



Figure 1: Symptoms of oaks infected by *Phytophthora* spp. Left: five years old plant with yellowish and small-sized foliage, right: basal stem necrosis

01 Introduction

Quercus petraea and *Q. robur* occur on 10 % of the forest surface and represent thereby the fourth-most frequent group of tree species in Germany. They have therefore a great ecological, economical as well as cultural importance. At the beginning of the forest damage surveys in Germany in the year 1984 oaks belonged still to the tree species with little damages. Unfortunately the actual survey has shown that oaks, similar to beech, represent now the most strongly damaged tree species. As mentioned by many authors severe drought episodes, flooding and other changes of site conditions may induce decline of oak stands. Such stress could be decisive as predisposing factors favouring attacks by boring insects, opportunistic fungi and root rot caused by *Phytophthora* spp. After the extreme drought period in the summer of 2003 an increasing number of oak trees were showing dieback, lack of fructification and high mortality.



Figure 2: Two years old Sessile oaks of East and Western Saxony provenances inoculated with *P. quercina* in climate chambers. a) Sporangium, b) Oospore of *P. quercina*

02 Investigation

Survey records in Southern, North-Western and Eastern Germany have demonstrated a strong correlation between the occurrence of *Phytophthora quercina* and specific site conditions. The current project has the aim to investigate how this host-specific pathogen of temperate climate would interact with its host under changing environmental conditions like drought and nitrogen stress. In addition two other pathogens (*H. annosum*, *F. quercus*) are selected for inoculation tests with different methods (Fig. 3).

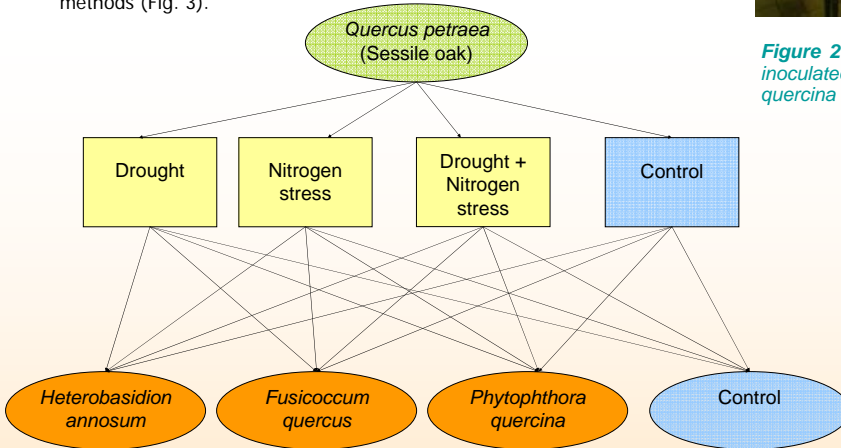


Figure 3: Schematic experimental design

04 Current Work

Morphological assessment (monthly)

- Estimating the above ground-condition of each plant
- Counting the number of leaves and internodes on the stem
- Measuring the stem length and diameter

Physiological assessment (periodically)

- Gas-exchange measurements with a porometer
- Measuring xylem water potential with a SCHOLANDER pressure bombe
- Chlorophyll fluorescence

Histopathological and chemical analysis

- Microscopy of root and stem tissue
- Comparison of root branching, length, diameter and surface area
- Determination of starch, fructose, saccharose and glucose concentrations with ELISA

Literature
Leonhard, S. (2004): Vorkommen und Bedeutung pilzähnlicher Phytopathogene (Abt. Oomycota) in ausgewählten Eichenbeständen des Freistaates Sachsen. Diplomarbeit, TU Dresden.
Schumacher, J.; Leonhard, S.; Solger, A. und Roloff, A. (2006): Occurrence and importance of fungal and fungus-like pathogens in oak forests of Saxony. Forst und Holz 61: 15 – 20.

03 Soil infestation method

The inoculation tests were conducted on 50 two-year *Q. petraea* plants of two different provenances of Saxony (Germany), representing different climate conditions. All plants were grown from seeds in green houses in sterilized peat-sand-mixed soil. Half of the plants were influenced by adding ammonium nitrate (2,5 g/m²) and half by growing under drought. Soil infestation was performed in May 2007 by using *P. quercina* which was isolated from a mature declining oak stand in Eastern Germany. Altogether twenty plates were flooded for two days with a sterilized soil suspension after incubating the cultures on carrot agar for one week. For stimulating sporangial production juvenile oak leaves were used. The inoculum (zoospores and mycel) were added directly sideways into each plant pot with drainage holes (Fig. 4). The non-inoculated control plants of each experimental set were treated with sterilized water only.



Figure 4: Inoculation methods

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