

## HABILITATION THESIS REVIEWER'S REPORT

### Masaryk University

<b>Applicant</b>	Mgr. Markéta Šámalová, Ph.D.
<b>Habilitation thesis</b>	Development of molecular tools for experimental biology of plants and fungi
<b>Reviewer</b>	doc. Mgr. Jan Zouhar, Ph.D.
<b>Reviewer's home unit, institution</b>	CEITEC, Faculty of AgriSciences, Mendel University in Brno

The presented thesis illustrates the substantial and remarkable contributions of Dr. Markéta Šámalová to the field of plant science. The introductory section comprises of 5 chapters that logically introduce readers to the research topics relevant to applicant's scientific career. This part is nicely written and clearly demonstrates the capabilities and competence of the applicant as a university teacher and mentor. The opening part is followed by 12 research papers that correspond and further expand the Introduction and cement the position of the applicant as a respected scientist with a distinct international impact.

I will specifically highlight the following successful research stories:

- 1) **The development of tightly regulated inducible expression system**, which has contributed to numerous successful applications of this methodology in various laboratories around the world. The two seminal articles (both published in 2005) were cited more than 220 times (as of March 2023).
- 2) **Important contribution to the deciphering of molecular mechanisms of *Magnaporthe oryzae* infection and colonization**. In 2013, Dr. Šámalová described a critical role of fungi-produced nitric oxide in the initial stages of infection and searched for NO producing enzymes. This publication has currently 54 citations. In 2014, Dr. Šámalová developed a unique redox state sensor for monitoring ROS activity and demonstrated the need of internal ROS signalling for successful fungal colonization. She also reported resistance of *Magnaporthe* germlings to external reactive oxygen species, indicating a robust antioxidant defence. To date, the corresponding publication has been cited 56 times.
- 3) **Studies on the GPI-anchored proteins in two pathogenic fungal species**. The study of glucan elongation proteins (GELs) revealed that absence of three members of this family (GEL1, GEL3 and GEL4) caused *Magnaporthe* to lose its pathogenicity and opened a possibility for future development of antifungal drugs. The corresponding publication, with Dr. Šámalová as the first author, has currently 33 citations. The applicant further continued with her work on GPI-anchored proteins and focused on *Aspergillus fumigatus*, the deadly human pathogen. Dr. Šámalová and her colleagues performed a genome-wide functional analysis of 86 GPI-anchored proteins from *A. fumigatus* using a generated mutant library. While investigating

previously uncharacterized members of this protein family, a novel mutant with reduced growth, higher sensitivity to drugs and reduced adhesion was identified. The corresponding protein thus represents a promising candidate for a potential drug therapy.

### **Reviewer's questions for the habilitation thesis defence**

- 1) Given the strict regulation of the GMO crops in the European Union, what is your opinion about future applications of inducible expression systems in agriculture? What physiological pathways are the most likely to be targeted by such alterations?
- 2) What experimental strategies can be used for isolation of chemicals that specifically target GPI-anchored proteins?
- 3) The plant cell performs constant vigilance of its cell wall integrity through various apoplastic sensors to detect putative attempts of pathogen colonization. How do these systems co-operate with the machinery necessary for the cell wall remodelling?
- 4) Considering a dramatic development of high-resolution microscopy techniques in the recent years, what field of cell biology might experience the biggest impact?

### **Conclusion**

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

Date: March 16, 2023

Signature: