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Miesto a dátum odoslania
Bratislava, 14. 8. 2023

Review of the PhD thesis

submitted by Lena Hunt MSc.

“Physiological, structural, and biochemical leaf traits of selected Poaceae species involved in oxidative stress protection and acclimation to different light conditions“

**Charles University, Faculty of Science
Study program Experimental Plant Biology. Prague, 2023**

PhD thesis submitted by Lena Hunt MSc., supervised by Prof. RNDr. Jana Albrechtová Ph.D., and the consultant Mgr. Zuzana Lhotáková, Ph.D. represents complex study of physiological, structural and biochemical leaf traits in grasses (with the main focus on barley) exposed to several abiotic stress factors. The thesis examines the contribution of individual leaf traits of plants exposed to varying irradiance and CO₂. The main interest was focused on oxidative protection mechanisms. The detail study was aimed mainly on individual phenolic compound production.

The aims of the thesis represent a highly topical issue, and I have read the thesis with a great interest. Barley is one of very important crop species and in Czech Republic its cultivation has long history and continuing importance. The last part of the study was realized in collaboration with Global Research Change Institute, Czech Academy of Sciences Brno in alpine tundra grassland comparing leaf functional traits of four grass species. The main question was about physiological reason of domination of invasive species.





The thesis is introduced with chapters Abstract, Introduction and Aims. The reader can easily identify the problem which attracted attention of the student and the way which she followed during her Ph.D. study. The key results received and published during her Ph.D. are also introduced. A detailed literature review entitled Scientific Background is followed by Summary of Published Papers and Overview of Main Findings summarizing again the received results. Following chapter is Discussion extensively and critically comparing results with the recent related publications. Chapter Conclusions indicates possible continuation of experiments in the future and may represent inspiration also for additional studies of co-workers, or students. The Acknowledgements mention support of two scientific supervisors and other colleagues offering advice and support during the experimental work and projects supporting all research financially. In this context I appreciated detail description of the roles of all co-authors of published papers as it is expressed in: Chapter 4. "Summary of Published Papers". This part is often missing in theses and readers in the present case can easily identify the collaborators dominating methods performed in the collaboration with the main author. References contain almost 200 citations of mostly recent literature. I appreciated the last chapter 8. "Supplement" with copies of all 4 published papers. This is sometimes also missing in Ph.D. theses and readers are expected to search for the publications via internet, which is not always easy.

The methods used in the study are adequate to fulfil the aims of the thesis, the candidate has chosen wide variety of methods to complete the study. I specially appreciate the complex approach to the topic. Another important and valuable contribution is possibility to use some very recent methods as HPLC-HRMS. These methods are bringing new results. The same is true in connection with development of new original methods and improvement of some classical methods – as in the study of stomata. Very realistic and critical approach to the results as expressed in Discussion is also very valuable. I valued part of conclusions that comparison of the results from various plant developmental stages (missing in the present study) may bring some new findings (Chapter 6.3; page 36).

Aims of the dissertation thesis were fulfilled, the results are well documented, and the text is easy to read with very few mistakes.

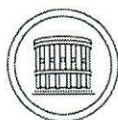




I have a few following questions and remarks to the candidate:

- In the literature there are data indicating relationships between silicon and phenolics in relation with stress. Could you comment this topic?
- You indicated several possible ways for continuation of your studies, e.g. surprising accumulation of hydroxibenzoic acids in barley cultivar Barke, (used in Pilsner beer) and commonly cultivated in Europe and possible relation of this fact with colder climate and its resistance to common fungal diseases. The other direction is to extend the research to below ground organs and processes. In addition, detail physiological, biochemical and structural study of natural vegetation and its changes related with the climatic changes seems to attract your attention as well. Which of these are you planning to follow?
- In discussion connected with defence of your thesis I would appreciate your opinion about antipathogenic function of tanins.
- In Chapter 6.3.3. "Temperature" you mention cold stress as "the major limiting factor for overall plant productivity". Will you kindly explain it?

Results achieved in the thesis represent new findings and important contribution to the study of important crop plants in reaction to abiotic stress resulting from global environmental changes. Light intensity and spectral composition, but mainly increasing CO₂ concentration induce changes in the nutritional quality of food. The new findings were published about individual phenolic compounds of different plant organs (leaves and grains). They were stimulated by interest of Lena Hunt and collaboration with enthusiastic colleagues from Charles University, University of Ostrava and Global Change Research Institute, Czech Academy of Sciences Brno and enabled by new methodology. Interesting contribution is the study of native flora and its changes in connection with climatic changes. I highly appreciate the wide range of methods used in this study and specifically also the modification of existing methods and development of new methodological approaches. The present thesis represents important contribution to the development of science. Publication of the results with several citations prove the value of the study.





In conclusion it is possible to state that the dissertation thesis of Lena Hunt MSc. fulfilled the aims and the candidate achieved important results and the conditions were met according to the regulations for the Ph.D. theses.

Based on the above-mentioned statements I propose to the scientific committee to award to **Lena Hunt MSc. title “Philosophiae Doctor“ (Ph.D.)**, in accordance with the requirements laid down for the degree of Ph.D.

I classify the thesis with the grade A.

I propose award “**Cum Laude**” to Lena Hunt MSc.

Bratislava, August 15, 2023

RNDr. Alexander Lux, CSc. Professor

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