Adaptive Phenotypic Plasticity of *Pseudoroegneria spicata*: Response of Stomatal Density, Leaf Area and Biomass to Changes in Water Supply and Increased Temperature

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Climate change may affect plant species distribution and community composition of grasslands. In the grasslands of southern British Columbia, Canada, Bluebunch wheatgrass, *Pseudoroegneria spicata* is a dominant species. We tested the plasticity of stomatal density and leaf area of Bluebunch wheatgrass and how these traits relate to plant biomass under water and temperature manipulations. The water supply treatments included ambient, increased ~ 30%, and decreased ~ 30%. The temperature treatments included ambient and increased ~ 1-3 ^{o}C through open top chambers. We hypothesized that: 1) increased water supply will increase biomass and decrease stomatal density and leaf area while decreased water supply will cause the opposite effect; and, 2) increased temperature will reduce biomass and increase stomatal density and leaf area. At the end of the second experimental growing season, above-ground biomass was collected. Abaxial stomatal density and leaf area was measured on Bluebunch Wheatgrass leaves. The first hypothesis was partially supported - increased water increased Bluebunch Wheatgrass biomass and significantly reduced leaf area, with no significant effect on stomatal density, while reduced water significantly increased stomatal density but had no affect on biomass or leaf area. The second hypothesis was rejected, but there were significant interactions effects on stomatal density and biomass. Overall, the stomatal density and leaf area were plastic in their response to water and temperature manipulations but the responses were site dependent, which indicates genotypic differences. Bluebunch wheatgrass is limited in its ability to respond to both reduced water and increased temperature.

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