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REMOVAL OF MICROPLASTICS IN FULL-CYCLE WATER TREATMENT PLANTS

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INTRODUCTION & AIM

Microplastic (MP) pollution is a critical global concern due to its widespread presence across ecosystems and confirmed risks to human health. The ubiquity of MPs in aquatic environments, food, and human organisms necessitates an evaluation of current mitigation strategies.

This study aimed to evaluate the effectiveness of conventional full-cycle Water Treatment Plants (WTPs) in removing microplastics (MPs) by analyzing samples from two WTPs in Goiânia, Brazil (Meia Ponte and Mauro Borges).

METHOD

A comprehensive sampling campaign was conducted over six days, collecting a total of 48 L of water—24 L from the Mauro Borges Water Treatment Plant (WTP) and 24 L from the Meia Ponte WTP. Samples of raw and treated water were collected continuously, strictly respecting the 4-hour hydraulic detention time of the WTPs to ensure a representative assessment of the treatment efficacy. Microplastics were subsequently separated and isolated using a vacuum filtration system, employing a Büchner funnel and Kitasato flask. This process utilized two distinct membrane pore sizes: 5 µm and 0.5 µm. Final particle identification and morphological analysis, including image capture for documentation, were performed using a stereo microscope (Stemi 508 zeis) coupled to the camera capture system Axiocam 105 color and Sftware ZEN 2.6 blue edition.

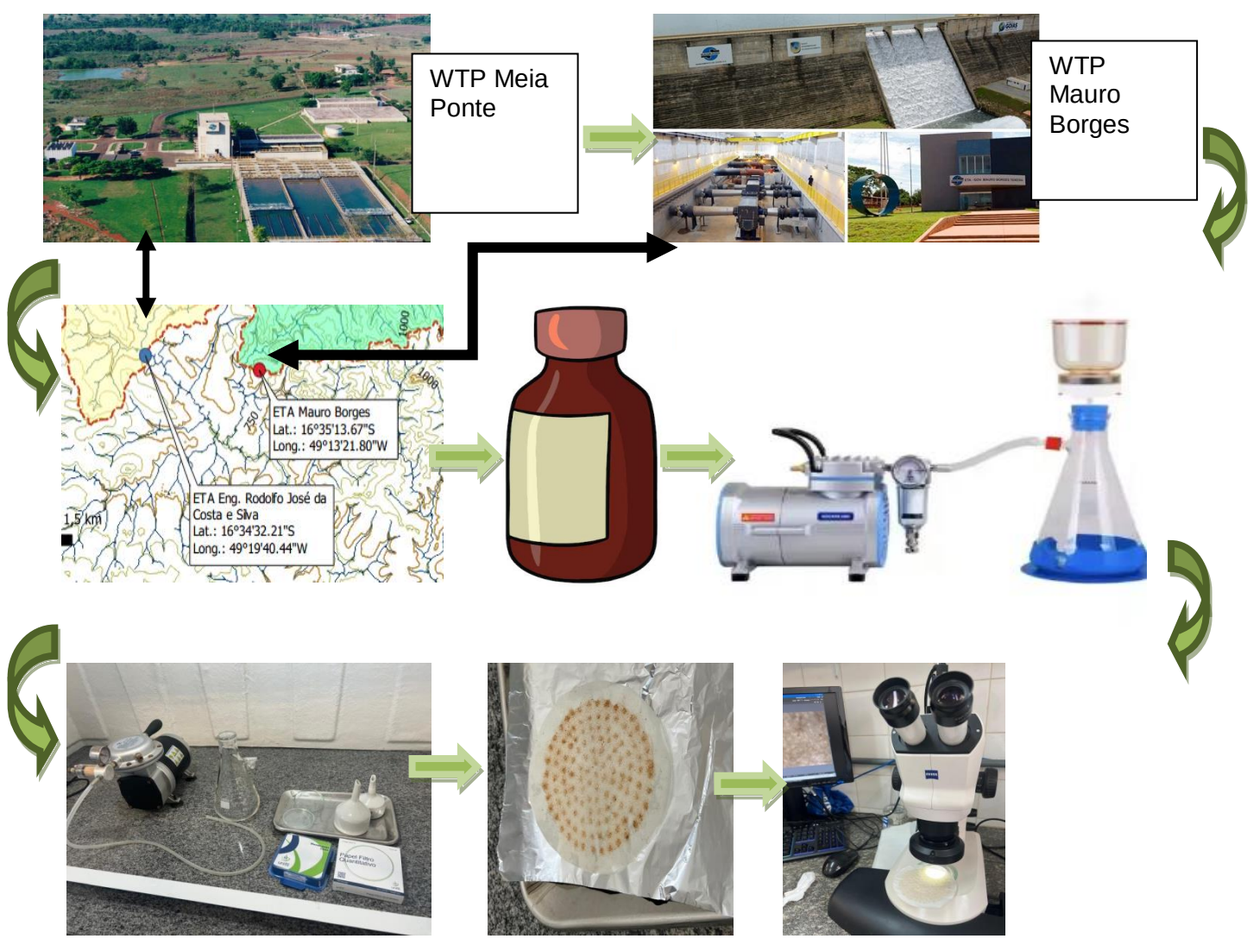

Figure1: Preparation of material experiments.

RESULTS & DISCUSSION

Results confirmed the persistence of MPs in all treated water samples, highlighting the limitations of conventional full-cycle treatment. The Meia Ponte WTP showed higher MP concentrations than Mauro Borges WTP, a difference likely due to the distinct source water environments: Meia Ponte's lotic source (continuous flow) favors MP suspension, resulting in a higher raw water load, while Mauro Borges's lentic source (slower flow) promotes MP sedimentation. This hydrological dynamic is a critical factor influencing MP load. These findings emphasize the urgent need for improved removal technologies (e.g., slow sand filtration) and further research into MP quantification, composition, and morphology for safer drinking water.

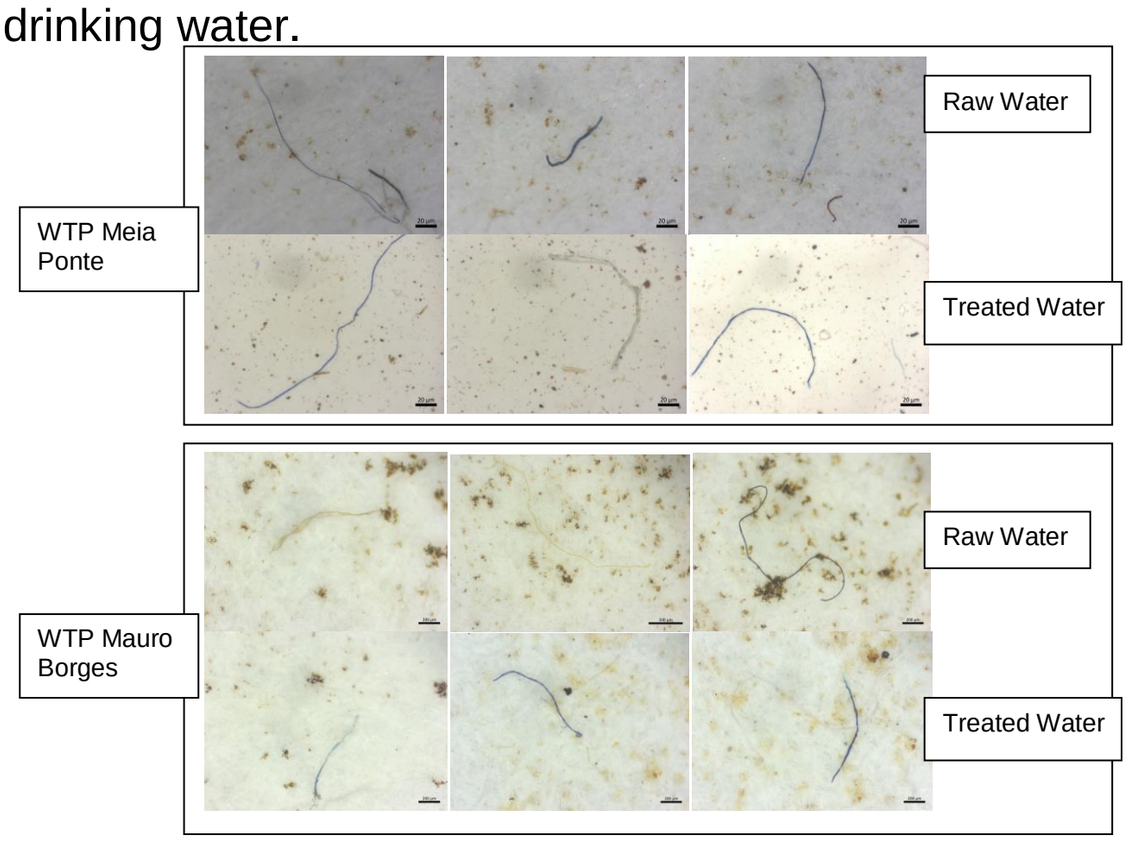

Figure 2: Results obtained.

CONCLUSION

The current study confirms the presence of Microplastics (MPs) in the treated water of both the Meia Ponte and Mauro Borges WTPs, located in the municipality of Goiânia, State of Goiás, Brazil, highlighting the significant limitation of conventional full-cycle treatment in mitigating this contaminant. Furthermore, the higher MP load at the Meia Ponte WTP is consistent with the pollutant transport dynamics of its lotic source environment, where continuous flow hinders deposition and carries particles directly to the intake. Therefore, the hydrological characteristics of the source rivers emerge as a key environmental variable influencing the raw water MP load."

FUTUREWORK/REFERENCES

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