

BIOGRAPHY



JOZEF MRAVEC

**Plant Science &
Biodiversity Center SAS
*Institute of Plant &
Biotechnology, Nitra,
Slovakia***

**Project number
IM-2021-23**

Project duration

1. 9. 2022 - 31. 8. 2027

I graduated from Comenius University with a major in Molecular Biology and immediately joined the group of Prof. Jiří Friml as a PhD student at the prestigious Center for Molecular Biology of Plants in Tübingen where I studied intracellular and intercellular transport of plant hormone auxin. This was a very fruitful time for my scientific career and personal development. I published several papers including first-author papers in *Nature* and *Current Biology*. Later I switched my interest towards plant cell walls to explore their role in plant development but also to unravel their industrial potential such as their bioconversion to fuels. I did several postdoctoral stays across Europe: in Belgium (VIB, Ghent), France (INRA, Versailles) and Denmark (University of Copenhagen), in latter I stayed for 10 years, became a grantee of Villum Foundation and Independent Research Foundation Denmark and got appointed as associate professor and the group leader of the Cell Wall Probing group. My latest most significant publication is a recently accepted *Nature Plants* paper about root hair growth. I have been planning my return to my home country for a long time with an aim to help Slovak science environment and the SAV IMPULZ grant scheme enabled me to do so. I can now pursue my research interests in exploring new ways to analyse components of plant cell walls, to study how these components form such intricate cell wall structure and to perform this research in Slovakia on a high international level. In 2020 I received 'A' for my ERC Consolidator grant application and hopefully the next year application will be funded. My contacts to both academia and Danish food and feed industry will help me to be a strong partner for EU Horizon Europe calls and Danish innovation funds.

Aptamer-based analytical platform for in vitro and in situ analyses of complex carbohydrates - CARBODNA

Complex carbohydrates are some of the most important biopolymers. They provide a sustainable source of materials, and energy and are a major part of human and animal diets. Due to their high molecular weight and high complexity, the determination of the precise amount and structure of these molecules is extremely technically challenging. For instance, one of the currently used methods called Compositional Microarray Polymer Profiling exhibits several serious drawbacks such as the requirement for a high level of expertise, expensive equipment, and is very costly and time-consuming. The CARBODNA project aims to make a leap forward in the area and develop a novel analytical platform based on aptamers sometimes also called synthetic or chemical antibodies. These are fragments of polynucleotides with the ability to bind target molecules with high specificity and avidity comparable to conventional monoclonal antibodies. The initial task of the project is to generate aptamers specific for polysaccharide components of plant cell walls, especially for those still lacking any specific immunological probes as well as novel aptamers for macromolecular 3D structures such as intermolecular interactions forming the intricate cell wall architecture. These new probing tools will be utilized to create a new system for quantification and compositional profiling of samples of different origin utilizing common well-established methods of molecular biology as well as for detailed imaging of the cell wall ultrastructure. Finally, the new technology will be applied to study the dynamics of cell walls during plant somatic embryogenesis and cellular elongation.



impulz



JOZEF MRAVEC

**Plant Science &
Biodiversity Center SAS
Institute of Plant &
Biotechnology, Nitra,
Slovakia**

**Project number
IM-2021-23**

**Project duration
1. 9. 2022 - 31. 8. 2027**

PUBLICATIONS

1. Herburger K, Schoenaers S, Vissenberg K, Mravec J. Shank-localised cell wall growth contributes to Arabidopsis root hair elongation (2022) *Nature Plants* (accepted).
2. Głazowska S, Mravec J. An aptamer highly specific to cellulose enables the analysis of the association of cellulose with matrix cell wall polymers in vitro and in muro. (2021) *Plant Journal* 108, 579-599
<https://onlinelibrary.wiley.com/doi/10.1111/tbj.15442>
3. Mravec J, Guo X, Hansen AR, Schüchel J, Kračun SK, Mikkelsen MD, Mouille G, Johansen IE, Ulvskov P, Domozych DS, Willats WGT. Pea Border Cell Maturation and Release Involve Complex Cell Wall Structural Dynamics. (2017) *Plant Physiology* 174, 1051-1066
<https://academic.oup.com/plphys/article/174/2/1051/6117420>
4. Mravec J, Kračun SK, Rydah MG, Westereng B, Clausen MH, Daugaard M, Van Cutsem P, Hjarvard De Fine Licht H, Hofte H, Malinovsky FG, Domozych D, Willats WGT. Tracking developmentally regulated post-synthetic processing of homogalacturonan and chitin using reciprocal oligosaccharide probes. (2014) *Development*. 141, 4841-4850
<https://journals.biologists.com/dev/article/141/24/4841/46564/Tracking-developmentally-regulated-post-synthetic>
5. Mravec J, Skúpa P, Bailly A, Křeček P, Hoyerová K, Bielach A, Petrášek J, Zhang J, Gaykova V, Stierhof Y-D, Schwarzerová K, Rolčík J, Dobrev PI, Seifertová D, Luschnig C, Benková E, Zažímalová E, Geisler M, Friml J. Subcellular homeostasis of phytohormone auxin is mediated by ER-localized PIN5 transporter. (2009) *Nature*. 459, 1136-1140
<https://www.nature.com/articles/nature08066>



impulz