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MEDICINAL PLANTS OF UZBEKISTAN: TRADITIONAL APPLICATIONS AND PHARMACEUTICAL USES

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Annotation. This article offers a comprehensive analysis of the pivotal role played by naturally occurring medicinal plants within Uzbekistan's rich and diverse flora, both in traditional folk medicine and the modern pharmaceutical industry. It thoroughly details the botanical description, chemical composition rich in beneficial substances, pharmacological properties, and practical application methods of widely distributed medicinal plant species found in our country. Furthermore, the prospects of utilizing these valuable plants in the modern pharmaceutical industry for creating new, effective medicines, producing biologically active supplements, and preparing natural cosmetic products are examined in detail. The article pays special attention to the rational utilization, effective conservation, and transmission of these invaluable medicinal plant resources of Uzbekistan to future generations. To this end, it provides information on the necessity of strengthening mechanisms for protecting unique plants and further enhancing methods for the wide popularization of their beneficial properties.

Keywords: Uzbekistan's flora, medicinal plants, folk medicine, botanical description, chemical composition, pharmacological properties, pharmaceutical industry, bioactive supplements, conservation, scientific research

Introduction.

Medicinal plants have held significant importance in human life. Ancient healers in Egypt, China, India, and Greece were well aware of the healing properties of plants and widely used them for treating and preventing various diseases. Interest in medicinal plants continues to grow even today. The main reasons for this include the side effects and high cost of synthetic drugs, as well as humanity's return to nature and the desire for naturally grown products. For instance, we find information about the use of plants as medicine in ancient Sumerian writings (around 3000 BCE). Egyptians, furthermore, used plants not only as medicine but also as cosmetic agents. Even "The Book of the Dead" contains detailed information about medicinal plants.

As long as human civilizations have existed, medicinal remedies have been present and incredibly diverse. The earliest records regarding the use of plants for therapeutic purposes date back to the 6th millennium BCE. Eastern folk healers achieved significant successes in applying medicinal plants. The unparalleled role of Abu Ali ibn Sina (Avicenna) (980-1037) in the advancement of medical science is undeniable. In particular, his work "The Canon of

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Medicine" ("Al-Qanun fit-Tibb") is studied in almost all medical universities. This treatise has served as a primary source of medical knowledge for centuries in both the East and the West. [1]

Today, many drugs used in the pharmaceutical industry are also derived directly from medicinal plants. For instance, we have frequently observed that aloe vera aids skin regeneration, ginger helps with nausea, and chamomile has a calming effect. Therefore, medicinal plants remain a crucial part of not only past but also future medicine.

Uzbekistan boasts 577 types of medicinal plants, with 250 of them currently utilized in scientific medicine. The effect of medicinal plants on the body depends on the quantity of compounds they contain. These compounds accumulate in varying amounts in different parts of the plant. The necessary parts of the plant are harvested at different times for medicinal preparation. For example, bark and buds are collected in early spring when they begin to appear, flowers when fully open, fruits and seeds when ripe, and underground organs (roots, rhizomes, and bulbs) in early spring or late autumn. The active substances in medicinal plants belong to various groups, which may include alkaloids, glycosides, flavonoids, tannins, and other mucilaginous substances, essential oils, vitamins, resins, and other compounds. Typically, closely related chemical compounds characteristic of one group are found in members of the same family or genus. However, some chemical compounds can also be present in plants belonging to different, unrelated families.

Main Part. Medicinal plants are plants that contain biologically active substances (secondary metabolites) which exert a therapeutic effect on the human body. Unlike synthetic drugs, they do not consist of a single defined chemical compound but rather represent a complex combination of dozens, sometimes hundreds, of compounds. It is precisely the synergistic interaction of this complex mixture that determines their healing properties.

The main active components of medicinal plants are as follows:

Alkaloids: These are complex nitrogen-containing compounds produced by plants. Alkaloids accumulate unevenly in different plant species. Plants belonging to the Solanaceae (nightshade) and Papaveraceae (poppy) families, in particular, are rich in alkaloids. The amount of alkaloids in the same plant can vary depending on the season, growing location, age, and developmental stage of the plant. Many alkaloids are valuable medicinal agents used in treating diseases of internal organs, nervous system disorders, and other ailments. These include morphine, papaverine, codeine, ephedrine, caffeine, and others. In medicinal preparations, the salts of alkaloids are typically used. The alkaloid content in plants ranges from trace amounts to 2-8%. They possess strong physiological effects (e.g., caffeine, morphine, atropine). [2]

Glycosides: These are organic compounds formed as a result of sugar molecules bonding with other molecules. They occur in various plants and perform diverse biological functions. Glycosides are compounds formed by the attachment of a glycosyl group to an aglycone. The glycosyl group consists of a sugar (e.g., glucose), which is attached to the aglycone. The aglycone is the non-sugar part of the compound. Aglycones can be various compounds, such as flavonoids, terpenes, steroids, and others. They have regulatory effects on heart activity and possess anti-inflammatory properties (e.g., cardiac glycosides). [3]

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Flavonoids: They possess antioxidant, anti-inflammatory, and capillary-strengthening properties. Flavonoids are also abundant in plant-derived foods and beverages, such as fruits, vegetables, tea, cocoa, and wine. They are divided into several subgroups, including chalcones, flavones, flavonols, and isoflavones. Flavonoids have been shown to have positive effects on human and animal health, and current interest focuses on their use for treating diseases and for chemoprevention. [4]

Tannins (Astringents): Exhibit anti-inflammatory, bactericidal, and astringent effects.

Essential oils: Possess antiseptic, spasmolytic, and calming properties.

Vitamins, microelements, organic acids, polysaccharides: Have general tonic and protective effects.

The methods of using medicinal plants are highly diverse, and they are mainly prepared in the following forms:

a) Infusions: Prepared by steeping the dry part of the plant in boiling water (e.g., chamomile tea).
b) Decoctions: Harder parts of the plant (roots, bark) are boiled in water.
c) Extracts: Biologically active substances are isolated from the plant using alcohol, water, or other solvents.
d) Oils: Prepared by extracting essential oils or steeping the plant in oil.
e) Powders and ointments: Grinding dried plant parts or preparing ointments from them.

II. Uzbekistan's Medicinal Plant Treasury: From Traditional Medicine to Pharmaceuticals.

Uzbekistan's unique climate and diverse topography have fostered a rich world of medicinal plants. Thousands of plant species grow in its foothills, mountains, riverine areas, and deserts. Many of these have been used in traditional medicine since ancient times and are now drawing significant interest from the modern pharmaceutical industry. Let us examine some of them:

1. Licorice (Glycyrrhiza glabra)

Botanical description: It is a perennial plant belonging to the Leguminosae (Fabaceae) family. Its root is primarily used in medicine. It can be frequently found along riverbanks and in riparian forests (tugai forests) of Uzbekistan.

Chemical composition: Glycyrrhizin, flavonoids, polysaccharides.

In folk medicine: It relieves coughs, treats sore throats, and reduces pain in gastric ulcers and gastritis. Additionally, it strengthens the immune system.

In pharmaceuticals: Glycyrrhizin has anti-inflammatory, antiviral, and mucoprotective properties. It is used to produce cough syrups, gastrointestinal preparations, and immunomodulators.

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Caution for use: It can increase blood pressure, which may lead to hypertension. Therefore, long-term use is not recommended.

2. Common Barberry (Berberis Vulgaris L.)

Botanical description: It is a thorny shrub belonging to the Berberidaceae family, growing to about 1.5-2 m tall. Its leaves are simple, it has yellow flowers, and red, elongated fruits (barberry berries). The inside of its roots and stems is yellow. It is found in the foothills and mountainous regions of Uzbekistan and is widely cultivated primarily as an ornamental plant. For medicinal purposes, its leaves are used medicinally.

Chemical composition: All organs of the plant contain alkaloids. The main alkaloid isolated from the roots of common barberry is berberine. In addition to berberine, the plant's roots contain palmatine, columbamine, jatrorrhizine, berberrubine, and oxyacanthine. Its fruits have been found to contain malic, citric, tartaric, and other organic acids, sugars, pectin substances, and ascorbic acid.

In folk medicine: Barberry preparations are used as a choleretic (bile-driving) agent in cases of hepatitis, hepatocholecystitis, biliary dyskinesia (hyperkinetic form), and gallstone disease not complicated by jaundice. In obstetric-gynecological practice, barberry tincture is prescribed as an auxiliary agent for postpartum hemorrhage due to uterine atony, and for bleeding associated with inflammatory processes. It is a plant with choleretic, astringent, strengthening, and laxative properties. The concentration of bilirubin in gallbladder bile decreases.

Contraindications: It is not recommended for individuals prone to thrombosis due to its ability to increase blood coagulation, nor for those taking blood-thinning medications. It is strictly contraindicated during pregnancy due to its potential to increase uterine tone.

In pharmaceuticals: Research has confirmed its antioxidant, antimicrobial, and anti-inflammatory properties. It is used to prepare digestive aids, antibacterial agents, and certain beverages. [5]

3. Marshmallow (Althaea officinalis L.)

Botanical description: It is a perennial herbaceous plant belonging to the Malvaceae family. It can reach a height of 50 cm to 1.5 meters. Its stem is branched, its leaves are oval and heart-shaped, and its flowers are white or pale pink. Primarily, its root is considered medicinal. Marshmallow is widely distributed in Europe, Western Asia, and North Africa. In Uzbekistan, it is cultivated as a medicinal plant in moist areas and along riverbanks.

Chemical composition: Mucilage (polysaccharides), pectin, starch.

In folk medicine: Its roots and leaves are used in medicine as an expectorant, anti-inflammatory, and emollient agent, to protect the gastrointestinal mucosa, and to soothe the skin.

In pharmaceuticals: Due to the coating and emollient properties of the mucilage content in marshmallow, cough syrups and infusions are prepared. This soothes the cough and facilitates

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expectoration. Furthermore, it is included in solutions for alleviating and rinsing oral inflammations, and in gastrointestinal preparations.

Adverse effects: Individuals with allergies to marshmallow or other plants belonging to the Malvaceae family should avoid its consumption or topical application. Allergy symptoms may include skin itching, rash, redness, swelling, or difficulty breathing.

Regarding the use of marshmallow preparations during pregnancy and lactation, consulting a doctor before use is recommended.

Marshmallow can lower blood sugar levels. If its preparations are consumed, it can lead to hypoglycemia, an excessive decrease in blood sugar. [6]

4. Aloe Vera (Aloe barbadensis miller) or Aloe (Aloe arborescens)

Botanical description: It is a cultivated plant belonging to the Asparagaceae (formerly Liliaceae/Aloaceae) family, growing as a tree-like or herbaceous plant up to 4 meters tall. Its leaves are thick, succulent, soft, sword-shaped, concave on the upper side and convex on the lower side, with thorny edges, reaching a length of 20-65 cm and a thickness of 12-15 mm. Although it originates from the arid regions of Africa, it is cultivated in home conditions and some greenhouses in Uzbekistan. Primarily, the gel part inside its leaves is considered medicinal.

Chemical composition: Anthracene derivatives (aloin, nataloin, isoemodin), aloyazid, polysaccharides (pectin, glucomannan), vitamins (A, C, E, B group), minerals (calcium, magnesium, zinc), essential oils, amino acids, resins.

In folk medicine: Aloe leaf has been used in traditional medicine since ancient times. The fresh leaf and its juice were applied to treat stomach and duodenal ulcers, gastrointestinal inflammations, and to stimulate appetite. Its liquid extract and tablets are used for eye diseases (conjunctivitis). It is taken to treat skin burns, cuts, insect bites, inflamed gums, colds, and to prevent constipation.

In pharmaceuticals: Strong anti-inflammatory, antibacterial, antiviral, antioxidant, and skin-regenerative properties have been confirmed. Based on aloe vera extract, wound-healing ointments, cosmetic creams, lotions, shampoos, as well as immune-boosting and digestion-improving drinks and supplements are produced.

Caution for use: Excessive internal intake can lead to diarrhea and electrolyte imbalances. Consultation with a doctor is recommended during pregnancy and lactation. Otherwise, heavy bleeding or miscarriage may occur in pregnant women. [7]

5. Shepherd's Purse (Capsella bursa-pastoris)

Botanical description: It is an annual herbaceous plant belonging to the Brassicaceae (Cabbage) family, growing to a height of 10-30 cm. Its basal leaves are short-petioled and pinnately lobed/divided, while stem leaves are sessile. The flowers form a raceme inflorescence on the stem. It grows wild in almost all regions of Uzbekistan, especially in gardens, along roadsides, and in uncultivated lands. The aerial part of the plant is considered medicinal.

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Chemical composition: Flavonoids (diosmin, rutin), choline, acetylcholine, alkaloids (bursin), organic acids, Vitamin C and K, malic and citric acids.

In folk medicine: Its aerial part is used as a hemostatic (blood-stopping) agent for uterine hemorrhages and gastrointestinal bleeding. It is also utilized for its diuretic and anti-inflammatory effects.

In pharmaceuticals: It is included in hemostatic preparations. Its flavonoids help strengthen blood vessels and reduce capillary permeability. It is found in some teas and extracts used in gynecological practice.

Caution for use: It can enhance blood coagulation, therefore it is not recommended for individuals prone to thrombosis and those taking blood-thinning medications. Its use is strictly contraindicated during pregnancy, as it can increase uterine tone. [8]

III. Collection, Storage, and Conservation of Medicinal Plants:

To preserve the healing properties of medicinal plants, their proper collection, drying, and storage are of paramount importance. The medicinal part of each plant species (root, leaf, flower, fruit) must be collected during a specific season, when its biologically active compounds are at their highest concentration. During collection, ecological purity must be observed, and plants should not be gathered from polluted areas (roadsides, industrial zones).

The drying process is carried out in the shade, in a well-ventilated area. Improper drying leads to the loss of the plant's medicinal properties. For storage, airtight, dark, and cool places are chosen.

Despite Uzbekistan's rich reserves of medicinal plants, some of them are declining due to human activities (over-collection, destruction of natural habitats). Therefore, it is crucial to conduct scientific and practical work on the conservation, cultivation, and restoration of medicinal plants.

The necessity of protecting nature and the environment, utilizing natural resources (forests, water and aquatic resources, subsoil resources, etc.) correctly and rationally, and preserving them for future generations, is enshrined in our fundamental law – the Constitution of the Republic. The Red Book, compiled on the initiative of Academicians E. M. Lavrenko and A. L. Takhtajan, plays a crucial role in preserving extinct and endangered plants, including medicinal plants, in their natural growth conditions, meaning in their conservation. The Red Book not only lists extinct and endangered plants but also details the measures required for their conservation and restoration in their natural growing conditions, as well as the causes of their extinction. [9]

IV. To ensure that people utilize natural medicinal plants more frequently than artificial (chemical) drugs, and thereby reduce dependency on pharmacies, the following comprehensive measures can be implemented:

1. Enhancing Public Awareness and Education:

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a) Promotion through Mass Media: Organizing clear educational programs, articles, and broadcasts via television, radio, and the internet (blogs, social networks) about the benefits of medicinal plants, methods for their proper collection, storage, and preparation, and, most importantly, in which cases and at what dosage they should be used.

b) Simplified Guides: Publishing and widely distributing books, booklets, and posters about medicinal plants, written in simple language understandable to the general public, devoid of scientific complexity and enriched with colorful illustrations.

2. Scientific Justification and Integration into Official Medicine:

a) Clinical Research: Proving the efficacy and safety of medicinal plants through modern scientific methods (clinical trials, laboratory analyses) and making the results public. This will increase public trust.

b) Training for Doctors and Pharmacists: Organizing professional development courses and training for medical personnel on herbal therapy, and teaching them to recommend natural remedies.

3. Ensuring Quality and Affordable Natural Preparations:

a) Strict Quality Control: Placing the quality and ecological purity (pesticide-free, heavy metal-free) of medicinal plant raw materials and derived preparations under strict state control, ensuring compliance with standards. Strengthening the certification system.

b) Affordable Prices: Increasing demand for natural preparations by making their prices more affordable compared to chemical drugs.

4. Revitalizing Cultural and Traditional Knowledge:

a) Studying Folk Medicine Heritage: Studying and systematizing folk medicine recipes that have been tested over centuries, and confirming their efficacy through analysis using modern scientific methods.

b) Ecotourism and the Concept of a "Green" Pharmacy: Developing ecotourism in areas where medicinal plants grow, introducing the plants to the public, and encouraging them to create their own 'green pharmacies'.

5. Emphasizing Healthy Lifestyle and Prevention:

Disease Prevention: Conducting wide-ranging campaigns aimed at preventing diseases through healthy eating, physical activity, and the prophylactic use of medicinal plants. Instilling the concept that "prevention is better than cure."

CONCLUSION

Despite the widespread use of synthetic preparations in modern medicine, methods of treatment with medicinal plants have become increasingly popular in both the East and Europe in recent years. This is explained by the high bioactivity of plant preparations, their fewer side effects on the human body, and their more affordable prices compared to synthetic drugs. Therefore, it is crucial to implement comprehensive approaches to encourage people to actively use natural medicinal plants instead of artificial drugs and to reduce pharmaceutical dependency. In this process, it is important to inform the public through mass media and specialized guides,

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prove the efficacy of plants through scientific research, and integrate them into official medicine. Furthermore, it is necessary to encourage the production of high-quality and affordable natural preparations under state control, revive the heritage of folk medicine, and focus on a healthy lifestyle. These measures will strengthen trust in natural medicines, reduce dependency on chemical preparations, and ultimately improve public health.

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