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Opinion

Beneficial Plant-Fungus Interactions in Mycorrhizal Symbiosis: Mechanisms

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INTRODUCTION

Mycorrhizal fungi are a broad group of fungal taxa that are found on the roots of more than 90% of all plant species. The genome and transcriptase study of numerous symbioses has just been completed using cutting-edge molecular and genetic methods in combination with high-throughput sequencing and sophisticated microscopy. Plant-fungal signalling networks have been identified, and the discovery of many new nutrient transporters has revealed some of the physiological processes that underpin symbiosis. As a result, the roles of each partner in a mycorrhizal connection are beginning to emerge. This new information can now be used to agricultural techniques [1].

N2O is a powerful greenhouse gas that contributes to global warming by destroying the protective ozone layer in the stratosphere. Its emissions from soil are regulated by ecological processes that are yet poorly understood. The presence of Arbuscular Mycorrhizal Fungi (AMF), a dominating group of soil fungi that develop symbiotic connections with the majority of land plants and influence a variety of essential ecosystem activities, can reduce N2O emissions from soil, according to this study [2]. We used two separate techniques (sterilised and re-inoculated soil and non-mycorrhizal tomato mutants) and two different soils to test for a functional association between AMF and N2O emissions in two independent greenhouse trials. When compared to microcosms with a well-established AMF community, N2O emissions increased by 42 and 33 percent in microcosms with low AMF abundance, implying that AMF regulate N2O emissions [3].

Increased N immobilisation into microbial or plant biomass, reduced concentrations of mineral soil N as a substrate for N2O emission, and altered water relations could all contribute to this. Furthermore, the abundance of important genes involved in N2O production (nirK) and N2O consumption (nosZ) was inversely linked with AMF abundance, demonstrating that AMF-induced alterations in the soil microbial community regulate N2O emissions. Our findings show that disrupting the AMF symbiosis through agricultural intensification may contribute even more to increasing N2O emissions [4].

Mycorrhizal fungi make up around 10% of all known fungal species, including nearly all of the Glomeromycota and significant portions of the Ascomycota and Basidiomycota. Arbuscular, ericoid, orchid, and ectomycorrhiza are some of the different forms of mycorrhizal connections. ectomycorrhizal and orchid mycorrhizal fungi are the most speciose forms of mycorrhizal fungi, and each of these types emerged from numerous distinct evolutionary events followed by convergent evolution. Fungal diversity has been aided by coevolution between mycorrhizal fungi and plants, although fungal diversification has not always followed plant diversification, and only a few fungus have strict host specificity [5].

The majority of mycorrhizal fungi rely heavily on plant photosynthate for energy; AM fungi are obligatory biotrophs, whereas EM and ericoid fungi are saprotrophic biotrophs. Although it's difficult to calculate the carbon cost of mycorrhizas, field and laboratory studies imply that plants contribute 10-20 percent of net primary production to their fungal partners.

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