

NOTES ON BUDGRAFTING

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ALTHOUGH budgrafting is now a process which has almost passed from the domain of special technical work into the realm of normal estate procedure, there is yet considerable diversity in the details of the technique adopted by different budders. Most of these variations have been employed experimentally on the Rubber Research Scheme Experiment Station, Nivitigalakele, and it is thought that a brief account of the conclusions reached might be of interest.

CUTTING THE STOCK PANEL

There is a certain amount of variation in the shape and size of the panel cut on the stock for the insertion of the bud-patch. Three types may be distinguished:

- (1) Rectangular panel of such a size that the bud-patch fits closely at sides and top end.
- (2) Rectangular panel about 1 inch longer than the bud-patch, and cut so as to leave about $\frac{1}{8}$ inch space on each side of the latter.
- (3) As No. 2, but with the top of the panel tapered to a point like a Gothic arch.

An experiment was carried out in a well-grown one-year-old seedling nursery at the Experiment Station to test the respective merits of methods Nos. 1 and 3. Sixty stocks were budded by each method, other details being balanced. There was not a single failure amongst the 120 buddings, indicating that, within limits and under the favourable conditions in which the budding was carried out, the shape and size of the stock panel in relation to that of the bud-patch is not a factor of *primary* importance in determining the success of the operation.

Under less favourable conditions, however, there would appear to be certain advantages, and no disadvantages, accruing to the long stock flap as described under methods (2) and (3) above. These advantages are outlined below. They are not purely theoretical, for it is significant that the budding successes secured at the Experiment Station have increased considerably both in the field and in the nurseries since adopting the long tapered panel as described under method (3).

(a) When removing the flap prior to inserting the bud-patch the cambium of the stock is inevitably touched by the spatula, resulting in slight injury at the top end and sometimes at the sides of the panel. With a close fitting patch this damaged portion of the stock cambium may come in contact with the edge of the bud-patch, and the latter may, therefore, not "take". When the stock panel is considerably longer and broader than the bud-patch the latter is placed with its top edge at least $\frac{3}{4}$ inch from the top of the panel, so that the whole of the patch is in contact with healthy cambial tissue. This argument applies with the greater force when the budder is somewhat clumsy or the bark difficult to peel.

(b) The top of the stock flap fits back neatly into its original position, and affords a convenient place for the budder to hold the flap while the graft is being bandaged. The budder must otherwise place his finger over the bud-patch, which may thus be subjected to uneven pressure and the possibility of movement.

(c) In the event of water getting through the bandage the flap whose top fits flush with the stock will clearly give greater protection to the bud-patch than the flap whose upper edge stands out from the stock. In this connection the tapered flap is considered to have a slight advantage over the rectangular flap since there is no horizontal crack in which the water can settle. Field experience with ordinary waxed cloth, which is not impervious to the heaviest rain, has shown that in wet weather the long tapered flap is definitely better than the short rectangular flap.

(d) The fact that the top portion of the flap fits back immediately into its original position helps to keep the flap alive. Indeed, when cutting off the flap at the first examination, it is usually possible to retain the upper portion in the stock.

REMOVING THE BUD-PATCH

At the Experiment Station the bud-lifter designed by R. A. Taylor and sold by Messrs. Hunter & Co., Colombo, is always used for removing the bud-patch except when the budwood does not peel readily. By the use of this instrument the bud-patch is removed in one motion, and there is no need to remove any wood or to trim the patch. Once the use of this instrument has been mastered the process of removing and preparing the bud-patch is rendered foolproof, and a considerable saving in time is affected. The size of the bud-lifter formerly employed was $1\frac{1}{2}$ inch by $\frac{3}{4}$ inch, but this has now been replaced by an instrument which cuts a bud-patch 2 in. long by $\frac{5}{8}$ in. broad. The narrower tool is considered more satisfactory as wasting less buds.

BANDAGING

The experiment mentioned above in connection with cutting the stock panel was also devised to compare the respective merits of different kinds of bandaging tape. The tapes used were:

- (1) Strips of strong white cloth dipped in

Entwas	5	parts
Resin	2	„
Tallow	1	„

This is the bandaging in general use at the Station.

- (2) * Rubberised tape Type A.
- (3) Experimental rubberised tape impregnated with "copperas" (ferrous sulphate).
- (4) * Rubberised tape Type B.

All the tapes were applied in the form of a puttee from the bottom upwards, and a shade of rubber leaves attached.

Altogether 120 stocks were budded and 100% success was obtained with each treatment. Since the weather conditions between the date of budding and the first examination were very favourable for budding success, i.e., fine weather with frequent light showers, the results afford little enlightenment beyond showing that none of the tapes have any toxic effect on the bud-patch. The tape treated with "copperas" was an experimental material but was clearly unsuitable owing to being insufficiently adhesive.

Since one of the main attributes of a good budding tape is its waterproof properties, the following tests were carried out to compare tapes Nos. 1, 2, and 4 in this respect:

Test 1—Stocks were budded and bound with each of the three types of tape, and were then uprooted and exposed to continuous rain for 2 hours. Examination revealed the following:

Waxed Tape.—Water had penetrated the bandage.

Rubberised Tape, Type A.—No water had penetrated.

Rubberised Tape, Type B.—Water had penetrated the bandage but apparently to a slightly less extent than with the waxed tape.

Test 2—Stocks budded and bound with the three tapes were immersed in a bucket of water for 2 hours. The water had penetrated the waxed tape and the rubberised tape Type B,

* Rubberised Tape Type A is procurable in Ceylon from Mr. E. W. Whitelaw, Pantiya, Neboda.

* Rubberised Tape Type B is procurable in Ceylon from Firestone Tyre & Rubber Company, Colombo.

but not the rubberised tape Type A. After 20 hours' immersion in water slight dampness was visible underneath the last-named tape along the lines where the bud-patch projected.

These tests show that the rubberised tape Type A is, for all practical purposes, an absolutely waterproof covering. The treatments to which the stocks were subjected were far severer than would be experienced in practice, since the bandages would normally receive a certain protection against rain due to the shade of rubber leaves. Under average weather conditions the waxed cloth and the Type B tape are sufficiently waterproof, but when the buddings are subjected to very heavy and continuous rain the rubberised tape Type A is clearly to be preferred.

Practical experience in the field confirms the above conclusions. Buddings carried out with the waxed cloth on the Experiment Station during the wet months of July, August, and September, 1931, were very successful, but it is to be noted that no abnormally heavy rain was experienced during this period. In May a number of new buddings on contour platforms were completely immersed for a few hours, and the bandages were penetrated. Work carried out in the Ratnapura District in June and July, which were months of exceptional rainfall, was found to be more successful with the rubberised than with the waxed tape.

The advantages of the rubberised tape Type A over the waxed cloth may be summarised as follows:

- (1) Greater waterproofness.
- (2) Needs no preliminary preparation but is ready for use, in rolls, when required.
- (3) The rubberised tape has been found to need no shade in nursery budding.

The only important disadvantage of the rubberised tape is its high price, though this is partly offset by the smaller length necessary per plant. The costs of the three types of tape per stock of 18-24 months old have been worked out as follows:

Waxed cloth (30 in.) 1·3 cents per stock.

Rubberised Tape Type A (24 in.) 3·7 cents per stock.

Rubberised Tape Type B (30 in.) 1·7 cents per stock.

It is concluded that under normal weather conditions the waxed cloth is entirely satisfactory, but that when heavy rain is likely to be experienced between the time of budding and the first examination the extra cost of the rubberised tape is more than counterbalanced by the greater assurance of success. The Type B tape occupies an intermediate position in all respects; it appears to have only minor advantages over the waxed cloth.

Where large stocks are budded and coir rope used for binding, a patch made by sticking two or three pieces of the rubberised tape together can be recommended in place of the ordinary square patch of waxed cloth.

- It is now believed that when bandaging the stock with waxed cloth very tight binding throughout is advantageous. Theoretically it is preferable to relax the pressure slightly over the bud itself but this does not appear to be borne out in practice. It is certain that more failures are due to loose than to tight bandaging.

TREATMENT OF CUT STOCKS

It is very important, particularly with large stocks, that the cut end should be protected against wood-rotting fungi. Tar was formerly recommended for this purpose; but this has now been replaced on the Experiment Station by a mixture of asphalt and kerosene. The grade of asphalt used is Mexphalte, DX Grade. This is heated and an equal part of kerosene mixed in. The cooled mixture has a consistency rather thicker than oil paint, and is easily applied with the finger or a piece of coconut husk. This mixture is preferred to tar on account of being more elastic and less liable to crack.

The procedure recommended below is based on the instructions issued by the Rubber Research Institute of Malaya, to whom due acknowledgment is made.

After the final examination of the budding the stock should be cut back with a sloping cut to within about 6 inches of the level of the bud-patch. On the day following pruning the cut surface should be covered with a layer of the asphalt-kerosene mixture. When the bud shoot shows about 3 feet of brown bark the snag must again be pruned with a cut sloping slightly away from the shoot. The level at which this second pruning should take place is marked by an external ridge of tissue which represents the limit of the live portion of the stock. Immediately after the pruning the cut surface should be painted with a 10% solution in water of Brunolinum Plantarium or similar water-miscible disinfectant. On the following day the surface is fully covered with the asphalt-kerosene mixture as before. It is important that the protective layer be maintained until the callusing over is completed, and on very large stocks it may be necessary to renew the application.