Symbiosis and Plant Genomics Group

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Név	**Titulus**	**Publikációk**	**CV**
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Research

Legumes compose the third largest family of flowering plants. *Medicago truncatula* and other leguminous plants are able to establish nitrogen-fixing symbiotic associations with specialized soil bacteria belonging to the genus rhizobia. This symbiotic interaction accounts for a significant proportion of biological nitrogen fixation worldwide.

Symbiotic nitrogen fixation takes place in specialized organs on the root, termed nodules wherein rhizobia converts atmospheric nitrogen to its fixed form (ammonia) that is assimilated by the host plant. Nodule formation is a result of several consecutive communication steps between the plant and the bacteria. Nod factors (NF) produced by the bacteria are essential signalling components for the formation of legume-rhizobial symbiotic interaction. The recognition of rhizobia in root hair cells induces the formation of tubular structures, the infection threads that penetrate cortical cells. The attachment of compatible bacteria to the root stimulates cortical cell divisions that result in the formation of nodule primordia. When the infection threads reach the developing nodules, rhizobia are released from the infection threads into the cytoplasm of nodule cells where bacteria are encompassed by plant derived peribacteroid membranes. These cytoplasmic structures containing rhizobia are referred to as symbiosomes. The symbiosome is the site of nitrogen fixation and functions in nutrient and signal exchange between the two symbionts. In symbiosomes the bacteria undergo morphological changes and metabolic differentiation to transform into their symbiotic state termed bacteroids. The bacteroid differentiation is an irreversible transition in nodules of *M. truncatula* and closely related legumes and it is directed by a large family of nodule-specific cysteine-rich peptides (NCRs) produced by the host plant.

The research of our group focuses on the agriculturally and environmentally important symbiotic association between leguminous plants and rhizobia. The aim of our research is to reveal the molecular steps of nodule initiation, bacterial invasion and nodule function to better understand the molecular basis of symbiotic nitrogen fixation. We use state-of-the-art molecular, genomic and biochemical methods to identify and characterize symbiotic genes, reveal interacting partners and regulation mechanisms occur during the symbiotic interaction. The aim of the study of NCR peptides is to identify their bacterial targets and reveal the exact role of NCR peptides during nitrogen-fixing symbiosis. Beyond their symbiotic action, cationic NCRs have strong antimicrobial effects on a wide variety of bacteria and fungi. Another focus of our research is to identify the action of cationic NCRs and study their potential medical application. In addition to the specificity of legume-rhizobia association mediated by NFs and the corresponding plant receptors, the success of the interaction is controlled by other plant and rhizobial factors, such as bacterial surface polysaccharides and, in certain cases, some host-specific NCR peptides. Our studies also focus on bacterial and plant genes that determine the compatibility and the effectiveness of the symbiotic interaction between rhizobia and the host plant.