Developmental stage during experimentally elevated temperature moderates pine seedling phenotypic and demographic responses

Ehren Moler[1], Thomas Kolb[2], Anne Brady[3], Briana Palmiero[3], Taylor Wallace[3], Kristen Waring[3], and Amy Whipple[3]

[1]University of Idaho College of Natural Resources
[2]Affiliation not available
[3]Northern Arizona University

October 20, 2020

Abstract

We subjected southwestern white pine (Pinus strobiformis Engelm.) seeds to controlled warming treatments to study responses of seed and seedling demographics, and morphological and physiological traits following warming during embryogenesis, germination, and early seedling growth. Daytime air temperature surrounding cones in tree canopies was warmed by +2.1 *C during embryo development. Resulting seeds and seedlings were assigned to three thermal regimes in growth chambers, with each regime separated by 4 *C. The embryo-warming treatment reduced percent seedling emergence in all germination and growth environments and reduced mortality of seedlings grown in the warmest environment. Warm thermal regimes during early seedling growth increased seedling resistance to oxidative stress and seedling transpirational water use even after applying cooler temperatures and experimental drought. Experimental warming imposed during seed development affected seedling demographic processes, and warming imposed during germination and seedling growth affected stress resistance and water relations. This work illustrates that the study of numerous ecophysiological and functional trait responses to various types of stress across multiple plant developmental stages is essential for understanding the effects of climate warming on forest regeneration processes.

Hosted file

`Moler et al_SWWP growth chamber warming_submission.pdf` available at https://authorea.com/users/368453/articles/487660-developmental-stage-during-experimentally-elevated-temperature-moderates-pine-seedling-phenotypic-and-demographic-responses