Plant Propagation PLS 3223/5222

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Chapters 11-13

Grafting and Budding
Graft Incompatibility

Graft Incompatibility

- Graft Compatibility - the ability of two different plants, grafted together, to produce a successful union and to develop satisfactorily into one composite plant.

- an interruption in cambial and vascular continuity leading to a smooth break at the point of the graft union, causing graft failure.

Graft Incompatibility

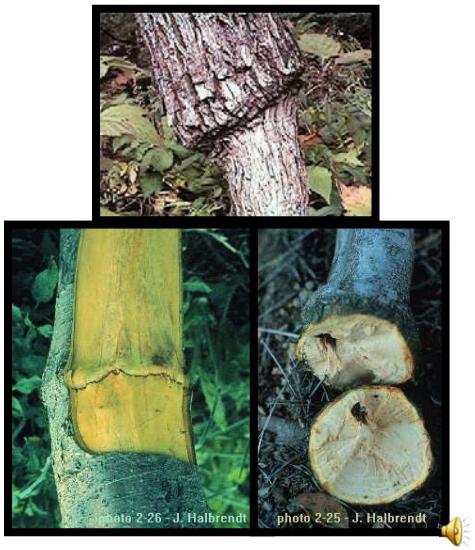
External Symptoms

- Failure to form a successful graft or bud union
- Yellowing foliage, early defoliation
- Premature death of trees
- differences in growth rates between stock and scion
- differences in growth cycles (dormancy) of stock and scion

Graft Incompatibility

External Symptoms

- Overgrowth at or below the graft union
- Suckering of the rootstock
- Breaking apart cleanly at the graft union.



Graft Incompatibility

Types

- Anatomical flaws
- Physiological incompatibility
  - Nontranslocatable (localized)
  - Translocatable
- Pathogen induced Incompatibility
  - Viruses
  - phytoplasma
    (micoplasma-like organisms)

GRAFT INCOMPATIBILITY

Figure 11–36 Physiological incompatibility between scion and rootstock. Scion overgrowth caused by blockage of assimilates translocating from the scion to the rootstock, causing a weak root system. The melon scion grafted on Cucurbita rootstock later died as a result of insufficient support from the rootstock.

GRAFT INCOMPATIBILITY

(a) (b)

Figure 11–37 Undesirable suckering of rootstocks. (a) Hamamelis vernalis 'Sandra' grafted on Hamamelis vernalis rootstock, and (b) rootstock suckers on recently grafted Ulmus alata 'Lace Parasol' grafted onto seedling Ulmus alata. The suckers will need to be removed.

GRAFT INCOMPATIBILITY

(a) (b)

Figure 11–38 While rootstock outgrowth is not desirable, a large, strong tree can still develop. (a) Sweet orange rootstock used for dwarfing, overgrowing the grapefruit scion. (b) Rootstock overgrowing scion on Morus alba 'Platanifolia.'

GRAFT INCOMPATIBILITY

(a) (b)

Figure 11–39 Scion or rootstock outgrowth can still lead to a large, strong tree. Such outgrowth (arrows) is more related to the genetic tendency for growth, than to incompatibility. (a) Scion overgrowing rootstock: Acer pentaphyllum on A. pseudoplatanus rootstock, and (b) grapefruit scion on sour orange rootstock, which tolerates alkaline, heavy soils, but can be susceptible to Trestiza.

GRAFT INCOMPATIBILITY

(a) (b) (c)

Figure 11–40 Callus bridge formation in graft union of compatible and incompatible Prunus spp. (a and b) Compatible 'Luizet' apricot grafted on 'Myrobalan' standard plum rootstock. (a) Callus in graft union from a compatible graft 21 days after grafting. The cells show an orderly disposition and are uniformly stained (160 × magnification). (c) Callus from incompatible graft of 'Monique' apricot on 'Myrobalan' standard plum rootstock ten days after grafting. The cells show an irregular disposition and the cell walls are thick and irregular.

GRAFT INCOMPATIBILITY

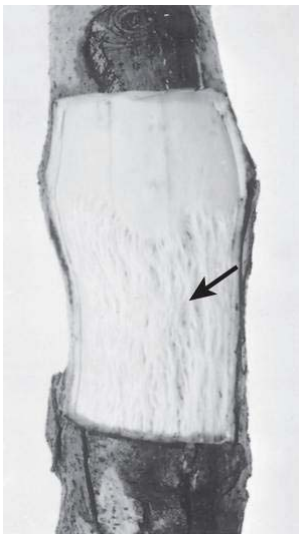


Figure 11–41 Latent viruses in the scion portion of graft combination may cause symptoms to appear in a susceptible rootstock following grafting. Here "stem pitting" virus symptoms (arrow) have developed in the sensitive 'Virginia Crab' apple rootstock. The wood of the scion cultivar—above the graft union—is unaffected.

Graft Incompatibility

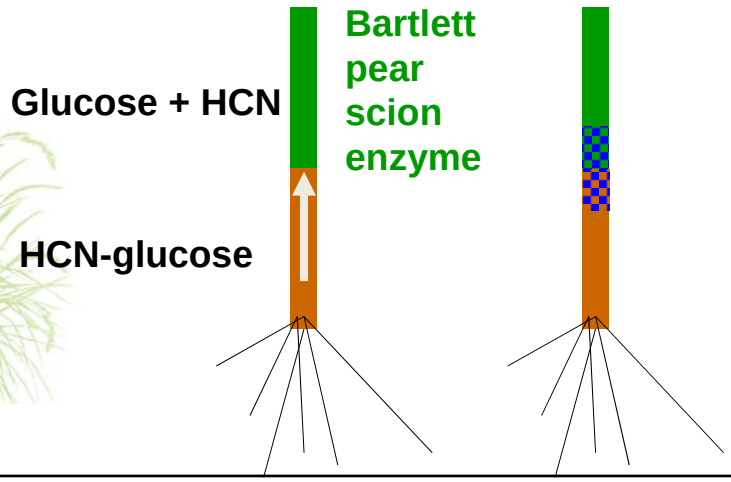
Non-translocatable

- Localized Incompatibility
- A mutually compatible interstock overcomes the incompatibility of the scion and rootstock.

Graft Incompatibility

Nontranslocatable

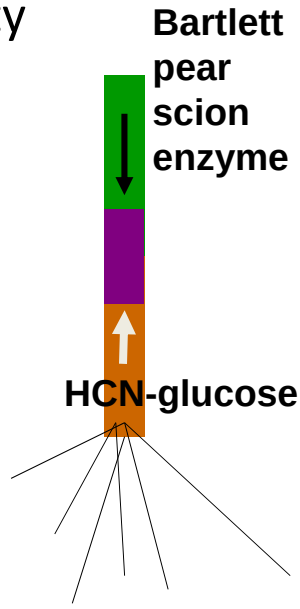
Bartlett Pear scion on **Quince rootstock**



Graft Incompatibility

Nontranslocatable

Bartlett Pear scion
with
Old Home Pear interstock
On
Quince rootstock



GRAFT INCOMPATIBILITY

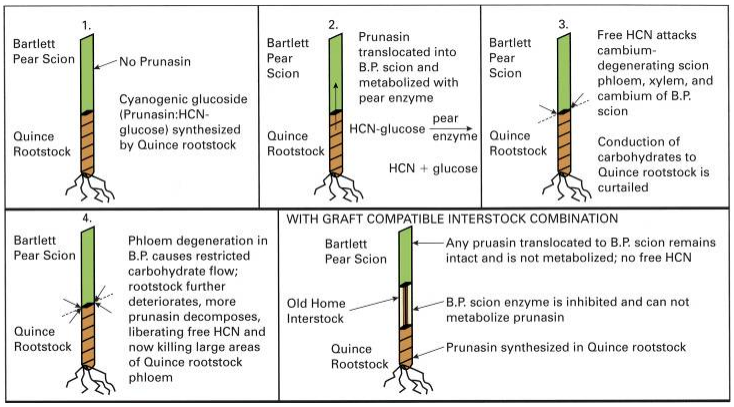


Figure 11–42 Nontranslocatable incompatibility of Bartlett pear scion overcome with `old Home' interstock on quince rootstock

Graft Incompatibility

Translocatable

- A mutually compatible interstock does not overcome the incompatibility

Incompatible unions:

- 'Hales Early' peach on 'Myrobalan B' plum roots
- 'Nonpareil' Almond on 'Marianna 2624' plum roots
- peach cultivars on 'Marianna 2624' plum roots

Graft Incompatibility

Causes and Mechanisms

- Physiological and biochemical mechanisms
  - prunasin (cyanogenic glucoside)
  - phenolic compounds (stress and wounding)
- Modification of cells and tissue
  - lignification of cell walls
- Cell recognition of the grafting partners (similar to pollen-stigma?)