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Deciphering free and esterified jasmonates in the responses of *Arabidopsis thaliana* to phosphorus deficiency

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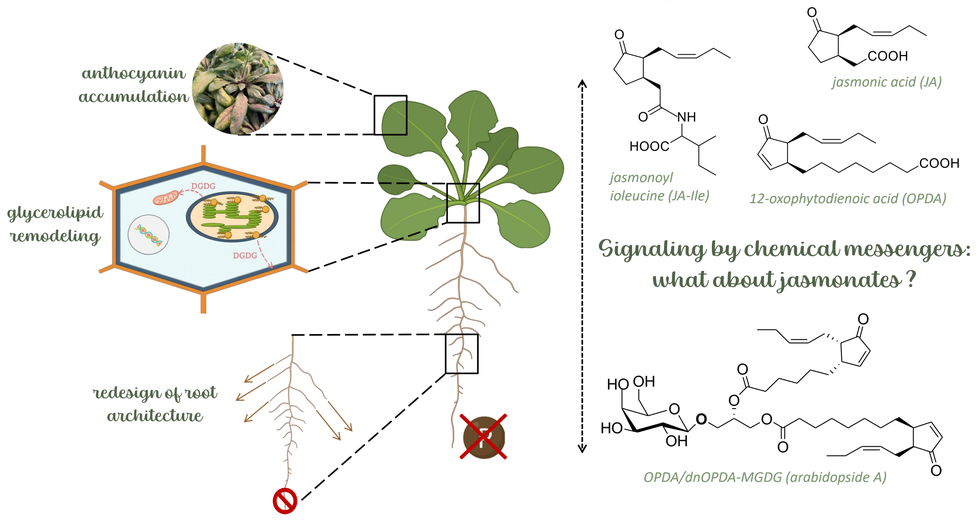
Introduction

As phosphorus (P) is a primary macronutrient displaying a very low bioavailability in many areas, P deficiency is widely encountered across the world[1].

To cope with P deficiency, plants have developed critical P starvation responses: increased root growth, **anthocyanin accumulation**, redesign of root architecture, expression of high-affinity P transporters, **glycerolipid remodeling**, etc[2].

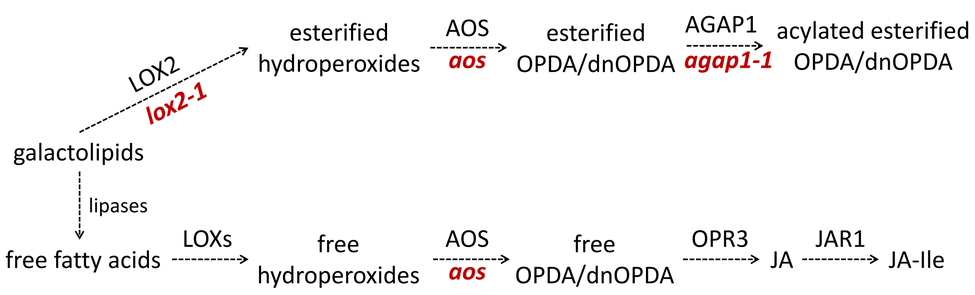


These responses are implemented following sensing and signaling of low P conditions, and this **signaling** is notably mediated by plant hormones[2]. Nonetheless, the functions of a wide class of galactolipid-derived plant hormones, known as **jasmonates**[3], remain to be clarified during P deficiency.

Objective and methods

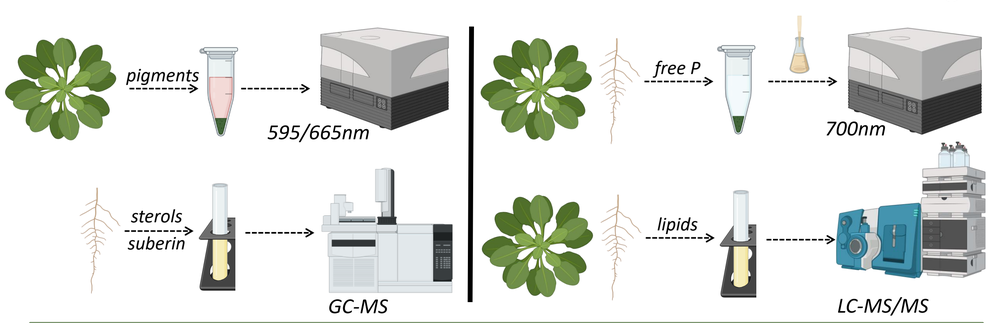
This study aims to unravel the involvement of free and/or esterified jasmonates in the control of P starvation responses, using a reverse-genetics approach based on the model plant *Arabidopsis thaliana* L. (Heynh.).

Wild type VS biosynthetic mutants: *lox2-1*, *aos*, *agap1-1*



Culture and analysis

Culture in hydroponics for 7 weeks (= 5 weeks control + 2 weeks with/without P) before harvest for extraction and analysis of anthocyanins, free P, glycerolipids, suberin and sterols.



Results

lox2-1 ------> almost no esterified OPDA/dnOPDA
aos ------> no JAs, regardless free or esterified
agap1-1 ------> no acylated esterified OPDA/dnOPDA

two-way ANOVA
Dunnett's post-hoc test
$\alpha = 0.05$

Leaf free P (n = 8-11)

Root free P (n = 5-11)

Leaf anthocyanin (n = 9-12)

Leaf glycerolipids (n = 5)

Root glycerolipids (n = 5)

Root suberin (n = 4-5)

Root sterols (n = 4-5)

Conclusion

References and funding

1. McDowell, R. W., Noble, A., Pletnyakov, P. & Haygarth, P. M. A Global Database of Soil Plant Available Phosphorus. *Sci Data* **10**, 125 (2023).
2. Rouached, H., Arpat, A. B. & Poirier, Y. Regulation of phosphate starvation responses in plants: signaling players and cross-talks. *Mol. Plant* **3**, 288–299 (2010).
3. Wasternack, C. & Hause, B. Jasmonates: biosynthesis, perception, signal transduction and action in plant stress response, growth and development. An update to the 2007 review in Annals of Botany. *Annals of Botany* **111**, 1021–1058 (2013).

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Illustrations of this poster were made using BioRender and GraphPad Prism 8.0.1 .