Brief information about the project

Title	AP22684531 «Development of hydrogel forms of plant extracts based on HPMC».
Relevance	In recent decades, drug delivery to and through the skin has attracted increasing interest in research and the pharmaceutical industry, primarily because the skin provides an easily accessible and painless route for administering medications, which fully aligns with patient needs. Moreover, dermal and transdermal drug delivery represents an attractive alternative to traditional oral and parenteral administration methods, offering several advantages. A relevant area of research is the development of gels containing antiviral agents, as well as combination gels that exhibit antiviral, antibacterial, regenerative, and local anesthetic effects.
Goal	This project is aimed at obtaining new hydrogel forms based on HPMC, plant extracts, studying their physicochemical properties and biological activity.
Tasks	Task 1. Obtaining extracts based on *Tamarix Hispida* using ultrasonic treatment. Determination of the quantitative and qualitative composition of the extracts obtained. This task is necessary to optimize extraction conditions and determine the quantitative and qualitative composition of the obtained water-ethanol extracts TH-10, 50, 70. Task 2. Preparation of hydrogels based on hydroxypropylmethylcellulose and study of rheological characteristics. Preparation of hydrogels based on hydroxypropylmethylcellulose with *Tamarix Hispida* extracts and study of rheological characteristics. This task is necessary to determine the rheological characteristics and physicochemical properties of the hydrogel base, to select the optimal concentrations of the base and extract and to develop an effective composition of the ointment form. Task 3. Determination of the biological activity of extracts and their hydrogel forms This task is necessary to determine the biological activity of the obtained extracts and their hydrogel forms, to identify the antioxidant, antimicrobial, anti-inflammatory, antiradical activity of the obtained extracts and their hydrogels.
Expected and Achieved Results	**Expected results:** 1) extracts TH-10, 50, 70 will be obtained from plant raw materials Tamarix Hispida using ultrasonic treatment, which have antioxidant, antiradical, anti-inflammatory, and antimicrobial activities. 2) hydrogels based on HPMC will be obtained, physicochemical characteristics will be determined, and optimal compositions will be proposed. **Achieved results according to the calendar plan:** **1. Obtaining extracts based on Tamarix Hispida using ultrasound treatment. Determination of the quantitative and qualitative composition of the obtained extracts.**

	The extraction conditions were optimized and the quantitative and qualitative composition of the obtained ethanol-water extracts TH-10, 50, 70 was determined. The optimal extraction method with the maximum yield includes extraction with an ethanol-water solvent (10, 50, 70%), crushed air-dried above-ground part of *Tamarix Hispida*, to a size of 2-3 cm at a raw material and solvent ratio of 1:4, on an ultrasonic unit "Sapphire" at an ultrasound frequency of 35 kHz, a temperature of up to 40 ° C, for 20 minutes. Qualitative and quantitative indicators of the extract of Tamarix Hispida plant material were also determined. As a result of the experimental data, the moisture content of the extract is 1.94%, ash content is 5.86%, the composition of extractive substances is 52.1%, the content of tannins is 11.6%, and flavonoids - 2.70%. The work will continue according to the schedule. 1.1 **Extraction of 10, 50, 70% water-alcoholic extracts from plant raw materials using maceration and ultrasonic treatment methods.** The extraction conditions were optimized and the quantitative and qualitative composition of the obtained ethanol-water extracts TH-10, 50, 70 was determined. The optimal extraction method with the maximum yield includes extraction with an ethanol-water solvent (10, 50, 70%), crushed air-dried above-ground part of Tamarix Hispida, to a size of 2-3 cm at a raw material and solvent ratio of 1:4, on an ultrasonic unit "Sapphire" at an ultrasound frequency of 35 kHz, a temperature of up to 40 ° C, for 20 minutes. 1.2 **Conducting qualitative and quantitative analysis of extracts.** Qualitative and quantitative indicators of the extract of Tamarix Hispida plant material were also determined. As a result of the experimental data, the moisture content of the extract is 1.94%, ash content is 5.86%, the composition of extractive substances is 52.1%, the content of tannins is 11.6%, and flavonoids - 2.70%. The work will continue according to the schedule. **2. Obtaining hydrogels based on hydroxypropylmethylcellulose and studying the rheological characteristics. Obtaining hydrogels based on hydroxypropyl methylcellulose with *Tamarix Hispida* extracts and studying the rheological characteristics.** Work is underway to determine the rheological characteristics and physical and chemical properties of the hydrogel base, as well as to select optimal concentrations of the base and plant extract to obtain an effective composition of the ointment form. Work continues in accordance with the calendar plan. **2.1 Study of the possibility of creating gels containing TH-10, selection of the optimal composition** To obtain an effective composition of the ointment form, the optimal concentrations of the base and extract were selected. The ultrasound method using a 10% alcohol solution in a ratio of 4:1 for 25 minutes was determined as the optimal conditions for obtaining the extract from the *Tamarix Hispida* plant. Based on the analysis of the rheological and physicochemical properties, the following was selected as the optimal composition of the hydrogel with extracts from the above-

	ground part of the *Tamarix Hispida* plant: 4% hydroxypropyl methylcellulose and 1% ethanol extract (TH-10), obtained in a 10% ethanol solution. **2.1.1 PhD dissertation defense** A joint seminar (pre-defense) on the discussion of the doctoral thesis was held on June 16th, 2025 at the Faculty of Chemistry and Chemical Technology. The topic of the seminar was the dissertation work "Hydrogel forms of phytopreparations based on plant raw materials of Kazakhstan". 2.2 **Study of the possibility of creating a gel based on hypromellose (HPMC) with TH-10 extract** Work is underway to select the optimal concentration of the base and extract to obtain an effective composition for the ointment form. Work continues in accordance with the calendar plan.
Names and Surnames of Research Group Members with Their Identifiers (Scopus Author ID, Researcher ID, ORCID, if available) and Links to Corresponding Profiles	**Project Leader – Arailym Amanzholkyzy,** MSc, Senior Lecturer, Researcher at the Department of Chemistry and Technology of Organic Substances, Natural Compounds and Polymers (Faculty of Chemistry and Chemical Technology), Al-Farabi Kazakh National University. ORCID: https://orcid.org/0000-0003-4052-1436 Scopus Author ID: 58678601100 Researcher ID: https://www.researchgate.net/profile/Arailym-Amanzholkyzy?ev=hdr_xprf **The scientific advisor is Zharilkassyn Abduakhitovich Abilov –** Doctor of Chemical Sciences, Professor at the Department of Chemistry and Technology of Organic Substances, Natural Compounds and Polymers (Faculty of Chemistry and Chemical Technology), Al-Farabi Kazakh National University. Link to the profile in Scopus: https://www.scopus.com/authid/detail.uri?authorId=6602837088 ORCID ID: https://orcid.org/0000-0002-2665-2539
Publications list with links to them	No
Patent information	The application titled "The method for obtaining a plant extract with antioxidant and antiradical activity" has passed the formal examination at the National Institute of Intellectual Property of the Republic of Kazakhstan and has been forwarded for further expert evaluation for the purpose of obtaining a patent for invention.