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Mango Propagation by a “ T ” Graft Method

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The accepted method of propagating mangoes in Trinidad is by ‘inarching’ or as it is also called ‘approach grafting’. This is one of the oldest methods used for the propagation of mangoes and records of its use in India date back to ancient times.

The inarching method consists of the growing of rootstocks in containers for about 12 to 18 months until they have attained a size of at least 3/8 in. to 1/2 in. in diameter when they are grafted on to scions while the latter are still attached to the mother tree. The containers with the rootstock are brought near to the scions by means of a platform or scaffold built under each tree at a suitable height (Figure 1). The graft takes three months to heal, and during this period, they are severed from the mother tree in two stages. Before planting out in the field, the plants are kept in a cool place for another month. It thus requires a minimum of approximately sixteen months to produce a mango plant by this method.

It will be realized that the building of these scaffolds, the growing of rootstocks for such a long period, and the carrying out of the grafting operation on these elevated platforms make this method of grafting slow, cumbersome and expensive.

The scions required for grafting are selected branches, and the number of plants that can be produced is limited by the availability of such branches on existing mother trees. A large number of fully matured trees occupying a considerable acreage is thus required to produce plants in economic quantities by this method and any planning for production has to be carried out several years ahead.

On account of these drawbacks alternative methods have been investigated, and in many countries inarching has been replaced by chip, shield or patch budding. Within recent times veneer grafts have become popular in the United States of America (POPENOE, 1956).

In Trinidad, however, alternative methods have been tried with limited success, and on account of the very low percentage of takes there was no change over from the existing method of inarching.

Investigations were thus initiated to determine the cause of failure of methods reported to be successful in other countries. Several trials of budding and grafting were carried out using different stages of growth of stock and scion, and different wrapping material. After correcting some of the causes of failure, a fair percentage of takes was achieved by patch budding and terminal wedge grafts on one-year old stocks growing in the field, and side veneer grafts on four-month old stock growing in containers and in the field.



Figure 1. Julie mango tree with inarched grafts and scaffolding

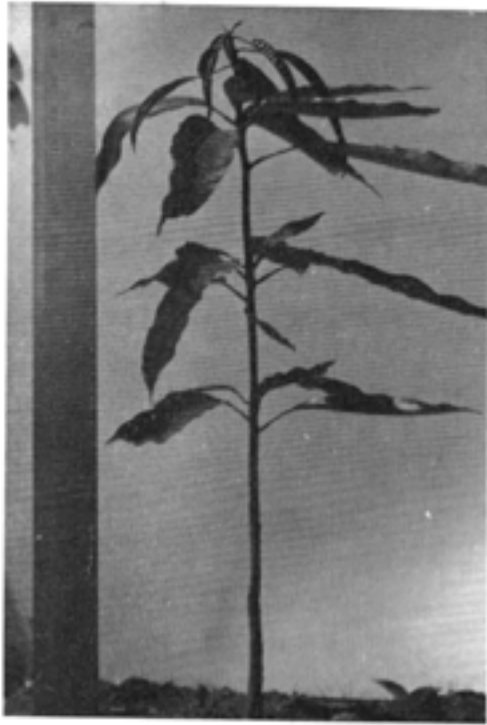


Figure 2. Four month old mango rootstock

With knowledge gained from these trials a new method has been devised for the propagation of mangoes—The ‘T’ Graft Method—which has the advantages of rapidity, low cost, and ease of production.

DESCRIPTION OF METHOD

The ‘T’ Graft Method consists of making a ‘T’ cut in the bark of the stock, and inserting between the wood and the bark a prepared terminal shoot. The scion is then tied firmly to the stock and the entire graft is wrapped with plastic tape.

Preparation of stock

Seeds of a vigorous variety of seedling mango are collected and sown in a germinating medium (cocopeat, sawdust etc.) and after sprouting they are removed to prepared nursery rows in the field. In Florida the hard seed covering is opened (LYNCH and MUSLARD, 1955) and the seed is separated from the husk before placing it in the germinating medium; this is done to reduce the period required for the seeds to sprout.

After four months the nursery seedlings, which should have attained a circumference of in. to 1 in. at 3/4 in. above ground level, may be grafted (Figure 2). This is the minimum size of stock on which a ‘T’ graft can be done with reasonable success.

Preparation of scion

The scions are selected from terminal shoots which have attained a growth of 3 to 4 in. and are at least 4 in. in circumference, with well matured growth on which terminal buds are swollen. The scion must always be slightly thinner than the stock. Thus, in selecting scions for grafting it is necessary to know the size of the stocks available.

Selected scions are defoliated 8 to 10 days before cutting off from the mother trees (Figure 3). This is done to allow the petiole stubs remaining on the shoot to drop off naturally, resulting in the formation of a protective seal at the points of abscission. Scions used without this pretreatment have resulted in a high percentage of failures, as a result of fungal infection through the cut petiole.

A sloping cut is made to the scion starting in from the base of the terminal bud and extending downward to at least 1.5 in., ending with a point on the other side of the scion (Figure 4) .

Grafting

At a point at least 3 in. above ground level, a ‘T’ cut is made in the bark of the stock. The horizontal cut of the ‘T’ is made half way round the circumference of the stock, and the vertical cut is made 1.5 to 2 in. long. The bark at the top end of the vertical cut is lifted sideways and downwards extending to half way down the length of the cut. On the top side of the horizontal cut, at the point where the two cuts of the ‘T’ meet, a chip of bark is removed to facilitate a closer fit between stock and scion (Figure 5).

The prepared scion is inserted between the bark and wood of the stock, and pushed down along the vertical cut of the ‘T’ until the top end of the cut surface of the scion is in contact with the cut surface left on the stock where the bark was removed from the top of the horizontal cut.

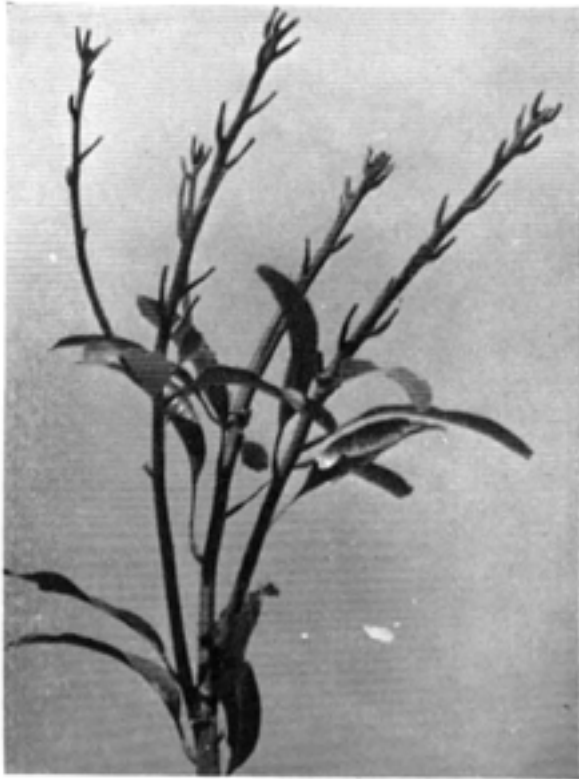


Figure 3. Julie mango branch trait defoliated terminal scions

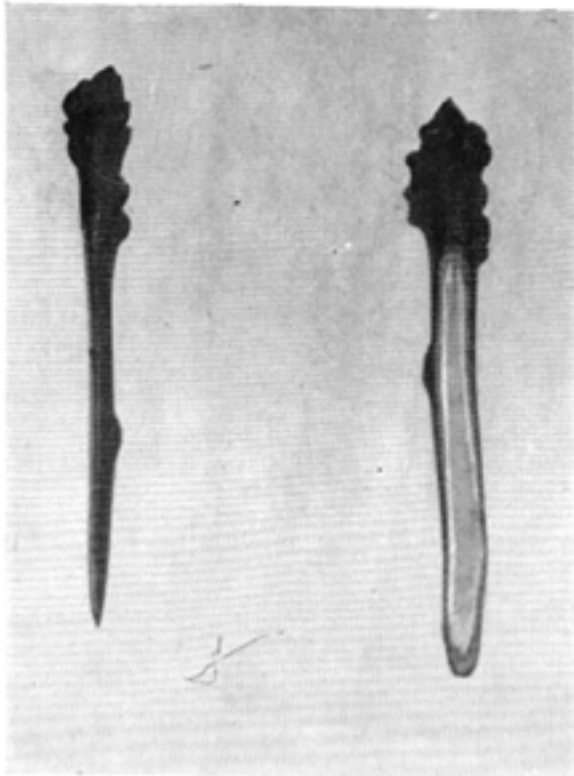


Figure 4. Scions prepared for grafting

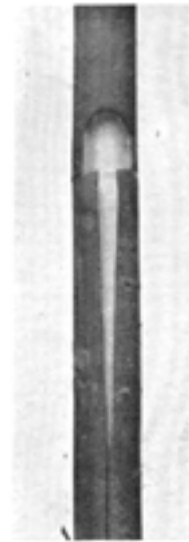


Figure 5. Rootstock with chip of bark removed above 'T' cut



Figure 6. Scion tied to rootstock



Figure 7. Scion wrapped with plastic tape



Figure 8. One month after grafting



Figure 10. Three months after grafting

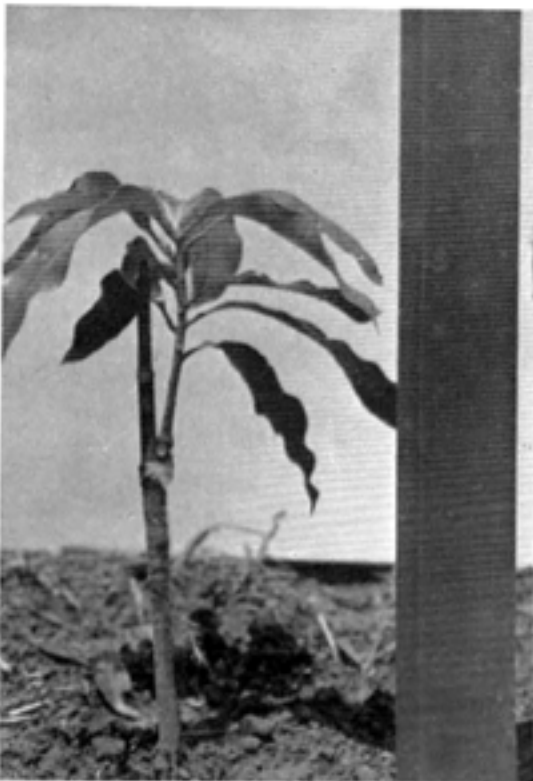


Figure 9. Two months after grafting

The scion is then tied firmly to the stock with raffia by making a knot near the region of the horizontal cut (Figure 6). The entire graft including the terminal bud is finally wrapped with resinite tape or polythene 0.0035 in. x 4 in. (Figure 7).

Over 80 per cent successful grafts have been obtained by the use of this method.

After-care

Twenty one days after grafting the wrapping material is removed from the terminal bud only, and about one third of the growth of the stock above the graft is cut back. The scion at this time is beginning to shoot from its terminal bud (Figure 8). After two months a fair amount of foliage is produced by the scion, and at this time the stock is cut back farther (Figure 9). At three end of the third month a final cut is made to the stock at the top end of the grafted region, and all wrapping material is removed. By this time the scion has grown and produced a crown of foliage large enough for the plant to be transplanted (Figure 10).



Figure 11. Lifted plants for transplanting

Lifting

The percentage of mortality in mangoes on lifting and transplanting is comparatively high. Trials carried out on lifting have shown that by lifting the plant in two stages, the percentage lost by this operation is reduced to a minimum. In the first stage, one month before lifting the plant, at a distance of 3 to 4 in. from the plant the soil is removed from one side to a depth of 8 to 10 in. and the tap root is severed. The soil is replaced, and the plant is given a dressing of sulphate of ammonia at the rate of 1 oz per plant. After the one-month period has elapsed the second stage of lifting the plant from the ground with a ball of earth is carried out. The ball of earth is wrapped with pieces of jute bagging material, and the plant is ready for immediate transplanting, or may be left in a cool place where it can be stored for weeks with a little watering (Figure II).

DISCUSSION

By the 'T' Graft Method a minimum of seven months to produce a fair sized plant is required. This is a saving in time of at least nine months when compared with the inarching method.

A grafter can complete at least 100 lateral grafts by this method in a working day as against 36 by Marching.

The cost of production by the 'T' Graft Method is estimated at 22c. per plant. The Marching method as carried out at St Augustine Station, a Governmental Agricultural Station for the propagation of plants in Trinidad, costs 95c. (B.W.I.) per plant—an appreciable

difference. The cost of production for 1000 plants by both methods is given for comparison

below.

(a) By inarching method

\$ c.(B.W.I.)•	
Seeds and bamboo pots	157.80
Preparation of soil, potting and watering	332.68
Scaffolding	293.30
Grafting, including untaping, cost of tape, twine and tar	174.39
Total	<u>957.17</u>

(b) By 'T' Graft Method

Seeds and preparation before planting	28.00
Preparation of land for planting	7.00
Planting, weeding and manuring	33.60
Grafting, including preparation of scions, untaping, cuttingback and cost of tape	51.25
Lifting	105.00
Total	<u>224.85</u>

*1 B.W.I. Dollar = 4s 2d

The above details of costs of production were prepared in January 1957 when the average rates for labour were as follows:

Men	— \$3.00 per day
Women	— \$2.70 per day
Boys	— \$2.46 per day

Much of the success of the 'Lateral Bark Graft' depends on the stage of growth of the stock. In Florida, rootstocks two to three weeks old are used with good success in chip budding (LYNCH and MUSLARD, 1955). In the 'T' Graft, however, it is necessary to have the bark and wood of the stock well developed, but the plant must remain in an active state of growth. This is noticeable by a new flush of leaves or by cutting the bark when a distinct ooze of plant sap from the cut surface can be seen. At this stage the bark lifts easily.

The type of wrapping material used is important. Resinite CT-4 Clear Budding Tape (size 1 in. x 0.004 in.) and polythene of the same gauge have given excellent results as against raffia and waxed tape. Good results have also been reported with the use of resinite tape in the budding of cocoa (TOPPER, 1956).

There seems to be some difference in the rate of growth of different varieties of mangoes used as rootstocks at least in the nursery stage. Three varieties locally known as 'vert', 'rose' and 'teen' were used as root stocks in these investigations. Of these 'rose' was the most vigorous and gave the best results on grafting. Further investigations are necessary to determine the most suitable rootstock.

SUMMARY

A new method—the 'T' Graft Method—of mango propagation is described. The method consists of making a 'T' cut in the bark of the stock and inserting between the bark and the wood a prepared scion from a terminal shoot.

The cost of producing plants by the new method is 23 percent of the cost by inarching. The output of

plants is greater and the period required to produce a plant is less than half the time required by inarching.

ACKNOWLEDGEMENTS

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