Using hyperspectral data to detect spotted lanternfly infestation in host tree species

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Abstract

Invasive species have historically disrupted environments by outcompeting, displacing, and extirpating native species, resulting in significant environmental and economic damage. Developing approaches to detect the presence of invasive species, favorable habitats for establishment, and predicting potential spread are crucial for effective management strategies to protect the environment and the economy. Spotted lanternfly (SLF, *Lycorma delicatula*) is a phloem-feeding planthopper native to China that poses a severe threat to horticultural and forest production in the United States. Current pest management strategies are being explored to contain the spread and damage caused by SLF, however, methods to rapidly detect novel infestations or low-density populations are lacking. Using spectroscopy, we can detect changes in leaf canopies associated with stress events relatively quickly and potentially over large geographic areas. Here, we hypothesize that SLF infestations change the spectral characteristics of tree canopies. To test this hypothesis, we sampled silver maple (*Acer saccharinum*), red maple (*Acer rubrum*), black walnut (*Juglans* nigra), and tree of heaven (*Ailanthus altissima*) at a common garden in Berks County, Pennsylvania with varying levels of SLF infestation enclosed on the trees. Composite spectral profiles separated based on SLF infestation level, but the magnitude of separation was different between species. We found multiple regions related with SLF infestation densities in each species, but not tree of heaven. By identifying changes in canopy spectral profiles in response to SLF infestation, we can possibly detect SLF infestations quickly and efficiently to help limit spread and better understand drivers of SLF movement across landscapes.

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