

Grafting: Mysterious Art or Just Another Gardening Chore

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GRAFTING:

(A) mysterious art,

OR

(B) just another gardening chore?

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There is no suspense here! The very way the question is posed should telegraph the correct answer, namely "B." And that should be your FINAL answer. If you're not sure and phone a friend for advice, or poll the APS membership, you may very well be persuaded to select "A" because the "mysterious art" answer is a myth established in many people's minds.

One definition of grafting does describe it as an art - the art of combining a twig or bud of one plant with a branch or root of another so that a union forms and growth continues" (Klingbeil & Dana, Univ. of Wisconsin, circular 572, June 1959).

But there is no mystery in how to do it. Perhaps the mystery concept has become established by the oft repeated remarks in the literature that even experienced, professional nursery persons count themselves lucky to attain a success rate of 50%. In fact, in the Nehrling book (see "1" below) the authors state (pg. 152) that 25% is lucky, counting the second year survivors. How depressing!

On the contrary, a success rate of 75-100% is a reasonable expectation, even by unskilled amateurs, IF you follow the RIGHT rules and perform ALL the steps as directed. My first experience in peony grafting began in August, 1984, when I cut 12 scions (all terminal buds) of Anna Marie, a hybrid tree peony seedling that I had not yet named, and took them to the Reath Nursery where Scott (David's son) made the grafts. On returning home I made two more and planted them in open garden soil. By next April, all 14 were sprouting vigorously, and all survived through the second year. However, in counting grafting successes, I do not count failures in the second year. Too many other factors can decrease the success rate that have no connection with one's grafting procedures.

During ensuing years I came to expect 75-100% success rates. The only deviations made from that first year were (1) to switch from the triangular grafting method to the wedge method, and (2) to use budding strips and Parafilm tape rather than the green, plastic floral tape used at the Reath Nursery. Before my exposure to peony grafting, I had successfully grafted lilacs and apples in spring, and chip-budded magnolias in August. These experiences helped eliminate the mystery from the art. It also got me used to budding strips and Parafilm tape.

Since there are excellent articles available on grafting, I do not intend to describe again all the steps to be taken. I do want to correct what I perceive as faulty advice, to emphasize the most important steps, and expand on a few topics. For good accounts on grafting I refer you to the following:

(1) Peonies Outdoors, and In. Arno & Irene Nehrling, 1960, pp. 151-153.

(2) The Peonies. Editor; Wister, 1962, pp. 183-190. I believe this section was written by Harold Wolfe.

(3) Root Grafting of Tree Peonies, David Reath article, APS Bulletin 213, 1975, but more readily available as reprints in APS - 75 Years, pp. 61-62, and the APS Handbook of the Peony.

(4) Propagation of Tree Peonies, John Simkins' article, APS Bulletin 310, June 1999, pp. 29-33.

In the past five years, three major books on peonies have been published; the first two below contain information on grafting:

(5) Peonies. Allan Rogers, 1995, pp. 120-124.

(6) The Gardner's Guide to Growing Peonies, Martin Page, 1997, pp. 27-29.

(7) Peonies. Jane Fearnley-Whittingstall, 1999. See pg. 357.

The best guides are #2 and #3. In #7, the author does not try to describe the "specialized technical skill" required in grafting, but does describe a method of rooting tree peony cuttings with up to a 50% success rate. A most encouraging report.

The names of two major grafting methods may be ambiguous. What I call the "wedge" method is also known as the "cleft" method; the wedge shape of the prepared scion is like that of an axe head, or the tapered wood or metal shapes used to split wood or lift heavy objects. In what I call the "triangular" method, some refer to the prepared scion as being shaped to a "triangular wedge" [not my idea of a true wedge], hence, they call this method the "wedge" method.

The triangular method is favored at the Reath Nursery and probably at Caprice Farm Nursery (#5 above), and is described in #2 (pp. 186 & 188), 3, 4, 5, and 6. The wedge graft is described in #1 and as an alternative method in #2 (pg. 186, left column). Two other methods are described on pg. 186 and 188 which seem very easy to perform. I've tried only the two major methods and find the wedge method much easier to do and to teach to others. (You need only follow the sketches provided with this article.) The triangular method is more difficult to execute, to explain (see the attempt in #4, pg. 31), and to illustrate. Nevertheless, Scott Reath makes an ART of it by whipping out grafts at 30 seconds each while I dawdle along at six minutes using the "easier" wedge method. I believe the Klehm Nursery uses the wedge method, but both bind the graft union with green, plastic, floral tape, a more efficient one step operation than the budding strip/Parafilm method. (Mr. Simkins, #4, suggests this may not be necessary, pg. 32. No wrapping at all?? Scary!).

Some claim there is no cambium layer in the root (and I tend to believe that, but some writers imply otherwise), hence, no need to bring the cambium layer of the scion in contact with the outer edge or surface of the root. Success depends on how close to 100% you can bring the cut, newly exposed, plane surfaces of the scion in contact with those of the stock (i.e., understock). That is why you are urged to shape the scion in two strokes. Well, good luck! A professional can do this. I usually have to whittle away to do it, but the last strokes are toward the same end - perfectly plane surfaces and eventually maximum contact.

This is the time to point out that these newly exposed surfaces are naturally free of fungus, bacteria, and man-made chemicals. DO NOT INTRODUCE EITHER. Keep your cutting instruments clean, and DO NOT water (tap water or rainfall) the grafts. No matter how well the graft union seems to be waterproofed, free-flowing water will penetrate and introduce disease organisms. Likewise, DO NOT treat completed grafts with a bleach solution. Why introduce sodium hypochlorite to virgin surfaces? You may, of course, treat the roots (I do!) and the scions, too, before making the grafts - but DO RINSE OFF the bleach solution afterwards! Whatever the strength of your bleach or the soaking duration, I figure the job isn't done until the roots are bleached noticeably lighter. A 10% solution works well (1 part household bleach plus 9 parts water).

My most important advice is to keep your completed grafts moist and continually warm, even VERY WARM, for the next 2-3 weeks. This is true whether you plant them in the open field, as I do, or hold them in plastic bags for later planting.

Finally, there is evidence that scions are still viable after six to seven weeks of cool moist storage. There is no need to discard valuable scions if they aren't used the same day, or within a few days of cutting. (But don't push your luck - fresher is better!).

To summarize the information in the last three paragraphs:

- (1) You can use scions up to two weeks, or older if stored carefully.
- (2) Keep grafts continually WARM for up to three weeks.
- (3) Do not water grafts, or allow rain water to reach them, until Spring growth begins.
- (4) Do not use a bleach solution on completed grafts.

These "rules" contradict some of the advice offered in other articles, but I feel confident in stating them. *There is another general rule to keep in mind:*

- (5) Keep grafts in sync with the natural growing season.

The longer you delay grafting (after mid-August in Zone 5), the more likely your success rate will decrease. Proper grafting time insures Fall root development and sufficient winter cooling - 90 days plus in the 30's Fahrenheit, or colder, maybe 40's OK. Open ground plantings may freeze, but freezing should be delayed and then prolonged into Spring as long as possible.

GRAFTING PREPARATION. I take great pains to observe Rules 2 and 5. The width of my grafting beds is 4 feet, which will accommodate a double row 2 ft. apart, with grafts one foot apart in each row. The length of the bed is determined by the number of grafts needing to be planted (for me, usually 40 ft.). This means cultivating an area 4 ft. wide by however long. (If I have two parallel beds, they are centered 6 ft. apart, leaving a 4 ft. wide path.) It may be helpful to amend the soil with compost. But don't make it acid. I think peonies prefer a pH on the alkaline or sweet side. Firm the soil and rake level. Water down. Use the rake handle to make holes that mark the graft locations. Insert deeply, about 12 inches; this allows hot air to penetrate the soil more readily. Cover the bed with clear. 3 or 4 mil, plastic sheeting, readily available in 10' x 25' rolls. Cut the roll into pieces 10' long and 5-6' wide. Overlap them about a foot until the entire bed is covered. To warm the soil deep down, this should be done two weeks in advance of planting. Since the 5-6' width is excessive at this stage, double up the edges and bury continuously in the ground so the hot air that develops under the plastic can't escape.

PLANTING THE GRAFTS. After making the grafts in the morning of a sunny day, plant them in the early afternoon. Unroll a sufficient amount of plastic and begin planting in both rows. (If you have weeds galore, spray them with Round-Up AFTER planting the grafts; their tips are buried and not susceptible to chemical damage. Honest!). I mark each group of varieties with an 8 inch plastic T label, but sink it to ground level to accommodate the re-laying of the plastic. I make holes for the grafts with a gravel shovel, removing a wedge of earth, and plant them upright [the grafts; I'm on hands and knees], but if they are unusually long, they are slanted. Some recommend this routinely, with varying degrees of slant. FIRM the soil around the roots and graft union, less so higher up. The soil should be warm to the touch at the depth of the union. In ensuing days, add more grafts until your x foot length is used up. If I know I have some poor grafts (small buds and/or thin scions), I plant 2, 3, or 4 in a spot intended for one. **NEVER** water the grafts. At the end of each planting, replace the plastic, covering the edges again with ground. The plastic should maintain high soil warmth and moisture, and keep rain water out. One year a thunderstorm blew off about 10 ft. of the plastic sheeting on one end. It was on rented land and I did not realize it for 3-4 days. I recovered the area, but the next Spring there was 100% failure in that area, with normal 75-100% "takes" elsewhere.

AFTERCARE. After three weeks or longer, well into September, remove the plastic. More weeding may be needed. To protect the plastic labels against breakage I hammer a 12 inch wood stake (48 inch laths cut into fourths) behind each one, leaving about four inches exposed. Cover the bed with marsh hay to about 6 inches deep. Baled hay comes in compressed layers which should be fluffed up. The area covered should extend beyond the rows by, say, 8-10 inches. Then recover with plastic, again burying the edges in soil - if possible. Here's where that "excessive" 5-6 foot width is needed. A 5' width doesn't quite do the job; 6' is better. Laths or longer strips of wood, along with bricks, will be needed to keep the plastic in place, esp. at the overlapped edges. The purpose of the plastic and hay is to delay freezing and allow for a long Fall season for root development. Eventual freezing is OK, if it occurs, but should be prolonged into Spring. If there is no snow cover over the plastic in early March (Zone 5), remove the plastic lest heating beneath it causes premature growth of the grafts into the hay. If this occurs, loosen the hay and hope the tender growth hardens in time to resist the more severe frosts. If any new shoots are killed (frost, sun, breakage), be patient. Even single-bud scions have two undeveloped side buds which may then grow and take over. In all of the above, let's hope you don't have a rodent problem.

GRAFTING PROCEDURE. Refer to the drawings. The wedge part of the scion (SIGH-un, also spelled "cion") is inserted into the cleft of the understock (or just "stock") so that one of the uncut, natural surfaces, marked "A", is flush with the root surface. The purpose is not to line up cambium layers but to avoid a depression or pocket where water can collect and disease start. If the scion width equals the stock width so that the same alignment occurs on the opposite side, that would be ideal. Usually I find the scion width is less than the stock width, which means a shoulder is formed on one side. This should be sliced off at a slant to make it easier to bind the union and to decrease the size of the pocket, i.e., the unfilled cleft space. Use a budding strip to bind scion to stock, drawing the exposed surfaces of each into firm contact. I usually start near the top and work down, leaving enough of the strip left to cover my thumb and tuck under that last loop. Then cover the entire area of the union with Parafilm tape. I cut the Parafilm into 1" x 4" lengths. Remove the backing, stretch out the first inch and hold against the budding strip. (It won't adhere by itself.) Loop the stretched part around and press against what is already being held down. It will adhere to itself, and you can now leisurely wrap the entire union, stretching the tape as you go. On larger roots, more than one piece of tape may be needed.

The cleft need not be of any particular width. If wider than the wedge end of the scion, the budding strip will draw the surfaces together. If too narrow, it can be cut wider. In fact, a single cut is OK if the stock will yield enough to allow the scion to be wedged in. This is often not the case, so I routinely make two cuts and remove a wedge shaped piece of root.

The drawing may be misleading. The scion usually takes up more cleft space than shown. Also, the root looks a bit too large, old, and gnarly, esp. with the thick laterals. The root piece should be young and, if available, I prefer ones with laterals, however thin. I feel this gives the new plant a head start for next year.

OWN ROOTING. The sooner roots develop above the graft union, the better. To encourage this, one year I wounded the scion wood with vertical slashes of the razor, moistened, and shook on some rooting powder, Hormodin 3. (There is usually more space to do this than shown in the drawing). All I can report is that the treatment did NOT hurt the success ratio of "takes," it being equally good for both treated and untreated grafts. But the careless use of Round-Up in the first growing season wiped out so many plants in one group or the other that no valid conclusions could be made.

RODENT CONTROL. At home, I have cats. The money saved on birdseed is used to buy cat food. My guilt at the loss of neighborhood birds has been assuaged by recent news that the state DNR is planning a hunting season for mourning doves. At my "away" garden I trap voles and their relatives with small plastic traps (they don't rust in the elements) baited with peanut butter. Place them near a hole or runway. To prevent birds from being killed, cut two holes in the edge of a plastic pot and place over the trap; weight with a brick.

SUPPLIES. This description of Parafilm tape and its application in grafting is taken from the manufacturer's website (<http://www.parafilm.com/FloraTapeHome.aspx?Menu=2&Prod=Nur>).

Parafilm grafting tape is an economical, fast and easy-to-use product that makes plant grafting and budding efforts a breeze for nursery workers, landscapers and gardeners. Apply Parafilm tape over the usual grafting rubber or tape normally used to hold the union secure until the graft takes hold. And, it may be enough alone to hold the scion of some soft-stemmed species in place.

Parafilm clear film has the right attributes to ensure your grafting efforts succeed. It is waterproof, flexible, stretchable and self-adhering. It allows gases (oxygen, carbon dioxide, etc.) to pass through, yet offers an excellent moisture barrier. The combination is perfect for grafting which requires a barrier to keep moisture in while allowing oxygen and carbon dioxide to pass through.

Available in clear tape in 1/2 " and 1" wide rolls.

When Parafilm is used in August to cover chip buds of magnolias, it must be slit vertically and unwrapped after about 18 days; otherwise the buds will rot. They are not expected to grow the current year. IF they do, in Zone 5, they'll likely produce growth too tender to survive the winter. I first learned of Parafilm in the early 1980's from a magnolia fan from whom I purchased a roll. Since then I buy it from the local hospital supply room. My last roll was 4 inches wide, 250 feet long, cost 15-20 dollars, and has lasted me a l-o-n-g time. Mellinger's offers a 1/2 inch size (I have no idea what quantity that is) for \$2. I have before me an old circular from the manufacturer, American (National?) Can Company, stating that Parafilm is available from medical and laboratory supply firms, incl. Fisher Scientific Co. The

circular explains its use in grafting - which I understand was an unintended use discovered later. Their instructions recommend pieces 2" wide x 3-6" long, and to cover all areas with two or more layers.

Mellinger's also offers budding strips in various sizes. I find the size illustrated to be ideal. As a substitute, use rubber bands. Some articles recommend size #33 which measures 3-1/2 inches (7" when cut) x 1/8" x 1/32" (gauge .031?). I've tried size #62 which measures 2-1/2 (5" when cut) x 1/4 x 1/32 and find it somewhat unwieldy.

In his article on grafting, #3, David Reath refers to the green, plastic, floral tape as "Miracle Tie," and this is offered by Mellinger's, pg. 45, in three sizes. It does not appear under "Grafting Supplies," and is described as "a green, stretchable tape for tying, staking, training or flagging. Strong, pliable and colorfast." Mellinger's, 2310 W. South Range Road, North Lima, OH 44452-9731. (www.mellingers.com). For other vendors, perform a web search on "parafilm grafting tape".

The best markers for a smooth surface are LISTO #1620 pens, made by the Listo Pencil Corporation, Alameda, California. They write like china markers but are much more practical as they can be clipped onto one's pocket and renewed with replacement leads, 1-3/8 in. long, six to a box, size 162. Marks last indefinitely, with no fading, but can be removed with water and a Comet type powder cleanser. I never see them in nursery supply catalogs, and buy mine at a local office supply store.

AGE LIMITS FOR VIABLE SCIONS. Once cut, scions can retain viability for 6 to 7 weeks. I first discovered this about 1986 when scions arrived in the mail before my grafting bed was ready. Stored in the refrigerator, they were used almost two weeks later with normal grafting success. (The cut ends do dry back a little, so extra long scions should be harvested to allow for necessary shortening.) I could have made the grafts when the scions arrived and held them in plastic bags and moist media for the entire three week healing period, but was unfamiliar with that option. For the past two years I've sent scions to Derek Irvine, NZ, and Bernard Chow, Australia. Both reported successful grafts. Mr. Chow said the scions were two weeks old without cold storage. The scions were cut about mid-December and grafted late December or early January. Since the seasons are reversed, this amounts to spring and early summer grafting! This gives rise to some interesting speculations:

(1) I understand that tree peonies sent from China to New Zealand are automatically refused at customs for fear of nematode infestation. Would not the importation of scions bypass that problem?

(2) Within one's hemisphere, north or south, would not Spring grafting be feasible? Lactiflora plants dug in March (Zone 5) could be warmed up and used to provide understock for scions taken in early April. After three weeks of warm, healing temperatures indoors, the new plants would immediately be in sync with the new growing season. I have never heard of any failures at this, probably because there have never been any attempts?

(3) Within one's hemisphere, August sales and exchanges of scions would bypass all the plant importation problems. Large-scale trading between nurseries in China, Japan, N. America, and Europe could increase tree peony sales by a quantum jump. Tell me if this is all fantasy and impractical. [My dates are for the northern hemisphere.]

NEW HORIZONS. Grafting allows you to quickly share your good fortune. One garden visitor wanted a tree peony seedling of which I had only the original plant. So I made three grafts in August and told her how to take care of them. A year later she returned and paid me for two plants, twice as many as what I have of my own seedling.

Peonies aside, grafting can expand your horticultural horizons, allowing you new vistas of gardening pleasure. You can make your own 5-in-1 fruit trees. Or 5-in-1 lilacs. I've recently converted a Japanese Tree Lilac to bearing only "Canadian" hybrids. Next I'd like to convert the Chinese Tree Lilac, with its peeling bark, to bear flowers of a little-leaf lilac shrub, *S. microphylla superba*, which reblooms in August. One could convert a domestic apple to a flowering crab, or a common magnolia to a yellow-flowered variety, or the common horse chestnut to a red-flowering type, or a ginkgo seedling to a male clone. Plums, apricots, and peaches will intergraft.

In the past six years I've learned of pear/Mt. Ash hybrids and Mt. Ash/chokecherry hybrids (some are listed in Mellinger's) and that they will graft onto each other and onto pear trees. A great conversation-piece in my garden is a pear tree bearing both pears and reddish purple Mt. Ash type berries with compound leaves.