

Review of Diploma Thesis – Doubravka Požárová: The Role of Phenotypic Plasticity in Parallel Altitudinal Differentiation in *Arabidopsis arenosa*

The thesis is about the research of phenotypic responses of *Arabidopsis arenosa* to environmental changes. Genetic and plastic responses were distinguished and evaluated using a system of parallelly evolved alpine and corresponding maternal foothill populations. Plants were cultivated from seeds and exposed to conditions mimicking original localities (in terms of temperature and irradiance). Their traits were measured and differences between ecotypes and treatments were evaluated. It was concluded that plants respond to environmental changes via both plastic and genetic changes.

Adaptation of organisms to their respective conditions represents a fascinating phenomenon. Study of its mechanisms is a big and important topic in ecology which is even more up to date given the challenge to adaptation imposed by climatic changes. Although the thesis focuses on one species, it is an often-used model species and therefore I believe knowledge of its variability, its basis and potential will be useful for science.

The experiment with *A. arenosa* is well designed (in its structure as well as size) to answer questions of the thesis and used statistical analyses are appropriate to evaluate the collected data. Results are correctly interpreted, and their presentation is mostly satisfactory. Text of the thesis is well readable and complies with all major requirements, therefore I recommend this thesis for defense.

In more detail: The topic is adequately introduced in the thesis including justification for the used approach to study plasticity of experimental plants. Description of the experiment is nicely done. Description of statistical analyses focuses mainly on Bayesian models, slightly neglecting other analyses, however overall sufficient. Results are detailed and I appreciate the approach to explore the data from various angles. On the other hand, results represent more than half of the thesis (excluding supplements) and seem to be decreasing in quality of presentation in later parts. Readability would be increased, I believe, by placing some of the content into supplements (such as tables of parameter's quantiles). Also, a much better job could have been done concerning visual presentation. It's a pity that the quality of graphs which were surely laborious and display results well, is diminished by poor labeling of variables and very often missing units! Discussion is short yet satisfactory – it covers all questions of the thesis and is well structured. Summary is ok but does not go beyond summarizing previous parts (a good conclusion often contains some outreach, further context, application or prospects for future research). Data and code for analyses are included in supplements which is a small plus but an important example for other theses and papers. Unfortunately, there are minor discrepancies between code in the supplements and description in the thesis (e.g.: number of iterations for Stan model, domain of parameter β_{0e}) and small mistakes such as missing commas. Otherwise, code quality deserves to be acclaimed.

Questions

1. You state (2.1.1) that the first generation of plants was cultivated and the second was used for the experiment to minimize maternal effects from original localities. This correctly suggests that some limited maternal effects could still be present. What type of maternal effects could be preserved into the second generation and what effects were eliminated?
2. Alpine populations tend to be perennial according to your thesis (3.2.2). Do we know anything more specific? How does one compare fitness of annual and perennial plants?

3. Only treatment without the difference in flowering rate between ecotypes is high temperature and irradiance (although the same trend is present). You speculate in the thesis (4.1) that could be because of disruption of gene regulatory machinery responsible for the timing of flowering. Why? Could you expand on that/justify it? What triggers flowering in plants?

4. Two treatments are marked as foothill-like and alpine-like. These seem to be appropriate labels. What purpose does it suit to try to mimic conditions of both ecotypes in the experiment? What would be the consequence for interpretation of your results if the mimicking would totally fail (in one or both cases)?

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