Title: **Plant Reactome: *in silico* modeling of reference rice pathways for knowledge discovery and translational research**

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Plant Reactome Knowledgebase (https://plantreactome.gramene.org) aims to translate large-scale genetic and gene expression data into biologically relevant information by deciphering cellular-level gene networks involved in plant development, reproduction, and plant response to biotic and abiotic stresses. Plant Reactome, an open source and freely accessible resource, provides manually curated pathways from rice (*Oryza sativa*) and gene-orthology-based pathway projections to 129 additional species. Our data model enables depiction of metabolic, transport, hormone signaling pathways, gene regulatory networks and any biological reaction or processes. Furthermore, the manual biocuration involves improving the genes functional annotation and identifying how rice genes relate to each other based on the critical review of published literature, re-analysis of publicly available peer-reviewed genomic (e.g., motif binding/DAP-seq/ChIP-seq), gene expression, and gene-gene interaction data. Plant Reactome's core infrastructure is built upon the Neo4j graph database management system, facilitating a seamless integration of heterogeneous data (i.e., genes, proteins, metabolites, gene-regulatory interactions, protein-protein interactions, enzymatic reactions, gene expression, pathways, gene-networks, etc.) by leveraging the Gene Ontologies (GO) and Plant Ontologies (PO). We engage and train undergraduate students in the review of scientific literature and biocuration of genes and pathways. Here, we show how researchers can use Plant Reactome as a discovery platform for the analysis of omics data, unraveling cellular complexities, and formulation of data-driven hypotheses. Plant Reactome acknowledges funding from the National Aeronautics and Space Administration, USA [80NSSC22K0891], USDA-ARS, National Science Foundation, USA [2029854], and in-kind support in the curation is provided by the Human Reactome, funded by the NIH NHRGI [U24 HG012198].