Effects of soil nitrogen reduction on competition between *Phragmites australis* and *Melaleuca ericifolia*

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Summary Nutrient enrichment, particularly nitrogen, is an important determinant of plant community productivity, diversity and invasibility in wetlands. It is thought to contribute to increasing colonisation and dominance of *Phragmites australis*, especially during restoration. Manipulating soil resource availability with understanding of plant-soil microbe interactions may explain the success of some invasive plant species and thereby, such type of management tools may be required for ecological restoration. We examined competition between *Phragmites australis* and *Melaleuca ericifolia* in greenhouse with range of AC treatments followed by cutting of *Phragmites* shoots in nutrient enriched soil. Additionally, we evaluated the effect of AC on plant free microcosms in laboratory to isolate direct effects from indirect effects on soil microbial community function. Overall, the objective was to test whether lowering nitrogen availability might be an effective strategy for suppressing *Phragmites* invasion in wetland. Activated carbon significantly decreased *Phragmites* growth by increasing *Melaleuca* biomass from 41% to 68% and thereby, reduced suppressive effect significantly on *Melaleuca* at higher concentration, together with repeated cutting of *Phragmites* shoots. AC also caused significant changes to microbial community functions, namely microbial respiration, N mineralisation, nitrification, and dehydrogenase enzyme activity that could potentially explain changes in plant growth. The overall effects on plant growth, however, may be partially microbially mediated, which was demonstrated through soil microbial functions. Results support the idea that reducing community vulnerability to invasion through manipulations of resource availability with understanding of plant-soil microbe interactions may provide a promising approach to invasive species management and ecology restoration.

Keywords *Phragmites australis*, nutrient enrichment, resource manipulations, soil microbes, restoration.