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STUDY ON THE WATER QUALITY OF ARANCA RIVER

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Abstract: It is widely acknowledged that agricultural activities significantly contribute to the contamination of surface water. As the global population continues to grow, the agricultural processes necessary to meet the increasing demand for food have become more intensive. Additionally, there has been a notable rise in the use of chemical agents in farming, particularly chemical pesticides and fertilizers. Many of these chemicals often contain traces of heavy metals, which pose serious environmental and health risks. The application of these substances in agricultural fields near aquatic ecosystems results in the leaching of active compounds and heavy metals into surface waters, leading to contamination. This study aims to assess the water quality of the Aranca River in the Sânnicolau Mare - Dudeștii Vechi - Valcani area, primarily as a consequence of improper waste disposal and agricultural practices. To evaluate surface water quality in this region, two sets of nine water samples were collected and analyzed in the Environmental Chemistry Laboratory of the University of Life Sciences "Regele Mihai I" in Timișoara. The findings revealed that the highest nitrate concentrations were 3.280 mgN/L and 2.966 mgN/L. Furthermore, two samples exceeded the permitted limit of 0.5 mgN/L for nitrites, while phosphate concentrations ranged from 0 to 16.3 mgP/L.

• Introduction

The quality of surface waters is essential for ecosystem health and safe water resources for human use. Key chemical parameters—such as pH, dissolved oxygen, nutrient levels, and heavy metal concentrations—are crucial indicators for assessing water bodies' ecological status and identifying pollution sources (Dwivedi & Tripathi, 2007; Garizi et al., 2011). Industrial, agricultural, and urban activities significantly alter surface water composition, impacting biodiversity and public health (Ji et al., 2016; Shrestha & Kazama, 2007).

Water characteristics include physical, chemical, bacteriological, and organoleptic properties. Water pH indicates acidity or alkalinity, influenced by hydrogen ion concentration. Ammonia, nitrates, and nitrites in water, byproducts of organic matter decomposition, signal recent pollution and pose health risks, especially when present in drinking water (Hortensia Rădulescu, 2001; Mănescu et al., 1994). Phosphates, from industrial discharges and agricultural runoff, promote eutrophication through excessive algae growth.

Calcium (Ca) enters surface waters primarily from limestone erosion and fertilizers, **Magnesium (Mg)** from magnesium-rich rocks and discharges, and **heavy metals** such as lead, mercury, and cadmium from industrial and agricultural sources, leading to toxic pollution. Surface water pollution alters physical, chemical, or biological qualities, making them unsuitable for use.

This study aims to assess the water quality of the Aranca River in the Sânnicolau Mare - Dudeștii Vechi - Valcani area, focusing on pollution due to inadequate waste disposal and agricultural practices.

• Material and method

Surface water pollution from improper waste disposal threatens aquatic ecosystems. This study assesses the water quality of the Aranca River in the Sânnicolau Mare - Dudeștii Vechi - Valcani area, impacted by waste and agricultural practices. Three sets of nine water samples each were collected from the same locations on three dates: 16.10.2023, 16.03.2024, and 19.10.2024.

METHODS

- Nitrites:** Spectrophotometric method (SR ISO 6777/96), detecting red complex at 540 nm.
- Nitrates:** Spectrophotometric method (SR ISO 7890/1-98), measuring absorbance at 324 nm.
- Ammonium:** Colorimetric method (SR ISO 7150-1:2001), using Nessler reagent at 425 nm.
- pH:** Potentiometric method (SR EN ISO 10523:2012), measuring potential difference.
- Metals:** Atomic absorption spectrometry (AAS) for precise metal concentration.

This methodology identifies pollutants and assesses their environmental impact on the river's water quality

• Results and discussions

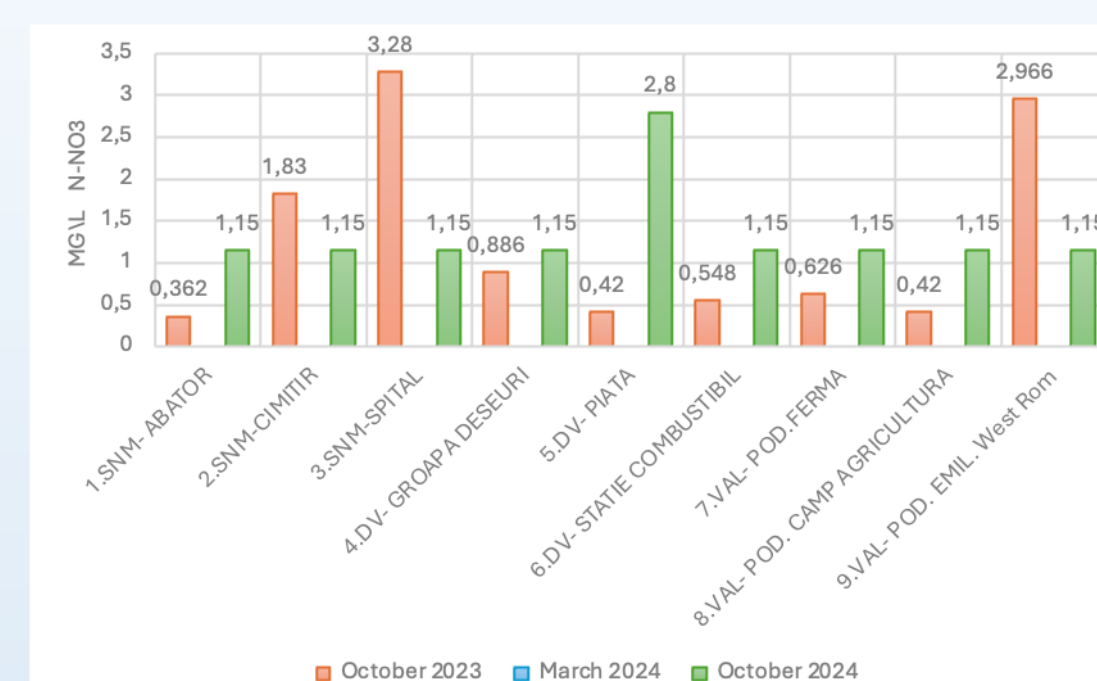


Figure 1. Nitrate (NO₃⁻) content of the Aranca River waters.

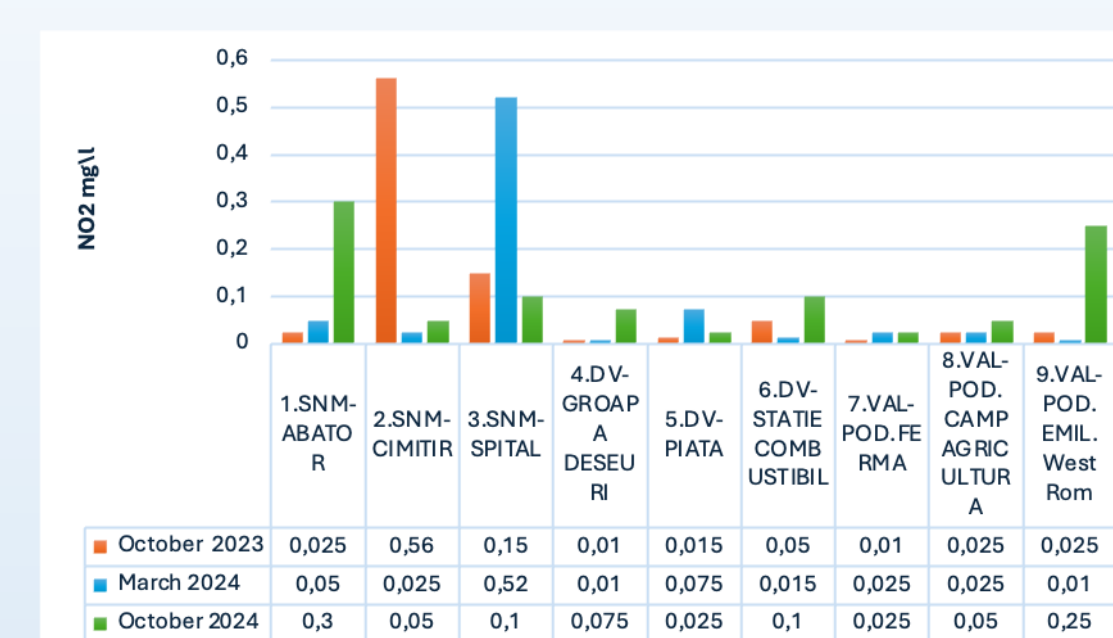


Figure 2. Nitrite (NO₂⁻) content of the Aranca River waters.

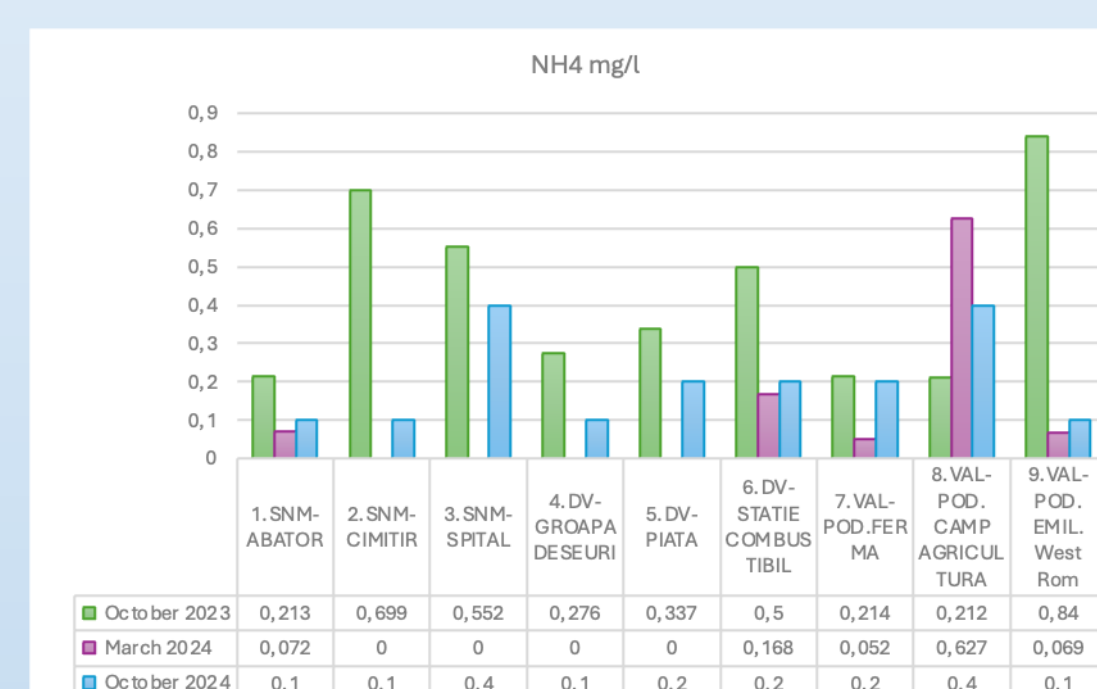


Figure 3. Ammonium (NH₄⁺) content of the Aranca River waters.

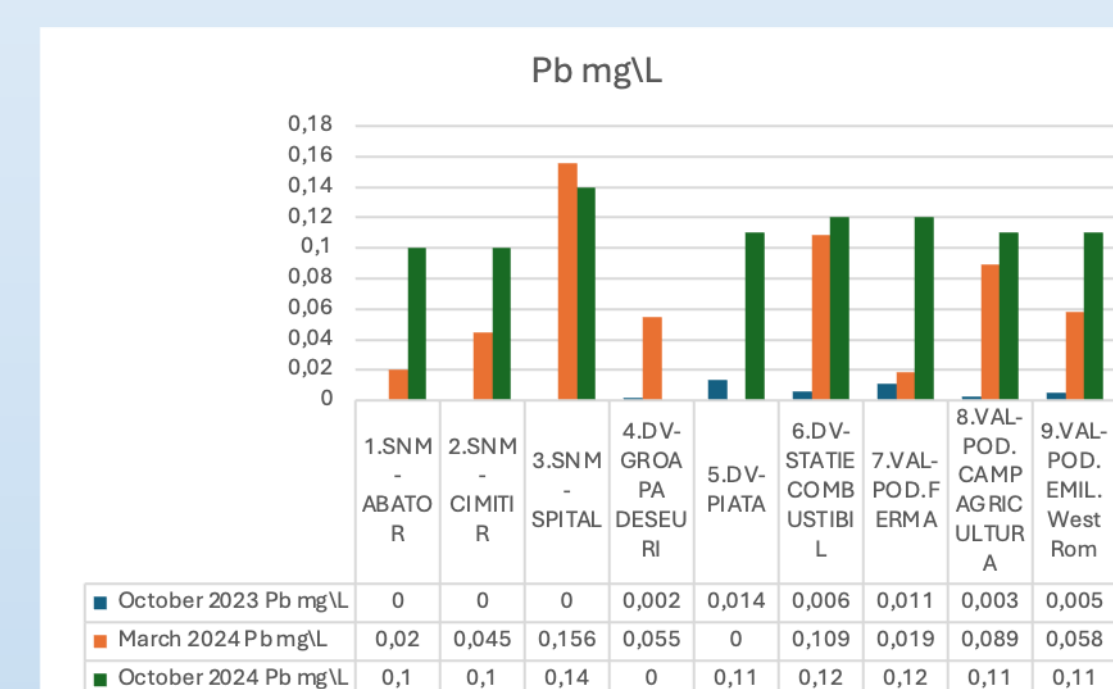


Figure 4. Lead (Pb) content of the Aranca River waters.

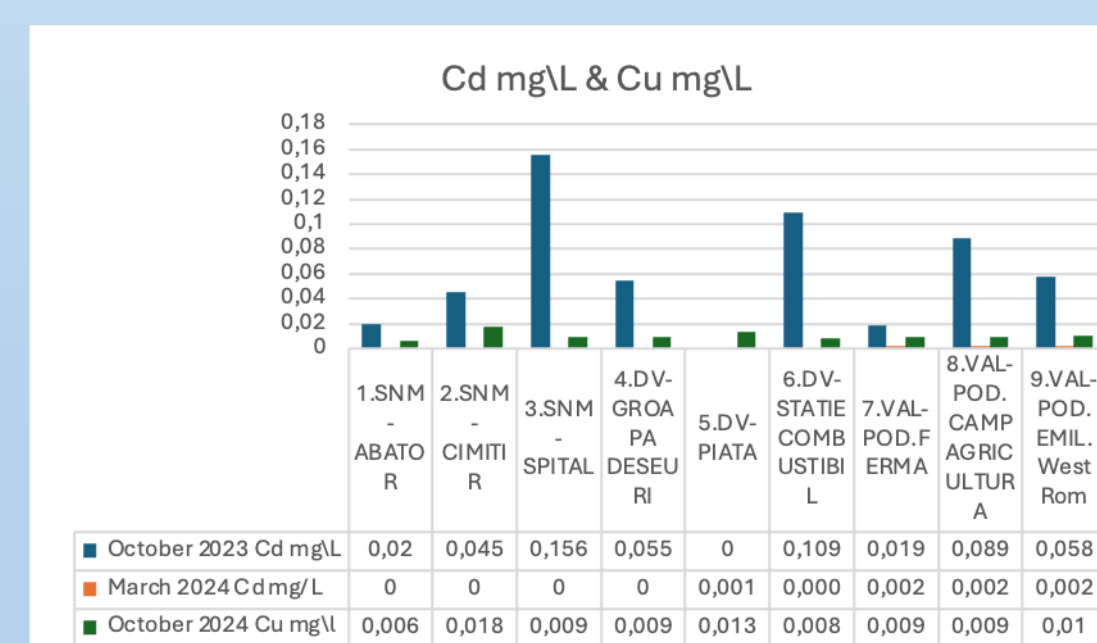


Figure 5. Cadmium and Copper content of the Aranca River waters.

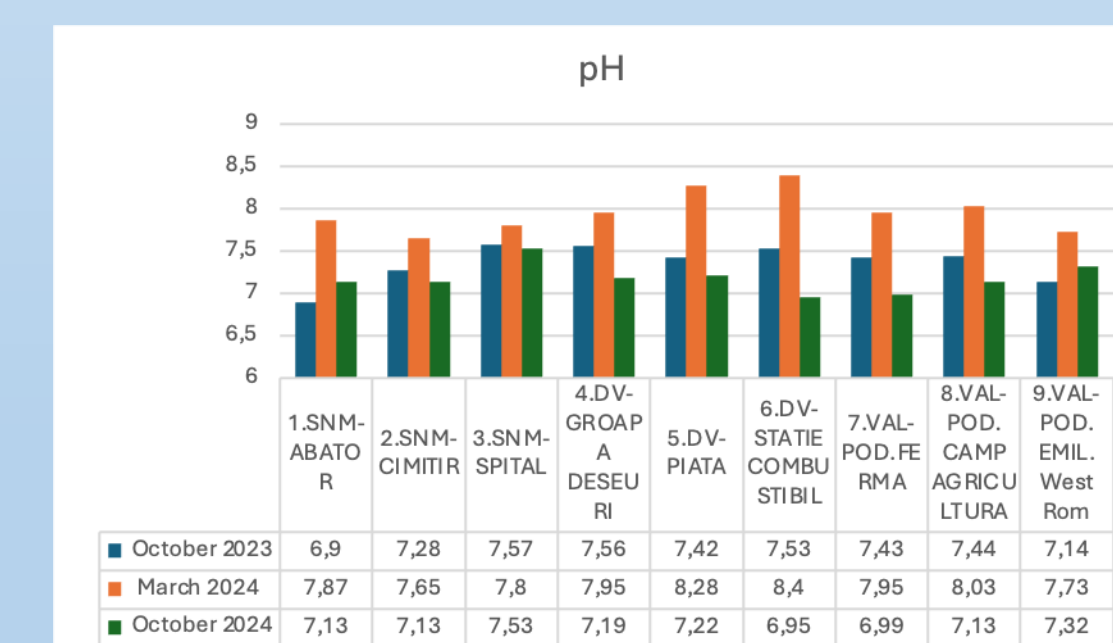


Figure 6. pH content of the Aranca River waters.

Conclusion:

Nitrates and Nitrites: The values are higher in October (2023 and 2024), suggesting a seasonal influence related to agricultural activities. In March 2024, the values are lower, likely due to dilution from rainfall and snowmelt.

Ammonium: Concentrations are higher in autumn, especially near agricultural areas and the hospital, indicating pollution from waste management and agricultural activities.

Phosphates: March 2024 shows an extremely high value near the hospital, suggesting significant pollution, possibly from sewage leaks. In other locations, levels are high in October, reflecting agricultural influences.

Calcium and Magnesium: Concentrations remain relatively constant, with no major variations, suggesting a stable water composition.

Heavy Metals: Cadmium and lead levels are higher in industrial areas and near the hospital, indicating consistent pollution sources. Copper shows a slight increase in October, probably due to seasonal accumulation.

pH: The values are neutral and stable across all locations, indicating an adequate chemical balance of the water.

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