Transcriptomics and metabolomics to characterize and identify fungal metabolites phytotoxic to *Phelipanche ramosa*, a parasitic plant of crops

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Branched broomrape (*Phelipanche ramosa* (L.) Pomel), an holoparasitic root weed with a wide host range, is known for its devasting effects on many crops worldwide. Soil fungi, notably *Fusarium* sp. are described as pathogenic to broomrape with the hypothesis of the production of phytotoxic fungal metabolites. The framework of my project is the search for phytotoxic fungal metabolites for *P. ramosa* using four *Fusarium* sp. strains, isolated from symptomatic branched broomrapes and identified as a promising candidate for *P. ramosa* biocontrol. For this purpose, a multi-omics approach combining genomics, transcriptomics and metabolomics is used and will i) provide a more detailed understanding of the molecular and biochemical mechanisms involved in the interaction between pathogenic fungi and *P. ramosa* ii) enable the identification of functional clusters with a pangenomic approach by the comparison of fungal genomes iii) determine if these metabolites are constitutively expressed in response to the host plant exudates. In this presentation I presents you a part of my work, recently submitted, that investigated fungal metabolites phytotoxic for *P. ramosa* and produced by the *F. venenatum* MIAE02836 strain. The methodology developed combined quantification of necrosis on broomrape microcalli by image analysis and characterization of potential phytotoxins by untargeted metabolomics. Phytotoxicity tests of crude extracts from the fungus alone or in presence of broomrape on *P. ramosa* microcalli and quantification of necrosis by image analysis confirmed the phytotoxic potential of *F. venenatum* MIAE02836 metabolites towards the early developmental stages of *P. ramosa*. Untargeted metabolomics data analysis revealed numerous metabolites produced by the strain of which four metabolites, accumulated in presence with the parasitic plant, are known for their phytotoxic potential: maculosin, cyclo(Leu-Phe), phenylalanyl-D-histidine and anguidine. These results suggest that combining image acquisition of the microcalli screening test and untargeted metabolomics is a relevant method to characterize fungal phytotoxins and opens up interesting prospects for the use of these later to control *P. ramosa*.