Effect of heat and drought on plant performance at rear range limits

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Climate has been long known to impact species distribution. However, it is not always clear which aspects of the environment are the most restricting (Hargreaves et al., 2014). A recent literature study documented that cold ends of species' distributions were most often affected by temperature, whereas warm ends of many species were shaped by moisture and temperature, apart from biotic interactions (Paquette & Hargreaves, 2021). Many species seem to withdraw from their warm end of distribution associated with climate warming (Rumpf et al., 2018), suggesting that warmer or hot-dry conditions reach levels outside of the ecological niche. In a greenhouse experiment, we tested whether the effects of heat and drought expected at warm range edges under climate warming were deleterious to plant performance, as well as if and how the effects interacted. We exposed one center and four range edge populations of the North American plant Arabidopsis lyrata to heat and drought, as it is increasingly experiencing these conditions at the rear range edge under climate change, and studied their effect in separation and in combination on plant traits and plant performance. Differences were tracked as reaction norms in response to stress treatments from the germination until reproduction. Here we present the results of this study, highlighting interaction effects between heat and drought on performance and the role of plastic trait changes.

Literature

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