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PHARMACOGNOSTIC CHARACTERISTICS AND PROSPECTS FOR THE USE OF ANISEED LOFANT (*LOPHANTHUS ANISATUS* BENTH)

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Abstract

An in-depth analysis was carried out of the use of aniseed lofanthus (*Lophanthus anisatus* Benth.) of the Lamiaceae family in folk medicine. It has been established that plant-based drugs have antimicrobial, antifungal, antioxidant, anti-inflammatory, and immunomodulatory properties. Their pharmacological classification, active substances, dosage forms, as well as the presence of herbal components are considered. Special attention is paid to the pharmacological properties of aniseed lofanthus (*Lophanthus anisatus* Benth.) and its potential use in the pharmaceutical field.

Keywords: Aniseed lofant, family of clear flowers, pharmacological activity, phytocomponents, essential oil.

Introduction

Lophanthus anisatus (aniseed lofanthus) is a perennial herbaceous plant of the Lamiaceae family, with a height of 1-1.5m. The plant is also known as a fennel mulberry, aniseed hyssop, and *Agastache foeniculum*. It refers to the Lamiaceae

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family. The shoots are numerous and tetrahedral. The leaves are petiolate, heart-shaped-lanceolate, sparsely toothed, 7.5-10 cm long and 4-4.5 cm wide. The root is fibrous. The flowers are blue-lilac, collected in spike-shaped inflorescences 2-10 cm long, located on axial and lateral shoots. The fruit of the plant is usually smooth, oblong-oval in shape, with a dark brown nut. Spring regrowth of plants begins in late February — early March, budding in late May, and mass flowering lasts from June to the end of August.

In its wild form, aniseed lofanthus grows in Central Asia and the Far East, in the western United States and Canada. Small lofanta plantations are also cultivated in countries like Moldova and Crimea.

As a member of the Jasnotkov family, aniseed lofant is widely used in pharmaceutical practice upon its high content of essential oils, flavonoids and other biologically active compounds. In recent years, there has been increasing interest in studying aniseed lofanthus as a promising source of medicinal plant raw materials.

The plant is characterized by pronounced pharmacological properties, including antioxidant, antimicrobial, anti-inflammatory, and immunomodulatory activity. In the traditional medicine of various countries, aniseed lofant is used for diseases of the respiratory, cardiovascular and digestive systems.

Despite its significant therapeutic potential, this plant has not been sufficiently studied in terms of pharmacological characteristics and standardization of medicinal plant raw materials, which indicates the existing gap for the relevance of further research.

The purpose of research: This article is written to summarize and systematize the literature data on the botanical features, chemical composition and pharmacological activity of aniseed lofanthus, which is referred as lofant or lofanthus in this article, as well as to assess the prospects for the creation of medicines based on this plant.

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The method of the research. The study analyzed domestic and foreign scientific publications devoted to the study of morphological features, chemical composition and pharmacological properties of aniseed lofant. While writing this article, methods of comparative analysis, systematization and generalization of literary data were presented in scientific journals, monographs, and pharmacognostic studies.

Distribution area of the plant. In natural conditions, aniseed lofant is widespread in North America, Central Asia and the Far East. Currently, the plant is cultivated in many countries as a medicinal, ornamental, and honey-bearing plant. In Eastern European countries, lofant is grown on small plantations in Moldova, Ukraine, Romania, as well as in some regions of the Russian Federation.

Chemical composition. Phytochemical studies have shown that the aboveground part of the plant contains a significant amount of biologically active compounds. The main components are: essential oil (up to 15%); methylhavicol (tarragol) — the main component of essential oil (70-80%); flavonoids; phenolic compounds; organic acids (ascorbic, caffeic, citric, malic); tannins; trace elements. The high content of essential oil determines the characteristic aniseed aroma of the plant and determines its pharmacological activity.

Pharmacological properties. The results of experimental studies indicate that aniseed lofant has a wide range of biological activity. It has been established that plant-based drugs have the following pharmacological effects: antimicrobial; antifungal, antioxidant, anti-inflammatory, and immunomodulatory. Besides that, it is discovered through studies that the essential oil of the plant exhibits pronounced antibacterial activity against a number of pathogenic microorganisms, including *Staphylococcus aureus* and *Escherichia coli*.

Application in medicine. In folk and traditional medicine, aniseed lofant is used in the form of infusions, decoctions, and extracts. Herbal preparations are used for: diseases of the respiratory system (bronchitis, acute respiratory infections);

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disorders of the gastrointestinal tract; diseases of the cardiovascular system; headaches and sleep disorders; diseases of the nervous system.

Наружно растение применяется при дерматологических заболеваниях грибковой природы, себорее, а также для укрепления волос.

Prospects for use in pharmacy. Despite the wide range of pharmacological activity, aniseed lofant is currently practically not used in official scientific medicine. Insufficient knowledge of the chemical composition and the lack of pharmacopoeial standardization limit the use of this plant in the pharmaceutical industry. However, the presence of a significant amount of biologically active substances makes it possible to consider aniseed lofant as a promising source for the development of new phytopreparations.

Results and discussions

In the course of phytochemical studies conducted by V.V.Chumakova (2013), the content of essential oil in the herb *Lophanthus anisatus* was studied upon which, scientists have been established that the essential oil of this plant is traditionally used in dermatology as an antimicrobial and anti-inflammatory agent, including in the treatment of scarring alopecia.

As part of the study, it was found that the content and existence of essential oil in vegetable raw materials depends on the method of its processing. Thus, in the freshly harvested grass of aniseed lofanthus, the essential oil content is $2.58 \pm 0.19\%$, while in the dried raw materials this indicator decreases to $2.20 \pm 0.18\%$. In addition, the obtained essential oil samples vary in color and component composition.

An analysis of the chemical composition of the essential oil showed that its main components are pulegone and menthone. In the sample obtained from fresh raw materials, the content of pulegone is 42.54%, and menthone is 19.90%. In the essential oil obtained from dried raw materials, the content of these compounds varies and amounts to 26.60% and 41.69%, respectively.

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Based on the data obtained, it was found that the biochemical specificity of aniseed lofanthus is associated with the peculiarities of the biosynthesis of mentone terpenoids. The initial compound of this group is piperitenone, from which pulegone and piperitone are formed at the first stage of reduction. Further recovery processes lead to the formation of menthone and isomenthone. At the same time, mentone is formed from piperiton, and isomentone is formed from pulegone. It is assumed that during the drying of vegetable raw materials, mutual transformations of essential oil components can occur, which explains the change in their quantitative content.

Phytochemical studies conducted by V.V.Chumakova and O.I.Popova have shown that the aboveground part of the aniseed lofant contains a significant amount of essential oil, flavonoids and phenolic compounds. The authors concluded that the plant can be considered as a promising source of medicinal plant raw materials for the development of phytopreparations with antioxidant and anti-inflammatory effects.

A comparative analysis of the component composition of the essential oil showed that significant changes in the chemical composition occur during the transition from freshly harvested to dried raw materials. These changes should be taken into account when rationing the quality of medicinal plant raw materials, as well as when using essential oil components as chemical markers in chemotaxonomy and chemosystematics.

Phytochemical studies of aniseed lofant have also made it possible to determine the content of other biologically active compounds. It has been established that the essential oil content in the plant is 2.00–2.50%. Pulegone (26.60%) and mentone (41.69%) were identified among the main components of the essential oil.

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In addition, phenolic compounds were identified in the plant, including chlorogenic, caffeic, gallic and p-coumaric acids, as well as coumarins and flavonoids, including umbelliferone, luteolin and quercetin. The total content of flavonoids (in terms of luteolin) is 5.50–6.00%.

The content of tannins (6.78–8.64%), gallic acid (2.00–2.50%) and organic acids (0.90–1.07%) was also found, among which ascorbic acid (0.11–0.16%) was detected.

The data obtained indicate a rich composition of biologically active substances of the herb aniseed lofanthus. Given the revealed chemical composition, this plant can be considered as a promising source of medicinal plant raw materials for the creation of drugs with antioxidant, antimicrobial, antimycotic and psychotropic effects aimed at strengthening hair, stimulating its growth and preventing hair loss.

It should be noted that earlier studies by Leonid B. Dmitriev and co-authors established that in plants with a pronounced aniseed aroma, the main component of essential oil is the phenolic compound methylhavicol. At the same time, plants with a mint flavor belong to the isomentone-pulgon chemotype, which is associated with the peculiarities of the biosynthesis of terpene compounds.

In the research of Mihai Popescu and co-authors, the chemical composition of aniseed lofanthus essential oil was analyzed. Scientists have established that the main components of the oil are monoterpene compounds with pronounced antimicrobial activity. Research results have shown that the plant's essential oil inhibits the growth of a number of pathogenic microorganisms, including *Staphylococcus aureus* and *Escherichia coli*.

The research by Krasimir Georgiev and Galina Vasileva was aimed at studying the biological activity of plant extracts. The authors found that extracts of aniseed lofanthus have a pronounced antioxidant effect, which is associated with a high content of phenolic compounds and flavonoids.

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In addition, a number of studies have shown that preparations based on aniseed lofant have antifungal activity and can be used in the treatment of dermatological diseases.

Thus, the results of the conducted studies indicate that aniseed lofanthus has a wide range of biological activity. Scientists note the prospects for further study of this plant to develop new medicines of plant origin.

Conclusion

Thus, an analysis of the data obtained and researched through previous literature indicates a significant pharmacological potential of the *Lophanthus anisatus* plant. Specifically in the pharmaceutical field, strengthened by the findings coming from conducted phytochemical studies. That have shown that the aboveground part of the plant contains a wide range of biologically active compounds, including essential oils, flavonoids, phenolic compounds, organic acids and tannins.

It has been established that the main components of the aniseed lofanthus essential oil are pulegone and mentone, the content of which may vary depending on the method of processing vegetable raw materials. In addition, various phenolic compounds and flavonoids with pronounced antioxidant activity have been identified.

The research results of various authors indicate that aniseed lofanthus has a wide range of biological activity, including antimicrobial, antifungal, anti-inflammatory and antioxidant effects. Due to this, the plant finds application in dermatology, phytotherapy and cosmetology.

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The data obtained allow us to consider aniseed lofant as a promising source of medicinal plant raw materials for the creation of new phytopreparations. However, in order to introduce drugs based on it into official medical practice, further comprehensive research is needed aimed at studying the pharmacological properties, mechanisms of action of biologically active substances and the development of methods for standardizing plant raw materials.

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