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MEDICINAL PLANTS OF UZBEKISTAN AND THEIR HEALTH BENEFITS

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Abstract. This study explores the pharmacological potential of medicinal plants native to Uzbekistan, emphasizing their scientifically validated applications against major diseases. The rich biodiversity of the region provides a valuable source of bioactive compounds such as flavonoids, alkaloids, and terpenoids, which exhibit antioxidant, anti-inflammatory, antimicrobial, and anticancer properties. Selected plants, including *Glycyrrhiza glabra*, *Hypericum perforatum*, *Mentha piperita*, *Matricaria chamomilla*, and *Nigella sativa*, were analyzed in terms of their active constituents and molecular mechanisms of action. Comparative evaluation revealed distinct therapeutic specializations, ranging from hepatoprotective to neuropharmacological and anticancer effects. The findings highlight the importance of integrating traditional knowledge with modern scientific evidence to support the rational use of plant-derived compounds in drug discovery and the development of novel therapeutic strategies.

Keywords: alkaloids, antioxidant activity, bioactive compounds, flavonoids, medicinal plants, pharmacology, terpenoids, Uzbekistan

Annotatsiya. Mazkur tadqiqot O‘zbekiston hududida o‘sadigan dorivor o‘simliklarning farmakologik potensialini va ularning asosiy kasalliklarga qarshi ilmiy asoslangan qo‘llanilishini o‘rganishga bag‘ishlangan. Mintaqaning boy bioxilma-xilligi flavonoidlar, alkaloidlar va terpenoidlar kabi biologik faol birikmalar manbai hisoblanadi. Ushbu moddalar antioksidant, yallig‘lanishga qarshi, antimikrob va o‘smaga qarshi xususiyatlarga ega. Glycyrrhiza glabra, Hypericum perforatum, Mentha piperita, Matricaria chamomilla va Nigella sativa o‘simliklari faol komponentlari va ta’sir mexanizmlari nuqtai nazaridan tahlil qilindi. Natijalar ularning gepatoprotektiv, nevrofarmakologik va antitumor yo‘nalishlarda ixtisoslashganligini ko‘rsatdi. Tadqiqot natijalari an’anaviy bilimlarni zamonaviy ilmiy yondashuv bilan uyg‘unlashtirish zarurligini tasdiqlaydi.

Kalit so‘zlar: alkaloidlar, antioksidant faollik, bioaktiv birikmalar, flavonoidlar, dorivor o‘simliklar, farmakologiya, terpenoidlar, O‘zbekiston

Аннотация. Данное исследование посвящено изучению фармакологического потенциала лекарственных растений, произрастающих на территории Узбекистана, и их научно обоснованного применения против

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основных заболеваний. Богатое биоразнообразие региона является источником биологически активных соединений, таких как флавоноиды, алкалоиды и терпеноиды. Эти вещества обладают антиоксидантными, противовоспалительными, антимикробными и противоопухолевыми свойствами. Были проанализированы растения Glycyrrhiza glabra, Hypericum perforatum, Mentha piperita, Matricaria chamomilla и Nigella sativa с точки зрения их активных компонентов и механизмов действия. Сравнительный анализ выявил их терапевтическую специализацию. Полученные результаты подчеркивают необходимость интеграции традиционных знаний с современными научными подходами.

Ключевые слова: алкалоиды, антиоксидантная активность, биоактивные соединения, флавоноиды, лекарственные растения, фармакология, терпеноиды, Узбекистан

INTRODUCTION.

In recent decades, scientific interest in medicinal plants has increased markedly, positioning them as a central focus in the advancement of modern pharmacology and natural product chemistry. Within global healthcare systems, naturally derived substances constitute a significant proportion of therapeutic agents. It is estimated that approximately 70–80% of the population in developing countries relies on plant-based remedies for primary healthcare needs [1].

In this context, the flora of Central Asia, particularly that of Uzbekistan, is distinguished by its remarkable biodiversity. The region hosts more than 4,500 plant species, of which at least 600 have been identified as possessing medicinal properties according to scientific reports.

This rich botanical diversity represents not only a cornerstone of traditional medicine but also a promising reservoir of bioactive molecules for modern drug discovery. Notably, plants adapted to endemic and semi-arid environments tend to accumulate unique secondary metabolites with enhanced biological activity [2].

Phytochemical and Pharmacological Basis. The therapeutic efficacy of medicinal plants is primarily determined by their content of biologically active compounds. Among the most significant classes are alkaloids, flavonoids, terpenoids, and phenolic compounds. These molecules exert their pharmacodynamic effects through interactions with diverse biological targets at the molecular level.

For instance, flavonoids act as potent antioxidants by scavenging reactive oxygen species and mitigating oxidative stress. Terpenoids influence intracellular signaling pathways, thereby exhibiting anti-inflammatory and antimicrobial activities. Alkaloids, in turn, frequently interact with enzymes or receptors, modulating central nervous system functions or metabolic processes [3].

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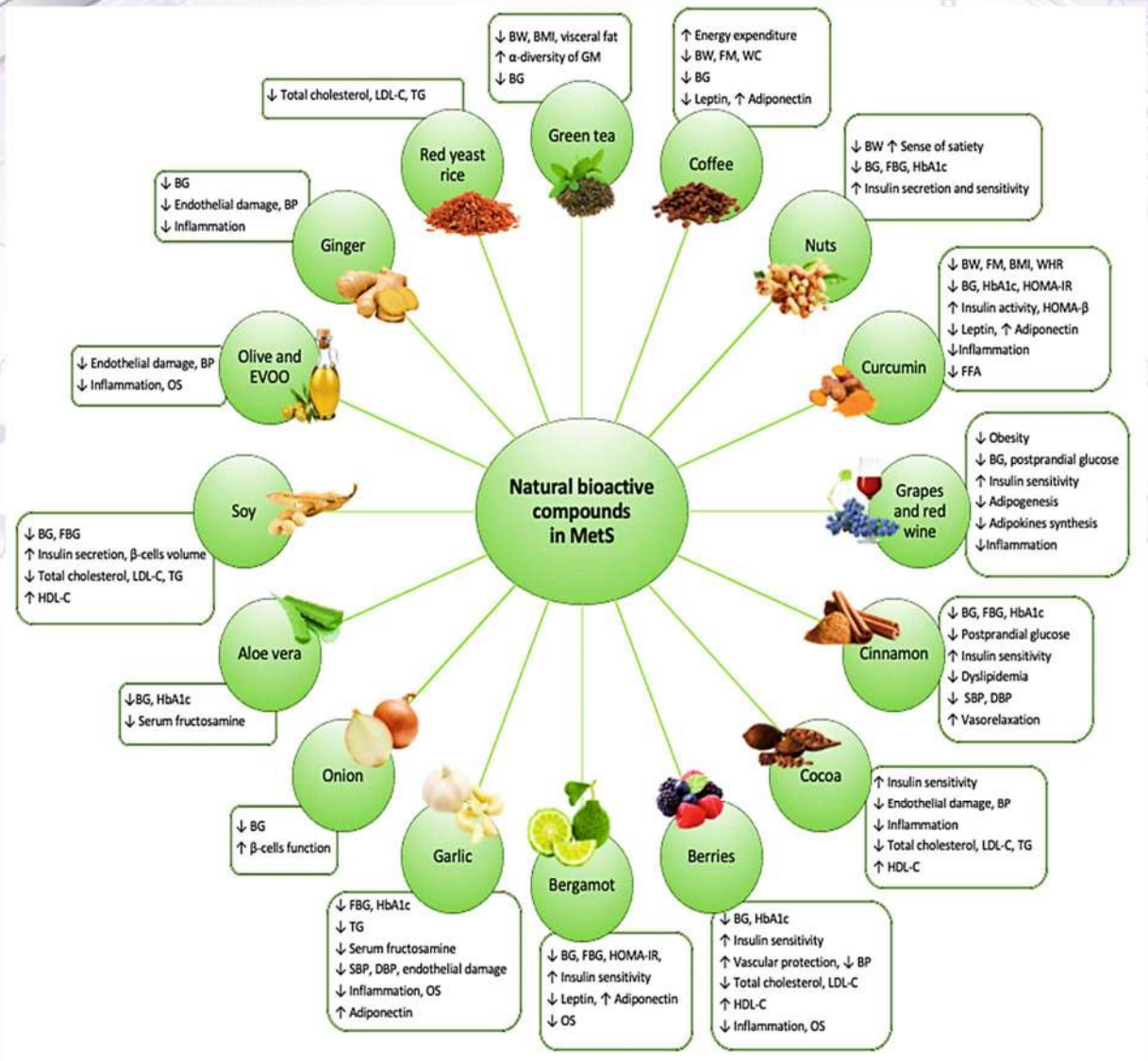


Figure 1: Bioactive compounds classification and mechanism diagram.

Core Scientific Analysis

1. Glycyrrhiza glabra

Active compounds: Glycyrrhizin, flavonoids

Mechanism of action: Exerts anti-inflammatory effects through inhibition of the NF-κB signaling pathway [4].

Disease target: Liver diseases and viral infections

Scientific evidence: Glycyrrhizin has been extensively studied for its hepatoprotective and antiviral properties

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Figure 2: Medicinal plant image – *Glycyrrhiza glabra*,

2. Hypericum perforatum

Active compounds: Hypericin, hyperforin

Mechanism of action: Inhibits the reuptake of monoamine neurotransmitters [5].

Disease target: Depressive disorders

Scientific evidence: Clinical studies have demonstrated its efficacy in mild to moderate depression.



Figure 3: Medicinal plant image –*Hypericum perforatum*

3. Mentha piperita

Active compounds: Menthol, menthone

Mechanism of action: Acts as a calcium channel blocker, producing a spasmolytic effect [6].

Disease target: Gastrointestinal disorders

Scientific evidence: Provides symptomatic relief in irritable bowel syndrome.

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Figure 4: Medicinal plant image – *Mentha piperita*,

4. Matricaria chamomilla

Active compounds: Apigenin, bisabolol

Mechanism of action: Anti-inflammatory activity via inhibition of COX and LOX enzymes [7].

Disease target: Inflammatory and dermatological conditions

Scientific evidence: Its dermatological applications have been confirmed in experimental studies



Figure 5: Medicinal plant image – Matricaria chamomilla.

5. Nigella sativa

Active compounds: Thymoquinone

Mechanism of action: Activates antioxidant and apoptotic pathways [8].

Disease target: Cancer and metabolic syndrome

Scientific evidence: Demonstrated to suppress cellular proliferation at the molecular level.

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Figure 3: Medicinal plant image – Nigella sativa.

Comparative Scientific Evaluation. A comparative analysis of these medicinal plants reveals distinct therapeutic specializations. For example, *Glycyrrhiza glabra* demonstrates a multifaceted mechanism in hepatoprotection, whereas *Nigella sativa* exhibits pronounced multi-target antitumor potential. In contrast, *Hypericum perforatum* is characterized by its highly specific neuropharmacological activity [9].

It is important to emphasize that although antioxidant activity is common across many medicinal plants, clinical efficacy cannot be solely attributed to this property. Flavonoid-rich plants typically provide broad cytoprotective effects, while those containing specific alkaloids or terpenoids tend to exhibit more selective and potent therapeutic actions [10].

Table-1

Pharmacological Characteristics of Selected Medicinal Plants

Plant	Active Compound	Disease	Mechanism
Glycyrrhiza glabra	Glycyrrhizin	Liver diseases	NF-κB inhibition
Hypericum perforatum	Hypericin	Depression	Monoamine regulation
Mentha piperita	Menthol	GI disorders	Calcium channel blockade
Matricaria	Apigenin	Inflammation	*COX/LOX* inhibition

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chamomilla			
Nigella sativa	Thymoquinone	Cancer	Apoptosis induction

CONCLUSION.

The present analysis demonstrates that medicinal plants native to Uzbekistan represent a scientifically valuable and pharmacologically diverse source of bioactive compounds with significant therapeutic potential. Their efficacy is not solely based on traditional usage but is increasingly supported by robust molecular and clinical evidence derived from contemporary research. The diversity of phytochemical constituents found in these plants enables their interaction with multiple biological targets, thereby enhancing their therapeutic versatility. Furthermore, the integration of traditional knowledge with modern pharmacological validation provides a more reliable framework for their rational application in medicine. Overall, these findings confirm that Uzbekistan's medicinal flora constitutes an important resource for future drug discovery and development.

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