

FTIR spectroscopy and imaging of wood-destroying fungi

Annette Naumann

Institute of Forest Botany, Georg-August-University Göttingen,
Büsgenweg 2, 37077 Göttingen, Email: anauman1@gwdg.de

Early identification of wood-destroying fungal species within wood is difficult since fungal infections might not be readily visible on the wood surface. At later stages, fungal mycelium might also develop on the wood surface. Moreover, mycelium of different species can feature very similar morphological characteristics. Detection and identification is necessary as early as possible, e.g. to prevent risks due to decay of street and forest trees as well as of construction wood. In this study, FTIR attenuated total reflection (ATR) spectra were employed to classify wood-destroying fungal species. Mycelia of various fungal species were cultivated in three independent sets under standardised conditions, freeze-dried, powdered, and subjected to FTIR ATR spectroscopy. Cluster analysis grouped nearly all spectra of the various species into separate subclusters according to their spectral similarity. Artificial neural networks (ANN) were successfully applied to classify the vast majority of the spectra to the correct class of the species.

For the localisation of fungal mycelium within wood by FTIR microscopy, beech wood blocks were artificially infected with the fungus *Trametes versicolor*. Four months after infection, microtome sections (30 µm thickness) were cut, air-dried and subjected to FTIR microscopy with a 64x64 focal plane array (FPA) detector. The spectra of fungal mycelium differed so significantly from those of wood and empty water-conducting elements (i.e. air) in wood that imaging of fungal distribution in wood was feasible (Naumann et al. 2005).

The presented results demonstrate the potential of FTIR spectroscopy and microscopy for identification and localisation of wood-destroying fungi. Furthermore, the techniques are promising to elucidate the complex processes and interactions during fungal growth and degradation of wood.

References

- Naumann, A., Navarro-González, M., Peddireddi, S., Kües, U., Polle, A. (2005). Fourier transform infrared microscopy and imaging: Detection of fungi in wood. *Fungal Genetics and Biology* 42, 829-835.