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Development and plasticity of endangered shrub *Lindera melissifolia* (Lauraceae) seedlings under contrasting light regimes

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Abstract

Lindera melissifolia **(Walt.) Blume seedlings were raised in a growth chamber to determine the effects of light availability on shoot growth pattern, and basic leaf and stem growth. *Lindera melissifolia* seedlings exhibited a sympodial shoot growth pattern for 3 months following emergence from the soil medium, but this pattern was characterized by a reduction in leaf blade area approximately 30 days after emergence, followed by increases in leaf blade area. Seedlings receiving low light were 76% taller than seedlings receiving high light. Seedlings receiving low light also had larger leaf blade dimensions, blade area, seedling leaf area, and greater mass. Seedlings raised in high light had a greater proportional distribution of biomass in the roots, suggesting possible water stress from greater vapor pressure deficits. Furthermore, these seedlings displayed sharp angles of blade inclination and blade folding – acclimation that reduces exposure to light and subsequent higher leaf temperatures in open environments. These differences in morphological response to light resulted in high phenotypic variability in *L. melissifolia* seedlings. *Lindera melissifolia* seedling development showed a brief period of phenotypic plasticity, followed by ontogenetic plasticity. The short period of phenotypic plasticity may, however, have profound ecological implications for the conservation and recovery of this federally endangered shrub. Further experimentation should take into account the development of ontogenetic standards for comparisons of plant traits in addition to temporal standards.**

Keywords: biomass distribution, light availability, ontogenetic plasticity, phenotypic plasticity, phenotypic variation.

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Introduction

Advancing the recovery of imperiled plant species can be stymied by a complex snare of political interests, economic constraints and biological difficulties (Schemske *et al*. 1994; Boersma *et al*. 2001; Heywood & Iriondo 2003). Although political and economic factors can be substantial (Bowles & Whelan 1994), unsuccessful efforts aimed at the recovery of imperiled plant species have been largely attributed to inadequate biological data (Heywood & Iriondo 2003). Boersma *et al*. (2001), who reviewed 71 recovery plans written for endangered plants and animals endemic to the USA, illustrated that progress in species recovery was greatest when relevant biological information was linked to recovery plan goals.

Knowledge of the ecological interactions between imperiled plant species and their environment ranks highly among biological information central to developing a recovery approach (Schemske *et al*. 1994). However, the acquisition of ecological information can be challenged by knowledge gaps in basic species biology. Without fundamental information on a species' biology, implementation of scientifically sound and ecologically relevant experimentation can be compromised. Ontogeny and variation in phenotypic traits are key aspects of basic

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