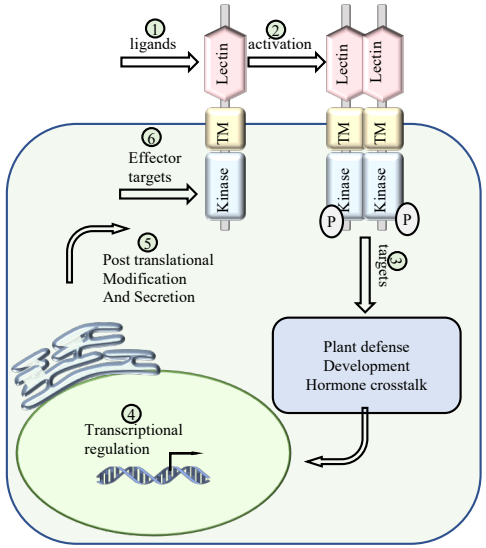
Foundational Genomics Research, PMI SFA

U.S. DEPARTMENT OF ENERGY | Office of Science

High Impact Publication: Lectin receptor-like kinases in plant-microbe interaction

Objective	• Perform a comprehensive analysis of the domain structure and function of lectin receptor-like kinases (LecRLKs) in plants, a follow-up study to the initial discovery of PtLecRLK1 identified as a key regulator of *Populus-Laccaria bicolor* symbiotic interaction (Labbé et al., *Nature Plants* 5, 676-680, 2019)
New science	• LecRLKs are involved in both pathogenic and beneficial plant-microbe interactions. Differences in domain structure contribute to the differences in interactions (pathogenic or beneficial). • The specificity of LecRLKs in perceiving extracellular signals is primarily determined by their extracellular domains, and the transmembrane domain is also involved in ligand binding. Ligand identification remains the most challenging step in uncovering LecRLK-based signal cascade. Omics-based screening and biochemical characterizations are critical for the identification of ligands. • Dynamic transcriptional, translational and post-translational regulations are key components of LecRLK-based signal cascade. Omics tools can help determine these modifications and regulations.
Impact	• LecRLKs belong to a large family of proteins, most of which have no known functions. A comprehensive analysis of the structure and function of this protein family is critical for revealing gaps in current research, predicting function and providing testable hypothesis. By analyzing the structure and function of LecRLKs, this study identified key areas of focus for future studies to determine the function of LecRLKs and the underlying molecular mechanism of actions.

Sun Y, Qiao Z, Muchero W, Chen JG (2020) Lectin Receptor-Like Kinases: The Sensor and Mediator at the Plant Cell Surface. *Front. Plant Sci.*, 10 December 2020. https://doi.org/10.3389/fpls.2020.596301



Future research directions for LecRLKs. As cell surface receptors and signal transduction mediators, LecRLKs can perceive extracellular signals and trigger intracellular responses to protect the plant. 1. Determination of the ligands of LecRLKs could clarify the recognition between plant-microbe and plant-environment at the molecular level. 2. The activation of LecRLKs after signal perception. Several findings indicate the formation of homodimer/ heterodimer and auto-phosphorylation are required for LecRLKs' kinase function. 3. The signaling pathways LecRLKs are involved in. Identifying their direct targets could be a meaningful solution. 4. Transcriptional regulation of *LecRLKs*. 5. LecRLKs have been found to be phosphorylated and N-glycosylated. 6. Some LecRLKs serve as key pattern recognition receptors (PRRs) and are involved in pathogen associated molecular patterns (PAMP) -triggered immunity (PTI). There is a very high potential that virulence effectors might target them to suppress host immunity.

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