

BIOLOGICAL SCIENCES

MEDICINAL PROPERTIES OF SPECIES BELONGING TO THE GENUS *STACHYS* L. AND THEIR USE IN FOLK MEDICINE

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Abstract

The genus *Stachys* L. is widely distributed in the flora of Azerbaijan and is considered one of the most valuable plant groups within the Lamiaceae family. This genus includes species such as *Stachys lavandulifolia*, *Stachys germanica*, *Stachys iberica*, and *Stachys byzantina*, which naturally occur in various regions of the country. Research indicates that these species possess significant therapeutic potential and have been used in traditional medicine for centuries. In this study, the morphological characteristics, distribution range, chemical composition, and pharmacological value of *Stachys* species were examined. The analysis revealed that the flowers and leaves of these plants contain flavonoids, essential oils, tannins, saponins, triterpenes, and other bioactive compounds. Literature sources confirm that these constituents exhibit antiseptic, anti-inflammatory, antispasmodic, sedative, antioxidant, and analgesic effects. The traditional applications of *Stachys* species are diverse, including the treatment of bronchitis, nervous disorders, digestive system diseases, rheumatism, skin problems, and wound healing. Among the species, *S. lavandulifolia* is particularly noted for its calming effects, whereas *S. byzantina* is distinguished by its wound-healing properties. Studies suggest that species within the genus *Stachys* are pharmacologically promising and hold significant potential for use in phytotherapy. Future scientific research is recommended to focus on evaluating the toxicological properties of their bioactive compounds and developing new plant-based therapeutic agents.

Keywords: *Stachys*, medicinal plants, chemical composition, pharmacological effects, traditional medicine, bioactive compounds.

INTRODUCTION

The genus *Stachys* L. belongs to the *Lamiaceae* family and is mainly represented by perennial herbaceous plants. These plants are found in various natural zones of Azerbaijan, including forests, meadows, sub-alpine and mountainous areas, riverbanks, and in proximity to human settlements. Although information on the distribution patterns, systematic position, chemical composition, and pharmacological significance of *Stachys* species is available, their detailed study in the flora of Nakhchivan is still an ongoing process [Abbasov, 2018; Dudchenko, 1990].

Research has shown that these plants possess a highly rich chemical composition. Various species have been found to contain essential oils, flavonoids, iridoid compounds, tannins, triterpenes, and other bioactive substances. These components are the main factors that determine the therapeutic effects of the plants. Sufficient scientific data are available regarding the anti-inflammatory, antimicrobial, and sedative effects of *Stachys lavandulifolia* and *Stachys byzantina* [Mozaffarian, 2012].

Historical sources indicate that *Stachys* species have been used in folk medicine since ancient times. Infusions prepared from the leaves and flowers of these plants were applied to treat digestive disorders, colds, coughs, headaches, and inflammatory conditions. In recent years, phytochemical studies have confirmed that these species possess high antioxidant activity, which demonstrates their considerable pharmacological value.

MATERIALS AND METHODS

The aim of this study was to investigate the distribution characteristics, chemical composition, and therapeutic potential of species belonging to the genus *Stachys* L. For this purpose, a wide range of sources was used, including local and international scientific journals, textbooks, scientific literature on pharmacognosy and ethnobotany, as well as systematic materials related to the flora of Azerbaijan. The main focus was on collecting information regarding the plant's use in folk medicine, its bioactive components, and pharmacological effects.

During the research process, laboratory samples, dried plant materials, morphological characteristics, and phytochemical data were analyzed.

Methodologically, the study was conducted based on botanical descriptions, comparative analysis, evaluation of pharmacological sources, systematization of ethnobotanical data, and descriptive analysis of the therapeutic applications of *Stachys* species. The collected data were structured according to the topic and grouped based on various uses of the plants.

The study was synthesized using both primary sources (plant descriptions, ethnomedical data) and secondary sources (scientific articles, textbooks). This approach has enabled a scientifically grounded assessment of the medicinal significance and pharmacological potential of *Stachys* species.

DISCUSSION AND RESULTS

Botanical Description and Distribution. The genus *Stachys* L. belongs to the *Lamiaceae* family and is mainly represented by perennial and, to a lesser extent, annual herbaceous plants and subshrub forms. Species

of this genus are distinguished by their morphological diversity and adaptability to different ecological conditions. In the flora of Azerbaijan, it has been identified that *Stachys lavandulifolia*, *Stachys germanica*, *Stachys iberica*, and *Stachys byzantina* are particularly widespread [Qasimov, 2020].

Based on morphological characteristics, the species are similar to each other, but there are distinguishing features. For example, *Stachys lavandulifolia* is recognized as a subshrub-type plant reaching 15–20 cm in height, with leaves that are thin, long, and linear-lanceolate in shape. The leaves of *S. iberica* and *S. byzantina* are covered with dense hairs, giving the plants a characteristic silvery-gray color. In *S. germanica*, the coarse texture of the leaves and their slightly serrated margins facilitate species identification. The flowers are predominantly pinkish-purple, and flowering occurs from

May to August, depending on the species [Rahman, 2019].

In terms of distribution, the genus *Stachys* is ecologically versatile. These plants naturally occur in regions of Asia Minor, the Iranian Plateau, the South Caucasus, and mountainous areas of the Near East. In Azerbaijan, particularly in the districts of Ordubad, Culfa, Babek, and Shahbuz in the Nakhchivan Autonomous Republic, different representatives of this genus can be found. *S. germanica* is more commonly found in dry meadows, whereas *S. iberica* and *S. byzantina* dominate mountain slopes [Qasimov, 2020].

Within the framework of this study, collected herbarium materials were dried using standard methods and prepared for laboratory analysis. The results indicate that *Stachys* species possess both morphological diversity and bioactive composition, highlighting their scientific and practical significance.



Figure 1. General morphological appearance of *Stachys lavandulifolia*.

Chemical composition and pharmacological properties. The genus *Stachys* is characterized by its richness in various bioactive compounds. In the composition of these plants, flavonoids, phytosterols, alkaloids, coumarins, phenolic derivatives, nitrogen-containing compounds, and high-molecular-weight fatty acids have been identified.

In particular, in *Stachys lavandulifolia*, approximately 10% non-volatile substances and 0.4% essential oils are present in the leaves. In its fruits, the amount of fixed (fatty) oils has been recorded to reach up to 44.3%. [Dudchenko, 1990]. This composition plays a key role in enabling the plants to exhibit various pharmacological effects and makes them promising for use both in folk medicine and in modern phytotherapy.

Table 1.

Chemical composition and medicinal significance of *Stachys* species.

Species	Main compounds	Medicinal applications
<i>Stachys lavandulifolia</i>	Flavonoids, essential oils, tannins	Anti-inflammatory, sedative, analgesic
<i>Stachys officinalis</i>	Alkaloids, coumarins	Spasmolytic, antitussive
<i>Stachys palustris</i>	Nitrogen-containing compounds	For laryngitis, diuretic
<i>Stachys inflata</i>	Phytosterols, fatty acids	Bronchitis, asthma, hypertension
<i>Stachys byzantina</i>	Flavonoids	Cardiovascular system, analgesic

Pharmacological activity of species

Stachys aspera: Hemostatic effect; used for cardiovascular disorders and tuberculosis.

Stachys officinalis: Antitussive, spasmolytic, reduces exudative processes; applied in gastrointestinal

hypofunction, liver diseases, pregnancy toxicosis, diphtheria, dysentery, and radiculitis.

Stachys palustris: Diuretic effect; used in laryngeal disorders.

Stachys inflata: Anti-inflammatory, sedative, tonic; employed in cases of hemorrhoids, hypertension, stroke, bronchitis, and bronchial asthma.

Stachys byzantina: Analgesic; administered as extracts and tinctures for cardiac insufficiency.

Stachys germanica: The flowers are used for constipation, whereas the leaves are applied in cases of dysmenorrhea, amenorrhea, mastitis, and gout. [Rahman, 2019; Abbasov, 2018].

Chemical significance. The bioactive compounds present in *Stachys* species play a key role in their pharmacological activity. The essential oils found in the plant are notable for their strong antiseptic and anti-inflammatory effects. Flavonoids exhibit antioxidant activity by protecting cells from oxidative stress. Tannins help to prevent bleeding due to their astringent and hemostatic properties. Phytosterols support the functioning of the cardiovascular system and have a positive effect on the regulation of metabolic processes. Fatty acids accelerate tissue repair and promote regeneration. The combined effects of these bioactive compounds enhance the plant's sedative, spasmolytic, analgesic, diuretic, and antibacterial properties.

Use in folk medicine. Genus *Stachys* L. belongs to the *Lamiaceae* family and consists mainly of perennial, and occasionally annual, plants. Several species of this genus have long been used in folk medicine for the treatment of various diseases. The leaves, flowers, and roots of the plant are employed for diverse therapeutic purposes [Qasimov, 2020].

1. Anti-inflammatory and Wound Healing Effects

The leaves and flowers of *Stachys* exhibit anti-inflammatory activity. Infusions and compresses of the plant are widely used in the treatment of wounds, skin ulcers, and burn scars [Rüstəmov, 2011].

2. Digestive System Disorders

Stachys teas help to normalize gastrointestinal function and are beneficial in cases of nausea and digestive disorders. Infusions prepared from the roots stimulate the function of the liver and bile ducts [Abdullayeva, 2012].

3. Sedative and Sleep-Regulating Effects

Infusions of the flowers calm the nervous system and help to alleviate sleep disorders. They are widely used in folk medicine for the treatment of stress and nervousness [Zeynalova, 2010].

4. Respiratory Tract Diseases

Infusions of the leaves and flowers of *Stachys* are used as a beverage for the treatment of cough, sore throat, and chronic bronchitis [Qasimov, 2020].

5. Urinary and Genitourinary System Disorders

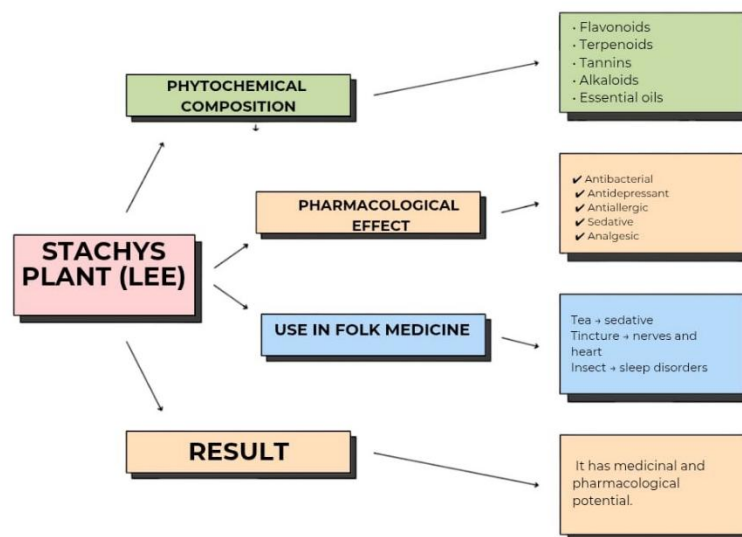
The diuretic effect of the roots and leaves of the plant has been noted. Infusions are used for therapeutic purposes in the treatment of kidney and urinary tract diseases [Rüstəmov, 2011].

Forms of use

Infusion: Leaves and flowers are steeped in boiling water for 15–20 minutes.

Compress and resin: Leaves are crushed and applied to wounds.

Tea: Dried leaves and flowers are prepared as a beverage.



Composition → Effects → Applications of *Stachys* Species

CONCLUSION

The conducted studies have shown that the chemical composition, pharmacological properties, and applications in folk medicine of species belonging to the genus *Stachys* L. are closely interconnected. Flavonoids, essential oils, tannins, triterpenes, phytosterols, and various fatty acids identified in the leaves and flowers of these plants are the main components

that form their antiseptic, anti-inflammatory, spasmolytic, sedative, antioxidant, hemostatic, and analgesic effects.

The pharmacological directions of each studied species are manifested in a specific manner. *Stachys aspera* is distinguished by its hemostatic effect and is used in cardiovascular disorders and tuberculosis. *Stachys officinalis* exhibits antitussive, spasmolytic, and exudate-reducing effects and is applied in gastrointestinal hypofunction, liver diseases, pregnancy toxicosis,

diphtheria, dysentery, and radiculitis. *Stachys palustris* has a diuretic effect and is used in laryngeal disorders. *Stachys inflata* possesses anti-inflammatory, sedative, and tonicity-enhancing properties and is applied in hemorrhoids, hypertension, stroke, bronchitis, and bronchial asthma. *Stachys byzantina* has analgesic properties and is used in cardiac impulse deficiency in the form of extracts and tinctures. *Stachys germanica* flowers are used in constipation, while its leaves are applied in dysmenorrhea, amenorrhea, mastitis, and gout.

Infusions, teas, compresses, and resins prepared from the leaves, flowers, and roots of these species have shown beneficial effects in digestive system disorders, respiratory tract diseases, nervous system disturbances,

skin diseases, wounds and genitourinary system disorders.

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