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Microbiological Water Quality Assessment in Rice Agroecosystems in Central coastal region of Portugal

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Abstract. The preservation of water resources has seen significant progress in agricultural technologies and management practices, aiming to minimize environmental impacts and promote the conservation of natural resources. This study focuses on the microbiological monitoring of water quality in the rice agroecosystem of the Lower Mondego Valley, Portugal, aiming to assess the impact of rice cultivation activities on the quality of water drained into the environment, within the scope of the PROMEDRICE project. Water samples were collected from irrigation and drainage networks of paddies, in July and August 2023 and 2024. Microbiological quality indicators assessed included total coliforms (TC), fecal coliforms (FC), fecal enterococci (FE), and ampicillin-resistant *Enterobacteriaceae* (E-Ampr), using standardized analytical methods. Antibiograms were performed directly on the isolates in mixed culture, using direct antimicrobial susceptibility tests, to determine the phenotypes resistant to 13 antibiotics, representing the main classes used in human medicine and livestock production in Portugal. Results revealed that irrigation water across the monitored plots exhibited a high microbial load. Notably, the rice agroecosystem exerted a beneficial effect on the microbial quality of drainage water, with observed reductions of approximately two orders of magnitude in TC, FC, and FE counts from the inlet to the outlet of the rice fields. However, E-Ampr counts increased in the paddy soil, likely due to the specific characteristics of the wetland ecosystem and the influence of local wildlife activity. This study provides a microbiological risk assessment of irrigation water contamination and highlights the positive role of rice agroecosystems in reducing microbial loads in drainage water. The findings contribute to support improved water management strategies and to mitigate public health and environmental risks associated with microbial contamination in rice production systems.

Keywords: coliforms, *Enterobacteriaceae*, antibiotic resistance, rice-based agroecosystem, microbiological indicators.