

# Inhibition of soil nitrification by root exudates from Australian native plant species

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## Introduction

Regulating nitrification in soils through biological nitrification inhibitors (BNIs) released in root exudates, allows plants to optimize nitrogen use efficiency (NUE). Sorghum bicolor is an agronomically important crop which has demonstrated root exudation of BNIs. Few studies, however, have explored BNIs originating from Australian native plant species adapted to highly weathered, N-poor soils. This study aims to investigate soil nitrification inhibition by root exudates of selected Australian native plant species.

## Methods

Australian native species, Hibiscus splendens and Solanum echinatum, adapted to low-N, light-textured acidic soils, and a reference species of S. bicolor were germinated in a laboratory then transplanted to nutrient solution culture. Root exudates were periodically collected by 24 h incubation in 1mM NH<sub>4</sub>Cl, after which they were isolated by anion exchange and evaporation. The concentrated exudates were tested with a potential nitrification assay to quantify the BNI capacity of each species. HPLC-UV was used to analyse sub-samples of exudates for organic acids (OA) speciation.

## Results and Discussion

Both Australian native species significantly inhibited nitrification activity with an efficacy similar to S. bicolor of approximately 80%. While exudates of H. splendens demonstrated close to 90% reduction of nitrite, S. echinatum exudates did not. This suggests potential species variation in targeted steps of the nitrification process.

Oxalic, citric and succinic acids were identified in root exudates; Australian native species released over 7x more OAs per dry root mass. No strong correlation was found between nitrification inhibition of root exudates and the identified OAs.

## Conclusion

Australian native plant species may provide a good model for identifying BNIs as demonstrated by significant inhibitory effects from exudates of H. splendens and S. echinatum. However, organic acids do not appear to play a key role in inhibition of soil nitrification processes.