Brief information about the project

Name of the project	AP14870201 Search and study of new secondary metabolites of cyanobacteria promising for use in agricultural biotechnology.
Relevance	Biopesticides are currently in the focus of attention of the agrochemical industry and agricultural producers around the world due to environmental safety. Cyanobacteria are a very valuable object with great potential in agriculture and of great interest for the development of agrochemical agents as biopesticides. The possibilities of using cyanobacteria in agrobiotechnology are determined by their broad metabolic capabilities and high productivity. The commercial development and application of these compounds as biocides is predicted to be more beneficial compared to synthetic biocides from an environmental point of view. Within the framework of the proposed project, the search and screening of cyanobacteria capable of synthesizing the sought-after secondary metabolites and studying their possibilities for the development of agrochemicals as biopesticides will be carried out. The main focus will be on identifying the nature of the biological activity of secondary cyanobacteria metabolites in order to determine the possible mechanism of action of secondary cyanobacteria metabolites. Data on their antimicrobial, herbicidal, insecticidal, fungicidal activity will also be obtained, which will allow selecting the most promising compounds for further development of biopesticides. Technological and pilot-industrial regulations will be presented on the basis of all the data obtained on the production of secondary metabolites for the development of agrochemicals as insecticides, herbicides and fungicides. The results of the conducted research will be the basis for the development of methods for combating agricultural pests and the subsequent integration of appropriate measures that prevent the development of pest populations and reduce the use of pesticides to economically justified levels, minimizing risks to human health, animals and the environment.
Purpose	Search and screening of cyanobacteria capable of synthesizing demanded secondary metabolites and studying their possibilities for the development of agrochemicals as biopesticides.
Objectives	- Isolation of promising cultures of cyanobacteria for biotechnology from natural substrates capable of synthesizing demanded secondary metabolites. - Study of cultural and morphological properties and identification of isolated cultures of cyanobacteria. - Study of photosynthetic productivity of isolated cyanobacteria cultures depending on physico-chemical factors. - Study of the biochemical composition of the selected most productive cultures of cyanobacteria in order to identify significant secondary metabolites. - Optimization of cultivation conditions to accelerate the rate of biomass accumulation and increase the content of valuable secondary metabolites.

	- Isolation and identification of secondary metabolites from cyanobacteria. - Identification of the nature of the biological activity of secondary metabolites of cyanobacteria. - Analysis of the effectiveness of secondary metabolites of cyanobacteria in relation to cultivated plants. - To study the effect of secondary cyanobacteria metabolites on the biological activity of the soil and the physico-chemical properties of soils under the conditions of model experiments. - Development of scientifically based technological regulations for the production of secondary metabolites for the development of agrochemicals as insecticides, herbicides and fungicides in the laboratory.
Expected and achieved results	- Water and soil samples from various regions of the Republic of Kazakhstan will be selected, the species composition of the algoflora of the samples under study will be determined and algologically and bacteriologically pure cultures of cyanobacteria capable of synthesizing secondary metabolites will be isolated. - Cultural and morphological properties will be studied by standard algological methods and pure cyanobacteria cultures will be identified by modern molecular methods. - Cyanobacteria fluorescence intensity will be assessed depending on physico-chemical factors and producing cultures will be selected. - The mass fraction of the main chemical elements of cyanobacteria cells will be determined in order to identify significant secondary metabolites. - The influence of physical and chemical factors to accelerate the rate of biomass accumulation and increase the content of valuable metabolites will be studied. - Secondary metabolites of cyanobacteria will be isolated and the physicochemical properties and structure of the isolated substances will be studied by modern spectral methods. - Herbicidal, insecticidal, fungicidal antimicrobial activity will be determined using weeds, insect pests and phytopathogenic fungi. - The degree of toxicity, rapid decomposition in the soil, safety for seeds of cultivated plants in the conditions of model experiments will be analyzed. - Microbiological and biological methods will be used to study the effect of secondary cyanobacteria metabolites on the microbiological and biological activity of the soil, and on the basis of agrochemical methods, the main physico-chemical parameters affecting the level of soil fertility in the conditions of model experiments will be determined. - The technological regulations will be presented on the basis of all the data obtained on the production of secondary metabolites for the development of

	agrochemicals as insecticides, herbicides and fungicides in the laboratory.
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List of publications with links to them	1. Eco-friendly biopesticides derived from CO2-fixing Cyanobacteria // Environmental Research // Journal article, 2023. doi: 10.1016/j.envres.2023.117419 2. Biodiversity of microalgae of acreage of the Akdalinsky massif and isolation of cyanobacteria with antibacterial activity // Микробиология и вирусология // №1/40 // 2023 г. https://doi.org/10.53729/MV-AS.2023.01.14
Patents	-