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 subject. Cuttings are taken when the new spring wood hardens to a degree that it will snap when bent and when it changes colour from green to light brown. This normally occurs in Hobart, Tasmania, in mid-summer. Cuttings are ideally 10 to 15 cm long and cut from the parent plant at the leaf axil from which the growth originated. The lower 1 to 2 cm of the cutting is wounded by slicing the bark sufficiently deep to expose the cambium. The prepared cutting is dipped into a suspension of Captan, approximately 5 g to 500 ml of water. Until 1978 all cuttings were then treated with a commercial rooting powder named as appropriate for use with semi-hardwood cuttings. They were planted some 4 to 5 cm deep into a medium consisting of 75% coarse sand and 25% peat. As is the usual practice, they are then held in a glasshouse on a sand bed heated to 22°C and under an automatic misting system.

Using this technique approximately 65% of all cuttings set reached maturity as viable plants after one year. No reference can be found in the literature to the percentage of cuttings that a propagator might reasonably expect to raise to maturity, but the 65% achieved is not accepted as satisfactory.

Several factors which might limit the success of the operation could be recognised, but the most important probably related to the inadequacy of the glasshouse. Great difficulty is experienced in maintaining the ambient temperature in the house sufficiently low to meet the percept that the cuttings should have "warm feet and cool heads".

In 1979 two experiments were initiated with cuttings collected under conditions similar to the previous years. In the first experiment a total of 1,440 cuttings of *Camellia japonica* or C. × williamsii cultivars were selected at random from 128 different cultivars. After preparation these were stood for 24 hours prior to planting in a 20 ppm aqueous solution of indole-3-butyric acid (IBA) as recommended by Hartmann and Kester (3).

The cuttings were divided into four unequal groups and placed into the following media as listed in Table 1. All groups were, as usual, held in the glasshouse on a sand bed heated to 22°C and under automatic mist.

Heat and misting were discontinued after 100 days and the cuttings examined after a further 80 days (Table 1.). The bottom heat was discontinued at 100 days due to the operator's absence. If the heat had continued longer, the percentage rooted in all groups should have improved, though the relative efficiencies of the various media would probably have been similar.

The anticipated percentage of cuttings surviving to viable

Table 1. The effect of media composition on the rooting of camellia cuttings treated with 20 ppm aqueous IBA

Rooting Medium	Number of Cuttings	Number Rooted at 180 Days	Number Callused but Without Roots at 180 Days	Percentage Rooted at 180 Days	Anticipated Percentage Surviving at 365 Days
GROUP I 75% Fine Sand 25% Peat	292	20	57	7%	13
GROUP II 50% Fine Sand 25% Polystyrene 25% Peat	537	245	85	46	51
GROUP III 75% Vermiculite 25% Peat	323	220	25	68	73
GROUP IV 50% Fine Sand 25% Perlite 25% Peat	288	76	30	26	33

plants at 365 days was calculated from previous experience which showed that of cuttings well callused but not rooted at 100 days, approximately 66% subsequently rooted.

It should be stated that the fine sand used in these mixtures was much finer than that used in previous years and complied with the specifications for sand used in the U.C. System for Container Grown Plants (1). The very poor results achieved in Group I may indicate the transcending importance of a medium which will allow adequate aeration of the cutting. In retrospect, it is unfortunate that a group of cuttings was not included using the type of coarse sand tested in previous years. The results in Group III, where the cuttings strongly rooted, suggest that this medium is worthy of further investigation.

The second 1979 experiment involved 120 *C. reticulata* cuttings drawn from 10 different cultivars. This material was divided into 4 groups each containing 30 cuttings and comprising 3 cuttings from each cultivar.

Hormonal treatments were applied as listed in Table 2. Apart from the hormonal treatment, all cuttings were treated similarly to those in Group 1 of the first experiment. The results are summarised in Table 2.

Table 2. The effect of hormonal preplant treatments on the rooting of camellia cuttings.

Hormone Treatment	Number of Cuttings	Number Rooted at 180 Days	Number Callused but Not Rooted at 180 Days	Percentage Rooted at 180 Days	Anticipated Percentage Survival at 365 Days
GROUP A 20 ppm IBA for 24 Hours	30	7	10	23%	47%
GROUP B 100 ppm Ethrel for 2 hours	30	3	11	10	33
GROUP C 400 ppm IBA in 50% ethanol for 5 seconds	30	7	14	23	53
GROUP D 1000 ppm IBA in lanolin	30	6	12	20	47

The only specific reference known to me concerning hormone concentration in the rooting of camellia cuttings is that used in Group A as given by Hartmann and Kester, (3). Jacobs and Steenkamp (4) state that the method of application of IBA as detailed in Group C gave satisfactory results in the propagation of proteas. Also, Fordham (2) in propagating mountain laurel experimented with a wide range of concentrations of IBA from 500 to 80,000 ppm and recorded success throughout the whole of the range, particularly when NAA was included.

The results achieved in Group C suggest that further observations with high concentrations of IBA in the rooting of camellias are required.

The use of Ethrel in Group B follows a suggestion made by Menary (5). This compound has been shown to stimulate the synthesis of endogenous auxins. It was suggested with the thought that the plant might synthesise endogenous rooting hormones in response to ethylene.

It seems remarkable that Group A in the second experiment should have rooted so much better than Group I in the first experiment, as both received identical treatment, and Group A was of a species normally regarded as difficult to strike. It is suggested that this reaction is probably related to differences in water management between the two groups and, if so, again emphasises the critical importance of the micro-environment in the rooting media.

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USE OF HARDWOOD BARK IN COMPOSTS

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Eucalypt bark is being composted by ponding it for 3 to 6 months and storing from 12 to 18 months prior to use. More research is needed, however as there are still a few problems to be sorted out, the method of composting and the time required being the most important.

Mr. Stan Clark, who is composting and marketing the material, believes a period of 20 to 24 months is essential to completely break down the solid particles of bark. He has found that after 18 months considerable heat returns to the stockpile if it is turned over. This pile should consist of at least 75 m^3 to get 55 to 60°C temperatures for pathogen control. This is achieved without the addition of any form of nitrogen. However, small trials in compost bins with chemicals added only gave 43°C for a period of eight days, but this then dropped back to 15.5°C.

Partly composted materials also create a problem with earthworms. They chew it up and almost completely empty tube stock, not leaving enough medium for the plant to exist on. Some toxins do remain and adversely affect growth. However, this can be improved by the addition of a nitrogenous fertilizer. Osmocote is very effective.

With some plants, particularly in the Primulaceae family, growth is excellent with rapid root penetration. We grew the best crop of polyanthus in 20 years with 100% bark, plus Osmocote, with a small amount of superphosphate added.

In the case of eucalypts and Australian natives large white roots can appear in a matter of three weeks in 12 cm pots. This