

How to Graft

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COLLEGE OF FOOD, AGRICULTURAL,
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1

Grafting

Grafting: The process of joining two plants or plant parts together in such a manner that they will unite and continue their growth as one.

Scion: a short stem piece with two or more buds and is that part of the graft combination which develops into the top (shoot) of the plant.

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Grafting

Rootstock/understock: The lower part that becomes the root system. Can be seedling or clonal in origin.



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Why Graft?

- Control size (dwarfing rootstocks)
- Plant cannot be propagated other ways
- Preserve a tree
- Create unusual forms
- Disease control

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What to Graft onto

- The closer the plants are related taxonomically, the more likely the graft will be compatible.
- Plants are generally grafted onto a rootstock of the same species/genera.
 - Ex. *Malus* 'Centennial' grafted onto *Malus* spp.

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Scion

- Scions should be collected from previous year's growth (1-yr. wood).
- Basal portions of stem are preferred
- Dark color indicates wood that is mature for grafting



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Scion

- Dormant scions should have 3-5 buds
- Conifer scions should be 3-6" long (depending on vigor of parent plant).



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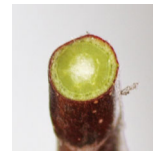
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Scion

- Low pith to wood ratio (10% is ideal).
- Less pith=greater carbohydrate storage



Ripe' scion



Soft' scion

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Tools

9

What Tools Are Needed?

- Grafting knife or utility knife
- Emory cloth (only if using a grafting knife)
- Block of wood
- Rubber budding strips
- Paraffin wax
- Rubbing alcohol
- Paper towel



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Preparing the Graft

Making the cut

11

Scion Preparation

Clean, straight cuts that are parallel.

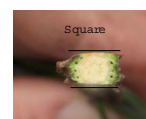
Proper Depth



Cambium layer



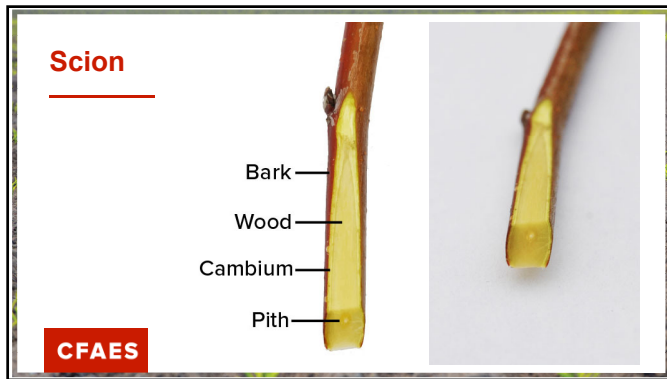
45° Angle



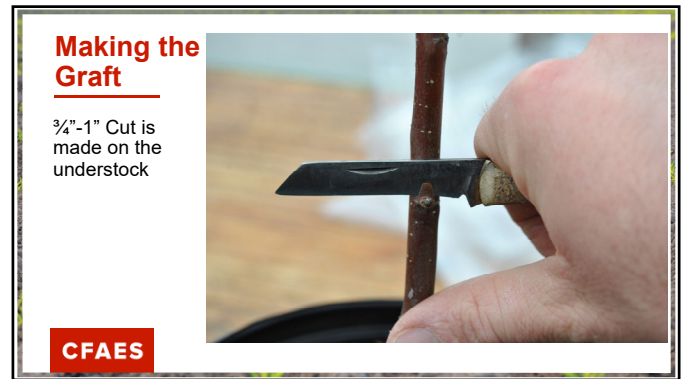
Square

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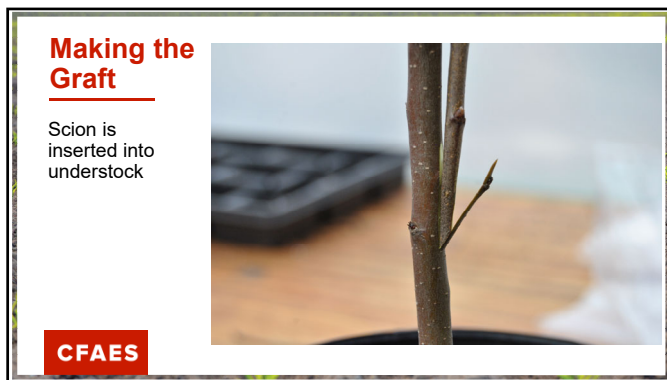
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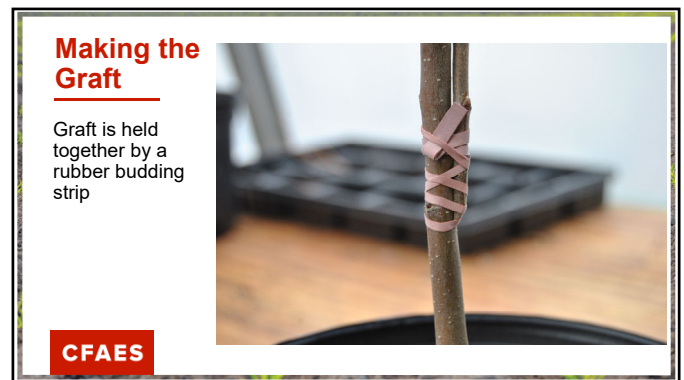
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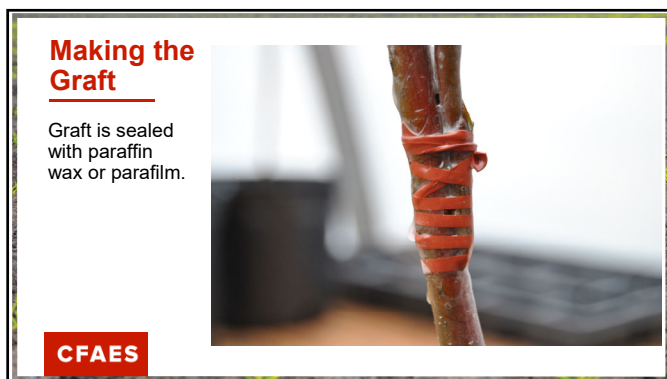
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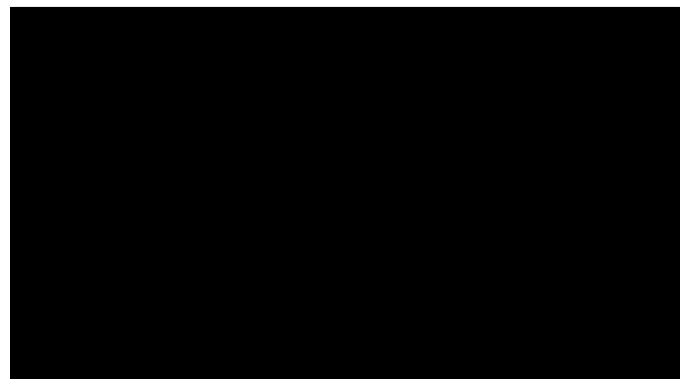
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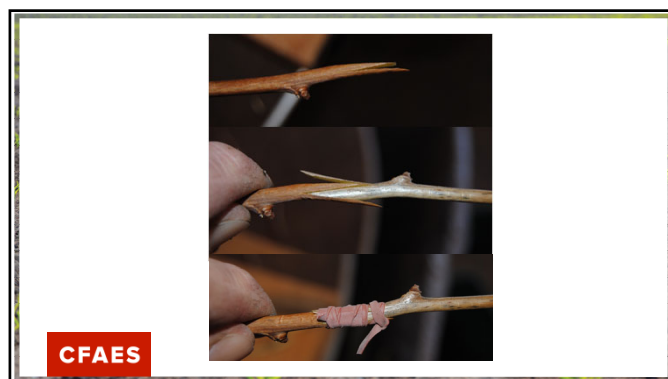
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18



19



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21



22



23



24

Care

- Grafts must be kept warm (between 40 and 70 degrees), humid, out of direct sunlight, and well-ventilated.
 - High humidity isn't needed for waxed grafts
- After graft has started to grow, cut rootstock back to just above graft union.
 - Promotes growth of scion.
 - Sometimes this is done in stages to facilitate faster growth of the scion.

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Bud Grafting

26



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27

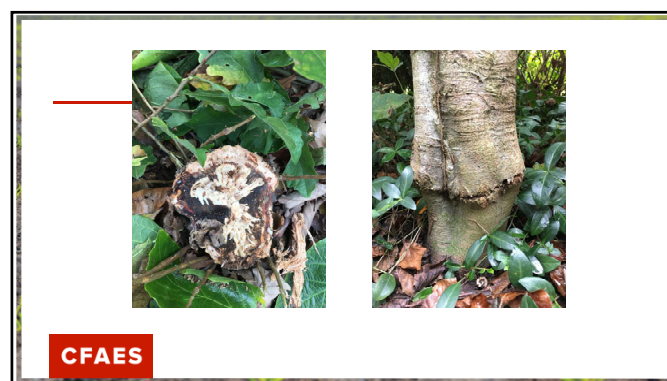


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Compatibility and Incompatibility

29



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Compatibility

- "A sufficiently close genetic relationship between stock and scion for a successful graft union to form, assuming all other factors are satisfactory." –Cornell University
- "The ability of two different plants, grafted together, to produce a successful union and develop into one composite or compound plant." – Hartman and Kester

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Incompatibility

- "An interruption in the cambial and vascular continuity leading to a smooth break at the point of the graft union." –Hartman and Kester
 - Normal vascular tissue doesn't form
 - Ray tissue fills the gap and doesn't lignify normally.

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Incompatibility

- Can happen immediately leading to death of scion (graft union doesn't form)
- Can be delayed up to 20 years.
 - More or less normal growth for a period of time.
 - Forms xylem, phloem, and periderm (bark).

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Types of Incompatibility

- Nottranslocateable
 - An interstock may be used to overcome incompatibility between scion and understock.
- Translocateable
 - Graft combinations in which the interstock does not overcome incompatibility.
 - Biochemical influence moves through the interstock.

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Types of Incompatibility

- Pathogen-induced
 - Viruses and phytoplasmas can cause incompatibility.

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Limits of Compatibility

- Degree of relatedness determines compatibility of scion and rootstock combinations.
- Further scion and rootstock are separated taxonomically the less likely the graft is to be successful.

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Limits of Compatibility

- Intracloal: all grafts with a clone will be compatible.
 - Few useful applications
- Interclonal/intraspecific: All grafts among clones will be successful
 - Apple cultivars onto clonal understock
 - Acer rubrum on Acer rubrum seedlings are incompatible
 - Quercus rubra on Quercus rubra is incompatible
- Interspecific/Intrageneric: Compatibility among species within a genus.
 - Pinus densiflora on pinus Sylvestris
 - Acer griseum on Acer saccharum

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Limits of Compatibility

- Intergeneric/intrafamilial: Most combinations with a family are incompatible
 - However, exceptions exist.
 - These grafts only last for a period of time. Not really "successful"?
 - Syringa vulgaris onto Ligustrum ovalifolium (Oleaceae)
 - Apple onto pear (Roseaceae)
- Interfamilial
 - No short term grafts between members of different families.

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Causes of Incompatibility

- Toxins
 - Prunasin
- Abnormal lignification
 - Xylem bridge doesn't form properly.
 - Incompatible enzymes (peroxidases) which are the catalyst for lignification.
- "The cellular and biochemical causes of incompatibility are not well understood." —Cornell University

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39

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40