

ANNOTATION

Of the dissertation work for the degree of Doctor of Philosophy (PhD) in the special “8D05101- Биология” on the theme “Study of the composition of biologically active substances of promising medicinal plants in South-east Kazakhstan” by Syraiyl Sayagul

General description of the work. The dissertation work is devoted to geobotanical, phytochemical, biomedical studies of industrial plants *Artemisia schrenkiana* Ledeb., *Leonurus turkestanicus* V.I.Krecz. and *Cerasus tianschanica* Poljak., growing in the southeast of Kazakhstan, as well as the effect of extracts obtained from plants on the body of animals exposed to diabetes mellitus and the activity of their antioxidant properties. In addition, the possibilities of expanding the base of new promising medicinal raw materials used in the country's manufacturing, economic, pharmaceutical, and healthcare sectors are being explored based on determining the effectiveness of biologically active substances.

Relevance of the research. According to the World Health Organization, in the next 10 years the volume of herbal medicines will account for 60% of the volume of medicines. Only 17 percent of medicines and medical organizations in our country are domestic products. The government has been tasked with increasing its volume to 50% by 2025. One of the effective ways to solve this problem is to use cheap, natural domestic raw materials and search for new medications. At the moment, out of 6,000 plants in the country, only 10% have been studied for their medicinal properties and introduced into production. Medicines made from plant materials are currently widely used for the treatment and prevention of many diseases. Every year the range in the country expands, the number of herbal preparations increases. The advantage of herbal preparations over synthetic medications is that they have a positive effect and low toxicity. As a rule, side effects can be observed when using synthetic medications, and plants are rich in antioxidants, and their use as a natural product or herbal medicine has a beneficial effect on the body. Medicinal plants of the domestic flora are a source of herbal medicines; their resources have not been sufficiently studied and are used in Kazakhstan. Therefore, we investigated the medicinal potential of three incompletely studied plant species growing in the southeastern part of Kazakhstan. At the same time, in Kazakhstan, diabetes mellitus occupies a leading place among the population, and therefore has aroused interest in assessing the effect of the studied plants on diabetes mellitus, identifying biologically active substances and studying the general botanical characteristics and antioxidant properties of plants. This work analyzes the state of use of medicinal plants of the domestic flora, necessary for the production of therapeutic and prophylactic medications. In this regard, the dissertation provides botanical and phytochemical characteristics of still poorly studied plant species (*A. schrenkiana*, *C. tianschanica* and *L. turkestanicus*) growing in the south-eastern part of Kazakhstan, as well as the influence of

biologically active substances contained in these plants on the organism of animals and considered the activity of their antioxidant properties.

The goal of the study: The main purpose of the work is based on the geobotanical characteristics of plants (*A. schrenkiana*, *C. tianschanica* and *L. turkestanicus*), growing in the south-east of Kazakhstan and analyzing biologically active substances to investigate the effects of extracts from them on the body of animals susceptible to diabetes mellitus, to determine the effectiveness of biologically active substances, to explore the possibilities of expanding the base of new medicinal raw materials used in the industrial, economic, pharmaceutical, healthcare sectors of the country.

Objects of the study:

1) to conduct geobotanical studies of the raw material base of plants *A. schrenkiana*, *C. tianschanica* and *L. turkestanicus*. Compile phytocenotic characteristics of the studied species.

2) to conduct microscopic studies of the raw materials of plants *A. schrenkiana*, *C. tianschanica* and *L. turkestanicus*.

3) to separate, determine and identify biologically active substances of the above-ground parts of plants *A. schrenkiana*, *C. tianschanica* and *L. turkestanicus*.

4) to investigate the effect of plant extracts of *A. schrenkiana*, *C. tianschanica* and *L. turkestanicus* on the blood of animals.

5) to analyze the histomorphology of the liver of animals that received unique plant extracts of *A. schrenkiana*, *C. tianschanica* and *L. turkestanicus* for experimental alloxan diabetes.

Subject of the study. Plant species: *A. schrenkiana*, *C. tianschanica* and *L. turkestanicus* growing in the south-east of Kazakhstan.

Research methods. The following methods were used during the research work on the topic of the dissertation: geobotanical, phytochemical, anatomical, determination of the level of lipid peroxidation, determination of general biochemical blood indicators and histomorphological research methods.

Scientific novelty of research. For the first time, with the aim of a full-scale study of the raw materials of the plant species *A. schrenkiana*, *C. tianschanica* and *L. turkestanicus*, the raw material base of plant species was assessed, a phytocenotic characteristic of plant communities with the participation of these species was developed, and an anatomical study of some plant representatives was carried out. Phytochemical analysis of biologically active substances in *A. schrenkiana*, *C. tianschanica* and *L. turkestanicus* plants was carried out, and their effect on experimental alloxan diabetes was studied. When determining the acute and subacute toxicity of plant extracts, the effect on animals was taken into account through special test experiments, and no harmful effects on the body were observed. At the same time, the effect of plant extracts of *A. schrenkiana*, *C. tianschanica* and *L. turkestanicus* on the blood of animals was studied, osmotic resistance of erythrocyte

membranes and the level of lipid peroxidation in liver microsomes, and it was found that the studied groups of plants also have antioxidant properties.

The scientific and practical significance of the study. The scientific results and concepts obtained were developed to study the general pharmaceutical properties of the industrially important plant species *A. schrenkiana*, *C. tianschanica* and *L. turkestanicus*. Currently, drug development requires modern rules for the preclinical evaluation of new pharmacological substances. As part of this research work, work can be carried out to improve the scientific and organizational aspects of preclinical studies of new drugs in accordance with the requirements for the procedure, control, as well as registration, storage and presentation of their results to the global pharmaceutical market. Carrying out experimental studies on animals in accordance with reforms in the field of drug marketing and in accordance with the main objectives of providing effective and safe drugs developed taking into account modern achievements of medical science and industrial technology is based on the main principles of research work. Determining the medicinal properties of *A. schrenkiana*, *C. tianschanica* and *L. turkestanicus* plants as a result of research on biologically active substances will contribute to the development of new herbal medicines through clinical and biological studies in the future, and will also lead to the development of biodiversity, ecology, pharmaceutical and medical industries of the Republic of Kazakhstan .

The main scientific conclusions proposed for defense:

The main results and conclusions of the study are divided into the following groups:

1) Conducting a geobotanical study of the raw material base of plants *A. schrenkiana*, *C. tianschanica* and *L. turkestanicus* and describing the floristic composition of plant communities in which the studied species were found. They were found to have sufficient raw material reserves for future pharmaceutical production.

2) As a result of studying the aerial parts of the plants *A. schrenkiana*, *C. tianschanica* and *L. turkestanicus* using pharmaceutical (microscopic, anatomical) methods, their features were revealed.

3) As a result of determining the biologically active substances of the vegetative parts of the plants *A. schrenkiana*, *C. tianschanica* and *L. turkestanicus*. it was revealed that the biologically active substances in the plant *C. tianschanica*, compared to the other two plants, contain vitamin C and group vitamins B (B3 ,B5, B6, Bc), elements Mg, Zn, Mg, Fe, K, flavonoids, phenols and it has been found to be rich in amino acids.

4) The effect of extracts isolated from plants *A. schrenkiana*, *C. tianschanica* and *L. turkestanicus* on the animal body was studied and the antioxidant content in these plants had a positive effect on the body.

5) Extracts of *L. turkestanicus* and *C. tianschanica* plants increase the osmotic resistance of erythrocyte and hepatocyte membranes.

6) According to the analysis of the histomorphology of the liver of animals receiving plant extracts of *A. schrenkiana*, *C. tianschanica* and *L. turkestanicus* in

experimental alloxan diabetes, it was shown that the plant extracts of *C. tianschanica* and *L. turkestanicus* had a positive effect on diabetes and restoration of liver function.

The author's personal contribution. Writing the dissertation and designing experiments on the topic of research, determining the purpose of the work, setting the research task, planning and performing experiments, processing and conducting the obtained data were carried out with the personal participation of the author.

The connection of the work with the research programs.

The dissertation work was carried out within the framework of the project "Comprehensive study of some promising species of medicinal plants of the family Asteraceae AP13067924", funded by the Science Committee of the Ministry of Science and Higher Education of the Republic of Kazakhstan (2022-2024).

Approbation of the study. The results of the dissertation work were presented and published at the following international scientific conferences:

- International scientific conference of students and young scientists "Farabi Alemi" (Almaty, Kazakhstan, April 6-9, 2020);
- International scientific conference of students and young scientists "Farabi Alemi" (Almaty, Kazakhstan, April 6-9, 2021);
- International scientific conference of students and young scientists "Farabi Alemi" (Almaty, Kazakhstan, April 6-8, 2022);
- International scientific and practical conference "Modern problems of biology and biotechnology", dedicated to the 70th anniversary of Doctor of Biological Sciences, professor, corresponding member of the National Academy of Sciences of the Republic of Kazakhstan Sultan Tuleukhanovich Tulekhanov (Almaty, Kazakhstan, May 27, 2021);
- International scientific conference "IOP Conference Series: Earth and Environmental Science 699" (Ekaterinburg, Russia, March 26, 2021).

The main results of the dissertation were heard annually at the scientific and technical council of the Faculty of Biology and Biotechnology of Al-Farabi Kazakh National University, at meetings of the Department of Biophysics, Biomedicine and Neuroscience.

Publications. Based on the results of the study, the author published 20 scientific papers in peer-reviewed scientific publications in the scientific direction of the dissertation, including 2 (two) journal articles indexed in the Science Citation Index Expanded and included in the 1st (first) quartile by impact factor in the Web of Science or having 83 (eighty-three) percentiles according to CiteScore in the Scopus database, 1 (one) article in the Scopus journal with 46 (forty-six) percentiles in the CiteScore database, 1 (one) article included in the international scientific citation database Scopus: International Forum «Modern Trends in Sustainable Development of Biological Sciences» and 1 (one) article in a journal included in the 4th (fourth) quartile for impact factor in the Web of Science database; 7 articles in a journal submitted by the Committee for Quality Assurance in the Field of Science and Education of the Ministry of Science and Higher Education of the Republic of Kazakhstan; 7 publications were published in materials of domestic international

conferences, 1 article was published in collections of materials of international scientific conferences.

The structure and scope of work. The dissertation consists of definitions, notations and abbreviations, introduction, literature review, object and methods of research, discussion of results, conclusion, list of references and applications. The volume of work is 141 pages, including 21 tables, 30 figures, 227 literary sources and 1 appendices.