ANNOTATION

dissertation work on the topic: **Pharmaceutical and pharmacological studies of *Eryngium planum* L. and drugs based on it**

for the degree of Doctor of Philosophy (PhD) in specialty 6D074800 –
" Technology of Pharmaceutical Production "

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Relevance of the research topic

According to the Comprehensive Plan for Development of Pharmaceutical and Medical Industry is planned to launch a number of new large pharmaceutical productions, which will increase the production of medicines, train highly qualified specialists and create permanent jobs for them. In this regard, it is relevant to study new pharmaceutical substances from domestic plant raw materials and medicines based on them.

Practical healthcare all over the world is characterized interest in herbal medicines and the centuries-old experience of their use in medicine.

The resources of plants in our country small but important part of biological resources, since more than a third of the medicinal products used in modern medicine are herbal preparations.

One of herbal which has scientific interest and perspective for study like medical herbal is Eryngium planum L.

Eryngium planum L. is perennial herbaceous plant of the celery family (Apiaceae) that has a tap root system. Eryngium capillaries are widespread in the steppes of northern Kazakhstan, in the mountains of the Dzungarian and Trans-Ili Alatau. It grows in pastures, fallow lands, along the edges of fields, at the edges of forests, sometimes as weeds.

Representatives of the genus Eryngium L. are being actively studied abroad, but in Kazakhstan this genus is unstudied.

Eryngium planum L. contains saponins, flavonoids, polysaccharides, essential oils, phenolcarbon compounds, ascorbic acid, zinc, etc.

Taking into account the valuable pharmacological effects of plants, the development of a domestic herbal medicine based on the extract of Eryngium planum L. is promising and relevant.

The aim of scientific work pharmacognostic study of medicinal plant raw materials Eryngium planum L. and pharmaceutical development of drugs based on it.

Objectives of the research:

- collect and store medicinal plant materials *Eryngium planum* L.;
- conduct pharmacognostic analysis of medicinal plant materials *Eryngium planum* L.;
- obtain and conduct phytochemical screening of extracts from *Eryngium planum* L.;
- standardize the extract *Eryngium planum* L. according to the requirements of regulatory documents*;*

- carry out pharmaceutical development of a medicinal product based on the extract *Eryngium planum* L.;
- study the safety and effectiveness of *Eryngium planum* L. extract and medicine based on it.

The objects of research: the aerial part of medicinal plant raw materials Eryngium planum L., an extract obtained by CO_2 extraction and a spray based on it.

The subject of study: according to scientific literature, conducting an analysis of the growing area, component composition, use in folk medicine, pharmacological properties of the object of study of the medicinal plant *Eryngium planum* L.; on this basis, determination of the goals and objectives of scientific research, determination of pharmacognostic characteristics of plant raw materials *Eryngium planum* L. and its standardization, optimal technology of the extract and study of its phytochemical composition, development of a spray based on carbon dioxide extract of *Eryngium planum* L., study of the pharmacological properties of carbon dioxide extract and drug on its basis, the development of normative documents defining the theoretical and practical importance of the dissertation.

The main provisions of the dissertation research submitted for protection

1) Results of a pharmacognostic study of medicinal plant raw materials *Eryngium planum* L.;

2) Experimental data on the technology for obtaining and studying extracts from medicinal plant raw materials *Eryngium planum* L.;

3) Results of the pharmaceutical development of a spray based on carbon dioxide extract of *Eryngium planum* L. and standardization

4) Results studies safety and pharmacological activity extract of *Eryngium planum* L . and spray on based on.

Scientific novelty:

- carried out pharmacognostic study of an unstudied species of the family *Apiaceae* of the genus *Eryngium planum* L. in Kazakhstan;
- developed an optimal technology for obtaining and standardizing extract of *Eryngium flatifolia*;
- developed optimal technology for the composition of a spray with carbon dioxide extract of *Eryngium planifolia* and standardization of the drug;
- carry out studies safety and effectiveness of extract eryngium planum and a spray based on it, and the pronounced antimicrobial activity of the carbon dioxide extract and a spray based on it was proven *in vitro*.

The scientific novelty of the research is confirmed by a patent for a utility model under registration number No. 6397 dated March 16, 2021. “Method for obtaining carbon dioxide extract from the aerial part of medicinal plant material *Eryngium planum*

Practical importance of research

- The technology for collecting and preparing plant raw materials *Eryngium planum* L. is presented. Identification has been confirmed «Institute of Botany and Phytointroduction". Certificate registration number № 01-08/9 от 16.03.2019г.;

- created method for obtaining a thick carbon dioxide extract from the aerial parts of plant raw materials *Eryngium planum* L. introduced into the LLP «ZHANAFARM»;

- Created project RD on CO_2 extract obtained under subcritical conditions from the herb *Eryngium planum* L.;

- created optimal technology spray with carbon dioxide extract of *Eryngium planum* L.;

- created draft of Relevant Documents for a spray with carbon dioxide extract of Eryngium *planum* L., which has been introduced into the LLC «AMICOS».

Doctoral personal contribution

The dissertation author independently conducted a review and analysis of domestic and foreign literature on the topic of the dissertation work, and carried out experimental work on all assigned tasks. This is confirmed by research results obtained in laboratory and production conditions using modern equipment and literature.

The reliability and validity of the research results is confirmed by the focus of the work performed on solving a current problem, implementation in a modern research center and draft regulatory documents.

Conclusion

The results of the dissertation research are as follows:

1. Carried out pharmacognostic analysis of the *Eryngium planum* L. plant:

- determined basic pharmacopoeial and technological parameters of medicinal plant raw materials *Eryngium planum* L. for select the optimal extraction technology for the purpose of maximizing the extraction of biologically active substances;

- when conducting a qualitative and quantitative analysis of the biologically active substances medicinal plant raw materials *Eryngium planum L.* were identified proteins, iridoids, steroids, flavonoids, polysaccharides, tannins, coumarins, saponins, phenolic acids and essential oils. It has been established that quantitatively predominate polysaccharides (5.553±0.067).

2. Determined and created quality specification for plant raw materials *Eryngium planum L*. (Order of the Ministry of Health of the Republic of Kazakhstan No. KR DSM-20 dated February 16, 2021) The results obtained during a long-term study of *Eryngium planum L*. raw materials allow us to establish the temperature (25±2)ºC, relative humidity (60±5)%, and a shelf life of 30 month.

3. Carried out standardization aerial parts of medicinal plant raw materials *Eryngium planum L.* and a quality specification for medicinal plant materials. A shelf life of 24 months has been established for medicinal plant raw materials *Eryngium planum L*. under long-term test conditions at temperature (25 ± 2) ° C and relative humidity (60 ± 5)% on three series of medicinal products.

4. Liquid and thick extracts were obtained by traditional and modern methods. Traditional - by percolation method using ethanol (50%) R and ethanol (70%) R, modern - by CO_2 extraction method under subcritical conditions. The chemical composition of extracts obtained by gas chromatography-mass spectrometry. When conducting a comparative analysis of biologically active substances extracts was found

that the extract obtained by carbon dioxide extraction under subcritical conditions differed in the content of chemical compounds. Created technological scheme for obtaining a thick extract from the aerial part *Eryngium planum* L.

For further work, selected extract obtained by CO2 extraction under subcritical conditions, in which 43 compounds were identified. The parameters of extraction were determined: operating pressure 51 atm, temperature 210C, and extraction time 11 hours, flow rate of the extractant through the raw material 5-10 cm3/h, degree of grinding of the raw material 3-5 mm, while the yield was 1.67%.

5. Created project RD on the quality specification for a thick extract obtained by CO2 extraction under subcritical conditions of *Eryngium planum L*., which was introduced at LLP "PLP ZHANAFARM". By indicators: description, identification, dry residue, weight loss upon drying, heavy metals, microbiological purity, quantitative determination, packaging, labeling, transportation, storage conditions, shelf life, main pharmacological action, etc.

6. Were obtained data on a long-term test of an extract based on plant raw materials *Eryngium planum L.;* no significant changes were observed based on the results of determining quality indicators (order of the Ministry of Health of the Republic of Kazakhstan No. KR DSM-165/2020 dated October 28, 2020).

7. Pharmaceutical development of spray based on carbon dioxide extract of *Eryngium planum L* was carried out. The optimal composition and technology were developed for producing spray.

8. Created quality specification on spray that based on carbon dioxide extract of *Eryngium planum L.,* which was introduced into LLP «AMICOS».

9. It has been tested safety and effectiveness of carbon dioxide extract of Eryngium planum L. and a spray based on. It was established that the extract and spray are safe, and when studying the allergenic effect, no reaction on the skin area extract *Eryngium planum* L and a spray based on.

10. It has been proven the expressed antimicrobial activity of the extract and the spray based on it against clinically significant microorganisms ATCC 10231, *Escherichia coli* ATCC 8739, *Staphylococcus aureus* ATCC 6538-P by serial dilution method and disk-diffusion method.

Approbation of dissertation results

The main results of the dissertation research were published and reported in: Proceedings of the VII scientific and practical conference with international participation "Priorities of pharmacy and dentistry: from theory to practice" (Almaty, 2018); Proceedings of the international scientific and practical conference "Integration of medical education, science and practical healthcare: new challenges and opportunities for KazNMU" (Almaty, 2018);

Materials of the international conference «Modern achievements of pharmaceutical technology and biotechnology: collection of scientific works» (Kharkiv, 2018 y.); In the scientific and practical conference dedicated to the 80th anniversary of KSMA (Bishkek, 2019); Materials of the VI scientific and practical

conference «GLOBAL SCIENCE AND INNOVATIONS 2019: CENTRAL ASIA». (Astana, 2019y.).

Publications

The results of the dissertation research were published in 12 scientific papers, including:

- an article in an international journal included in the Scopus-1 database;
- articles in journals recommended by the Committee for Quality Assurance in Education and Science -3;
- abstracts in materials of international scientific and practical conferences -7;
- patent for a utility model -1.

Scope and structure of the dissertation

The dissertation includes 145 pages of machine text, 45 tables, 38 figures, 29 formulas, 122 domestic and foreign literature, as well as applications. The work consists of an introduction, literature review, materials and methods, 5 sections of the experimental part, conclusions by section and conclusion.