Brief information about the project

Name of the project	AP14972916 «Creation and investigation of an algorizobacterium consortium with high target metabolic activity, as well as the development of a technique for producing biofertilizers based on it, in order to increase the agricultural crop yields» (0122PK00793)
Relevance	There is currently a significant degradation of agricultural lands, soil pollution with various pesticides, and a decline in the natural fertility of soils in many countries around the world, resulting in a decrease in crop product quality,significant harm to human health, and, as a result, a massive economic and environmental crisis.Of course, using chemical fertilizers(nitrogen, phosphorus, potassium)ensures a high yield, but their irrational use has a number of negative consequences, including chemical saturation of food plants, pollution of groundwater and the atmosphere due to the accumulation of compounds atypical for the natural environment in the soil,changes natural soil microbiome. An effective set of natural problems is the revival of organic farming, the essence of which is to use the potential of natural living systems,in particular photo- and heterotrophic microorganisms.
Purpose	Creation and investigation of an algorizobacterium consortium with high target metabolic activity, as well as the development of a technique for producing biofertilizers based on it, in order to increase the agricultural crop yields.
Objectives	• Obtain pure cultures of microalgae from various water and soil ecosystems, study their cultural and morphological properties and identify isolated pure cultures. • Evaluate the photosynthetic productivity of isolated microalgae depending on external factors and, based on the data obtained, select the most productive strains. • Evaluate the nitrogen-fixing activity of the isolated strains of phototrophic microorganisms depending on external factors (light, temperature, pH of the medium) and, based on the data obtained, select active strains characterized by a high nitrogen-fixing ability. • Isolate pure cultures of PGP bacteria from the soil and rhizosphere of various plants, study their cultural and morphological properties, and identify isolated pure cultures. • Evaluate the phosphate-mobilizing and nitrogenase activities of the isolated PGPB strains depending on external factors (temperature, pH of the medium) and, based on the data obtained, select active bacterial strains. • Compilation of active microbial algo-cyano-rhizobacterial consortia to increase crop yields. • Analysis of the biochemical composition of selected strains of microalgae and PGP bacteria. • To study the effect of the consortium formed by microalgae and PGP bacteria on phytopathogenic microorganisms and soil fungi. • To study the biostimulating activity of a consortium of microalgae and PGP bacteria strains on the growth of agricultural crops in laboratory and greenhouse conditions.

	• Develop technological regulations for obtaining a biological product based on a consortium of microalgae and PGP bacteria to enrich the soil with nitrogen and phosphorus and, accordingly, increase soil fertility and crop yields in the field.
Expected and achieved results	A technological procedure for obtaining and using a biological product based on a consortium of microalgae strains and PGP bacteria will be developed
Research team members with their identifiers (Scopus Author ID, Researcher ID, ORCID, if available) and links to relevant profiles	1. Bauenova Meruyert Omirbaikyzyz, h index -7, Researcher ID: GMX-7224-2022. ABD-6906-2021. Scopus Author ID: 57201014777 https://www.scopus.com/authid/detail.uri?authorId=57201014777 2. Sadvakasova Assemgul Kalyikumarovna, h index-12, Researcher ID: IRT-6784-2023. https://orcid.org/0000-0003-1456 Scopus Author ID: 55978114100 https://www.scopus.com/authid/detail.uri?authorId=55978114100
List of publications with links to them	1. Assemgul K Sadvakasova, Meruyert O Bauenova, Bekzhan D Kossalbayev, Bolatkhan K Zayadan, Zhiyong Huang, Jingjing Wang, Huma Balouch, Hesham F Alharby, Jo-Shu Chang, Suleyman I Allakhverdiev Synthetic algocyanobacterial consortium as an alternative to chemical fertilizers // Environmental Research. – 2023. – V. 233. 116418. https://doi.org/10.1016/j.envres.2023.116418. Импак-фактор 8.3. H-Index-54.0, Q-1, CiteScore-9,0. Процентиль: 91. 2. Kamshybayeva G.K., Kossalbayev B.D., Sadvakasova A.K., Bauenova, M. O., Zayadan B.K., Krapivina A.A., sainova G.A., Alharby H.F., Allakhverdiev S.I. Effect of the photosynthesis inhibitors on hydrogen production by non-heterocyst cyanobacterial strains, International Journal of Hydrogen Energy. 2023. 10.1016/j.ijhydene.2023.03.453. Q-1, IF- 7.139.
Patents	Sadvakasova A.K., Bauenova M.O., Kossalbayev B.D., Zayadan B.K., Kirbayeva D.K. Ybrai S.N. Patent for a useful model *"Tolypothrix Tenuis* J-1 cyanobacteria strain to enrich the soil with nitrogen and increase the yield of agricultural crops" No. 8446. 10/13/2023

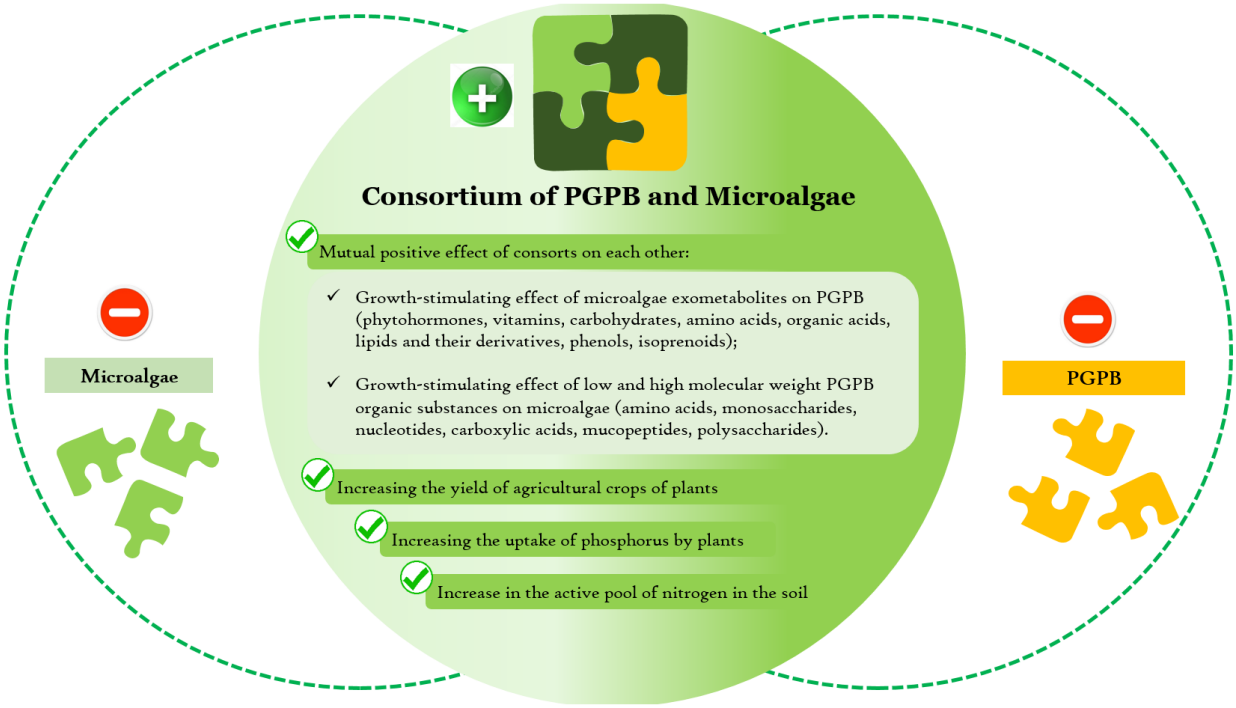

Figure – Advantages of using a consortium (PGPB+microalgae) in agrobiotechnology