Mycorrhizal associations of fungi and plants are usually viewed as mutually beneficial, but some non-photosynthetic plants cheat their fungal partners. Molecular tools can now be used to identify the fungi being exploited.

Figure 1 Partners in an epiparasitic symbiosis.

a. Spores of Glomus sinuosum, a species of arbuscular mycorrhizae (AM) fungus closely related to the species that Bidartondo et al. find is associated with the non-photosynthetic plant Arachnitis uniflora.
b. The flower of A. uniflora.
simulating natural plant communities, species of Glomales differ in their ability to promote growth of particular plant hosts. The underlying mechanisms responsible for these differential growth effects are unknown. Bidartondo and colleagues’ study raises the tantalizing possibility that asymmetries in fungus-mediated transfer of carbohydrates between plants could be a factor.

The new work is significant because it demonstrates that Glomales, which produce by far the most common form of mycorrhizae, can be drawn into epiparasitic associations. It also joins a growing body of research suggesting that mutualisms are not stable endpoints in evolution, but are inherently unstable and can be disrupted by conflicts of interest among the partners. The breakdown of mutualisms can lead to parasitism or even the complete dissolution of the symbiosis. In the groups studied by Bidartondo et al., the plants are parasitic on AM fungi and their associated green plants. At the other extreme, an AM fungal species, Glomus macrocarpum, has been implicated as the cause of stunt disease of tobacco plants.

Clearly, the characterization of AM symbioses as benign, stable associations does not reflect their dynamic nature. Functional and ecological studies are now needed to quantify the costs and benefits of mycorrhizal symbioses and to understand what causes them to shift along the continuum from mutualism to parasitism.

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