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PHARMACOLOGICAL PROPERTIES OF MEDICINAL PLANTS GROWING IN THE TERRITORY OF UZBEKISTAN

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ABSTRACT: This article presents a scientific analysis of the pharmacological properties of medicinal plants naturally growing in the territory of Uzbekistan. The study focuses on widely used species such as Glycyrrhiza glabra (licorice), Hypericum perforatum (St. John's wort), Matricaria chamomilla (chamomile), Mentha piperita (peppermint), and Peganum harmala (Syrian rue). Their biologically active compounds and mechanisms of pharmacodynamic action were evaluated based on contemporary pharmacognostic and pharmacological data. The results demonstrate that these plants possess anti-inflammatory, antimicrobial, antioxidant, antispasmodic, sedative, and immunomodulatory properties. The development of phytopharmaceuticals based on local plant resources represents a promising direction for the national pharmaceutical industry.

Keywords: medicinal plants, pharmacological activity, phytotherapy, bioactive compounds, flavonoids, alkaloids, Uzbekistan flora.

INTRODUCTION

Medicinal plants have been used for therapeutic purposes since ancient times and remain an essential source of biologically active compounds in modern medicine. Central Asia, particularly Uzbekistan, is characterized by rich biodiversity and unique ecological conditions that support the growth of numerous medicinal plant species. More than 4,500 plant species grow in Uzbekistan, of which approximately 1,200 are considered medicinal.

In recent decades, global interest in phytotherapy has increased significantly due to the growing prevalence of chronic diseases, antibiotic resistance, and the demand for safer therapeutic alternatives. Herbal medicines are generally associated with lower toxicity and a broader spectrum of biological effects compared to synthetic drugs.

Uzbekistan possesses substantial natural resources of medicinal plants that are widely used in traditional and scientific medicine. However, comprehensive pharmacological evaluation and standardization remain essential for their effective integration into modern pharmaceutical production.

Aim of the study

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To analyze the pharmacological properties of selected medicinal plants growing in Uzbekistan and evaluate their potential applications in pharmaceutical practice.

Objectives

- To identify major bioactive compounds of selected plant species
- To analyze their pharmacodynamic mechanisms
- To assess their therapeutic applications based on scientific literature

MATERIALS AND METHODS

The study was conducted using analytical review methods based on pharmacognostic, phytochemical, and pharmacological data from contemporary scientific sources (2022–2025).

Selection criteria for plant species included:

- Natural growth in Uzbekistan
- Documented traditional and clinical use
- Scientifically confirmed pharmacological activity

The analysis focused on major classes of bioactive compounds such as alkaloids, flavonoids, saponins, glycosides, and essential oils. Mechanisms of action were evaluated based on experimental and clinical research findings.

RESULTS

1. Glycyrrhiza glabra (Licorice)

Phytochemical composition

- Glycyrrhizin
- Flavonoids
- Saponins
- Coumarins

Pharmacological effects

- Anti-inflammatory
- Expectorant
- Antiviral
- Immunomodulatory

Glycyrrhizin exhibits corticosteroid-like activity by inhibiting the metabolism of cortisol, thereby enhancing anti-inflammatory effects. Licorice extracts are widely used in respiratory diseases, gastritis, and peptic ulcer treatment.

2. Hypericum perforatum (St. John’s Wort)

Active constituents

- Hypericin
- Hyperforin
- Flavonoids
- Tannins

Pharmacological effects

- Antidepressant
- Antimicrobial
- Wound-healing
- Antioxidant

Hypericin and hyperforin modulate neurotransmitter levels (serotonin, dopamine, norepinephrine), contributing to antidepressant activity. The plant is commonly used in mild to moderate depressive disorders.

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3. Matricaria chamomilla (Chamomile)

Main components

- Essential oils (azulene, chamazulene)
- Apigenin
- Coumarins

Pharmacological properties

- Antispasmodic
- Anti-inflammatory
- Sedative
- Gastroprotective

Chamomile extracts reduce smooth muscle spasms and are frequently used in gastrointestinal disorders, inflammatory conditions, and mild anxiety states.

4. Mentha piperita (Peppermint)

Principal compound

- Menthol

Pharmacological actions

- Antispasmodic
- Analgesic
- Antimicrobial
- Carminative

Menthol acts on calcium channels in smooth muscles, reducing spasms in the gastrointestinal tract. Peppermint oil is widely used in irritable bowel syndrome and digestive disorders.

5. Peganum harmala (Syrian Rue)

Chemical composition

- Harmaline
- Harmine
- Other β-carboline alkaloids

Pharmacological effects

- Antimicrobial
- Antiparasitic
- Sedative
- Potential anticancer activity (experimental data)

Due to its high alkaloid content, Syrian rue demonstrates strong biological activity; however, dosage control is critical due to possible toxicity.

Comparative Analysis of Pharmacological Properties

Plant Species	Major Active Compounds	Main Pharmacological Effects
Licorice	Glycyrrhizin	Anti-inflammatory, antiviral
St. John's Wort	Hypericin	Antidepressant
Chamomile	Apigenin	Antispasmodic, sedative
Peppermint	Menthol	Analgesic, antispasmodic

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Plant Species	Major Active Compounds	Main Pharmacological Effects
Syrian Rue	Harmaline	Antimicrobial

The results indicate that medicinal plants growing in Uzbekistan possess significant pharmacological potential due to their rich content of bioactive phytochemicals.

DISCUSSION

The findings confirm that Uzbekistan's medicinal flora represents a valuable source of pharmacologically active substances. Many of the identified compounds (flavonoids, alkaloids, glycosides) exhibit multifunctional biological effects, including antioxidant and anti-inflammatory properties.

Compared to synthetic drugs, phytopreparations offer:

- Lower incidence of adverse reactions
- Synergistic therapeutic effects
- Potential for long-term use

However, challenges remain regarding:

- Standardization of active ingredients
- Clinical validation
- Quality control according to GMP standards

Further experimental and clinical research is necessary to ensure safe and effective pharmaceutical development.

CONCLUSION

Medicinal plants growing in the territory of Uzbekistan demonstrate significant pharmacological activity supported by modern scientific evidence. Species such as licorice, St. John's wort, chamomile, peppermint, and Syrian rue possess anti-inflammatory, antimicrobial, sedative, and immunomodulatory effects.

The development of standardized phytopharmaceutical products based on local plant resources represents a promising direction for strengthening the national pharmaceutical industry. Future research should focus on clinical trials, toxicological evaluation, and advanced extraction technologies.

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