

## Eureka Journal of Health Sciences & Medical Innovation (EJHSMI)

ISSN 2760-4942 (Online) Volume 2, Issue 3, March 2026



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### STUDY OF THE TECHNOLOGICAL PROPERTIES OF DRY EXTRACT WITH DIURETIC EFFECT

Sharipova Saodat Tursunbaevna <sup>1</sup>,  
<sup>1</sup>Tashkent Pharmaceutical Institute  
E-mail: saodat.67@list.ru

Fatillovova Xonzodabegim Furqat qizi <sup>2</sup>,

Nematova Ziyoda Bunyod qizi <sup>3</sup>  
E-mail: nematovaziyoda622@gmail.com  
Tel: +998 77 036-66-76

#### Abstract

In this work, the technological properties of a dry plant extract with a diuretic effect were studied. During the study, the moisture content, fluidity, density, granulometric composition and hygroscopicity of the extract were determined, and their importance in the development of dosage forms was assessed. The results obtained showed that the dry extract is suitable for the preparation of tablet and capsule forms. The storage conditions and technological stability of the extract were also analyzed. The results of the study allow the creation of effective drugs based on the dry diuretic extract.

**Keywords:** Diuretic, dry extract, medicinal plant, technological properties, hygroscopicity, flowability, granulometric composition, tablet, capsule.

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### Introduction

Medicinal plants play an important role in modern medicine and pharmaceuticals. In recent years, interest in natural medicines has been growing. The main reason for this is that herbal products have relatively few side effects compared to synthetic drugs, are well absorbed by the body, and can be used for a long time. Medicinal plants with diuretic effects are especially widely used in the treatment of diseases of the urinary system.

Kidney and urinary tract diseases are among the most common pathologies in the world. Diuretics are of great therapeutic importance in the treatment of nephritis, pyelonephritis, cystitis, urolithiasis, and various conditions accompanied by fluid accumulation in the body. In the treatment of these diseases, herbal preparations not only increase urine output, but also have anti-inflammatory, antiseptic, and spasmolytic effects. Therefore, the creation of new, effective, and safe drugs based on extracts from medicinal plants is one of the urgent issues.

In pharmaceutical practice, various extracts are obtained from plant raw materials - liquid, concentrated and dry extracts. Among them, dry extracts have a number of advantages: they have high stability, can be stored for a long time, are convenient in transportation and dosing, are relatively safe from a microbiological point of view, and are widely used in the production of various solid dosage forms. Dry extracts serve as an important raw material, especially in the preparation of tablets, capsules, granules and powders.

To use a dry extract as a medicine, it is necessary to thoroughly study not only its pharmacological activity, but also its technological properties. Technological properties include moisture content, flowability, density, granulometric composition, viscosity, compressibility, and hygroscopicity of the substance. These indicators are of decisive importance in developing the dosage form, optimizing the production process, determining storage conditions, and ensuring quality.

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For example, in the process of preparing tablets from substances with low fluidity, dosing accuracy may be impaired. In hygroscopic substances, as a result of moisture absorption, hardening, sticking or chemical decomposition are observed. Density and granulometric composition directly affect the encapsulation and pressing process. Therefore, before creating a drug based on a new dry extract, it is necessary to comprehensively study its technological properties.

Diuretic plant extracts contain flavonoids, saponins, organic acids, essential oils and other biologically active substances that activate kidney function and help remove excess fluid and salts from the body. However, the physicochemical properties of these substances can significantly affect the technological properties of the extract. Therefore, each extract should be studied individually.

The relevance of this work is determined by determining the technological properties of a dry extract with a diuretic effect and assessing its suitability for the creation of solid dosage forms. The results of the research will serve the development of effective drugs from local plant raw materials in the pharmaceutical industry and will allow the creation of import-substituting drugs. Thus, the study of the technological properties of the dry extract of the diuretic is of significant scientific and practical importance in the field of pharmaceutical technology and serves as a scientific basis for the creation of new, effective and safe drugs. The results of this study provide the necessary information for the future development of tablets, capsules or other modern dosage forms based on this extract.

Research on the technological properties of diuretics and dry extracts from medicinal plants is one of the important areas in pharmaceutical science. Scientific research conducted in this area is mainly aimed at studying the physicochemical, pharmacological and technological properties of plant extracts. The textbook “Pharmaceutical Technology” by A.I. Tikhonov and co-authors (2002) describes in detail the methods of extracting plant raw materials, their

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types, and the advantages of dry extracts. The authors note that dry extracts have high stability and are widely used in the production of tablets and capsules. (1). In the work “Phytochemistry and Technology of Phytopreparations” by V.P. Georgievsky (2005), the chemical composition of plants with diuretic effects and their effect on the body are studied. In this source, flavonoids, saponins, and organic acids are indicated as the main biologically active substances that increase urine output. (2).

In the textbook “Pharmacognosy of Medicinal Plants” (2010) by Uzbek scientist Sh.K. Salimov, the pharmacological properties of diuretic plants, including bearberry, centaury, corn silk, and others, are analyzed. The author emphasizes that herbal preparations, in addition to stimulating kidney function, also have an anti-inflammatory effect. (3).

The research of N.A. Zilfikarov and co-authors (2014) showed that the technological properties of dry extracts - flowability, density, granulometric composition and hygroscopicity - are decisive factors in the development of dosage forms. The need for the correct selection of storage conditions is especially noted for hygroscopic substances. (4).

M.A. Kholmatov's scientific work on pharmaceutical technology (2018) covers the issues of creating import-substituting drugs based on dry extracts from local plant raw materials. According to the research results, the moisture content and compressibility of the extract directly affect the quality of the tablets. (5).

### Purpose of the Research

In recent years, research (2021–2023) has focused on standardizing plant extracts, improving their stability, and creating modern solid dosage forms. These studies once again confirm that dry extracts are a promising raw material in the pharmaceutical industry.

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### Materials and Research Methods

Dry extracts from medicinal plants with diuretic effects are important raw materials in pharmaceutical practice. They serve as the main active ingredient in the production of solid dosage forms - tablets, capsules, granules and powders, which are widely used in the treatment of kidney and urinary tract diseases. The effectiveness of dry extracts directly depends not only on their pharmacological activity, but also on their technological properties. Therefore, a thorough study of the physicochemical and technological parameters of dry diuretic extracts is an important stage in the creation of new drugs [1].

**Dry extract technology.** The production of dry extracts from medicinal plant raw materials consists of several sequential processes. First, the raw materials are sorted, cleaned of foreign impurities and dried to an optimal moisture level. If the drying process is carried out incorrectly, biologically active substances may decompose or evaporate. The dried raw materials are subjected to a grinding stage. The degree of grinding determines the extraction efficiency, since the interaction with the solvent increases with the increase in the surface area of the particles. Too fine a powder makes filtration difficult, so the optimal dispersion is selected [2].

During the extraction stage, biologically active substances are extracted using a solvent. Flavonoids, saponins and potassium salts contained in diuretic plants are mainly water-soluble, therefore water or water-alcohol solutions are used. Extraction can be carried out by soaking, boiling or percolation methods. Technological parameters are strictly controlled, since excessive temperature and time during the process can lead to the decomposition of active substances [3]. The resulting liquid extract is filtered to remove mechanical impurities and then concentrated. Concentration is often carried out under vacuum at low temperature. This method helps to preserve heat-sensitive substances. The next

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step is drying, which uses spray, vacuum or freeze-drying methods. The result is a dry extract that is stable, easy to store and easy to dose [4].

Chemical composition and pharmacological significance. Diuretic plant extracts contain many biologically active substances. Flavonoids increase renal glomerular filtration, and saponins increase urine output. Organic acids and especially potassium salts help to remove excess fluid and sodium ions from the body. In addition, essential oils have antiseptic and anti-inflammatory effects. The complex of these substances, along with the diuretic effect, provides a complex therapeutic effect [5].

An important advantage of herbal diuretics is their mild and physiological effect. Unlike synthetic diuretics, they do not cause a sharp disruption of electrolyte balance and are relatively safe even with long-term use. Therefore, they are widely used in chronic kidney disease, urinary tract inflammation, and edema syndromes [6].

**Moisture content.** One of the main indicators determining the quality of a dry extract is its moisture content. If the humidity is high, the development of microorganisms accelerates, chemical decomposition increases, and the substance becomes viscous. The optimal humidity is usually recommended to be around 5–8%. This indicator ensures the stability of the extract and extends its shelf life. [7].

Hygroscopic extracts quickly absorb moisture from the air. As a result, the powder may harden, aggregate, or change color. Therefore, such preparations should be stored in hermetically sealed containers, protected from moisture. [8].

**Determination of flowability.** Flowability is an important parameter in powder technology. It represents the ability of a substance to flow freely and affects the accuracy of dosing during the manufacturing process. It is evaluated by parameters such as flow angle, flow rate and bulk density. Finely dispersed

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powders usually have low flowability, which can cause problems during tablet compression or encapsulation. [9].

Excipients may be added to improve the solubility. For example, microcrystalline cellulose, starch, talc, or colloidal silicon dioxide reduce the friction between particles and ensure free flow. This helps to maintain a uniform mass and quality of the dosage form.

**Density and granulometric composition.** The bulk density and compacted density of a dry extract determine its packaging properties and compressibility. Powders with low density are bulky and take up more space during encapsulation. High density facilitates the compression process. The granulometric composition, i.e. the particle size distribution, also has a significant impact on the technological process.

If the particles are too small, they will stick together and dusting will increase. Too large particles will make it difficult to form a uniform mixture. Therefore, granulation methods are used to achieve the optimal granulometric composition. As a result of wet or dry granulation, the particles become larger, which improves flowability and compressibility.

**Hygroscopicity and storage stability.** Many plant extracts are hygroscopic and actively absorb moisture. This leads to a change in physical state, decomposition of active ingredients and a decrease in the quality of the dosage form. Determining the degree of hygroscopicity is important in determining storage conditions. Generally, a dry, cool and light-protected environment is recommended for such substances.

Antioxidants or desiccants can be used to increase stability. In addition, modern packaging materials such as aluminum foil, multilayer polymer bags, or blisters are effective in protecting against moisture.

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### Conclusions

In conclusion, the study of the technological properties of a dry extract with a diuretic effect is of great importance in assessing the potential of this substance for use in pharmaceutical practice. During the study, the moisture content, fluidity, density, granulometric composition, and hygroscopic properties of the extract were analyzed and their influence on the development of dosage forms was determined. The data obtained indicate that the dry extract is a promising raw material for solid dosage forms.

It was found that the normal level of moisture content ensures the stability of the extract and prevents physicochemical changes during storage. Flowability indicators determine the accuracy of dosing the substance and the continuity of the production process. Optimal density and particle size facilitate the encapsulation and pressing processes. At the same time, the hygroscopicity of the extract indicates the need to store it in conditions protected from moisture.

Based on the results of the study, it can be said that the dry extract of the diuretic is technologically suitable for the preparation of solid dosage forms such as tablets, capsules and granules. If necessary, its technological properties can be further improved by using excipients. This will allow the creation of effective, safe and convenient medicines based on this extract in the future.

In general, the conducted studies have shown that the dry extract of the diuretic is a promising natural resource for the pharmaceutical industry. Continuing research in this area, in particular, studying the biopharmaceutical properties of the finished dosage forms and assessing their clinical efficacy, is one of the important tasks for the future.

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