

Plant Pathology Seminar Series



“The mutualism-parasitism continuum: Arbuscular mycorrhizal fungi and their interactions with plants”

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Abstract:

Arbuscular mycorrhizal fungi (AMF) are obligate biotrophs that associate with the root systems of the vast majority of vascular plants. They develop extensive hyphal networks that allow them to absorb water and nutrients from the soil. Through specialized, intracellular interfaces called arbuscules in roots of their host plants, they absorb photosynthates from the plant and transfer nutrients from the soil, mainly phosphorous, into the plant (Bonfante and Genre, 2010). AMF have evolved alongside plants for around 450 million years and can provide them an array of benefits via this carbon-phosphorous trade (Chagnon et al., 2013). The dynamics of this trade are influenced by both biotic and abiotic factors, causing a growth differential in their hosts known as the mycorrhizal growth response (MGR). Depending on species interactions and environmental conditions, MGR can trend positively or negatively, causing the relationships between AMF and their hosts to be seen as either mutualistic or parasitic. This sliding scale of plant-AMF relationships has been referred to as the mutualism-parasitism continuum (Johnson et al., 1997). Since this concept's proposal, many research groups have conducted studies to gain insight into the workings of the continuum and how it is influenced by various environmental factors, such as nutrient and light availability (Olsson et al., 2010; Reynolds et al., 2005). After over a decade of research on the nature of these interactions, an indirect phosphorous-transfer pathway was discovered (Grace et al., 2009). This pathway is present even in relationships that would be classified as parasitic on the continuum, triggering a discussion on the applicability of the original continuum model (Johnson and Graham, 2013). This led to three different interpretations of the continuum, with focuses on overall outcomes, biological processes, and plant fitness (Smith and Smith, 2013). While the concept of the continuum did not change much following this dialogue, the research involved, and the questions posed throughout it have affected the direction of contemporary studies. Recent studies have been using the traditionally outcome-based interpretation of the mutualism-parasitism continuum but have begun to account for the nature of the underlying processes as well (Basyal and Emery, 2021; Harrower and Gilbert, 2021). The future of this research has major implications for ecology and restoration efforts. Additionally, the more we understand how AMF interact with plants and which factors influence their tendencies to help or hinder plants, the more viable they become for applications in agriculture.

4:10 pm | November 1st, 2021 | Plant Pathology 515, Fall 2021
Zoom Link: <https://wsu.zoom.us/j/94763621072>
Meeting ID: 947 6362 1072
Passcode: 3710
Call in number: 1 253 215 8782



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