Abstract

A current problem is the infestation of the black alder (*Alnus glutinosa*) by the pathogen *P. × alni*, which causes the loss of alder stands and disrupts riparian ecosystems. The spread of the *'phytophthora* disease' occurs through water, the host is infected through the root system and the pathogen attacks the conductive tissues. As a result of the disease, the tree gradually loses its root system, lesions appear on the trunk, defoliation occurs and the individual inevitably dies. The only solution to the situation is preventive measures to prevent further spread by careful removal of infected alder trees.

The aim of this paper is to discuss the relationship between black alder and *P. × alni* in the context of the physiological changes that occur in the foliage of the infested individual. Leaf functional traits, chlorophyll fluorescence and optical properties of black alder exposed to *P. × alni* (inoculation into soil or confirmed occurrence of the pathogen in natural conditions) were measured using non-invasive methods.

The results of the chamber experiments suggest that the mean values of the measured parameters do not change significantly in the initial stages of infection, but there is a widening of the variance of the values in infected individuals. We tested whether the genetic origin of the alder (Czech and Norwegian provenance), elevated atmospheric CO_2 concentration or sterility of the growing substrate interfered with the expression of infection in functional traits of leaf and fluorescence parameters. The results were equivocal, rather suggesting that neither the genetic origin of alder nor the elevated CO_2 concentration would be reflected in the response to *P. × alni* inoculation. A field investigation in the Litavka river basin with evidence of occurance of the *P. alni* complex yielded the finding that the range of variance of measured foliar physiological parameters increased with the intensity of tree infestation. AnthM, ABS/RC, DI_0/RC, LMA and reflectance in the chlorophyll absorption bands appear to be the most promising of all parameters for detecting symptomatic trees. The results of this work can be used for further remote sensing research aimed at monitoring and management of *phytophthora* disease in blackalder.