

36th annual PMB retreat

Talk title & abstract

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Title:

The roles of the type-A Response Regulators in rice development and yield

Abstract:

The phytohormone cytokinin is instrumental in regulating plant growth and development, including shoot formation, vascular development, and leaf senescence, to name a few. Cytokinin also influences yield in cereal crops such as rice, where elevated levels of cytokinin in the panicle lead to higher grain yield, making components of the signaling pathway of great agronomic interest. While the cytokinin signaling pathway (a His-Asp phosphorelay) is well characterized in Arabidopsis, it is not well-studied in monocots such as rice. There are many translatable parallels between the two species, but key differences in function within gene families have been identified. The type-A RRs are negative regulators of the signaling pathway and have been fairly well characterized in Arabidopsis, but little work has been done in rice. Despite the type-A RR gene families being of comparable size between Arabidopsis and rice, they are generally phylogenetically species-specific, further complicating the prediction of function from Arabidopsis to rice. To parse out the roles attributable to the type-A RRs in rice, we generated higher-order knockout mutants using CRISPR/Cas9, targeting the genes by clade. We conducted a broad-scale morphological screen of these lines for key developmental and yield-associated traits and present a summary of the findings here. Agriculturally relevant traits regulated by the type-A RRs include lodging resistance, plant growth habit, and panicle morphology. We have also uncovered a rather complex perturbation to grain development, which warrants further study.