M2 student internship - 2020

Title: Effect of microclimatic factors on the efficacy of a biocontrol agent.

Contact:
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Context:
Biocontrol agents are promising tools to reduce the use of chemical pesticides in agriculture. Moreover they represent one of the few means of intervention in organic farming, which makes the success of their use particularly important. Due to their special characteristics (living organisms), the deployment of microbial biocontrol agents is more complex than applying chemical molecules. This can hinder their adoption and foster the variability of their efficacy. Taking this complexity into account would make their use more reliable. Thus, to facilitate advice to farmers, it is necessary to develop decision support systems (DSS), integrating the determinants of efficacy of the biocontrol agents. Among the different factors that can influence the protective efficacy of biocontrol, microclimatic conditions are known to impact survival, establishment and activity of microbial agents on or around the plant.

Objectives:
The internship will be part of a project that aims to analyze the impact of microclimatic factors (temperature and relative humidity) on the severity of tomato powdery mildew and on the efficacy of the biocontrol agent *Ampelomyces quisqualis*. The specific objectives of the internship will be:
(1) to carry out a review of the scientific literature to identify the effect of microclimatic factors on the development of the disease and on the efficacy of the biocontrol agent, (2) to statistically analyze data from previous work (controlled-condition experiments and field trials), and (3) to generate new data to complement the available information.
This study is part of the PhD project BiOAD of Thomas Pressecq: "Development of decision support systems to promote the use of biocontrol".

Activities:
This work will involve a critical analysis of the scientific literature, statistical analyses of data and the realization of biological experiments. A set of data already obtained in our laboratory, from controlled-condition experiments and field trials, will be analyzed with different statistical models (general linear mixed models, multivariate analysis…). In a first step, analyses will be carried out on the development of disease in absence of biocontrol treatments, to quantify the effect of microclimatic variables on the severity of powdery mildew and to understand to what extent they are good predictors of this severity. In a second step, the analysis of data on treated plants treated will help to understand how these microclimatic factors contribute to the protective efficacy of the biocontrol agent. This is an essential first step before the ultimate development of a DSS. In order to generate new data to complement existing information, additional experiments will be carried out on whole plants in phytotrons and/or in 128m^2 plastic tunnels fully-equipped with climatic sensors.

Lab description:
The research objective of the INRAE Plant Pathology research unit is to contribute to the development of effective and durable plant disease control methods that are compatible with a high-quality agricultural production mobilizing the principles of agroecology. To this end our unit has computer resources, fully-equipped microbiology laboratories as well as experimental facilities (greenhouse intended for the production of healthy plants, phytotrons, experimental fields) necessary for the realization of the project.

Prerequisite skills and main competence acquired:
Skills: interest in statistical analysis and field work, knowledge of statistical software (preferably R), knowledge on plant pathology and biocontrol would be appreciated.
Competence acquired: acquisition of scientific writing methods in English, critical analysis of the bibliography, statistics, phytopathology techniques, design and implementation of experiments.

Application form:
Please send a CV and a letter of motivation to marc.bardin@inrae.fr and thomas.pressecq@inrae.fr.