Vegetable grafting

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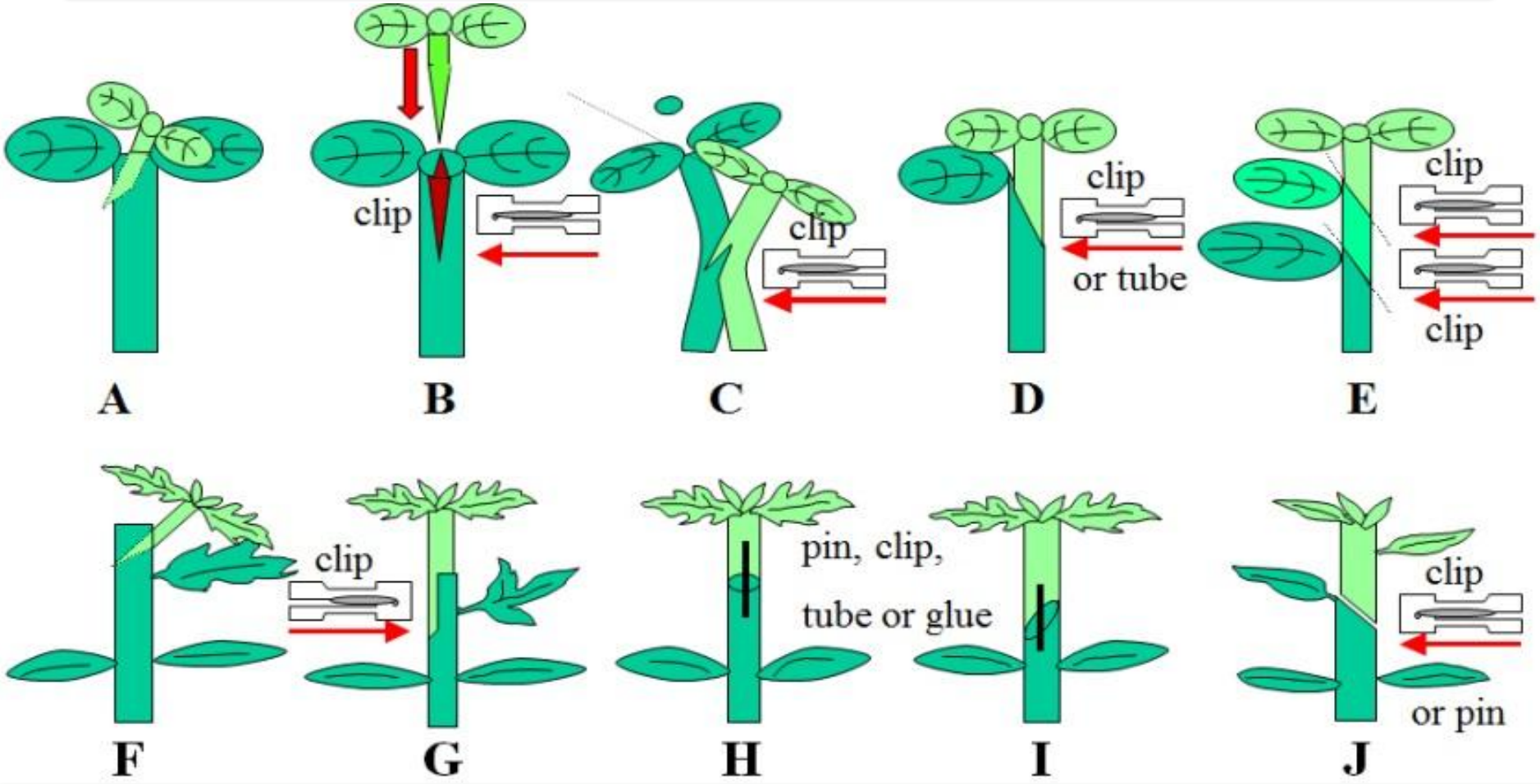
What is grafting?

The union of two or more pieces of living plant tissue, which are forced to develop vascular connection and grow as a single

Savvas, et al.2010 Sci. Hort

Grafting methods applicable for herbaceous grafting

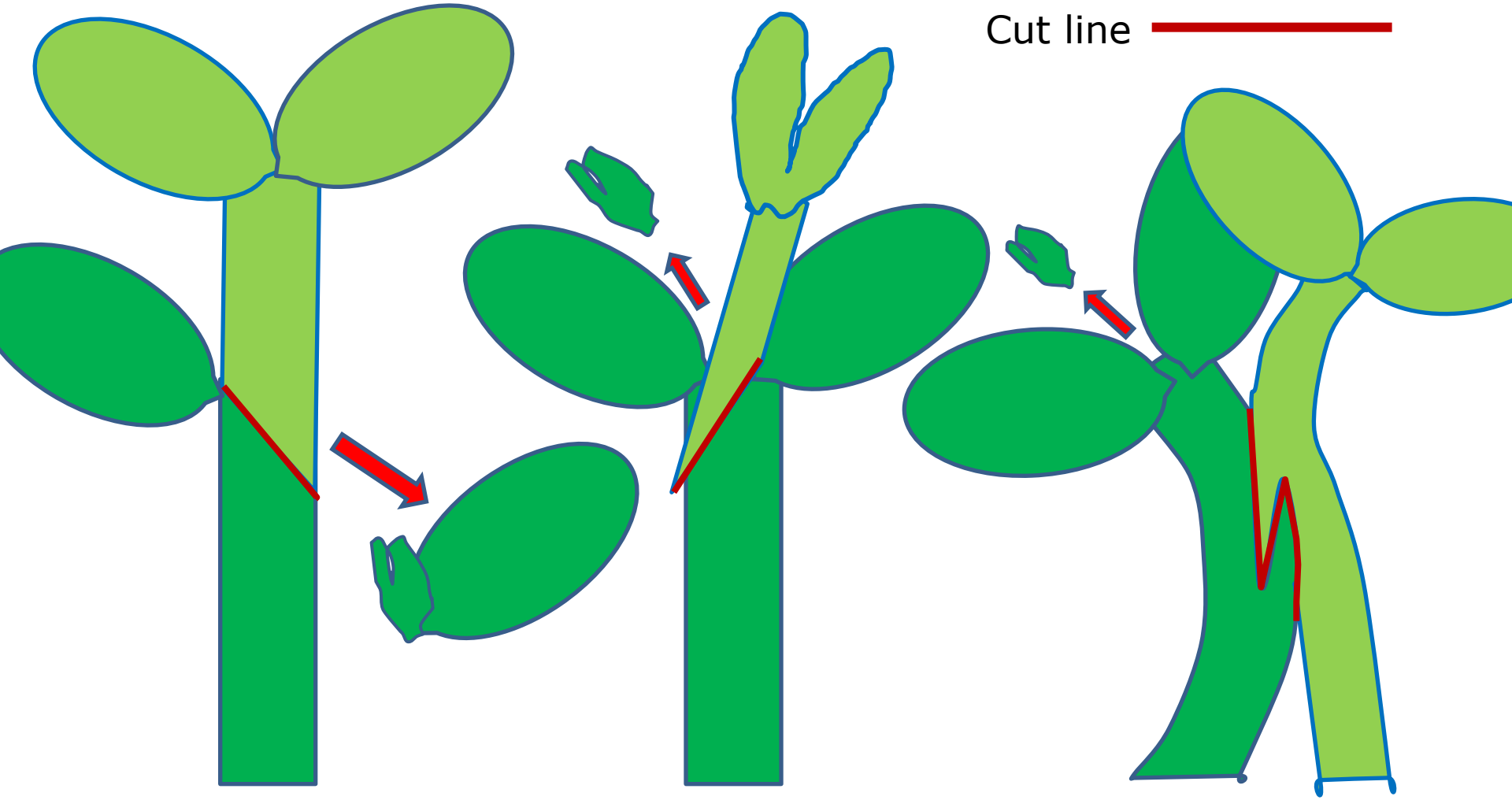


Grafting methods commonly practiced

Cucurbits (up)-A: hole insertion TAG), B: cleft (CG), C: tongue approach(TAG), D: splice SP), and E:double splice grafting)DSG)

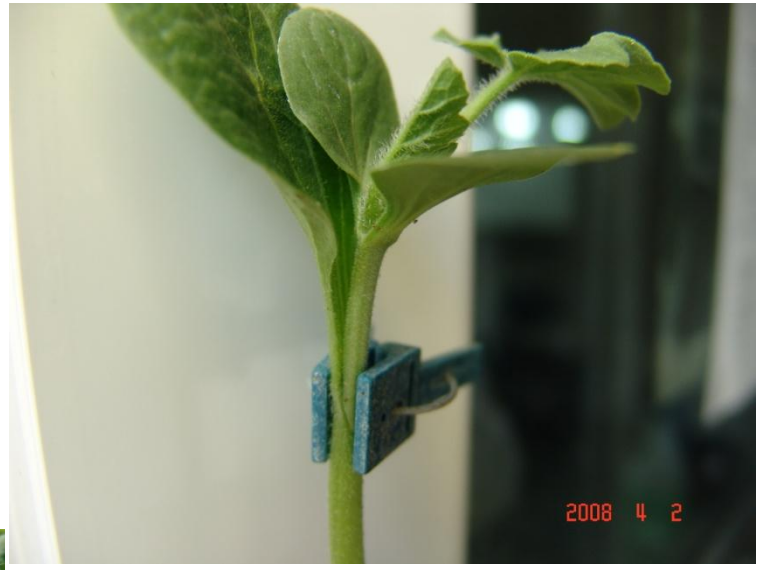
Solanaceous Crops(down)- F: hole insertion(TAG), G: cleft(CG), H & I: pin (PG), and J:splice grafting(SG)

Major grafting methods



Splice | **Hole Insertion** | **Tongue Approach**

Grafting of Cucurbitaceae



6.3α

6.3β

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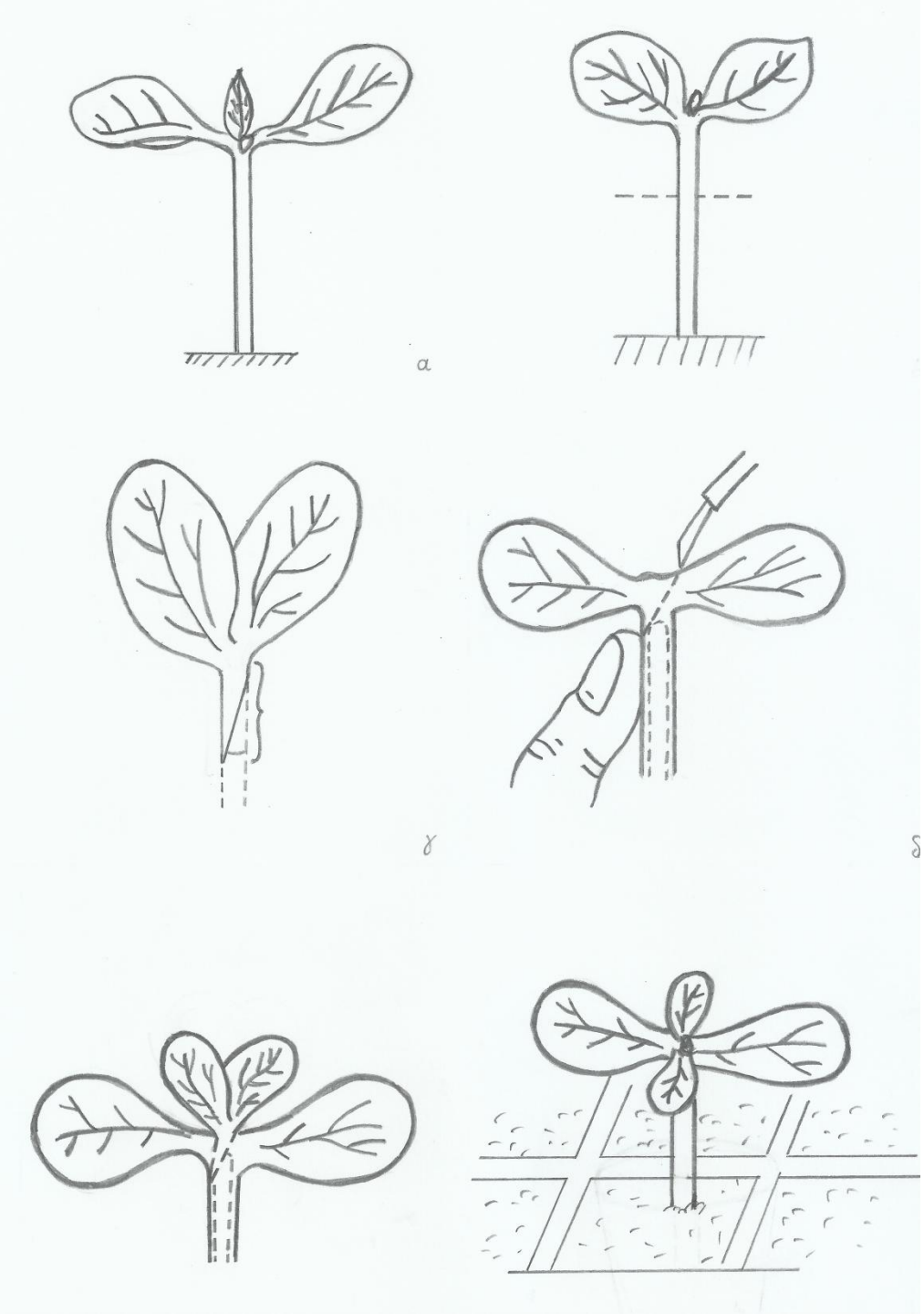
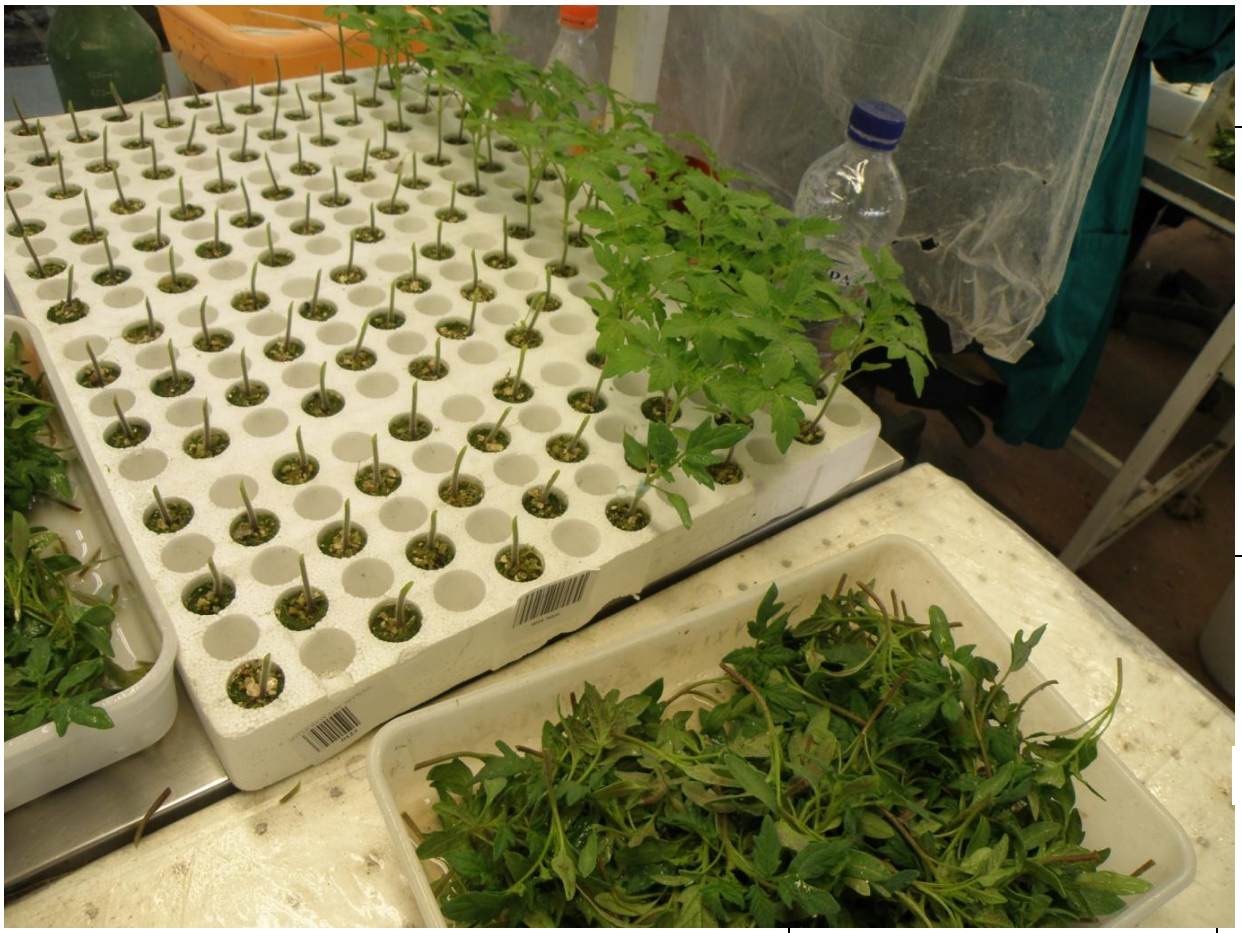
Splice grafting in Cucurbitaceae

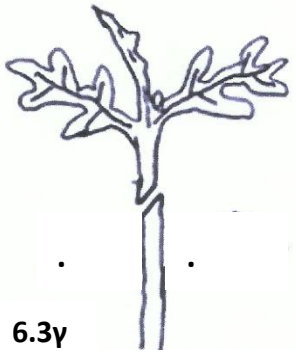
Tongue approach grafting in Cucurbitaceae

Hole insertion grafting in Cucurbitaceae

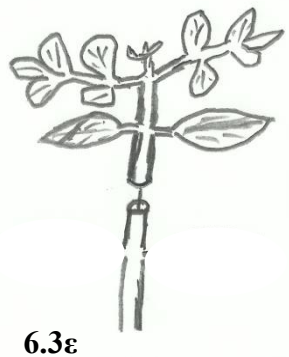


Grafting of Solanaceae
(splice grafting)

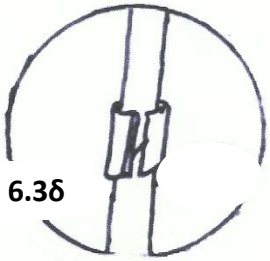




6.3γ



6.3ε



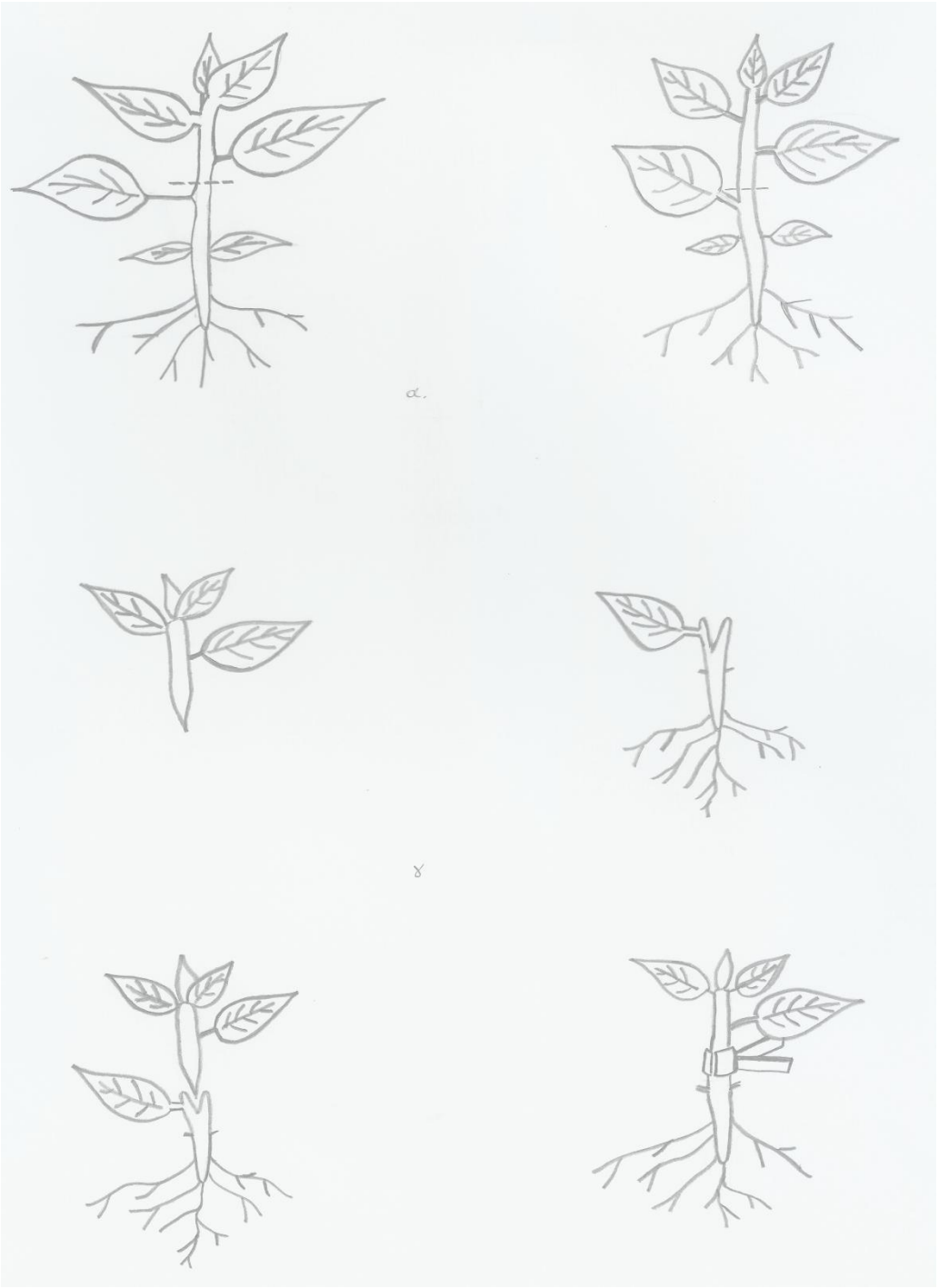
6.3δ

6.3δ

6.3στ

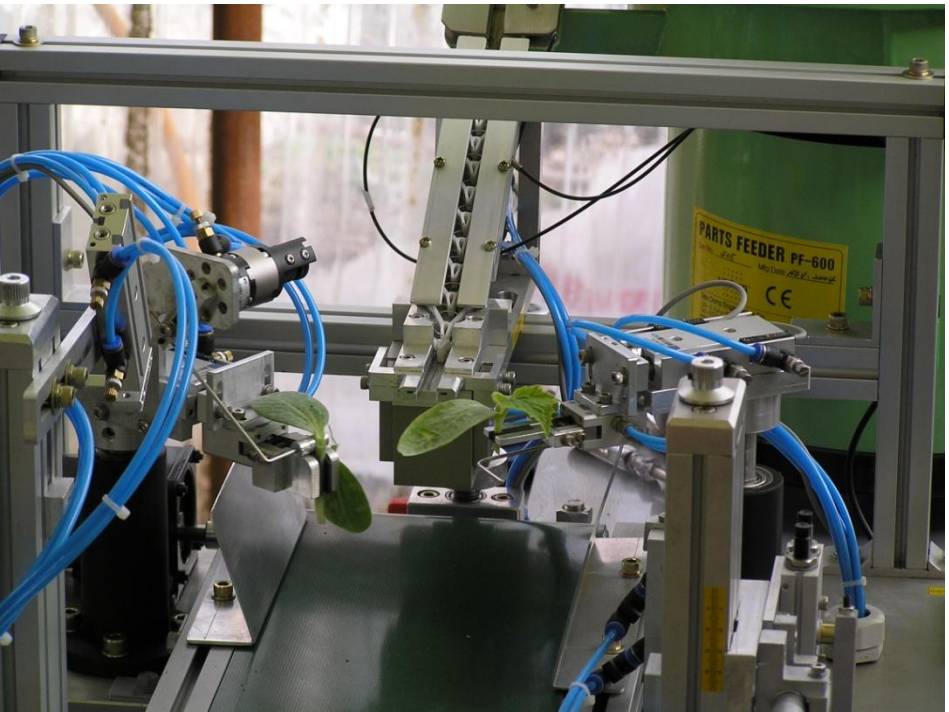
Tomato plant grafted following the splice grafting method

Cleft grafting



Manual grafting

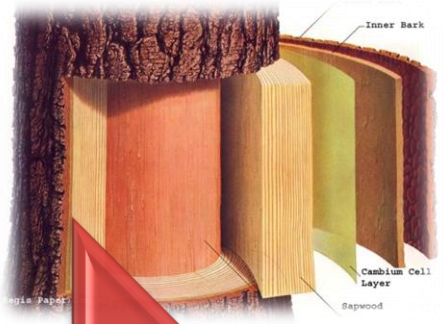
Grafting machine



Grafting Union Formation

What happens?

- callus proliferation (from both the rootstock and the scion),
- callus bridge formation,
- differentiation of new vascular tissue from callus cells and
- production of secondary xylem and phloem



The vascular connection in the rootstock–scion interface may determine water and nutrient translocation, affecting other physiological traits

Any incompatibility between rootstock and scion could lead to

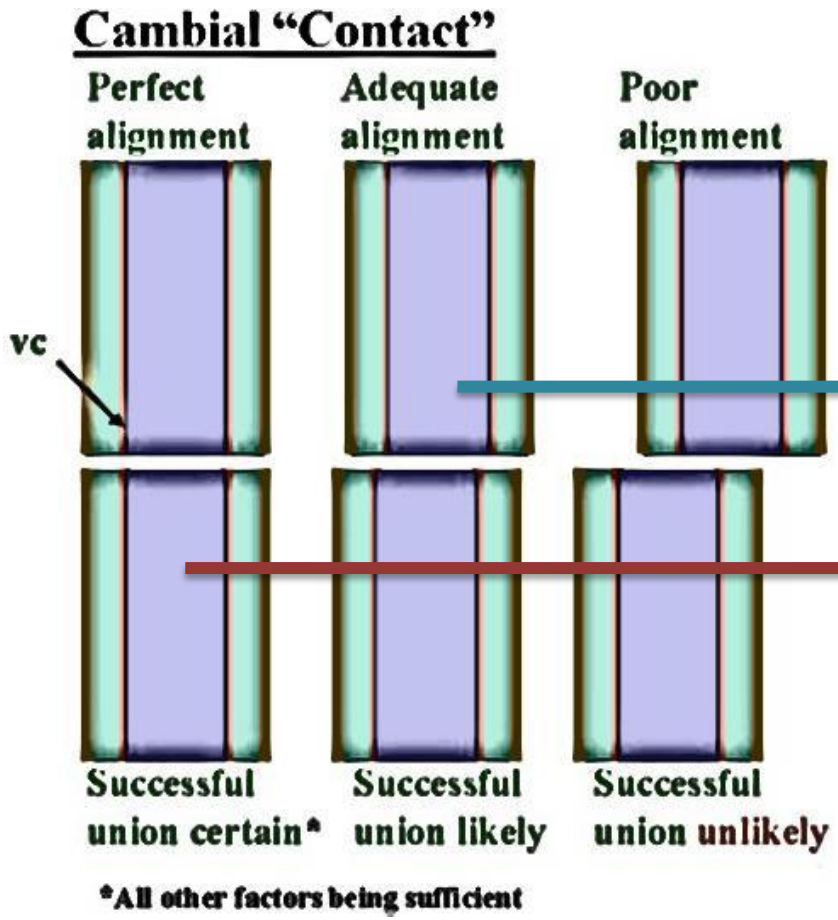
- **defoliation**
- **reduction of scion growth**
- **low survival of grafted plants**

Martínez-Ballesta, et al.2010 Sci. Hort. 127, 112-118

What makes grafting successful?

A. Compatibility

B. Cambial "contact" (alignment)



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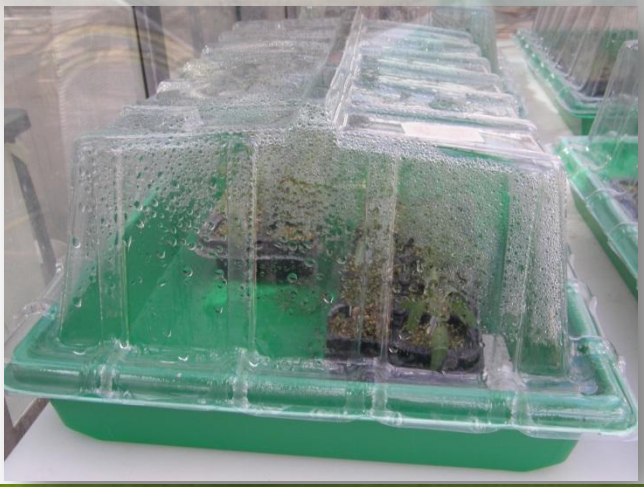
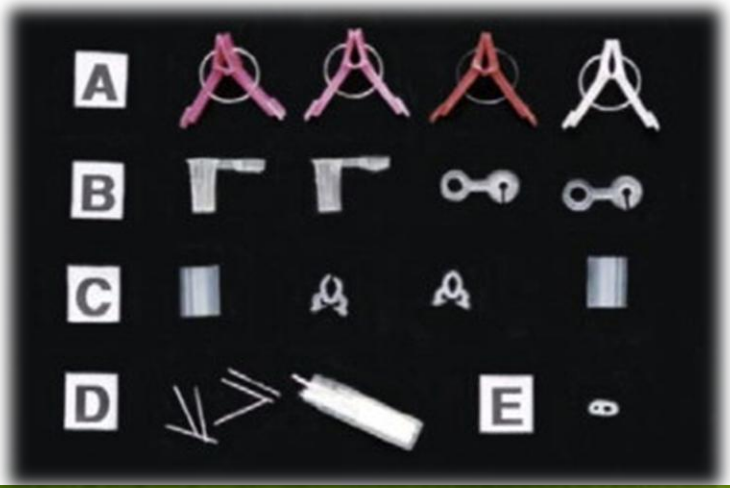
What makes grafting successful?

C. Pressure (To form a continuous bridge of callus, across which a new vascular cambium and then xylem and phloem)

D. Avoid tissue desiccation (mechanical barriers to water vapor loss are important)

Promotion of cell division from the graft union is optimum under environmental conditions of 25-30°C and 95% or higher relative humidity, which protect the wounded tissues from desiccation

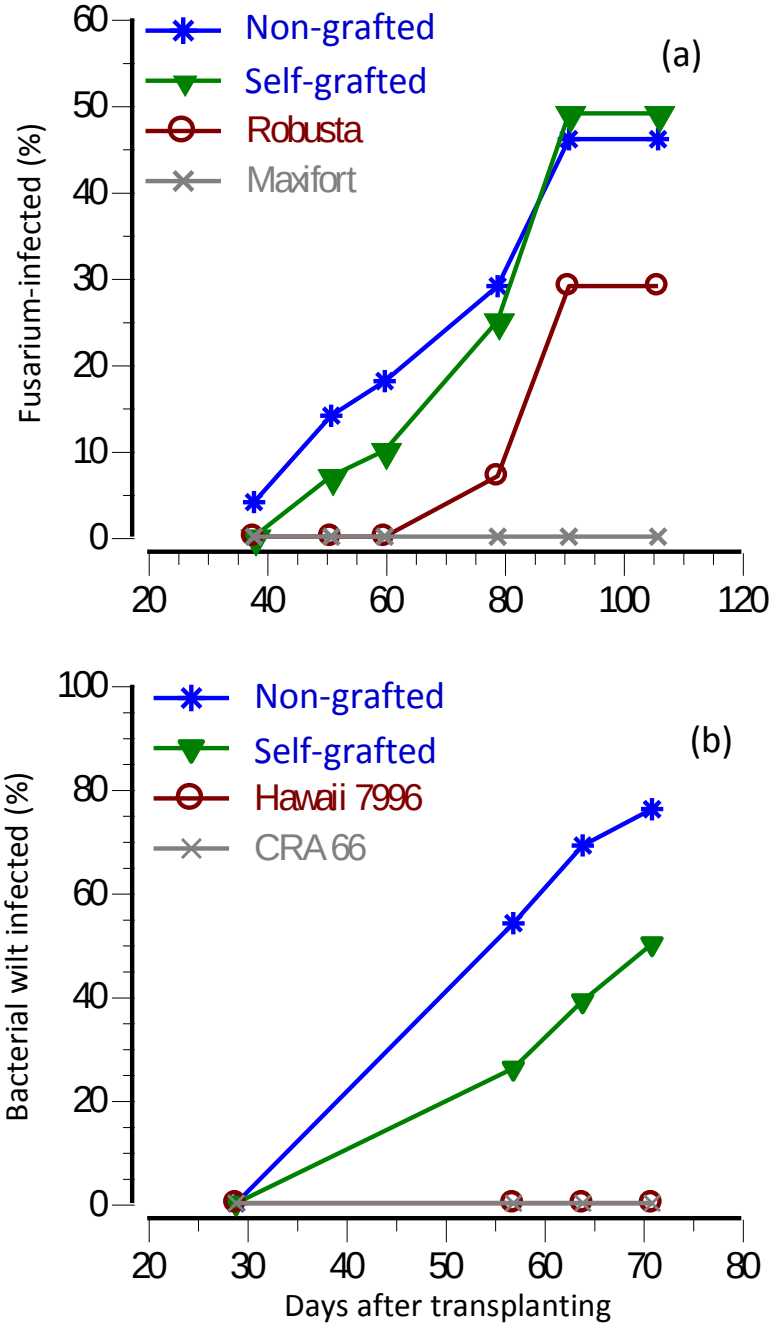




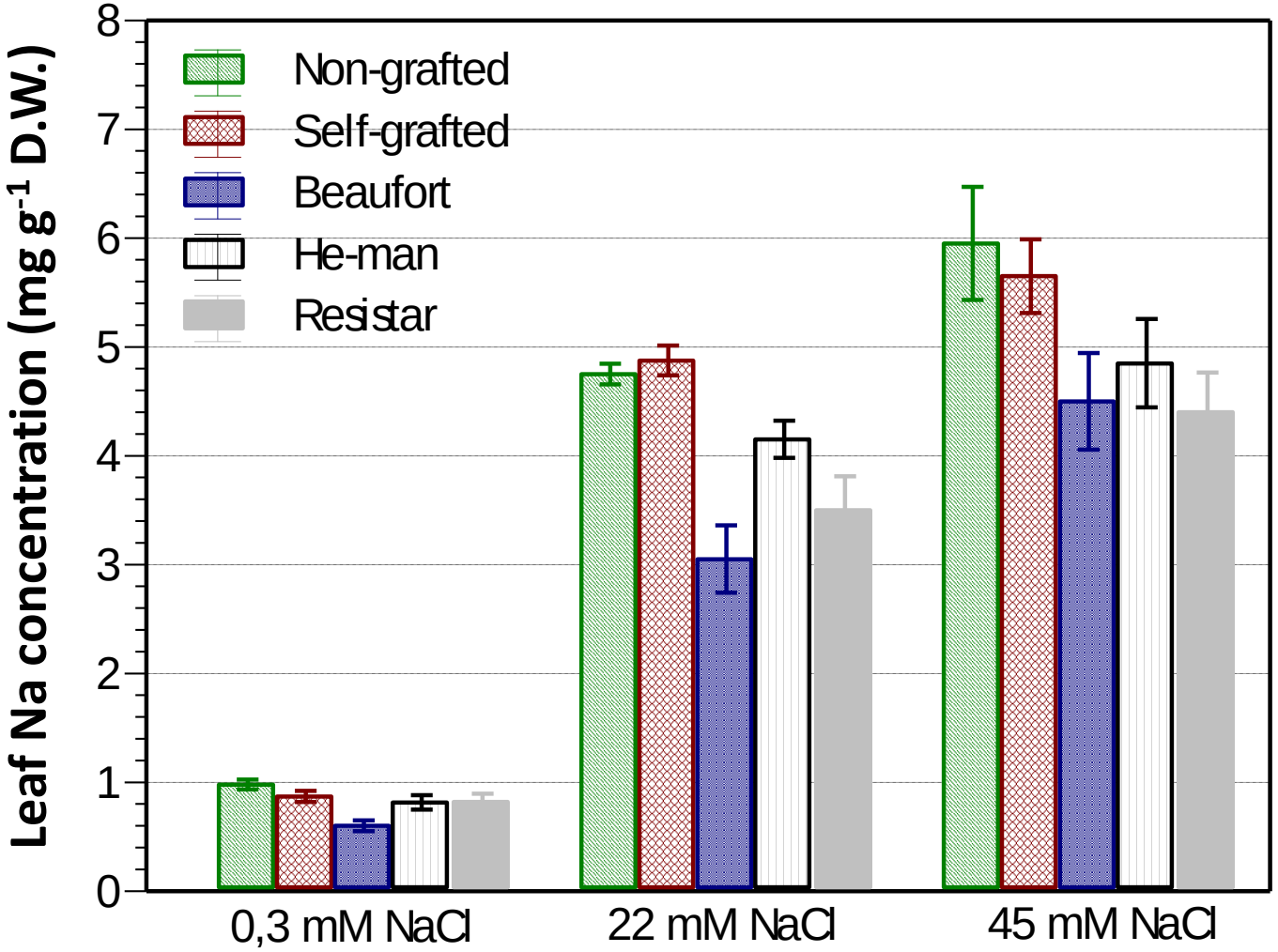
Percentages of non-grafted, self-grafted and hetero-grafted tomato plants infected by:

a) *Fusarium oxysporum* f. sp. *lycopersici* and

b) bacterial wilt (*Ralstonia solanacearum*).



Impact of grafting and rootstock genotype ('Beaufort', He-man' 'Resistar') on leaf Na concentration in tomato grown at low (0.3 mM), moderate (22 mM) or high (45 mM) salinity.



Mechanisms involved in rootstock performance at stress conditions

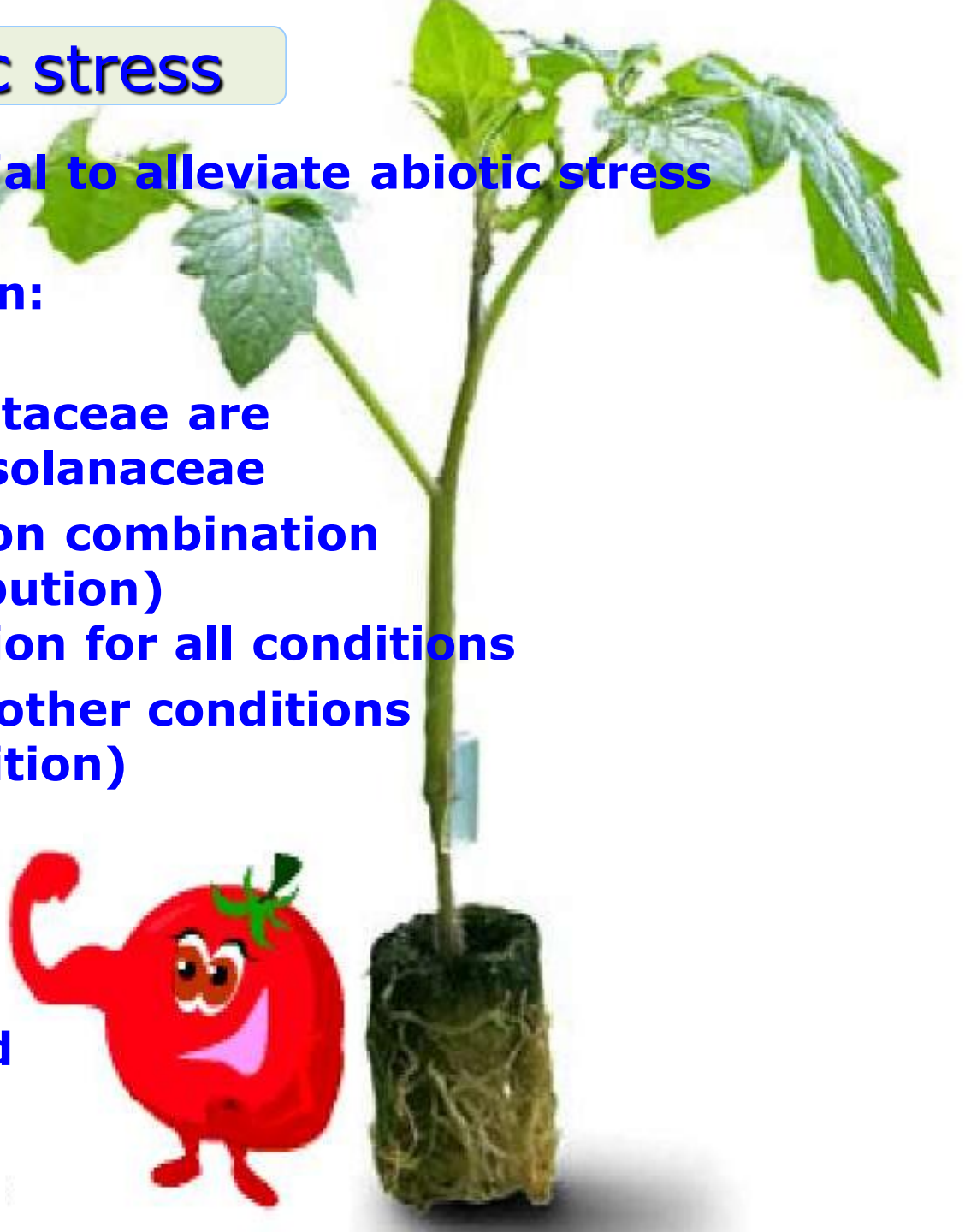
Root growth and architecture

Root functioning

- Nutrient absorption
- Absorption and translocation of water
- Lipid peroxidation and antioxidants
- Sink-source relations (photosynthesis)
- Production, (upward) transport and signaling of phytohormones

Grafting and abiotic stress

- Grafting has a potential to alleviate abiotic stress conditions
- Advantages depend on:
  - species, e.g.
    results on cucurbitaceae are
    not the same for solanaceae
  - the rootstock/scion combination
    (assimilate distribution)
    not one combination for all conditions
  - interactions with other conditions
    (climate and nutrition)
- effects on taste and health related characteristics are interesting but not always clear and need further research




Thank you for your attention!