified as a neuroprotective agent that prevents brain damage in acute ischemic stroke.

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№ п/п	Компоненты листьев	Кол-во, %	R,* мин.	
1.	Метоксален	1,94	18,88	
2.	Бергаптен	4,07	19,12	
3.	Остол	4,78	19,73	
4.	8-(метилвинил)-2H-фуро[2.3-h]-1-бензопиран-2-он	3,61	19,94	
5.	5-гидрокси-7-метокси-2-метил-6-(3-метил-2-бутенил)- 4Н-бензопиран-4-он	0,83	22,02	
6.	Изомер прангенина	32,80	23,30	
7.	Прангенин (оксиимператорин)	20,66	24,63	
8.	9-(2-гидрокси-3-метил-3-бутенилокси)-4-метоксифуро(3,2-g) хромен-7-он	1,56	26,66	
9.	Компоненты корней		1.00 A.	
10.	Ангелицин (изопсорален)	1,69	16,22	
11.	Метоксален (меладинин, метокси-8-псорален)	2,65	18,33	
12.	Бергаптен	2,74	19,07	
13.	Остол (7-метокси-8-изопентилкумарин)	5,09	19,68	
14.	Ороселон (5)-изопропенилангелицин s. кваннин)	71,36	19,90	

Com	oonent com	position of	f methanol	fraction	of leaves	and r	roots of A	. archangelica

Our study of the composition of angelica coumarins showed the predominance of prenylated forms of psoralen in the roots and leaves, in particular prangenin and imperialin derivatives. Imperatorin inhibits the activity of matrix metalloproteinases, preventing neuronal apoptosis after temporary cerebral ischemia.

The high content of sesquiterpenoids in the essential oil of the studied samples of A. archangelica allows them to be used as a promising source of anti-inflammatory and antitumor agents.

The data obtained confirm the validity of the inclusion of angelica by the empiricists by monks in the diet and its use as a universal medicine. The centuries-old experience of using Angelica officinalis as a gingerbread herb and in folk medicine testifies to the need to revive the traditions of using A. archangelica in Russian cuisine. Given the high antiplatelet activity of angelica coumarins, angelica products should be included in the diet of elderly people with cerebral pathology. The presence in angelica of compounds with antiviral activity makes it promising to include products from angelica in the winter diet of children for the prevention of viral diseases.

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