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Integrated responses of mycorrhizas to nutritional and biotic stresses

Session 1

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Among the biological inducers of resistance, mycorrhizal fungi are one of the most widespread in natural systems, mycorrhizal plants are extremely sensitive to environmental challenges and react faster against abiotic and, as we showed recently, can also confer resistance against the necrotrophic fungus *Botrytis cinerea*, so called mycorrhiza-induced resistance (MIR). The benefits of AM symbiosis in plants have been widely studied in terms of P uptake but few studies have described the effect on N uptake and metabolism. As nitrogen depletion in plants have been showed to increase susceptibility to pathogen infection, the AMF uptake of N in low N environments may confer competitive advantages for the host. AM plants subjected to N depletion showed a metabolic priming profile. They showed an enhanced NRT2.1 and 2.3 gene expression, both known as nutritional status sensors and a significantly altered JAZ and DELLA gene expression. Mycorrizal symbiosis antagonizes the negative impact of N starvation on the amino acid and N rich compounds metabolism in tomato plants. Thus, even thought nitrate depleted tomato plants become more susceptible to *Botrytis cinerea* infection, AM plants perceive more efficiently N depletion than non-mycorrhizal plants and activate the hormone regulation responses faster and stronger. The AM protects tomato plants by reducing fungal hyphae development and promoting a strong accumulation of callose around the penetration points. However, nitrate depleted plants were less protected by the AM and accordingly they produced less callose upon infection. These results suggests that both events, the AM-priming and nitrate depletion induced susceptibility play a role in the tomato defence against *B. cinerea* by additive non-linked mechanisms.