Vegetable Grafting

Eggplants and Tomatoes

WASHINGTON STATE UNIVERSITY EXTENSION FACT SHEET • FS052E

Vegetable grafting is a centuries-old technique utilized in Asia to improve plant production, reduce disease susceptibility, and increase plant vigor. Commercial production and demand for grafted vegetable plants continues to increase across Asia and Europe. Vegetable grafting was introduced in the United States almost 20 years ago and commercial growers and home gardeners are becoming more aware of its attributes and potential to manage soil-borne diseases and adverse soil conditions.

This fact sheet provides brief descriptions of how to prepare plant material for grafting, some general considerations for grafting, the most common techniques used to graft eggplant and tomato, healing grafted plants, and transplanting and maintaining grafted plants in the field. Each grafting technique has several different names, so for clarity, here we use the most common name for each technique. Also included is a step-by-step process for grafting both eggplant and tomato using the splice grafting technique.

Splice grafting is the most commonly used grafting method for eggplant and tomato because it has a high success rate (95%), is relatively simple, and can be used to graft a large number of plants in a short amount of time. Deciding which grafting technique to use depends on the number of plants, their size at the time of grafting, the feasibility of using special grafting clips, and personal preference.

Preparing for Grafting

For a successful graft union to form, the cambium of the rootstock and scion must be well aligned and in contact with one another. The scion and rootstock plants must therefore have similar stem diameters at the time of grafting. However, the scion and rootstock may not germinate or grow at the same rate. Conduct a preliminary trial to determine the growth rates of rootstock and scion plants in your growing environment. Based on the results, seed both scion and rootstock varieties so that they are ready for grafting in 14–21 days. Seed more plants than necessary so that you have a greater selection for matching stem diameters. It is rare to get 100% graft survival, so it is always recommended to graft additional plants to account for some graft failure.

Water both rootstock and scion plants 12–24 hours before grafting. Unless absolutely necessary, do not water plants immediately before grafting. If reusing grafting clips, make sure they have been cleaned and sterilized. A few hours before grafting, spray the inner healing chamber surfaces with water to raise the relative humidity within the chamber (see "Vegetable Grafting: The Healing Chamber," FS051E, for more information on healing chamber construction and management). Use only clean, sharp razor blades and sanitize hands with antibacterial soap or hand gel. Fill one or two spray bottles with tap water to mist plants frequently during grafting.

Plants are ready for grafting when they have 2–4 true leaves. Graft during a time of day when plant transpiration is lowest, such as early in the morning, to minimize water stress in the newly grafted plants.

The Grafting Process

Cut the rootstock stem below the cotyledons to prevent it from producing new shoot growth. Select a scion with a stem diameter that matches the rootstock stem diameter and cut here. The entire cut surfaces of both scion and rootstock stems should be in close contact so that air is not trapped between them. If the cut surface of the scion or the rootstock dries out, the graft will fail.

Once you are comfortable with the grafting process, you can cut multiple rootstocks and scions at one time to speed up the process; cutting all seedlings in one flat (72-cell trays) is a good number to work with at one time. Discard rootstock tops immediately to minimize confusion. Mist all plants with water frequently to reduce water stress. After you have finished grafting a flat of plants, place it immediately in a healing chamber.

Cleft Grafting

Also known as apical grafting and wedge grafting.

Technique. Cut the rootstock stem horizontally to remove the top of the plant and discard the top (Figure 1). Cut a 0.5 cm long vertical incision into the center of the rootstock. Cut the scion stem into a 0.5 cm long wedge and insert it into the vertical incision in the rootstock. Place a

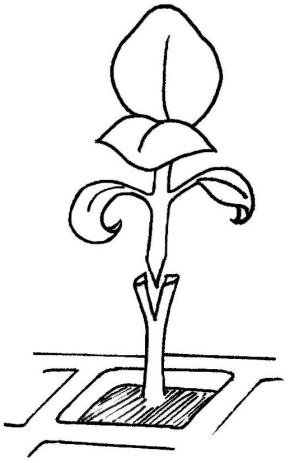

Figure 1. Cleft grafting.

plastic clip or parafilm around the graft union to hold it tightly together.

- *Advantages*. The cleft (vertical) cut holds the scion more tightly than splice grafting, so it is possible to use parafilm rather than grafting clips to secure the graft union.
- *Disadvantages*. This technique takes more time than splice grafting. The rootstock stem may split if the scion wedge is too wide.

Side Grafting

Also known as tongue approach grafting and side-by-side grafting.

Technique. Cut matching 45° incisions in scion and rootstock stems, approximately ¾ through the stem, to create "tongues" (Figure 2). Join the stem tongues together so that the cut surfaces are in contact. Wrap parafilm tightly around the graft union to prevent moisture loss. After 5 days, begin to sever the rootstock top and the scion roots from the grafted plant such that the two are completely separated within 3 days.

- *Advantages*. This technique has a high success rate. It is less stressful on the plant than other grafting techniques, as the scion is able to absorb water through its root system during the healing process. High humidity is not required to heal grafts, so a healing chamber, although recommended, is not necessary. Larger plant material can be used, and stems can have slightly different diameters.
- *Disadvantages*. The rootstock and scion must be transplanted together into a larger container at the time of grafting, which requires more greenhouse space. This technique is slower and slightly more difficult than splice grafting or cleft grafting. The scion and rootstock can get confused and should be labeled if they look similar so that the graft does not end up with the rootstock variety on top and the scion variety on the bottom.

Splice Grafting

Also known as top grafting, tube grafting, and slant-cut grafting. This is the most widely used grafting technique for tomatoes and also works well for eggplants.

Technique. Cut the rootstock and scion at matching 45° angles and clip together with a silicone grafting clip (Figures 3 and 4).

- *Advantages*. Easy technique to learn, and a fast way to graft large quantities of plants.
- *Disadvantages*. Grafting clips are required to hold the scion and rootstock in close contact.

Healing the Grafted Plants

When placing newly grafted plants in a healing chamber, mist the inside walls and top of the healing chamber surfaces very well. Seal the healing chamber and do not

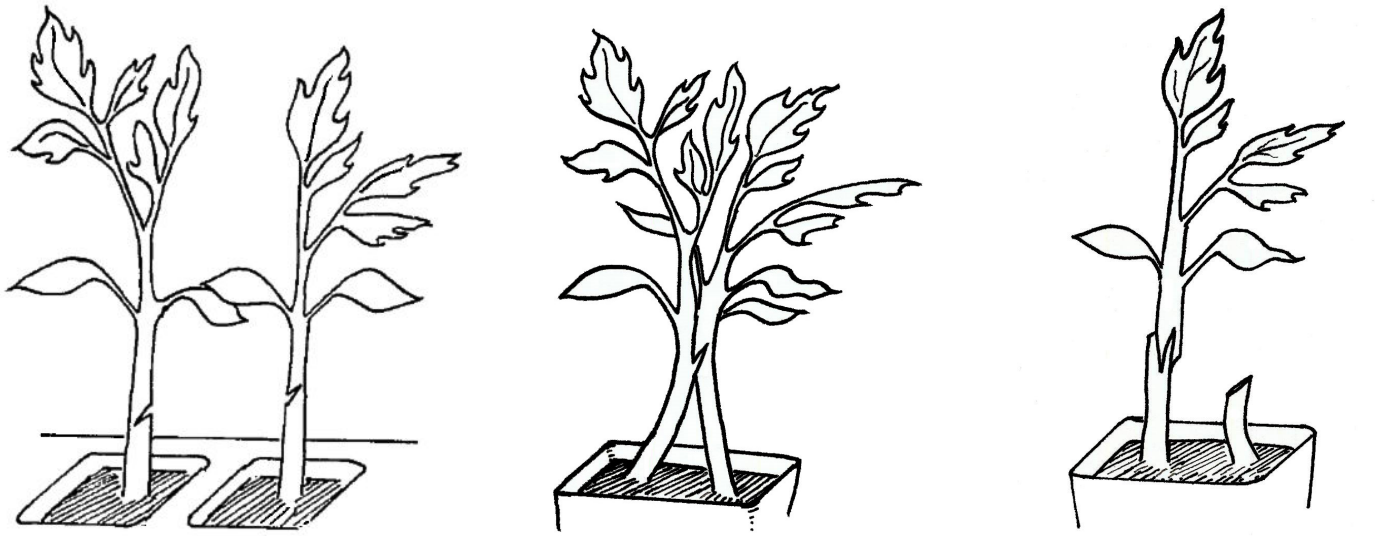

Figure 2. Side grafting.

Figure 3. Splice grafting of tomato plants. Cutting tomato stem at a 45° angle (A) and using a clip to secure the scion to the rootstock (B).

Figure 4. Silicon grafting clips used in splice grafting eggplant and tomato.

disturb for 2 days. On day 3 after grafting, open the healing chamber just enough to spray inside the plastic with water to raise the humidity, and close again. Water collecting at the graft union can lead to disease, necrotic tissue, and graft failure. If these symptoms are observed, avoid misting plants directly. Do not disturb the healing chamber on day 4. On day 5, open the healing chamber for 30 minutes, then spray plastic surfaces and close the chamber. On day 6, open the healing chamber for one hour, then spray the healing chamber well and close tightly. On day 7, open the healing chamber for 6–8 hours, then spray the healing chamber and close tightly. On day 8, remove the plants from the healing chamber.

This healing schedule is based on the greenhouse grafting environment at Washington State University Mount Vernon Northwest Washington Research & Extension Center. Your greenhouse or grafting environment may be different (higher or lower humidity and temperature), and you may need to adjust the exposure times for grafted plants so that they are not stressed when introducing them back into the greenhouse environment. The key is to slowly acclimatize the grafted plants without causing permanent wilting which will lead to plant death.

Transplanting into the Field

Although the scion and rootstock establish vascular connection at approximately 7 days, it takes at least 14 days from grafting for the graft union to fully heal. After removing plants from the healing chamber, allow them to rest in the greenhouse for 1–2 days before hardening them off for 5–7 days before transplanting. Adjust this schedule if needed so as to not stress plants when introducing them into the field environment.

Do not place grafted transplants into the field under windy conditions. If wind is an issue in your area, leave the silicone grafting clips on the plant for a few weeks to provide support. You may also remove the clips at transplanting and wrap the graft union with parafilm to provide extra support. Parafilm will break away from the stem as the stem increases in diameter. Similarly, silicone grafting clips will fall off as the stem increases in diameter. Collect the grafting clips, and clean and sterilize them before you use them again.

When transplanting, make sure that the graft union remains above the soil line. If the graft union is buried, the scion will root into the soil and any advantages that would have been provided by the rootstock, such as resistance to soil-borne diseases, will be nullified.

Field Maintenance of Grafted Plants

Remove any remaining grafting clips 2–3 weeks after field transplanting. Check the plants at least once a week to see if the rootstock has regrown and remove it immediately. Many commercial rootstocks are extremely vigorous and will quickly overtake the scion variety.

By **Sacha Johnson, Patti Kreider**, and **Carol Miles**, WSU Mount Vernon Northwestern Washington Research & Extension Center.

Issued by Washington State University Extension and the U.S. Department of Agriculture in furtherance of the Acts of May 8 and June 30, 1914. Extension programs and policies are consistent with federal and state laws and regulations on nondiscrimination regarding race, sex, religion, age, color, creed, and national or ethnic origin; physical, mental, or sensory disability; marital status or sexual orientation; and status as a Vietnam-era or disabled veteran. Evidence of noncompliance may be reported through your local WSU Extension office. Trade names have been used to simplify information; no endorsement is intended. Published October 2011.

FS052E