Abstract

Plants adjust to challenging environments by genetically fixed changes and phenotypically plastic response. Alpine environments pose multiple challenges to plant life including cold, high irradiance and short vegetative period. To survive such specific conditions, plants often significantly alter their morphology. In my thesis I studied to which extent specific traits of alpine ecotypes repeatedly appear among independently formed alpine populations and to which extent these changes represent fixed genotypic differentiation vs phenotypic plasticity. To address these questions I performed an experiment in which *Arabidopsis arenosa* plants from sixteen populations belonging to two ecotypes (alpine and foothill) were grown in conditions resembling alpine vs foothill conditions. Specifically, I modified levels of irradiance and temperature and complemented alpine-like and foothill-like treatment by additional two extreme treatments to reach full-factorial design. I used discriminant and classificatory analysis to examine the overall morphological differentiation characterised by set of twenty measured traits. Then I examined variation in each trait by statistical Bayesian model that I designed for this purpose. I found out that although ecotypes are predominantly differentiated by fixed morphological differences, there is a set of traits that appear strongly plastic, and the direction of plasticity differs between alpine and foothill plants. The results suggest that both non-plastic and plastic changes play role during recurrent alpine adaptation in *Arabidopsis arenosa*.

Keywords: plasticity, alpine environment, *Arabidopsis arenosa*, common garden experiment