

Publication

Adaptation of flowering phenology and fitness-related traits across environmental gradients in the widespread *Campanula rotundifolia*

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Plant populations need to adjust to climate warming through phenotypic plasticity or evolution of trait means. We performed a common-garden experiment with European populations of *Campanula rotundifolia* to investigate current adaptation in fitness-related traits and the potential for future adaptation. The common garden was situated in Switzerland and contained plants from 18 populations from four regions: Central Europe, The Netherlands, Scandinavia and the Swiss Alps. We assessed current adaptation with trait-environment correlations, and we compared molecular marker with trait differentiation to investigate past selection. How traits may change under future climate warming was investigated via selection analysis. Trait-trait correlations were performed to reveal genetic constraints. The majority of analysed phenotypic traits showed regional differentiation and all traits showed indications of past selection. Flowering duration decreased with latitude and elevation, suggesting adaptation to growing season length. The Central European populations performed best, indicating home-site advantage. Selection analysis showed positive selection on fitness-related traits whereas phenological traits showed less clear patterns. Trait-trait correlations were mostly neutral or favourable to selection. This study suggests that flowering phenology and other fitness-related traits of *C. rotundifolia* are adapted to the current climatic conditions and have the potential to evolve under climate change.

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