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Alleviation of Thermal Stress in Pinus ponderosa by Plant-Growth Promoting Rhizobacteria Isolated from Mixed-Conifer Forests

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Abstract : Climate change enhances the occurrence of extreme weather: wildfires, drought, rising summer temperatures, all of which dramatically decline forest growth and increase tree mortality in the mixed-conifer forests of Sierra Nevada, California. However, microbiota living in mutualistic relations with plant rhizospheres have been found to mitigate the effects of suboptimal environmental conditions. The goal of this research is to isolate native beneficial bacteria, plant-growth promoting rhizobacteria (PGPR), that can alleviate heat stress in Pinus ponderosa seedlings. Bacteria were isolated from the rhizosphere of Pinus ponderosa juveniles located in mixed-conifer stand and further characterized for PGP potential based on their ability to produce key growth regulatory phytohormones including auxin, cytokinin, and gibberellic acid. Out of ten soil samples taken, sixteen colonies were isolated and qualitatively confirmed to produce indole-3-acetic acid (auxin) using Salkowski's reagent. Future testing will be conducted to quantitatively assess phytohormone production in bacterial isolates. Furthermore, bioassays will be performed to determine isolates abilities to increase tolerance in heat-stressed Pinus ponderosa seedlings. Upon completion of this research, a PGPR could be utilized to support the growth and transplantation of conifer seedlings as summer temperatures continue to rise due to the effects of climate change.

Keywords : conifer, heat-stressed, phytohormones, Pinus ponderosa, plant-growth promoting rhizobacteria
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