The Web of Mycorrhizal Fungi: Identifying Associations Between Orchids, Ceratobasidium Fungi, and Trees

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The forest ecosystem contains a mycorrhizal fungi network that interweaves different organisms and facilitates nutrient and chemical transfers. The orchid G. spectabilis is an agent in this network, as it relies on fungi in the genus Ceratobasidium to germinate and grow. However, the relationship between orchids and fungi can be further complicated when these fungi simultaneously associate with other plants. Fungi that partake in this secondary relationship are called ectomycorrhizal (ECM) fungi and revealing whether or not G. spectabilis associates with ECM fungi is both essential for its conservation and key for understanding the complexity of forest ecosystems. Finally, as only a few studies have found Ceratobasidium to be ECM, this study can begin to show how widespread ECM associations are in Ceratobasidium fungi. A two-fold test was used to determine if an ECM relationship exists.The first test was an isotopic analysis of the orchid leaves, since ECM fungi would provide their hosts with a greater ratio of isotopes 15N and 13C. Second, the tree roots surrounding the orchid were amplified with primers specific to fungi used by G. Spectabilis. The isotopic analysis revealed a significantly higher concentration of 15N ($p<0.001$) and 13C concentration ($p=0.04$) in the orchid samples, suggesting a reliance on ECM fungi. The presence of the correct Ceratobasidium strains in both the amplified product and the DNA sequences indicated that the orchid's fungi associate with tree roots. Collectively, these results confirm an ECM association between this strain of Ceratobasidium fungi and trees.

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Second Award of $2,000