

Bioecological Features and Pharmaceutical Use of Galega Officinalis L. (Literature Review)

Safarova N. K, Safarov A. K, Atabekova D. L.

Institute of pharmaceutical education and research. Tashkent, The Republic of Uzbekistan

Abstract: Galega officinalis L. is a promising medicinal plant. Galega officinalis contains alkaloids, glycosides, carbohydrates, proteins, tannins, saponins, phenylcarboxylic acids, flavonoids, triterpenes and etc. Preparations of Galega officinalis have hypoglycemic activity and have a complex effect on the body. Despite the large number of medicinal properties, Galega officinalis is poisonous, as a result of which it has certain contraindications for use.

Keywords: Galega officinalis, bioecological features, phytochemical composition, diabetes mellitus, hypoglycemic activity, phytotherapy.

In recent years, the increasing demand for medicinal and prophylactic preparations obtained from plants and the limited resources of naturally growing medicinal plants have created the need to expand the cultivation of medicinal and essential oil plants. Cultivation of medicinal plants not only meets the needs of the population, but also allows solving a number of environmental problems. Also, the rapid development of the pharmaceutical industry is a strong factor in the increase of medicinal plants.

Medicinal plants and preparations obtained from them are widely used in medicine for the treatment and prevention of various diseases.

Due to the growing demand for raw materials of medicinal plants, comprehensive study of medicinal plants is an urgent problem and has great theoretical and practical importance. The solution to this problem depends on the search for new medicinal plants and the in-depth study of cultivated medicinal plants.

Fabaceae, a family of leguminous plants rich in species, is important for the introduction of plants, and biologically active substances obtained from many of its species are widely used in scientific and folk medicine.

Phytochemical and pharmacological in-depth research of biologically active substances obtained from plant species belonging to this family allows to supplement medicinal products with new preparations.

Such a promising representative of the legume family is Galega officinalis L. A comprehensive study of medicinal galega is of great theoretical and practical importance.

It is known that in the researches devoted to the genus Galega, their great importance and the fact that they are fodder, medicinal, honey-producing, ornamental and meliorant (increasing soil fertility) plants are noted [1].

In the central regions of Ukraine, it was observed that the growth and development of medicinal galega was greatly affected by the heat factor. The height of the medicinal galega plant reaches 60-80 cm, and the roots reach 50 cm, forming many side branches [2].

The biochemical composition of the medicinal galega grown in the conditions of the North Caucasus has been determined to change during the development periods of the plant. The amount of total protein is 12.6-26.9% of dry mass, fat is 1.0-1.2%, fiber is 27.3-37.8%, nitrogen-free extractives are 42.0-47.0%, and the amount of ash It was 6.7-9.5% [3].

In order to use it as a medicinal raw material, it is noted that it produces 15-25 t/ha in the first year and 14.5-16.4 t/ha in the second vegetation year [4].

The amount of galegin in the above-ground biomass of medicinal galega was 144.6 mg/kg, and the amount of galutheamine was 71.8 mg/kg (based on absolute dry mass). The root of the plant was found to contain 12.8 mg/kg of saponins and 52.8 mg/kg of glycosides. As a result of increased nitrogen nutrition and symbiosis, the amount of galegin and galutheamine decreased in the above-ground mass of the plant and increased in the roots [5].

Bioecological properties and phytochemical composition of medicinal galega have not been studied in the conditions of our republic.

Therefore, this article describes the bioecological properties and phytochemical composition of medicinal galega, as well as its use in pharmaceuticals.

Botanical classification. 5 to 8 species are included in the *Galega* genus in different sources, only two of them - *Galega officinalis* L. and *G. orientalis* L. - have been well studied.

Medicinal galega (*Galega officinalis* L.) is a perennial herb. The height of the stem is 40-90 cm, well branched, covered with nothing or sparse short hairs. A plant with a root stem. The root is thick, penetrates the soil to a depth of 50-70 cm, has a large number of rhizomes.

The leaves are double pinnate, 5-10 pairs of lanceolate 5-20 cm long, 1-4 cm long and 0.4-1.5 cm wide. The leaves do not shed when they dry. The flowers are numerous (10-20) and form a 20-25 cm long panicle. The color of the flowers is different: white, purple. The fruit of *Galega* is a pod, inside there are 5-7 green-yellow, sometimes brown seeds. When the seeds are ripe, the pods do not crack, they dry without falling from the plant [6].

Phytochemical composition and use in pharmaceuticals. Since ancient times, doctors have been using medicinal plants with hypoglycemic effect in scientific and folk medicine. In 1980, the World Health Organization noted a strong focus on research into the search for antidiabetic drugs and their mechanism of action [7].

Phytotherapy has a great role in the early stage of diabetes and in its mild and moderate condition.

One of the promising plants with hypoglycemic effect is galega (*Galega officinalis* L.).

The above-ground part of the plant (flowers, leaves and stem) is used as medicinal raw material [1].

It is known that a number of physiologically active substances are stored in the green mass and seeds of Eastern galega and medicinal galega. These are galegin, methanin and quinozolones. These substances stimulate the secretion of milk in animals by stimulating the sympathetic-adrenaline system, increasing the processes of blood formation and circulation.

Medicinal galega has a well-developed, vigorous root system consisting of a main taproot and densely arranged lateral roots. In the main root, up to 7 cm deep, up to 18 rhizome-type buds are formed, which, when they emerge, form new stems. Up to 1,500 nodules have been observed in years with good weather in the strong root system that penetrates the soil to a depth of 50-80 cm. Their quantity and nitrogen-fixing activity are determined by a number of factors [5].

Medicinal galega contains various alkaloids from biologically active substances. They are nitrogen storage substances in plants, most of them have high physiological activity and have a strong effect on human and animal organisms.

Among the natural pharmacologically active substances, alkaloids are the main substances, from which the most highly effective drugs are obtained in modern medicine. Alkaloid-containing plants have been used by man since ancient times, but the first alkaloids were isolated from plants at the beginning of the last century. The peganine alkaloid contained in the medicinal galega relaxes the smooth muscles of the small intestine and uterus, has the property of expelling bile.

The highest amount of crude protein in the vegetative mass of medicinal galega in the positive conditions of symbiotic relationship was observed in the second and third years of plant vegetation, this indicator was 21.9%, and in Eastern galega - 21.5% in the second year. In the control variant, the amount of crude protein was reduced by 1, 2, 3, 6%.

The amount of non-nitrogenous extraactive substances in the upper part of medicinal galega was quite variable, it was observed to change in the range of 30-34%.

The amount of Kletchatka varied between 28-33%. Due to the improvement of symbiosis conditions and the supply of biological nitrogen to plants, it was found that the amount of kletchatka decreased by 1.4% [5].

Raw materials are collected during the flowering phase of the plant. And after the seeds are fully ripe (September - October). The storage period of raw materials is 1 year.

Medicinal galega contains alkaloids, proteins, carbohydrates, vitamins, additives, saponins, acids, flavonoids, triterpenes and other compounds [8,9,10,11]. Preparations of this plant improve heart function, lower blood pressure, help to treat hemorrhoids, larynx diseases and obesity.

Galegin alkaloid is one of the main active ingredients of medicinal galega.

Guanidine alkaloids have a hypoglycemic effect on the body: they increase the amount of glycogen in the liver, reduce the activity of amylase and insulinase enzymes [12].

It prevents insulin from being broken down by peptidases, improves the transport and exchange of glucose into the cell, and enhances the synthesis of proteins from fats [7].

The stem and seeds of galega contain the alkaloid galegine. Galegin is used in pharmaceuticals to obtain the drug metformin, which is used to treat type 2 diabetes. Galegin reduces the amount of glucose in the blood, increases the production of insulin, and increases the amount of glycogen in the liver. Therefore, medicinal galega is included in the collective herbs that reduce the amount of sugar in the blood [13,14,15].

In the United States, Great Britain, and Bulgaria, galega is used in official medicine to treat mild diabetes [14].

The mechanism of action of galegin depends on the amount of galegin. Galegin is a strong guanidine base and belongs to the biguanide group according to its chemical structure. They reduce the activity of insulin-degrading enzymes by converting glucose into fructose, and increase the regeneration of beta-cells of the pancreas [13,16].

Other compounds of medicinal galega have a softening and choleric effect and improve the tone of the intestinal system.

The biologically active substances extracted from the above-ground part of medicinal galega and eastern galega consist of flavonoids, alkaloids, phenylcarboxylic acids, guanidines, amino acids and polysaccharides. Both galega plants contain significant amounts of macro- and micronutrients in the aboveground part. Medicinal galega raw materials can be a potential source

for the treatment and prevention of diseases caused by micronutrient deficiency. In particular, it can be used to treat pathologies related to copper, zinc and chromium elements. Ions of heavy metals are hardly found [17,18].

A relatively high amount of alkaloids can be found in the above-ground part of the medicinal galega, but they are practically not found in the eastern galega.

N.A. According to Osmanova, the amount of flavonoids (quercetin) can be used as a criterion for standardization of plant raw materials [19].

The authenticity of the raw material is determined by the presence of simple hairs on the calyx leaves of the medicinal galega plant and the presence of hairs on the calyx leaves of the oriental galega.

Based on the above information, we believe that it is of great theoretical and practical importance to study the growth, development and productivity of the plant (*Galega officinalis* L.) in different soil and climate conditions, to determine the phytochemical composition of the raw materials obtained from it, and to study the use of biologically active substances in pharmaceuticals.

Literature:

1. Тизина Н.Г. Галега восточная и лекарственная // Сб. научных трудов ВИЛАР “Генетические ресурсы лекарственных и ароматических растений”: Мат. междунар. конф. – М.: 2004. – С.318-320.
2. Стаднийчук Н. Особенности морфогенеза *Galega officinalis* L., первого года жизни // Тр. IV Международного симпозиума: Новые и нетрадиционные растения и перспективы их использования. – М.: РУДН, 2001. – С.326-329.
3. Фисун М.Н., Говоров С.А., Сарбашев А.С., Чочаева С.М. Нетрадиционные кормовые культуры: их интродукция, технология выращивания и хозяйственное использование. – Нальчик: КБГСХА, 2002. – 122 с.
4. Маломусов А.Х. Продуктивность козлятника лекарственного в зависимости от условий выращивания в горной зоне КБР // Дисс... канд.сельхоз.наук. – Нальчик, 2003. – 139 с.
5. Дорохина Н.П. Симбиотическая активность и урожайность козлятника лекарственного и восточного в зависимости от условий выращивания // Автореф. дис... к.с/х.н. – М.: 1998. – 15 с.
6. Сафаров А.К., Сафарова Н.К. *Galega officinalis* L. – перспективное лекарственное растение / Материалы 1-республиканской научно-практической конференции с международным участием “Актуальные вопросы и тенденции развития современной фармацевтической отрасли”. – Ташкент-2023. - С. 205-206.
7. Трумпе Т.Е. Фитотерапия сахарного диабета / В кн: “Актуальные вопросы фитотерапии”. Мат. юбил. конф. РДО “Фитотерапевтическое общество” 2002. – С.124-127.
8. Зевахина Ю.А., Офицеров Е.Н. Пектиновые вещества *Galega orientalis* // Химия и технология растительных веществ: Мат. II Всероссийской конференции. Казань (24-27 июня 2002 г.). – Казань, 2002. – С.115-116.
9. Османова Н.А., Пряхина Н.И. Некоторые фармакологические свойства надземной части *Galega officinalis* L. и *G. orientalis* Lam. // Растительные ресурсы. – 2003. Т. 39, Вып.4. – С.119-129.
10. Champavier Y., Allais D.P., Chulia A.J., Kaouadji M Acetylated and non-acetylated flavonol triglycosides from *Galega officinalis* // Chem. Pharm. Bull. – 2000. Vol. 48(2). – P.281-282.

11. Gonzalea-Andres F., Redondo P., Pescador R., Urbano B. Management of *Galega officinalis* L. and preliminary results on its potential for milk production improvement in sheep // *New Zeland Journal of Agricultural Research*. – 2004. Vol. 47. – P.233-245.
12. Кутовая А.М., Давыдова В.Н.. Галега лекарственная как перспективное растение в XXI веке. // Сб. трудов третьей научно-практ. конф. аспирантов и молодых ученых. “Молодые ученые и фармация XXI века”. – М.: 2015. – С.81-84.
13. Мартынчик И.А., Трумпе Т.Е. Галега лекарственная (*Galega officinalis* L.) – перспективное растение гипогликемического действия (обзор литературы). // Сборник трудов Международной научной конференции “Перспективы лекарственного растениеводства” – М.: ВИЛАР, 2018. – С.679-683.
14. Палей А.Е., Логвиненко И.Е., Логвиненко Л.А., Гребенникова О.А., Виноградов Б.А. Биологически активные вещества галеги лекарственной (*Galega officinalis* L.). // Труды Никитского ботанического сада. Национальный научный центр. 2011. т. 133. – С.152-159.
15. Руженкова И.В. Фитотерапия при сахарном диабете: лечение лекарственными растениями. – Ростов-на Дону: Феникс, 2014. – 225 с.
16. Мартынчик И.А., Трумпе Т.Е., Ферубко Е.В. Анализ механизма действия галеги лекарственной (*Galega officinalis* L.). // Вопросы биологической, медицинской и фармацевтической химии. 2019. 22 (9). – С.12-15.
17. Бакун А.С., Гурина Н.С., Царенков В.М. Изучение элементного состава травы галеги лекарственной (*Galega officinalis* L.). // Вопросы биологической, медицинской и фармацевтической химии. 2020, т. 23. №6. – С.16-21.
18. Бакун А.С., Гурина Н.С. Фитохимический анализ травы Галеги лекарственной // БГМУ в авангарде медицинской науки и практики // Сб. реценз. научных работ. М-во здравоохранения Республики Беларусь. – Минск: 2017, вып. 7. – С.224-227.
19. Османова Н.А. Фармакологическое изучение травы галеги лекарственной и галеги восточной // Автореф. дис...канд.фарм.наук. – СПб.: 2003. -23 с.