

In Prague 7<sup>th</sup> September 2011

**Reviewer comments on Ph.D. thesis of Mgr. Lenky Malíkové entitled „Adventitious sprouting of short-lived plants in natural populations“**

Ph.D. thesis are composed from four original research papers – one paper was published in journal entitled *Annals of Botany* and the second in *Canadian Journal of Botany*. Two papers are in the stage of manuscripts probably under review now. Lenka is in two cases the first author and in two cases the second author. According to my opinion, this is a sufficient for the successful defence of the thesis.

The main aim of this study was to investigate adventitious sprouting of short-lived plants, annuals and biennials especially. The first study was performed on the landscape level. Very interesting is the result, that there was no difference in adventitious sprouting between annuals and biennials. Further majority of investigated species were able to create adventitious sprouts and this ability was minimally affected by nutrient availability.

The second study was closely connected with the first study. In the same populations of short-lived species, effect of damage of apical meristem on sprouting was investigated. The main result is that potential bud bank initiated only after injury can enable a plant to overcome a meristem limitation after severe disturbance also in the case of short-living species.

The third study was performed on the individual species level. Laboratory experiment investigating compensatory growth of *Euphorbia peplus* was combined with a field study on 33 different populations of this species. The most interesting is the conclusion, that regeneration after severe disturbance is dependent on the age of the plant – higher 14 days after the plant emergence than 42 days after the plant emergence.

Similarly to the third study, the last fourth study was performed on the individual species level. Regeneration of invasive annual weed species *Euphorbia geniculata* after disturbance was investigated in the field in Indonesia and then in the laboratory in Třeboň in the Czech Republic. The most interesting finding was high interpopulation variability in the ability to regenerate after disturbance. This stress the necessity for studies performed on more populations, not only on the level of one population.

In general, the study is very interesting and shows that many short-living species are able to regenerate after relatively severe disturbance.

**Critical comments**

The use of Ellenberg Indicator Values (EIVs) – According to my opinion, EIVs are non-critically used within the manuscripts. For example several times is written about measurement or estimation of nitrogen or light availability, but these values were not measured, but only very roughly estimated according to EIVs. Further, EIVs for nitrogen are not for nitrogen, but rather for ecosystem productivity. Nice example is the use EIVs for estimation of N availability in the ecosystem is the Rengen Grassland Experiment – there are two treatments with the same nitrogen application and therefore nitrogen availability for plants (100 kg N ha<sup>-1</sup> per year) and they differ substantially in EIVs for nitrogen, because there is a high phosphorus limitation in one treatment (see the paper by

Chytrý M., Hejcman M., Hannekens S. M., Schellberg J. (2009): Changes in vegetation types and Ellenberg indicator values after 65 years of fertilizer application in the Rengen Grassland Experiment, Germany. *Applied Vegetation Science* 12: 167–176.). EIVs for nitrogen can therefore not be used for estimation of nitrogen availability in ecosystems but rather for productivity.

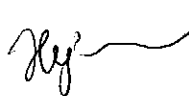
#### Study 2

That is nice to see results of statistical tests in the table, but for practical reasons, it will be nice to publish results for individual tested species (such table with data is missing in the paper). This is because the farmer for example wants to know behaviour of an individual plant (weed) species which is problematic on his field rather than to read generalizations for all investigated annuals.

Can you please make any practical recommendation for farmers how to more effectively control occurrence of short-lived weedy species if they are able to regenerate after disturbance?

#### Conclusions

Lenka performed huge amount of work during the data collection, analysis and writing of scientific papers. I believe that the quality of the Ph.D. theses is sufficient enough to be successfully defended.



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#### Review

of the PhD-thesis of Mgr. Ing. *Lenka Malíková* on '*Adventitious sprouting of short-lived plants in natural populations*'

Lenka Malíková presents in her thesis the results of empirical field studies and laboratory experiments on plants that are capable of regenerating from roots. The main aim of the thesis was to investigate the role that adventitious sprouting plays for short lived plant species especially in disturbed ecosystems, a phenomenon which has only been studied rarely until now. The thesis is a part of the research-focus of Jitka Klimešová on clonal regeneration in herbaceous plants.

The thesis consists of 84 printed pages and is structured into a general introduction (10 pages), four case studies (71 pages), in which the original results are presented and a very short summary of the results (3 pages) which is named 'general conclusions' in the text. All four case studies are organized as independent scientific papers which can be read on their own, i.e. each is divided into an introduction, material and methods-section, results and a discussion.

Lenka Malíková is first author in two of the case studies, and second author (of three authors in total) in the others. Two papers have already been published, one manuscript is submitted and the other pending to be submitted. According to the co-authors statements, Lenka Malíková was mainly involved and responsible for the design and execution of the field- and lab-studies, the preparation and writing of the manuscripts, whereas the statistical analysis was mainly performed by the co-authors.

The thesis is written in English which is generally on an acceptable level. However, the English could be improved, as several linguistic and grammatical faults as well as spelling mistakes are scattered throughout the thesis, especially in the sections that have not been published yet but also even in the titles of the cases studies. However, these problems are not very serious and rarely hindered me in understanding the scientific content.

All in all, the thesis can build the basis for a PhD. degree and I recommend it for defence.

In the following I will shortly comment the four case studies and raise some scientific issues and questions for discussion.

### Specific comments and questions

#### Case Study I

- In the thesis species re-sprouting from the roots are not treated separately from species that re-sprouting from the hypocotyl. I wonder if it makes any difference if species are re-sprouting from the roots or from the hypocotyl?
- Is there any reason why 'winter' is not mentioned in the introduction as a typical seasonal climate in which monocarpic plants find good conditions?
- In the introduction some hypotheses are given under which adventitious resprouting is expected to be overrepresented. However, it is not fully clear to me, to which extent these hypotheses are specific for adventitious resprouting or if they would be similar when formulated for axillary resprouting. In other words, I wonder if there are any differences between the ecological and environmental requirements of species with a high potential for adventitious resprouting and a high potential for axillary resprouting.
- In this context it I would also be interested in the question whether there any trade-off between the potential for axillary resprouting and adventitious resprouting?
- It would have been useful to read more about the used approach for phylogenetic correction within the thesis.
- Can the found relationships between the number of adventitious buds/shoots and base width, number of a axillary branches and phenological stage be interpreted as allometric effects?

#### Case Study II

- The title is not clear to me and should be revised!
- In this case-study the results are presented exclusively in the text and in tables. Maybe it would have increased the readability if some of the results would have been presented in figures.
- The main result of this case-study seems to be the positive relationship between disturbance and resprouting from the potential bud bank. Therefore, I wonder if you ever tested the relationship between the Briemle/Ellenberg Indicator values for mowing, grazing and trampling tolerance (data are available e.g. in BIOLFLOR, Klotz et al. 2002) and adventitious resprouting potential? This could have been done on both, the community and the species level.

- In table 3 and table 4 (which is exceptionally printed after table 5) the results are presented with and without phylogenetic correction. In table 1 and 2 the results are presented only without phylogenetic correction. I do not understand why plant height (table 1) and number of axillary branches (table 2) are treated different than number of adventitious buds and shoots (table 3) and the cumulative length of adventitious shoots (table 4).
- How reliable and resilient are the results regarding the relationship between resprouting and environmental conditions? Especially, I wonder if the Ellenberg-Indicator approach is appropriate for characterizing the differences in the light environment between disturbed and undisturbed plants/sites?
- It is not clear to me, why the tolerance to disturbance was limited ONLY by the availability of meristems?

#### Case Study III

- What do you mean with 'establishment' in context of your growth chamber experiment?
- Is there a difference between 'locality' (legend of Fig.1) and 'community' (legend of Fig 2)?
- Are the different patterns for 'no of branches' and 'no of adventitious shoots' related to different functions of these organs?
- What are the reasons for the 'optimal curves' that describe the relationship between 'leaf cover' / 'nitrogen availability' and 'no of adventitious shoots'?
- In the discussion it is mentioned that the architecture is more in accordance with the bet-hedging strategy than with an architecture mainly regulated by the cost of apical dominance-hypothesis. It is not really clear to me on which traits this conclusion is based.

#### Case Study IV

- It really seems curious that there is no correlation between the number of adventitious buds per plant in the field and the pot experiment. Therefore, I wonder not only how often the field sites were disturbed but also of what type the disturbance was. Is there a possibility that the disturbance in the field did not seriously reduce aboveground biomass and that the plants were mainly resprouting from axillary buds?

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