iberian PLANT BIOLOGY 2023

Braga Portugal
9-12 July

XVIII Portuguese Spanish Congress of Plant Biology

XXV Meeting of the Spanish Society of Plant Biology

BOOK OF ABSTRACTS

Portuguese Society of Plant Biology

Spanish Society of Plant Biology

IS1-2

Mycorrhiza induced resistance against pests: from the lab to the field

Maria José Pozo[1], J. Lidoy[1] J. Rivero[1], Z. Minchev[1], B. Ramirez[1], L. Dejana[1], A. Frattini[2], J.M. Garcia[1], E. Berrio[1], M. Garcia-Alonso[1], M. Aguirrebengoa[3], E. Benitez[3], L. España[1], A. Ramos[1], A. Martinez Medina[3], S. Herrero[2], V. Flors[4], C. Azcón[1], J.A. Lopez Raez[1]

[1]*Department of Soil and Plant Microbiology, Estación Experimental del Zaidín (CSIC), Granada, Spain,*

[2]*University Institute of Biomedicine and Biotechnology (BIOTECMED), Department of Genetics, Universitat de València, Spain,*

[3]*Plant-Microorganism Interactions Unit, Institute of Natural Resources and Agrobiology of Salamanca (IRNASA-CSIC), Salamanca, Spain,*

[4]*Department of Biology, Biochemistry and Natural Sciencies, Universitat Jaume I, Castellón, Spain*

Arbuscular mycorrhizal fungi (AMF) can prime plant defences increasing their resistance against pathogens and insect herbivores. Using tomato as a model, we have shown that inoculation with different AMF reduces the performance of the chewing herbivore *Spodoptera exigua* and the leaf miner *Tuta absoluta*. Transcriptomic and metabolomics analyses revealed that this Mycorrhiza Induced Resistance (MIR) is associated to boosted activation of plant direct and indirect defences in response to the attackers. We found primed accumulation in attacked leaves of antiherbivore metabolites, including alkaloids and polyamine conjugates, and functional analyses demonstrated that some of the identified compounds significantly inhibit herbivore development. In addition, the symbiosis altered the volatile blends released by the plant, and enhanced the attraction of natural enemies of the pests (*Nesidiocoris tenuis*, commonly used in biocontrol programs). Finally, networks analyses allowed the identification of key regulators of the primed response within the jasmonic acid and ethylene signalling pathways.

Despite the many studies showing induced resistance by microorganisms in different plant-pest systems, the variability in the protection achieved under agronomic settings is hindering the application of this strategy in agriculture. Plant-microbe-herbivore interactions are highly context dependent, with multiple biotic and abiotic factors influencing the final output. Identifying such factors is essential to optimize the application of microbial inoculants for crop protection in agriculture. We found that the plant genotype and nutrient availability are important drivers of the context dependency of MIR in tomato. Despite of the variability, comparisons across different experimental scales, from controlled lab set-ups to commercial production conditions, confirmed that MIR can be achieved under crop production conditions and is compatible with other biocontrol methods. Accordingly, MIR can be a relevant addition to current Integrated Pest Management Programs.