EXPLORING LEAF LITTER FLAMMABILITY IN EASTERN U.S. OAK AND PINE FORESTS: IMPLICATIONS FOR FIRE ECOLOGY

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PURPOSE AND SCOPE

The purpose of this study was to investigate the relationship among leaf litter traits associated with flammability across a gradient from pyrophytic (fire-adapted) to mesophytic (moisture-loving) species. This research was conducted in forests of the Southeastern United States, having a regional and climatic gradient, and includes both burned and unburned areas. By examining leaf litter traits and their variability, this study aimed to understand the factors influencing leaf litter flammability, determine an overall effect of burning on litter traits across all species and locations, and determine how the effect of burning differed among species and locations.

METHODS AND APPROACH

Leaf litter of 12 different species (pyrophytic to mesophytic) was collected from 12 locations in the Southeastern United States with burned and unburned sites at each location. Leaf litter from eight sites was collected between January and February 2022 and the remaining three sites from January to March 2023. At each site, we selected a stand that had been burned regularly in the past 10 years and one that had no regular prescribed fire implementation for at least 10 years. We measured leaf litter traits related to fuel bed characteristics and forest flammability, which included leaf curl, leaf thickness, leaf perimeter, leaf one-sided surface area, specific leaf area (SLA), leaf volume, surface area to volume ratio (SA:V), and leaf dissection index (LDI). Data were analyzed using analysis of variance and principal component analysis.

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FINDINGS AND IMPLICATIONS

LDI and SLA varied among species in response to burning and the interaction between species and burning. A significant effect of species (P >0.001) and location (P >0.001) was observed on flammability traits in both burned and unburned sites. This analysis compared the effects of burning on LDI and leaf conservatism (mass/square root of area) among and within hardwood species. Overall, there was no significant effect of burning on dissectedness or conservatism because different species responded differently to burning. The general patterns for hardwood species in response to burning showed that tulip poplar (*Liriodendron tulipifera*) increased in dissectedness, whereas black oak (*Quercus velutina*) decreased in dissectedness. However, post oak (*Q. stellata*) and sweetgum (*Liquidambar styraciflua*) showed no significant change in dissectedness with burning. Other species exhibited intermediate responses. Post oak showed the greatest increase in conservatism (higher mass/area ratios) in response to burning, and sweetgum showed the greatest decrease in conservatism with burning. Additionally, there was significant variation among sites: black oak generally decreased in LDI in response to burning but increased in LDI at Strawberry Plains. Post oak typically increased in mass/area at most sites but decreased at Penny Bend. Overall, this study enhances understanding of the relationships between leaf litter traits and flammability. The relationship between plant traits and flammability at the species level is important for a broader understanding of the vegetation-fire dynamic at both local and landscape scales.