A REVIEW OF CONTAINER-GROWN GRAFTLINGS, AS PRACTICED BY SUNRAYSIA NURSERIES

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Until recently our nursery's production of all grafted subjects was conducted in the traditional manner of lined out field rows. Inspired by a paper presented at our inaugural I.P.P.S. meeting held at Leura in 1973, presented by Mr. Roy Rumsey, "The Propagation of Container-grown roses," we determined to apply similar techniques to our crops.

As with all differing techniques, there are inevitably disadvantages and advantages when comparisons are made. In the transition from field-produced graftlings, to container-grown graftlings, we believe the advantages far outweigh the disadvantages.

Disadvantages:

Higher production costs due to controlled environmental structures, our current capital costs being: —

1) propagation (controlled environment) house, $150.00/sqm bed space.
2) seedling production polyhouse @ $9.00/sqm bed space.
3) grafting and training shadehouse @ $7.65/sqm bed space.
4) "Hardening Off" open modules @ $1.35/sqm bed space.

Higher transport costs if graftlings are shipped in containers.

Consumer Advantages.

Superior fibrous root system.
No transplanting shock — no reduction in root area or leaf area.
Extended transplanting period.
Pathogen-free potting media.
Reduced period between transplanting and subject maturity = quicker cash returns.
Reduced losses at transplanting.

Nursery Advantages.

Superior working conditions; broader spectrum of skilled craftsmen.
Superior environmental conditions = reduced losses.
60% greater density of plants per unit area.
Extended sales season.
Reduced production period = less man-hours and production closer to market demands.
Superior product = increased good will = increased sales.

PRODUCTION METHODS FOR SPECIFIC CROPS

Over the past five years we have grafted grapevines, citrus, avocados, olives, chinese gooseberries (kiwifruit), pistachio, *Prunus* spp., *Fraxinus, Koelreuteria,* and *Hibiscus;* we are currently extending our techniques to all graftlings grown at our nursery.

Grapevine graftlings. Nematode and phylloxera-resistant stocks — 'Salt Creek,' (Ramsay), 'Dog Ridge,' 'Harmony,' 'Schwarzman,' 'Teleki,' R99, 'So4,' 'K 51-32,' 'K 5 B.B.,' have all been worked to some 40 different *Vitis vinifera* cvs. Stock and scion cuttings are collected during dormancy and dipped in 0.1% "Chinasol", a surface sterilant, for 15 hours. They are stored in plastic bags at 1° to 2°C. Stocks are cut to 36 cm in length and graded into 12 grades from 5 to 15 mm in diameter. Scions are cut to single bud lengths and graded similarly. Stock and scions are bench-grafted (32 cm in length from cutting base to graft union).

Scion and union are wax covered and the cutting base dipped in 2,000 ppm IBA for five seconds. Bench grafts are packed in callusing boxes and cool stored at 1° to 2°C until required for growing on.

During spring callusing boxes are placed on heated benches in the propagating house for 7 to 28 days, depending upon stock cultivar. After root initation, callusing, and bud burst have occurred the graftlings are potted up to 3″ propagating tubes. These are placed under plastic covers, with mist, in the propagating houses for 14 days. They are then weaned from mist and hardened for a further 14 days and moved to the tube house of 75% shade. Once the graftlings are self supporting in late spring to early summer, they are moved to poly plant bags in full light. Graftlings are sold the following winter. In our own vineyards we have transplanted Doradillo/Harmony grafts in September with spring growth 15 cm to 25 cm long, trained them to vineyard trellis in the first season and cropped them at 12.5 tonnes per hectare in the second growing season, a feat certainly not possible had the graftlings been field-grown. This result is due directly to the superior container-grown root system and no transplanting check to growth.

Citrus. Stocks in current demand by our citrus industry, sweet orange, citrange, *Poncirus trifoliata,* citronella, Cleopatra *mandarin,* Rangpur lime, and *Citrus celebica* × *C. grandis* ? *(C. macrophylla)* (Alemow) have all been worked to some 38 scion cultivars with equal success.

Seed is harvested autumn to winter as it matures and is hot water treated at 52°C for 10 mins. It is cool stored at 1° to 2°C

until required for spring planting. Seed is direct sown into 3″ propagating tubes in early spring and grown on in poly houses until early summer. Tubes are potted on to 3 liter poly plant bags and put down under 50% shade.

It is imperative that seedlings are culled during this operation for "bench roots" and off type "sexual embryo" seedlings. Also the tap root must be severed to induce a fibrous branching root system, thus avoiding root binding.

The seedlings are autumn budded with dormant micro buds and grown on the following season. Stocks are cut back to the bud in late winter and scion growth is trained under 50% shade. The trees are moved to full light in early autumn for hardening off. Sales commence 19 months from seed sowing.

Bench grafting of citrus stock cuttings is a very simple operation and produces a saleable tree in the same period as seedling budding. However, the production of large quantities of graftable stock cuttings is more costly than seed production. Bench grafting is a technique which could be used to increase production in the event of late orders for certain stock and scion combinations where seedling grafts do not meet the demand.

The tops of late summer micro-budded stock can be cut off in the autumn and used as stock cuttings. These are bench grafted with whip or cleft grafts on the day of gathering, bound with budding rubber, waxed and set in 75 mm tubes, under mist. Stocks and scions unite as rooting occurs. The grafts are weaned from mist after 24 days and held dormant over winter in the tube house under 75% shade, then potted on to 3 liter poly plant bags in July and trained under 50% shade in the ensueing season. They attain saleable size simultaneously with micro-budded seedlings.

Great regard for the possibility of virus transmission should be taken if this technique is to be employed. We recommend the use only of scion material of the same parentage as that budded to seedlings from which stock cuttings are taken.

Avocado. Both Guatemalan and Mexican rootstocks have been worked to twelve scion cultivars, again with good success.

Seed is harvested autumn to winter as it matures. It is hot water treated at 50°C for 30 minutes and planted immediately in heated propagating houses. As germination commences, seedlings are transplanted to 3 liter poly plant bags and moved to poly houses. Scions are collected in a dormant state from late winter to early summer and stored at 1° to 2°C until required for grafting.

Grafting commences late winter and is completed by early

summer. Once scion growth commences and callus is evident, graftlings are moved to 50% shade for training. Sales commence 18 months after seed sowing.

Chinese Gooseberries. (Kiwifruit) New Zealanders appear to have a preference for 'Bruni' stock. For this reason we are currently using 'Bruni' seedlings; however, we have used seed of most other cultivars and successfully grafted eight scion cultivars to all seedling stocks.

Seed is harvested late winter and sown immediately after extraction in trays placed in propagating houses. Seedlings are pricked out to tubes and grown on in the tube house in 75% shade. Tubes are potted on to 2½ liter poly plant bags in early summer and grown on in poly houses. The seedlings are top-grafted by the whip or cleft graft the following winter. They are moved to 50% shade as soon as union is completed and trained. Sales commence 18 months after seed is sown. All other subjects referred to have been similarly worked with great success, using either seedling or cutting stocks budded or top-worked as with citrus production.

Conclusion. As with all nursery products, the market place dictates the terms. The demand for our container grown graftlings is ever increasing to the extent where we no longer produce any of the above mentioned crops in our field nursery.

SETTING UP A MIST PROPAGATION SYSTEM

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The basic concept of any type of propagation system is to induce roots on a cutting in the shortest possible time. This is usually achieved by subjecting the cutting to an environment conducive to rooting, i.e. high humidity, low light, and zero stress. How one achieves this is left to your imagination, but I would like to discuss just one possible system. I will indicate some of the factors one should consider in the construction of a heat mist propagation bed. Construction of such a bed is relatively simple and usually gives very good results.

Site. Choice of a level site for the construction of a propagation house of any size is important. The major reasons for this are ease of construction and level installation of mist lines, reducing possible drip. General house construction may be of light-weight bubble or igloo design, or a more substantial glasshouse which has been adequately protected from corrosion.