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Dissolved natural organic matter (NOM) impacts photosynthetic oxygen production and electron transport in coontail *Ceratophyllum demersum*

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Abstract

Dissolved natural organic matter (NOM) is dead organic matter exceeding, in freshwater systems, the concentration of organic carbon in all living organisms by far. 80–90% (w/w) of the NOM is made up of humic substances (HS). Although NOM possesses several functional groups, a potential effect on aquatic organisms has not been studied. In this study, direct effects of NOM from various origins on physiological and biochemical functions in the aquatic plant *Ceratophyllum demersum* are presented. Environmentally relevant concentrations of NOM cause inhibitory effects on the photosynthetic oxygen production of *C. demersum*. Various NOM sources and the synthetic humic substance HS1500 inhibit the photosynthetic oxygen production of the plant as observed with 1-amino-anthraquinone, a known inhibitor of plant photosynthesis. 1-Amino-anthraquinone may serve as an analogue for the quinoid structures in NOM and HS. Most likely, the effects of NOM may be related to quinoid structures and work downstream of photosynthesis at photosystem (PS) II.

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Keywords: Humic substances; NOM; Photosynthetic oxygen production; Electron transport; Quinoid structures