ANAC044 modulates P reutilization in P deficient Arabidopsis thaliana root cell wall in an ethylene dependent manner

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Abstract

Phosphorus (P) deficiency is a major problem in agriculture, thus identifying factors affecting plant's ability to reutilize previously assimilated P is a prerequisite for improving the P homeostasis in crops grown with P deficient soil. Here, we report the involvement of a NAC (No apical meristem [NAM], Arabidopsis transcription activation factor [ATAF] and Cup-shaped cotyledon [CUC]) transcription factor in P deficiency resistance in Arabidopsis. Compared to the wild type (WT, Col-0) plants, the anac044 mutant displayed P deficiency resistant phenotype, together with the increasing root length, root and shoot biomass under P deficiency. ANAC044 was frequently expressed, including roots and shoots. Upon P deficient treatment even within 1 d, ANAC044 transcript accumulation was strongly up-regulated. Further analysis revealed that, under P-deficient condition, the cell wall, particularly the pectin of anac044, released more P than that of WT, accompanied by an increment of ethylene production, as a result, more soluble P was available in anac044 root and shoot. Thus, the study here uncovers the role of ANAC044 in maintenance of P homeostasis through ethylene signaling.

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