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.

**Water Quality.** A major concern of any mist system is an adequate quantity and quality of water with sufficient pressure to operate mist correctly. Many problems have occured where water quality has been poor due to both salt and disease problems. Dissolved solids in water used for mist systems should be low for two reasons: (1) high salt water will leave a deposit on the surface, thus reducing the photosynthesis rate (very important for adequate root development), and (2) high salt levels are injurious to young roots. High salts also cause marginal burn of foliage of many crops and suppress growth. To overcome these salt problems, a relatively small desalination unit may be installed to clean up your water. Since mist systems use only a small total amount of water, a relatively small unit will often suffice. However, the unit must be large enough to prevent flow restriction when misting is in operation.

Disease pathogens in water supplies can result in almost total destruction of a crop or, at best, spread a disease throughout the nursery. To overcome this a chlorination plant should be installed. This is best sited at the source of water, i.e. at the pumping site or incoming water from main supply. A sufficiently large unit should be installed to ensure treatment of all the water used on the nursery site.

The problem of algal growth has become very noticeable with the introduction of PVC pipes. Chemicals available for control often adversely affect plants. Algae may be controlled with the use of micro-pore filters down to 5 microns. There are several types of filters, including throw-away cartridge types used in homes. Three filters in series may be needed to clear-up the algae. Larger reusable filters are also available. Filter choice should be dictated by maximum water flow required, not necessarily by volume of water used. Mist systems require large volumes of water for only 10 to 15 seconds, so the chosen filter must allow this water to flow easily. If the flow is restricted improper misting will occur.

**Controller.** From experience the time clock system appears to be the best form of mist control. Electronic leaves are generally unreliable at present but improving technology may change their status.

The controller will regulate the amount and frequency of water applied through the mist nozzle so it must be geared to the cutting requirements. Under hot, dry conditions high mist frequencies are required, and vice-versa. It is often better to have high misting frequency and short actual mist time, rather than the opposite. This is because one wants to keep the leaf surface moist, reducing transpiration of cutting rather than watering the cutting.

**Mist Heads.** Mist heads should be chosen keeping in mind the following conditions:

(1) an inbuilt filter, easily cleanable
(2) adequate coverage
(3) even mist

There are many kinds of nozzles on the market at present which do the job satisfactorily provided the correct water pressure is applied. If pressure is too low, the nozzle will not give adequate coverage. The mist will not be fine enough and will result in dry edges. If pressure is too high the mist may be too fine resulting in cloud formation, again resulting in dry spots. Mist nozzles should thus be chosen to match the water pressure on site or a pump should be used.

The use of the inbuilt filter helps prevent blockage of very small orifices in mist nozzles. This is important in filtering out any additional algal growth which may occur in the mist line.

The mist line should be level to ensure even misting. Water will find its own level and will flow to the lowest point. This means that the mist line will tend to drain itself at the lowest point during misting interval. Thus, to avoid this the line must be level. Misting times will also vary considerably if the water line is empty. It will take some time for the water line to refill before proper misting will occur over the total length of the line. This leads to longer misting times at one end and shorter at the other end, giving a wet and a dry end. Levelling the line obviates this.

There are many factors which can cause problems with insufficient water supply. This mist system supplies a large amount of water in usually a few seconds, i.e. 15 to 20 seconds. An average line probably uses approximately 9 to 13.5 l of water during this time, which is about 27 to 54 l per minute. Thus, to ensure sufficient water at the mist nozzle, feeder line size must be relatively large, e.g. 25 mm.

In the case of larger areas, more than one solenoid may be required to give an adequate mist system. Lines may be controlled independently with each line having its own controller, or electronically operating a tripping sequence of each solenoid with one controller.

Mist head spacing is very important. For a mist nozzle which has a 1.8 to 2.1 m spread, the nozzles should be placed 0.9 to 1.2 m apart. This ensures good overlap and adequate coverage.

**Bench Heating.** Rooting times and percentage strikes are dramatically improved by keeping the temperature of the rooting medium at 23 to 25°C (70 to 75°F). This can be achieved either by using hot water pipes or electric cables buried in sand or concrete blocks, or directly in the rooting medium.

The amount of energy required to heat a misting bench is approximately 15 watts/square foot or 56 BTU/square foot. For example, a bench 30 × 1.8 m (100 × 6 feet) requires approximately a 34,000 BTU heater or 9 KW heating cable to hold the bench at 25°C (75°F). For a bench which does not have mist, the energy requirement is approximately half; i.e. 30 BTU/square foot or 8 watts/square foot. The figures are approximately the same for sand and cement benches. The temperature in the bench is controlled by a thermostat which turns the heat on or off as required to maintain soil temperature. To check the temperature at differing positions on the bench simply insert a thermometer into the soil mix and read the temperature.

Technical information is usually available from suppliers of mist equipment.

## CAMELLIA PROPAGATION

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There are many references in the literature to the vegetative propagation of various species of plants by cuttings. In my observation the majority of these articles assume that the effect of treatment on all plant materials which can be broadly claimed as similar, will be comparable irrespective of the species. For example, commonly used commercial rooting powders are available in three strengths to meet the needs of all cuttings within the broad classifications of softwood, semi-hardwood and hardwood. I believe that such an assumption is unlikely to be valid and advance the view that there is need for further specific studies on the rooting behaviour of cuttings of various species.

This is particularly true with camellia in which root formation is so slow that the cutting may expend its store of energy, or for some other reason, die before developing a root system of its own. Such an eventuality is less likely in kinds of cuttings that root quickly. Unlike some plant species which initiate roots in cuttings through apparently intact bark, the camellia only does so through a callused wound. The propagator's success is in some measure a reflection of the speed with which callusing can be induced.

My procedure in the treatment of camellia cuttings is the consensus of opinion from the many articles available on the