

Category	: International Rice Research Conference
Select Theme	: Disruptive technologies and innovations
Endorsement email	:
Keyword 1	: Modeling and systems biology
Keyword 2	:
Keyword 3	:
Title of Entry	: Regulatory feedback response mechanisms to phosphate starvation in rice
Presenting author	: Ishan Ajmera
Presenting author email	: ishan.ajmera@nottingham.ac.uk
Co author 1	: Charlie Hodgman
Co author 2	: Dov J. Stekel
Affiliation presenting author	: Centre for Plant Integrative Biology, School of Biosciences, The University of Nottingham, UK
Affiliation 1	: Centre for Plant Integrative Biology, School of Biosciences, The University of Nottingham, UK
Affiliation 2	: School of Biosciences, The University of Nottingham, UK
Select only one type of presentation	: 3-5 minute flash talk
Abstract	<p>: Phosphorus is a growth-limiting nutrient for plants. The growing scarcity of phosphate stocks threatens global food security. Phosphate-uptake regulation is so complex and incompletely known that attempts to improve phosphorus use efficiency have had extremely limited success. This study improves our understanding of the molecular mechanisms underlying phosphate uptake by investigating the transcriptional dynamics of two regulators: the Ubiquitin ligase PHO2 and the long non-coding RNA IPS1. Temporal measurements of RNA levels have been integrated into mechanistic mathematical models using advanced statistical techniques. Models based solely on current knowledge could not adequately explain the temporal expression profiles. Further modeling and bioinformatics analysis have led to the prediction of three regulatory features: the PHO2 protein mediates the degradation of its own transcriptional activator to maintain constant PHO2 mRNA levels; the binding affinity of the transcriptional activator of PHO2 is impaired by a phosphate-sensitive transcriptional repressor/inhibitor; and the extremely high levels of IPS1 and its rapid disappearance upon Pi re-supply are best explained by Pi-sensitive RNA protection. This work offers both new opportunities for plant phosphate research that will be essential for informing the development of phosphate efficient crop varieties, and a foundation for the development of models integrating phosphate with other stress responses.</p>

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