



*Changes in Sugarcane Plants after
Microgravity using VSB-30 sounding Rocket*

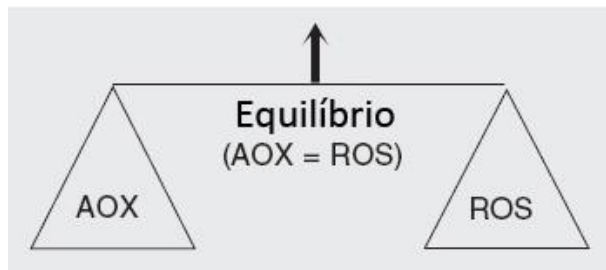
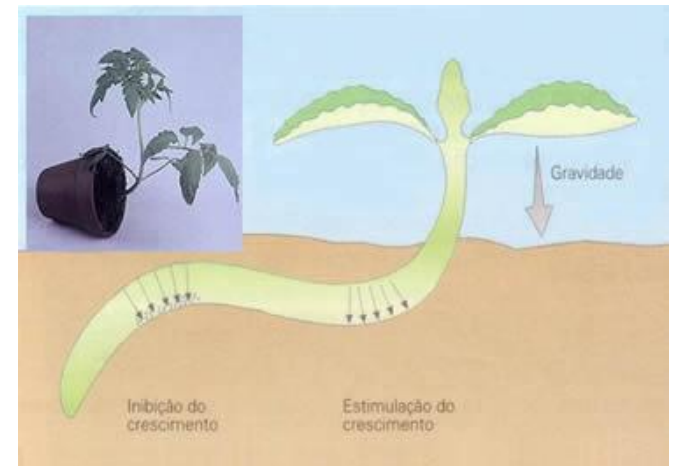
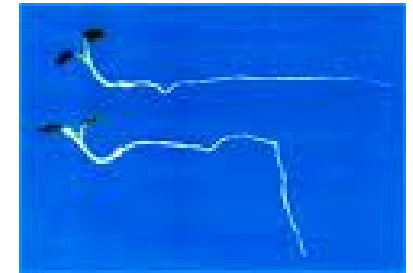
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United Nations/Costa Rica Workshop on Human Space
Technology
San José, Costa Rica 7 March - 11 March 2016



Microgravity

- ✓ Plants evolved in presence of gravity 1 g
- ✓ SSI development problems - germination, seeds production, etc...



Sugarcane:

Monocot

C4

Sacharum spp.

27 % new genes

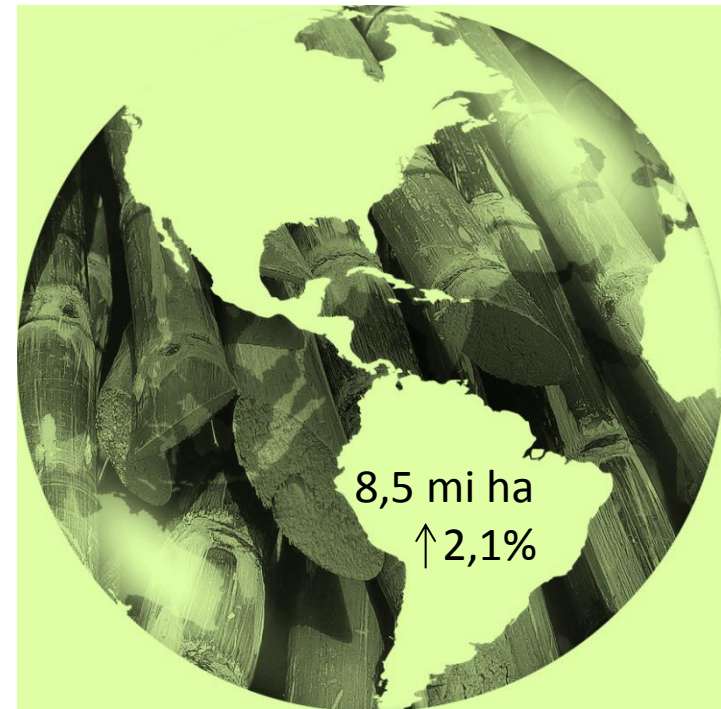
Complex genome

ESTs e BAC

Sucrose stocked in stalks

0.7 M

Sugar and ethanol



100 countries produced
45% world production
0,5% world area



3 AO – 2007 – 2010 AEB

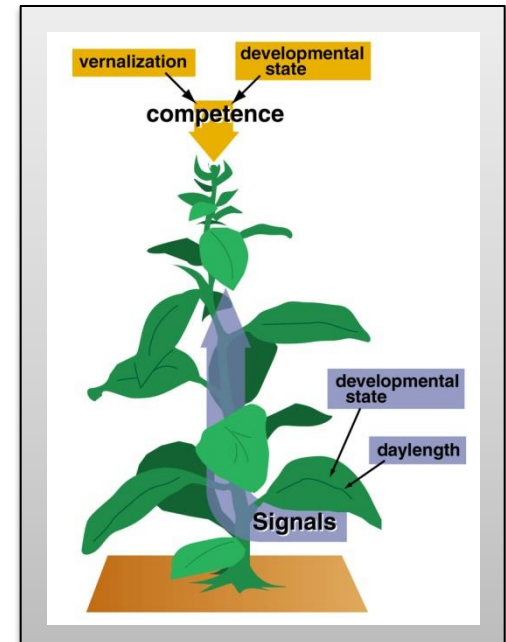


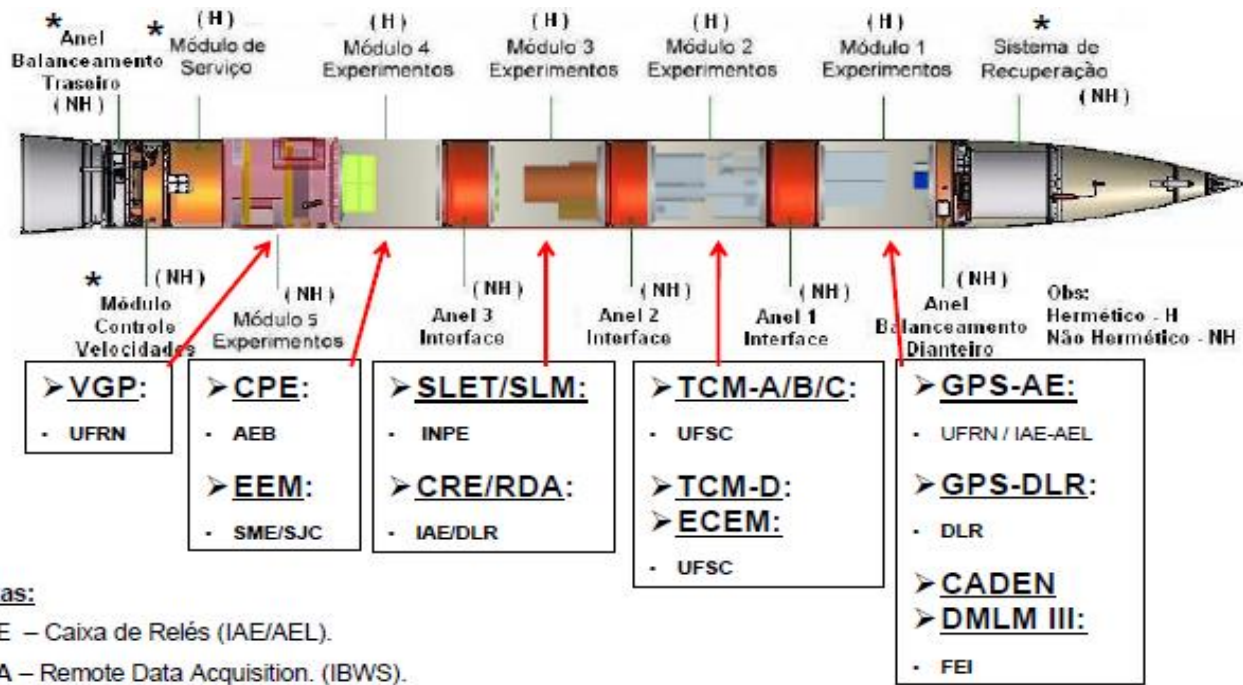
Microgravity Effects

How plants respond to?

Which is the signal pathway?

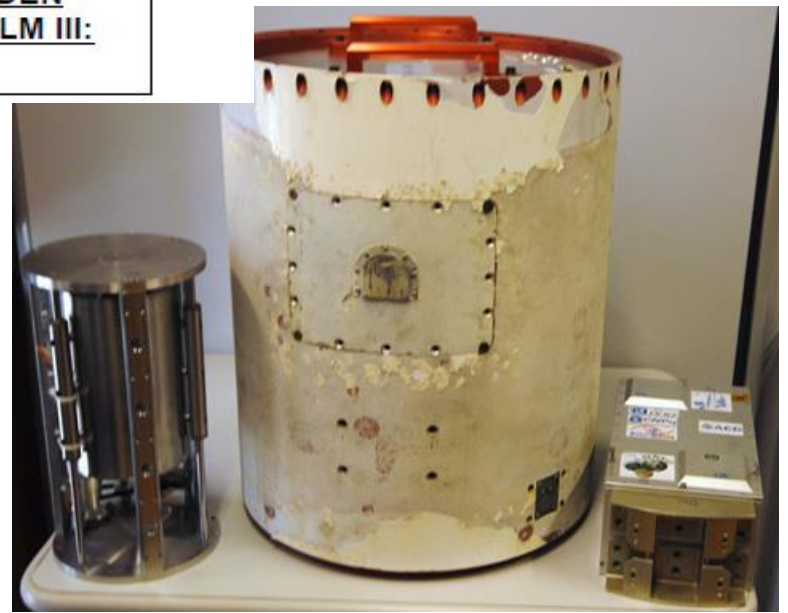
How plant grown after this?





Notas:
 CRE – Caixa de Relés (IAE/AEL).
 RDA – Remote Data Acquisition. (IBWS).

Hermetic boxes
 - late access





CLA station



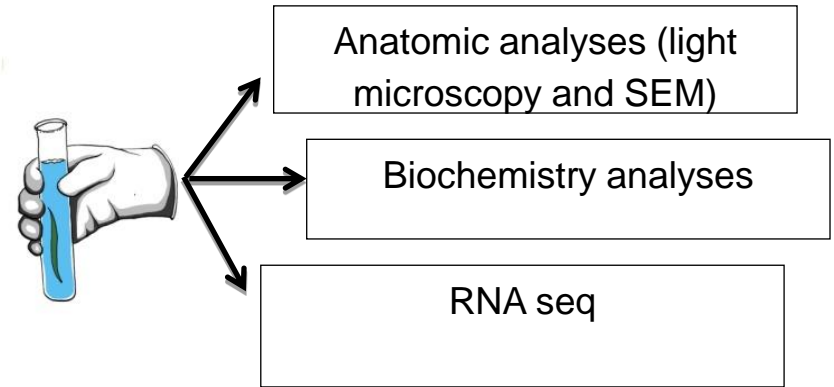
242 km

145 km

18 min

06 min microgravity

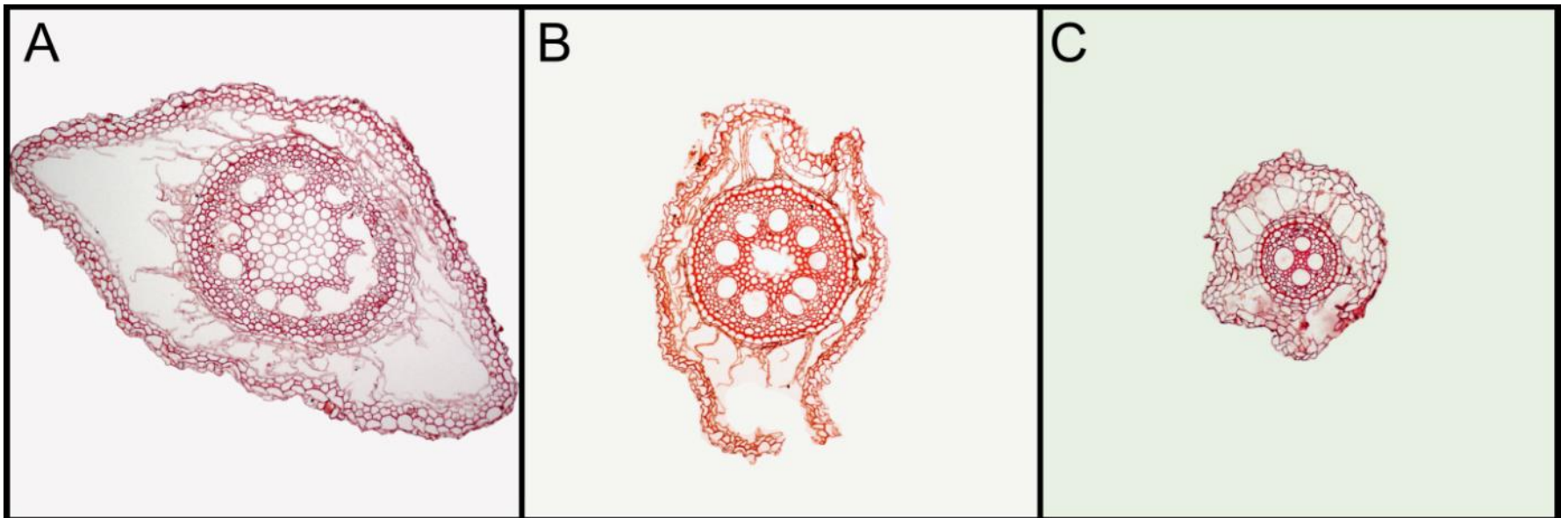
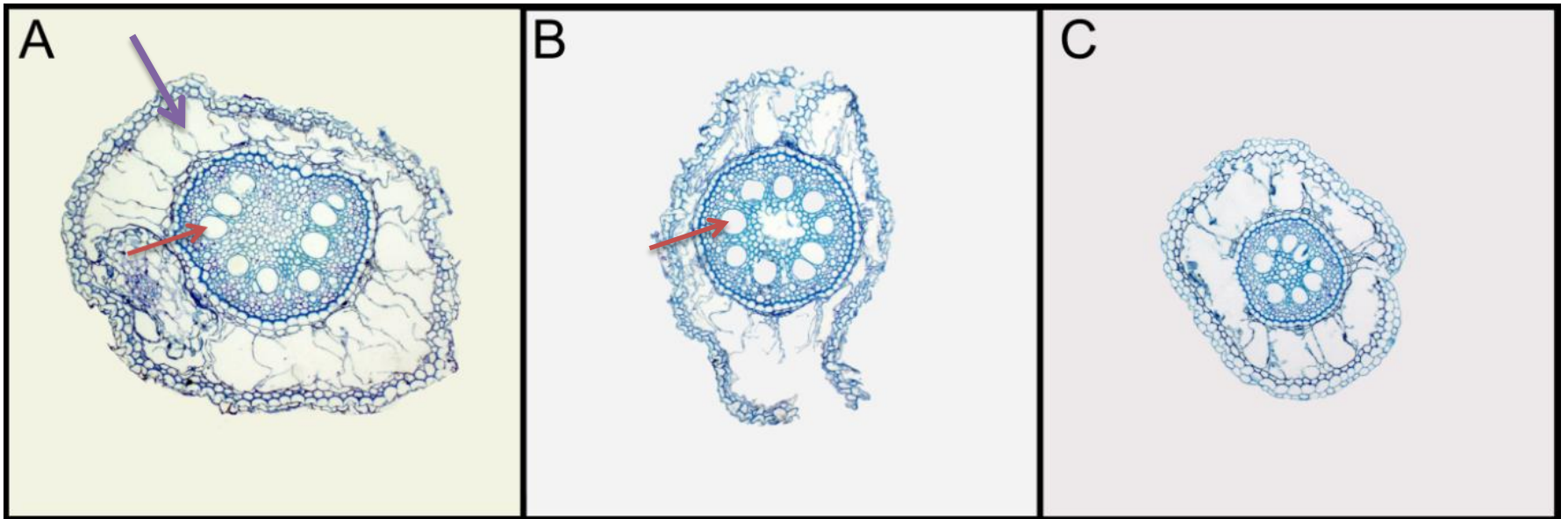




Plants were isolated

- leaves;
- roots.

Root analysis



Anatomic analysis



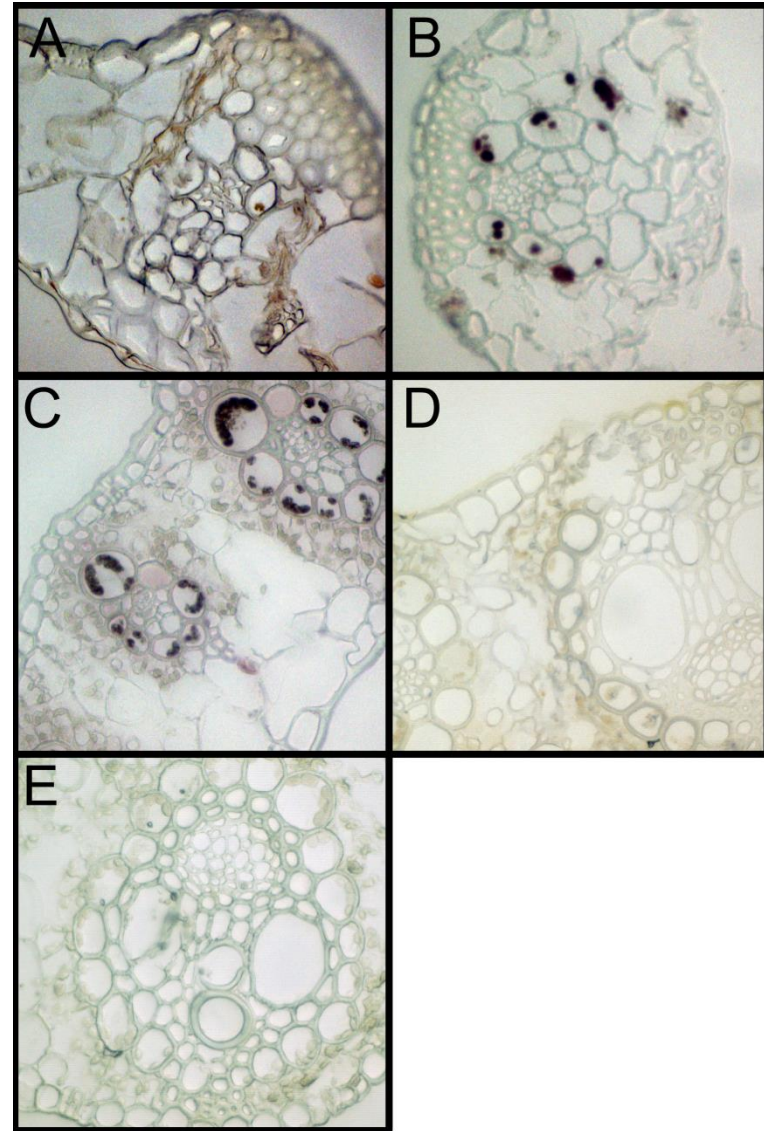
Zinc chloride Leaves

Microgravity related to metabolic changes ?

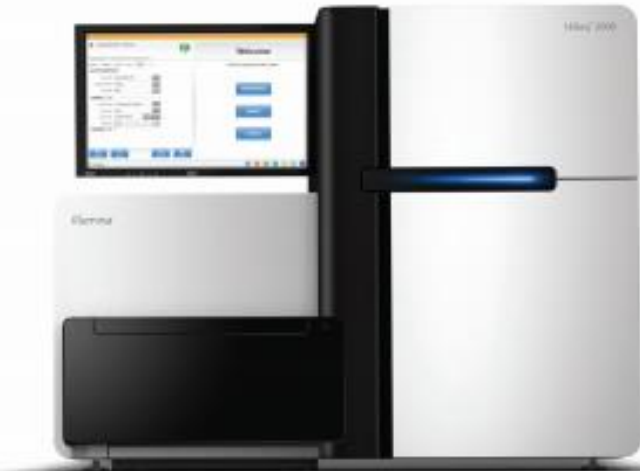
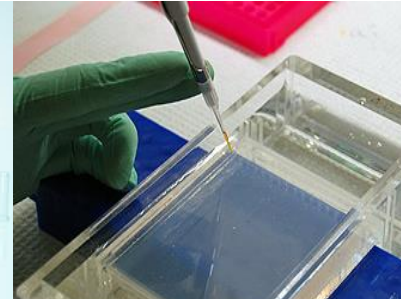
Stress



Lignin

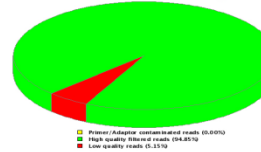


RNA extraction and sequency

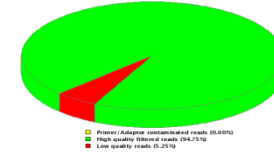


NGS QC TOOLKIT

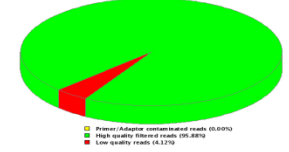
MICROGRAVIDADE: RAIZ VERTICAL
Summary of quality check and filtering



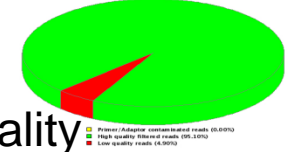
MICROGRAVIDADE: FOLHA VERTICAL
Summary of quality check and filtering



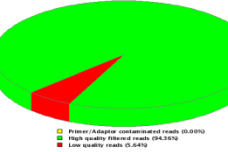
MICROGRAVIDADE: RAIZ HORIZONTAL
Summary of quality check and filtering



MICROGRAVIDADE: FOLHA HORIZONTAL
Summary of quality check and filtering



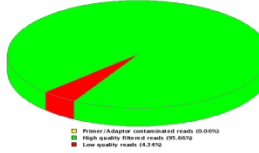
CONTROLE VIBRAÇÃO: FOLHA
Summary of quality check and filtering



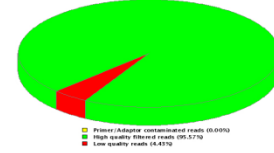
CONTROLE CAIXA: RAIZ VERTICAL
Summary of quality check and filtering



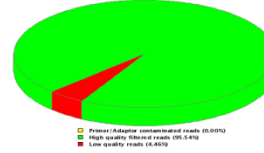
CONTROLE CAIXA: FOLHA VERTICAL
Summary of quality check and filtering



CONTROLE CAIXA: RAIZ HORIZONTAL
Summary of quality check and filtering



CONTROLE CAIXA: FOLHA HORIZONTAL
Summary of quality check and filtering



- Sequences obtained with 95% quality

- Changes in metabolic and RNA expression pattern in leaves and roots



4AO - 2013

Mission VSB30 October 2016

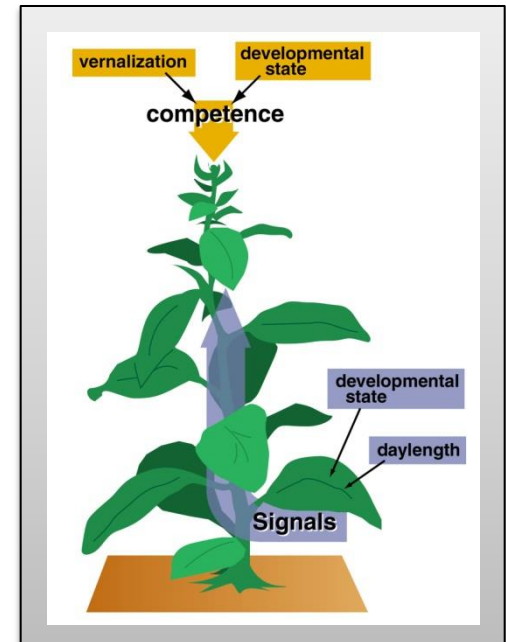


Microgravity effects – two boxes

How plant responds ?

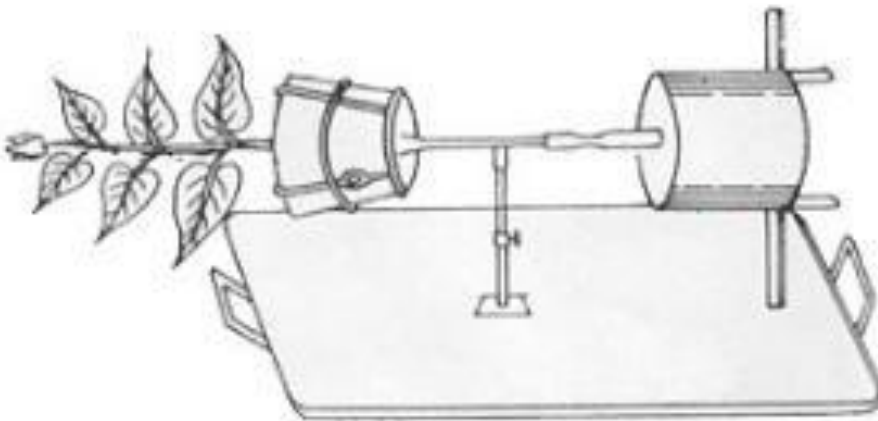
Proteomic analysis one box for
molecular

How plants grow after this stimulus?



*Others tools (simulated
microgravity)*

Clinostat - UNOOSA



Sugarcane plants

Medicinal plants

Educational approach

Science class, chemistry, biology



Plant Group

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Colaborators

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