

GRAFTING CAMELLIA SINENSIS

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Abstract. Grafting *Camellia sinensis*, the tea plant, has only recently become a commercial practice. This paper describes two methods, based on the cleft and stub grafts, which have proved successful.

INTRODUCTION

Malawi, where the techniques were developed, lies in the Southern tropics. The tea growing areas, at the foot of two mountains, (which cause the necessary high rainfall for tea culture) are about 3,000 ft above the sea level, thus temperatures are not excessively hot.

The four seasons can be described as:

December to March	—	hot and wet
March to June	—	cool and damp
July to September	—	cool and dry
October to November	—	hot and dry

Although Malawi only produces about 1% of the world's tea, the industry is a major one for the small country. Tea is a fairly conventional crop but tends to be surrounded by a shroud of oriental mystique. There are three factors which make it differ from other crops:

- a) it is an evergreen
- b) it is a woody perennial used for its leaves
- c) plant populations of 3500 per acre are usual (up to 10,500 have been considered) which means a large scale nursery with low production costs

The plant is usually trained to a small bush about 30 inches high with a flat surface of 16 sq ft. This is a convenient height for the pluckers when harvesting.

If it is allowed to grow unpruned and planted at a wide spacing, it will develop into 30 ft high bushes, with a well developed frame. Such plants are grown for seed production and form the usual rootstocks for cleft grafting.

CLEFT GRAFTING METHODS

The best season for cleft grafting is June to August when there

is no sap flow in the stock plants. Should the grafts made in this season fail, there is an opportunity for re-grafting in September/October.

Ideally the rootstock is 6 or 7 years old with several branches about 3 inches in diameter. Bushes up to 40 years old with 8 inch diameter stems, and young plants 2 years old with ½ inch diameter stems, have been successfully cleft grafted, but good results are not easily attained.

The first operation is to cut back the growth to 5 feet, then erect a shade over and around the plant. Just before grafting, five branches are removed. Any moss and lichens growing on the selected branches are removed. The stock branches are then cleft with a heavy knife. The direction of the clefts should follow the circumference of an imaginary circle, joining the five branches. Scionwood, which can be 6 months to 3 years old, with green to gray bark, is cut into about 9 inch lengths with at least 3 leaves. If the clone is large-leaved, the leaves are often halved. The lowest leaf is removed and the scion is shaped so that the cut starts about 1 inch above the lowest bud, with the bud on the outside of the scion. A wooden wedge, or the end of the heavy knife, is used to hold the cleft open while the scions are put into place. Besides aligning the cambium layers, care is taken to place the lowest scion bud just below the top of the stock branch. So far the system is similar to any cleft graft top — working procedure. The whole graft is now wrapped with moist sphagnum moss or foam plastic, held in place by a polythene tape. Then the scions and top of the stock are covered with a polythene bag which is tied just below the moss.

The graft is left like this for about 8 weeks until callus is obvious on both stock and scion. The use of the shade should now be evident. The sunlight is so strong that excessively high temperatures would rapidly build up in the sealed polythene bags, so that shade must be arranged to allow as much light as possible to penetrate *without* excessive temperature build-up. The shades need constant attention. The grafts may need the moss re-moistening and an aphid or caterpillar spray during the 8 weeks.

After callus has been seen, the bag is untied but left *in situ* as a weaning stage. A week or so later the bag and polythene tapes are removed, and after another week or so the shade is thinned. If shade reduction is delayed all the new scion growth is floppy, like “rubbery-wood” disease; however, normal growth takes place if the plant is pruned and the shade removed.

Comment. The union is very strong. In a few cases the wind may have broken the shoots above the union. It is for this reason that the lowest bud should be below the top of the stock. I have seen several trees with severe bark scorch when the shade has been

removed before the polythene tape; there have been cases of the stock dying shortly after the union has taken place. There is no indication that the unsealed cleft has ever been the cause of trouble, in fact attempts to seal the cleft with hot or cold waxes or bitumastic products have seriously reduced the number of successful grafts.

Uses of the Cleft Graft. So far there are two practical applications:

- a) Improving existing seed gardens.
- b) The rapid build up of clonal material.

Seedgardens. Although seed is rapidly being replaced by vegetative propagation there is still a place for improved seedlings. In Malawi, plant improvement has been geared to quality rather than to quantity. At present five clones selected for quality and compatibility are grafted into a seed garden. Ultimately it is hoped to reduce this to two clones. Tea is always cross pollinated so with only 2 clones in a seedgarden it will be practical to collect the seeds so that the male *and* female parents are known.

Even from 5 clones the progeny produces excellent quality and much greater uniformity than the old seed types. If a seedling is to be used as seed bearer, about 8 years elapse between germinating the seed and harvesting a seed crop. Grafting an existing seed garden produces a seed crop in 3 years.

Clonal material. Growth from the grafts is very rapid, resulting in a large quantity of cuttings in a very short period. Eight months after the stock is grafted about 100 cuttings per bush are available. If, at this time, the plant is pruned about 15 inches above the graft, a further 500 cuttings per bush are available during the next ten months. Had the scarce clonal material been used as cuttings, rather than scions, the plants would still be in the nursery and it would be another two years before they provided any cuttings at all. The grafted bushes are not easy to manage for cutting production and it is my opinion that after a few years, planters will use clonal plants in the fields as a source for further cuttings.

STUB GRAFT METHOD

The other type of graft I have adapted successfully for commercial use in tea is the stub. A year old plant, in a polythene pot, is selected as the stock plant. An oblique cut is made, about 3 inches above soil level, so as to cut just less than halfway through the stem. The scion, which is usually a 6-inch piece of green-barked wood with 2 nodes, has its base shaped into a wedge with one long cut and one short cut. The scion leaves are usually halved to reduce the weight of the scion. The cut in the stock is opened by bending the stock branch and the scion is put in place. When the stock branch is released the scion is firmly gripped. No sealing or tying is needed.

The top of the stock branch is cut back to be slightly higher than the top of the scion. A polythene bag is carefully put over the whole plant, taking care not to knock the scion out of place. The bag is tied just below the level of the soil in the pot. The grafts are then placed in an area of shade. I am developing another variation where grafted plants are put in sealed polythene tunnels rather than each have its own bag. So far the results have not been so good as the bags.

As soon as callus is obvious on both stock and scion, hardening-off can begin. The first stage is to untie the string but leave the bag in place. Later the bag is completely removed and the stock shoot cut away just above the union. Later the shade is gradually thinned. It seems that this graft can be successful at any time of the year. The controlling factor is the field planting of the grafted plants, which is restricted to December-January, and this works back to grafting in about March, or holding the plants a long while in the nursery.

Comment. Once again the graft is left unsealed. A seal of "Flintkote" (an aqueous suspension of bitumen) has been found detrimental. As yet there is very little known about the influence of the rootstock on the growth of a tea bush. However, extending the knowledge of apples, it seems possible that the rootstock will influence vigour and, in turn, yield. However, as rate of growth is usually inversely proportional to the quality of prepared tea, the rootstock might also influence quality. Trials are already in hand to investigate rootstock influences.

Uses of the Stub Graft. The ease with which cuttings root is a clonal characteristic in tea. It is probable that if a clone of exceptional quality needed for a breeding programme was a poor rooter, then it could be stub grafted. Even on a large scale the production of composite plants is practical, although suckers may be a problem.

SUMMARY

These two methods of grafting have become a practical proposition by using polythene bags to surround the leafy scions. Both methods are relatively simple and can be undertaken by unsophisticated labour. It seems possible that the methods could be adapted for other species which are difficult to graft.