

Brief information about the project

Name of the project	AP19680563 «Development of a biological product to increase the yield of grapes»
Relevance	A current direction is the development of biopesticides based on plant extracts to combat fungal diseases, adapted to local soil and climatic conditions. Also, the implementation of the project will reduce the number of synthetic pesticides used, which will result in improved quality and productivity of grape crops
Purpose	Development of biopesticides based on plant extracts to combat fungal diseases of grapes to increase productivity
Objectives	<ol style="list-style-type: none">1. Selection of grapes (Almaty region, Talgar district, from the Almalyk ampelographic collection) with subsequent transportation to the laboratory and further determination for the presence of fungal diseases.2. Selection of samples of plants and tobacco waste to study the component composition of the studied plant species, such as <i>Eryngium karatavicum</i> Iljin, Marigold flowers of the Aster family (<i>Tagetes erecta</i>), Tobacco (<i>Nicotiana tabacum</i>) with the aim of using them as raw materials for production extracts with insecticidal activity. Extraction and chromatographic analysis of plants and tobacco waste.3. Obtaining aqueous and ethanol extracts from plant objects. This step includes solvent selection, extraction method selection, cleaning, drying, grinding to obtain a homogeneous sample, improving analytical extraction, and increasing surface contact of plant samples in the solvent system. The resulting extracts will have insecticidal properties, which will be used to combat fungal diseases of grapes.4. Study of optimal doses of extracts against pests and pathogens in laboratory conditions. Study of the mechanism of action of biopesticides against mildew, odium, gray mold, anthracnose.5. Development of pilot batches of the biological product. Testing of the obtained biopesticides to combat fungal diseases of grapes, such as mildew (powdery mildew), oudium, gray rot, anthracnose in field conditions.6. Drawing up instructions for the use of biological products. Publication of scientific articles in international scientific journals, filing a patent for a biological product.
Expected and achieved results	<ol style="list-style-type: none">1. During the analysis of the literature review, popular biopesticides based on plant extracts and microorganisms were identified, used in the processing of grapes at all stages of cultivation to combat diseases and pests, as well as to increase productivity. During the analysis of the literature review, the following results were also obtained: - the most commonly used plant-based biopesticides, such as eucalyptus (<i>Eucalyptus globulus</i>), lemon (<i>Citrus limonum</i>), cinnamon (<i>Cinnamomum zeylanicum</i>), broadleaf lavender (<i>Lavandula latifolia aspic</i>); - the most commonly used biopesticides based on microorganisms, such as <i>Trichoderma</i>, <i>Bacillus velezensis</i>, <i>Aspergillus carbonarius</i>; - grape peels are used as biopesticides against fungal diseases.2. Work has been carried out on the selection and selection of plants from various regions of Kazakhstan. Plants with pesticide activity were selected, such as: <i>Karatau eryngium</i> (<i>Eryngium</i>

	<p><i>karatavicum Iljin</i>) selected in the South Kazakhstan region, Lenger; tobacco waste (<i>Nicotiana tabacum</i>); Marigolds are flowers of the Aster family (<i>Tagetes erecta</i>) selected in the village. Almalybak, Almaty region. Sampling was carried out between July and September 2023. The selected samples were delivered to the laboratory, preserved by natural air drying and prepared for further processing.</p> <p>3. Selected plant materials were crushed, and extraction was carried out using ultrasonic and CO₂ extraction methods. The obtained extracts were analyzed by gas chromatography with mass spectroscopic detection. The following results were obtained: - the main organic components, such as falcarinol, cyclohexene, 3-(1,5-dimethyl-4-hexenyl)-6-methylene, were identified in the <i>Eryngium karatavicum Iljin</i>; - identified the main organic components, such as 2-propenoic acid, 2-methyl-, (tetrahydro-2-furanyl) methyl ether, caryophyllene in Marigold flowers of the Aster family (<i>Tagetes erecta</i>); - identified the main organic components, such as pyridine, 3-(1-methyl-2-pyrrolidinyl)-, 5-hydroxymethylfurfural, cotinine in tobacco waste (<i>Nicotiana tabacum</i>).</p> <p>4. Samples of different grape varieties with potential fungal diseases were selected from the vineyards of the Almaty region, Talgar region, and from the Almalyk ampelographic collection. Sampling of different grape varieties with potential fungal diseases was carried out during the period from 08/01/2023 to 09/10/2023 from the vineyards of the Almaty region, Talgar region, from the Almalyk ampelographic collection and the South Kazakhstan region, the city of Saryagash. The following grape varieties were selected: Rakhat, Medeo, Alma-Ata, Pestrotsvetny, Almaly, Iyulsky, Kara-koz, Early Kibraysky, Skorospely, Sokhibi. From the selected grape samples, diseases such as Anthracnose (<i>Gloeosporium ampelophagum</i> Sacc), Oidium (<i>Oidium tuckeri</i>), teleomorph (<i>Uncinula necator</i>), Mildew (<i>Plasmopara viticola</i>), Gray rot (<i>Botryotinia fuckeliana</i>) were isolated and identified.</p>
Research team members with their identifiers (Scopus Author ID, Researcher ID, ORCID, if available) and links to relevant profiles	<p>1. Egemova Saltanat Sabitovna, PhD, H-index – 4, Scopus Author ID – 26655342200, ORCID – 0000-0002-6028-6229.</p> <p>2. Alimzhanova Mereke Baurzhanovna, candidate of chemical sciences, PhD, assoc. professor Hirsch index – 7, Researcher ID K-3756–2013, ORCID: 0000-0003-2641-0828, Scopus author ID: 35083073100.</p> <p>3. Syrgabek Erkanat Arkynuly, Master of Technical Sciences Hirsch Index – 1, Scopus Author ID – 57736408100, ResearcherID – GMH-2154-2022, ORCID – 0000-0003-2165-1294.</p> <p>4. Meirbekov Nurkanat Ayazbayuly, Master of Science, Hirsch Index – 0 ORCID – 0000-0001-6440-3544</p> <p>5. Ibraimov Aibat Bolatbekovich, Master of Science, H-index – 1, H-index – 1, Scopus Author ID – 57323449900, Researcher ID – AAS-5992–2020, ORCID – 0000-0003-2342-5960</p>
List of publications with links to them	<p>In international peer-reviewed journals:</p> <p>- Syrgabek Y., Alimzhanova M., García-Encina P. A., Jiménez J.J., López-Serna R. Greenness evaluation of sample preparation methods by GAPI for the determination of pesticides in grapes: A review. Trends in Environmental Analytical Chemistry, 39, e00206</p>

	<p>(2023). https://doi.org/10.1016/j.teac.2023.e00206 (percentile according to CiteScore in the Scopus database - 95);</p> <p>In domestic journals:</p> <p>Meirbekov, N., Ibraimov, A., Syrgabek, E., Egemova, S., Batyrbekova, S., Kazybaeva, S. (2023). Pathogenic microorganisms of grapes: mechanism of infection and methods of protection. Microbiology and virology, 4(43), 16–31. https://doi.org/10.53729/MV-AS.2023.04.02</p> <p>In international scientific conferences:</p> <ul style="list-style-type: none"> - Chromatographic analysis of extract of Karatau Eryngium (<i>Eryngium karatavicum iljin</i>), 12th Aegan Analytical Chemistry Days, October 19-22, 2023, Istanbul, Turkey; - Investigation of CO₂ Extract of Tagetes erecta for antifungal activity from raw materials grown in Kazakhstan, 1st Aristotle conference on chemistry advances and challenges in Chemistry, November 12-15, 2023, Thessaloniki, Greece.
Patents	-