



Review of the doctoral thesis of Anna Aldorfová, Interaction of plants and soil and other factors affecting plant invasiveness

Although this thesis addresses a varying set of questions, they all include in their scope alien plant species and the role the plant-soil feedback plays in their lives. These two themes also define the structure of the introductory text, which is a compact (seven pages long), yet readable explanation for the ideas of plant-soil feedback (PSF) and of plant invasiveness. This text also includes the discussion of required methodological approaches and of their limitations. The introduction is followed by a summary of the five studies (research papers) presented in this thesis. Finally, there is also a single synthesizing chapter, providing summary and discussion of the results across all the aspects of presented doctoral research.

I believe that all five studies share some important marks of their quality. Interesting questions are well introduced and subsequently turned into nice experimental designs, in which sufficient attention was paid to important technical details. I liked the decisions made by the authors such as the observation of PSF at two or even more ontogenetic stages, variation of environmental conditions, under which the plant-soil feedback experiments proceeded, retaining of the variability among populations of individual species (in the first two studies), or the pairing of congeneric species across multiple life histories in Study 2.

The meticulous attention to detail paid off in all the studies, yielding interesting results, which are then excellently discussed. Alas, it happened too often that this poor reviewer had thought of interesting question to ask during the defence, while reading the methods or results sections, only to find the issue thoroughly discussed in the final part of the corresponding manuscript. Consequently, I admit, my questions will hardly take the defendant by surprise, hopefully promoting a thorough discussion.

For Study 1, I had some doubts about the way the phylogenetic corrections were performed: using the first three axes of principal coordinate analysis of the patristic distances as covariates likely accounts for similarities within the major lineages (such as monocots vs dicots or rosids vs asterids), but the evolutionary dependence among the members of the same family or genus, which is usually much stronger, will not be accounted for with such a choice. As this study seems to be still at the manuscript stage, I suggest the authors to consider using a stepwise selection of phylogenetic eigenvectors instead. This is rather technical issue, however, so no feedback is needed during thesis defence.

I have also a small comment about Study 3. It is sad that the invasive *Impatiens glandulifera* was not included in the study, so that the ratio of invasive and non-invading alien species remained at 1:3. The potential utility of including that species is clearly demonstrated



by extensive comparisons with the results obtained for *Impatiens glandulifera* in other published studies, as seen in the discussion.

I have particularly enjoyed Studies 4 and 5, because they represent, respectively, well thought-out observational and experimental project, both performed under field conditions. Their origins seem to go back to the time of student' master study allowing for a rather long observation periods. Study 4 investigated the spread of invasive *Impatiens parviflora* into habitats of different types, examining the effects of local environmental conditions on the species success at different developmental stages. Study 5 focused on the most easily invaded habitat of oak-hornbeam forest and the authors investigated what effects an experimental removal of *Impatiens parviflora* has on the composition of the remaining vegetation. I liked the pairwise arrangement of plots of the two compared treatments as well as the considerations given to possible edge effects. Study 5 not only reveals specific compositional changes, but using trait-based approach the authors also identify their likely causes.

Here come few questions or comments I would like to discuss with the doctoral candidate during the defence.

1. Your research deals mostly with the intraspecific PSF of alien species. In the light of frequently observed pattern, where the invasive species prevails in the community biomass, perhaps the inter-specific PSF is also important for its success. Can you briefly consider the differences and relative importance of these two types of PSF for the success of invasive plant species?
2. In the first two studies, your experiments providing the estimates of PSF direction and strength are based on using, in the second (feedback) stage, only a single specimen of tested species per pot (after the germination rate based on 10 seeds was recorded and redundant seedlings discarded). Therefore, the biomass-based PSF characteristic was estimated on the selected individual (always "the largest one") growing with no intra- or inter-specific competition. Do you think this could affect the observed predictive power of PSF for species invasiveness?
3. I was mildly puzzled by the definition of phylogenetic novelty of investigated alien species. It is based on presence of a native species of the same genus within Czech Republic, irrespectively of whether that species occurs in the habitats potentially invaded by the considered alien. I would guess there might be more phylogenetically novel species if they are identified in a more realistic way. What do you think?
4. In Study 5, the effect of invasive *Impatiens parviflora* was studied by its experimental removal. I wonder how the plants were removed? Here I relate to my (rather limited) gardening experience, where the removal of germinating weeds distorts soil surface and sub-surface zone and this might, eventually, release some nutrients from the soil. I wonder what are your thoughts about this and whether the differences in the availability of



nitrogen and phosphate ions between the two plot types were examined at the end of your experiment?

5. I found the approach of Study 1 to model selection using ΔAIC quite appealing, but when you decide to take such a path, you should be more careful with wording and with the interpretation of results. Fig. 4 caption suggests that negative values indicate "significant contribution" to explaining invasiveness, but ΔAIC value -2 (estimated for the seedling-based PSF effect) is not very convincing, as larger drops in AIC are usually required by devotees of parsimony-based model selection. I presume you have not performed real tests of significance here? Without additional inputs, my conclusion would be different from yours, namely that although the PSF at seedling stage had a more important role for predicting invasiveness than the PSF for adult biomass, even its role was not sufficiently important to be seriously considered.

To bring my review to a conclusion, I am happy to state that I am fully satisfied with the results and presentation of doctoral research of Anna Aldorfova, based on the submitted thesis.

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