



Medicinal Hyssop (*Hyssopus Officinalis* L.) - Perspective

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Abstract: In recent years, there has been a growing interest in natural sources, particularly plant-derived medicines, in the fields of medicine and pharmaceuticals. The main reason for this is that the biologically active compounds found in medicinal plants have a relatively gentle effect on the human body, often have fewer side effects, and are considered environmentally safe.

This article presents information on the chemical composition and pharmacological activity of the medicinal plant hyssop (*Hyssopus officinalis* L.), widely used in traditional medicine and scientific medicine.

Key words: medicinal hyssop, chemical composition, pharmacological activity, use, research.

Currently, most of the available medicines in the world are based on natural substances or their synthetic analogues. Therefore, the identification of new natural sources, the isolation of biologically active substances from them, and the study of the possibilities of their use in modern pharmacology have become an urgent area of scientific research.

The flora of Uzbekistan is distinguished by its rich biodiversity and biogeographic diversity. Over 4,500 plant species have been recorded in the country, with a large portion of them being endemic or semi-endemic species. Among these species, there are numerous plants that have not yet been fully studied but may possess promising medicinal properties. Utilizing these plants would not only foster the development of the national pharmaceutical industry but also partially reduce the dependency on imported medicinal products.

The process of discovering new promising medicinal plants encompasses several stages: analyzing traditional folk medicine practices, identifying biologically active compounds through phytochemical research, evaluating their pharmacological effects in laboratory conditions, and implementing practical applications. Research conducted in this field not only contributes to the development of new medicinal products but also serves to enhance the efficacy of existing medications.

Thus, the identification and scientific substantiation of new prospective medicinal plants is one of the strategic tasks of great importance in the development of modern medicine.

In this regard, the medicinal hyssop (*Hyssopus officinalis* L.) plant is of particular importance.

The purpose of the research is to analyze the literature on the chemical composition, pharmacological activity, and use in traditional medicine of the medicinal plant hyssop (*Hyssopus officinalis* L.) and to assess its prospects.

Methods. In the process of preparing this literature review, a systematic approach was applied to the search, selection, and analysis of existing scientific sources. In the research process, existing scientific sources on the chemical composition, pharmacological activity, and use in traditional and modern medicine of the medicinal hyssop (*Hyssopus officinalis* L.) plant were thoroughly studied. The literature was searched through the databases of Google Scholar, ResearchGate, Scopus, ScienceDirect, as well as local scientific journals of Uzbekistan and the CIS countries. The following



keywords were used in the search process: *Hyssopus officinalis L.*, medicinal hyssop, chemical composition, pharmacological properties, traditional medicine, plant raw materials, essential oil.

The search included scientific papers, articles, and conference materials from 2000 to 2025. The works of foreign and local researchers were jointly studied, and their scientific innovation, relevance, and reliability were assessed.

The selected sources for the study met the following criteria:

- ✓ Direct connection with the medicinal hyssop (*Hyssopus officinalis L.*) plant;
- ✓ Must be published in a scientific article or an official publication;
- ✓ Availability of precise information on chemical composition and pharmacologically active substances;
- ✓ Consistency and reliability of scientific methodology and results.

Repeated, unknown sources, or materials with low reliability were excluded from the analysis.

The selected sources were subjected to substantive analysis, and the information contained in them was grouped by thematic directions: botanical description and distribution, chemical composition, biologically active substances, use in folk medicine, possibilities of modern pharmaceuticals.

Existing scientific results for each group were analyzed, their differences and general trends were identified. Based on this, promising directions for the development of medical hyssop and research gaps were identified, and recommendations for further scientific research were developed.

RESULTS. Hyssop (*Hyssopus officinalis L.*) A perennial herbaceous or semi-shrub belonging to the Lamiaceae family, reaching a height of 50-60 cm, fragrant. Stems are several, straight-growing 4-edged, branched at the top, covered with fine hairs. Leaves lanceolate or oblong, pointed, oppositely arranged on the stem. The flowers form a unilateral spike-like inflorescence at the tips of the branches and stems. The calyx is light green, usually one side is purple. Petals bisexual, blue, violet, rarely pink or white. He has 4 fathers. Fruit - 4 nuts. The seeds are oblong, dark brown. Blooms in July-September, fruits in August.

The aerial part of the medicinal hyssop plant is used as a raw material. From the second year of the plant's full flowering period, raw materials are prepared: the upper parts of flowering shoots are cut 20 cm long using sickles or special scissors without rough wooden bases. It is dried in a closed place, thinly spread, or in dryers at a temperature of 35-40°C. Stored in dry ventilated areas. A properly dried plant has a pungent smell and bitter taste[1].

A widespread plant, medicinal hyssop, grows in Europe, in the upper and lower reaches of the Black Sea region, on the slopes of the mountains of Crimea, the Caucasus, Central Asia, and the Altai, between rocks, and in the steppes[2]. The homeland of medicinal hyssop is considered to be the countries around the Mediterranean Sea, North, West, and Central Asia. In Uzbekistan, it grows in Tashkent, Samarkand, Andijan, and Sukhandarya regions.

It is now cultivated in North America and almost all of Europe. Today, this plant is included in the pharmacopoeias of Portugal, Switzerland, France, and Romania. In Russia, it is still used in traditional medicine[3].

12 varieties of medicinal hyssop are included in the State Register of Breeding Achievements of Russia[1].

Essential oil, vitamins, tannins, organic acids, glycosides (diosmin, hyssopyl), flavonoids (quercetin 7-O- β -D-apiophuranosyl- (1 $\rightarrow$ 2) - β -D-xylopyranoside and quercetin 7-O- β -D-apiophuranosyl- (1 $\rightarrow$ 2) - β -D-xylopyranoside 3'-O- β -D-glucopyranoside), ursol and oleanolic acids, pigments, bitter substances, polysaccharides, and other compounds have been identified in the composition of the medicinal plant hyssop.



Apigenin 7-O-b-D-glucuronide was isolated as the main flavonoid from the aerial part of medicinal hyssop, collected in Iran. When conducting all structural studies using spectral methods, a total of 20 compounds were identified in the essential oil, which constituted 99.97% of the oil. The main compounds are identified as myrthenyl acetate, camphor, hermacrene, and spatulenol. At the same time, the isolated extracts exhibited high antioxidant activity [4].

Essential oil was isolated from the medicinal hyssop plant grown in the Astrakhan region, and the dependence of the accumulation of essential oil on the plant's vegetation period was studied. As a result, the greatest accumulation of essential oil was observed in the flower clusters of medicinal hyssop (0.6-0.8%), and in the aerial part - 0.4%. The composition of the isolated essential oil was determined by gas-liquid chromatography, as a result of which 32 compounds were identified in its composition, 27 of which were identified (the main ones are 63.55% hysopinocamphon, 9.45% pinanediol). Comparative analysis of experimental results and literature data on the composition of hyssopic essential oils grown in other countries showed that there is a significant difference in the chemical composition of the obtained hyssopic essential oil samples. They lack limonene, tuyen, and linalool, and the β -pinen content is significantly lower than that of hyssop essential oil grown in Poland (6.14%) or India (18.4%) (1.58%) [5].

In addition, hyssopic essential oil was found to contain hysopinocamphon (57.27%), (-) -b-pinen (7.23%), (-) -terpinen-4-ol (7.13%), pinacarvon (6.49%), carvacrol (3.02%), p-cymene (2.81%), and mirtental (2%) as the main component [6].

Phytochemical studies conducted by Russian scientists have revealed the presence of essential oil, flavonoids, coumarins, tannins, carbohydrate derivatives, nitrogenous compounds, organic acids, carotenoids, and triterpene derivatives in the medicinal hyssop topsoil [7].

When studying the chemical composition of the medicinal hyssop plant grown in Uzbekistan, it was found that it contains tannins (5%), flavonoids (0.3%), ascorbic acid (0.055%), essential oils (0.2%), polysaccharides (25.6%), and organic acids (6.1%). As a result of the analysis of the content of elements in the aerial part of medicinal hyssop using the ISP-MS method, 43 elements of great importance for human health were found, of which potassium, phosphorus, silicon, magnesium, and calcium were found in the largest quantities. Also, as a result of studying the amount of amino acids in its composition by HPLC, it was experimentally proven that it contains 19 amino acids, 8 of which are essential amino acids. The content of essential amino acids was 38.4% [8,9].

At the same time, when studying the aerial part of hyssop by HPLC, 17 phenolic compounds were found, including 14 of which were identified for the first time for this raw material: phenolic carboxylic acids (isoferuric acid, chlorogenic acid, oxalic acid), flavonoids (vitexine, chrysoeriol, hyperoside, rutin, hesperidine, vitexin, quercetin, luteolin, apigenin), coumarins (scopoletin, umbelliferon).

Individually, 9 separate substances of phenolic nature were isolated from the product of the medicinal plant hyssop: chlorogenic acid, coumarins (skopoletin, umbelliferon), flavonoids (diosmin, vitexin, hyperoside, rutin, vitexin).

For the first time, polysaccharides were studied by fractions, and water-soluble polysaccharide complexes, pectin substances, hemicellulose A, and hemicellulose B were isolated [10].

Medicinal hyssop is one of the oldest medicinal plants, and the famous ancient Greek physician Hippocrates used it in his practice. For medical purposes, green buds of hyssop, cut before flowering, were used. In his works, he noted it as a digestive stimulant, a remedy for profuse sweating and colds.

hyssop essential oil has low antioxidant activity against some test microorganisms and high antimicrobial (*S. pyogenes*, *S. aureus*, *C. Albicans*, *E. Coli*) [6], antibacterial, antiviral, and expectorant activity [11,12].



Additionally, hyssop raw material is recommended for bronchial asthma, angina pectoris, neurosis, joint diseases, chronic colitis, meteorism, diabetes mellitus, and is also used as anthelmintic, diuretic, wound healer, and antiseptic [13,14].

In modern folk medicine, an infusion of the medicinal herb hyssop is used similarly to marmarak. For coughing, it is prescribed for rinsing throat inflammation. Its hot infusion is taken for pneumonia, asthma, and upper respiratory tract diseases. In folk medicine of a number of European countries, hyssop is used to treat rheumatism, stomach pain, to reduce sweating, and during menopause. In Bulgarian folk medicine, hyssop is used as a remedy for digestive disorders, constipation, rheumatism, as an expectorant, and anthelmintic. Scientific research confirmed its antispasmodic properties.

The aroma of medicinal hyssop is very pleasant, therefore it is used as a spice in the preparation of various dishes. It can be used for preparing various preserves, pickling cucumbers, cabbage, and tomatoes, as well as for adding a pleasant aroma to fruit compotes and syrups.

DISCUSSION. As a result of the analysis and generalization, it can be concluded that natural resources, especially medicinal plants, remain one of the most important areas of modern medicine and pharmaceuticals. The biologically active substances contained in them are of great importance in the treatment and prevention of various diseases and in strengthening human health.

The search for new promising medicinal plants includes not only the study of existing species, but also a scientific assessment of plants used in traditional folk medicine, but not sufficiently studied from a scientific point of view. As a result of such research, new substances with high pharmacological activity, possessing antioxidant, anti-inflammatory, antimicrobial, antidiabetic, or immunostimulating effects, can be identified.

The richness and biogeographic diversity of Uzbekistan's flora creates enormous opportunities for the discovery of new medicinal plant species. At the same time, the preservation of endemic and rare species, their rational use, and the organization of scientific research based on the principles of ecological sustainability are of great importance.

Medicinal hyssop is considered a promising plant for scientific research due to its rich chemical composition and multifaceted pharmacological effects. The results of the analysis show that the composition of the essential oil of hyssop samples grown in different countries differs, which depends on environmental conditions and the influence of agrotechnical factors.

In many sources, it is noted that the main active substances of hyssop - flavonoids, polyphenols, and essential oil components - possess antioxidant and anti-inflammatory properties. Therefore, the development of new phytopreparations from this plant is one of the promising directions.

In the future, there is a possibility of developing complex preparations based on medicinal hyssop with antimicrobial, antioxidant, and immunomodulatory effects.

CONCLUSION

Medicinal hyssop (*Hyssopus officinalis* L.) is a promising medicinal plant with a rich chemical composition and multifaceted pharmacological activity. Analysis of the literature confirmed the widespread use of this plant in folk medicine and modern medicine.

The creation of new natural, environmentally safe, and effective pharmaceutical products based on it plays an important role in the development of the national pharmaceutical industry.

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