ENZYMATIC HYDROLYSIS OF DISSOLVED ORGANIC PHOSPHORUS IN THE EVERGLADES STA SOURCE WATERS

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Characterizing dissolved P fractions in source waters is critical to addressing questions about variabilities in the P retention performance of Everglades STAs. We compared and contrasted enzymatically hydrolysable dissolved organic P fractions in <0.2 µm using surface water samples collected from four sites [outflow from Lake Okeechobee (S354), inflow to STA-2 (S6), inflow to STA 3/4 (G370), and inflow to L8 FEB (G538)]. Water samples were incubated at 37°C with alkaline phosphatase, phosphodiesterase, or phytase for 16 hours in the dark to estimate hydrolysis of DOP and generation of soluble reactive phosphorus (SRP). Alkaline phosphatase additions hydrolyzed little (G370, S354) to no P (S6, G538). Phytase hydrolysable SRP did not differ between sites and was equivalent to about 9 to 46% of total dissolved P, with the highest phytase hydrolyzed SRP at G370, and the lowest phytase hydrolyzed SRP at S6 site. However, for the S6 site, the net SRP increase from phosphodiesterase hydrolysis of DOP was significantly larger than the other three sites. Phosphodiester hydrolysable SRP for S6 (24.1 µg L^{-1}) was almost 3-, 2.9-, and 2- folds higher than in the G538, G370, and S354 sites, respectively. As such, phosphodiesterase could hydrolyze around 78% of total dissolved P in S6, 89% in S354, 95% in G538, and 97% in G370 site. It is, however, important to note that the 0.2 µm filtered water samples used in our study had significantly lower dissolved P relative to 0.45 µm filtered samples for these same sites (e.g., 0.2 µm: range 5.4-39.7 µg L^{-1} vs. 0.45 µm range: 27-78 µg L^{-1}). Nevertheless, these results show that a significant portion of DOP in <0.2 µm fraction of STA source waters is predominantly phosphodiester hydrolysable fraction.

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