FuSloN

Project title: Role of nitrogen in plant-fungal pathogen interactions during seedling establishment

Acronym: FuSloN (Fungus Seedling Interaction Nitrogen)

Project duration: 36 months – Start date: 01/10/2018 End date: 30/09/2021

Key-words: Arabidopsis thaliana, Alternaria brassicico/a, Sustainable agriculture, Defence responses, Nitrate transporters, Nitrogen metabolism, Nutrition, Signalling.

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Summary:

Context
Successful crop establishment relies on the ability of the seeds to germinate ahd establish seedling rapidly and uniformly. However, early stages of plant development are highly susceptible to environmental variations. With the development of sustainable agriculture, limitation of chemical uses for plant fertilization (nitrate supply) also concerns these early stages. ln addition, rules and laws regarding seed treatments will dramatically evolve in the next future leading to reduction of seed treatments for example with fungicides. ln this context, the control of seed-borne fungal pathogens present on seeds or in the soil will be less efficient, increasing the risk for seedlings to be exposed to disease development. Nitrogen (N) is a metabolic resource at a central place of plant-fungal pathogen interactions. On one side, pathogens require N for their development and infection process. On another side, seedling development also requires N, which can be provided from seed reserve rhobilization, but also from nitrate, a naturally occurring form of N in the soil and a nutrient known to regulate seedling growth as a signal molecule. The levels of nitrate supply may also dramatically affect the interplay between host and pathogen for N acquisition. ln this context, the role of N in the plant-fungal pathogen interactions during seedling establishment taking into account various nitrate supply levels requires investigation.

Goals
This project, which gather expertise of two teams of UMR IRHS "Seedling, Metabolism and Stress" (SMS) and "Pathologies fongiques des semences" (FungiSem), aims at deciphering the role of nitrogen in plant-fungal pathogen interactions during seedling establishment, using the pathosystem Arabidopsis thaliana ,-Alternaria brassicicola, a seed-borne necrotrophic pathogen causing damping-off disease of sèedlings leading to important economic lasses.

Methodology
Plant stages from seed germination to se·edlings with four rosette leaves will be considered. Experiments will be carried out at two contrasting nitrate levels, corresponding to the natural'concentration in à non-fertilized soil and to a noh-limiting one, and taking advantage of èompariso·n of the wild-type Col-0 Arabidopsis genotype with mutants for the gene AtNPF6.3 encoding a nitrate sensoHransporter. Following this strategy; the importance of nitrate supply for·the susceptibility of Arabidopsis to A. brassicico/a.will be assessed during seed germination and seedling development as a function of nitrate supply conditions. Metabolite profiling i.e. contents of nitrate and amino acids, hormones involved in- plant defence signalling· pathways, defence metabolites, and expression . of plant and fungal genes potentially involved in N metabolism and ç:lefence during the p1ant-pathogen molecular interactions will be.analysed during .seedling development after seed inoculation with A. brassicicola.