

Research projects

- 04/1993 – 06/1997:** ‘Die *Phytophthora* - Erkrankung der europäischen Eichenarten (The *Phytophthora* disease of European oak species)’, funded by the Allianz Foundation for the Protection of Environment.
- 01/1997 – 03/1999:** Project F44 ‘*Phytophthora* - Kartierung für Stiel- und Traubeneiche in Bayern auf der Grundlage der Waldzustandserfassung 1994 (WZE-Vollstichprobe): Versuch einer Korrelation mit Kronentransparenz, Wurzelschäden und Standortfaktoren (Screening for *Phytophthora* in stands of pedunculate and sessile oak in Bavaria on the basis of the Assessment of Forest Condition 1994: attempted correlation with crown transparency, root damages and site factors)’, funded by the Bavarian State Ministry for Food, Agriculture and Forestry.
- 07/1997 – 06/2000:** ARC Project 901 ‘Development of molecular diagnostics for detecting and identifying *Phytophthora* species involved in oak decline in Europe’ (07/1997-06/1999), ‘Development of molecular diagnostics for detecting and identifying oak and beech root pathogens *Phytophthora syringae* and *P. undulata*, and AFLP analyses of *P. quercina* isolates.’ (prolongation period 07/1999-06/2000), funded by the Deutscher Akademischer Austauschdienst (DAAD) (British-German Academic Research Collaboration Program ARC).
- 01/1998 – 03/2001:** Project PATHOAK, ‘FAIR CT97 3926’ ‘Long term dynamics of oak ecosystems: Assessment of the role of root pathogens and environmental constraints as interacting decline inducing factors’, funded by the European Commission.
- 04/1999 - 04/2000:** Project F45 ‘Untersuchungen zur *Phytophthora* - Erkrankung der Schwarz- und Grauerle in Bayern: Verbreitung des Erlenpathogens in Baumschulen (Investigations on the *Phytophthora* disease of common alder and grey alder in Bavaria: occurrence of the alder pathogen in nurseries)’ funded by the Bavarian State Ministry for Food, Agriculture and Forestry.
- 06/1999 – 02/2001:** Concerted Action ‘FAIR 5 CT97 3615’ ‘*Phytophthora* disease of alder in Europe: potential for damage; opportunities for limitation of pathogen spread, and for management and control’, funded by the European Commission.
- 01/2001 - 06/2004:** Project F45 II ‘Entwicklung eines Managementkonzeptes für die *Phytophthora* - Erkrankung der Erlen in Bayern (Development of a management concept for the *Phytophthora* disease of alders in Bavaria)’, funded by the Bavarian State Ministry for Agriculture and Forestry.

07/2004 - 03/2005: Project F47 ‘Schäden an der Buche in Bayern – Untersuchung ausgewählter Bestände auf möglichen Befall durch *Phytophthora* und Risikoabschätzung des Gefahrenpotenzials durch Verschleppung der Krankheit mit Baumschul-Material (Damages on beech in Bavaria – investigation of selected stands on potential infections by *Phytophthora* and risk assessment of the danger of disease spread via infested nursery stock)’, funded by the Bavarian State Ministry for Agriculture and Forestry.

Supervising activities

- Salomon, A. (1995)** Untersuchungen am Wurzelsystem von Stieleichen (*Quercus robur*) im Forstamt Freising (Investigations on root systems of pedunculate oaks (*Quercus robur*) in the Forest District of Freising). Diploma thesis, Fachhochschule Freising, pp. 54.
- Nechwatal, J. (1995)** Untersuchungen an Stammnekrosen erkrankter Stieleichen - Beschreibung und mögliche Ursachen (Investigations on stem necroses of diseased pedunculate oaks – description and possible causes). Diploma thesis, Ludwig - Maximilians – University of Munich (LMU), Freising, pp. 41.
- Joas, K. (1998)** Untersuchungen zur Sporangienbildung verschiedener *Phytophthora* – Arten in Abhängigkeit von pH-Wert, Stickstoff- und Aluminiumkonzentrationen (Investigations on the effects of pH and different concentrations of nitrogen and aluminium on the formation of sporangia of various *Phytophthora* species). Diploma thesis, Fachhochschule Freising, pp.65.
- Zolles, H.-B. (1998)** Untersuchungen zur Isolierung sowie zur Optimierung der Isolierung von Pilzen der Gattung *Phytophthora* aus Böden unter besonderer Berücksichtigung von Waldböden des Buntsandsteins (Investigations on the optimisation of methods for the isolation of *Phytophthora* species from soil with special emphasis on forest soils derived from sandstone). Diploma thesis, Fachhochschule Freising, pp. 96.
- Leonhard, S. (2004)** Vorkommen und Bedeutung pilzähnlicher Phytopathogene (Abt. *Oomycota*) in ausgewählten Eichenbeständen des Freistaates Sachsen (Occurrence and importance of fungal-like oomycete pathogens in selected oak stands of Saxony). Technical University of Dresden, Tharandt, pp. 72.
- Jönsson, U. (2004)** *Phytophthora* and oak decline – impact on seedlings and mature trees in forest soils. Universität Lund, Department of Ecology, Plant Ecology and Systematics, Lund, Schweden, pp. 121.

External consultant and supervisor of the following projects:

Importance of *Phytophthora* spp. and nutrient availability for root vitality of pedunculate oak (*Quercus robur*). PhD student Ulrika Jönsson, University of Lund, Department of Plant Ecology, Forest Ecology, Lund, Sweden.

Untersuchungen über die am Eichensterben im Freistaat Sachsen beteiligten Phytopathogene (pilzliche und pilzähnliche Mikroorganismen) (Investigations on fungal and fungal-like

plant pathogenic microorganisms involved in oak decline in Saxony). Technical University of Dresden, Faculty of Forest Botany and Forest Zoology, Tharandt, Germany. Funded by the Saxon Ministry for Environment, Agriculture, Food and Forestry (SML).

Untersuchungen zum „neuartigen Erlensterben“ im Biosphärenreservat Spreewald (Ursachen, Verbreitung, Folgen und Gegenmaßnahmen) (Investigations on the new alder mortality in the biosphere reserve Spreewald (causes, distribution, implications and control)). Technical University of Dresden, Faculty of Forest Botany and Forest Zoology, Tharandt, Germany. Funded by the Brandenburg Ministry for Agriculture, Conservation and Development.

Training and teaching activities

Training of scientists

Between 1995 and 2004 17 seminars and exercises were given in Freising and abroad on methods for the isolation, identification and testing of pathogenicity of soil-borne *Phytophthora* species, and on the identification of characteristic disease symptoms. Scientists of the following research groups attended these courses:

- University for Soil Science (BOKU), Vienna, Austria,
- Technical University of Dresden, Tharandt, Germany,
- University of Tuscia, Viterbo, Italy,
- University of Bari, Italy,
- University of Florence, Italy,
- Lund University, Lund, Sweden,
- Oregon State University, Corvallis, USA,
- Cornell University, Ithaca, USA,
- Forest Research Station of Lower Saxony, Göttingen, Germany,
- Forest Research Station of Baden-Württemberg, Freiburg, Germany.
- INRA Nancy, Champenoux, France,
- Forestry Commission Research Agency, Alice Holt, UK,
- Scottish Crop Research Institute (SCRI), Dundee, UK,
- CNR, Florence, Italy,
- Slovenian Forestry Institute, Ljubljana, Slovenia.

Training of foresters

Between March 2001 and March 2002 nine seminars and field exercises were given in order to train more than 250 foresters from almost all Forest Offices of the Bavarian State Forestry and 30 biologists from the river authorities in the detection of *Phytophthora* root and collar rot symptoms of alders, and in the biology, pathways and control of *Phytophthora alni*. These trainings were the basis for the Bavarian-wide survey of the disease in forest and riparian ecosystems performed between October 2001 and May 2002.

Scientific meetings

Meetings with published papers (see list of publications)

08/1995: International Colloquium on ‘Bioindication of Forest Site Pollution: Development of Methodology and Training BIOFOSP’, Slovenian Forestry Institute, Ljubljana, Slovenia.

09/1995: Eichensterben in Deutschland: Situation, Ursachenforschung und Bewertung (Oak decline in Germany. Situation, causes and evaluation.) Symposium at the Forest Research Station of Lower-Saxony in Göttingen, Germany (published in *Mitteilungen der Biologischen Bundesanstalt für Land- und Forstwirtschaft*, Berlin-Dahlem, Volume **318**).

03/1998: Workshop of the IUFRO Working Party ‘Disease / Environment Interactions in Forest Decline’, Federal Forest Research Centre, Vienna, Austria.

05/1998: 3rd annual meeting of the working party ‘experimental ecology of plants’ of the Ecological Society, Bielefeld, Germany.

09/1998: 18th International IUFRO Meeting for Specialists in Air Pollution Effects on Forest Ecosystems, Heriot-Watt University, Edinburgh, UK.

09/1999: First International Meeting on Phytophthora’s in Forest and Wildland Ecosystems, Oregon State University, Grants Pass, Oregon.

11/1999: 4th Westdeutsche Baumpflegetage, Cologne, Germany.

10/2000: 52nd German Plant Protection Conference, German Phytomedical Society, Freising, Germany.

10/2000: Forstwissenschaftliche Tagung (Conference of Forest Science) 2000, Freiburg, Germany.

10/2001: Second International IUFRO Working Party 7.02.09 Meeting on *Phytophthora* in Forests and Natural Ecosystems, Murdoch University, Albany, West-Australien.

10/2002: Forstwissenschaftliche Tagung (Conference of Forest Science) 2002, Göttingen, Germany.

05/2003: Conference „black alder tree of the year 2003“, Burg im Spreewald, Germany
(published in *Forst und Holz* **58**).

05/2003: Conference „black alder tree of the year 2003“, Rott / Inn, Germany (published in
Beiträge zur Schwarzerle, *LWF-Bericht* **42**).

09/2004: Third International IUFRO Working Party 7.02.09 Meeting on *Phytophthora* in
Forests and Natural Ecosystems, Freising, Germany.

Meetings with summarizing reports

1998-2001: Four workshops of the EU project „Long term dynamics of oak ecosystems:
Assessment of the role of root pathogens and environmental constraints as interacting
decline inducing factors“, (Project PATHOAK, „FAIRCT973926“), in Freising
(Germany), Nancy (France), Viterbo (Italy) and Bordeaux (France).

06/2000: Meeting of Task Leaders of the EU Concerted Action “*Phytophthora* disease of
alder”, Stourport on Severn, UK.

11/2000: Meeting of Task Leaders of the EU Concerted Action “*Phytophthora* disease of
alder”, Gembloux, Belgium.

Non-published talks on *Phytophthora* topics as invited speaker

1995: Institute of Specific Botany and Mycology, University of Tübingen, Germany.

1996: INRA Nancy, Champenoux, France.

Institute of Forest Protection and Dendrology, ETH Zürich, Switzerland.

1997: Scottish Crop Research Institute, Dundee, UK.

1998: Scottish Crop Research Institute, Dundee, UK.

1999: Forest Research Agency, Farnham, UK.

Plant Protection Service, Wageningen, Netherlands.

2000: Department of Plant Ecology, Lund University, Sweden.

2001: Institute of Forest Entomology, Forest Pathology and Forest Protection, University for
Soil Science (BOKU), Vienna, Austria.

2002: Department of Plant Ecology, Lund University, Sweden.

Institute for Forest Botany and Forest Entomology, Technical University Dresden,
Germany.

Forest Research Agency, Farnham, UK.

2003: 1. Göttinger Colloquium for Forest Protection, Forest Research Station of Lower
Saxony, Göttingen, Germany.

Forest Research Station of Baden-Württemberg, Freiburg, Germany.

2004: Federal Office and Research Centre for Forests, Vienna, Austria.

University of Tuscia, Viterbo, Italy.

2005: University of Konstanz, Germany.

Research

Scientific research in foreign countries

1995: Slovenia and Italy.

1997: Scotland.

1998: Scotland and France.

1999: Scotland and England.

2000: Sweden.

2002: Sweden.

2004: Austria, Italy, Sweden.

2005: Austria, Netherlands.

Main research

- root pathology of trees,
- methods for isolation and identification of *Phytophthora* and *Pythium* spp. from plant tissues, soil and water,
- host specificity, aggressiveness, dissemination and phylogeny of *Phytophthora* species,
- Coordination and practical realisation of large-scale field surveys on soil-borne and water-borne *Phytophthora* pathogens,
- ***Phytophthora*-mediated decline of oaks (*Quercus* spp.):**
 - distribution, aggressiveness and ecology of the involved soil-borne *Phytophthora* species,
 - relationships between site factors, *Phytophthora* population in the rhizosphere, crown condition and root condition of trees,
 - interaction between site factors, *Phytophthora* fine root damage and insect defoliation,
 - interaction with environmental constraints such as nitrogen input and drought.
- ***Phytophthora* root and collar rot of alders (*Alnus* spp.):**
 - distribution of the disease, dissemination of the alder *Phytophthora* and infection process, influence of site factors on disease incidence and progress,
 - role of infested nursery stock in disease distribution,
 - management and control,
 - variability of the alder *Phytophthora*.
- **Root and collar rot and aerial bleeding cankers of beech (*Fagus sylvatica*) caused by *Phytophthora* spp.:**
 - etiology and symptomatology,

- distribution, aggressiveness and ecology of the involved soil-borne *Phytophthora* species,
 - relationships between site factors, *Phytophthora* population in the rhizosphere, crown condition and root condition of trees,
 - effect of weather conditions on disease incidence,
 - occurrence of *Phytophthora* spp. in beech fields of nurseries.
- **Littleleaf disease of *Pinus occidentalis* and *Pinus caribaea* in the Dominican Republic caused by *P. cinnamomi*.**

Research interests

- Research on control of *Phytophthora* diseases and development of integrated management concepts.
- Monitoring of seasonal and annual fluctuations of *Phytophthora* populations on different sites and in different ecosystems.
- Detection and description of new *Phytophthora* species in Europe and in other continents, and analysis of their potential host ranges among European tree and shrub species. Such investigations are urgently required in order to identify potentially harmful pests before they are introduced to Europe.
- Investigations on
 - mechanisms of spread and pathways of *Phytophthora* diseases,
 - factors triggering the onset of *Phytophthora* epidemics,
 - Effects of environmental constraints, i.e. nitrogen input into soils and altered temperature and precipitation patterns according to global change scenarios, on host-*Phytophthora*-pathosystems,
 - the succession of ascomycetes and basidiomycetes in *Phytophthora* affected stands and on the importance of the secondary disease cycle for the ecosystem damage,
 - changes of tree species compositions in *Phytophthora* affected ecosystems,
- Molecular analyses of different populations of widespread *Phytophthora* species in order to get informations on their origins and potential pathways.
- Role of nurseries in the emergence of *Phytophthora* hybrids, the introduction of exotic *Phytophthora* species, and the dissemination of *Phytophthora* species and other pathogenic fungi.