

ANNOTATION

**Dissertation work on the topic «Development of a conceptual project for the production of therapeutic and prophylactic products based on fruit *Morus Alba L.*» for the degree of Doctor of Philosophy (PhD) in the specialty 8D07201 – «Technology of pharmaceutical production»
Nurdaulet Zhumabaev Narbekuly**

Relevance of the research topic

One of the key directions of the National Development Plan of the Republic of Kazakhstan until 2029 is to improve the quality of life and improve the healthcare system. The plan considers the prevention of noncommunicable diseases, reduction of mortality rates among the population and the development of domestic pharmaceutical production as the main priorities. In order to expand the production of medicines and increase their availability, it is planned to strengthen cooperation with global pharmaceutical corporations, attract investments, introduce advanced technologies and new developments, as well as deploy production facilities in the regions.

The development of healthcare infrastructure is an important component of improving the well-being of the population. This direction is clearly outlined in the Concept of Healthcare Infrastructure Development for 2024-2030 (Resolution of the Government of the Republic of Kazakhstan dated June 12, 2024 No. 454). In addition, in accordance with the Comprehensive Plan for the Development of the Pharmaceutical and Medical Industry for 2020-2025, the development of the production of medicines based on local medicinal plant raw materials is one of the strategically important areas.

It was noted above that in the state programs of the pharmaceutical industry, special attention is paid to reducing dependence on imported products and efficient use of the resources of plant raw materials growing in the republic. However, today the share of medicines produced by domestic manufacturers in the market is only 14.9%. This indicates the need for more efficient use of local medicinal raw materials and expansion of pharmaceutical production. The rational use of local natural resources and the introduction of innovative technologies are important factors in ensuring the sustainable development of the pharmaceutical industry in Kazakhstan. The study is conducted in accordance with the "Sustainable Development Goals", namely: SDG No. 2 — eliminating hunger and ensuring food security, SDG No. 3 — promoting a healthy lifestyle and improving the well-being of the population, as well as SDG No. 12 - responsible consumption and production.

In this regard, the development of biologically active additives and medicines from local plants is a strategically important area. Of particular interest is the white (*Morus alba L.*), which contains biologically active substances with antioxidant, anti-inflammatory and immunomodulatory properties.

Morus alba L. — a perennial woody plant belonging to the *Moraceae* family, native to many countries of Asia and Europe, as well as in Northern India, Afghanistan, Iran, the Caucasus, Turkey, China, Korea, Southern Europe, America

and several regions of Africa. The leaves and fruits of white mulberry are rich in biologically active compounds such as anthocyanins, flavonoids, vitamins and minerals that help maintain the overall health of the body.

White mulberry, in addition to its antioxidant and anti-inflammatory effects, helps regulate blood sugar levels, prevent cardiovascular diseases, and strengthen the immune system. However, in Kazakhstan, the level of processing of medicinal plant raw materials and its use in pharmaceutical production is lower than in foreign countries, which indicates the need to increase the pharmaceutical independence of the country. Development of therapeutic and prophylactic products based on *Morus alba* L. increases the competitiveness of the pharmaceutical industry in Kazakhstan and contributes to improving public health.

Therefore, the dissertation research is aimed at a comprehensive study of the pharmacognostic, chemical, and pharmaceutical-technological properties of the *Morus alba* L. plant in order to develop therapeutic and preventive products and create a concept for their production. The research results have both scientific and practical significance and serve as the basis for the introduction of innovative technologies in the pharmaceutical industry.

The purpose of the study:

Study the plant *Morus Alba* L. as a source of raw materials, to develop a therapeutic and prophylactic product based on an extract obtained using modern methods, and to create a concept for its production.

Research objectives:

- 1) To conduct a pharmacognostic and phytochemical analysis of the plant *Morus Alba* L.;
- 2) Choose an effective technology for obtaining fruit extract *Morus Alba* L. and standardize it;
- 3) To evaluate the chemical composition and safety of the extract from the fruits of *Morus Alba* L.;
- 4) Selection and standardization of technology for the production of a therapeutic and prophylactic product (capsule) based on *Morus alba* L. extract;
- 5) Develop a conceptual design and feasibility study for the production of a therapeutic and prophylactic product.

Objects of research:

Fruits of *Morus Alba* L.; extract from fruits of *Morus Alba* L.; therapeutic and prophylactic product (in the form of capsules).

Research methods:

Pharmacopoeial and non-pharmacopoeial methods (physical, physico-chemical, pharmaceutical-technological), information-analytical, statistical methods, as well as methods of marketing analysis.

Subject of research:

Optimal technology for obtaining extract from fruits of *Morus Alba* L., the study of the component composition, safety and stability of the extract, as well as the development of a conceptual design and feasibility study.

Scientific novelty of the research:

In the course of the research, the following fundamental and applied new results were obtained for the first time, aimed at solving urgent problems in the field of pharmaceuticals and phytochemistry:

- comprehensive standardization and assessment of the quality of local raw materials: for the first time, a comprehensive pharmacognostic profile of the quality of *Morus alba* L. raw materials collected from the flora of the Turkestan region was determined and standardized. This result scientifically proved the compliance of raw materials with the requirements of the State Pharmacopoeia of the Republic of Kazakhstan.;

- based on the results of phytochemical analysis, qualitative and quantitative indicators of the main biologically active compounds of the raw materials of *Morus alba* L. fruits — flavonoids, anthocyanins and phenolic compounds - were established for the first time, and their pharmacological activity was confirmed.;

- development and patenting of optimal extraction technology: an optimal technology for obtaining extract from fruits of *Morus alba* L. has been created, based on maceration with ultrasound exposure, which allows the most efficient extraction of biologically active substances. The component composition of the extract was determined and its toxicological safety was assessed. This technological solution is confirmed by the patent of the Republic of Kazakhstan for utility model No. 7396 "Method of obtaining extract from the fruits of *Morus alba* L. by maceration with ultrasonic exposure" (registered 08/26/2022);

- technological justification of the domestic therapeutic and prophylactic product: based on the obtained extract of *Morus alba* L. For the first time, the optimal composition and technology for the production of capsules for therapeutic and prophylactic purposes have been developed, the qualitative indicators of the finished product and the results of stability studies determining its shelf life have been substantiated. Conceptual design documentation and a feasibility study for the organization of the production of this product in Kazakhstan have been created, which contributes to solving the problems of import substitution and ensuring the country's drug safety through the production of domestic pharmaceutical products.

Questions submitted for defense:

- Results of pharmacognostic analysis and standardization of raw materials of *Morus alba* L. fruits growing in the Turkestan region;

- Optimal technology for obtaining extract from fruits of *Morus alba* L., determination of its component composition and safety assessment;

- Development of technology for the production of capsules for therapeutic and prophylactic purposes based on the extract of *Morus alba* L., their standardization and determination of stability;

- A conceptual design for the production of a therapeutic and preventive product and a feasibility study.

The practical significance of the work and the implementation of the research results in practice

Practical significance of the work and implementation of the research results: the scientific results of studying the extract of *Morus alba* L. and the therapeutic and prophylactic product obtained on its basis, as well as the concept of

its production, were introduced into the educational process of the Kazakh-Russian University of Medicine, ARDO - Fito LLP and KAZHK Kazakh National Medical University named after S.Zh. Asfendiyarova".

Personal contribution of the doctoral student

The doctoral student independently performed all stages of research work, selected the necessary methodological approaches, analyzed and processed the data obtained, and published articles based on scientific conclusions. In addition, in the process of writing his dissertation, he systematized the research results and formulated scientific conclusions.

Approbation of the work

The main provisions of the dissertation work were presented and published in the materials of international scientific conferences:

- International Scientific and Practical Conference "Current issues and trends in the development of pharmacognosy", dedicated to Professor D. A. Muravyeva, Pyatigorsk, RIA-KMV publishing house, 2021;

- III International Scientific and Practical Conference "Formation of a scientific school in the field of pharmacy, development prospects and continuity of generations", dedicated to Professor R. Dilbarkhanov, Almaty, 2020;

- International Scientific Conference for young scientists and students "Current issues and prospects of development in the field of biology, medicine and pharmacy", organized jointly by the South Kazakhstan Medical Academy and the Nazarbayev Foundation, December 10-11, 2020 (in the format of a videoconference).

Information about publications

A total of 13 scientific papers have been published on the topic of the dissertation, including:

- 2 articles in international peer-reviewed scientific journals included in the Scopus and Web of Science Core Collection databases;

- 6 articles in journals recommended by the Committee for Quality Assurance in Education and Science of the Ministry of Science and Higher Education of the Republic of Kazakhstan;

- 3 theses at international scientific and practical conferences in Kazakhstan and Russia;

- 1 utility model patent has been obtained.

Scope and structure of the dissertation

The dissertation consists of 150 pages, its contents include 61 tables, 27 figures and 145 domestic and foreign literature sources. In addition, 18 applications are attached to the work. The dissertation includes an introduction, a literature review, a section of materials and research methods, four chapters devoted to individual studies, conclusions on the results obtained, and a conclusion.