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## Allelopathy of *Eucalyptus grandis*

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Allelopathy has been identified as an underlying mechanism of detrimental environmental impacts within commercial plantations. *Eucalyptus spp.* is known to generate huge amounts of volatile organic compounds (VOCs) that can function as phytotoxins and thus inhibit other plants. In the present study, biochemical markers, including activities of acetylcholinesterase (AChE) and oxidative stress enzymes, such as superoxide dismutase (SOD) and glutathione S-transferase (GST), were assayed to assess changes in *Eisenia fetida* at the physiological level induced by different doses of VOCs as part of an acute toxicity test over 7 and 14-day exposures. In addition, the toxicities of VOCs were investigated using a soil avoidance test and comet assay. The results revealed that *E. fetida* exhibited significant avoidance behavior towards the highest concentrations of undecane, decane, 2,4-dimethyl heptane, and 2,2,4,6,6-pentamethyl heptane. The tail DNA percentages were significantly increased for all experimental treatments relative to control. However, under the treatments of VOCs, Olive tail moment content and comet tail length also display an obvious increase compared to control, except for that of octane, undecane and decane treatments. As VOC concentrations and durations increased in the soil, activities of AChE, SOD, and GST were either stimulated or inhibited. Among the VOCs, decane, 2,4-dimethyl heptane, 2,2,4,6,6-pentamethyl heptane, and 2,4-di tert butyl phenol exerted stronger effects on enzymatic activities. In summary, VOCs in rhizosphere soils of *E. grandis* might exert a toxic impact on *E. fetida*, among which 2,4-dimethyl heptane, 2,2,4,6,6-pentamethyl heptane, and 2,4-di-tert-butyl phenol have the strongest effects. It was found that 4 and 8 year might be the important turning points for the dynamics of the allelochemicals. The effects of water-soluble allelochemicals were stronger than that of VOCs. At present, selection of the main effective phenol compounds through UPLC-MS and their physioecological effects are in progress.

### Biography

Danju Zhang has her expertise in silviculture, forest ecology, and chemical ecology. She along with her team has focused on the short rotation Eucalyptus plantations for over 25 years. She identified the volatile organic compounds and water-soluble phenol allelochemicals and evaluates their physio-ecological effects on plant and soil biota.

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