

## Project title

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### Background

Fungal pathogens constitute a major problem in agriculture, causing diseases with potentially serious consequences for yield. The diseases occur under both conventional and organic agricultural practices, but the majority of studies of these have been made in conventional systems and the diseases have been studied separately. There are some problems in transferring this knowledge to an organic system. In a system where prevention via knowledge of biological processes is the major tool is it not sufficient to look at a disease as a disconnected factor, it must be seen in the context it occurs. In reality what a plant experiences at a given point in time, is more likely to be multiple diseases rather than only one.

Furthermore, from a purely ecological perspective, several pathogens occupying the same host are highly likely to have an influence on each other, based on their exploitation of the same resource. This is the background for the present PhD project, which is focused on interaction between two diseases. It is important to mention though, that the BAR-OF project explores interactions between disease and other elements of the system (e.g. weeds.)

The pathogens and consequent diseases studied are *Rhynchosporium secalis* (causes scald) and *Pyrenophora teres*, conidial stage: *Drechslera teres*, (causes net blotch) on their host spring barley. These diseases have both increased in importance in the temperate world, probably due to changes in farming practice and increased areas grown with barley.

### Objective

The objective of the present project is to gain new knowledge on interactions between scald and net blotch on spring barley grown in an organic farming system. This objective is approached via field trials and mathematical modelling. The field trials have consisted of selected varieties of spring barley inoculated with the pathogens and disease data collected from general variety trials under the BAR-OF. The mathematical modelling describes and explores the effect of host canopy structure on outcomes of two simultaneously developing pathogens.

interaction between leaf pathogens, on the host defined via its resistance properties. The final aim of the project is to aid in setting guidelines for choice of suitable varieties in a multi-disease environment.

### Progress - 2005

The work in the previous year has been focussed on data analysis, simulation modelling and writing of papers for the thesis. The chapters to be included in the thesis are listed below, along with the status of the papers.

1. Introduction

*A general introduction to plant pathology, organic farming and disease interactions. The two pathogens R. secalis and D. teres are presented.*

2. Critical reflections and outlook

*A discussion on the PhD process and the relevance of the results from the PhD project for organic farming and perspectives for future research is considered.*

3. Papers:

I. Interactions between fungal pathogens on leaves

*A review-paper, to be submitted to the European Journal of Plant Pathology. The journal has proved interest in the paper and awaits the submission.*

II. Simultaneous epidemic development of scald (*Rhynchosporium secalis*) and net blotch (*Drechslera teres*) on individual leaf layers of a spring barley crop.

*Will be submitted to Plant Pathology before thesis submission*

III. Simulation of fungal pathogen development on individual leaves

*Draft*

IV. Anatomy of a net blotch epidemic

*Draft*

**Talks** Seminar at Department of Plant Biology, KVL. May 2005

**Meetings** SUSVAR workshop in Witzenhausen, Germany in October 2004.

**Plans – 2006** None, related to PhD project.  
The plan is to submit the thesis by November 2005

## **Publications**

Pinnnschmidt, Hans and Vollmer, Jeanette H. and Hovmøller, Mogens S. and Munk, Lisa and Østergård, Hanne (2002) [Multiple diseases, host resistance and the role of variety mixtures for disease control in organically grown spring barley](#). Poster presented at 1. international symposium on organic seed production and plant breeding, Berlin, Germany, 21 - 22 Nov 2002; Published in *Proceedings of the 1. international symposium on organic seed production and plant breeding*, page 73.

Vollmer, Jeanette and Østergård, Hanne (2004) [Studies of interaction between pathogens](#). Paper presented at 11th International Cereal Rusts & Powdery Mildews Conference, John Innes Centre Norwich, UK, 22-27 August 2004, page A2.73.

Vollmer, J.H.; Pinnnschmidt, H.O.; Munk, L. and Østergård, H. (2005) [Simultaneous epidemic development of scald and net blotch on single leaf layers of a spring barley crop](#). Poster presented at 9th international workshop on plant disease epidemiology, Landerneau, France, 11-15 April 2005.