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PHYSICOCHEMICAL AND PHYTOTOXIC QUALITY OF IRRIGATION WATER FOR THE TREES OF GENERAL SAN MARTÍN PARK, MENDOZA, ARGENTINA.

QUALIDADE FÍSICO-QUÍMICA E FITOTÓXICA DA ÁGUA DE IRRIGAÇÃO PARA AS ÁRVORES DO PARQUE GENERAL SAN MARTÍN, MENDOZA, ARGENTINA

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ABSTRACT

Background: General San Martín Park, located in Mendoza, Argentina, is the city's most emblematic green infrastructure, designed in 1896 by architect Carlos Thays. The park plays a critical role in microclimate regulation, water conservation, and public health resilience. **Aim:** The purpose of this study was to assess the quality of the water used for irrigation in the most important park of the city of Mendoza, the General San Martín Park, through a comprehensive series of analyses. **Methods:** This study assessed the physicochemical and biological quality of irrigation water in the park, focusing on parameters such as temperature, pH, turbidity, electrical conductivity, hardness, alkalinity, nitrates, sulfates, and anthropogenic contaminants. Samples were collected at 20 points across the irrigation network during three periods (October 2024, April 2025, October 2025). **Results**: Indicate that irrigation water is generally of good quality, suitable for sustaining the park's forest mass. pH values remained within the optimal irrigation range (6.5–8.4), while nitrate levels were consistently below the 30 ppm threshold, with no nitrites detected. Hardness and alkalinity varied spatially, particularly near the Alto Godoy Water Treatment Plant, suggesting localized inputs of dissolved solids. Turbidity and conductivity strongly correlated with hardness, reflecting the influence of suspended and dissolved mineral content from runoff and seasonal hydrological dynamics of the Mendoza River. Importantly, we found no evidence of toxic anthropogenic contaminants such as heavy metals, cyanides, or petroleum derivatives. **Discussion:** Overall, the findings emphasize the need for continuous monitoring. From a management perspective. These results establish a baseline of water quality indicators for the park. They provide essential input for long-term strategies in conservation, recreation, and environmental education, ensuring resilience against water scarcity and urban expansion. The study underscores the park's role as both a cultural heritage site and a living laboratory for sustainable urban ecology.

Keywords: *Quality, Irrigation, Trees, San Martín Park, Mendoza*

RESUMO

Introdução: O Parque General San Martín, localizado em Mendoza, Argentina, é a infraestrutura verde mais emblemática da cidade, criado em 1896 sob o projeto do arquiteto Carlos Thays. O parque desempenha um papel crítico na regulação do microclima, na conservação da água e na resiliência da saúde pública. **Objetivo**: Avaliar a qualidade da água utilizada para irrigação no principal parque da cidade de Mendoza, o Parque General San Martín, por meio de uma série abrangente de análises. **Métodos:** Foram avaliados parâmetros físico-químicos e biológicos da água de irrigação do parque, incluindo temperatura, pH, turbidez, condutividade elétrica, dureza, alcalinidade, nitratos, sulfatos e contaminantes antropogênicos. As amostras foram coletadas em 20 pontos da rede de irrigação durante três períodos (outubro de 2024, abril de 2025, outubro de 2025). **Resultados:** Indicam que a água de irrigação apresenta, em geral, boa qualidade, adequada para sustentar a massa florestal do parque. Os valores de pH permaneceram dentro da faixa ótima para irrigação (6,5–8,4), enquanto os níveis de nitrato estiveram consistentemente abaixo do limite de 30 ppm, sem detecção de nitritos. A dureza e a alcalinidade mostraram variabilidade espacial, particularmente em pontos próximos à Estação de Tratamento de Água Alto Godoy, sugerindo aportes localizados de sólidos dissolvidos. A turbidez e a condutividade apresentaram forte correlação com a dureza, refletindo a influência do conteúdo mineral suspenso e dissolvido proveniente do escoamento e da dinâmica hidrológica sazonal do Rio Mendoza. Importante destacar que não foram encontradas evidências de contaminantes antropogênicos tóxicos, como metais pesados, cianetos ou derivados de petróleo. **Discussão:** Os achados enfatizam a necessidade de monitoramento contínuo. Do ponto de vista da gestão, os resultados estabelecem uma linha de base de indicadores de qualidade da água para o parque, fornecendo insumos essenciais para estratégias de longo prazo em conservação, recreação e educação ambiental, garantindo resiliência frente à escassez hídrica e à expansão urbana. O estudo reforça o papel do parque como patrimônio cultural e como laboratório vivo para a ecologia urbana sustentável.

***Palavras-chave**: Qualidade, Irrigação, Árvores, Parque San Martín, Mendoza*

1. INTRODUCTION

Urban parks, as public green spaces, are multifunctional. Their functions include leisure and recreation, environmental regulation, aesthetics, education, and social interaction all of which contribute to improving the population’s quality of life (Segovia & Neira, 2009).

The General San Martín Park is located in the district of Ciudad de Mendoza, the provincial capital. Established in 1896, it is the oldest and most significant park in the city of Mendoza, serving as a local emblem. The park encompasses 307 cultivated hectares and 86 hectares under expansion, with 17 km of pathways. At the time of its creation, public health policies were being developed, so the park was designed around environmental principles (oxygen provision, climate regulation) as well as social purposes.

It was conceived as a cultural product that reflected domesticated, culturalized nature while also fulfilling important landscape functions. Its design followed the European style, particularly French, and the project incorporated a wide range of attractions, services, and activities integrating social, recreational, cultural, and sports uses. These included a botanical garden, zoo, regatta lake (shown in Figure 1), restaurant, music kiosk, bathhouses, and facilities for cricket, lawn tennis, soccer, and cycling, along with avenues, gardens, waterfalls, grottos, and islands (Suden, 2024).

Figure 1. View of the artificial lake of General San Martín Park, Mendoza, Argentina

Mendoza's General San Martín Park originated with the proposal of hygienist physician Emilio Coni, who believed it was necessary to establish a health-promoting space, including a provincial hospital, in an elevated area of the city protected by green barriers.

To make this possible, they had to build infrastructure such as irrigation canals and flood defenses. Architect Carlos Thays was entrusted with the design, and in 1897 the layout of streets, canalization, and the planting of the first tree species began. Today, the park represents Mendoza's "great garden," where streets, lush groves, and irrigation ditches coexist as shown in Figure 2.

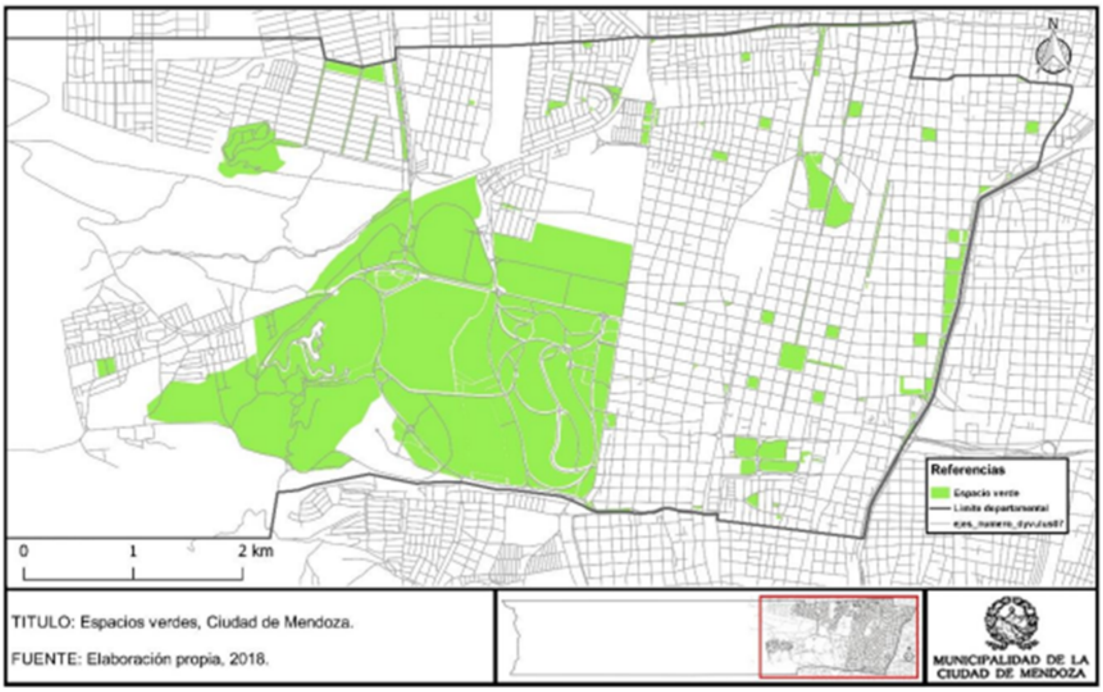

Figure 2. Green Spaces of the city of Mendoza, Argentina (Source: Municipality of Mendoza, 2018)

The park constitutes an example of green infrastructure in semi-arid regions, where the artificial lake and forested areas fulfill strategic functions for urban resilience, including microclimate regulation, water storage, and environmental education. Its study is relevant to disciplines such as urban planning, urban ecology, water resource management, and public health.

The city of Mendoza lies on a neotectonically active piedmont, characterized by alluvial fans, river terraces, and colluvial deposits that create a complex and dynamic geomorphological profile. The Mendoza piedmont functions as a transitional zone between the Andes Mountains and the plain, strongly influenced by tectonic activity, erosion, and sedimentation processes that condition both urban development and water resource availability, as can be observed in the geomorphological profile of the city of Mendoza shown in Figure 3

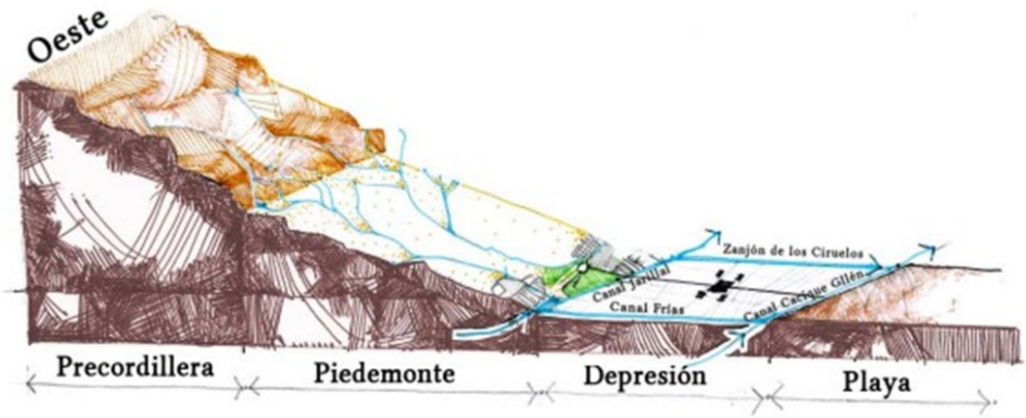

Figure 3.

Geomorphological profile of the city of Mendoza.

The piedmont is the area that topographically connects the mountainous zone with the plain; elevations range between 1,300 and 1,600 m a.s.l., descending to 800 m a.s.l. in the urbanized area (Vich & Pedriani, 1993). General San Martín Park is located in the transitional zone between the piedmont and the depression where Mendoza's urban core lies. This configuration facilitates the irrigation of the park through a complex system of canals and ditches.

Since 1996, General San Martín Park has been designated a protected environmental area, to be preserved for its qualified representativeness as natural and cultural heritage—both present and future—aimed at its integral development through conservation, education, recreation, production, and research, with multiple ecological, social, and economic purposes (Law 6394, 1996). The law establishes specific uses for General San Martín Park, including the conservation of diverse species of flora and fauna, its landscape and cultural resources, environmental education and training, research to generate scientific knowledge of the urban environmental unit, the training of scientists, technicians, administrators, and managers in environmental management, as well as the use of the area as an open laboratory for environmental research.

Human activity and peripheral urbanization may affect the quality of the water resources used for irrigating the park's trees. Anthropogenic activities and the growing vehicle fleet cause direct air pollution and indirectly affect irrigation water, a phenomenon more pronounced in the downtown area than in San Martín Park (Puliafito et al., 1997). Consequently, human activity and urbanization may influence the water resources intended for irrigation.

This project aims to conduct a comprehensive assessment of the physicochemical and phytotoxic quality of the water used to irrigate tree species in General San Martín Park. This evaluation seeks not only to determine the suitability of the water for sustaining urban vegetation, but also to identify potential risks associated with anthropogenic pressures and peripheral urbanization. By analyzing key physicochemical parameters (such as pH, electrical conductivity, dissolved solids, and nutrient concentrations) together with phytotoxic indicators, the study aims to provide a reproducible diagnostic framework for understanding how water quality influences tree health and long-term ecosystem resilience. The results are expected to inform evidence-based management strategies that integrate conservation, public health, and urban ecological planning in semi-arid environments.

2. MATERIALS AND METHODS

2.1. Study Area

General San Martín Park is located in the city of Mendoza, Argentina (32°53′25″S, 68°52′16″W) and covers 394 hectares of forested and urbanized land. It contains more than 300,000 planted tree specimens adapted to stony soils and an arid climate, sustained by an irrigation system composed of a network of ditches and canals that maintain the forested mass within a desert environment.

The main irrigation canals of General San Martín Park are the Canal del Oeste and the Canal Civit, shown in Figure 4, which are derivations of the Mendoza River originating from the Cipolletti Dam and crossing the department of Godoy Cruz. The General Department of Irrigation – First Zone Canal Inspection (Canal del Oeste–Canal Civit) of Mendoza Province manages irrigation. The Canal Civit primarily supplies raw water to the Alto Godoy Water Treatment Plant, with its effluents subsequently integrated into the irrigation system of General San Martín Park. In contrast, the Canal del Oeste mainly irrigates forested and ornamental areas within the park.

Samples were collected at 20 sampling points, beginning at the main irrigation inflow (control #1, Canal del Oeste), with the remaining 19 samples distributed along the layout of the gravity-fed irrigation system, as shown in Figure 4 and the geospatial information in Table 1.

Sampling point (control #1) corresponds to the inflow of the water resource into the irrigation system, representing the control point with no anthropogenic contamination.

At each sampling point, samples were collected in quintuplicate, and the mean value of each assay was calculated for statistical comparisons across the different sampling periods.

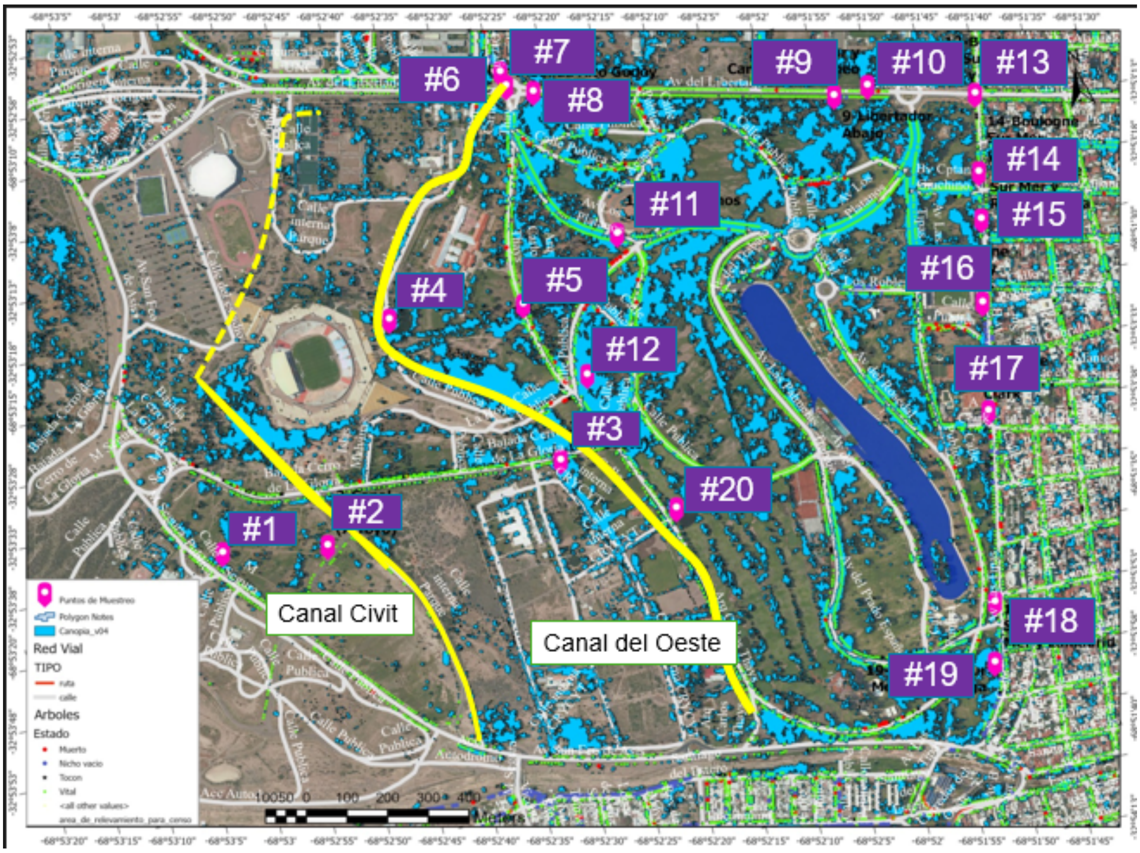

Figure 4. General San Martín Park. Irrigation canals (highlighted in yellow), sampling points (highlighted in magenta), and canopy (highlighted in light blue).

The processed samples correspond to the periods of October 2024, April 2025, and October 2025.

2.2. Design:

This study was descriptive and prospective in nature. Determinations were performed for physicochemical indicators of water quality, phytotoxicity, and anthropogenic contaminants in the irrigation water of the tree population in General San Martín Park, Mendoza City.

Table 2 shows the parameters tested in the irrigation water.

2.3. Statistical Analysis

Variability among sampling points was evaluated using repeated-measures ANOVA followed by Dunnett's multiple comparison test (significance threshold: $p < 0.05$). All statistical analyses were performed with

GraphPad® Prism software.

3. RESULTS AND DISCUSSION

3.1. Results

3.1. Results

Sample temperatures were consistently maintained within normal irrigation limits. Mean values recorded in October 2024 and 2025 remained stable at 13.5 ± 0.1 °C across all initial samples, whereas lower temperatures were observed in April 2025, averaging 9.6 ± 0.1 °C (range: 9.4–10.0 °C). No significant variations were detected among the sampling points in each seasonal measurement when compared to the water inflow (ANOVA, $p = 0.1836$).

Sample pH levels remained within acceptable limits for irrigation. Mean pH values ranged between 7.25 and 7.88 across all samples. Temporal measurements showed slight variation: October 2024, mean 7.66 ± 0.14 (range: 7.25–7.88); April 2025, mean 7.60 ± 0.15 (range: 7.21–7.80); and October 2025, mean 7.64 ± 0.12 (range: 7.20–7.78). In all sampling periods, pH remained within the suitable range for irrigation (6.5–8.4), as shown in Figure 5. Significant variation compared to the inflow was observed at sampling point #3 (Canal del Oeste/CONICET) (ANOVA, $p < 0.05$), #9 (Libertador Street) (ANOVA, $p < 0.01$), and #13 (Boulogne Sur Mer & Civit) (ANOVA, $p < 0.05$).

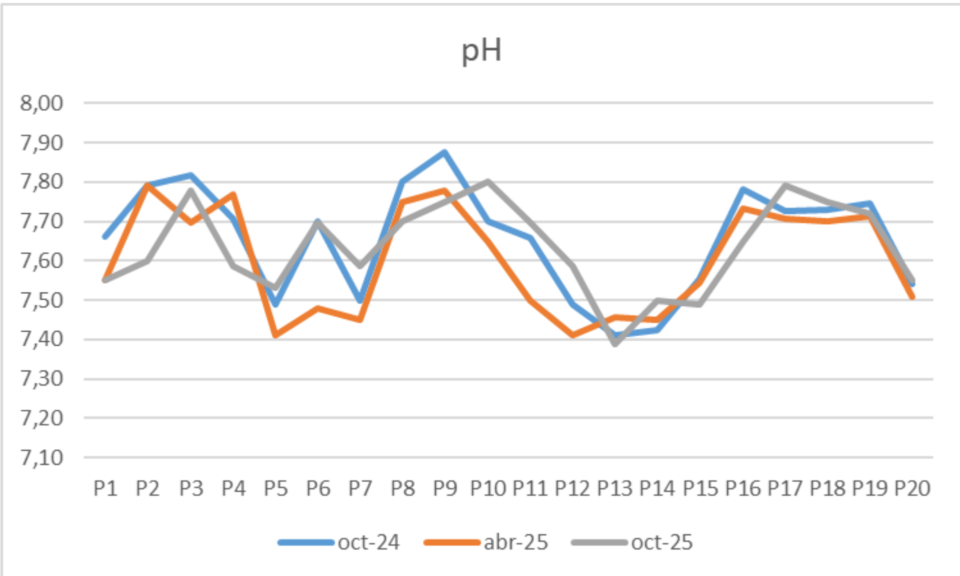

Figure 5. pH variability in the irrigation water of sampling points in General San Martín Park, Mendoza

Turbidity levels were slightly elevated at sampling points #6 (Canal del Oeste – National University of Cuyo) and #7 (Alto Godoy Water Treatment Plant outlet), with values ranging from 8 to 12 NTU, as shown in Figure 6. Average turbidity values across sampling periods were October 2024,

2.75 ± 3.13 NTU; April 2025, 2.84 ± 3.15 NTU; and October 2025, 3.13 ± 3.91 NTU. Turbidity increased overall in October 2025. Highly significant variation compared to the inflow was detected at sampling points #6 (ANOVA, p < 0.001) and #7 (ANOVA, p < 0.001).

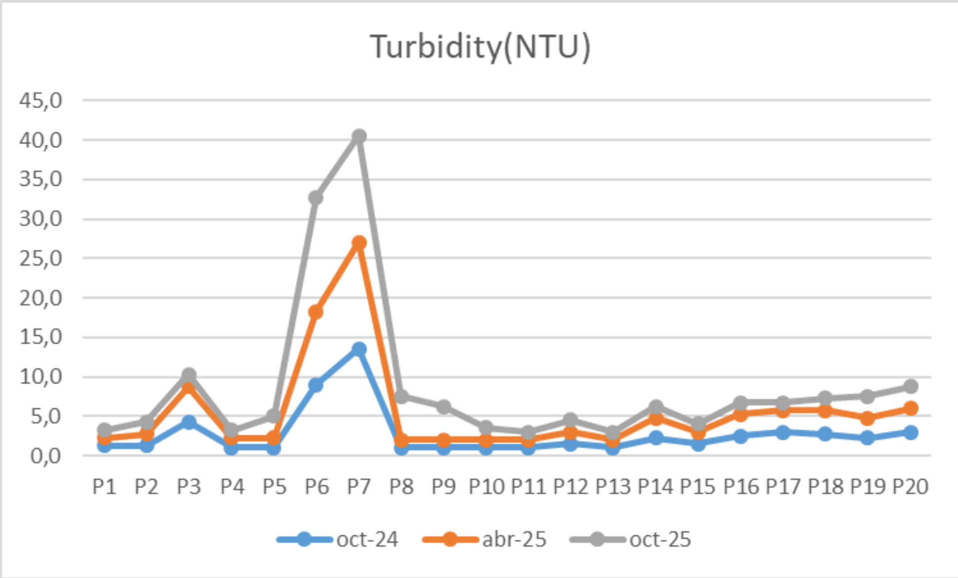

Figure 6. Turbidity variability in the irrigation water of sampling points in General San Martín Park, Mendoza

Alterations in electrical conductivity levels were detected at sampling points #6 (Canal del Oeste – UNC) (ANOVA, p < 0.001) and #7 (Alto Godoy outlet) (ANOVA, p < 0.001). All other measurements remained within the normal values for irrigation water (0–3 dS/m). Average conductivity values were 2.05 ± 0.63 dS/m in October 2024, 1.85 ± 0.78 dS/m in April 2025, and 1.93 ± 0.83 dS/m in October 2025, as shown in Figure 7.

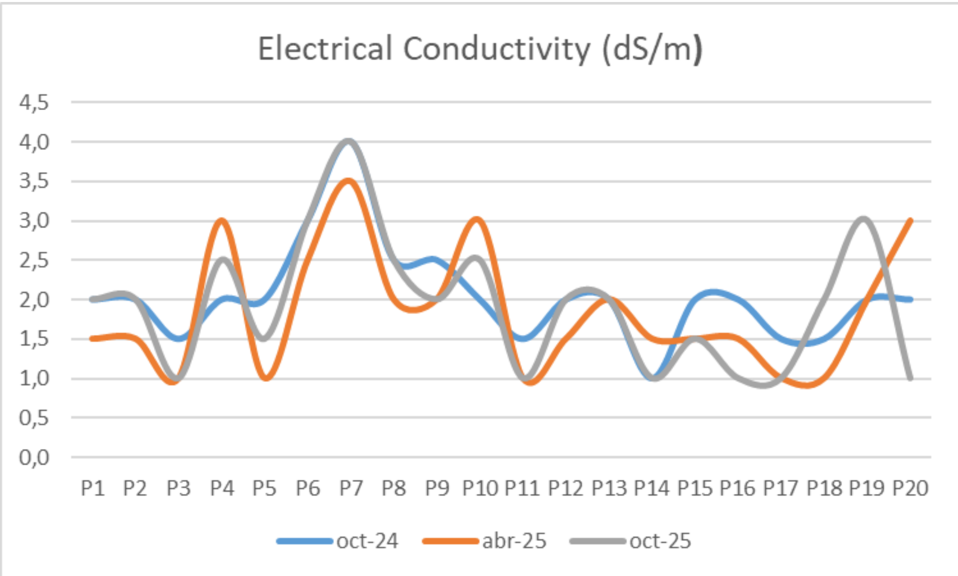

Figure 7. Electrical Conductivity variability in the irrigation water of sampling points in General San Martín Park, Mendoza

Most samples showed phosphate concentrations below 0.25 ppm, remaining under the irrigation water limits (0–2 ppm). The mean phosphate concentration was 0.22 ± 0.02 ppm. Higher values (0.25–0.35 ppm) were observed at sampling point #4 (Canal Civit – Stadium) in October 2025 and at sampling point #6 (Canal del Oeste – UNC) in October 2024 and April 2025, as shown in Figure 8. No significant differences compared to the inflow were detected (ANOVA, $p = 0.1346$).

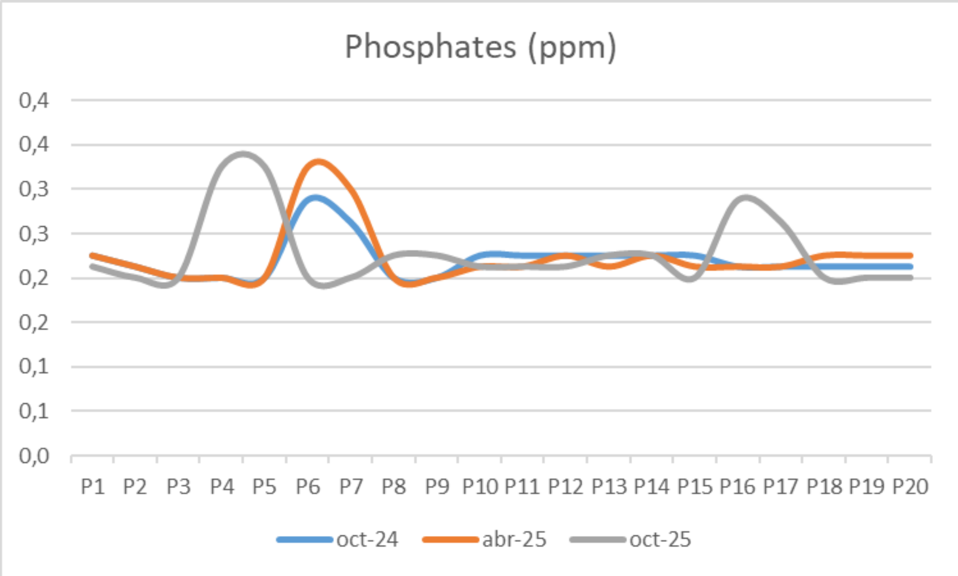

Figure 8. Phosphates variability in the irrigation water of sampling points in General San Martín Park, Mendoza

Nitrate concentrations were generally low and within the reference values for irrigation (<10 ppm). Mean values were October 2024, 0.79 ± 0.62 ppm; April 2025, 0.64 ± 0.47 ppm; and October 2025, 0.80 ± 0.71 ppm. Elevated values were noted at sampling point #7 (Alto Godoy outlet), #8 (Libertador Street – Upper), and #9 (Libertador Street – Lower), as shown in Figure 9. Significant differences compared to the inflow were detected at sampling point #7 (ANOVA, $p < 0.01$), #8 (ANOVA, $p < 0.001$), and #9 (ANOVA, $p < 0.01$).

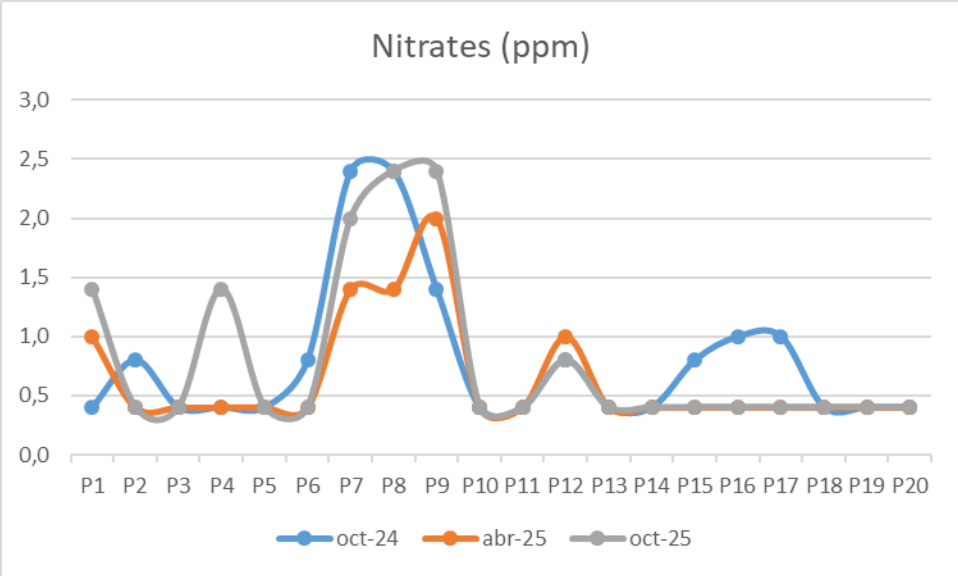

Figure 9. Nitrates variability in the irrigation water of sampling points in General San Martín Park, Mendoza

Total hardness consistently exhibited the highest values. The measurements were as follows: October 2024, 285.80 ± 34.25 ppm; April 2025, 283.00 ± 32.90 ppm; and October 2025, 291.20 ± 49.77 ppm. These values (220–420 ppm) classify the water as hard. Sampling point #7 (Alto Godoy outlet) consistently showed the highest hardness levels, as illustrated in Figure 10.

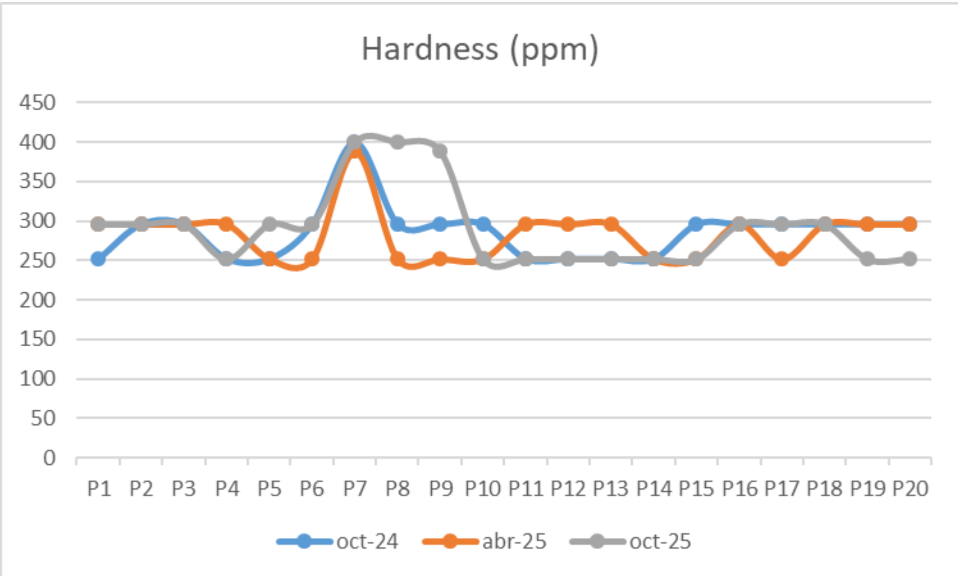

Figure 10. Hardness variability in the irrigation water of sampling points in General San Martín Park, Mendoz

Sulfate concentrations remained within the acceptable limits for irrigation (<250 ppm). Mean sulfate values were October 2024, 238.40 ± 12.94 ppm; April 2025, 238.00 ± 18.15 ppm; and October 2025, 238.00 ± 16.90 ppm. Higher but still tolerable values (250–350 ppm) were observed at sampling point #7 (Alto Godoy outlet), as shown in Figure 11. Significant differences compared to the inflow were detected at sampling points #7 and #8 (ANOVA, $p < 0.001$).

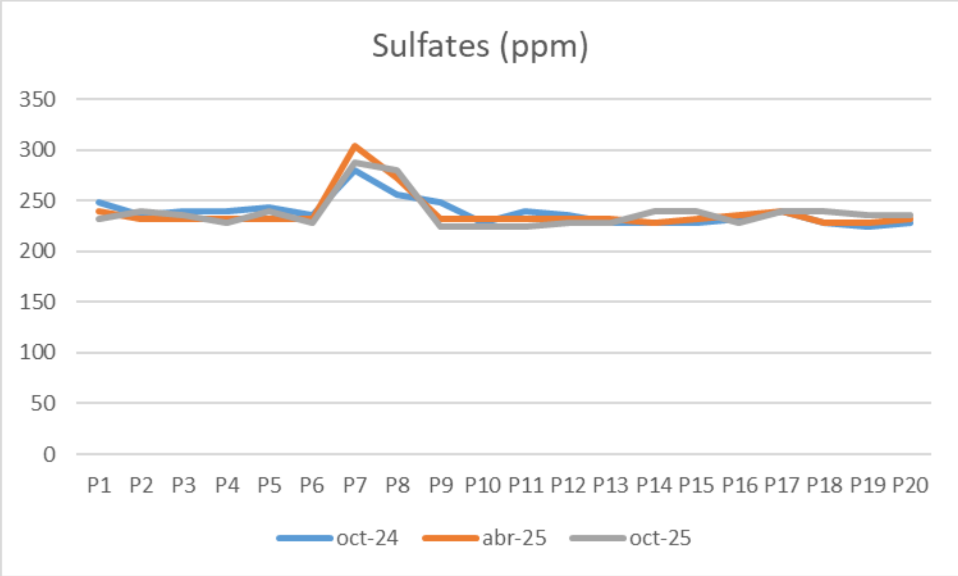

Figure 11. Sulfates variability in the irrigation water of sampling points in General San Martín Park, Mendoza

Alkalinity values remained within the moderate ranges for irrigation (50–150 ppm). Mean alkalinity values were: October 2024, 133.20 ± 7.35 ppm; April 2025, 127.40 ± 9.82 ppm; and October 2025, 130.20 ± 4.72 ppm, as shown in Figure 12. A significant difference compared to the inflow was detected at sampling point #8 (ANOVA, $p < 0.001$).

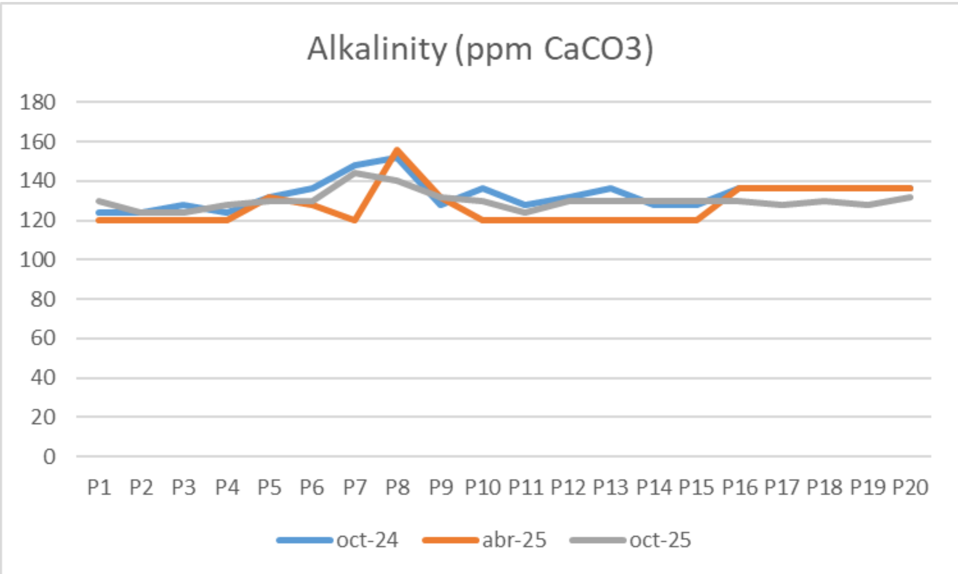

Figure 12. Alkalinity variability in the irrigation water of sampling points in General San Martín Park, Mendoza

Total mesophilic aerobic counts remained within the acceptable ranges for irrigation. (<10,000 CFU/ml), with no significant differences compared to the inflow. Mean values were: October 2024, 12.85 ± 4.68 CFU/ml; April 2025, 8.35 ± 5.55 CFU/ml; and October 2025, 19.00 ± 6.61 CFU/ml.

Root germination index values were mostly optimal (80–90%). Only sampling points #6 (UNC outlet) and #7 (Alto Godoy outlet) exhibited reduced but still acceptable values (70–75%), as shown in Figure 13. Mean root growth values of Lactuca sativa were: October 2024, 86.75 ± 3.91%; April 2025, 87.95 ± 3.12%; and October 2025, 84.80 ± 4.23%. Significant differences compared to the inflow were detected at sampling points #6 and #7 (ANOVA, $p < 0.001$), while a slight difference was observed at sampling point #11 (Los Plátanos Street) (ANOVA, $p < 0.05$).

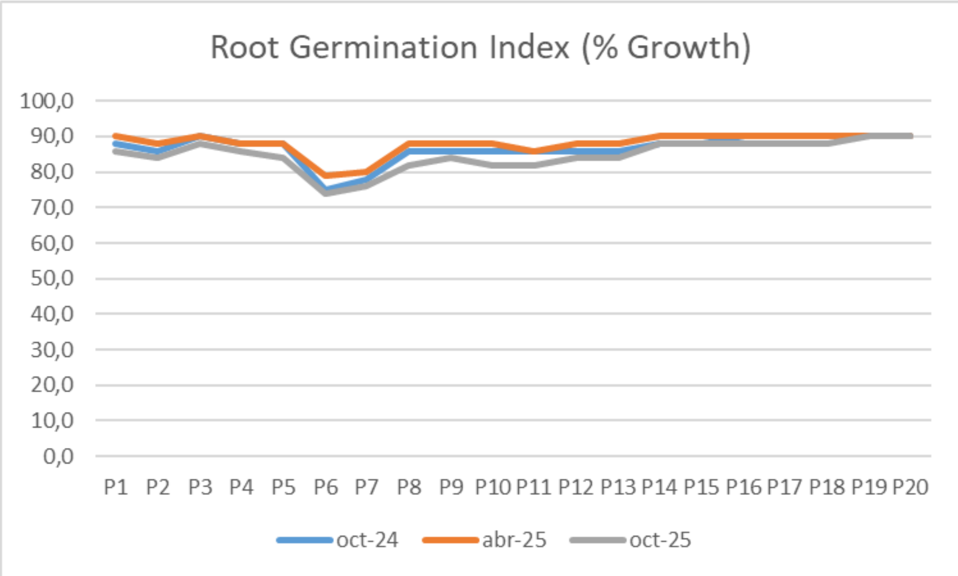

Figure 13. Root Germination Index variability in the irrigation water of sampling points in General San Martín Park, Mendoza

No evidence of anthropogenic contaminants such as bromine, copper, total chlorine, free chlorine, iron, potassium bisulfate, cyanides, lead, nickel, or petroleum derivatives was detected in the analyzed samples.

The comprehensive analysis of water quality parameters for irrigating tree species in General San Martín Park, Mendoza, Argentina, indicates that the analyzed water is of good quality for irrigation, with no significant problems related to salinity or anthropogenic toxic elements. The greatest variability was identified at sampling points #6 (Canal del Oeste/National University of Cuyo) and #7 (Alto Godoy Water Treatment Plant outlet), which consistently showed higher values, suggesting local input of solids through runoff. This variability showed seasonal patterns associated with periods of increased flow or watershed activity of the Mendoza River during spring months (October) compared to autumn months (April). Nitrate levels were consistently well below the irrigation limit (30 ppm NO_3^-), and no nitrites were detected.

3.2. Discussions

Turbidity is directly associated with the concentration of total dissolved and suspended solids, and a correlational model can be established to estimate the concentration of dissolved solids in water samples intended for forest irrigation. This finding is consistent with data reported for domestic wastewater (Bolívar-Cuartas et al., 2021) and can be linked to various environmental variables such as flow rate, discharge, and the deposition velocity of dissolved sediments (Vidart et al., 2022).

Total hardness, salinity, and alkalinity in irrigation water are associated with calcium carbonate inputs carried by runoff from the melting Mendoza River and the limestone formations of the Andes Mountains (Morábito et al., 2005). These authors also note that these mineral contributions shape salinity, which affects the suitability of water for agricultural irrigation. Seasonal variations may relate to dilution from autumn rains compared with spring, as rainfall changes the proportion of surface and groundwater flow (Lauro et al., 2022).

The observed nitrate levels may be associated with decomposing organic matter and diffuse inputs from urban anthropogenic activities (Salatino et al., 2017). However, these concentrations do not pose a risk to the park's plant species. The sulfates detected in the irrigation water of General San Martín Park may result from the dissolution of gypsum ($CaSO_4 \cdot 2H_2O$) in geological substrates transported from the Andes Mountains (Rosselot, 2017). No evidence of contamination from urban discharges or other anthropogenic sources affected the quality of the irrigation water system in the park under study, in contrast to reports from irrigation canals in Greater Mendoza (Morábito et al., 2012).

4. CONCLUSIONS

Total hardness and alkalinity in irrigation water in General San Martín Park show clear spatial patterns and strong relationships with pH and carbonate concentrations, requiring sector-specific monitoring. Current values are suitable for irrigation; however, the observed variability justifies continuous monitoring. The very low chlorine levels do not pose a risk to the trees, although points with detections (#6 and #8) require monitoring. The observed variability suggests specific sources associated with processes at the nearby water treatment plant. Low sulfate levels do not affect the quality of irrigation water for the park's trees. However, potential increases should be monitored, as they could affect more sensitive species such as ash. Seed germination indices of Lactuca sativa affected by elevated turbidity levels and the presence of nitrates serve as a sensitive bioindicator. Although they do not indicate acute toxicity, adult woody species may be more tolerant than lettuce seedlings, while chronic exposure to contaminants could compromise their long-term health. General San Martín Park hosts a diversity of tree species, many of which are tolerant to semi-arid conditions but sensitive to contaminants in water and soil. Periodic monitoring is therefore necessary to prevent progressive degradation of more sensitive tree species, particularly in a context of water scarcity and increasing urban pressure.

5. DECLARATIONS

5.1. Management Implications

These initial results on irrigation water quality in General San Martín Park constitute a baseline of contamination risk indicators and provide the foundation for periodic monitoring over time. Such monitoring will optimize resource management and enhance its potential uses, ensuring a supply of safe water for both forestry and recreational activities.

5.2. Disclosure Statement

The authors declare no conflicts of interest.

5.5. Open Access

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Table 1. *. Geospatial Info of sampling points in General San Martín Park, Mendoza*

ID	Location	Coordinates
#1	Canal del Oeste Entrance	-32.893852, -68.883338
#2	Canal Civit (Stream)	-32.894167, -68.880597
#3	Canal del Oeste (CONICET)	-32.893300, -68.874119
#4	Canal Civit (Malvinas Argentinas Stadium)	-32.889326, -68.877727
#5	Canal del Oeste (Escuela Hogar)	-32.889597, -68.874202
#6	Canal del Oeste (National University of Cuyo)	-32.884225, -68.873473
#7	Canal del Oeste (Alto Godoy Water Treatment Plant Outlet)	-32.884568, -68.873398
#8	Canal del Oeste (Libertador Street – Upper)	-32.884820, -68.872733
#9	Canal del Oeste (Libertador Street – Lower)	-32.886289, -68.865019
#10	Libertador Street and underground canal	-32.886217, -68.864102
#11	Los Plátanos Street and underground canal	-32.888424, -68.871381
#12	Thays Street and Del Grifo	-32.891484, -68.872948
#13	Boulogne Sur Mer Street and Civit	-32.886889, -68.861382
#14	Boulogne Sur Mer Street and Zapata	-32.888682, -68.861725
#15	Boulogne Sur Mer Street and Rufino Ortega	-32.889763, -68.861929
#16	Boulogne Sur Mer Street and Arístides Villanueva	-32.891655, -68.862369
#17	Boulogne Sur Mer Street and Clark	-32.894141, -68.862830
#18	Boulogne Sur Mer Street and Lamadrid	-32.898502, -68.863753
#19	Boulogne Sur Mer Street and Luzuriaga	-32.899871, -68.864096
#20	Thays Street (Golf Course Entrance)	-32.894916, -68.871413

Table 2. *Parameters tested in the irrigation water of sampling points in General San Martín Park, Mendoza*

Parameter	*Method*	*Limit of detection*
Temperature	Thermometer, pH meter(Milwaukee® PH55)	-5.0 – 60 °C
pH	Thermometer, pH meter(Milwaukee® PH55)	-2.0 – 16.0
Electrical Conductivity	Conductivity-meter/TDS (Milwaukee® T75)	0-2000 ppm
Turbidity	Turbidimeter (Arcano® TB100)	0 - 1100 NTU
Phosphates	Colorimetry (API®)	0 – 100 ppm
Carbonates	Semi-quantitative colorimetric (Tespert®).	0 - 400 ppm
Nitrates	Semi-quantitative colorimetric (Tespert®).	0 – 250 ppm
Nitrites	Colorimetry (Tetra®)	0 – 40 ppm
Total Hardness	Semi-quantitative colorimetric (Tespert®).	0 – 425 ppm
Total Alkalinity	Semi-quantitative colorimetric (Tespert®).	0 – 240 ppm
Calcium	Colorimetry (API®)	
Bromine	Semi-quantitative colorimetric (Tespert®).	0 – 20 ppm
Copper	Semi-quantitative colorimetric (Tespert®).	0 – 10 ppm
Total Chlorine	Semi-quantitative colorimetric (Tespert®).	0 – 10 ppm
Free Chlorine	Semi-quantitative colorimetric (Tespert®).	0 – 10 ppm
Sulfates	Semi-quantitative colorimetric (Tespert®).	0 – 250 ppm
Iron	Semi-quantitative colorimetric (Tespert®).	0 – 10 ppm
Potassium Bisulfate	Semi-quantitative colorimetric (Tespert®).	0 -20 ppm
Cyanides	Semi-quantitative colorimetric (Tespert®).	0 – 240 ppm
Lead	Semi-quantitative colorimetric (Tespert®).	0 – 500 ppm
Nickel	Semi-quantitative colorimetric (Tespert®).	0 – 250 ppm
Petroleum Derivatives	Semi-quantitative colorimetric (Macherey-Nagel® 90760).	0 -10 ppm
Mesophilic Aerobic	Culture Media. (Britania® Nutrient Agar)	CFU/mL
Total & Fecal Coliform	Culture Media (Chromocult®)	CFU/mL
Root Germination Index	(Bioassay with *Lactuca sativa*)	0 – 100 %