Seasonal variation in the phytoremediation potential of *Pontederia crassipes* and its associated microbiota

Lima Filho, C.M.; de Lima, D.V.N.; Vilar, M.C.P; Rogers, R.; Vieira, A.V.G.R.; Furlanetto, A.B.P.; Azevedo, S.M.F.O.

Introduction

Eutrophication is a worldwide water quality issue characterized by enrichment of nutrients such as N and P in water bodies. A promising and sustainable way to mitigate eutrophication is the phytoremediation of nutrients by aquatic plants. A potential species for phytoremediation is the water hyacinth (*Pontederia crassipes*) which, together with its root microbes, play a role in water restoration. We compared the nutrient removal efficiency by *P. crassipes* and the composition of its root microbial community over a seasonal cycle.

Methodology

Each mesocosm (3000 L) received 30 plants. It was added weekly in the first mesocosm NPK 10-10-10 to increase soluble phosphorus concentration up to 400 µg/L.

Water samples were analyzed for the following parameters:
- Conductivity and pH;
- Nutrients (P and N);
- Dissolved oxygen;
- Temperature;
- Chlorophyll-a concentration

The dataset was analyzed by Principal Component Analysis (PCA) to assess any seasonal difference in the plant-driven water changes.

In addition, five plants from the first and the last mesocosm units were harvested weekly to assess the microbial community by examining the 16S bacterial rRNA gene.

Results

It was observed a higher removal efficiency in summer (53% of P, 17% of N) than winter (23% of P, 4% of N) and the physical-chemical parameters had distinguished values in summer and winter, mainly related to water temperature (Figure 2). The main Orders identified were Chroococcales in summer and Bacillales in winter (Figure 3).

Conclusions

Our results evidenced that seasonality may influence nutrients phytoremediation in water as well as plant microbial composition, which is probably a consequence of significant temperature variations. Therefore, although the water hyacinth plays a role in nutrients removal, its application must consider the seasonal variations.

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References
