

TreeHarm: Development of diagnostic and treatment methods to identify and protect forest trees against harmful organisms

Kiran Singewar (kiran.singewar@thuenen.de), Matthias Fladung (matthias.fladung@thuenen.de)
Thünen Institute of Forest Genetics, Großhansdorf, Germany

Climate change leads to rising temperatures that cause drought stress to forest trees. Both, traditional and new plant pathogens take advantage of the stress creating huge damage to forest trees and ecology. Therefore, it is an urgent need to identify beneficial and infectious organism habitats on native forest trees. In the first part of the project, diagnosis of the fungal, insect, and bacterial species of the three forest tree species (Norway spruce, European aspen, and English Oak) is carried out using DNA barcoding, metagenomics, and morphotyping methods. For bacterial community identification, the next-generation high-throughput metagenome sequencing method is being used. Moreover, a data bank containing photographs, and information about insects and mushrooms harvested around the trees is being created. In the second part of the project, two alternative treatment strategies are being developed and tested for their practicability, 'the Mycorrhiza and RNA interference (RNAi) vaccination' against insect pests and fungal pathogens. The "mycorrhiza vaccination" method will be tested in different field trials to proof whether the application of native mycorrhizal fungi can strengthen the physical constitution of trees. RNAi-mediated double-stranded RNA (dsRNA) vaccine, complementary to a vital gene sequence, is being tested against different insect and fungal pathogens. Preliminary tests have been carried out with larvae of the butterfly *Lymantria dispar*, a severe insect pest species. Feeding, exogenous, and/or topical application of dsRNA is being tested. The hand-in-hand diagnosis and treatment strategies will provide insights and advanced methods to protect our native forest trees.