OPTIMIZATION OF OBTAINING MEDICINAL PRODUCTS FROM PASSIFLORA IN THE FOOTHILL CONDITIONS OF THE FERGANA VALLEY

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Abstract. This paper examines the prospects for the cultivation and pharmaceutical processing of passiflora under the foothill conditions of the Fergana Valley. The necessity of optimizing the processes of cultivation, harvesting, drying, storage, and extraction of biologically active substances from plant raw materials is substantiated. Special attention is given to preserving the complex of flavonoids and other pharmacologically active compounds across various stages of technological processing. An integrated approach to obtaining standardized plant raw materials and passiflora-based medicinal products is proposed, taking into account regional natural and climatic features.

Keywords: passiflora, *Passiflora incarnata* L., medicinal plants, phytopharmaceuticals, flavonoids, extraction, medicinal plant raw material, Fergana Valley.

Modern development of the pharmaceutical industry is characterized by growing interest in medicinal products of plant origin. Expanding the range of medicinal plants that can be cultivated under regional natural and climatic conditions to serve as a source of domestic pharmaceutical raw materials is acquiring particular relevance. One promising plant in this direction is passiflora, primarily passionflower (*Passiflora incarnata* L.), the aerial parts of which are utilized as medicinal plant raw material.

The pharmacological value of passiflora is determined by the presence of a complex of biologically active compounds, among which flavonoids and other phenolic compounds play a essential role. Passiflora-based preparations are traditionally used in phytotherapeutic formulations that exert a sedative effect, and they are also applied in conditions accompanied by heightened nervous excitability and sleep disturbances. Consequently, the development of rational methods for the cultivation and processing of this plant presents both scientific and practical interest.

The foothill areas of the Fergana Valley are characterized by a specific combination of thermal regimen, solar insolation, topography, soil conditions, and seasonal moisture distribution. These factors directly influence the growth and development of medicinal plants, the accumulation of secondary metabolites, and the quality of the resulting plant raw material. Therefore, the technology for growing and subsequently processing passiflora must be adapted to local agro-climatic conditions.

The objective of the study was to substantiate approaches to optimizing the production of medicinal products from passiflora cultivated in the foothill conditions of the Fergana Valley.

The object of the study was the medicinal plant raw material of passiflora grown in the foothill zone of the Fergana Valley. The investigation examined the main stages of the technological chain: plant cultivation, determination of rational harvesting times for the aerial part, primary processing, drying, size reduction, storage, and extract preparation. Raw material quality was evaluated based on key pharmacognostic and technological parameters

characterizing its suitability for further application in the manufacturing of phytopharmaceuticals.

Obtaining high-quality plant raw material is largely determined by cultivation conditions. In the foothill zone, proper plot selection, provision of a rational water regimen, timing of sowing or planting, and monitoring plant status throughout the vegetation period are of critical importance. Sufficient solar insolation combined with rational irrigation can create favorable conditions for vegetative biomass accumulation and the synthesis of biologically active substances.

A key element of optimization is determining the rational period for harvesting medicinal raw material. It is advisable to harvest the aerial parts of passiflora during the period characterized by active accumulation of the complex of biologically active compounds. Standardizing harvest times reduces the variability of raw material chemical composition and ensures more stable quality of the resulting medicinal products.

No less significant is the primary processing of plant material post-harvest. Prolonged storage of freshly harvested raw material prior to drying may be accompanied by enzymatic processes and a decrease in the concentration of individual biologically active substances. Therefore, timely transportation and primary processing of the harvested plant material must be ensured.

A promising direction for optimization is the application of gentle drying regimens. Elevated temperatures can alter the composition of thermolabile components in plant raw material. Thus, the drying process must be carried out under controlled temperature conditions, adequate ventilation, and protection of the raw material from factors contributing to the degradation of biologically active compounds. Achieving optimal residual moisture simultaneously ensures the preservation of the medicinal raw material during subsequent storage.

An important technological stage in obtaining medicinal products from passiflora is extraction. The efficiency of active substance extraction depends on the degree of comminution, extractant composition, solid-to-solvent ratio, temperature, and process duration. Optimizing these parameters increases the yield of the biologically active compound complex while reducing plant material consumption and energy costs.

To obtain standardized phytopharmaceuticals, it is expedient to monitor the content of the main groups of biologically active substances in both the starting raw material and the resulting extracts. Particular attention should be paid to the flavonoid complex as one of the most significant compound groups in passiflora. Prospectively, standardizing the extract by marker component content can ensure quality stability and reproducibility of the pharmacological action of the finished product.

An integrated approach to processing passiflora cultivated in the foothill conditions of the Fergana Valley provides an interconnection between agrotechnical and pharmaceutical-technological measures. Optimizing only a single stage of production does not fully solve the task of obtaining a high-quality preparation. Maximum effect can be achieved through the standardization of the entire technological chain—from selecting plant cultivation conditions to the packaging and storage of the finished extract.

Of special practical interest is the feasibility of organizing regional production of medicinal plant raw material. Utilizing locally grown passiflora can contribute to expanding the

raw material base of the pharmaceutical industry, making rational use of the agro-climatic potential of the Fergana Valley's foothill districts, and reducing reliance on imported plant raw materials.

Furthermore, cultivating medicinal plants in foothill territories can be regarded as a promising direction for diversifying agricultural production. Subject to compliance with Good Agricultural and Collection Practices (GACP) for medicinal plants, it is possible to obtain standardized raw materials suitable for further industrial use.

Conclusions. The foothill conditions of the Fergana Valley present strong potential for the cultivation of passiflora as a promising source of medicinal plant raw material. The optimization of obtaining medicinal products on its basis should encompass a rational selection of agrotechnical conditions, standardization of harvest times for aerial parts, timely primary processing, the use of gentle drying regimens, and the refinement of extraction parameters for biologically active substances. Monitoring the content of biologically active substances at key stages of the technological process enhances the quality and reproducibility of the resulting phytopharmaceuticals. Developing regional production of passiflora raw material can expand the range of domestic phytopharmaceuticals and enable more efficient utilization of the natural and climatic potential of the Fergana Valley.

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