

Comprensione dei meccanismi di azione delle sostanze biostimolanti attraverso l'integrazione della metabolomica e della trascrittomica

Prof. Luigi Lucini – Università Cattolica del Sacro Cuore

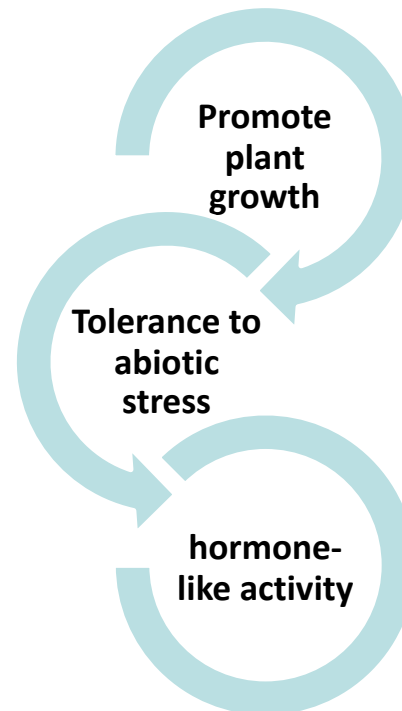
Prof. Youry Pii – Libera Università di Bolzano



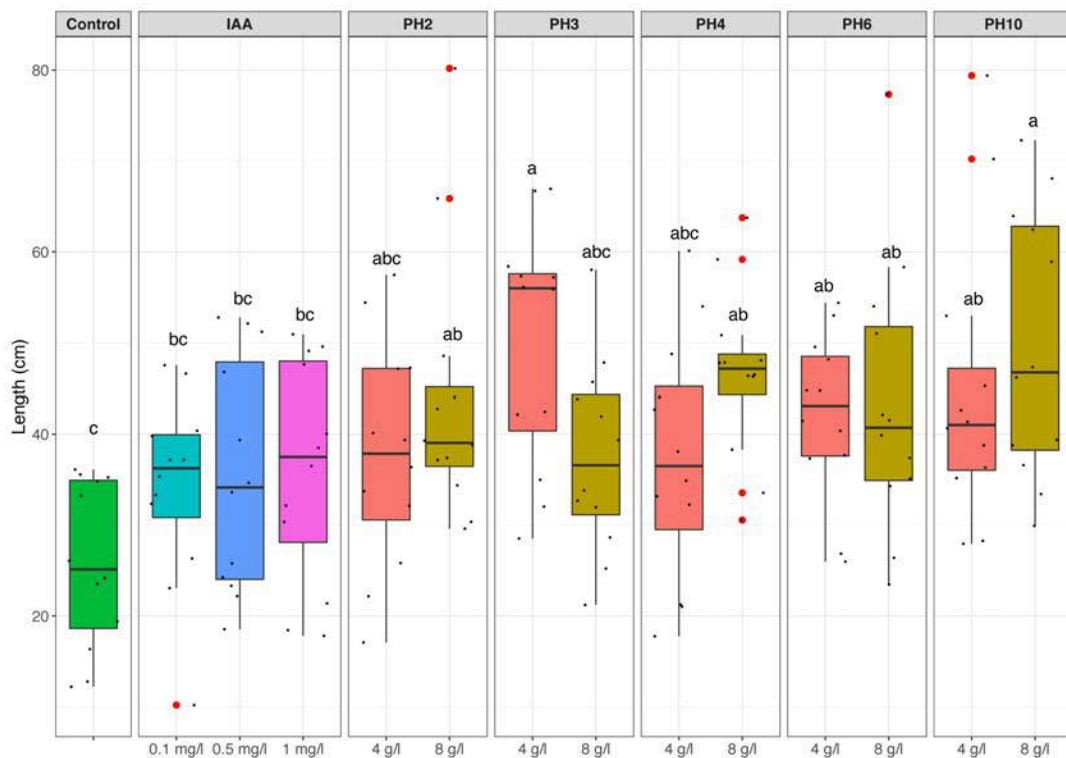
2^a BIOSTIMOLANTI
CONFERENCE **DIGITAL**

Protein hydrolysate

Mixture of polypeptides, oligopeptides and small molecules that are manufactured from protein sources using partial hydrolysis



Mechanisms are still poorly understood



Rooting activity of PH

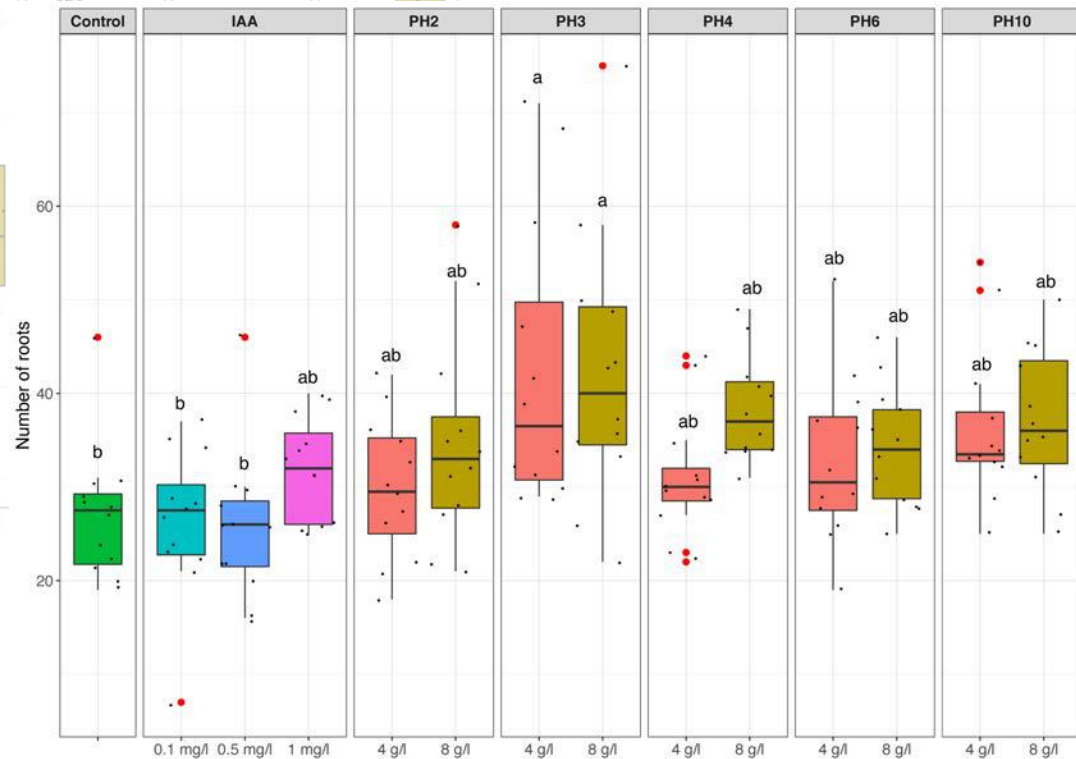
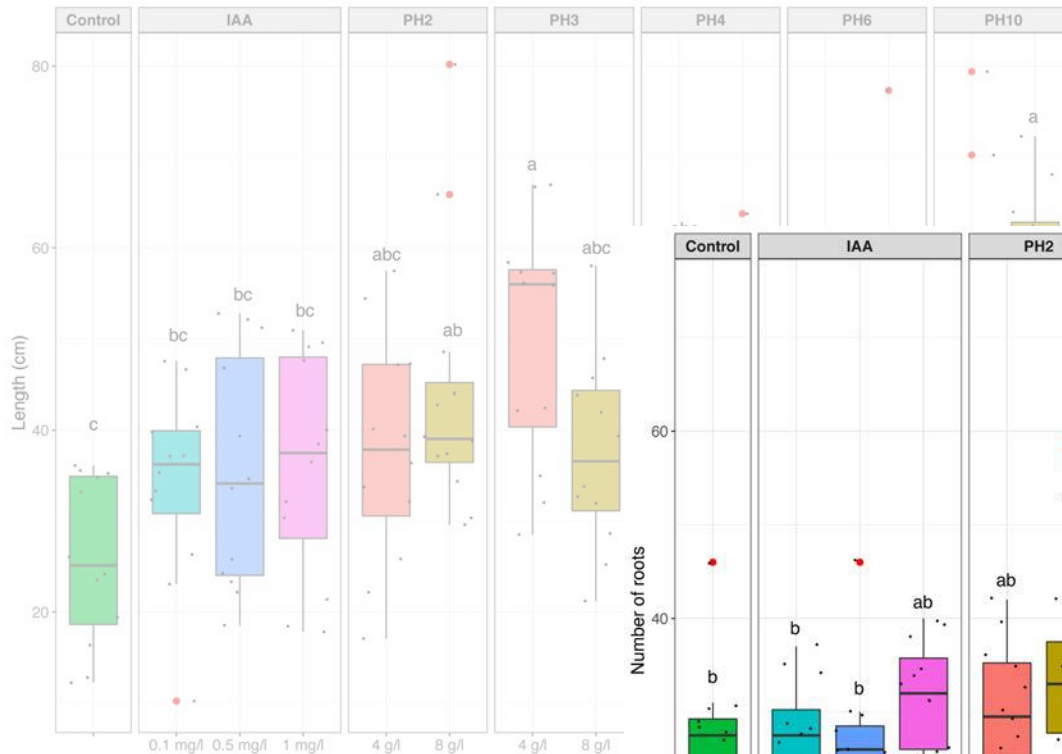


Control



PH3 foliar

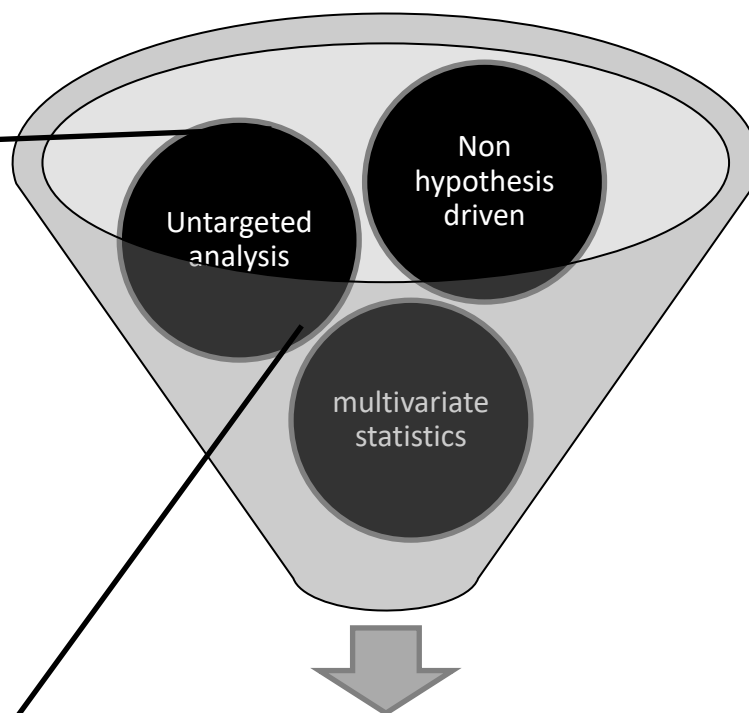
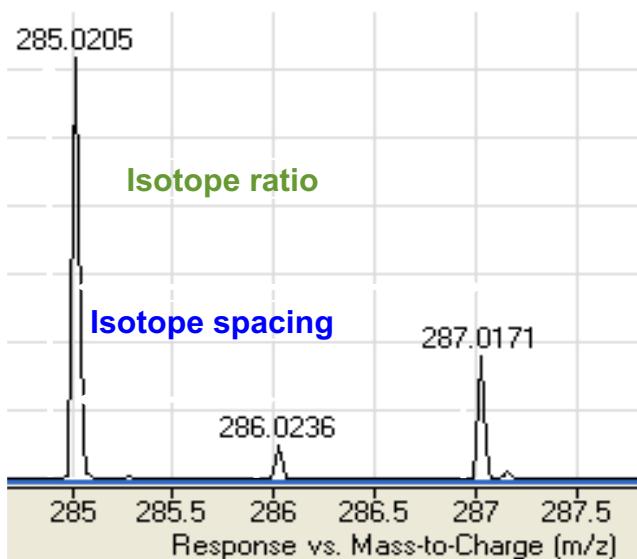
Rooting activity of PH



→ Following the treatments with PH, root development showed an increasing trend

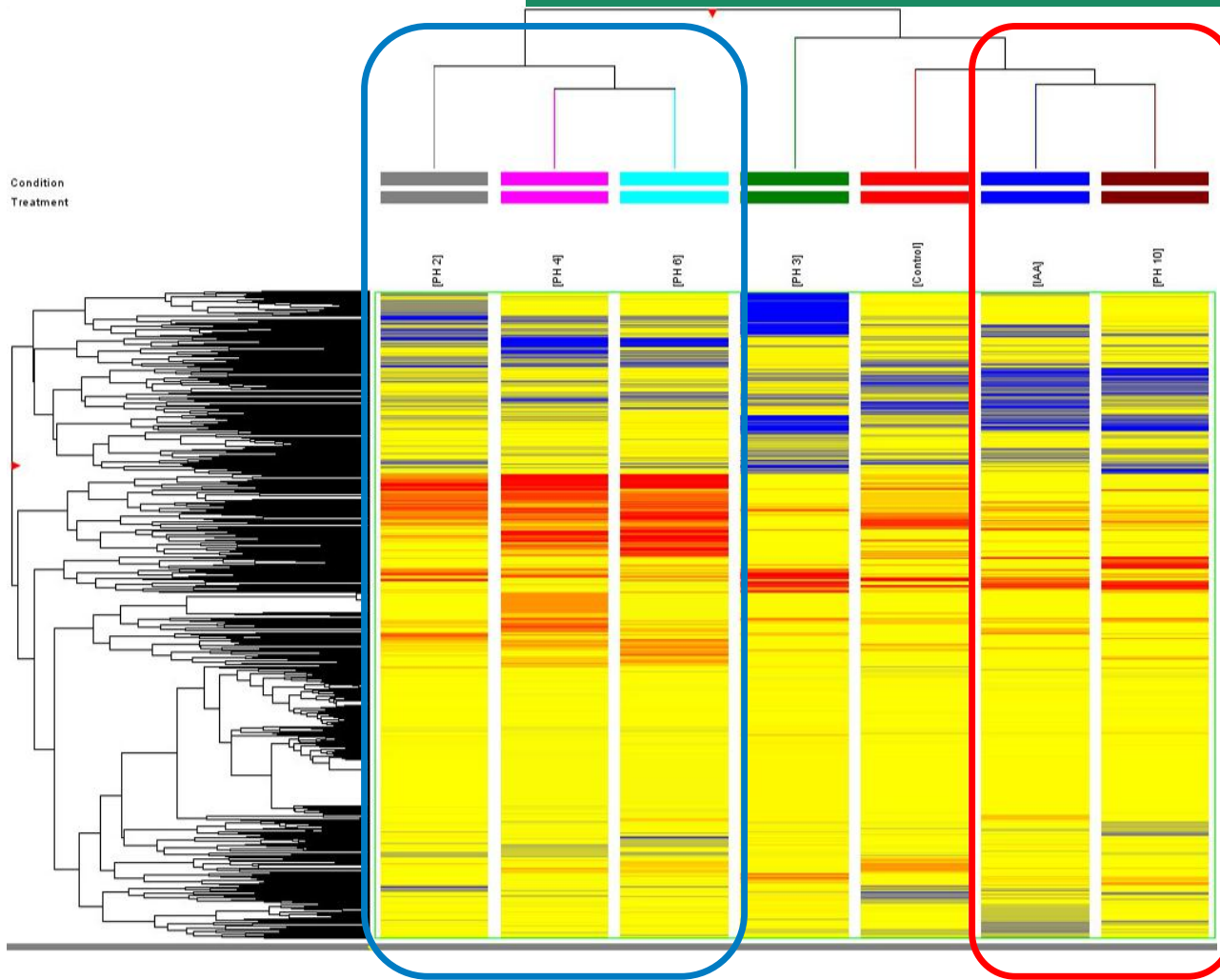
metabolomics

Monoisotopic mass

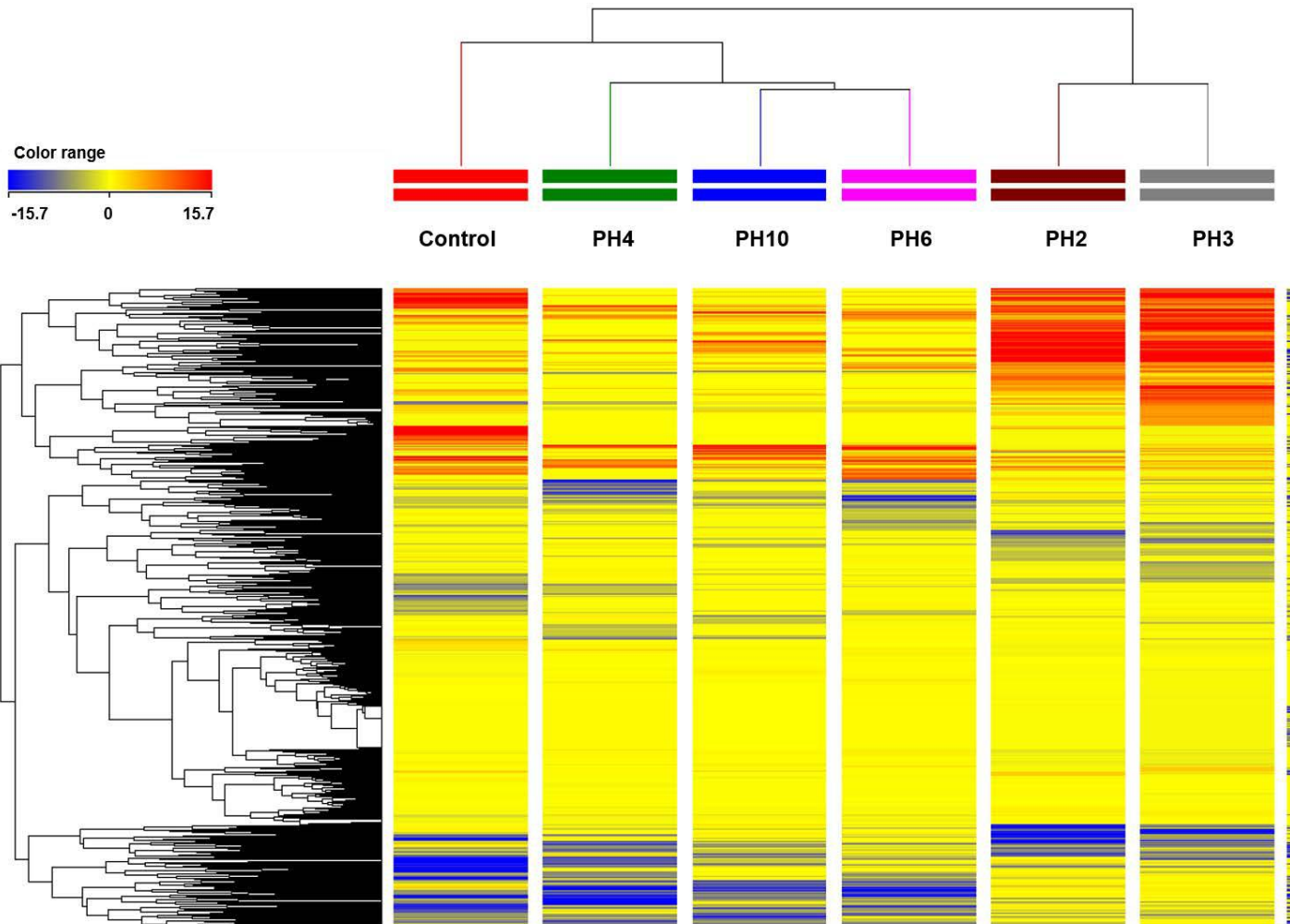


molecular mechanisms

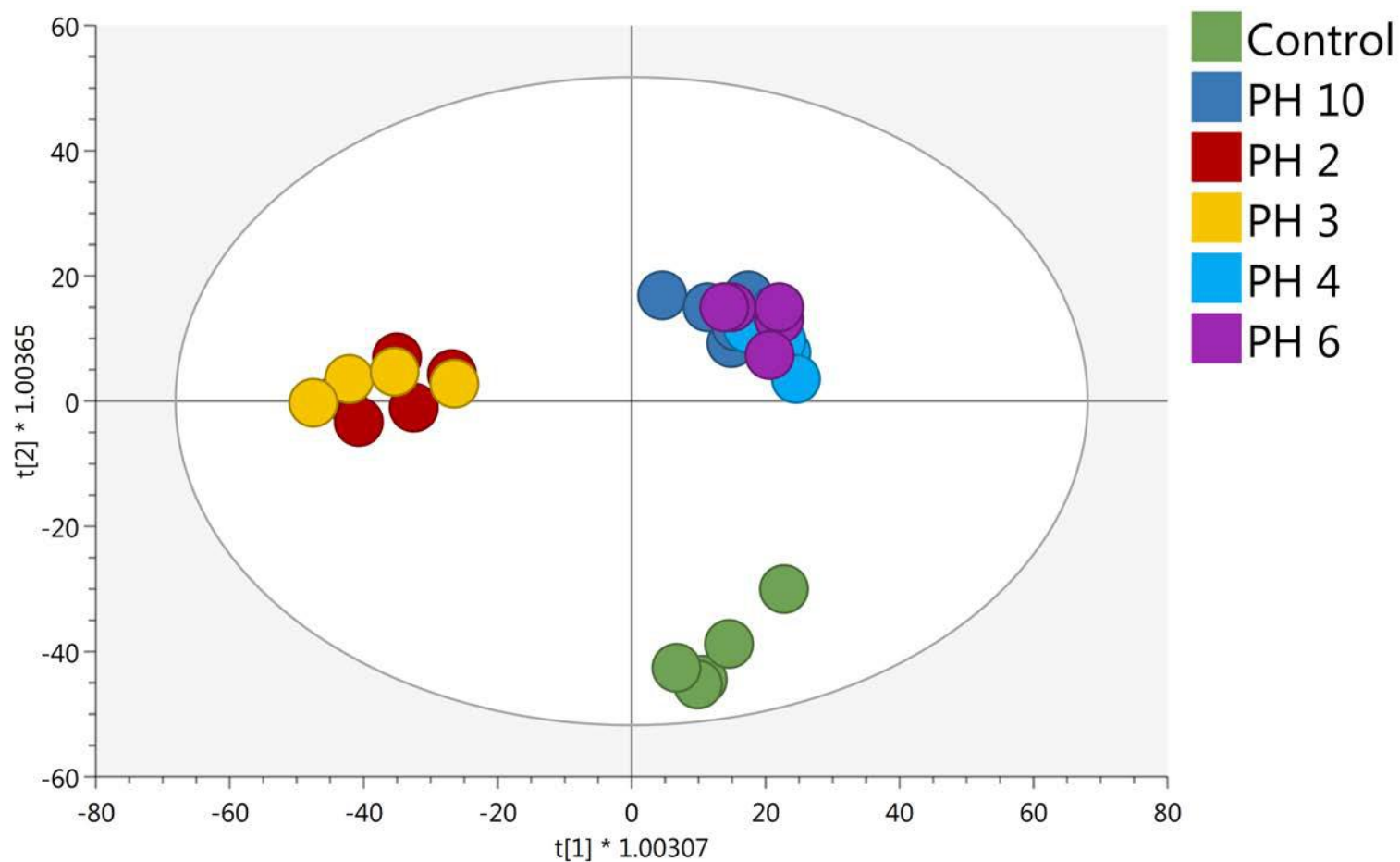
Hierarchical clustering, shoots



Hierarchical clustering, roots

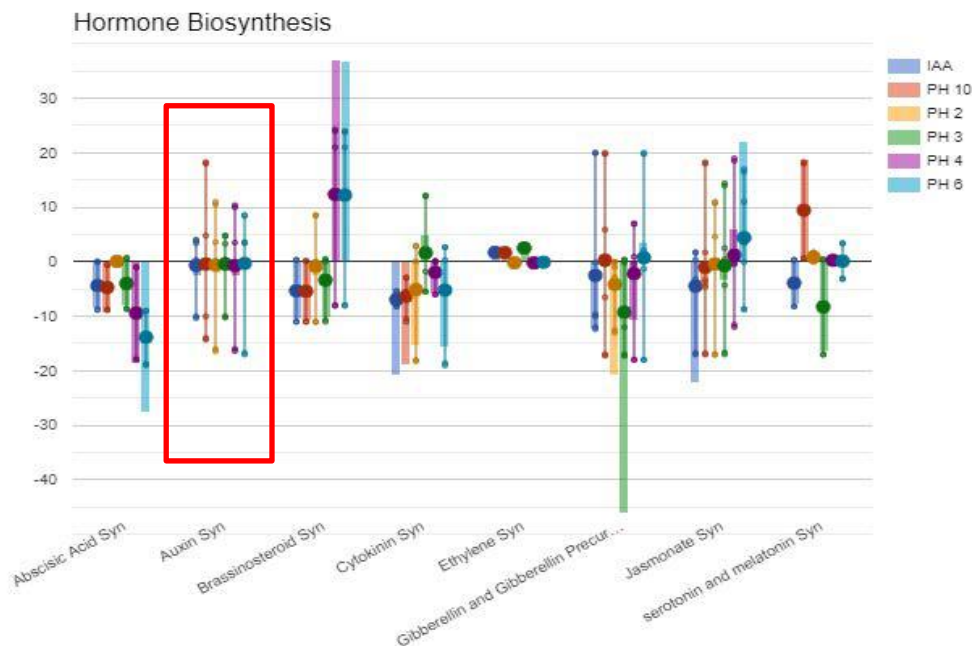


Supervised OPLS-DA



Rooting activity of PH

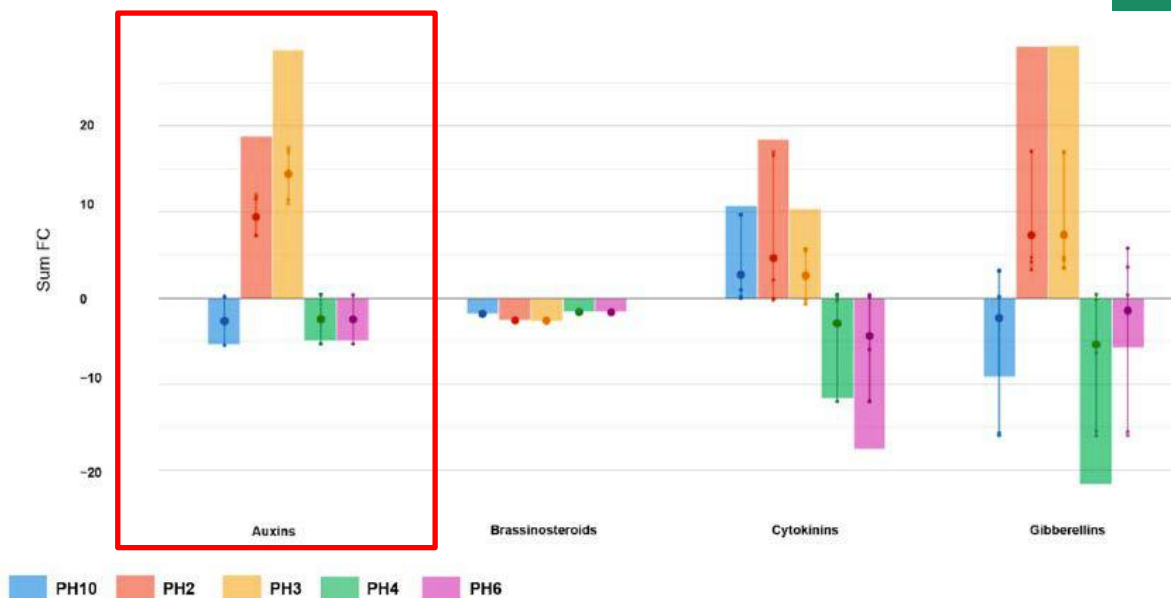
Shoot Metabolome



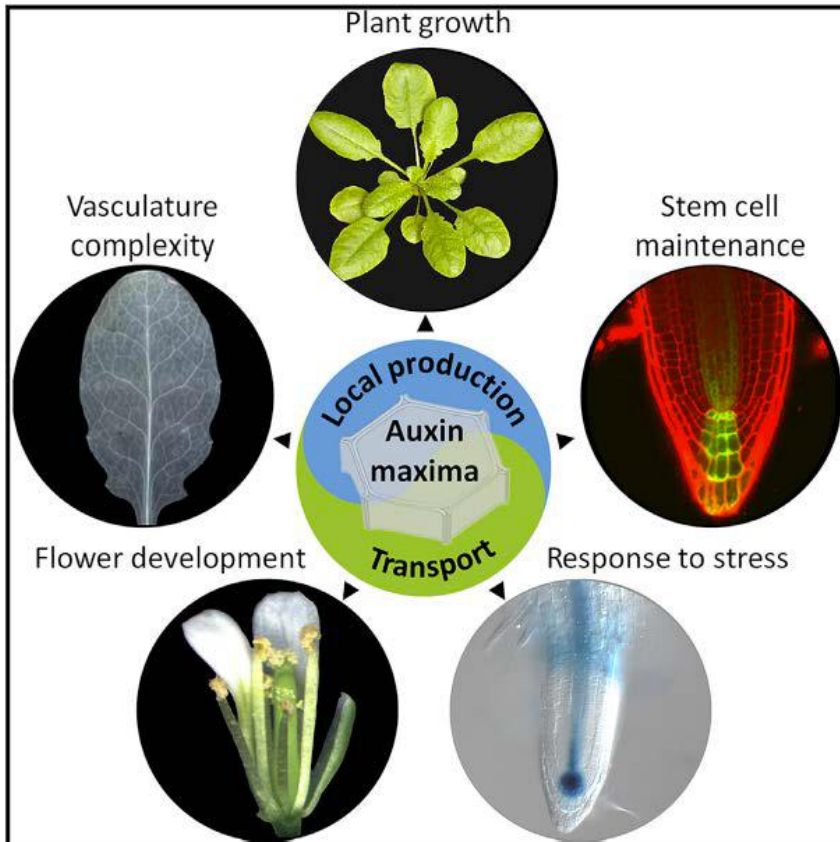
Metabolites involved in the synthesis of auxin are **not differentially modulated** in the leaves of treated plants as compared to untreated ones.

Rooting activity of PH

Root Metabolome

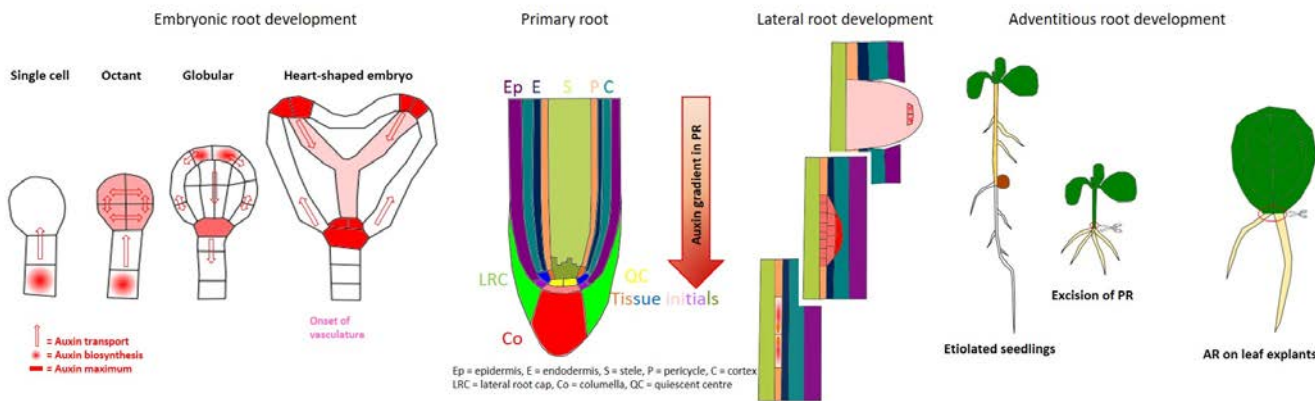
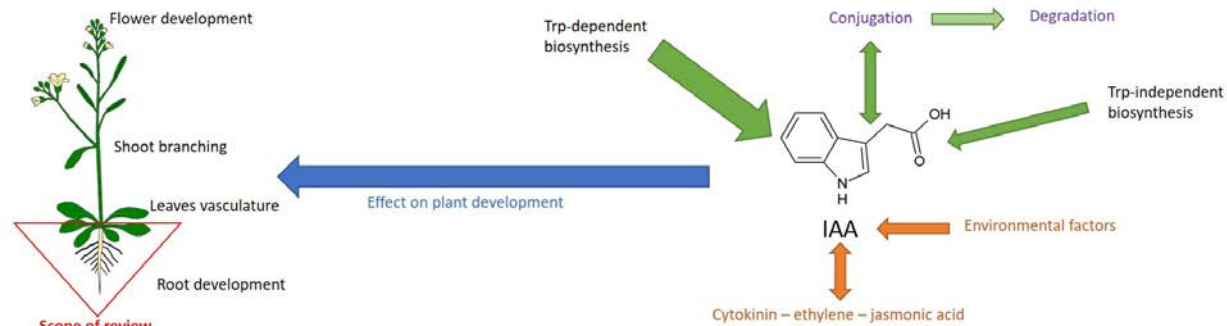


Rooting activity of PH



- The plant hormone auxin (IAA) is a key regulator of plant growth and development.
- Local biosynthesis and polar transport of auxin act together to generate auxin gradients.

Rooting activity of PH

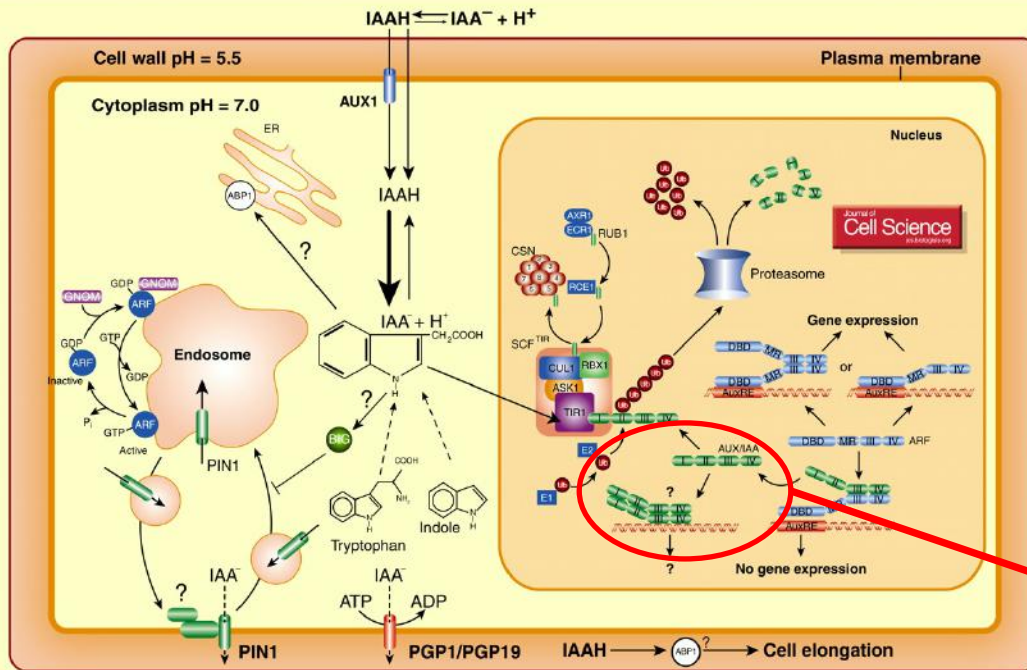


Auxin concentration is tightly regulated in plants → **biosynthesis** vs. **conjugation/degradation**

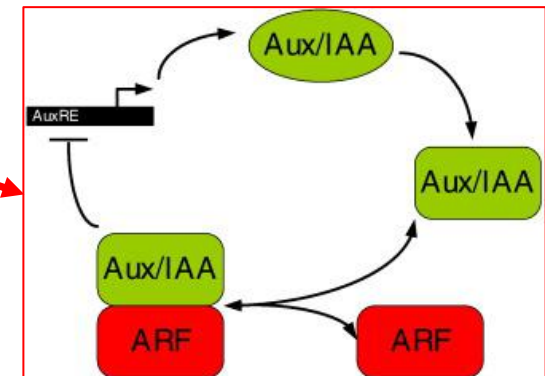
Auxin-mediated signaling

Auxin Signaling

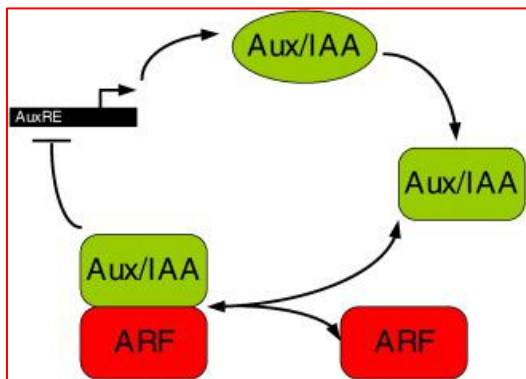
Tomasz Paciorek and Jiří Friml



Aux/IAA Transcription factors



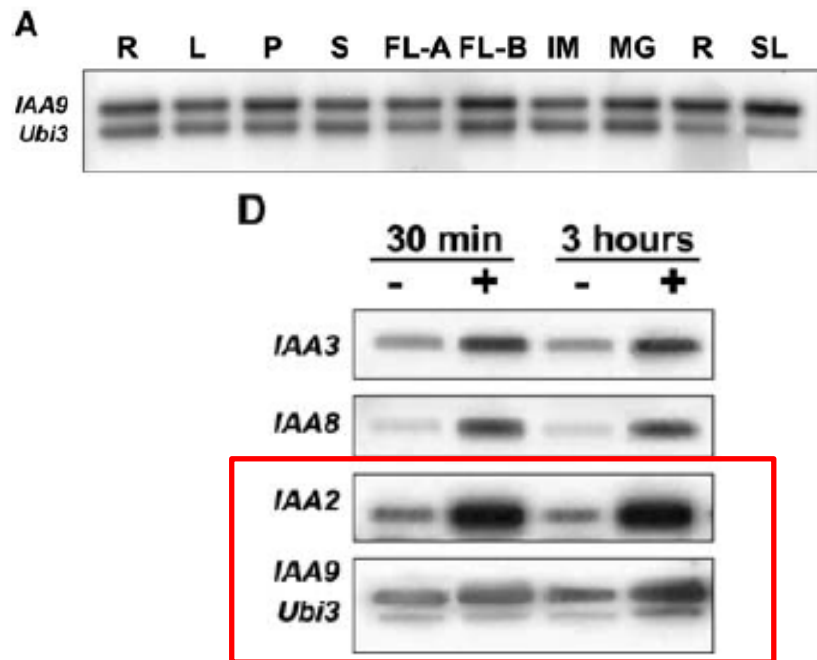
Aux/IAA Transcription factors



SlAux/IAA2

SlAux/IAA9

Auxin-mediated signaling

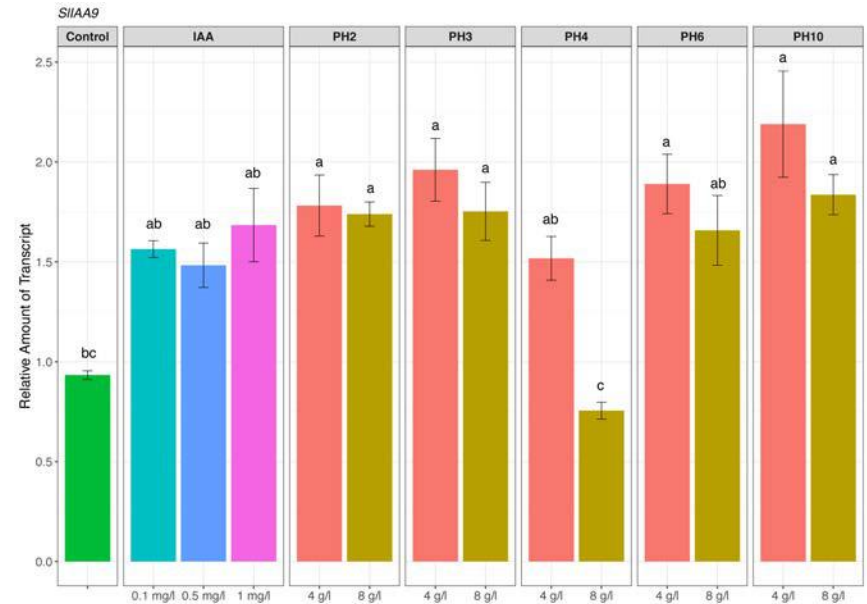
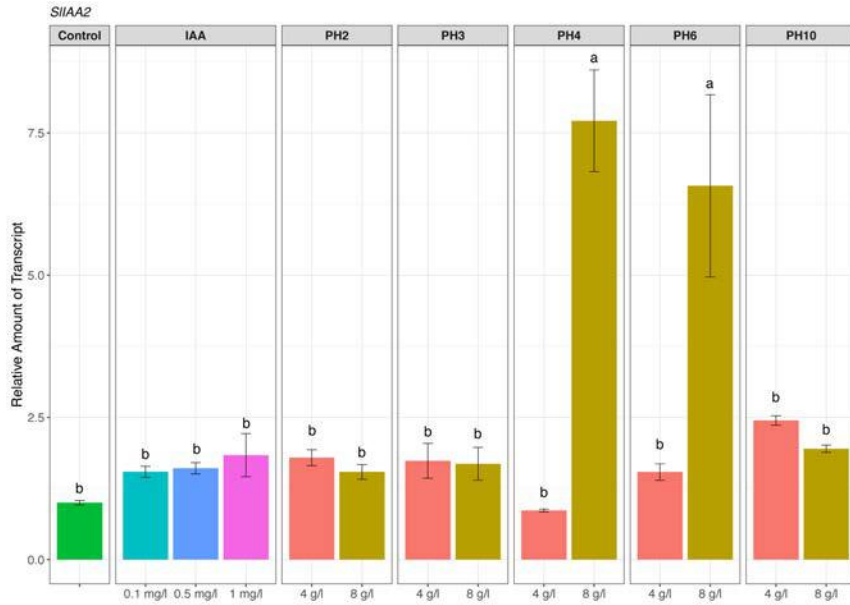


The Plant Cell, Vol. 17, 2676–2692, October 2005, www.plantcell.org © 2005 American Society of Plant Biologists

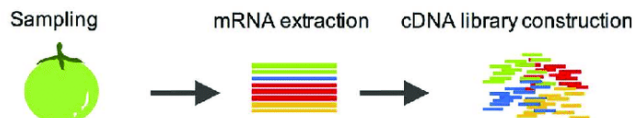
The Tomato *Aux/IAA* Transcription Factor *IAA9* Is Involved in Fruit Development and Leaf Morphogenesis ^{WU}

Hua Wang,^a Brian Jones,^a Zhengguo Li,^b Pierre Frasse,^a Corinne Delalande,^a Farid Regad,^a Salma Chaabouni,^a Alain Latché,^a Jean-Claude Pech,^a and Mondher Bouzayen^{a,1}

RT-PCR analyses



Sample preparation

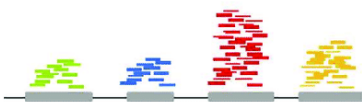


RNA-sequencing

Data analysis

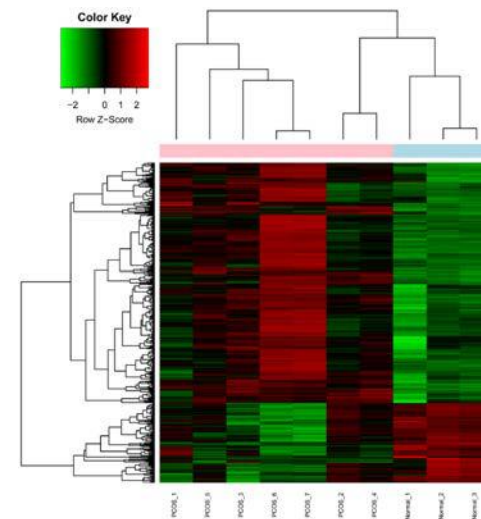
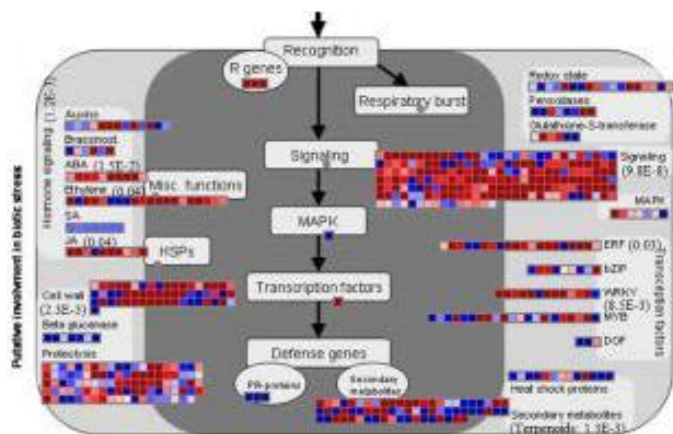
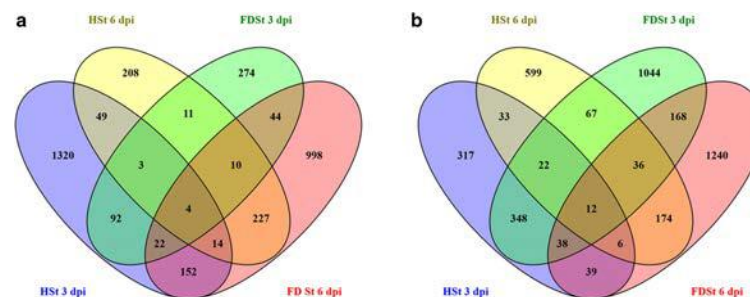
"Direct-mapping method"

Direct mapping to reference genome



Reference genome;
Tomato 'HEINZ 1706', Version SL2.50

Next steps



Conclusions

- ✓ Rooting experiments showed a PH-dependent stimulation of auxin response
- ✓ Distinctive effects were observed between different plant organs, despite the PHs were applied foliarly
- ✓ A broad reprogramming of metabolism was elicited by the PHs, and the metabolite signature overlapped with exogenous auxin only in shoots
- ✓ Transcription Factors involved in auxin response are activated by PH treatments; nevertheless, genome-wide transcriptomic approaches are required to gain further insight in the biological effects of PH

Thanks for your attention!!