

Brief information about the project

Name of the project	AP26196039"Cadmium toxicity for rice plants and the use of physico-chemical methods to increase resistance" (2025-2027)
Relevance	Rice cultivation is one of the promising agricultural sectors with high potential for export. In Kazakhstan, this crop plays an important role in replacing imported products and stimulating exports. However, the problem of soil contamination with cadmium is relevant for many developing countries, including Kazakhstan, due to the widespread use of phosphorous fertilizers and pesticides containing cadmium. The accumulation of trace amounts of cadmium in the soil reduces crop yields, slows down plant growth and development, disrupting their physiological and biochemical processes. In this regard, the study of cadmium-resistant rice varieties, as well as the search for ways to reduce its toxicity using physical and chemical methods such as growth regulators and microwave radiation, is an urgent task.
Purpose	To identify the toxic effect of cadmium on rice plants and to determine the most effective methods for increasing the resistance of rice varieties to cadmium using growth regulators and microwave radiation.
Objectives	1. Study of the effect of cadmium ions on the physiological and biochemical parameters of various rice varieties, as well as the determination of relatively resistant varieties 2. Investigation of the effects of growth regulators on the physiological and biochemical characteristics of rice varieties when exposed to cadmium. 3. The use of microwave radiation to increase the resistance of rice plants to the toxic effects of cadmium
Expected and achieved results	1. During screening for the resistance of rice plants to cadmium ions, rice varieties with relative resistance to cadmium will be determined based on physiological and biochemical parameters. (2025) The result has been achieved. 2. The effectiveness of using growth regulators to reduce the toxic effects of cadmium ions on the physiological and biochemical parameters of rice will be established (2026). 3. The effectiveness of various modes of pretreatment of seeds with electromagnetic radiation to increase the resistance of rice plants to cadmium (2027) will be determined.
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Usage	1. Commercial growth regulators, which have shown the greatest effectiveness in increasing plant resistance in conditions of cadmium ion pollution, can be used for agricultural enterprises located in areas contaminated with cadmium, as well as for those where phosphorous fertilizers are actively used. 2. When successful results are achieved in seed treatment using microwave radiation, it becomes possible to use this method for plant resistance to abiotic stresses.
Priority compared to real-world alternatives	At present, cheap commercial growth regulators available on the domestic market are used only locally in horticulture. At high rates, they could be used in ecologically unpolluted areas. 2. Microwave radiation is also used only in laboratory conditions. With high performance, this method can be used on a large scale and after purchasing the device, and in cooperation with manufacturers of such a device, this area can be commercialized for the purpose of acquisition. Providing farmers with microwave-treated seeds.
List of publications with links to them	1. Atabayeva S.D., Rakhymgozhina A.B., Nurmahanova A. et al. “Cadmium Stress Responses in Rice Cultivars: Identifying Physiological Traits for Resilient and Safe Rice Production”, ES Food and Agroforestry, 2026. процентиль 96 (Scopus). Accepted for publication 2. CQASHE MSHE «Bulletin of KazNU» (ecological seria) A.S. Nurmahanova, S.D. Atabayeva, A.B. Rakhymgozhina, S.S. Kenzhebayeva, S.Sh. Asrandina, A.Zh. Beisenova, Myltykbayeva A.B. “Significance and application of plant growth regulators” Accepted for publication 3. Fifth International Conference of the Society of Environmental Sustainability. Environmental Sustainability (2026). Oct 6 - 8, 2025, Almaty, Kazakhstan. Abstracts Материалы опубликованы в изд. Springer.(Scopus) https://doi.org/10.1007/s42398-025-00408-1 Was published A.B. Rakhymgozhina, S. D. Atabayeva, A. S. Nurmahanova, S. S. Kenzhebayeva, et al. “Growth and physiological response of rice plants to cadmium stress “ 4. Atabayeva S.D., Rakhymgozhina A.B., Nurmahanova A.S., Asrandina S.Sh., Kenzhebayeva S.S., Myltykbayeva A.B. «Cadmium Tolerance in Rice to Safeguard Food and Nutrition Security» □ Accepted abstract for International Conference “9th International Conference on Food and Nutrition - KL (ICFN-2026)»

	29th & 30th May 2026, Kuala lumpur, Malaysia
Patents	Not planned