

## An Emergence of *Pinus taeda* Needle Defoliation and Tree Mortality in Alabama, USA

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**Abstract :** *Pinus taeda*, commonly known as loblolly pine, is a crucial timber species native to the southeastern USA. An emerging problem has been encountered for the past few years, which is better to be known as loblolly pine needle defoliation (LPND), which is threatening the ecological health of southeastern forests and economic vitality of the region's timber industry. Currently, more than 1000 hectares of loblolly plantations in Alabama are affected with similar symptoms and have created concern among southeast landowners and forest managers. However, it is still uncertain whether LPND results from one or the combination of several fungal pathogens. Therefore, the objectives of the study were to identify and characterize the fungi associated with LPND in the southeastern USA and document the damage being done to loblolly pine as a result of repeated defoliation. Identification of fungi was confirmed using classical morphological methods (microscopic examination of the infected needles), conventional and species-specific priming (SSPP) PCR, and ITS sequencing. To date, 17 species of fungi, either cultured from pine needles or formed fruiting bodies on pine needles, were identified based on morphology and genetic sequence data. Among them, brown-spot pathogen *Lecanostica acicola* has been frequently recovered from pine needles in both spring and summer. Moreover, Ophistomatoid fungi such as *Leptographium procerum*, *L. terebrantis* are associated with pine decline have also been recovered from root samples of the infected stands. Trees have been increasingly and repeatedly chlorotic and defoliated from 2019 to 2020. Based on morphological observations and molecular data, emerging loblolly pine needle defoliation is due in larger part to the brown-spot pathogen *L. acicola* followed by pine decline pathogens *L. procerum* and *L. terebrantis*. Root pathogens were suspected to emerge later, and their cumulative effects contribute to the widespread mortality of the trees. It is more likely that longer wet spring and warmer temperatures are favorable to disease development and may be important in the disease ecology of LPND. Therefore, the outbreak of the disease is assumed to be expanded over a large geographical area in a changing climatic condition.

**Keywords :** brown-spot fungi, emerging disease, defoliation, loblolly pine

**Conference Title :** ICMM 2020 : International Conference on Mycology and Mushrooms

**Conference Location :** Paris, France

**Conference Dates :** August 27-28, 2020