A MEDIUM-CHAIN 3-HYDROXY FATTY ACID TRIGGERS INDUCED SYSTELIC RESISTANCE IN ARABIDOPSIS

Matthieu Touchard, Schellenberger Romain, Marion Cordier-Demissy, Sandra Villaume, Chrstophe Clement, Fabienne Baillieull, Florence Mazeyrat-Gourbeyre, Sandrine Dhondt-cordelier, Jérôme Crouzet, Stephan Dorey, et al.

A medium-chain 3-hydroxy fatty acid triggers Induced Systemic Resistance in Arabidopsis

Matthieu Touchard[1], Romain Schellenberger[1], Marion Cordier-Demissy[1], Sandra Villaume[1], Christophe Clément[1], Fabienne Baillieul[1], Florence Mazeyrat-Gourbeyre[1], Sandrine Dhondt-Cordelier[1], Jérôme Crouzet[1], Stephan Dorey[1] and Sylvain Cordelier[1]

[1] Résistance Induite et Bioprotection des Plantes, EA 4707, SFR Condorcet FR CNRS 3417, Université de Reims Champagne-Ardenne, Reims, 51100, France

Introduction

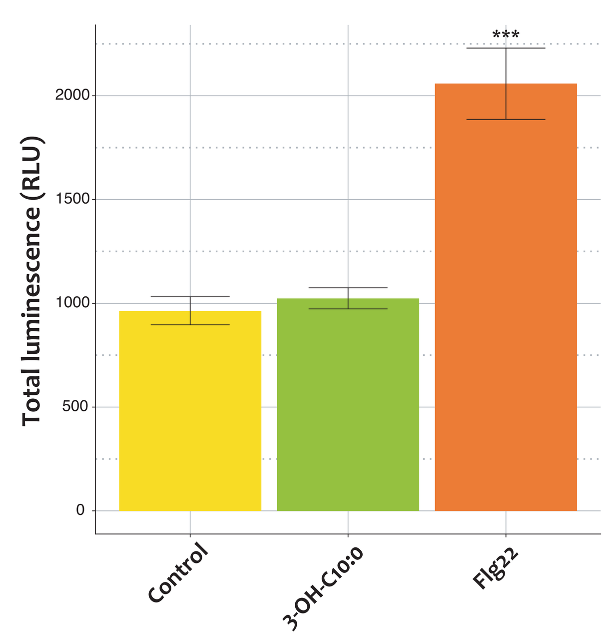
In their environment, plants are frequently challenged by pathogenic microorganisms. To deal with these pathogens, plants possess an arsenal of defence mechanisms, quickly activated after perception of the microorganism. This perception involves Microbe-Associated Molecular Patterns (MAMPs) that are recognized by plant cells through Pattern Recognition Receptors (PRRs) resulting in plant innate immunity (MTI, MAMP-Triggered Immunity). Rhamnolipids (RLs), produced by *Pseudomonas aeruginosa*, are highly effective to induce foliar local resistance against phytopathogenic microorganisms on several plants[1, 2, 3]. Recently, medium-chain 3-hydroxy fatty acids (mc-3OH-FAs), building blocks of *P. aeruginosa* RLs, are inducing plant immunity on *A. thaliana* leaves through the bulb-type lectin receptor kinase LORE[4]. Among these mc-3OH-FAs, bearing 8 to 12 carbons, the 3-hydroxydecanoic acid (3-OH-C10:0) represent the strongest immune elicitor[4]. The immune response activated upon 3-OH-C10:0 sensing was characterized in leaves, but currently there is no information on the perception in roots.

The aim of this study is to investigate whether 3-OH-C10:0 is perceived by *A. thaliana* roots and if this perception triggers a systemic resistance against the necrotrophic fungus *Botrytis cinerea*.

3OH-C10:0 triggers immunity markers in roots

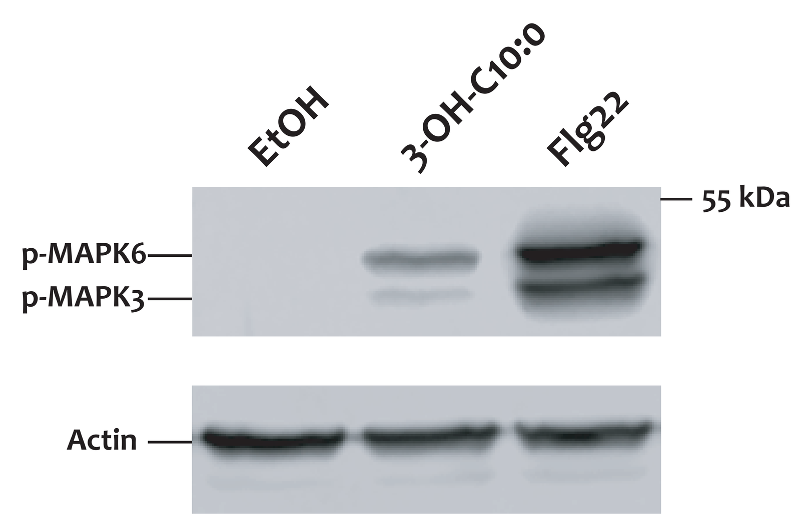
In the following experiments, 3-OH-C10:0 was used at 10 µM. The flagellin-derived Flg22 peptide was used as positive control at 1 µM.

ROS accumulation



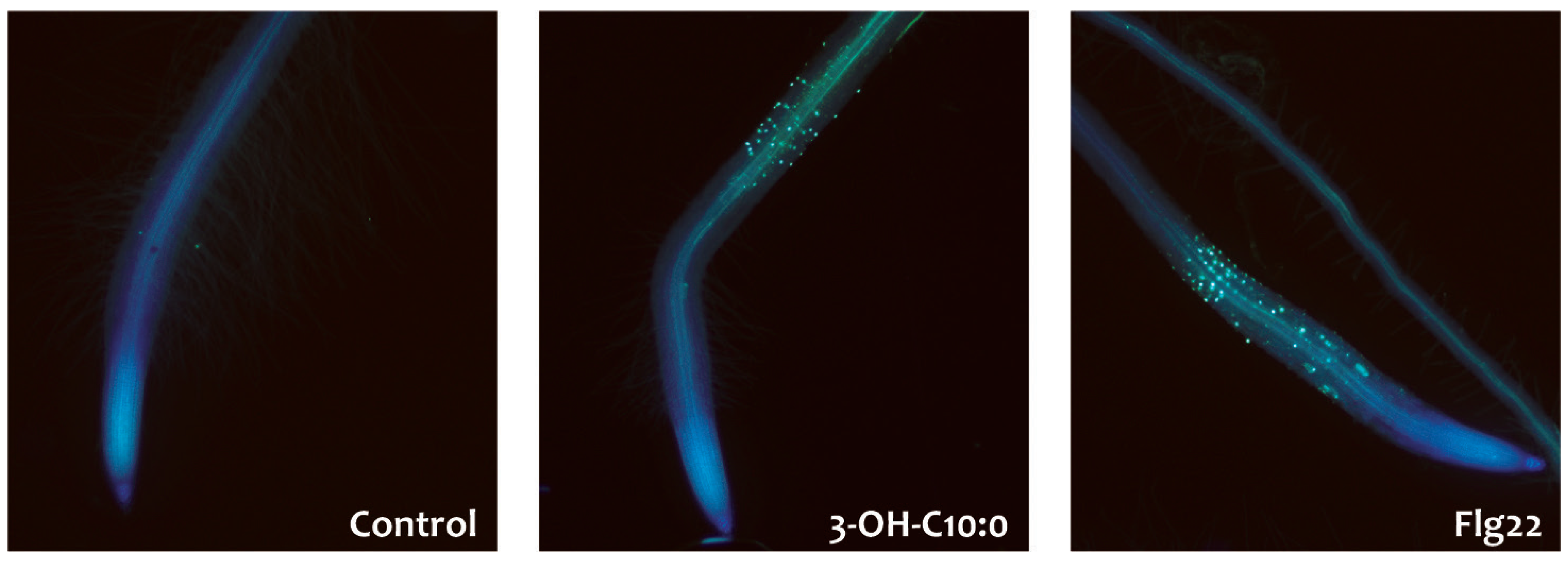
Unlike Flg22, **no ROS production is detected** after challenge with 3-OH-C10:0.

MAPK activation



3-OH-C10:0 treatment induces **MAPK3 and MAPK6 activation** in *A. thaliana* roots. The response is weaker than with Flg22.

Callose deposition

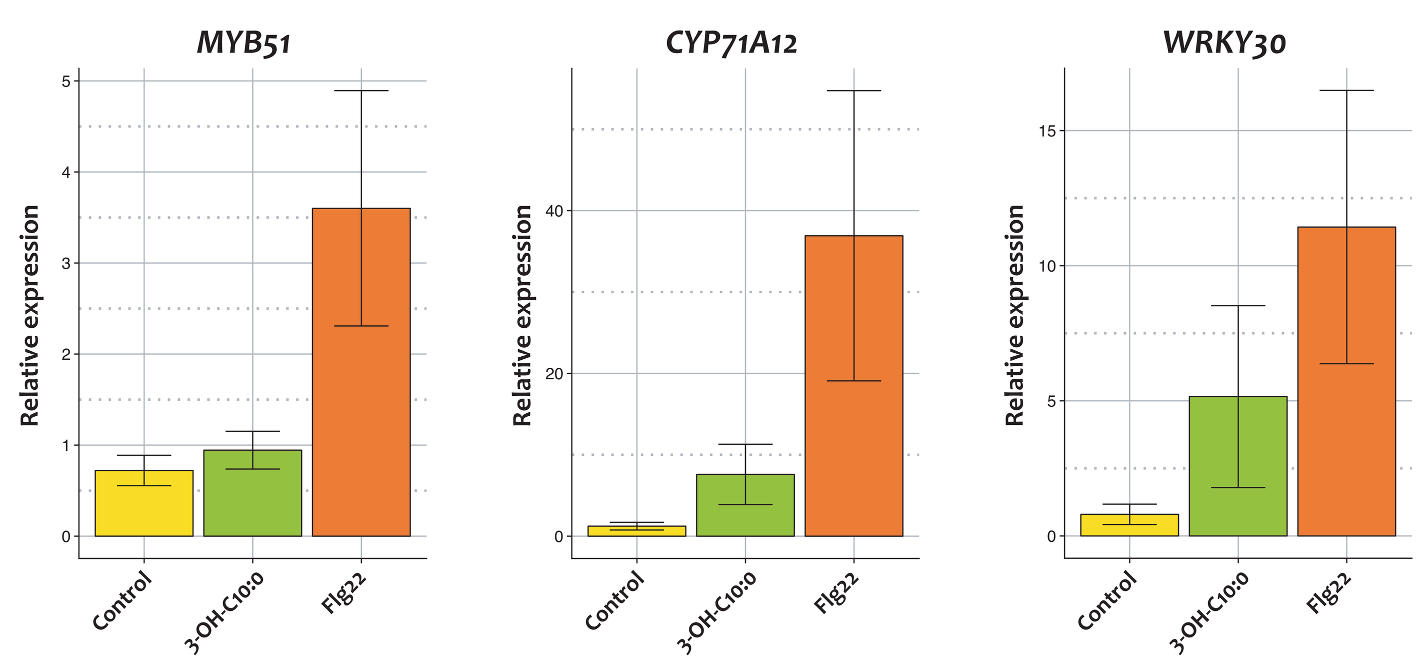


Similarly to Flg22, 3-OH-C10:0 treatment **triggers callose deposition** localized to the epidermal layer in the root elongation zone.

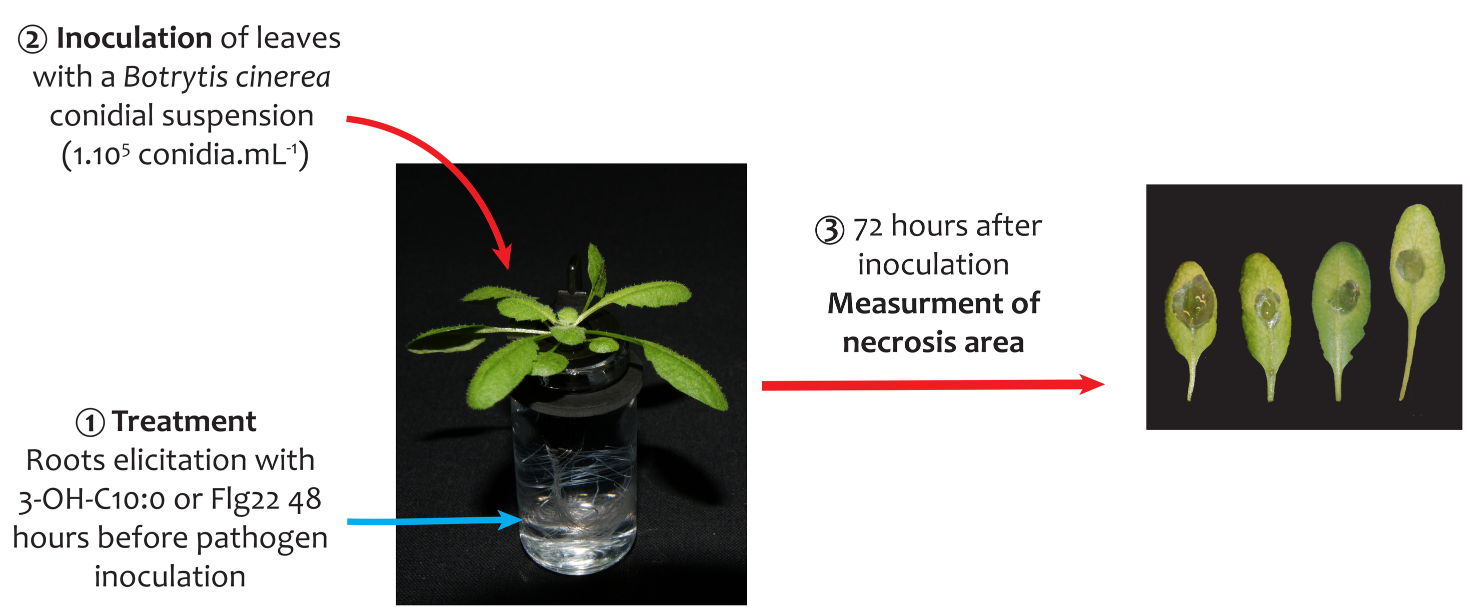
3-OH-C10:0 triggers transcriptional changes in roots

Expression pattern of the root MTI marker genes, *MYB51*[5], *CYP71A12*[5] and *WRKY30*[6] was followed by qRT-PCR in roots 3h after treatment.

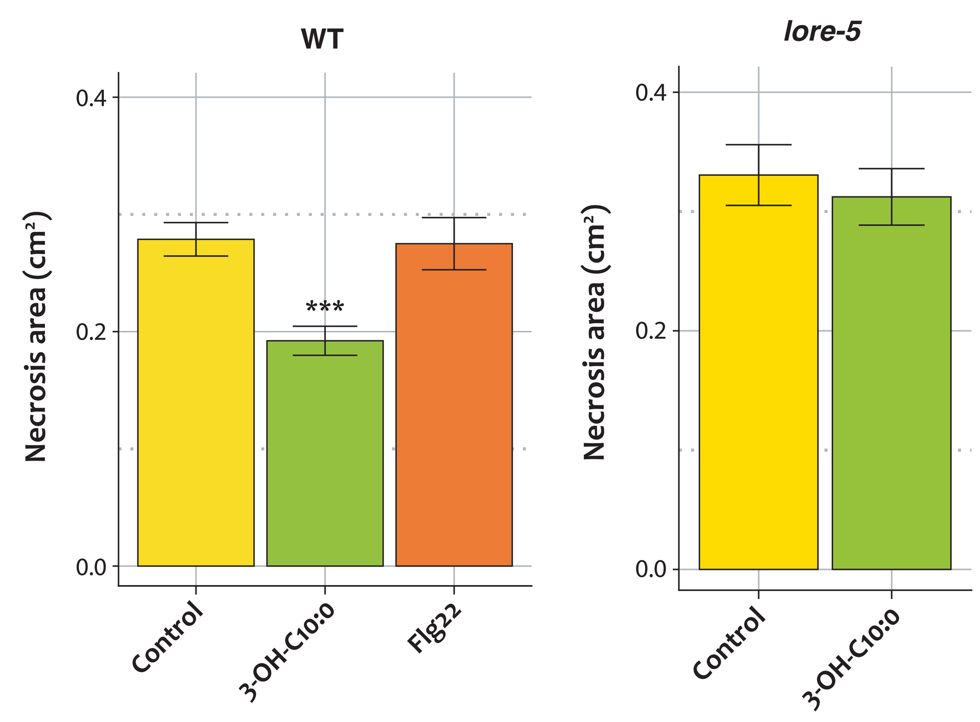
- ***MYB51* gene expression is significantly induced after Flg22 treatment but not with 3-OH-C10:0.**
- ***CYP71A12* and *WRKY30* genes are up-regulated by both 3-OH-C10:0 and Flg22.**



3-OH-C10:0 induces systemic resistance against *B. cinerea*



- **WT plants treated with 3-OH-C10:0 show a significant reduction on disease severity.**
- **3-OH-C10:0-triggered ISR against *B. cinerea* is lost in *lore*-5 plants.**
- **Flg22 does not trigger ISR against *B. cinerea*.**



Conclusion

Our results show that the 3-OH-C10:0 building block of RLs is perceived by *A. thaliana* roots and triggers a LORE-dependent systemic resistance against *B. cinerea* in *A. thaliana* leaves.

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