

Seasonal patterns of pine wilt disease incidence and the vector infestation near the northern limit of the disease in Japan

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During the last few decades, pine wilt disease has spread to cool-climate regions in Japan and, more recently, the potential risk of it spreading into the European midwest has also become a concern. In a coastal pine stand (84.7 ha) in Akita, near the northern limit of pine wilt disease in Japan, we investigated seasonal variations in the incidence of damage caused by the disease to trees and oviposition by the disease's insect vector, *Monochamus alternatus*, during a two-year period. Foliage discoloration occurred throughout each year, and its seasonal variation showed a bimodal pattern in *Pinus thunbergii* (a higher peak in May–June and a smaller peak in October) and a clear peak in June in *P. densiflora*, which differed from the patterns in seasonal variation seen for warm-climate regions. Oviposition scars by *M. alternatus* were found in 40–45% of the trees damaged each year. The percentage of trees that were oviposited in was higher in *P. thunbergii* than in *P. densiflora*. This appeared to reflect the difference in seasonal discoloration pattern between the two species. Analysis of the oviposition risk showed that trees that exhibited discoloration starting between July and October had a significantly higher risk or significantly higher oviposition scar densities, particularly for those that became discolored between August and September (2.5–14.6-fold higher risk than during other months). Oviposition scar densities per damaged tree were similar within the period of higher oviposition risk. Considering both oviposition risks and scar densities, we concluded that trees with discoloration that become apparent between July and October are important targets for preventing the spread of pine wilt disease in Akita.

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