

Biosignalling Molecules and Biomass Documentation of *Casuarina equisetifolia* Inoculated with *Frankia*

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Abstract

Hopanoids are intuitive secondary biosignalling molecules of *Frankia* which is a nitrogen fixing actinomycete symbiont inducing root nodules in a diverse group of about 200 species. *Casuarina equisetifolia* is an economically important tree nodulated by *Frankia*. Some of the bioactive secondary molecules were found to be more important for establishing the root-associated growth of *Frankia* due to the presence of a mixture of mono- and sesqui-terpenoids, and fatty acid derivatives. Over 56 compounds were detected from different day culture fractions of *Frankia* using GC-MS-MS, and a total of 19, 23 and 14 components were characterized and identified in 15, 25 and 30th day cultures respectively. Some of the derivatives retained at 15th day were reported to produce vesicles in roots of *C. equisetifolia*. The analysis indicated variations in the presence of biotransformed signaling molecules, especially the hexa decanoic acid, phthalic acid and their derivatives at different stages of its growth period. The compounds, such as isoterpinolene, 2, 4, Phenol-bis (1, 1-dimethyl ethyl) and 1-Dotriocantanol produced in later stages of *Frankia* growth period tend to restrict the oxygen disturbances in the nitrogenous activity and thereby enhancing nodulation and nitrogen fixation in *C. equisetifolia*. The ureides, allantoin and allantoic acid, represent major fractions of the soluble nitrogen pool of nodulated *C. equisetifolia* throughout vegetative and reproductive growth. Allantoin content was profoundly high for the *C. equisetifolia* seedlings treated with 25th day *Frankia* culture as compared to 15th and 30th day cultures. Biosignalling compounds identified from *Frankia* culture were found to increase biomass of casuarina, especially the plant height, nodule number and nodule weight. In the present study, it was found that the *Frankia* produced a complex of bioactive compounds, like hopanoids and terpenoids at different stages during its growth period. Their role in plant-pathogen and plant-insect interactions is being studied to determine their potential in pest control.