

Dormancy of trees shows adaptive variation along the North-South gradient

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Abstract

Chilling requirement of endodormancy release is a key adaptive trait in extratropical trees, preventing an untimely growth onset during autumn and winter. However, little is known about the inter-specific variation of the trait along geographical and climatic gradients. Here, we examined the variation of chilling effects on endodormancy release along 20° to 53.5° long North-South gradient in China. By means of a climatological eco-evo analysis of gridded air temperature data representing the years 1951-2019 for 5968 locations in China we first deduced our evolutionary hypothesis: selection along the climatic gradient has led to inter-specific differences such that higher temperatures work as chilling in the warm southern than in the cool northern climates. Subsequently, we tested the hypothesis by experimental data with 14 Chinese tree species and observational phenological records. The pattern predicted by our hypothesis was found in both tests. Our results show that the differences between species representing a long climatic gradient are the key to understanding the adaptive significance of endodormancy and chilling requirement, as well as to assessing the tree responses to climatic change.