

Differential aerobic decomposition between a native and exotic macrophytes of tropical reservoirs

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Decomposition is essential for carbon and nutrients cycling for all ecosystems (Hoorens et al., 2003). In lentic aquatic environments (e.g., lakes and reservoirs), aquatic macrophytes are the main autochthonous detritus source, and their mineralization is fundamental for maintaining biogeochemical cycles, associated with energy flux and detritus food-webs. (Bianchini Junior et al., 2014). In disturbed systems, some of these aquatic plants are potentially invasive due its high growth rates and elevated productivity (Pieterse and Murphy, 1990). The excessive growth of invasive submerged macrophytes, and consequently accumulation of biomass, provides increased rates of decomposition, leading to reductions in dissolved oxygen concentrations, changes of redox potential, increases of detritus accumulation rates and consequential changes in biogeochemical cycles (Reddy and Delaune, 2008). Considering the need for understand nutrient and carbon cycling processes involving invasive macrophytes, we compared the aerobic decomposition of two important same niche submerged macrophytes, the Brazilian native *Egeria densa* Planch. and the exotic *Hydrilla verticillata* (L.f.) Royle.

We collected and processed samples of *H. verticillata*, *E. densa* and water in the Jupuí and Porto Primavera reservoirs, both located in Paraná River Basin, Brazil (Chiba de Castro et al., 2013) and aerobic incubations and carbon fraction estimations were carried out in the laboratory (Cunha-Santino and Bianchini Junior, 2002) during 80 days. The oxygen consumption (OC) kinetics from mineralization of aquatic plant detritus was fitted using a non-linear method (Levenberg-Marquardt iterative algorithm; Bianchini Junior et al., 2014). To verify differences among aerobic decomposition, a co-variance analysis test (ANCOVA) was applied (PAST, v.2.01).

The kinetics parameterization obtained from the fitting of experimental data presented high determination coefficients; *H. verticillata* presented significant (ANCOVA; $F = 36.42$, $p < 0.001$) higher oxygen consumption than *E. densa* (Figure 1). The significant differences between the OC from *H. verticillata* and *E. densa* mineralization can be explained by the lignin content. *H. verticillata* presents 50% higher refractory fraction content than *E. densa* due

to lignin content (Chiba de Castro et al., 2013). The most recalcitrant quality of lignin, when compared with the other fibers (i.e. cellulose and hemicellulose), requires a great proportion of energy allocated to mineralization (Kourtev et al., 2002) and consequently high OC. The accentuated OC in the first days occurred due mineralization of labile compounds, displaying a high velocity and high oxygen demand. The subsequent decrease in OC is related with predominance of refractory compounds, with lower mineralization rates. Refractory fraction can be

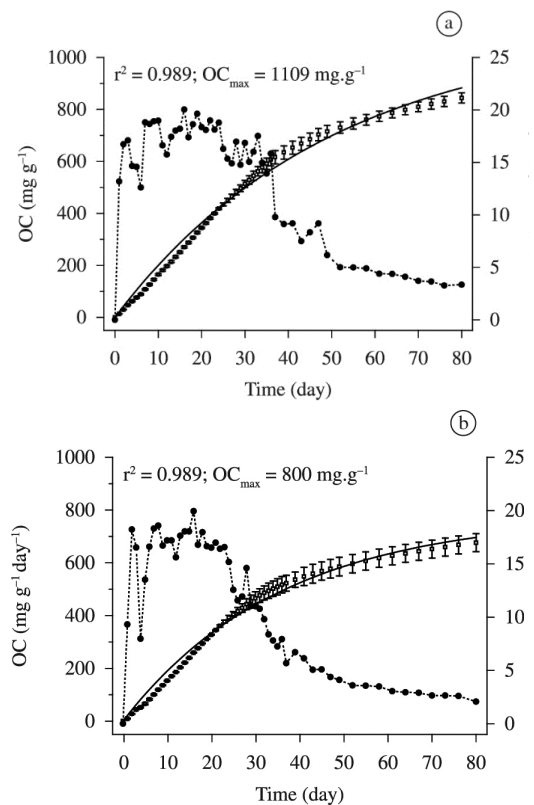


Figure 1. Temporal changes of oxygen consumption (OC) of (a) *Hydrilla verticillata* and (b) *Egeria densa* detritus in aerobic incubations.

metabolized 10 to 20 times slower than the labile fraction (Gillon et al., 1994). Changes in the species composition of plant communities could be result in changes in the enzymatic activities of the microbiota, mainly in heavily invaded communities by exotic species and could also explain these differences found (Kourtev et al., 2002). In addition, the temporal evaluation of OC allows the indirect description of microorganism metabolism as result of decay processes in aquatic ecosystems, once the recognition the proportionality among the substrate disappearance and the formation of microbial biomass products (Bianchini Junior et al., 2006).

H. verticillata and *Egeria* native species have so many ecological and morphological similarities that they probably compete in the Paraná basin (Sousa et al., 2009). However, due to faster growth, *H. verticillata* would present the highest competitive potential (Bianchini Junior et al., 2010). The higher oxygen demand of detritus and the potential dominance upon other submerged native macrophytes, provides changes in the ecosystem in medium and long term as accumulation of particulate refractory material in the sediments and the increased of anaerobic heterotrophy.

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