

# Chip Budding Magnolias: Part II

by Charles Tubesing

Before beginning a detailed description of the chip budding process, a discussion of the selection and preparation of the scion and stock, as well as the tools used, is in order.

*Selection and Preparation of Scions.* Chip budding in late winter/spring is done with scion wood collected in the dormant state and kept under refrigeration until used. At any time after leaf-fall and until 4-6 weeks before bud-break, the shoots produced the previous growing season are cut off with pruning shears, placed in a plastic bag with a few drops of water, and refrigerated. In refrigerated storage at 35°-40°F, the buds will remain viable for at least two to three months. A weekly inspection of the stored scion wood for mold or drying out is advisable, and if desired the scions may be disinfected prior to storage in a way to be described later.

Although winter/spring and late summer are the customary times for chip budding, this technique can be performed successfully throughout the summer, using "resting" buds present on shoots a year old or more. Normally, such a bud is found on a leafless section of stem and is quite small, often somewhat flattened against the stem. In this case, budwood is prepared by finding a useable bud, then cutting off the shoot three to four inches above and below the bud. This

leaves the bud in the center of a 6-8 inch long section of stem. Such budwood should be stored the same way as dormant scion wood, but cannot be expected to keep in good condition for as long. Consequently, you should use it as soon as possible. Chip budding in the summer is of primary value in allowing you to acquire clones which unexpectedly become available during the summer. When there is a choice, however, it is preferable to chip bud in late winter/spring or late summer.

Late summer chip budding is done with shoots produced in the current growing season, removing the shoots at the junction with the previous year's growth. Shoots are mature enough to use as budwood when the wood toward the base of the stems has changed from a juicy, translucent green to a firm, opaque white. Even when the base of the stem has become "lignified" in this way, the tip of the stem will still be green and soft, so use only those buds from the bottom one-third to one-half of the stem.

Budwood collected in late summer is most subject to desiccation and deterioration, both because of its condition and the usual state of the weather at that time of year. It may seem obvious to say so, but plants that are wilted should be avoided as sources of budwood. Ideally, scion wood should be collected fairly early in the morning if the day is sunny, before the mother plants are subjected to any moisture stress. If drought conditions are present, giving the mother plants a thorough watering the day before collection is a good idea.

Immediately after collecting budwood, remove the leaves to reduce moisture loss. If the leaves are cut off with a sharp knife or pruning shears,

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leaving about one-quarter inch of each petiole attached to the budstick, a "handle" is produced for each bud, making it much easier to hold and manipulate the bud chips later on. After preparing the budsticks in this way, wrap them immediately in damp cloth and place them in the shade. This will keep them in good condition for use later the same day. If the scion wood is to be kept overnight or longer, it should be refrigerated as for dormant budwood. If the mother plants for budwood are close at hand, you should collect scion wood the same day you will use it. Otherwise it may be stored in the refrigerator for a few days, but plan to use it as soon as you conveniently can.

At whatever time of year collected, budwood should be selected from healthy, moderately vigorous side shoots. Very rapidly growing shoots, such as watersprouts, have a large diameter pith and very little wood, and are not desirable as scions for reasons to be noted later. Often mature trees which have flowered profusely will produce only short, curved "spur" shoots with several nodes congested together. These can often be used if necessary by making the bud chips much smaller than usual. If you have access to such a plant and can plan ahead, cutting back one or more branches a foot or so down to a live bud or shoot will encourage production of elongated, straight shoots, which are more desirable for scions. Branches should be cut back on the sunny side of the tree, in late winter or early spring.

#### *Selection and Preparation of Stocks.*

A discussion of stock-scion compatibility and suggested combinations will be taken up in a later installment of this series. What I wish to discuss here are the physical criteria for selecting an individual stock, and the way it is prepared for grafting. First, a stock must possess a

straight length of stem at least one inch long and preferably as low down on the stem as possible. The combination of a straight stock and scion at the point of union will permit maximum cambial contact. When rootstocks are raised from seed, a few seedlings will usually have twisted, crooked stems, and these should be discarded as soon as they are noticed, for they will not improve with age. Very acceptable rootstocks can be produced from cuttings in this regard, because cuttings can be selected from straight shoots.

My emphasis on budding low on the stock is not concerned with achieving a successful union, but with doing a professional job, which is to say, an aesthetic one. In chip budding there is always a bit of a "dog leg," or crook, produced in the stem because the shoot which develops from the scion bud extends outwards at first as well as up. This crook is much less noticeable if the chip bud was made only two to four inches above the ground.

Another consideration in selecting a stock is that, in the area where the bud chip will be placed, the stock must be of equal or greater diameter than the shoot from which the bud chip will be taken. It is possible to chip bud onto large stocks at least four to five times the diameter of the scion wood. When this is done, the amount of growth produced from the scion in the season after it is "forced" is impressive.

After the stocks have been selected, they require some preparation before grafting. Because it is necessary for stocks to be actively growing at the time of grafting, those to be used for chip budding in winter should be brought into a greenhouse kept at 60°-70°F about two weeks prior to budding. Chip budding can commence when swelling of the buds is observed.

Other preparations have to do with clearing and cleaning the area on each stock where the chip bud will be made. Use a sharp knife to remove any buds, leaves or shoots on the stem from



ground level to two to three inches above the area where you intend to graft. A utility knife should be used for this, and your budding knife retained for its specialized purpose, so you can maintain its edge at maximum sharpness. When budding onto stocks in the ground, you may wish to remove any branch extending from the same side of the stock where you plan to bud (usually the north side) to provide a clear view and access to the "target" area.

After clearing off the stem in this way, rub a coarse dry rag over the area to remove soil adhering to the stem, including sand grains that can rapidly dull the blade of your budding knife. Then if desired, but this is by no means essential, swab the stem with a 10 percent bleach solution, made by mixing one part of household chlorine bleach to nine parts water. Scion wood may also be dipped in this solution for one minute, then rinsed off with clean

water. This disinfectant wash is an added precaution against transfer of disease organisms from the bark to wounds made in the grafting process. It is also helpful to dip your budding knife into this bleach solution between grafts, wiping it dry on a clean rag draped over your belt before going on.

*The Budding Knife.* Using a suitable knife is essential to success in chip budding. A thin straight blade which is very sharp should be used. I happen to use a professional budding knife, but a thin-bladed pocket knife will do as well, and injector razor blades have been used successfully. I have used a single-edged razor blade for very small chip buds, but the thickened guard tends to get in the way. The use of injector blades requires using both hands to pull the blade like a drawknife, which seems awkward to me. However, someone who is mechanically inclined could likely construct a handle capable of firmly

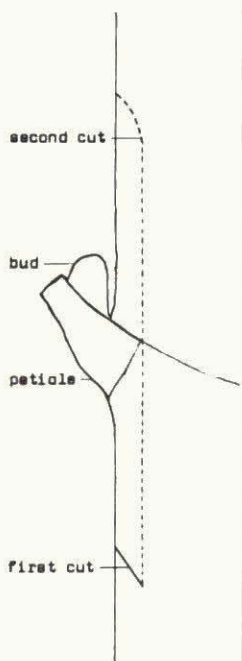


Fig. 1

Removing the bud chip



Fig. 2

Removing the stock chip

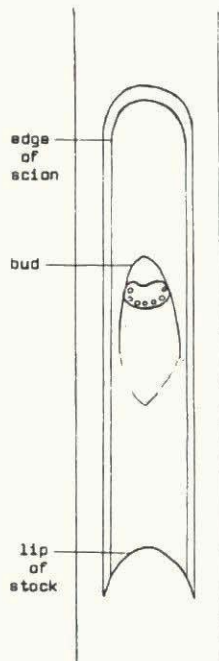


Fig. 3

Bud chip in place

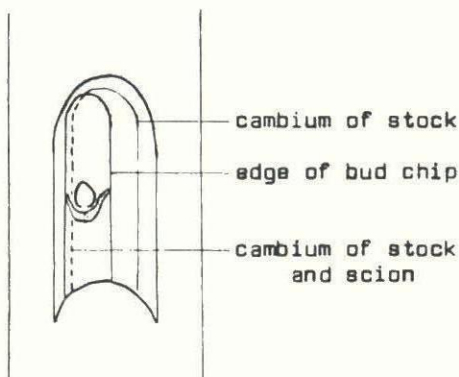


Fig. 4

#### Placement of bud chip on oversized stock

holding an injector blade and thereby making a serviceable budding knife. Of course, the advantage of using a razor blade is that no skill in sharpening a dulled blade is required; you just discard, and replace it with a new one. Let me say at this point that sharpening a knife is not as hard as it may seem. High-quality knives made of good steel (avoid stainless steel!) are easier to sharpen and will hold a good edge longer than cheap ones. Craft knives with disposable blades can also be used for chip budding, but the cutting edge of the blade must be parallel to the handle for ease in making straight cuts.

**Making the Chip Bud.** In chip budding, some propagators prefer to make the cut into the stock first, and then remove the scion. I was taught to prepare the bud chip first; it can be used as a guide for the correct length of the cut on the stock. If the bud chip is made first, it is necessary to hold it while making the cuts on the stock. Some will find this awkward, particularly when using potted stocks, which require some support from the free hand. Because both procedures have been used with success, you should try each, and use the one most comfortable for you. I will describe the

procedure in the order I do it.

First, the budstick is picked up and grasped firmly at the base between the thumb and last three fingers of the left hand (if you are right-handed). The index finger supports the budstick, the fingertip placed directly underneath the bud to be included in the scion. It is good practice not to use the bottom bud on the budstick, because of its proximity to the cut end and the likelihood that it has been injured by moisture loss. So the second bud from the base is the first used, and additional bud chips are removed sequentially up the budstick as needed. If there are sufficient buds available to allow a choice, buds located on crooked sections of stem should not be used.

The first cut (Fig. 1) is made approximately  $\frac{3}{4}$  inch below the bud, cutting in and down at a  $20^\circ$  angle for  $\frac{1}{8}$  inch. The second cut (Fig. 1, dotted line) is begun about  $1\frac{1}{2}$  inches above the first, or  $\frac{3}{4}$  inch above the bud. This cut is begun at the same angle as the first, but as soon as the bark is penetrated the angle is decreased, so the knife makes a straight, shallow slice that ends when it meets the bottom of the first cut. The way these cuts are made is very important. In magnolias with very soft wood, such as members of the section *Rytidospermum* (*M. hypoleuca*, *M. macrophylla*, etc.), direct pressure will be sufficient to move the knife blade steadily through the wood, with somewhat the feel of cutting through hard cheese (as one English propagator put it). For magnolias with harder wood, however, it will be necessary to begin the cut near the base of the knife blade, and while maintaining downward pressure, to draw the blade slowly from base to tip. If you should run out of blade before completing the cut, just back the blade out of contact with the budstick and move the base of the blade over to its original position. Then start again where you left off, with the same drawing



motion. By no means should you push the knife blade back to the base while it is still in contact with the scion wood, or attempt to remove the bud chip by means of a sawing motion. Either will produce a ragged, irregular surface which will greatly limit your percentage of success. Your goal should be to make the cut smooth and straight.

An additional consideration in the removal of the bud chip is to avoid including pith in the chip. Pith is the white spongy tissue found in the center of stems of many plants. In a shoot of moderate vigor or less, the pith is relatively narrow, and the wood thick enough to permit removal of a bud chip without entering the pith. But in very vigorous shoots, as are produced by healthy young plants or as suckers or watersprouts by older plants, the diameter of the pith is much greater, and the wood much thinner, making exclusion of pith from the bud chip difficult. For this reason, such shoots should be avoided in the selection of budwood. In a single shoot, the thickness of the wood decreases toward the tip, making the more basal buds generally more suitable for scions. Should you inadvertently cut too deep and enter the pith when cutting a bud chip, it is best to discard the chip and start again. However, if you are in short supply of buds of that particular clone, it is possible to carefully shave the back of the bud chip down to solid wood so that it can be used.

When the second cut in the budstick meets the first the bud chip is freed, and is removed by pinching it gently against the knife blade with the right thumb. The chip is then lifted away and the budstick is laid aside while the chip is transferred to the fingers of the left hand and grasped by the petiole base if present, or by the edges, avoiding contact with the cut surfaces.

In preparing the stock to receive the bud chip (Fig. 2) virtually the same

cuts are made, using the chip as a template to gauge the length of the second cut. If the stock is much larger in diameter than the scion, however, the cuts in the stock should be made more shallow. This will limit the amount of bare wood which lies exposed after the bud chip is placed, and over which the callus tissue must grow to complete healing of the graft.

It should be noted that for grafting onto potted stocks, the orientation between your body and the stem of the stock is the same as that between your body and the budstick for removing scions. When chip budding onto the base of a stock planted in the ground, however, the usual practice is to back up to the stock and bend over double from the waist, so that you are facing it upside down. In this position, the cuts to remove the chip from the stock are made with a pushing motion, again drawing the blade from base to tip as needed.

After the second cut into the stock has met the first, the chip produced is lifted out and discarded. Then the scion is inserted firmly in its place, with one important consideration, namely, that the cambial tissues of stock and scion be placed in as close contact as possible. Because the cambium is a cylinder of tissue separating the bark and the wood, it appears on the cut surfaces of the stock and scion as two vertical lines separating the green bark and the light-colored wood. All that is necessary is to line up the cambia of stock and scion on one side, bringing together one of the cambial lines from each. This can be done by looking in from above as you insert the bud chip under the "lip" of tissue at the bottom of the cuts on the stock, and shifting it to the left or right as needed. Alternatively, you can mentally gauge the relative thickness of the bark of the scion and stock, estimating how much of the cut area of bark on the stock will be exposed when the chip is properly



*Tying the scion growth to stock stub for support, Magnolia campbellii 'Veitch's Clone' chip-budded onto M. × soulangiana (photo Charles Tubesing).*

placed, and place the scion accordingly. Normally, the bark of the stock will be thicker than that of the scion, so that with proper placement, some of the green internal tissue of the bark of the stock will be exposed on the side on which the cambia are matched. (Figs. 3 & 4).

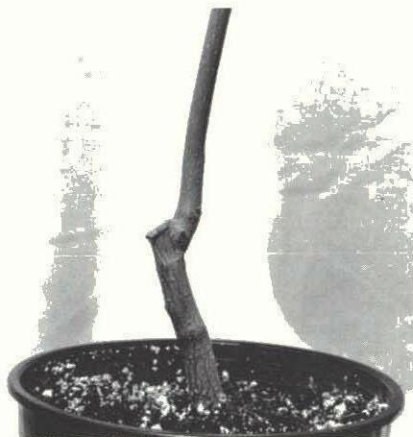
#### *Tying Materials and Procedure.*

Once the bud chip has been satisfactorily placed against the stock, it is necessary to tie it firmly so it will remain in place until union is complete. It is also necessary to cover or wrap the graft with some moisture-proof material to prevent the scion from drying out before it has joined with the stock. These requirements are often satisfied in two steps. First, the chip is tied in with a rubber strip about 1/16 inch wide and 6-8 inches long. Starting below the lip on the stock, one end of the rubber strip is anchored by overlapping it with two winds of the strip around the stock. Then the strip is wound in the same direction in a spiral up the stem and around the graft, lapping each new wind slightly over the last. When winding, the strip should be stretched tautly enough so

that it snugly grips the stem. Unless the bud on the scion is very small and flattened, the rubber strip should not be wound over it, but directly below it and then above it in consecutive turns. The winding is continued slightly past the top of the bud chip, then is completed by passing the end of the strip underneath the previous turn and pulling it tight.

The rubber tie is not enough to prevent drying of the scion, so at this point a clear polyethylene sheet, of which most plastic bags are made, is wrapped over the graft and sealed with tape. Alternatively, you can paint over the tie with paraffin which has been melted in a double boiler, avoiding coating the bud if it is exposed.

A simpler method of tying and sealing in the graft was developed by the East Malling Research Station in England. In this method, an 8-10 inch strip of polyethylene tape (ungummed), either one-half or one inch in width, is used as the tying material. I have found the half-inch wide tape more suitable for magnolias. This polyethylene tape is available from nursery supply firms, but an entirely



*Stock stub is removed and the cut painted with a wound dressing. M. sieboldii 'Plena' chip-budded onto M. sieboldii seedling (photo Charles Tubesing).*





*Union of M. heptapeta 'Japanese Clone' on M. × soulangiana, showing completely healed wound where stub of stock was removed (photo Charles Tubesing).*

satisfactory substitute may be cut from clear polyethylene bags using a straight edge and razor blade. Because polyethylene does not cling or stretch like rubber, a bit more practice is required to get used to tying with it. Because it is almost essential to have both hands free when tying with the plastic strip, this material is better adapted for tying onto stocks which are firmly anchored in the ground. However, when using a container-grown stock, I find that by gripping the pot tightly between the toes of my shoes, I can hold the stock steady enough to tie in the bud chip almost as readily.

In either case, the tie is made from a bent-over position, looking upside down at the graft. With the left hand holding one end of the strip and the right holding it at a point two to three inches over from that, the portion of the strip between the fingers is pulled tightly over the lip on the stock. Behind the stock, while still maintaining pressure, the hands exchange the portions of tape that they were holding, and the left hand now winds the tape clockwise around and over the end held by the right hand, trapping it tightly against the stock. This serves to anchor the strip. The winding is now continued in a clockwise direction up the stem, lapping each new turn slightly over the

previous one. Tension is maintained just short of breaking the strip. As with the rubber tie, a small flattened scion bud may be covered with the plastic strip, but one that sticks out should not be covered. I have found that the inclusion of an extra, seemingly redundant, wind of the tape directly below such a prominent bud results in a tighter seal around it. Otherwise, there is often a small gap in the tie at the edges of the bud chip at this point. The turns of the strip are continued above the bud and past the top of the scion, where the tie is completed by passing the end of the strip underneath the previous turn and pulling tightly on the end until it breaks. During the tying process, the aim should be to lay the plastic strip as flat and wrinkle-free as possible to ensure a tight seal.

Now that the description of the grafting process is complete, I would like to strongly suggest that you do not immediately go out and attempt a graft. Instead, break down the procedure into steps as it was described, and work at one step at a time until you have satisfied yourself that you can do it repeatedly in a satisfactory and consistent manner. For practice in removing chips, select straight shoots from a soft-wooded species, such as willow, alder, or poplar, so that you can concentrate on making regular cuts without having to apply a lot of pressure. You shouldn't even bother with including buds in the chips at first.

To practice tying, take an unbranched shoot one-half inch thick and stick it into the ground. Then take a plastic strip and tie it on to the shoot, being careful to anchor it firmly, wind it smoothly and tightly, and finish it off securely. After you have become comfortable with manipulating the plastic strip, select a bud on the shoot and practice tying as though it were the scion bud. Once you are satisfied with your mastery of all the steps, combine them, still using expendable materials, and practice the whole

procedure until you can move from one step smoothly into the next. By this point, you will be ready to make your first actual graft, and because you are more relaxed and confident in your actions, it is very likely you will succeed.

*Removing the Tie and Forcing the Bud.* A bud chip will unite completely with a stock in 10 to 21 days in a greenhouse maintained at no lower than 65° F, or in three to six weeks outdoors, depending on the time of year. Where rubber ties are used, it is necessary to guess when union is complete and the tie may be removed, necessitating re-tying in some cases. If you have tied with a clear polyethylene strip, however, you can observe whether healing is complete without disturbing a thing. The plastic tie acts as a window. The external indication that the graft is knitting properly is the appearance of callus tissue on all of the exposed cuts in the stock.

Callus appears as light-colored growths which fill the gaps between the stock and the edges of the bud chip. Once you see that callus has reached the edge of the bud chip all around, you may remove the tie with confidence. In cases where the stock is of much greater diameter than the scion (Fig. 4), there is a correspondingly larger area for the callus to fill to one side of the chip, so of course healing will require more time. It is best to wait until the callus has totally covered this area of exposed wood on the stock before removing the tie, because the callus serves to "tie down" the edge of the bud chip. Otherwise as the scion begins to grow, the unattached side of the chip will curl away from the stock, and the scion is likely to break off at the union.

Although rubber ties are degraded by ultraviolet light outdoors and in commercial practice are routinely left in place on grafts until they "rot off," it is a good idea to remove them when union is complete. Polyethylene ties do not deteriorate rapidly enough, and



*Completely healed union of M. heptapeta 'Japanese Clone' on M. × soulangiana. "Dog-leg" is minimal (photo Charles Tubesing).*

therefore should be removed soon after stock and scion have united, or constriction will occur. The procedure for removing both kinds of tie is similar: Pull the end of the tie away from the stem so that you can insert the point of the knife or scissor blade under the last turn of the tie and sever it. Then, slowly unwind the tie down the stem, taking care around the scion bud, which is easily broken off if it sticks out at all.

Whether the scion bud should be forced into growth immediately after the tie is removed depends on the date. Any grafts which have united completely by mid-June may be forced into growth immediately. Grafts which



*Union of M. heptapeta (syn. denudata) 'Japanese Clone' chip-budded onto M. × soulangiana (photo Charles Tubesing).*





*Closeup of union of M. sieboldi 'Plena' and M. sieboldii seedling showing angle at which stock stub should be removed.*

have finished healing later than that should not be forced until the next spring, because the growth produced that late in the summer would likely not be able to harden off rapidly enough in the fall, making it susceptible to frost damage.

The scion-bud is forced into growth by cutting off the top of the stock, four to six inches above the graft union, also removing any shoots or buds coming from the stock below that point. As the growth from the scion bud elongates, the shoot is tied to the stub of stock as if it were a stake. This tying serves two purposes: It encourages the production of a straight erect stem, and it guards against breakage of the scion.

At a convenient time after the scion growth has firmed up so that it will stay in place when untied, the stub of stock is removed with pruning shears at the point where the scion stem emerges. Because even a sharp pair of shears tends to crush the stem somewhat, the cut should be trimmed

down to uninjured tissue with a sharp knife so that it slants downward slightly from the scion (see photograph). At this point, if desired, the cut may be sealed with melted paraffin or pruning paint, although this is by no means essential. After the stub has been removed, for safety's sake, it is advisable to stake the graft for the rest of the summer. If the graft is not exposed to wind, however, and needs no encouragement to grow straight, then staking can be omitted.

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