

## CHIP BUDDING TECHNIQUES IN THE NURSERY

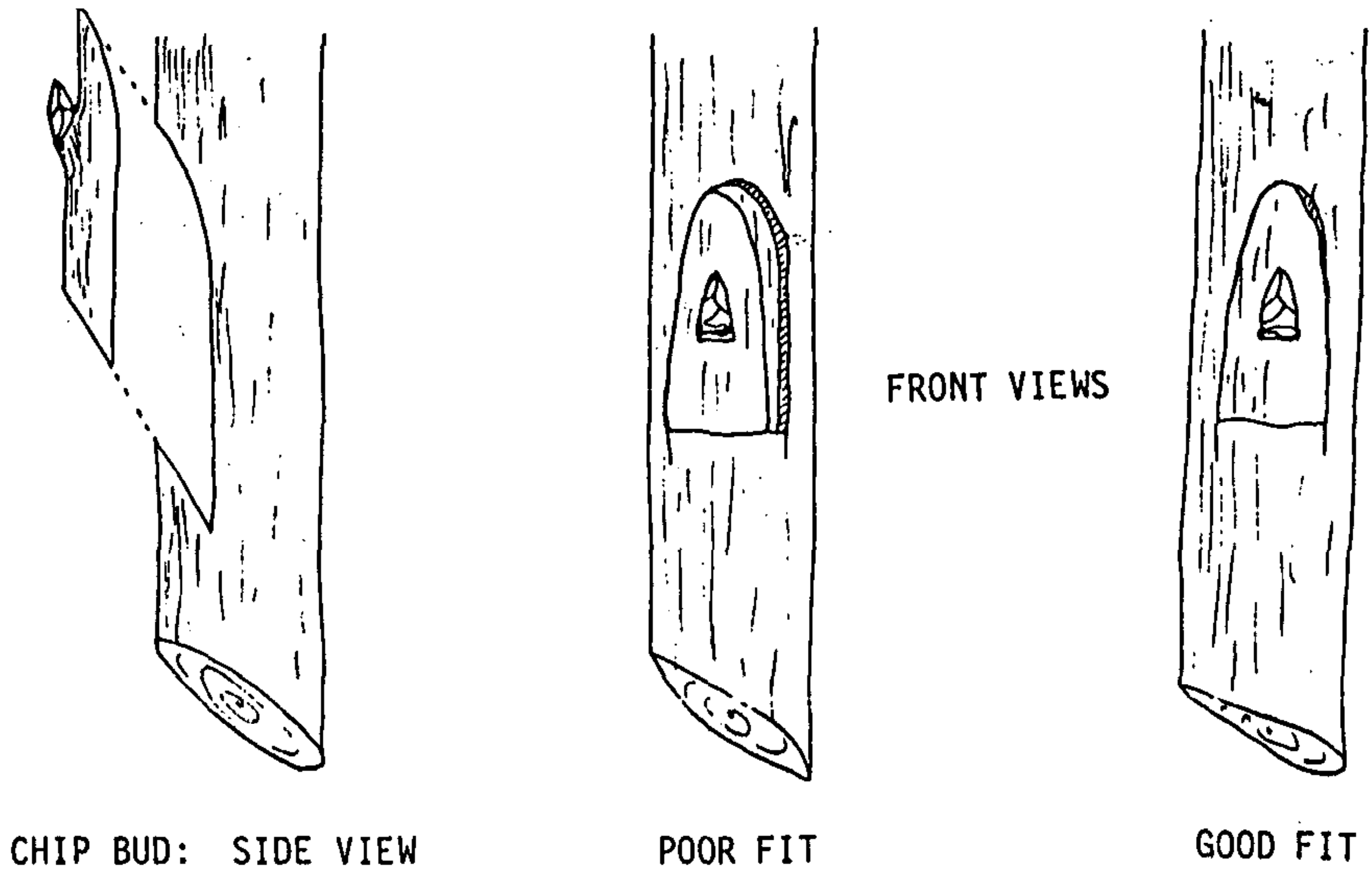
ROBERT H. OSBORNE

*Corn Hill Nursery Ltd.  
Petitcodiac, New Brunswick  
Canada, EOE IPO*

Chip budding is not a new technique. It has been used for decades and possibly for centuries. Recently however there has been a renewed interest in the technique. Much of the interest in North America has occurred as a result of British studies which have shown the technique to have many advantages over shield budding or T-budding. Before describing these advantages it might be advisable to describe the technique for those who are unfamiliar with it.

It makes no difference whether the stock or scion piece is prepared first, however we generally prepare the stock first. This reduces the handling of the scion piece and requires less juggling. The initial cut involves a downward thrust with a sharp grafting knife. The cut begins with a gentle curve until a depth equal to  $\frac{1}{3}$  of the stock's diameter is reached. Keeping the cut straight, proceed downward until the cut is approximately  $\frac{3}{4}$  in. long. The length of the cut will vary somewhat with the size of the material being used. The second cut is made diagonally downward to meet the end of the first cut. The angle of this cut is usually about  $30^\circ$ . Our experience indicates that this cut is extremely important in the later healing process as it allows the cambium just below the bud to heal with the stock cambium, thereby helping the bud to continue growth after the budding process. We found in our initial attempts that those buds with a poor bottom cut would often die even though the chip itself would unite well with the stock.

After the stock has been prepared the scion piece is cut in precisely the same manner. The cuts should be made with one fluid motion rather than working your way through them. A flat cut is essential in order that no air spaces interfere with good cambial contact. It is important that the knife be very sharp so as not to tear the cambial cells and to facilitate the creation of flat surfaces. The bud piece is then slid into the stock being sure to gently but firmly lock the lower cuts. Align one side as perfectly as the cuts will allow. Hopefully the other side will match as well (Fig. 1). It is our experience that those buds which are matched on only one side are generally poorer growers if and when they heal. Although the cuts are very simple, an experienced budder is invaluable. The matching of the bud piece to the cut in the stock is critical to success and takes some practice to master. With experience the matching process becomes instinctive and a good budder can move very quickly.



**Figure 1.** Steps in preparing the chip bud.

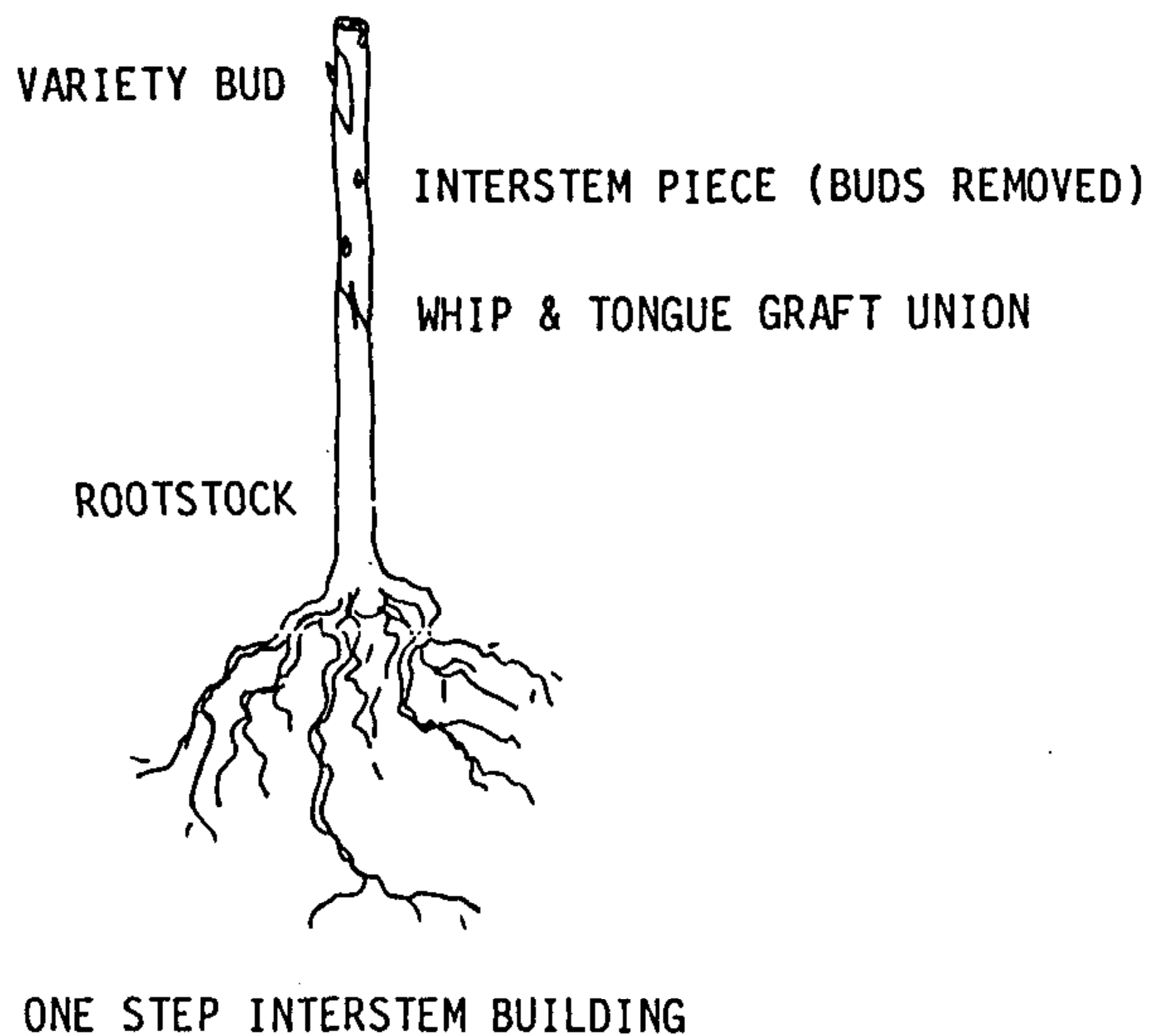
After the alignment is complete the bud must be wrapped in order to maintain moisture and exclude air which would dry out the cut surfaces. To our knowledge most growers using this technique rely on polyethylene strips for this purpose. We have been fortunate to discover a material called Parafilm<sup>®</sup>, made by the American Can Co. It is used as a laboratory film for covering beakers and such. It is a stretchy self-adhesive plastic material which is easy to apply, does not need to be tied and breaks down as the tissues expand. The bud has no problem breaking through the film and there is no need to go through the field later to untie the strips. For most of our budding needs we buy 4 in. wide rolls which we cut into  $\frac{3}{4}$  in. strips. Only as many pieces as will be needed for the day are cut and care is taken to keep dirt from contaminating them. Generally the temperatures we experience during the budding season allow for just enough stretching for good pressure against the bud, however in very cold conditions the Parafilm<sup>®</sup> will have more tendency to break. In very warm conditions it can stretch a bit more than one might wish. Any drawbacks are more than offset by the product's virtues, particularly the fact that it does not need to be tied, thus reducing the time spent on each tree. We are quite fond of this material.

As the bud heals the Parafilm<sup>®</sup> will crack and by winter air will be able to circulate around the bud. A word of warning, however. If the stocks are growing very slowly or if your budding has been done late and the Parafilm<sup>®</sup> has not cracked before the onset of winter the

Parafilm® will retain condensation which will freeze and kill the buds. In this case you must cut away the film. On actively growing stocks budded at the proper time this is not a problem.

If budding is done in summer the stock will be cut back the next spring as is usual with other forms of budding. If done in the spring it is possible to cut the stock off immediately above the bud during budding; however we have found that our take has improved substantially by allowing the bud to heal for at least a week before cutting off the rootstock. It makes sense that the sap flowing past the cut surfaces will enhance the healing process. It is important that stocks not be allowed to grow too long, however, as this delays the transfer of apical dominance to the budded area, thus reducing subsequent growth of the bud. We generally cut off our stocks 2 weeks from the date of budding. Growth and care of the trees from this point is identical to trees budded by conventional methods.

Recently we have adopted the chip bud technique into the production of interstem trees, of which we produce a good number (Figure 2). In the past we had budded the interstem cultivar onto the rootstock the first year, then budded the cultivar onto the interstem the next year. Our new technique saves us a year.



**Figure 2.** Use of the chip bud technique in producing interstem trees.

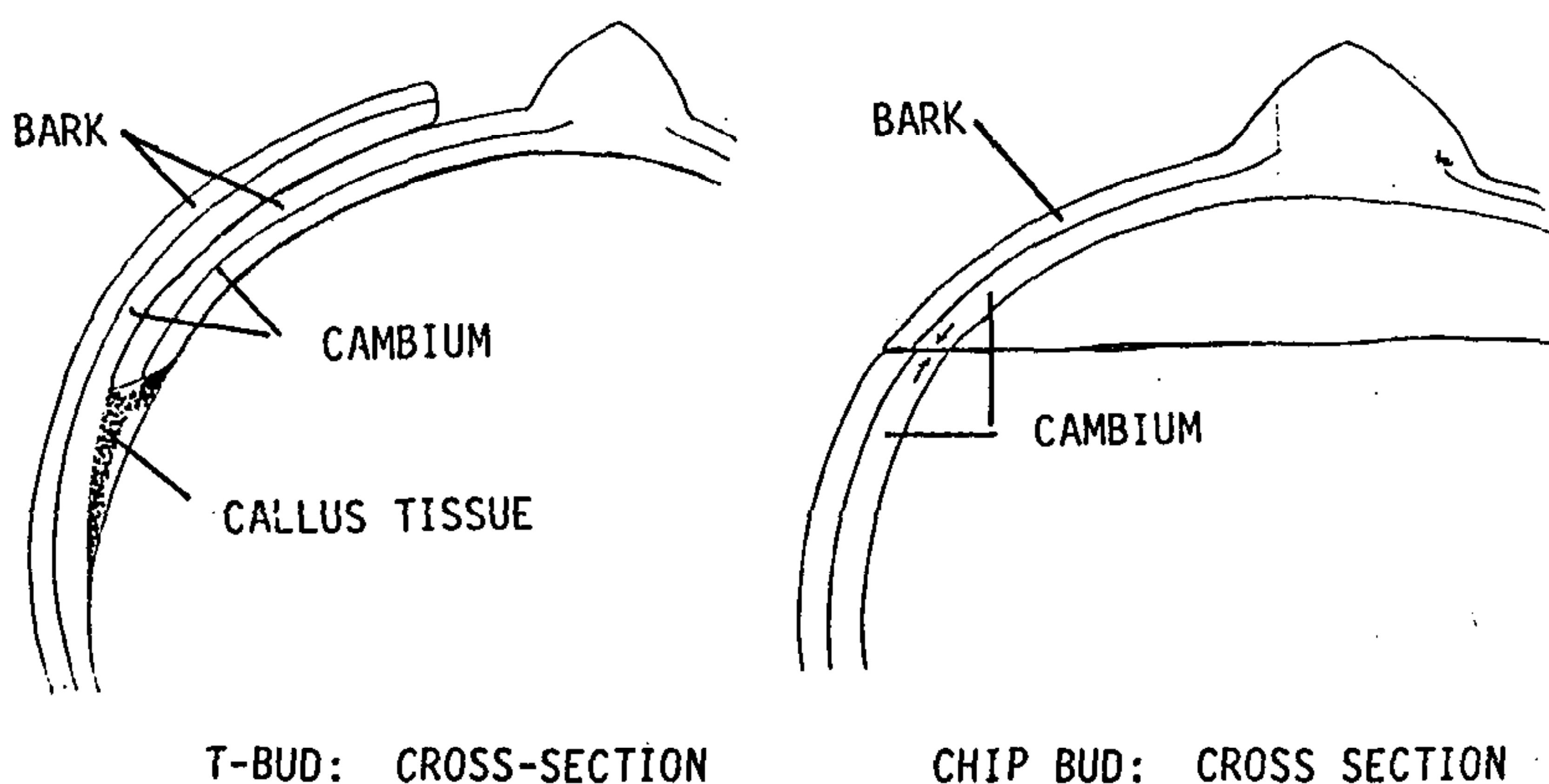
We gather fresh scionwood of the interstem cultivar from hedges grown specifically for this purpose. These are cut into lengths corresponding to the length of interstem desired. At this time they are also de-budded. The cultivar is then chip-budded onto the top of the interstem piece and sealed with Parafilm®. The



budded interstem piece is then whip and tongue grafted onto the rootstock. This graft is wrapped in Parafilm<sup>®</sup> and then brushed with a resin-beeswax-linseed oil preparation. We feel this gives the graft sufficient support for handling yet it does not need to be untied at a later date, which is the case if they are bound with budding rubbers. The completed trees are healed in sawdust in a vertical position at 4°C (approx. 40°F.) until the ground is ready for planting. This allows the bud and graft union to be at least partially healed before being set out. Although we do much of this indoors on the bench it is also quite feasible to prepare the interstem pieces indoors and then graft them onto rootstocks in the field. Growth on trees grafted in the field is quite vigorous. This technique not only saves a year of production time but produces a much smoother, straighter stem, a perennial sore point with interstem trees.

Many people have asked us why we chip bud? This is a fair enough question considering that the conventional T-bud is a time-tested, relatively easy, fast and reliable method of propagation. We feel, however, that chip budding offers several important advantages, some of which are universal and others which are particularly advantageous for our situation.

If we compare the T-bud with the chip bud technique we discover there is a subtle, but to us, important difference. The T-bud is inserted beneath a flap of bark and cambium tissue. As callus tissue from the stock's cambium and the bud's cambium start cell division they essentially fill the space between them with undifferentiated parenchyma cells until they meet and unite. Under good conditions with well managed material this process occurs within a few weeks (Figure 3). A chip bud, however, is a type of miniature graft. The bud is cut out of the scion stick and inserted in a matching cut made into the stock. The cambiums of each are placed into direct contact. Under normal conditions healing takes place rapidly because as



**Figure 3.** Tissues involved in healing of the T-bud and chipbud.

soon as callus production begins the cells come into immediate contact. Both techniques can and, of course, are successful methods to achieve the same end. The difference is in the speed of unification and, I would argue, the strength (at least in the short term) of the bond.

At our location in New Brunswick, Canada, our summer budding season is short. Our material is generally mature enough to bud by the first or second week of August. By the end of August and certainly by the beginning of September many localities around us have already experienced frost. While our particular location usually escapes these harbingers of winter, the point is that night temperatures by late August are very low. Our budding success using T-bud methods are often quite low. Even if our buds do unite well we often lose many to our very low temperatures in winter. We were searching for a method which would eliminate some of these problems. The rapid healing of the chip bud has helped us to increase our percentage of successful takes.

Another disadvantage to our site is wind. We are located on a hill which receives more than its share of breeze. It is great for keeping insects at bay but it also has the unfortunate habit of knocking newly healed budded shoots off their stocks. Our losses were quite high until we began chip budding. Inspection of wind-damaged trees usually showed that the callus tissue under the T-bud flaps had not formed sufficient fibrous strength to withstand our windy conditions, whereas the chip budded trees did not have the large quantity of undifferentiated, structurally weaker cells.

Another advantage that we find of great help is the ability to use much smaller scionwood than would ordinarily be possible with T-budding. The use of very thin budwood in T-budding will often result in a poor stand and larger scionwood is a decided advantage. Often the scionwood one has is either not as vigorous as would be desired or the cultivar being used produces small thin wood. The experienced chip budder can scale the size of the cut to match the size of the scionwood and we have been quite successful using scionwood less than  $\frac{1}{8}$  in. in diameter. If the budder is using very small buds the cut on the rootstock will be no more than a delicate shave and a small flap of bark for the bottom cut. This surface, if one examines it, will be entirely composed of cambial tissue, therefore when the bud is placed upon the stock there is a very good cambial contact taking place.

Conventional budding is nearly always done in late summer when the bark is slipping. Chip budding is far less limiting. Because it does not require the bark to slip it can be accomplished at any time during the growing season if dormant buds are available. In our climate we usually cannot complete our budding during the small "window" allowed us and we do a great deal of our propagation in spring. Not an enviable situation due to the pressures of our spring

season, but nevertheless a fact of life at our nursery. Without the chip budding technique we would be at a distinct disadvantage as we would need to graft all our material, a time-consuming process and one which uses more precious scion material than we can often afford.

I should point out in all fairness that it would be very difficult to argue that chip budding is as fast as T-budding. A good T-budder could probably keep ahead of a good chip budder under ordinary conditions. I will say that an experienced chip budder can do a lot of trees in a day and if those trees have a higher percentage of takes then the nursery certainly gains rather than loses in the long term.

We believe the chip budding technique can be of advantage to many propagators, whether or not it is used exclusively. As an example, failed trees which had been budded in the summer can be re-budded in spring using the chip bud to create better stands. This is particularly valuable if the cultivar in question is of high value. It is useful for such techniques as one-step interstemming and can be of value in the greenhouse as well. Whether or not you adopt chip budding on a large scale we think nearly every nurseryman can make use of this valuable technique. We urge you to try this technique if you have not already done so. You may find it will assist you in making your nursery more efficient and profitable.

CHARLES HILDEBRANT: What is the time of the year that you are doing your *Betula* grafts?

ROBERT OSBORNE: In mid-August in Canada.