

Review of Doctoral Thesis at Charles University of Prague (September 2020)

PhD Candidate: Andrea Veselá

PhD Title: External conditions, seed characteristics and other factors affecting seed germination of alpine species.

General assessment

This PhD thesis analyses drivers of seed germination in mountain plants, using three study systems to address inter- and intra-specific responses. The topic is relevant to address species responses to current and future climatic gradients and to understand the regeneration of cold-adapted species by seeds. The main strength of the study is to address multiple drivers which are scarcely considered in the topic, like the maternal effects of source populations, the water potential of germination conditions, the interaction with seed mass, and the species' phylogenetic signal. The use of seeds collected in different populations and different mountain regions, and the development of common garden experiments, are highly remarkable. The PhD also shows a sound methodological background, with a general good description of methods and results. The main weakness lies on the formal presentation of the Discussion sections in the unpublished chapters, including vague statements and several misinterpretations, but this is easy to improve before final publication. Overall, I think the dissertation qualifies the candidate to obtain a PhD degree.

Major questions to the candidate

- I congratulate the candidate for using common garden experiments in studies 1 and 2. In a similar experiment I supervised years ago (Fernández-Pascual et al., 2013), we followed the approach of collecting seeds from the source populations to germinate them in a common garden experiment, using the new generations (F1, F2) as a source of new seeds for germination tests. This is the approach used in e.g. the classic study on *Achillea lanulosa* cited in ecology textbooks. However, you preferred to move plants instead of seeds. *What are the reasons behind this decision? How do you think this decision could influence your results when compared with the approach of collecting seeds from the mother plants?*

- Chapters 1 and 2 are based on the SeedClim sites in Norway and the common garden in Prague to compare effects on “field” and “cultivated” plants. However, you analyzed the data differently. I am particularly concerned with the concept of “Change moisture” in chapter 1. From my view, there is one single treatment (water stress, with two levels, as in Chapter 2) over N populations. Water stress cannot be related to total annual precipitation because it changes along the year, in alpine environments only occurring in specific periods (Mondoni et al. 2015). Similar concern applies to “Change temperature”. Although I agree in exploring the effect of source climatic conditions, *do you think that calculating the difference between summer (air) conditions in the original population and temperature/moisture in your germination plate is realistic?*
- Cold stratification is generally seen as a requirement to break physiological dormancy, postponing germination to the season free of snow. In germination tests for mountain plants, it is recommended to mirror field conditions by using realistic periods of cold stratification and temperature regimes. This should be done preferably with fresh seeds, i.e. a few weeks after collection (Baskin et al. 2006). Under such assumptions, *what do you think are the main limitations of your experiments in chapters 3 and 4? What would you change if you were offered to repeat the experiments again?*

Cited references

Baskin, C.C., Thompson, K. and Baskin, J.M. (2006) Mistakes in germination ecology and how to avoid them. *Seed Science Research* 16: 165-168.

Fernández-Pascual, E., Jiménez-Alfaro, B., Caujapé-Castells, J., Jaén-Molina, R. and Díaz, T.E. (2013) A local dormancy cline is related to the seed maturation environment, population genetic composition and climate. *Annals of Botany* 112: 937-945.

Mondoni, A., Pedrini, S., Bernareggi, G., Rossi, G., Abeli, T., Probert, R.J., Ghitti, M., Bonomi, C. and Orsenigo, S. (2015) Climate warming could increase recruitment success in glacier foreland plants. *Annals of Botany* 116, 907–916.

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