

HABILITATION THESIS REVIEWER'S REPORT

Masaryk University

Applicant

Mgr. Markéta Šámalová, Ph.D.

Habilitation thesis

Development of molecular tools for experimental biology of plants and fungi

Reviewer

Doc. Ing. Lenka Burketová, CSc.

Reviewer's home unit, institution

Laboratory of Pathological Plant Physiology, Institute of Experimental Botany, Czech Academy of Sciences

The habilitation thesis presents the most important results achieved by the author during her scientific career, which she spent in various laboratories: at the University of Oxford (UK), at the Institute of Biophysics AS CR and at CEITEC of Masaryk University. Working in these different places gave her the opportunity to deal with different aspects of experimental molecular biology, so that her habilitation thesis covers topics related to molecular methods used in plant sciences and both human and plant pathogens. Besides interesting results, Dr Šámalová has also made methodological contributions to the scientific community, as her methodological approaches can be applied in various research contexts.

The habilitation thesis is carefully written and consists of an introductory section, which is intended to introduce the reader to the topics under investigation, and a collection of 12 selected scientific articles. The 23-page introduction is divided into five chapters corresponding to the main topics, which are mostly experimental molecular tools for the study of plants and fungi. In this part, the author summarises the achievements in this field, explains the motivation for her studies and comments on her own results, which she documents in the attached articles.

The scientific articles contained in this work have been published in high-ranking journals and testify to Dr. Šámalová's scientific erudition and competence in both research and teaching.

Main research areas and gained results included in thesis:

- The focus of this work is to provide useful tools for molecular biology studies in plants. One very successful story concerns a chemically inducible gene expression system pOp6/LhGR, which the author demonstrated in the model plant species *Nicotiana tabacum* and *Arabidopsis thaliana* and later in a monocotyledonous model plant, rice. The system proved to be efficient, tightly regulated and one of the most sensitive systems ever developed. The results were published in a prestigious Plant Journal and the detailed characteristics and comparison of pOp6/LhGR with other inducible systems were presented in a widely cited review article.

- Another tool for studying cellular processes is quantitative and qualitative ratiometric fluorescence imaging, which has been developed for studies of endomembrane trafficking in both tobacco and *A. thaliana*. Part of the work involves studies of plant and human fungal pathogens. New tools have been developed to study redox state using redox green fluorescent protein *in situ*. NO production and its role in germ tube and appressorium formation provided evidence that NO is also an important regulatory molecule in fungi.
- The last part of the introduction is devoted to the biomechanics of the plant cell wall, in particular the role of expansins. Dr. Šámalová nicely summarises the current knowledge on the structure and functions of expansins. This topic offers interesting possibilities for further research, which are outlined in the thesis, e.g. loosening of the cell wall using the DEX-inducible transcriptional activation system pOp6/LhGR and *in vivo* studies of plant roots after induced apoplast acidification by the toxin fusaric acid or plant hormones.

Reviewer's questions for the habilitation thesis defence

- As I am involved in research on plant-microbe interactions, I would like to ask your opinion on fungal cell wall-associated enzymes in contact with plant cells. Could they play a role in remodelling the fungal cell wall to facilitate fungal penetration into plant tissues?
- I found your work on NO production in *Magnaporthe oryzae* very interesting. Since this pathogen is a hemibiotroph, could the production of NO be related to the different life stages, i.e. the transition from the biotrophic to the necrotrophic stage, or could the NO produced by the fungus serve as a signalling molecule for the plant cells?
- The role of expansins in plant development is obvious, but do they also play a role in the interaction between plants and pathogenic or non-pathogenic microbes? Do you think their activity could be influenced by phytohormones secreted by some pathogens?

Conclusion

The habilitation thesis entitled "Development of molecular tools for experimental biology of plants and fungi" by Dr. Markéta Šámalová **fulfils** requirements expected of a habilitation thesis in the field of Plant Physiology.

Date: 17.3. 2032

Signature: