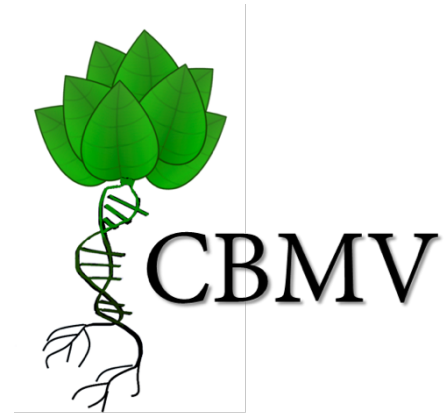




Rooting the future: Plant development modulation for agrobiothecnology

Lorena Norambuena

Centro de Biología Molecular Vegetal

Departamento de Biología

Facultad de Ciencias

Universidad de Chile



Lorena Norambuena's Lab



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Postdoctorado

**Dr Analía Espinoza
Dr Cecilia Rodríguez-Furlán
Dr Ricardo Tejos**

Doctoral thesis

**Patricio Pérez-Henríquez
Lorena Pizarro
Carlos Rubilar-Hernández**

Master thesis

**Milagros Bracamonte
Aliosha Figueroa
Stefanía Morales
Claudio Osorio
Sara Zapata**

Undergraduate thesis

Alvaro Guajardo

Visitor

Gabriela Madrid

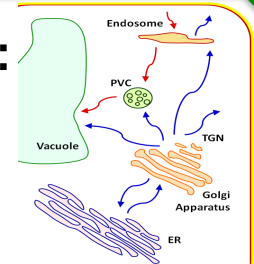
Professional

**Uri Aceituno
Mirna Cruz-Amaya
Giovanna Miranda**

Technician

Sebastian Urbina

**Protein trafficking:
Regulation and
Role in plant
Development**



**Agro-chemical
Biotechnology**



**Chilean strawberry
Fruit Development**



Funding



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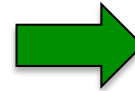
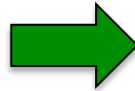
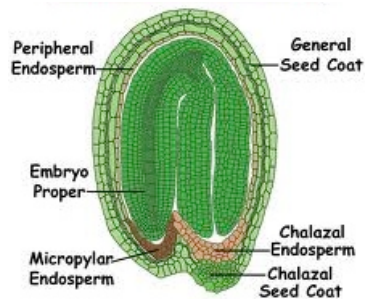


Plant development is plastic

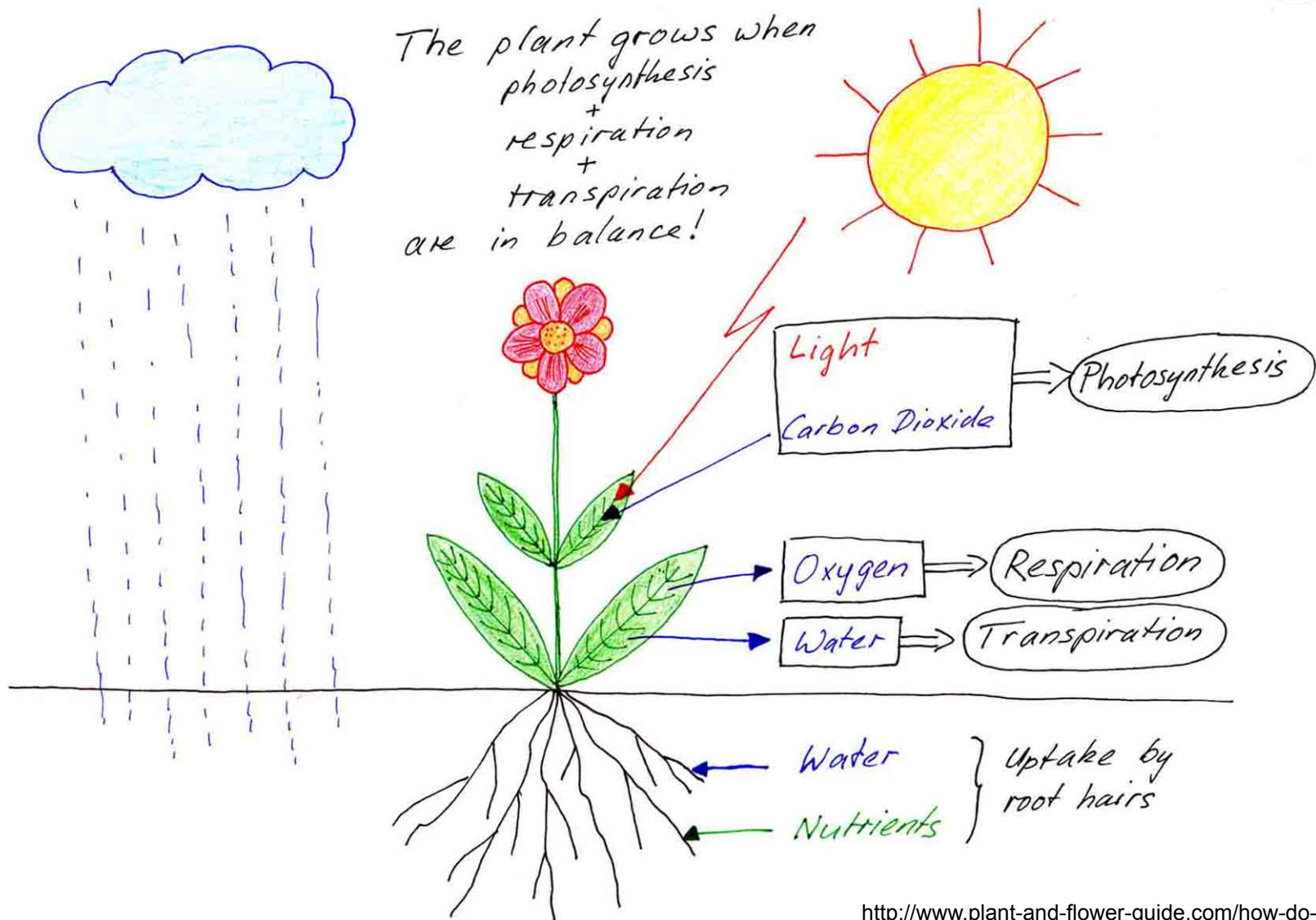
Development

Embryonic

Postembryonic

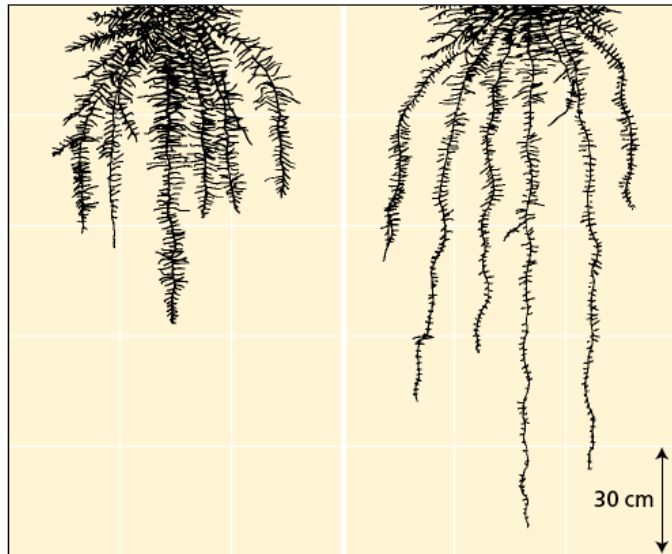


The speed and degree of development depends on enviromental conditions

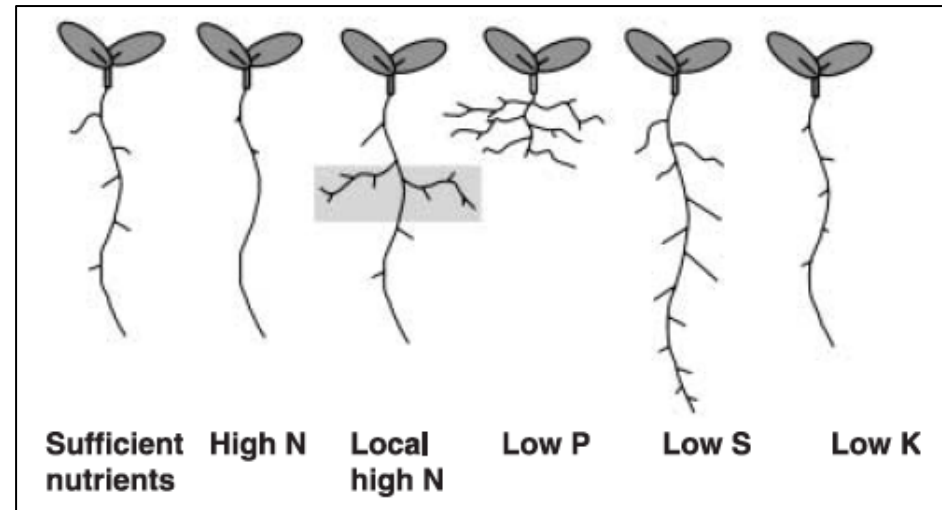
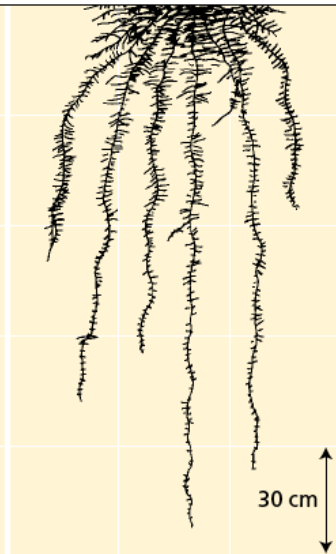


Root developmental plasticity integrates dynamically different environmental stimulus

Dry soil

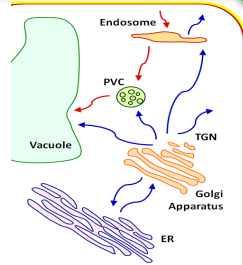


Irrigated soil



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Protein trafficking: Regulation and Role in plant Development



Agro-chemical Biotechnology



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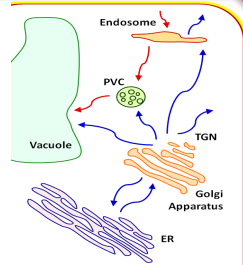


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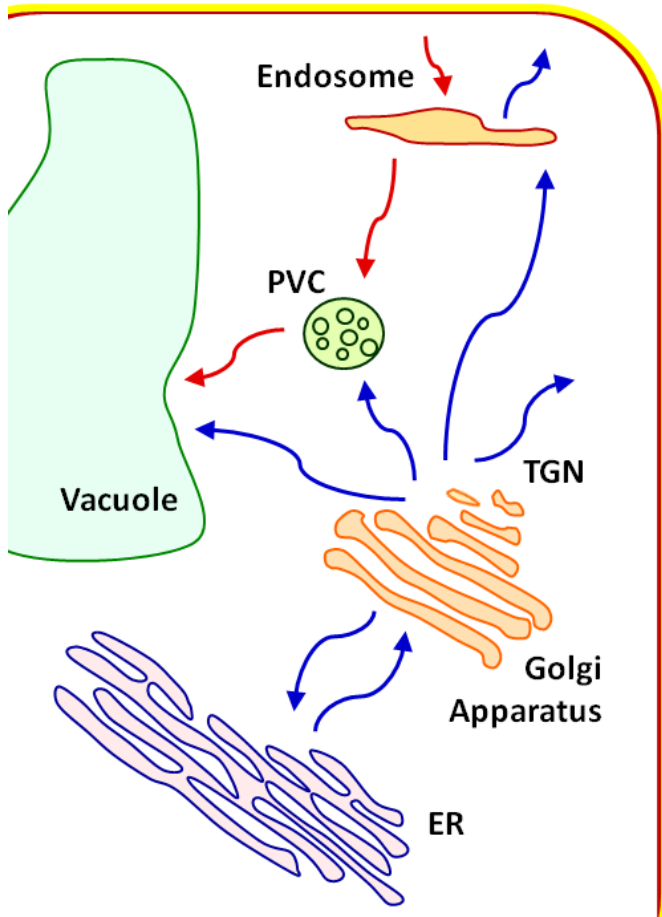
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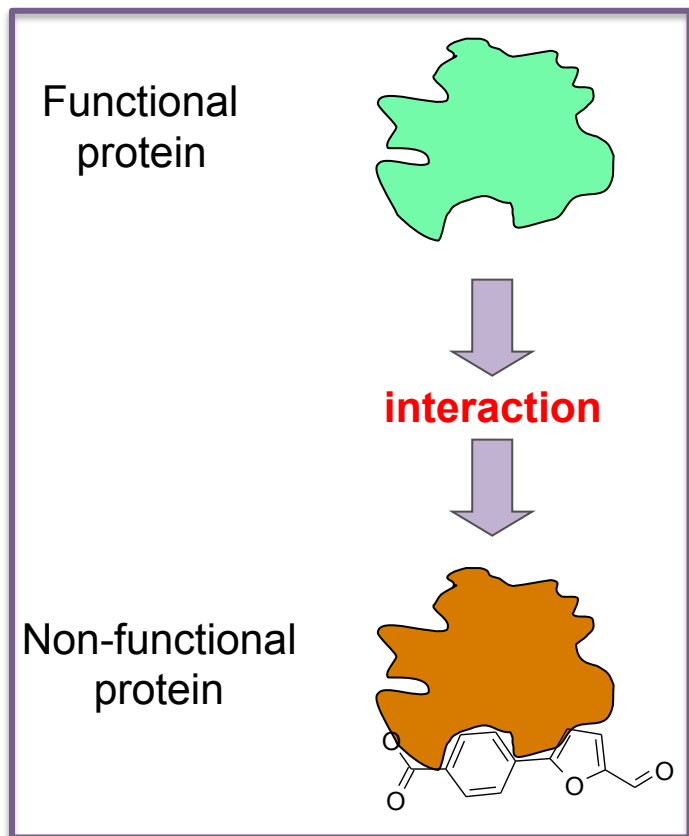
Plant protein trafficking is required for physiological processes in plants



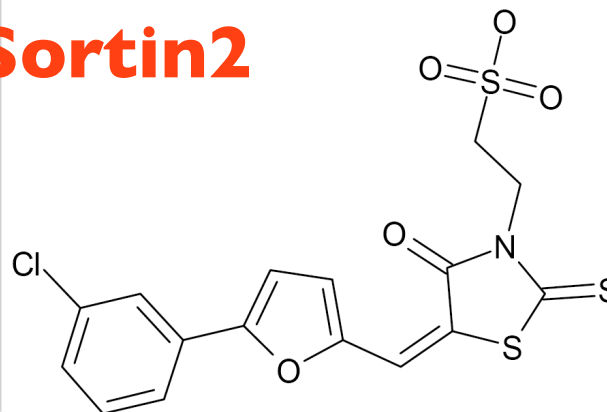
- Cellular maintenance:
Protein synthesis, trafficking and sorting
- Polar axis establishment
- Development
- Gravitropic response
- Pathogen response
- Salt resistance

The bioactive Sortin2 was identified on a chemical genomics screening

Chemical genomics approach

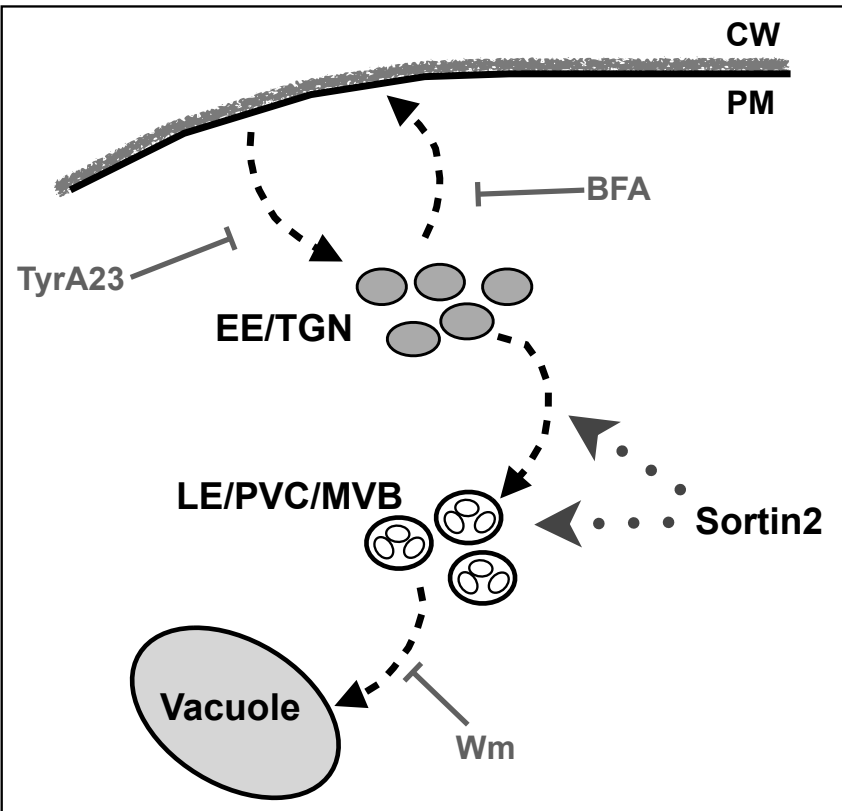


Sortin2

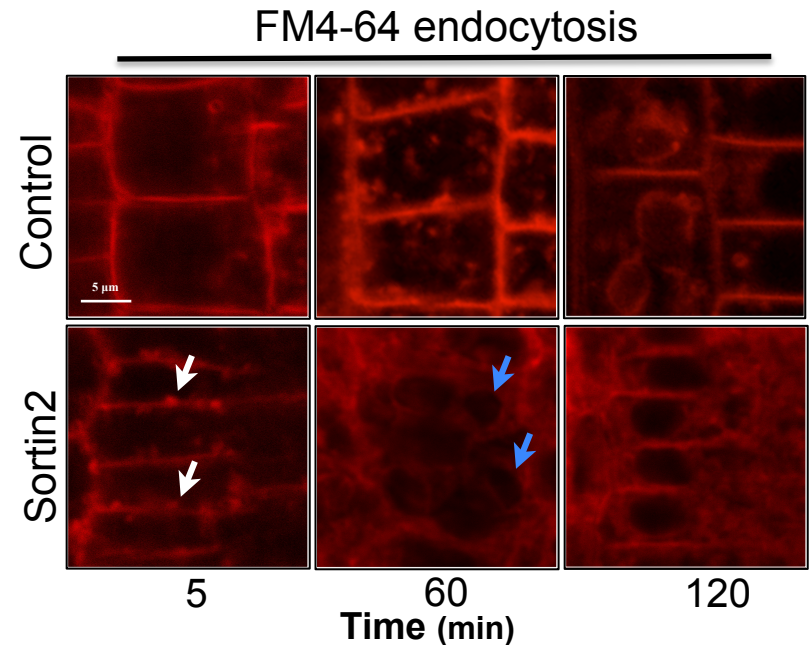
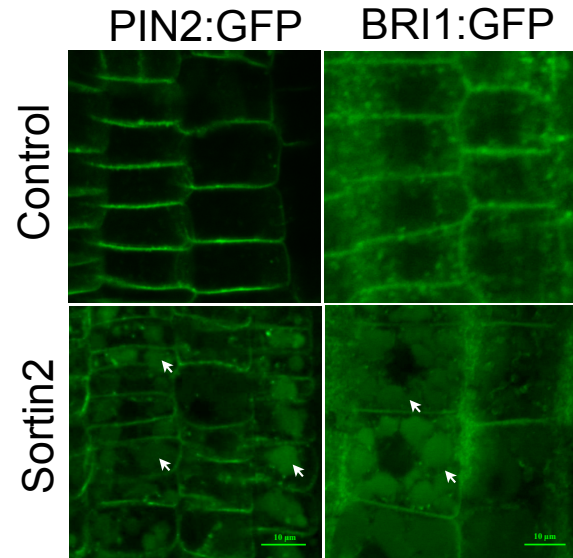


Chemical genomics uses small molecules to perturb, study and control the cellular and physiological function of proteins

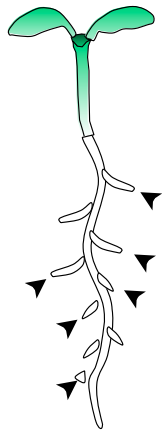
Sortin2 induces endocytosis towards the vacuole



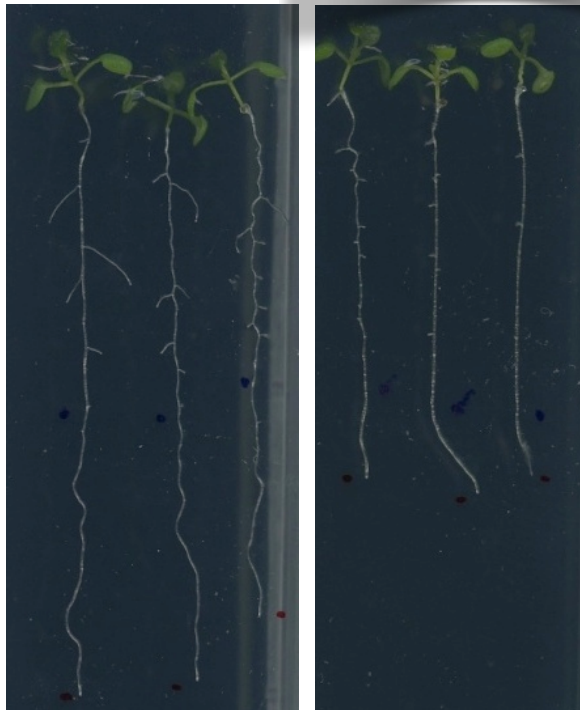
Peréz-Henríquez et al. (2012)
Molecular Plant 5 (6): 1195-1209



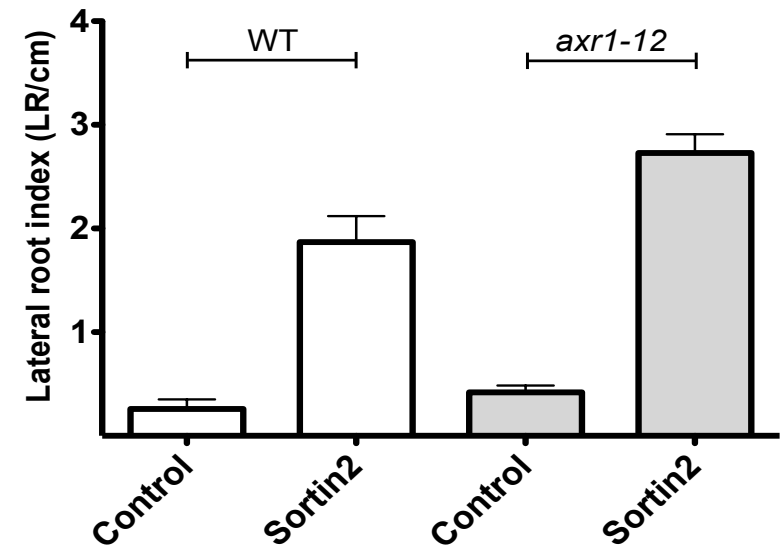
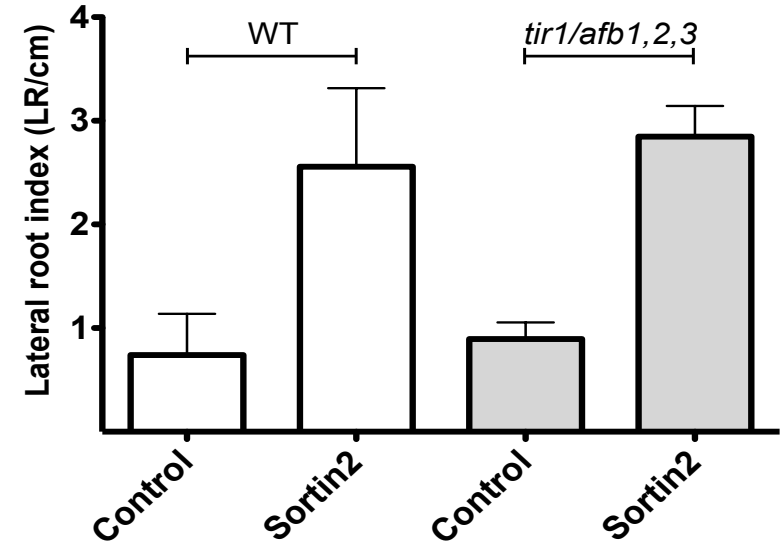
Sortin2 induces lateral roots independently of the SCF^{TIR} auxin receptor



Control

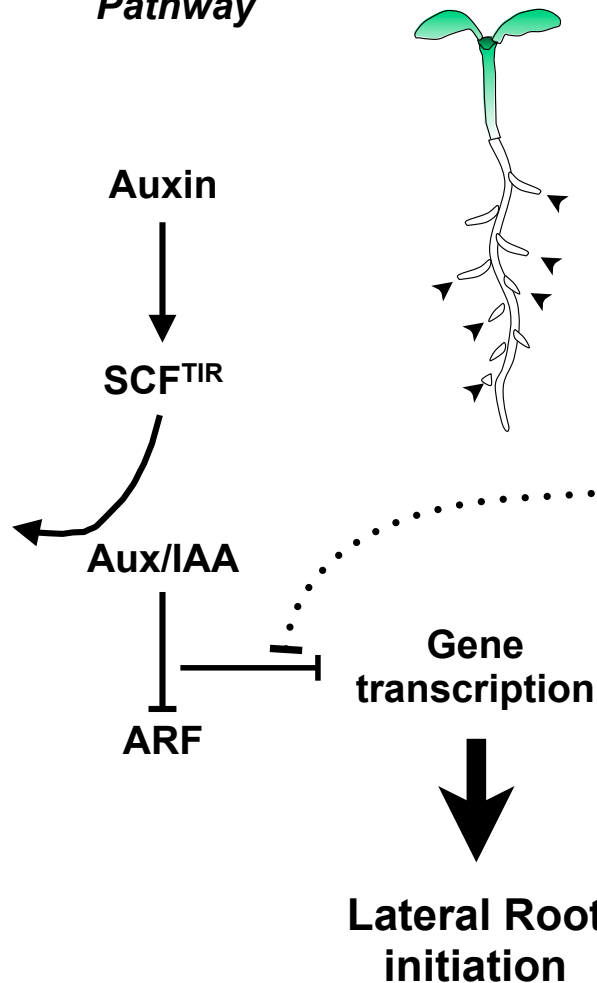


Sortin2

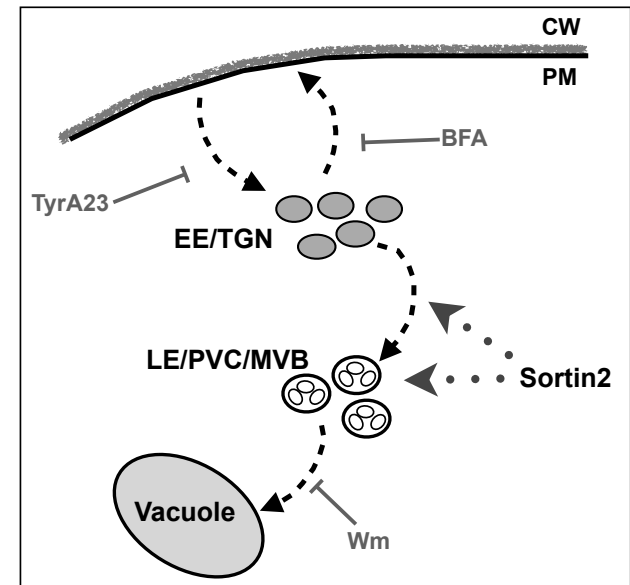
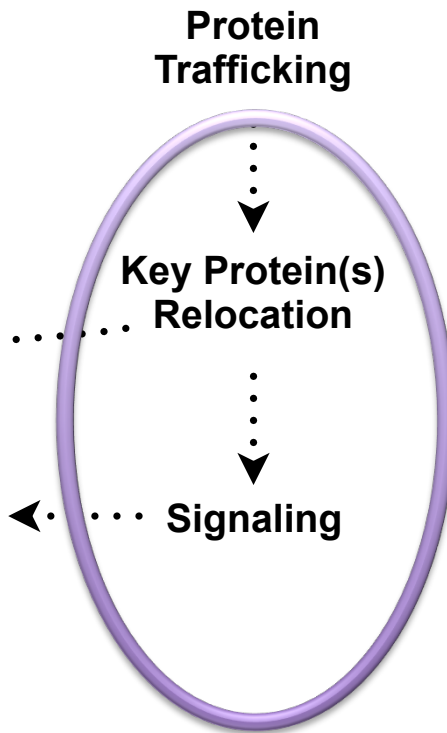


Protein trafficking relocation leads lateral root development

SCF^{TIR} Dependent Pathway



SCF^{TIR} Independent Pathway



Lateral root formation signaling

- Endogenous regulated growth
- Nitrogen deficiency
- Phosphate deficiency
- Sulphate deficiency
- Jasmonate-mediated pathogen response

SCF^{TIR} Dependent Pathway

Auxin
↓
SCF^{TIR}

Aux/IAA

ARF

Gene transcription

Lateral Root initiation

SCF^{TIR} Independent Pathway

Protein Trafficking
⋮
↓

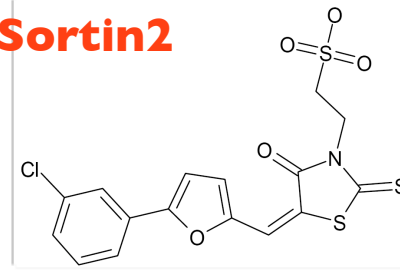
Key Protein(s) Relocation
⋮
↓

Signaling

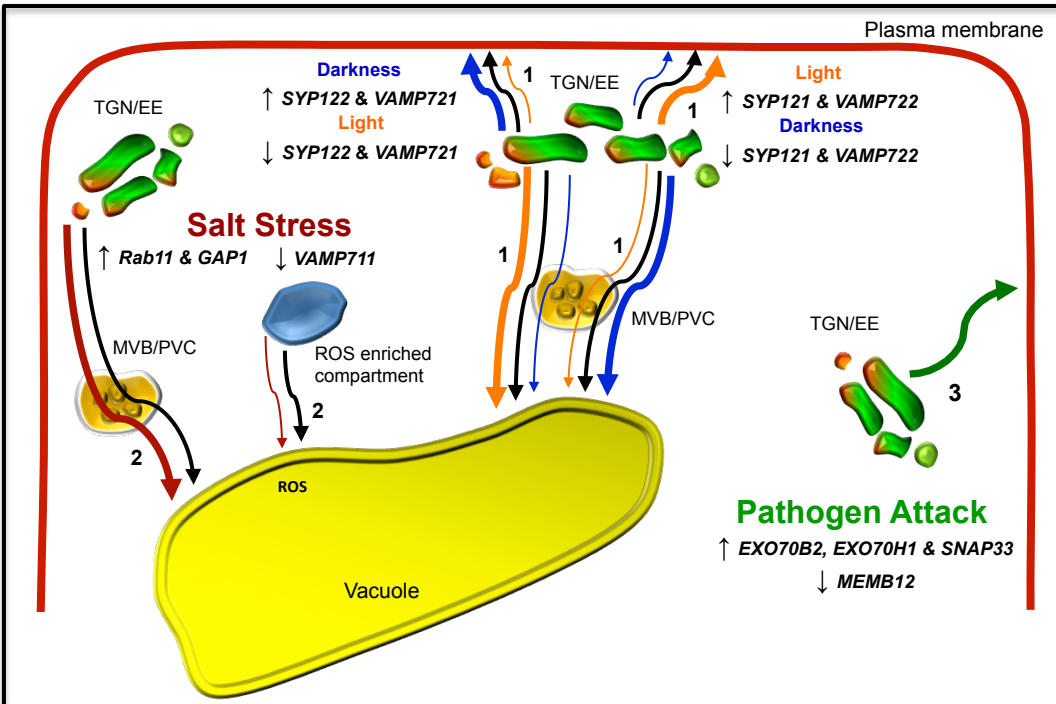


- Mechanical stimulation
- Salt stress
- Glucose signaling

Sortin2



Protein trafficking is regulated upon environmental conditions



Pizarro & Norambuena, 2014

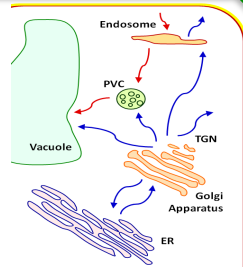
Endocytosis ratio



Salt resistance

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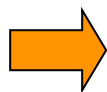
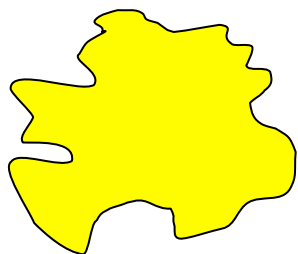


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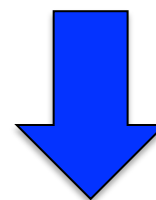
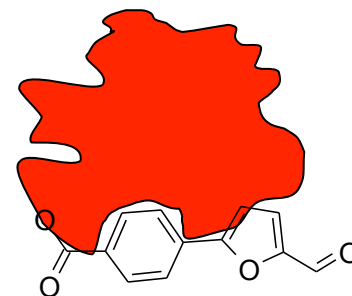
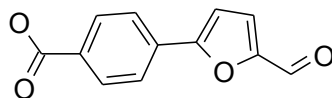


Chemical Genomics uses small compounds to alter protein function

Interaction



Biomodulator 1

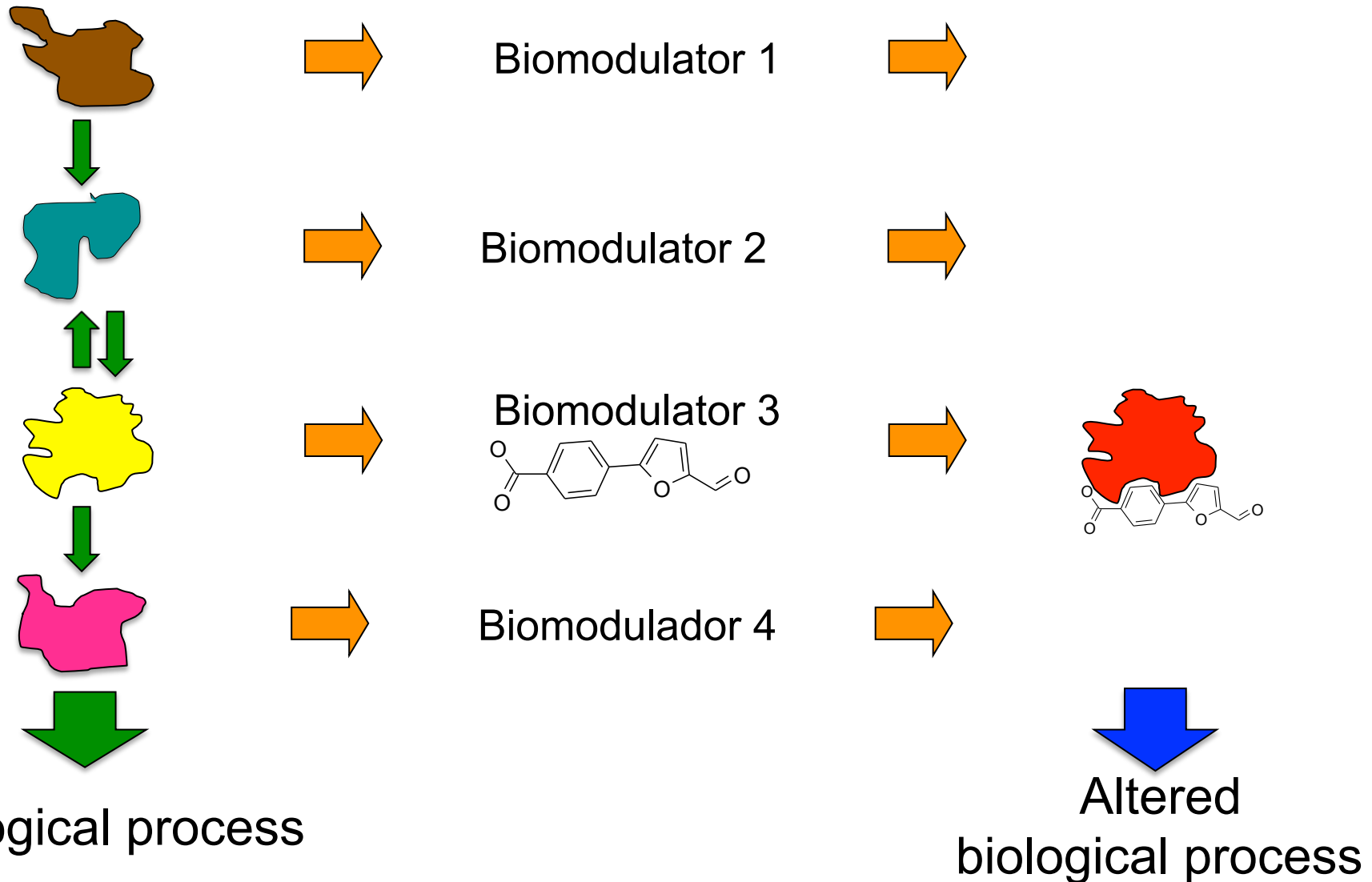


Altered
biological process

Biological process

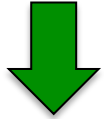
Biology and Chemistry diversity: Powerful combination

Interaction

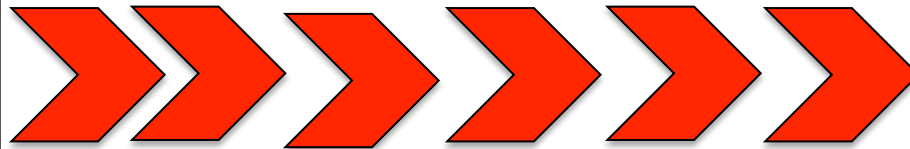


Prototype test: “*ex vitro*” assay

Arabidopsis growth biomodulator

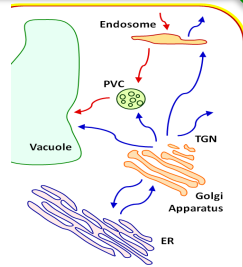


Example: Tomato plants



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Fragaria chiloensis: a exotic fruit

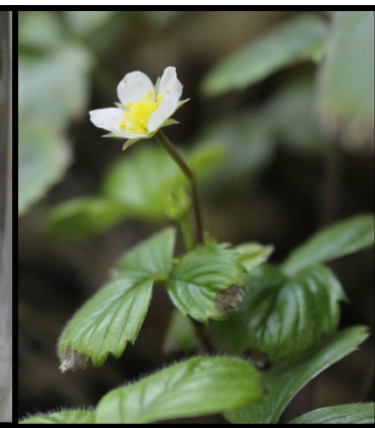
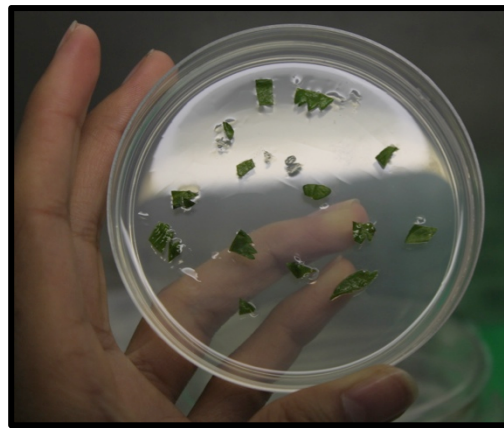
- Strong smell and flavor
- Non climacteric fruit
- Pathogen resistance
- Low temperature and salt resistance



Anillo Joint Grant: Universidad de Talca, Universidad de Chile and Universidad de Concepción
Drs: Alejandra Moya, Raul Herrera, Michael Handford, Carlos Figueroa and Freddy Mora

Main Goal: getting to know *Fragaria chiloensis*

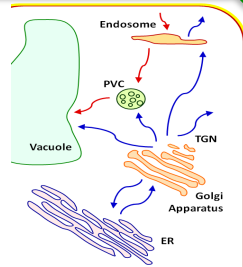
Determining the molecular bases that will lead to a better understanding of the traits that regulate fruit ripening in this species, in order to improve quality and favour its options in the national and international markets



Anillo Joint Grant: Universidad de Talca, Universidad de Chile and Universidad de Concepción
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Acknowledgments

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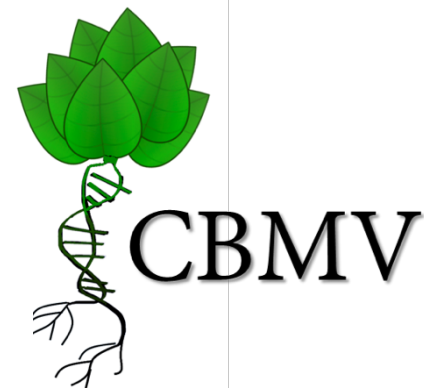
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To all members and former members of the lab

Collaborators

- Dr **Miguel Allende**, Universidad de Chile, Chile
- Dr **Tom Beckman**, University of Gent, VIB, Belgium
- Dr. **Bruce Cassels**, Universidad de Chile, Chile
- Dr **Alvaro Glavic**, Universidad de Chile, Chile
- Dr **Rodrigo A Gutiérrez**, Pontificia Universidad Católica, Chile
- Dr **Michael Handford**, Universidad de Chile, Chile
- Dr **Raúl Herrera**, Universidad de Talca, Chile
- Dr **Glenn Hicks**, Institute for Integrative Genome Biology at UCR, US
- Dr **Alejandra Moya**, Universidad de Talca, Chile
- Dr **Ariel Orellana**, Universidad Andrés Bello
- Dr **Natasha Raikhel**, University of California Riverside, UCR, US
- Dr **Marcela Rojas-Pierce**, North Carolina State University, US
- Dr **Claudia Stange**, Universidad de Chile, Chile
- Dr **Jan Zouhar**, Universidad Politécnica de Madrid, Spain



*Muchas
Gracias*

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