

## Annotation

dissertation on the topic "**Pharmacognostic study of species of the genus *Allium* in the flora of Kazakhstan and prospects for their use**"

for the degree of Doctor of Philosophy (PhD) in the specialty

6D110400 - "Pharmacy" of **Kadyrbaeva Gulnara Mukhametovna**

**Relevance of the research topic.** As part of the implementation of the National Project "Healthy Nation" for 2021-2025, the main task of the domestic pharmaceutical industry is import substitution, which consists in developing and creating domestic medicines of a full production cycle in the country and bringing the share of domestic pharmaceutical products from 17% to 50%.

As part of the implementation of the Comprehensive Plan for the Development of the Pharmaceutical Industry for 2020-2025, the issue of organizing the production of medicines using medicinal plants growing on the territory of the Republic of Kazakhstan has received the status of a state priority.

The research of promising medicinal plants as sources of biologically active substances and the development of herbal pharmaceutical substances based on them is relevant.

In this regard, of particular interest are plants of the genus *Allium*, growing in the territory of the Republic of Kazakhstan, which are valuable sources of biologically active compounds, many types of which have long been used in folk medicine as diuretics, hemostatic, anti-inflammatory, bactericidal agents. Based on the above, the pharmacognostic study of some plants of the genus *Allium* in the flora of Kazakhstan and their pharmacological activity is promising.

**The aim of the study:** pharmacognostic study of milk flower onion (*Allium galanthum*), turkestan onion (*Allium turkestanicum*) and prospects for creating herbal pharmaceutical substances based on them.

### **Research objectives:**

Establish diagnostic morphological and anatomical features of LRS of milk-flowered onion and Turkestan onion;

Conduct a comprehensive phytochemical study of the LRS of milk flower onion and turkestan onion and identify the main groups of biologically active compounds;

To standardize raw materials of milk-flowered onion and Turkestan onion in accordance with pharmacopoeial requirements;

To develop the optimal technology of extracts based on milk-flowered onion and Turkestan onion, to standardize the obtained extracts;

To study the biological activity profile of the obtained extracts;

**Objects of research:** leaves and bulbs of milk-flowered onion and turkestan onion and extracts based on them.

**Research methods:** macroscopic, microscopic, phytochemical, commodity science, physico-chemical, microbiological, statistical methods.

**Scientific novelty:**

For the first time:

-diagnostic morphological and anatomical features of LRS *Allium galanthum* and *Allium turkestanicum* were identified as a result of a comparative morphological and anatomical study, allowing identification of the studied species;

- a comparative phytochemical study молочногоof milk flower onion and Turkestan onion was carried out using modern physical and chemical methods (HPLC-MS, GC-MS); these studies made it possible to establish the values of primary and secondary metabolic products, element composition for identification. HPLC-ESI-QTOF-MS/MS analyses revealed up to 17 main components, of which 15 substances belonging to different classes of natural compounds were identified: simple organic acids, flavonoids and their glycosides, which make up the main group of metabolites in the tested extracts. It was found that the plants *Allium galanthum*, *Allium turkestanicum* and are characterized by variability of flavonoid compounds. Thirteen flavonoids and their glycosides are common to the studied genus. The identified substances are chemical markers of the studied plants and are used for standardization. Extracts of diethyl ether were analyzed using GC-MS and 25, 22 and 17 volatile compounds were identified in the leaves and bulbs of *A. galanthum* and *A. turkestanicum* bulbs, respectively.

- screening pharmacological studies of the studied plants of the *Allium* genus were carried out. It was revealed that all the studied species have low toxicity and a certain level of biological activity: antimicrobial, antioxidant, tyrosinase and are promising for introduction into medical practice, as raw material sources: leaves and bulbs of *Allium galanthum* and bulbs of *Allium turkestanicum*.

The priority of the conducted research is protected by the patent of the Republic of Kazakhstan for a utility model: "Method for obtaining an extract with antimicrobial and antioxidant activities from the *Allium galanthum* plant"(patent No. 7156).

#### **The main provisions of the dissertation research submitted for defense:**

- Results of a comprehensive pharmacognostic study of the LRS of milk flower onion молочного(*Allium galanthum*) and turkestan onion (*Allium turkestanicum*): phytochemical, morphological and anatomical tests to develop approaches to standardization;

- Results of experimental substantiation of the development of an optimal technology for obtaining herbal pharmaceutical substances based on LRS of milk-colored onion and Turkestan onion with antimicrobial, antioxidant and tyrosinase activities.

**Practical significance of the study.** The technology of collecting, harvesting and storing *Allium galanthum* bulbs and leaves *Allium galanthum* and *Allium turkestanicum* bulbs *turkestanicum* was implemented by FitOleum LLP, Esik, Kazakhstan.

The спецификацияquality specification of *Allium galanthum* bulbs and leaves *Allium galanthum* and *Allium turkestanicum* bulbs *turkestanicum* was developed, on the basis of which the project of regulatory documentation for medicinale and vegetable raw materials was developed: "Milk-colored onion leaves", "Milk-colored onion bulbs", "Turkestan onion bulbs".

The technology of the production process of pilot series of extracts from plant medicinal raw materials of leaves and bulbs of milk-flowered onion молочноцветного and Turkestan onion at the pharmaceutical enterprise "FitOleum" LLP» has been developed.

The technology of cultivation of the studied plants was developed in accordance with the principles of the стандарта GACP standard "Good Agricultural and Collection Practice for starting materials of herbal origin" (Надлежащая практика выращивания и сбора исходного сырья растительного происхождения).

The results obtained during the dissertation research are applied in the scientific and educational process of the Lublin Medical University (Department of Pharmacognosy) and departments of the School of Pharmacy of the Kazakh National Medical University.

The use of LRS "Milk-colored onion leaves", "Milk-colored onion bulbs", "Turkestan onion bulbs in medical practice as antimicrobial, antioxidant agents is justified.

**Personal contribution of the author.** All the results of the dissertation research were obtained by the author independently, which indicates the personal contribution of the applicant to the science in the field of pharmacy.

The reliability of the results, the main provisions submitted for defense, conclusions and conclusions formulated in the dissertation work is justified by a significant amount of experimental material, fully confirmed by the results of our own research conducted in laboratory and industrial conditions, using modern instruments and accurate measurement methods, as well as comparison with literature data.

**Testing the work.** The main provisions of the dissertation were reported and published in the materials of international scientific and practical conferences: **the International Scientific and Practical Conference "Modern methods of correction of acne and other skin problems in cosmetology practice"** (Kharkiv, Ukraine, 2018); the VI All-Russian Scientific and Practical Conference with International participation "Innovations in the health of the nation" (St. Petersburg, Russia, 2018); VII Scientific and Practical conference with international participation "Priorities of pharmacy and dentistry – from theory to practice" (Almaty, Kazakhstan, 2018); IV International Scientific and Practical Conference "Global Science and Innovation 2019: Central Asia" (Astana, Kazakhstan, 2018). Kazakhstan, 2019); XIV International Scientific and Practical Conference "Years of Rural Development, Tourism and Folk Crafts (2019-2021)" (Dushanbe, Tajikistan, 2019); VIII International Scientific and Practical Conference "Priorities of Pharmacy and Dentistry – from theory to practice" (Almaty, Kazakhstan, 2019); International Conference "Modern Science. Management and Standards of Scientific Research" (Prague, Czech Republic, 2020).

**Information about publications.** Based on the research results, 14 scientific papers were published, including: an article in an international peer-reviewed scientific journal included in the Scopus database and the Web of Science Core Collection-1; articles in journals recommended by the Committee for Quality Assurance in Education and Science of the Ministry of Education and Science of the

Republic of Kazakhstan-4; articles and abstracts in collections of International scientific and practical conferences (Russian Federation, Czech Republic, Ukraine, Kazakhstan) – 7; articles in international journals (Russia) – 1; utility model patents- 1.

**Scope and structure of the dissertation.** The thesis is presented on 155 pages of typewritten text, contains 38 tables, 66 figures, 15 appendices. This paper consists of an introduction, a literature review, a chapter devoted to materials and methods of research, three chapters of own research, a conclusion, and a list of references consisting of 212 sources.

**Conclusion.** The dissertation is devoted to the pharmacognostic study, standardization of raw materials of Turkestan onion and lactic onionмолочноцветного, optimal technology for obtaining extracts and studying the profile of their biological activity.

Evaluation of the prospects for studying domestic plant species of the *Allium* genus showed that Turkestan onion and milk-flowered onion are of scientific and practical interest as a renewable source of plant raw materials for the production of plant substances.

Diagnostic anatomical and morphological features that allow identifying the LRS of Turkestan onion and milk-flowered onion have been established. Indicators of identification of Turkestan onion bulbs, bulbs and leaves of milk-flowered onion were determined according to the following indicators: A. macroscopy, B. microscopy.

HPLC-ESI-QTOF-MS/MS analysis allowed preliminary identification of the main signals recorded in the obtained chromatograms. Flavonoids and their glycosides make up the main group of metabolites in raw materials of Turkestan onion (bulbs) and milk-flowered onion молочноцветного(leaves, leaves).

Quality indicators for raw materials of Turkestan onion (bulbs) and milk-flowered onion молочноцветного(leaves, leaves) and their acceptance criterion were established, and standardization of Turkestan onion (bulbs) and milk-flowered onion молочноцветного(leaves, leaves) was carried out in accordance with the requirements of the State Fiscal Service of the Republic of Kazakhstan. A quality specification has been developed for "Turkestan Onion bulbs", "Milk-flowered onion молочноцветногоbulbs", "Milk-flowered onion молочноцветногоleaves".

As a result of long-term stability tests of raw materials, a shelf life of 24 months was established. at a temperature of  $25 \pm 2$  °C and a relative humidity of  $60 \pm 5$  %.

It was found that the analyzed extracts of nonpolar diethyl ether exhibit a stronger biological activity compared to water and water-ethanol extracts of different proportions. The first extracts proved to be strong antimicrobial agents not only against the test gram-positive bacteria, but also inhibited the growth of several strains of gram-negative bacteria and yeast, possibly due to the presence of 16-gentriacontanone (palmiton) and 1-tritriacontanol among other components of the extracts.

The presence of flavonoids, oxygen-saturated long-chain alkanes and alcohols certainly affected the increased antiradical potential of the extracts. AG bulb

diethyl ether extracts have also been shown to inhibit mouse tyrosinase by up to 54% of its activity, which may confirm its promising bleaching properties.

The proven anti-radical properties of the tested extracts, when added to cosmetics, can exhibit soothing properties against the negative effects of environmental stressors that affect skin function and lead to increased generation of reactive oxygen species. Finally, the antimicrobial potential of the test samples will be important for preserving pharmaceutical products, as well as for inhibiting the development of bacterial infections on the surface of skin prone to irritation and acne.

In conclusion, the results of the survey described in this description strongly confirm the use of *A. turkestanicum* and *A. galanthum* extracts in the pharmaceutical industry