NUTRIENT HOMEOSTASIS

A seesaw between Pi and Zn

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Phosphorus and zinc (Zn) are among the most important nutrients for plants. As the major resource of phosphorus in the soils, phosphate (Pi) is transported into the root system by the high-affinity Pi transporters (PHTs), whose expression levels are controlled by different external and internal cues. It has been long known that the status of Pi and Zn is interactional, indicating a possible coordinating mechanism. Recently, using genome-wide association studies (GWAS), the Hatem Rouached group at the French National Institute for Agricultural Research (INRA) identified a new factor that regulates Pi accumulation under Zn deficiency in *Arabidopsis*.

In this study, Kisko et al. aimed to uncover pathways that contribute to natural variations of Pi accumulation in response to Zn deficiency. They carried out GWAS analyses using 223 *Arabidopsis* accessions to hunt for candidate genes that are associated with variations of shoot Pi concentrations corresponding to Zn availability. Following up, by analysing the transfer-DNA-insertion mutant lines, they found one of the candidate genes, called *LYSO-PC ACYLTRANSFERACE 1* (*LPCAT1*) (which encodes an enzyme catalysing the lipid conversion from lyso-phosphatidylcholine (Lyso-PC) to PC), is a negative regulator of shoot Pi accumulation specifically under Zn deficiency. Promoter sequence and transcriptional analyses suggest that the Zn-dependent *LPCAT1* transcription is regulated by bZIP23 transcription factor. The *lpcat1* mutant accumulates more Pi when Zn is depleted, simultaneously it contains increased levels of Lyso-PC and decreased levels of PC.

Nutrient signalling and homeostasis are always fascinating topics in the fields of plant growth regulation and agricultural application. The interesting data presented in this study also point out possible future directions towards detailed mechanisms of the interplays between specific lipid metabolism and Pi uptake.

Lei Lei

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