Winter shade increases snow gum growth

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Abstract

There has been an enormous emphasis placed on the impact of increased temperatures associated with global warming. Linked with climate change has been the possibility of future changes to the current location of the tree line. However at a finer scale the clearing of forest cover can lower temperature significantly. Not only is the thermal environment significantly modified when trees are removed, so is the light environment. In cold regions, snow gum (*Eucalyptus pauciflora Sieb. ex Spreng.*) seedlings are often located beneath the canopy and on the southern side of single adult trees. This pattern is consistent with avoidance of both extreme temperature minima and prolonged exposure to direct sunlight.

Snow gum was studied in the field to test the influence of shade on growth during autumn and winter. The experiment was conducted in an undulating treeless pasture (elevation 1000m) near Gudgenby homestead, Namadgi National Park, ACT. There frosts are common, and in winter minimum weekly screen temperatures remain below, or close to -5oC. Near the ground, where seedlings are found, minimum temperatures can be several degrees colder than in a weather screen at 1.2 m. Seedlings were planted on the north, exposed side of a vertical shade cloth shelter and on the shaded southern side. Overnight air temperatures 5 cm above ground were similar on both sides of the vertical shade shelters, although day temperatures were slightly warmer on the unshaded side.

In both autumn and winter, shaded seedlings had higher photosynthetic efficiency, as measured by chlorophyll fluorescence, than corresponding exposed seedlings. At the end of winter shaded seedlings had greater light

saturated photosynthetic capacity. The shaded seedlings also allocated more biomass to leaf area relative to total biomass (Leaf Area Ratio) compared to the exposed seedlings. These three responses led to the shaded treatment having significantly higher rates of growth at the end of winter compared to the unshaded treatment.

These results show that shade alone can significantly improve growth in environments where frosts are common. This study shows that not only is temperature important in determining the growth and survival of plants in cold regions, but how it interacts with other factors such as light is important as well. It is only through an understanding of these interactions that we will be able to confidently predict changes to mountain vegetation associated with global warming.

Notes to readers

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