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STUDY OF PHARMACOLOGICAL ACTIVITY OF *Glycyrrhiza glabra* L.

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ИЗУЧЕНИЕ ФАРМАКОЛОГИЧЕСКОЙ АКТИВНОСТИ *Glycyrrhiza glabra* L.

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Abstract. In article the results of overview research about pharmacological activity of *Glycyrrhiza glabra* L. is given. Liquorice (licorice) root is derived from the inner part of the root and underground stem (rhizome) of Glycyrrhiza glabra (Fabaceae, the bean family). The peeled drug is of much higher quality than the root with the bark, and is produced in several south-eastern European countries, Turkey, China and Russia. It has a very characteristic taste and smell, and is used in confectionery. The sweet taste also makes the identification of the drug relatively easy and so adulteration is uncommon. The most important bioactive secondary metabolite is glycyrrhizic acid, a water-soluble pentacyclic triterpene saponin which gives the drug its characteristic sweet taste (it is about 50 times sweeter than sucrose). Liquorice also contains numerous flavonoids (chalcones and isoflavonoids), coumarins and polysaccharides, which contribute to the activity.

Аннотация. Показаны результаты обзорных исследований фармакологической активности *Glycyrrhiza glabra* L. Сырой препарат получают из внутренней части корня и подземного стебля (корневища) растения *Glycyrrhiza glabra* L. (Fabaceae). Очищенный препарат намного качественнее, чем корень с корой, и производится в ряде стран Юго-Восточной Европы, Турции, Китае и России. Он имеет очень характерный вкус и запах и используется в кондитерском производстве. Сладкий вкус также делает идентификацию препарата относительно легкой, поэтому фальсификация встречается редко. Наиболее важным биологически активным вторичным метаболитом является глицирризиновая кислота — водорастворимый пентациклический тритерпеновый сапонин, придающий препарату характерный сладкий вкус (он примерно в 50 раз слаще сахарозы). В состав лакрицы также входят многочисленные флавоноиды (халконы и изофлавоноиды), кумарины и полисахариды, которые способствуют повышению активности.

Keywords: licorice, medicinal properties, glycyrrhizic acid.

Ключевые слова: солодка голая, лекарственные свойства, глицирризиновая кислота.

Glycyrrhiza glabra L. is a member of the legume family (Fabaceae). Other names: licorice root, licorice, liquorice, glycyrrhiza. Licorice glabrous is a perennial rhizomatous herbaceous plant, up to 150-200 cm high. The main root, as well as vertical and horizontal rhizomes form a multi-layered network of intertwined roots; they are anchored in the soil with the help of adventitious

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roots. Roots penetrate the soil to a depth of 8 m or more and usually reach the water table. Stems are glabrous or sparsely shortly pubescent with sparsely scattered point glands or glandular spines. Leaves are pinnate, 5-20 cm long, with 3-10 pairs of sticky, shiny, dense, oblong-ovate or lanceolate leaflets.

Inflorescences are rather loose axillary brushes, 5-12 cm long, with a peduncle 3-7 cm long. Flowers are 8-12 mm long with a whitish-purple corolla and a sharply toothed calyx. Fruit is an oblong, straight or slightly curved 1-8-seeded pod, up to 3.5 cm long, naked or studded with glandular spines. Seeds are kidney-shaped, up to 3.5 mm in diameter, shiny, greenish-gray or brownish.

The distribution area of licorice is quite wide. In the valleys of large rivers of Kur-Araz lowland it forms associations together with other plant species.

Chemical composition. From the roots and rhizomes of licorice isolated up to 23% of saponin-glycyrrhizin (potassium and calcium salt of glycyrrhizic acid), which gives them a sweet taste, and 27 flavonoids (liquiritin, liquiritoside, isoliquiritin quercetin, kaempferol, apigenin, etc.), the total content of which reaches 4%, glabrous (glycyrretic) acid, steroids, essential oil, asparagine, ascorbic acid (up to 30 mg%), tannins (8.3-14.2%), bitters, pigments, gum resins, asparagine, higher aliphatic hydrocarbons and alcohols, higher fatty acids, alkaloids and others.

Licorice roots and rhizomes — in addition to traces of essential oil, vitamins, proteins, bitter (up to 4%) and resinous (3-4%) substances, lipids (about 4%), polysaccharides (pectin substances 4-6% and starch up to 34%), monosaccharides and disaccharides (up to 20% in total), contain flavonoids (3-4%) and triterpene saponins (about 20%).

Among 27 diverse flavonoids, the most important are flavonol and chalcone and their isoforms — licurazide, kaempferol, liquiritoside, liquiritin, isoliquiritin, neoliquiritin, rhamno-liquiritin, uraloside etc. It is the flavonoids, flavonol and chalcone derivatives, that provide the appropriate preparations of licorice. Among triterpene saponins the main one is glycyrrhizin. In addition, an aglycone of uralene glucuronic acid, oxyglycyrretinic (uralenic) acid, was found in the roots and rhizomes of licorice.

The above-ground part of the plant contains carbohydrates (up to 2.13%), polysaccharides, organic acids (up to 2.5), essential oil (0.02), triterpenoids (glycyrrhizic acid, in the hydrolysate - glycyrretic acid, etc.), triterpene saponins, coumarins (1.9-2.4), tannins (5.5), flavonoids (isoquercitrin, quercetin, kaempferol, etc.), lipids (6.26%), nitrogen-containing compounds (choline, betaine), vitamins (ascorbic acid, carotene). The composition of essential oil includes aldehydes, ketones, alcohols and their derivatives, terpenoids, aromatic compounds, higher aliphatic hydrocarbons, esters of higher fatty acids.

The roots and rhizomes are of medicinal value. Licorice is part of the preparations recommended for diseases of the upper respiratory tract (expectorant, anti-inflammatory action). It is also included in diuretic and laxative collections, due to its antacid and coating properties are used in hyperacid gastritis, peptic ulcer and duodenal ulcer. This herb is also used for bronchial asthma, neurodermatitis, allergic and professional dermatitis, eczema, rheumatism, gout and hemorrhoids.

Licorice powder is also used in pharmaceutical practice as a base for pills to improve the taste and odor of medicines. Glycyrrhizic acid, which is up to 23% in licorice roots, gives them a sweet taste. This has made it possible to use glycyrrhizic acid in the therapeutic diet of diabetics (e.g. in Japan, where saccharin is banned).

In Eastern traditional medical systems, licorice root was used not only to treat stomach diseases (including stomach ulcers), lung diseases (bronchitis and even tuberculosis), included in

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collections for the treatment of rheumatism, impotence, nephritis, but also prescribed to the elderly and old people as a rejuvenating, life-prolonging remedy [3, 4, 11].

In India, licorice root was widely used in the treatment of some eye diseases and even to improve eyesight. In traditional Korean medicine, as in Chinese medicine, licorice roots and rhizomes are also the most common in prescriptions [13, 15, 16].

Korean recipes, which include powder from licorice roots and rhizomes, are used mainly in the treatment of tuberculosis, various nervous diseases and diabetes mellitus [8-10, 12].

In Bulgarian folk medicine, there is also empirical experience in the use of “sweet roots” in the form of a decoction of rhizomes and roots, which is used in cases of difficult urination due to various diseases, such as adenoma of the prostate gland [14, 17, 19].

In Japanese traditional medicine, the popularity of licorice is almost as popular as in Chinese or Korean medicine. Chinese and ancient Tibetan medicine believes that licorice preparations rejuvenate all organs of the human body. In China they treat obesity, chronic alcoholism, pyelonephritis, etc. [5-7, 18].

In gynecological practice, decoction of licorice root is used as an anti-inflammatory agent for diseases of the female genitalia, toxicosis of pregnancy, pathologic menopause. In France, licorice root syrup is used for rheumatism [20].

In contrast to licorice grown all over the world, the licorice grown in Azerbaijan contains 24% glycyrrhizic acid. It means that licorice growing in our country contains large amount of antiviral substances. At Biyan Industrial Park, located in Agdash district of Azerbaijan the herbal extract and syrup of licorice is produced that is very effective for cough, respiratory inflammation, bronchitis, various types of pneumonia, lung and immune system complications. In particular, there are syrups of sedative action [21].

There are some contraindications to the use of licorice: pregnancy, as the use of licorice may cause edema in women; lactation period, as licorice extract is contraindicated in infants; heart failure; high blood pressure, so patients with arterial hypertension should be very careful with licorice; individual intolerance to licorice, which is extremely rare; diabetes mellitus; increased activity of the adrenal glands; liver disease, especially cirrhosis; hypokalemia, as the use of licorice flushes potassium out of the body; licorice should not be used in obesity.

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