Brief information about the project

Name of the project	AP09057982 «Phytochemical Profiles and Development of Medicinal Plants Targeting Skin Diseases»
Relevance	**The relevance of the project** is the search for new, potentially active substances in the treatment of skin diseases.
Purpose	**The purpose of the project** is to conduct a comprehensive phytochemical study of Siberian buckthorn (*Ligilaria Sibirica*) and white earth wormwood (*Artemisia terrae-albae*) plants growing in the Almaty region, create technological schemes for separating complexes and individual compounds, determine the chemical composition and structure, study biological activity in the treatment of skin diseases.
Objectives	**Specific Aim 1** A) (1) Conducting in-depth review on medical plants species which growing in Kazakhstan, data analysis based on their distribution, traditional use in Kazakh Medicine and published international studies; (2) Carrying out an expedition for medicinal plants from Kazakhstan; (3) Collecting plant samples of *Ligilaria sibirica* and *Artemisia terrae-albae* species B) Studying the chemical profiling of the collected plant materials and perform the required qualitative and quantitative analysis of their main bioactive compositions based on the guidance of Pharmacopoeia of Kazakhstan C) Carrying out extractions of *Ligilaria sibirica* and *Artemisia terrae-albae* species and partitioning the crude extract with the different solvent system; (2) Development of principle isolation block scheme for obtaining the BAC (Biological Active Complexes); (3) Optimizing of the needed quality control methods associated with the biologically active constituents, and run the needed pharmacological; studies for the active complexes produced at the initial phase **Specific Aim 2** A) The division of the tinctures into different extracts. Development of the main block scheme for extraction of biologically active complex (BAC) from *Ligilaria sibirica* and *Artemisia terrae-albae*; Search and creation of methods for purification of biologically active complexes; Search and development of methods for purification of biologically active natural compounds; B) Identification, isolation and structure elucidation of biological active components by using modern physical and chemical methods as LC-MS (Liquid Chromatography- Mass Spectrometry), HRMS (High Resolution Mass Spectroscopies), 2D NMR (Two Dimensional Nuclear Magnetic Resonance Spectroscopy), ECD (Electronic Circular Dichroism) from medicinal plants. **Specific Aim 3** A) Pharmacological study complexes obtained at the initial stage; Biological screening of biological active compounds.

	B) Study the dependence and realtions of biological activities with the structure of isolated compounds. The results of scientific research will be issued and registered in the form of interim and final reports. All project members will actively participate in national and international conferences. The research results will also be published in leading national journals and in peer-reviewed foreign scientific publications indexed by international databases Web of Science and (or) Scopus, with a non-zero impact factor.
Expected and achieved results	**Expected results** Conducting an expedition of medicinal plants from Kazakhstan; Review of current knowledge about the biological, chemical and pharmacological properties of Ligularia Sibirica and Artemisia terrae-albae; assessment of the studied plant species for industrial significance; study of chemical profiling of collected plant raw materials and carrying out the necessary qualitative and quantitative analysis of their main biologically active compositions based on the guidelines of the Pharmacopoeia of Kazakhstan; Carrying out extractions of Ligularia Sibirica and Artemisia terrae-albae species and separation of the crude extract into various solvent systems; development of a basic isolation flowchart for obtaining biologically active complexes; optimization of necessary quality control methods related to biologically active components, and conducting necessary pharmacological studies to determine the activity in the treatment of skin diseases of active complexes obtained on the initial stage Search and development of purification methods suitable for working with biologically active substances. Identification and isolation of biologically active compounds using modern chromatographic, physico-chemical methods such as column chromatography, HPLC, Preparative HPLC, LC-MS, ESI; determination of the structure of the main biologically active compounds using modern chemical and physical methods such as HRMS, 1D and 2D NMR, ECD. Launch of the necessary dose response curves of the main active components / developed formulas(s) from Ligularia Sibirica and Artemisia terrae-albae; study of the structure-activity relationship; study of potential synergy between active components. 1) publication of articles in foreign peer-reviewed scientific journals: Will be published - at least 2 (two) articles and (or) reviews in peer-reviewed scientific publications in the scientific direction of the project, included in the 1st (first), 2nd (second) or 3rd (third) quartiles in the Web of Science database; - at least 2 (two) articles or reviews in a peer-reviewed foreign or domestic publication recommended by KOKSON. **Achieved results**

	- a complete review of the literature of the studied plants has been conducted; - a qualitative and quantitative analysis of the selected plants was carried out; - - the amino and fatty acid composition has been determined; - extracts of different solvent polarities (ethanol, ethyl acetate, petroleum, hexane, aqueous extracts) were obtained; - individual substances have been isolated and characterized; - silver nanoparticles were synthesized by the "green" method; - cytotoxicity and antibacterial activity have been studied
Research team members with their identifiers (Scopus Author ID, Researcher ID, ORCID, if available) and links to relevant profiles	1. **Project manager: PhD, Associate Professor. Dyusebaeva M.A.** Scopus ID 56784212700 2. Nurlybekova Aliya Scopus ID 57204532098; 3. Kudaibergenova Aidana Scopus ID 57870762300; 4. Vasilina Gulzira Scopus ID 55604181500; 5. Izdik Nazerke Scopus ID 58291509200.
List of publications with links to them	**Articles in the journals of the Committee for Quality Assurance in Education and Science of the Ministry of Education and Science of the Republic of Kazakhstan:** 1. Kudaibergen A.A., Nurlybekova A.K., Dyusebaeva M.A., Yun Jiang Feng, Zhenis J. Phytochemical study of Artemisia A. terrae-albae // Reports of the National Academy of Sciences of the Republic of Kazakhstan, 2021, No. 4 (338), pp. 122-128. Doi.org/10.32014/2021.2518-1483.68 ***2.*** Zhenis J., Kudaibergen A.A., Nurlybekova A.K., Yun Jiang Feng, Dyusebaeva M.A. INVESTIGATION OF THE CHEMICAL COMPOSITION OF LIGULARIA SIBIRICA // Reports of the National Academy of Sciences of the Republic of Kazakhstan. - 2022. - No. 4. - pp. 18-28 ***Articles in international journals:*** 1. Berganayeva, G., Kudaibergenova, B., Litvinenko, Y., Nazarova, I., Sydykbayeva, S., Vassilina, G., Izdik N., Dyusebaeva, M. (2023). Medicinal Plants of the Flora of Kazakhstan Used in the Treatment of Skin Diseases. *Molecules*, *28*(10), 4192 – Q2. https://www.scopus.com/record/display.uri?eid=2-s2.0-85160376818&origin=resultslist 10.3390/molecules28104192 2. Dyusebaeva, M.A.; Berillo, D.A.; Berganayeva, A.E.; Berganayeva, G.E.; Ibragimova, N.A.; Jumabayeva, S.M.; Kudaibergenov, N.Z.; Kanapiyeva, F.M.; Kirgizbayeva, A.A.; Vassilina, G.K. Antimicrobial Activity of Silver Nanoparticles Stabilized by Liposoluble Extract of *Artemisia terrae-albae* // *Processes* 2023, *11*, 3041. https://www.scopus.com/record/display.uri?eid=2-s2.0-85175190851&origin=resultslist https://doi.org/10.3390/pr11103041- Q2.
Patents	