




Plasmodiophora brassicae infections under drought stress – phenotypic assessment of the infection in different host plants under a hot and cold drought.

Aim of the study

Plasmodiophora brassicae is a soil-borne obligate parasite which causes clubroot disease in brassicas. Infections with *Plasmodiophora brassicae* can lead to gall formation on the roots and reduced growth of the host plants, causing annual crop losses of 10 % making it one of the economically most important pathogens of cruciferous crops. Different brassica species like *B. rapa, B. napus, B. juncea* but also *Arabidopsis thaliana and A. arenosa* are potential hosts of this parasite. During the infection many markers for drought stress are enhanced in the host plant, while the parasite prefers cool temperatures and high soil moisture. With global change an increase in drought but also in extreme events such as (flash) flooding are expected.

The aim of this master thesis is the characterization of the parasite-host interaction of *P. brassicae* with different host species under (a) a hot summer drought, (b) a cold winter drought and (c) under relief of the drought and (d) a control experiment. Co-cultivating selected brassicas and P. brassicae will generate phenotypical data. Additionally different microbiological and molecular methods, such us microscopy, PCR and qPCR, will be used to quantify and investigate the infection process and to describe the behaviour of *P. brassicae*. We will analyse differences and similarities between the selected hosts and treatments to better understand the impact of an infection with P. brassicae under drough and drought relieve experiments and to formulate hypothesis about the impact of extensive droughts on the pathogen. We will design the experiment to test (i) the increased severity hypothesis, where infections will induce stronger and more symptoms in the host plant and where pathogens accumulate in the soil, (ii) the reduced severity hypothesis, where the infection will be more rare and symptoms will be milder and the (iii) pathogen extinction hypothesis, where no infections will take place under extended drought conditions.

Experimental design

- greenhouse and growth chamber experiments using artificially infected potted plants.
- planned are 2-3 experiments over ca 6 month.
- lab work and data analysis are continuous once a sub-experiment has started.

Methods

- co-cultivation of host-parasite
- phenotypical investigation of the interaction using the phenotypical platform Phenospex® and by manual phenotyping
- detection and quantification of *P. brassicae* via DNA and RNA extraction, PCR, qPCR
- microscopy for microbiological characterization of the interaction
- chlorophyll measurements using HPLC, analysis of the metabolome
- data analysis of the obtained data and data mining
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