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METHODS OF GRAFTING TAMARILLOS (TREE TOMATOES) (*CYPHOMANDRA BETACEA*)

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History. During 1964, experimental work was carried out at Plant Diseases Division, D.S.I.R., Auckland, on tomatoes. This involved grafting tomatoes on resistant rootstocks for nematode control. As a matter of private interest a few tamarillos were grafted. These few trees were later given to me to study their resistance to root-rot diseases in my tree nursery. The stock used for these trees were *Solanum aviculare* and *Solanum mauritianum*. These grafted plants were planted at random in my tamarillo plant nursery in the field.

During the following winter months disaster overtook this nursery block as 80 percent of the seedlings succumbed to *Phytophthora* root rot, owing to extremely wet soil conditions. The surprising result was that none of the grafted trees were effected.

On the strength of these results I was convinced that grafting tamarillo plants on these rootstocks would solve the *Phytophthora* problem. My property has a clay soil and 60" of rainfall per annum, where seedlings die after a few years of heavy cropping.

Propagation procedures.

Seed Collection. Two stocks were considered, namely *Solanum aviculare*, a native shrub growing in the bush in our area; secondly, *Solanum mauritianum*, a common treelike plant considered to be a noxious weed in the northern parts of New Zealand. Seed of both these species were readily available in our area.

Seed Sowing. Seeds are sown in August under glass in heated soil beds with emergence usually in about 4 weeks.

Potting of seedlings. Late October for *S. aviculare* and mid-November for *S. mauritianum* is when the seedlings are potted. Growth rate varies between the two species. All plants are potted into 5" plastic pots. Once the seedlings have been potted, they are placed in a shadehouse for growing on. One has to be careful not to use too much nitrogen in the potting mix as too rapid growth of the stock plants results in excessive

succulent growth not suitable for grafting. The stocks should be sufficiently woody so that a mechanically strong graft union can be attained.

The *S. aviculare* seedlings attain grafting size by late November. This stage occurs when the stems are of pencil thickness. The total height of the plants above soil level will reach about 12" at this time. The seedlings *S. mauritianum* reach grafting size at least a month later.

Preparation for Grafting. Tools required: Razor blades, 3/4" packaging tape and tape dispenser, secateurs, clothes pegs.

Collection of scion wood. Scion wood is taken from softwood terminal growth of mature tamarillo trees. Trees selected are those producing large fruits of desirable shape and quality. Wherever possible trees should be selected free from virus disease. Scion pieces used are about 2" long with three or four leaves attached. During preparation all but the terminal leaves should be removed. Collected scion wood is kept in a plastic bag.

Grafting Operation. Potted stock plants are brought into the glasshouse. Using a razor blade all leaves are removed from the stem; the top of the plant is cut off about 6" above soil level. Using the razor a vertical incision is made into the stem to receive the scion. The scion piece is then prepared making a pointed V cut about 3/4" long. The scion is then wedged into the cut made into the stock. To hold the graft into place, packaging tape is used, just wrapped around once, the sticky surface on each end of the strip just held together by itself. The two ends so glued together are clamped by a clothespeg to give extra holding strength. The idea of this is to prevent the tendency of the stock to curl back away from the scion wedge. The adhesive strength of the tape is not strong enough to prevent this from happening.

After care. The newly-grafted plants are placed under intermittent mist in shade under glass. The mist is set to run on high moisture output for three weeks. At the end of this time growth will have started on the scion and shoots will develop from the stock — these should be removed. At this stage, the plants can be slowly weaned off the mist for a period of about 10 days. Leaf development is rapid at this stage and plants may be moved to an outside shade house. When suitable conditions prevail plants are lined out in the field or nursery in the open.

Nursery Care. After lining out in the field the young plants are staked to encourage upright growth. Prune off lateral growth, as branches that form in the early growth phase result in weak crotches and later breakages.

Discussion. Over a 12-year period 8,000 grafted tamarillo plants have been planted. The ultimate production of the grafted trees is superior to seedling trees. Spectacular resistance to *Phytophthora* root rots has resulted. Not all my problems were solved, however, as other diseases, such as verticillium, have taken their toll of trees in the orchard. Further work is being carried out to find stocks resistant to the other diseases encountered.

PHYSIOLOGICAL FACTORS LIMITING THE PROPAGATION OF DECIDUOUS ORNAMENTALS BY HARDWOOD CUTTINGS

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Since the initial breakthrough with hardwood cutting propagation of fruit tree rootstocks (2,4,5), the logical progression of research has extended towards the evaluation of such techniques on deciduous ornamental species. Most of such work has been done by the research groups who were involved with fruit tree rootstock hardwood propagation, and a similar trend in emphasis has been true with the N.Z. Nursery Research Centre, where extensive trials are continuing with hardwood cutting propagation of deciduous ornamentals.

The initial approach to the propagation of deciduous ornamentals by hardwood cuttings has been to impose those treatments which were successful on genera such as *Malus* and *Prunus*, to a wide range of ornamental species. Although some species have responded well to the standard treatment, others have not. Subsequent research has established a broad base from which more detailed studies can be developed. Many of the factors limiting the successful hardwood propagation of deciduous ornamentals are similar to those which were found with studies of fruit tree rootstock propagation. When evaluating the factors which limit the propagation by hardwood cuttings, it is essential that all influences are considered in combination rather than each one in isolation.

Juvenility. Although very little is understood about the components of juvenility in plants, the importance of using juvenile plant material for cutting propagation has long been recognized (6). From our recent trials, it has become apparent that the use of juvenile plant material for hardwood cutting propagation is of paramount importance. Other methods of cutting propagation can utilize material which may be temporarily juvenile because of the timing of collection, summer cutting