SESSION VI
INSECTS AND MICROORGANISMS

Trichoderma confers resistance to tomato plants against *Spodoptera littoralis* larvae by disrupting the symbiotic role of their gut microbiota

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Beneficial fungi belonging to the genus *Trichoderma* are important biocontrol agents of fungal pathogens and promotes plant growth. Here we investigate how the interaction between tomato plants and a phytophagous insect, *Spodoptera littoralis* (Lepidoptera, Noctuidae), can be driven by hidden interactions involving their respective microbiotas. We describe the mechanism underlying this insect-plant interaction as modulated by the colonization of tomato roots by strain T22 of *Trichoderma afroharzianum* (T22-plants). Larvae fed with T-22-plant leaves show a marked and significant reduction of their growth, delayed development and a much higher mortality, compared to controls.
Since the observed negative effects on survival and development could be mediated by the fungal induction of plant defense barriers targeting midgut functionality and thus its physiology, the midgut structure, its enzymatic profile and transcriptional activity were investigated as well as the composition and functional properties of gut microbiota. The changes induced in tomato plant by the fungus do not cause structural damage to the gut and/or alterations of its digestive capacity, but mediate gut dysbiosis in *S. littoralis* larvae. This dysbiosis is largely responsible for the reduced nutritional support by the gut microbiota to the host and the consequent negative impact on insect development and survival. Indeed, this phenotype can be fully rescued by oral administration of the functional *S. littoralis* gut microbiota or of the bacterial species *Enterococcus casseliflavus*, the symbiont that accounts for most of the changes in the metatranscriptomic analysis of the microbiota. Our results shed new light on the role played by a soil microorganism in the modulation of an interkingdom competition influencing nutritional resource allocation, laying the foundation for the development of sound strategies for the sustainable management of agroecosystems and for an in-depth assessment of the ecological impact by biocontrol agents.

KEY WORDS: Holobionts, insect-plant interactions, insect gut microbiota, soil microbiota.

ORAL PRESENTATION