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Phylogenetic relationships among Australian and South American orchid mycorrhizal fungi

Orchids depend on a highly specialized mycorrhizal fungal association for seed germination. Orchid mycorrhizal fungi (OMF) typically belong to the form genus *Rhizoctonia*, a group of basidiomycetes comprised of several genera including the binucleate genera *Ceratobasidium* and *Tulasnella*; and the multinucleate genera *Thanatephorus* and *Sebacina*. *Ceratobasidium* species are some of the most common OMF reported and have been found in orchid species from Europe, North America, Tropical America and Australia. *Ceratobasidium* isolates from South American orchid species were placed in four clades and those from Australian orchid species in eight, but the relationship between these OMF and other *Ceratobasidium* species is not yet clear. The main aims of this study are to use the nuclear ribosomal internal transcribed spacer region (ITS) to:

- 1) Determine the relationship between *Ceratobasidium* isolates from terrestrial and epiphytic orchid species of Australia.
- 2) Determine the relationship between *Ceratobasidium* isolates from Australian, Puerto Rican, and Central American orchid species.
- 3) Place these OMF into a more general phylogeny of *Rhizoctonia* like fungi.

Phylogenetic analysis of the ITS region has revealed complex an ecological web of associations amongst the fungal genus *Ceratobasidium*. Australian terrestrial orchid species of the genus *Pterostylis* were shown to be highly specific in their OMF relationship and these isolates were most closely related to *Ceratobasidium* AG-H and *Ceratobasidium* AG-D, both potential plant pathogens. Isolates from the Puerto Rican terrestrial orchid species *Erythrodes plantaginea* were most closely related to *Ceratobasidium* AG-A, an isolate from strawberry.

Like these terrestrial Puerto Rican orchid isolates, OMF from Australian epiphytic orchid species were also shown to be similar to a *Rhizoctonia* like isolate from strawberry, *Ceratobasidium* AG-B(o). Additionally these Australian epiphytic OMF were more closely related to three of the four clades of OMF from epiphytic orchid species from Central America and the Caribbean then they were to OMF from terrestrial Australian *Pterostylis* species. Furthermore, these Central American epiphytic OMF clades were closely related to soil fungi from Japan: *Ceratobasidium* AG-S and *Ceratobasidium* AG-Q. Additionally the combined phylogeny reveals that isolates previously identified as *Ceratobasidium cornigerum*, may have been misidentified as this species appears polyphyletic.