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# Arbuscular mycorrhizal fungi make a complex contribution to soil aggregation

Peter McGee, Cathal Daynes, and Field Damien
University of Sydney, Australia (peter.mcgee@sydney.edu.au)

Soil aggregates contain solid and fluid components. Aggregates develop as a consequence of the organic materials, plants and hyphae of arbuscular mycorrhizal (AM) fungi acting on the solid phase. Various correlative studies indicate hyphae of AM fungi enmesh soil particles, but their impact on the pore space is poorly understood. Hyphae may penetrate between particles, remove water from interstitial spaces, and otherwise re-arrange the solid phase. Thus we might predict that AM fungi also change the pore architecture of aggregates. Direct observations of pore architecture of soil, such as by computer-aided tomography (CT), is difficult. The refractive natures of solid and biological material are similar. The plant-available water in various treatments allows us to infer changes in pore architecture. Our experimental studies indicate AM fungi have a complex role in the formation and development of aggregates. Soils formed from compost and coarse subsoil materials were planted with mycorrhizal or non-mycorrhizal seedlings and the resultant soils compared after 6 or 14 months in separate experiments. As well as enmeshing particles, AM fungi were associated with the development of a complex pore space and greater pore volume. Even though AM fungi add organic matter to soil, the modification of pore space is not correlated with organic carbon. In a separate study, we visualised hyphae of AM fungi in a coarse material using CT. In this study, hyphae appeared to grow close to the surfaces of particles with limited ramification across the pore spaces. Hyphae of AM fungi appear to utilise soil moisture for their growth and development of mycelium. The strong correlation between moisture and hyphae has profound implications for soil aggregation, plant utilisation of soil water, and the distribution of water as water availability declines.