

Chapter 32

Evolutionary Aside 32.2--Origins of Mycorrhizae

Several approaches using both fossils and extant plants have been used to investigate the origins of the plant–mycorrhizae symbiosis. Arbuscular mycorrhizae have been associated with plants for over 400 million years. The most compelling evidence comes from the discovery of a fossil *Aglaophyton major* plant with arbuscles. *A. major* lacked vascular tissue and had rhizoids rather than true roots. It was a very simple plant with branching stems that terminated in reproductive structures called sporangia. Its arbuscles, however, were morphologically identical to modern day arbuscles.

Additional supporting data comes from comparing the rRNA sequences of 12 living species of arbuscular mycorrhizae fungi. Based on difference in sequence, it was estimated that these fungi shared a common ancestor 462 to 353 MYA, well within the 400-million-year dating of the *A. major* fossil.

Based on morphology, *A. major* appear related to the bryophytes (mosses). Obtaining evidence of mycorrhizal associations with earlier land plants has been difficult because of the lack of fossils. In a clever experiment, liverworts, which are argued to be the closest living relative to early land plants, were treated with and without mycorrhizae. Those treated with mycorrhizae had enhanced growth, supporting the claim that mycorrhizae–plant symbiosis were critical in the colonization of land.