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Promotionsverfahren von **Herrn M.Sc. Jannik Hornbergs**
Auslage der Dissertation und Gutachten sowie Termin der mündlichen Prüfung
Anlage: Einseitige Zusammenfassung der Dissertation

Sehr geehrte Damen und Herren,

in dem oben genannten Promotionsverfahren wird die Annahme der Dissertation

Investigation of *Arabidopsis thaliana* SEC14-LIKE PITP PATL2 in metal nutrient homeostasis

von den Berichterstattenden Prof. Dr. P. Bauer und Prof. Dr. G. Groth beantragt. Sie kann zusammen mit den Gutachten in der Zeit

vom 01.12.2024 bis 12.12.2024

eingesehen werden. Bitte wenden Sie sich zur Einsicht an das Promotionsbüro (promotionmnf@hhu.de).

Einsprüche gegen diese Dissertation können nur zwei Tage nach der vorgenannten Frist geltend gemacht werden. Erfolgt kein Einspruch, so gilt die Dissertation als angenommen (§ 7 Ziffer (5) PO).

Sofern die Dissertation angenommen wird, findet die mündliche Prüfung am

17.12.2024 um 15:00 Uhr

im **Hörsaal 6 E** statt. Als Prüferinnen bzw. Prüfer sind vorgesehen:
Prof. Dr. P. Westhoff, PD Dr. S. Matsubara und Prof. Dr. A. Heese.

Die Öffentlichkeit ist bei der Befragung zugelassen.

Mit freundlichen Grüßen
im Auftrag

Silke Krispin

Jannik Hornbergs

Summary

Peripheral membrane proteins play vital roles in cell signalling by associating with membranes and protein complexes. In plants, the SEC14-GOLD class of phosphatidylinositol (PI) transfer proteins, known as PATELLINS (PATLs), exhibit multifunctional capacities crucial for plasma membrane-related processes. PATLs are characterised by the SEC14 lipid-binding and Golgi-dynamics (GOLD) domains, which work together to regulate lipid transport, signalling, and membrane interactions. These proteins have emerged as key players in cellular adaptation to environmental and hormonal stimuli, highlighting their significance in plant resilience and stress responses.

The regulation of PATLs via post-translational modifications (PTMs), particularly phosphorylation, has been identified as a major control mechanism. Analysis of Arabidopsis PATLs revealed phosphorylation hotspots in the conserved SEC14 and GOLD domains, along with additional variable N-terminal regions. These phosphorylation events correlate with environmental and hormonal responses, such as iron (Fe) deficiency, abscisic acid, and ethylene signalling, as well as stress responses. These modifications influence PATL-mediated lipid transport and protein interactions, underscoring their role in cellular resilience. By targeting phosphorylation-driven regulation, future research may harness PATLs for biotechnological innovations, including improved crop stress tolerance.

A deeper understanding of PATELLINS has revealed the dual regulatory roles of their structural domains. PATELLIN 2 (PATL2), a representative SEC14-GOLD protein, associates with membranes via its GOLD domain and binds lipophilic antioxidants such as tocopherol. Experimental and computational analyses have identified unique residues for tocopherol and PI-phosphate (PIP) binding, demonstrating how the GOLD domain regulates SEC14 functions. Phosphorylation of the SEC14 domain further modulates PATL2 functions, affecting membrane interactions and lipid-binding capabilities. These findings emphasise PATL2's role in maintaining cellular lipid signalling.

PATL2 also plays specific roles in mitigating oxidative stress during Fe acquisition. The interaction between PATL2 and IRT1, a Fe transporter in Arabidopsis roots, links SEC14 proteins to Fe import for the first time. PATL2 alleviates lipid peroxidation caused by reactive Fe^{2+} uptake by binding the antioxidant tocopherol and negatively influencing Fe reductase activity. This mechanism connects vitamin E with root metal ion transport, offering molecular insights into lipid antioxidant interactions. PATL2's ability to protect root cells from oxidative damage highlights its importance in plant development and stress management.

Together, these insights establish PATELLINS as dynamic regulators of lipid signalling and cellular adaptation, with implications for enhancing plant resilience and development under environmental challenges.