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**DEVELOPMENT OF MODERN APPROACHES TO THE
TECHNOLOGY OF ANTIDIABETIC HERBAL
PREPARATIONS IN UZBEKISTAN****Islomova Sumbula**

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Email: sumbula0396@gmail.com<https://doi.org/10.5281/zenodo.20062597>**ARTICLE INFO**Received: 24th April 2026Accepted: 29th April 2026Online: 30th April 2026**KEYWORDS**

Diabetes mellitus, pharmaceutical technology, herbal preparations, medicinal plants, dry extracts, phytotherapy, Uzbekistan, antidiabetic drugs

ABSTRACT

Diabetes mellitus remains one of the major global healthcare challenges, requiring continuous improvement of pharmaceutical treatment approaches. In Uzbekistan, the increasing prevalence of diabetes and the growing interest in herbal medicines have stimulated scientific research aimed at developing effective phytopreparations with hypoglycemic activity. The present article investigates modern pharmaceutical technological approaches used in the development of antidiabetic herbal preparations based on local medicinal plants. Special attention is paid to extraction technologies, optimization of dosage forms, standardization of plant raw materials, and the advantages of dry extracts in pharmaceutical production. The study demonstrates that Uzbekistan possesses substantial medicinal plant resources suitable for producing modern antidiabetic phytopreparations with reduced toxicity and improved pharmacological activity. The implementation of advanced pharmaceutical technologies may contribute to strengthening the national pharmaceutical industry and reducing dependence on imported medicines.

Introduction

Diabetes mellitus is one of the most widespread endocrine disorders in the modern world. According to international statistical data, the number of diabetic patients continues to increase annually due to urbanization, unhealthy dietary habits, reduced physical activity, and genetic predisposition. In Uzbekistan, the prevalence of type 2 diabetes has significantly increased during the last decade, creating additional challenges for the healthcare system.

Conventional synthetic antidiabetic drugs remain widely used in clinical practice. However, prolonged use of synthetic medicines may lead to undesirable adverse effects, including hypoglycemia, hepatotoxicity, nephrotoxicity, and gastrointestinal complications. Therefore, considerable attention has recently been devoted to the development of herbal medicines possessing hypoglycemic and antioxidant activity. Uzbekistan is rich in medicinal plants widely used in traditional medicine. Medicinal plants



such as licorice, milk thistle, barberry, chicory, rosehip, and nettle contain biologically active compounds capable of regulating carbohydrate metabolism and reducing oxidative stress. The development of pharmaceutical

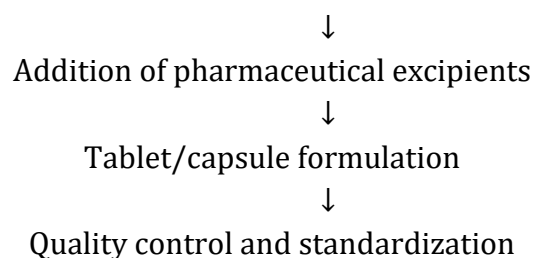
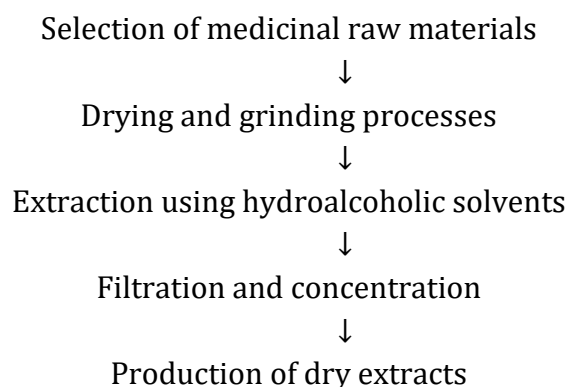
technologies for processing these medicinal plants represents an important scientific direction for modern pharmaceutical science.

Table 1. Medicinal Plants Used in Antidiabetic Phytopreparations

Medicinal plant	Active compounds	Pharmacological effect	Technological significance
Glycyrrhiza glabra	Flavonoids, glycyrrhizin	Hypoglycemic, anti-inflammatory	Suitable for dry extracts
Silybum marianum	Silymarin	Hepatoprotective, antioxidant	Tablet and capsule production
Berberis vulgaris	Berberine	Blood glucose reduction	Hydroalcoholic extraction
Cichorium intybus	Inulin	Improves carbohydrate metabolism	Powder formulations
Urtica dioica	Polyphenols, vitamins	Metabolic regulation	Tea and extract production

Modern pharmaceutical technology requires not only the identification of biologically active compounds but also the development of stable and effective dosage forms. One of the most promising approaches is the production of dry extracts because they possess higher stability, lower microbial contamination risk, and improved dosage accuracy compared to liquid extracts.

Diagram 1. Technological Stages of Herbal Antidiabetic Preparation Development



The extraction stage is considered one of the most critical technological processes in herbal medicine production. Hydroalcoholic extraction methods are widely used because they provide higher yields of flavonoids, alkaloids, and polyphenolic compounds compared to aqueous extraction methods. Optimization of extraction temperature, duration, and solvent concentration directly affects the quality and pharmacological activity of the final preparation.

Table 2. Comparison of Extraction Technologies

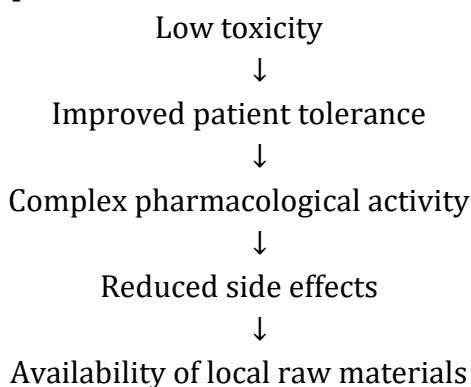


Extraction method	Advantages	Disadvantages	Application
Aqueous extraction	Simple and inexpensive	Lower extraction efficiency	Traditional preparations
Hydroalcoholic extraction	High yield of active compounds	Requires solvent removal	Modern phytopreparations
Ultrasound-assisted extraction	Fast extraction process	Higher equipment cost	Industrial production
Supercritical extraction	High purity extracts	Complex technology	Advanced pharmaceutical industry

In Uzbekistan, the implementation of innovative pharmaceutical technologies remains an important objective for the development of import-substituting medicines. Modern tablet and capsule production technologies allow pharmaceutical manufacturers to improve the bioavailability and stability of herbal preparations.

The selection of pharmaceutical excipients is another important aspect of dosage form development. Excipients such as microcrystalline cellulose, starch, lactose, and magnesium stearate improve tablet hardness, disintegration time, and dissolution characteristics. In addition, film coating technologies protect biologically active compounds from environmental factors and improve patient compliance.

Diagram 2. Advantages of Modern Herbal Antidiabetic Preparations



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Lower production costs

Scientific studies conducted by Uzbek researchers indicate that combined phytocompositions demonstrate synergistic pharmacological effects. For example, combinations of licorice and milk thistle extracts not only contribute to blood glucose regulation but also improve liver function and antioxidant defense mechanisms.

At the same time, standardization remains one of the most significant challenges in phytopreparation technology. Variability in climatic conditions, harvesting periods, and storage conditions may influence the concentration of biologically active compounds in medicinal plants. Therefore, implementation of Good Manufacturing Practice (GMP) standards and modern analytical methods is necessary for ensuring product quality and safety.

Conclusion

The development of modern pharmaceutical approaches for antidiabetic herbal preparations represents a promising direction for pharmaceutical science in Uzbekistan.



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Local medicinal plants contain biologically active compounds with hypoglycemic, antioxidant, and hepatoprotective properties suitable for the production of effective phytopreparations.

Modern extraction technologies, production of dry extracts, and optimization of dosage forms contribute to improving the quality, stability, and pharmacological activity of herbal medicines. The use of local medicinal plant resources may strengthen the national pharmaceutical industry, reduce

dependence on imported medicines, and increase access to affordable antidiabetic therapy.

Further research should focus on clinical evaluation, standardization of plant raw materials, and implementation of innovative pharmaceutical technologies in industrial production. The integration of traditional medicinal knowledge with modern pharmaceutical science may significantly contribute to the development of safe and effective herbal antidiabetic medicines in Uzbekistan.

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