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OBTAINING AND STANDARDIZATION OF A BIOACTIVE SUPPLEMENT WITH DIURETIC EFFECT BASED ON LOCAL PLANT RAW MATERIALS (ON THE EXAMPLE OF BITTER WORMWOOD AND TRIBULUS TERRESTRIS PLANTS)

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Abstract

In recent decades, the use of plant-based bioactive supplements has attracted significant attention in pharmaceutical and medical research. Medicinal plants represent an important source of biologically active compounds that can support physiological functions and contribute to the prevention of various diseases. This study analyzes the possibilities of obtaining and standardizing a bioactive supplement with diuretic activity based on local medicinal plant raw materials, particularly bitter wormwood (Artemisia absinthium) and tribulus (Tribulus terrestris). These plants are widely distributed in Central Asia and have long been used in traditional medicine for their pharmacological properties. Scientific literature indicates that both plants contain flavonoids, saponins, essential oils, and other secondary metabolites that exhibit diuretic and anti-inflammatory effects. The study focuses on the analysis of phytochemical composition, technological processing stages, and quality control indicators necessary for standardizing a bioactive supplement derived from these plants. Moisture content, ash content, extractive substances, and flavonoid concentration were considered as the main parameters for standardization. The results of the analysis demonstrate that bitter wormwood and tribulus can serve as promising plant raw materials for the development of natural diuretic supplements. The proposed technological scheme allows preservation of biologically active compounds while ensuring product safety and quality. The findings highlight the potential of local medicinal plants as sustainable resources for the pharmaceutical industry and emphasize the importance of proper standardization in the production of herbal bioactive supplements.

Keywords

medicinal plants, bioactive supplement, diuretic activity, bitter wormwood, tribulus terrestris, phytotherapy, standardization.

Introduction

The growing interest in herbal medicine and plant-derived pharmaceutical products has led to increased research on medicinal plants and their biologically active components. Plants have long served as an important source of therapeutic substances, many of which are still used in modern medicine. In particular, herbal remedies with diuretic properties play a significant role in supporting urinary system function and treating certain metabolic disorders [1].

Diuretics are substances that promote the excretion of excess fluid and salts from the body through increased urine production. They are commonly used in the management of kidney diseases, urinary tract infections, hypertension, and edema. However, synthetic diuretics may cause electrolyte imbalance or other adverse effects during long-term use. Consequently, natural plant-based diuretics are increasingly considered as safer alternatives [2].

Central Asia, including Uzbekistan, is rich in medicinal plant species that have been traditionally used in folk medicine. Among them, bitter wormwood (Artemisia absinthium) and tribulus (Tribulus terrestris), commonly known as temirtikan, are well known for their pharmacological properties. Bitter wormwood contains essential oils, flavonoids, and sesquiterpene lactones that contribute to its antimicrobial and anti-inflammatory activity. Tribulus terrestris is rich in steroidal saponins and flavonoids, which are known to influence urinary excretion and metabolic processes [3].

Despite the traditional use of these plants, modern pharmaceutical science requires standardized approaches to ensure safety, quality, and reproducibility of herbal preparations. Standardization is an essential step in the production of bioactive supplements, as it allows for the control of chemical composition and therapeutic efficacy [4].

The aim of this study is to analyze the possibility of producing a bioactive supplement with diuretic activity based on bitter wormwood and tribulus plant raw materials and to determine the key parameters required for its standardization.

Materials and Methods

This study was carried out through analytical review of scientific literature related to pharmacognosy, phytochemistry, and herbal pharmacology. Various international and regional scientific sources describing the chemical composition and pharmacological effects of Artemisia absinthium and Tribulus terrestris were examined.

Bitter wormwood and tribulus were selected as the primary plant raw materials due to their widespread availability and established medicinal properties. Information regarding their phytochemical composition, including flavonoids, alkaloids, saponins, and essential oils, was systematically analyzed.

In addition, technological processes commonly used in the production of herbal extracts were reviewed. The stages considered included raw material preparation, extraction, filtration, concentration, and drying. These stages were evaluated in terms of their influence on the preservation of biologically active compounds.

Quality indicators required for the standardization of bioactive supplements were also examined. These indicators include moisture content, total ash content, extractive substances, and flavonoid concentration, which are widely used in pharmacopoeial standards [5].

Table 1 Main bioactive compounds of selected medicinal plants

Plant	**Main bioactive compounds**	**Pharmacological effect**
Bitter wormwood (Artemisia absinthium)	Essential oils, flavonoids, sesquiterpene lactones	Anti-inflammatory, diuretic
Tribulus (Tribulus terrestris)	Steroidal saponins, flavonoids	Diuretic, metabolic stimulant

Results

Analysis of the scientific literature indicates that bitter wormwood and tribulus possess significant pharmacological potential. Bitter wormwood contains a variety of secondary metabolites, including flavonoids and essential oils, which have been associated with antimicrobial and anti-inflammatory activities. These compounds may indirectly support kidney function and fluid regulation [6].

Tribulus terrestris is widely studied for its steroidal saponins, particularly protodioscin, which has been linked to improved urinary function and metabolic regulation. These compounds can contribute to increased urine production and improved excretion of metabolic waste [7].

The combination of these two plants in a single bioactive supplement may enhance their diuretic effects through synergistic interactions between their phytochemical components.

In order to ensure the quality and stability of the final product, several physicochemical parameters must be controlled during the standardization process.

Table 2 Quality indicators for the standardization of the bioactive supplement

Indicator	**Standard value**
Moisture content	5–7 %
Total ash	3–5 %
Flavonoid content	Not less than 3 %
Extractive substances	Not less than 15 %

The determination of these parameters helps evaluate the pharmaceutical quality of the supplement. Moisture content influences product stability, while ash content reflects the presence of mineral components. Flavonoid concentration is often used as an indicator of biological activity.

Figure 1

General technological scheme for obtaining a bioactive supplement from plant raw materials

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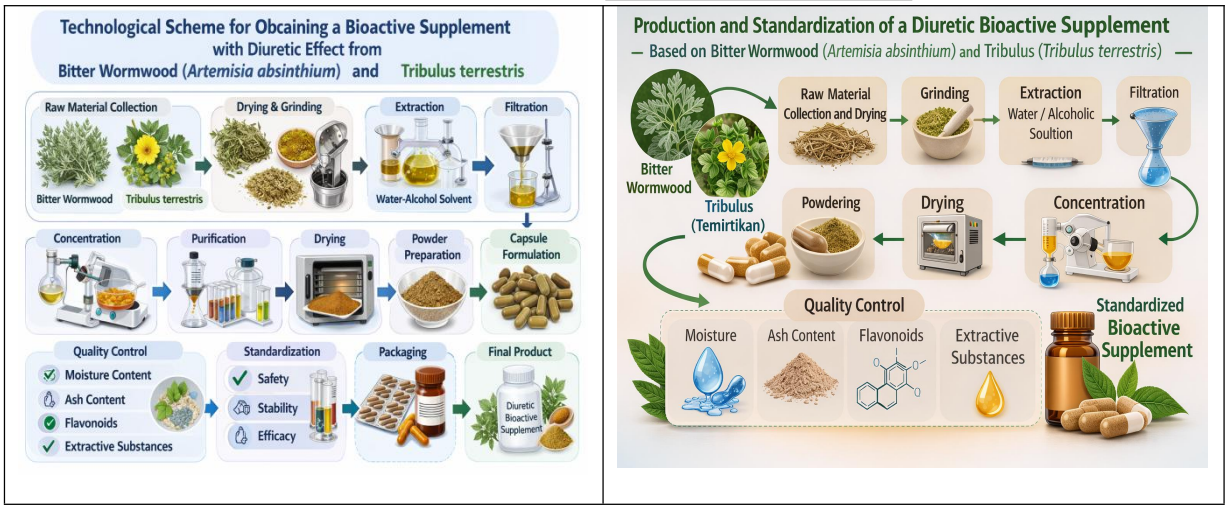

The technological process typically begins with the collection and preparation of plant raw materials. The dried plant material is then subjected to extraction using aqueous or hydroalcoholic solvents to isolate bioactive compounds. The extract is filtered, concentrated, and dried to obtain a powdered form that can be used in capsule or tablet formulations. Quality control and packaging are performed in the final stage to ensure product safety and stability.

Discussion

The use of medicinal plants as sources of bioactive supplements represents an important direction in modern pharmaceutical research. Plants contain a wide variety of natural compounds that can exert therapeutic effects without causing severe side effects often associated with synthetic drugs [8].

The selection of bitter wormwood and tribulus for this study is supported by their long history of traditional medicinal use as well as scientific evidence regarding their phytochemical composition. These plants contain multiple classes of bioactive compounds that may contribute to diuretic activity and overall metabolic regulation [9].

Another important aspect of herbal supplement development is standardization. Without proper standardization, herbal products may vary significantly in chemical composition and therapeutic effectiveness. Standardization ensures that the product contains consistent levels of biologically active compounds and meets pharmacopoeial quality requirements [10].

Furthermore, the use of locally available plant resources may provide economic benefits by reducing dependence on imported pharmaceutical raw materials. The cultivation and processing of medicinal plants can contribute to the development of the local pharmaceutical industry and promote sustainable use of natural resources [11].

Conclusion

The analysis conducted in this study demonstrates that bitter wormwood (Artemisia absinthium) and tribulus (Tribulus terrestris) are promising sources of plant raw materials for the production of bioactive supplements with diuretic activity. Both plants contain biologically active

compounds such as flavonoids, essential oils, and saponins that may support urinary system function.

The standardization of herbal bioactive supplements requires careful control of physicochemical parameters such as moisture content, ash content, extractive substances, and flavonoid concentration. These indicators are essential for ensuring the safety, stability, and quality of the final product.

The development of herbal supplements based on local medicinal plants can contribute to the advancement of the pharmaceutical industry while promoting the sustainable use of natural resources.

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