Chemical ecology of freshwater macrophytes: Limited or unexplored allelochemical interactions?

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Abstract

While much is known on the chemical ecology of plant-plant, plant-herbivore and plant-microorganism interactions in terrestrial ecosystems since the field started in the 1970s, much less is known for freshwater systems. This is surprising, since aquatic higher plants are believed to be "secondarily" aquatic, thus descending from terrestrial ancestors. Recent findings of bioac-tive compounds in a wide range of aquatic higher plants supports the notion that the field has been not well explored yet. However, many truly temperate aquatic species, i.e. submerged macrophytes, are from plant families at the base of the phylogenetic tree. Those seem to have a limited range of secondary metabolites, based on the few studies available. Among the few well studied species are members of the Haloragaceae, which have a range of fully aquatic species present throughout the world. We have investigated the multifaceted role of allelochemicals in *Myriophyllum spicatum* in the interaction with abiotic and biotic stressors. Environmental conditions such as light and macronutrient availability are differentially affecting the pool and individual polyphenols. Hydrolysable polyphenols such as the ellagitannin tellimagrandin II are involved in the inhibition of cyanobacteria and algae, as well as the deterrence of, and negative growth effects on aquatic insect herbivores. They can also be degraded by epiphytic bacteria, and *M. spicatum* shoots seem to harbor a specific epiphytic bacterial community compared to other submerged aquatic plants. From the literature overview and our case study we conclude that chemical defences in freshwater macrophytes are probably not limited but largely unexplored.

Keywords: freshwater systems, submerged macrophytes, allelopathy, hydrolysable tannin, induced chemical defense

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