HOST-PATHOGEN-INTERACTION OF *PHYTOPHTHORA CITRICOLA* AND *P. PSEUDOSYRINGAE* WITH EUROPEAN BEECH (*FAGUS SYLVATICA*)

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Fagus sylvatica is an important tree species and due to its immense tolerance towards different climate conditions and habitats it is one of the major tree species in European forests. Over the past years the number of trees infected with *Phytophthora* increased dramatically. Particularly *P. citricola* was described as an important and an aggressive species in this context, that besides *P. cactorum* and *P. cambivora* lead to destruction of trees. Noticeable differences could be observed regarding virulence and symptom development: Infection with *P. citricola* that was identified as most aggressive species resulted in massive reduction of fine root mass. Before trees showed any wilting symptoms, rates of photosynthesis and transpiration decreased. Intriguingly also the nonaggressive *Phytophthora* species *P. pseudosyringae* reduced fine root system likewise, but neither wilting nor die back of plants occurred (Jung et al., 2003; Fleischmann et al., 2004)[1]. The root system of beech seedlings infected with *P. pseudosyringae* was reduced in length but far less destructed than *P. citricola* infected roots which points out some kind of development of resistance in beech seedlings after infection with *P. pseudosyringae.* This project aims to investigate these mechanisms by employing an aggressive and a non-aggressive *Phytophthora* species on beech, since until now any resistance mechanisms involved in *Fagus sylvatica -Phytophthora* interaction are completely unknown. Besides the above ground symptoms we investigated the extent and mode of action of the infection process of both *Phytophthora* species in beech roots. We applied histological, physiological (photosynthesis, water potential, transpiration) and molecular (qPCR and gene expression) methods to determine nature and progression of the infection in beech seedlings with *P. citricola* and *P. pseudosyringae* as well as a temporal dependence of symptom development on quantity of infestation. A biphasic course of infection of the root tissue could be observed after infection with *Phytophthora*, at which the first increase was due to zoospore encystment within the first 36 hours. The second peak is correlated with penetration and growth in beech root tissue. Most remarkably was the fast and immense colonization of xylem vessels by hyphae of *P. citricola*, from where rapid propagation of this aggressive *Phytophthora* species into other parts of the plant evolves. The activity of hydrolytic enzymes (as glucanases and invertases) in both *Phytophthora* species was investigated and content of soluble sugars, as well as starch were determined to elucidate their role for colonization by *Phytophthora* species with different pathogenic impact. At the present time our group is about to transform *P. citricola* and *P. pseudosyringae* with GFP (green fluorescent protein) to acquire three-dimensional data sets from intact, individual, pathogen encounter sites *in planta* and to open possibilities for analysis of functional genes involved in infection processes.

[1]Jung et al. (2003), Mycological Research 107: 772-78; Fleischmann et al. (2004), Forest Pathology 34: 79-92