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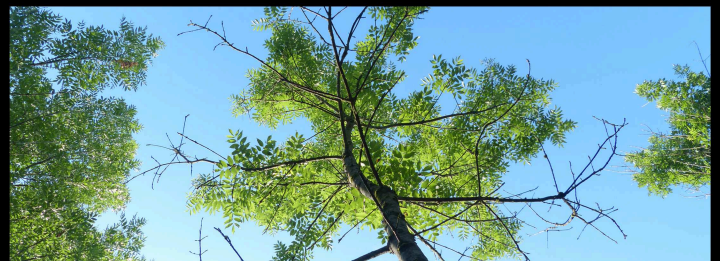
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Identification of European ash resistant to the invasive pathogen *Hymenoscyphus fraxineus* using Fourier-transform infrared (FT-IR) spectroscopy

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Over the last two decades common ash (*Fraxinus excelsior*) has been threatened by an alien invasive pathogen *Hymenoscyphus fraxineus* (syn. *H. pseudoalbidus*; *Chalara fraxinea*) introduced to Europe from East Asia. As with most introduced pests and pathogens where the host plant lacks a history of co-evolution, the damage is devastating. The very existence of ash is now under threat as large populations of ash are disappearing from forest ecosystems and urban landscapes. Genetic resistance can be an important tool for disease management and to conserve the species from further demise. Even with high infection and mortality rates, variation in ash susceptibility to the pathogen has been observed within natural populations in field studies [1-3]. These studies show that disease expression is under strong genetic control (a heritable trait) which suggests considerable gain through selection and long-term breeding. While the mechanisms of ash resistance to *H. fraxineus* are unknown, some preliminary work supports the notion that plant specialized secondary metabolites are important for ash defense against *H. fraxineus* [4]. The objective of this work will be to determine if using a state-of-the-art chemical fingerprinting technique known as Fourier-transform infrared (FT-IR) spectroscopy can identify ash resistant to *H. fraxineus*. FT-IR spectroscopy has been tested successfully in other forest-tree pathosystems to, for example, identify putative phenolic biomarkers in coast live oak against the deadly invasive pathogen *Phytophthora ramorum* [5], and discriminate between elm clones of differing levels of susceptibility to the Dutch Elm disease pathogen *Ophiostoma novo-ulmi* [6]. In 2015, we collected material from a select number of known susceptible and resistant ash genotypes from genetic trials in six countries (Sweden, Germany, Austria, France, Lithuania, and Denmark). Therefore, the objectives of this project will be to use FT-IR spectroscopy to 1) discriminate between resistant and susceptible genotypes and 2) predict the concentration of putative phenolic biomarkers of resistance. The implications of these results could significantly advance our current screening protocol and aid in the development of a more resistant ash population for future planting in forests, cities, and landscapes.

References

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Keywords

ash dieback, phenolic biomarkers, *Fraxinus excelsior*, *Hymenoscyphus fraxineus*, FT-IR spectroscopy