A Field Study Examining Factors Involved in Oak Decline in Exotic Oaks Growing in North America

Nanjappa, Diya (School: Quincy Senior High School)

Oak decline is a global phenomenon threatening oak tree populations, the economic value of timber, and ecosystems. This study addresses a research gap by analyzing factors contributing to oak decline in exotic (European and Asian) and native oak taxa growing in North America. It was hypothesized that exotic oaks growing in North America would exhibit similar levels of decline (measured by percent dieback, percent canopy loss, and oomycete infection rate) as native North American oaks. Tree health indicators, including percent dieback, percent canopy loss, aspect, percent slope, median rooting depth, and tree condition were measured and recorded for each of two species of European, Asian, and North American trees growing in the Starhill Forest Arboretum. Root and soil samples were collected from all trees using a shovel and soil core sampling tool, and were sent to respective labs for oomycete presence and soil nutrient content testing. The data for each measured decline factor was compared between the native and exotic trees to identify distinctions. No significant difference was found between percent dieback in native and exotic oaks or infection rate between native and exotic oaks; however, an ANOVA and Tukey HSD test revealed a significant difference ($p<0.01$) between percent canopy loss in native and exotic oaks, rejecting the null hypothesis. A Pearson Correlation test found a significant relationship ($p=0.003$) between percent canopy loss and condition, indicating canopy loss was the symptom of oak decline in this study, and exotic oaks exhibited greater decline than native oaks.

Awards Won: