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The effects of laurel (*Laurus nobilis* L.) on development of two mycorrhizal fungi

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ABSTRACT

Hundreds of aromatic plant species are growing naturally around Mediterranean. Plant essential oils are incorporated in aromatic plant material and follow the litter fall. During litter degradation, the presence of essential oils can affect soil microorganisms. Mycorrhizal fungi have never been investigated so far under the presence of volatile oils. The aim of this study was to explore the effect of aromatic *Laurus nobilis* L. on development of two mycorrhizal species *Glomus deserticola* and *Glomus intraradices*. The response of fungi colonization and host growth were monitored under different concentrations of *L. nobilis* leaves and essential oil. The major compounds of *L. nobilis* essential oil were 1,8-cineole (49.6%), sabinene (7.8%), α-pinene (6.0%), eugenole (5.6%), α-terpinyl acetate (5.2%) and β-pinene (5.1%). Both mycorrhizal fungi colonized successfully the host plants whose growth was positively influenced by mycorrhizal fungi. *G. deserticola* presented higher infection level than *G. intraradices*. The addition of *L. nobilis* leaves in the soil resulted in mycorrhiza inhibition. The level of inhibition was positively correlated with the added amount of aromatic leaves in the soil. The essential oil presented a little higher inhibition than the leaves. The presence of this aromatic plant in many different ecosystems could contribute in mycorrhiza inhibition and it is suggested, when it's possible, reduction of laurel litter before reforestation programs.

1. Introduction

Aromatic plants make a remarkable contribution to the flora and vegetation of the Mediterranean environment. Aromatic plants contain essential oils, have the capacity to synthesize, accumulate and emit volatiles that may act as aroma and flavour molecules due to interactions with living organisms. Aromatic plants produce volatile organic compounds (VOCs) diffusing into the atmosphere and the soil. Plant foliage is the source of at least two-thirds of global VOC emissions depending on land characteristics, species composition, foliar density, and other factors (Guenther, 1997).

The fade of essential oil during degradation is significant since it is affect soil microorganisms. Plant essential oils are incorporated in plant material and follow the litter fall. Litter deposit depends primarily on the productivity of plant communities, affected by climate, soil fertility, soil water retention and species composition (Pausas, 1997). A growing interest in biologically active volatile chemicals within soil and their effect on microorganisms has been demonstrated (Joner et al., 2001; Prati and Bossdorf, 2004; Bainard et al., 2009). The majority of these chemicals when applied to soil at low concentrations (1 μl g^{-1} of soil) can increase microbial numbers and their respiration, while at higher concentrations they become inhibitory (Schlesinger and Hasey, 1981; Bowers and Locke, 2000; Kumbhar et al., 2001; Koide et al., 2005). Secondary compounds emanating have been reported to cause a shift in the microbial population structure upon contact with the soil, reducing the number of fungi and increasing the numbers of bacteria (Letessier et al., 2001; Fujii et al., 2005).

The importance of mycorrhiza is well documented by several authors. It is the mutualistic symbiosis (non pathogenic association) between soil-born fungi and roots of higher plants (Frank, 1885) to describe the union of two different beings to form a single, morphological organ, in which the plant nourishes the fungus and the fungus the plant. The most common mycorrhiza association is the AM type, found in most plant families. Arbuscular mycorrhizal fungi (AMF) invade only the primary cortex and have not been found to be present in the vascular tissue, secondary cortex or thick fleshy roots of plants, although the outer cortex may be colonized by infection hyphae (Sutton, 1973). AM fungi may play an important role as transport paths for nutrients in nutrient cycling processes (Bowen, 1980; Jehne, 1980; Thangaswamy et al., 2004; Smith and Read, 2008).

Investigations of Robinson (1972) in many mycorrhizal fungi and Rose et al. (1983) on ectomycorrhizal fungi stated the sensitivity of mycorrhizal fungi to phenolics. However, if mycorrhizal fungi are able to infect tree roots, they may render trees less

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