Fungal volatile organic compounds: their role in bark beetle management in the southeastern United States

Background

The southeastern forest industry of the US plays a major role in the wood dynamics of the country, contributing over 50% of the wood demand. Nonetheless, the sustainability of the wood resource base is of concern to stakeholders within the forestry sector due to the incidence of pest and diseases. Southern pine decline (SPD) is one of the complex disease syndromes which slowly and progressively weakens the trees ability to grow. Unfortunately, *Pinus taeda* (loblolly pine), the predominant and economically important tree crop in the southeast US suffers from SPD. Bark beetles and their associated ophiostomatoid fungi contribute to SPD after predisposition by abiotic factors. The relationships between bark beetles and their associated ophiostomatoid fungi are mediated by fungal volatile organic compounds (FVOCs). The FVOCs have been hypothesized as potential biocontrol agents. The study seeks to identify and quantify volatile organic compounds associated with ophiostomatoid fungi. Volatiles will be sampled from strains of *Leptographium terebrantis, L. procerum, Grosmannia huntii* and *G. alacris* isolated from declining loblolly pine from the southeastern US. The study will potentially identify volatile chemical compounds to be incorporated into integrated pest management strategies to minimize economic losses from SPD.

Approch

Cultures of *L. terebrantis, L. procerum, G. huntii* and *G. alacris* (using 5 mm diameter plugs) on actively growing small Malt Extract Agar plates (60 cm x 15 cm). Fungal cultures were selected from already collected strains by the Forest Health Dynamics Lab. Cultures were placed in a volatile collection chamber which consist of a 473 mL glass jar with Teflon tape on its threading and fitted with a metal cap. Two holes drilled in the caps, fitted with a Teflon tube containing activated charcoal to collect volatiles from fungal cultures and filter ambient air. Volatiles were extracted by adding the activated carbon to dichloromethane. The mixture was vortexed, sonicated, centrifuged and transferred to a gas chromatograph (GC) vial, to be analyzed with gas chromatograph mass spectrometer (GC-MS) VOC identification and quantification.

The initial challenge that we had with GC-MS has been resolved recently. Standardization of various reagents and test runs are currently underway. Once test runs are completed, extracted samples will be analyzed.

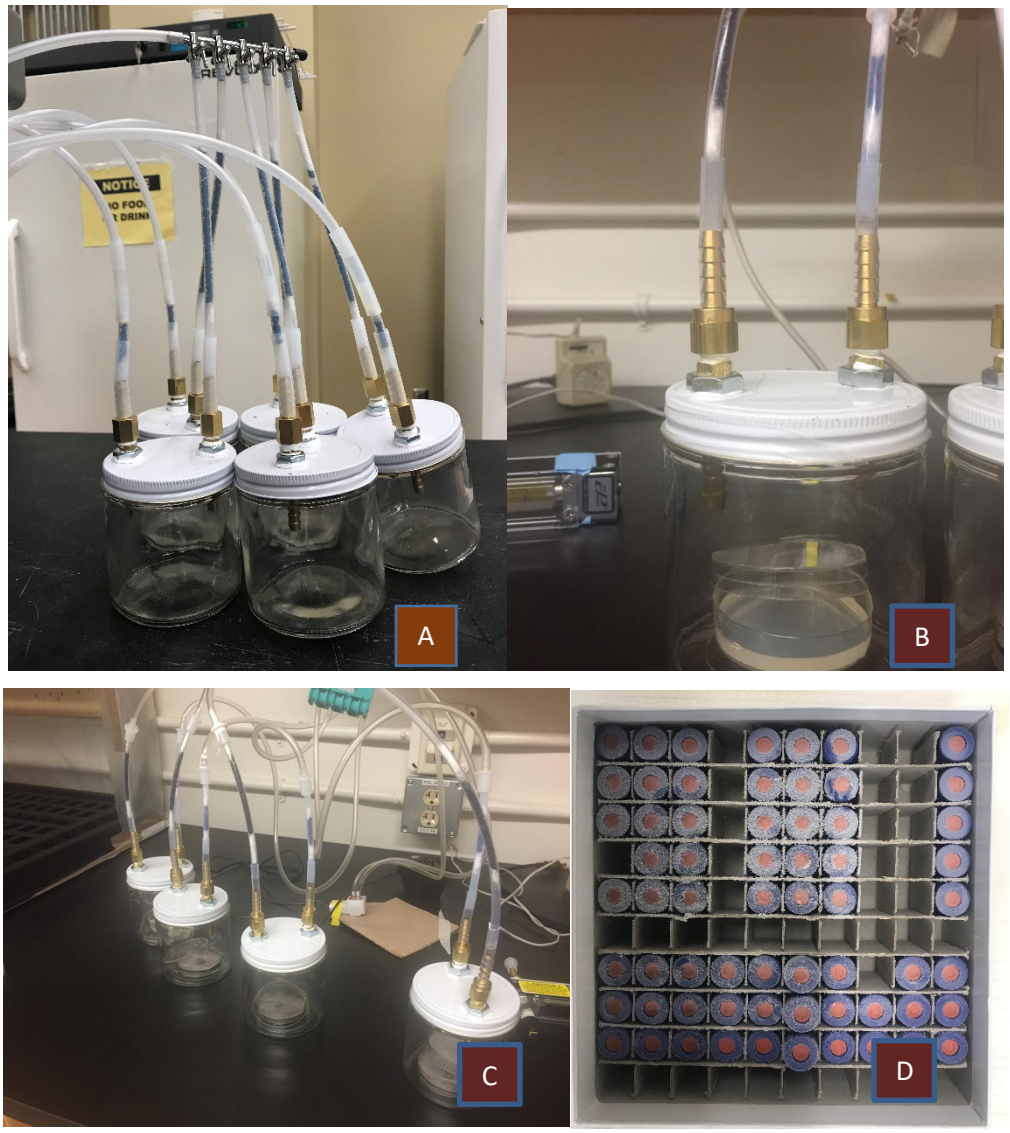

Figure 1: Volatile collection chambers containing fungal cultures (A, B & C). Samples of volatile extractions awaiting analysis (D).