

Technique of tomato grafting

by

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Tomato grafting workshop

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- What is grafting?
- Why graft tomatoes ?
- Grafting methods.



What is grafting?

Grafting: -joining the parts of two separate plants (**scion** and **rootstock**) so that they will unite and continue to grow as a single plant.

Scion: -That part of the union to be attached to the rootstock

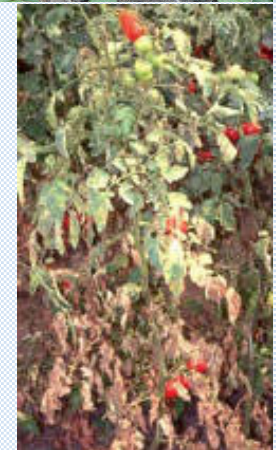


Rootstock: -That part of the union which contains the root portion of the union



Why grafting tomatoes

- Advantages of rootstock:
 - Resistance to soil-borne diseases
 - ✓ **Fusarium wilt:** melon, cucumber and **tomato**
 - ✓ **Bacterium wilt:** **tomato** and eggplant.
 - ✓ **Verticillium wilt:** **tomato**.
 - Resistance to root-knot nematodes:
cucumber, melon, watermelon, **tomato**,
and eggplant.



And More.....

- ✓ Increased nutrient uptake.
- ✓ Scion grows when impossible on own root.
- ✓ To adjust scion growth and earliness.
- ✓ To increase fruit size, yield and quality.

Scion importance

Desirable cultivar for:

- ✓ Unique traits
- ✓ Quality
- ✓ Yield

Disadvantages of Grafting

Grafting requires:

- Space
- Material
- Expertise
- Increased Cost:
 - ✓ Cost for rootstocks: not cheap
 - ✓ Cost of labor if manually
 - ✓ Cost for Robot if automatically
- Possible incompatibility
 - ✓ rootstock must match with our scion
- **Try out first**

Systems of grafting for tomato plants

- Manual
 - ✓ Tubing
 - ✓ Tongue Approach
 - ✓ Cleft
- Automatic
 - ✓ Robot



✓ Tubing

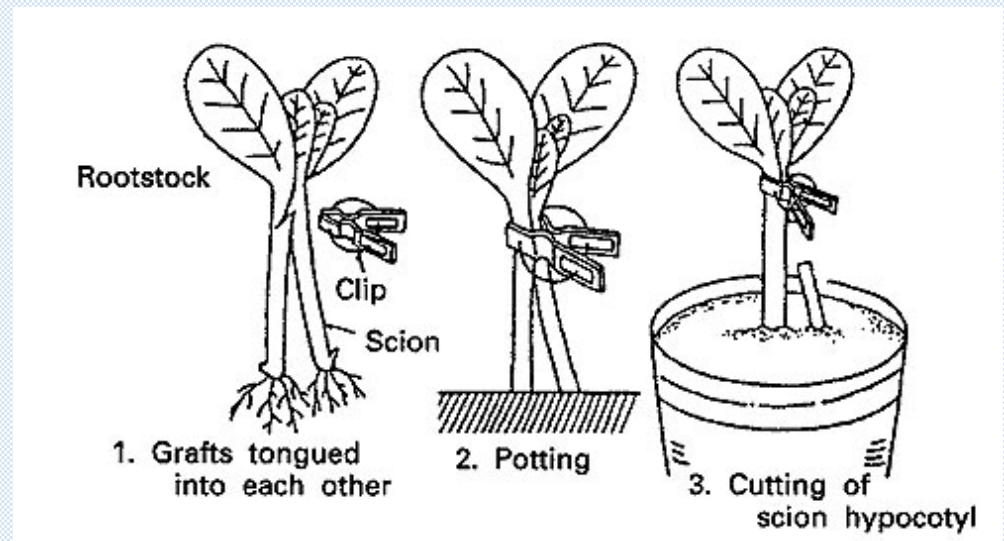


Three to five true leaves;

- Stems are 1.5 to 2 millimeters in diameter;
- Choose cloudy days or in the afternoon when transpiration is low;
- No-water stress

✓ Tongue Approach

Tongue Approach Grafting is a technique that allows the scion donor-plant to remain on its own rootstock until the graft heals. This method is commonly used because it produces a higher survival (success) rate, especially when greenhouse conditions for healing and acclimation are less than ideal for successful tube grafting



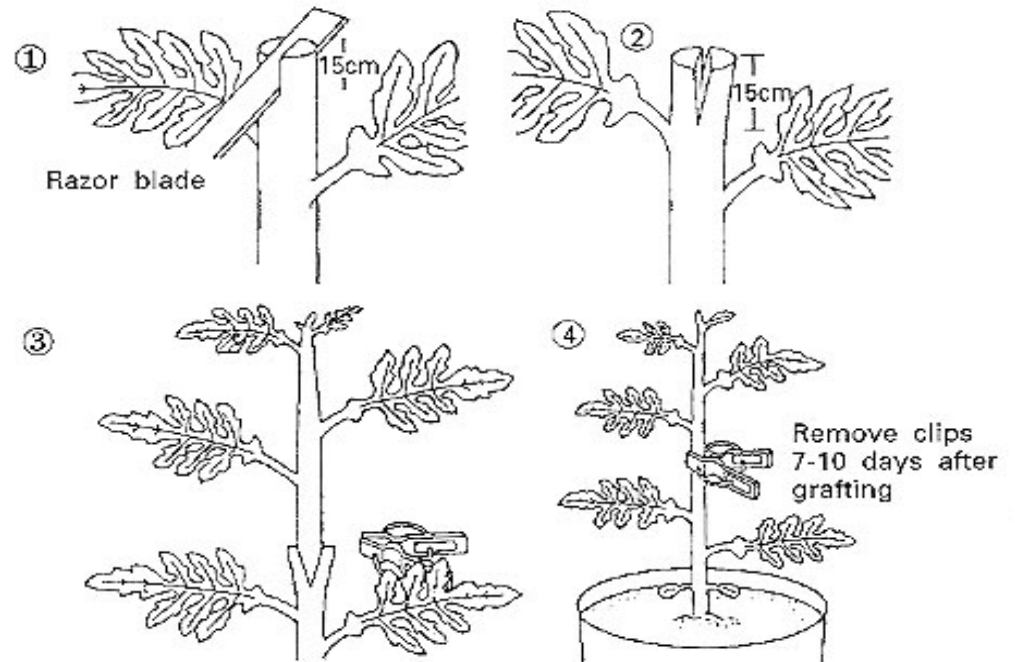
Rootstock sowed 5 to 7 days before scions
Graft when:
rootstocks have 4-5 true leaves and
scions have 2-3 true leaves
Keep one true leaf on the rootstock seedling.



✓ Cleft

• Rootstock

- Should seed 7 to 10 days earlier than scions
- Conduct grafting when rootstocks grow to 8-10 cm tall, 0.5-0.8 cm in diameter, with 6-7 true leaves
- Leave two true leaves when cut



• Scion

- 4-5 true leaves
- Leave 2 to 3 true leaves and the tip



- **Automatic**
 - ✓ Robot

- **Semi automated machine**

The first model that can graft both cucurbits and tomato. Widely marketed in Asia and North America. 650 - 900 grafts per hour at 95% or better success rate. Needs 2-3 workers to assist the machine.



- **Fully automated machine**

Introduced in Japanese market in 2009. 800 grafts per hour at 95% or greater success rate. Need one worker to assist the operation.



Need for tomato grafting

- Rootstocks
- Scion
- Razor blades
- Clips
- An incubator –a healing chamber

Varieties of Hawaiians rootstock for tomato plants

Tomato Variety (Nematode Resistant/Bush/Determinate)



Anahu is a determinate tomato plant with uniform ripening. Fruits approx. 5-8oz. Matures in 75-80 days. Resistant to the common **root knot nematode, fusarium wilt, gray leaf spot** and one strain of **spotted wilt virus**. It is also tolerant to tobacco mosaic virus.

Healani is a determinate tomato plant with uniform ripening. Fruits approx. 6-8oz. Matures in 75-80 days. Oblique fruit shape. Resistant to the common **root knot nematode, fusarium wilt, gray leaf spot** and one strain of **spotted wilt virus**. It is also tolerant to tobacco mosaic virus



Kewalo is a determinate tomato plant with uniform ripening. Fruits approx. 6-8oz. Matures in 75-80 days. It is tolerant to **bacterial wilt** as well as **tobacco mosaic virus**. Resistant to the common **root knot nematode, fusarium wilt, gray leaf spot** and one strain of **spotted wilt virus**.

- **Scion:**

The scion of the grafted tomato represents the upper portion of the plant and is selected for its fruit quality characteristics

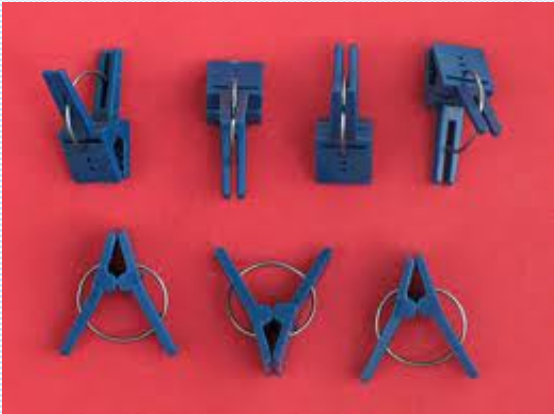


- **Razor blades:**

- ✓ old-fashioned double-edged razor blade and snap it in half lengthwise while it is still in its paper cover. It is important to use this type of blade because they are thinner and sharper than the other types of razors



Clips



Min. Order: 2000 Pieces
Price: US \$0.01-0.2 / Piece



Tomato clips "tutor" - plastic sticks
for supporting the **grafted** plants
- Sterilizable and reusable



Flexible silicone grafting clips
Bag of 200 \$13.95



- Clips for grafting Solanaceae and Cucurbitaceae plants
- ✓ Transparent color
- ✓ High heat resistance
- ✓ Very good adaptability to the possible diameter differences between rootstock and scion
- ✓ Automatically falls down as a consequence of the plant growth
- ✓ Very good percentage of taking roots
- ✓ Diameters available: 1,2 mm 1,8 mm, 2,0 mm 2,8mm



Healing

Healing is **the most critical process** of grafted seedling production.

Propagators should not overlook this process and should try to achieve the conditions as close to that recommended here

- Healing conditions

- ✓ **Relative humidity:** 95% or greater. Gradually decrease toward the end.

- ✓ **Air temperature:** 28-29C (82-84F)

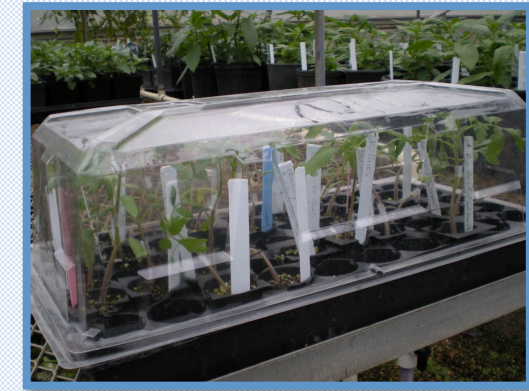
- INSIDE the healing chamber. The optimum healing temperature (82-84F)) is slightly warmer than growing temperature (~25C; 77F)..

- ✓ **Light intensity:** Darkness for the first 24-48 hours and then provide light

- ✓ **Duration:** 4-6 days

- Healing systems

1. Healing chambers with artificial lighting
2. Healing chambers in greenhouse with natural light



Healing systems

1. Healing chambers with artificial lighting



The high humidity is maintained with a fogging system.

Humidity is maintained by a shallow layer of water at the bottom of the boxes



2. Healing chambers in greenhouse with natural light

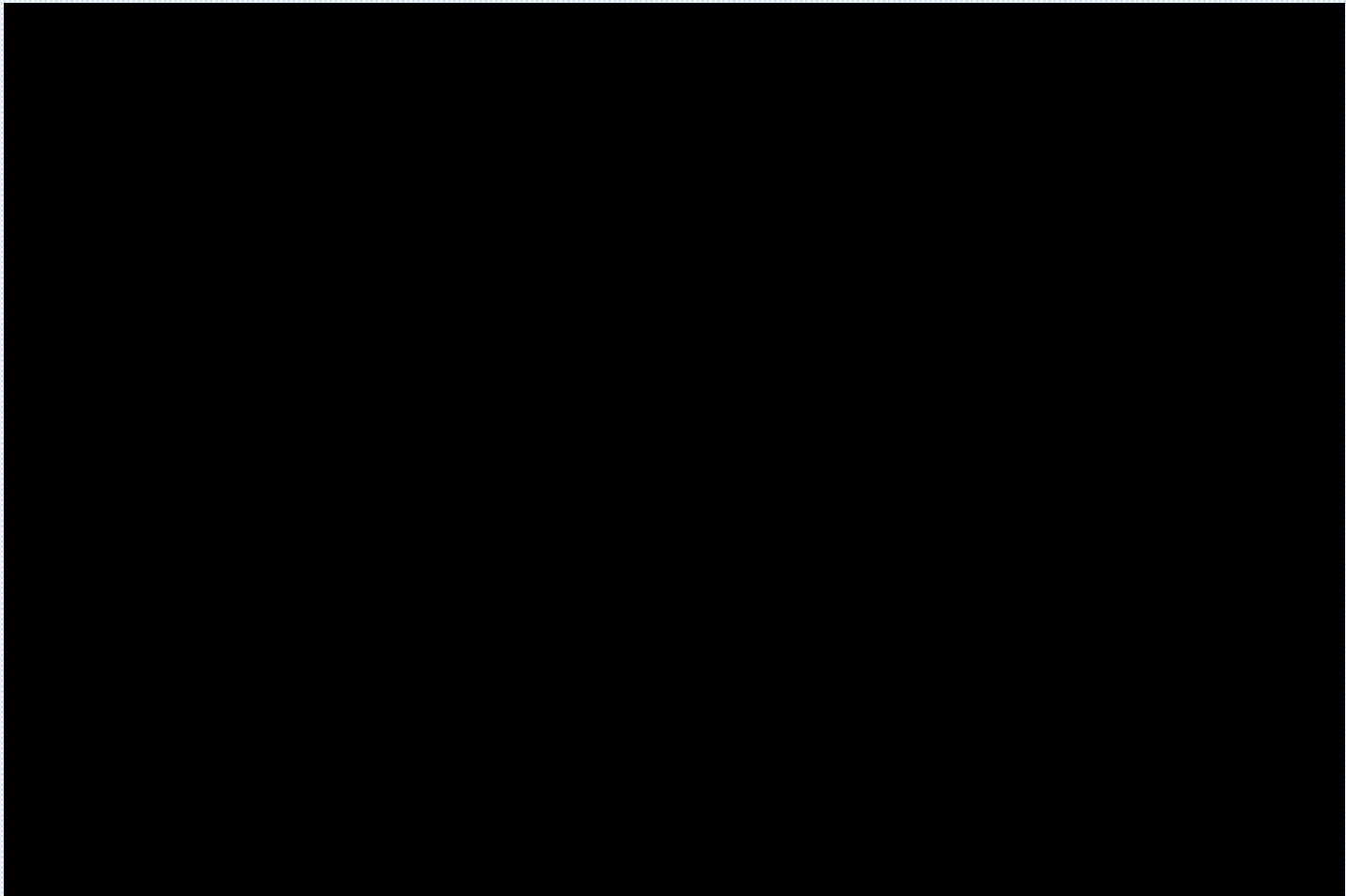


After healing, the plants must be:

re-acclimated to the full-sun conditions gradually over a period of 3 to 4 days.

Management of Grafted Transplants

- Similar to normal transplants
- Remove all suckers from rootstocks
- Graft union above the ground
- Depends on rootstock and scion cultivars, manage plant to have one or two leading shoots:
 - Maxifort: two leaders
 - Beaufort: one leader



- *Questions!*

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- # Rootstock

Seed Supplier/ Rootstock	Disease Resistance							Vigor
	Tomato Mosaic Virus	Corky Root	Fusarium Wilt		Verticillium Wilt	Bacterial Wilt	Nematodes	
			Race 1	Race 2	Race 1			
deRuiter Seeds								
Maxifort	High	High	Moderate	High	High	Susceptible	High	5
Beaufort	High	High	Moderate	High	High	Susceptible	High	3
Takii Seeds								
Anchor-T	High	Susceptible	High	High	High	Moderate	High	5
Survivor	High	Susceptible	High	High	High	Moderate	High	5
Aegis	High	Moderate	High	High	High	Moderate	High	4
Bruinsma Seeds								
Body	High	High	Susceptible	High	High	Susceptible	High	5
Robusta	High	High	Susceptible	High	High	Susceptible	Susceptible	3

Maxifort: very vigorous; greatly increase vigor (both above ground and below-ground growth).

Beaufort: moderately increase in plant vigor.