RESULTS

Axillary buds were rapidly induced from axillary meristem of the node explant. Induction of axillary buds in the range of 87% to 100% was achieved after 13 days in culture. Benzyladenine (BA) at 0.5 to 2.0 mg litre^{-1} had no effect on the induction of axillary buds. The rooting of axillary shoots was promoted by the addition of NAA at 0.05 mg litre^{-1} to the medium. Through this procedure genetically stable plantlets were ready for acclimatisation in approximately 75 days from the start of culture.

When the shoot internode explants were cultured on the media with BA added, callus and adventitious shoots were formed on the cut end of the explant. The formation of adventitious shoots was best on the medium supplemented with 1 mg litre^{-1} BA.

A large number of plantlets were produced using leaf cuttings as explants. Two types of shoot formation were observed. One was from the cut section of the leaf (by which it was divided into distal and proximal halves) and callus was often induced from the cut surface. The other was from the mid-vein near the petiole of the proximal half of the leaves. Benzyladenine had a greater positive effect on organogenesis of these explants than did isopentyladenine (2iP). Benzyladenine at 2 to 3 mg litre^{-1} resulted in the highest adventitious shoot formation per explant. The formation of adventitious shoots from the cut section of the distal half of the leaves was greater than that from the proximal half.

SUMMARY

Micropropagation can be used successfully to obtain a large number of clonal plantlets. Three types of explant material can be used; leaf cuttings on M&S medium supplemented with 3 mg litre^{-1} BA, shoot internodes on M&S medium supplemented with 1 mg litre^{-1} BA, and nodal segments on M&S medium with no added BA. Adventitious shoots or axillary buds will be induced depending upon the source of the explant material. All plantlets should be transferred to a rooting medium (M&S plus NAA at 0.05 mg litre^{-1}). Once roots have initiated the plantlets can be acclimatised and eventually moved to a greenhouse environment for growing on.

Propagation of *Michelia* and *Manglietia*

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SEED

Plants produce clusters of seed pods varying from a few to 20 or more capsules, each containing one or two seeds. Hard black seeds are surrounded by flesh varying in colour from orange to pink or red. Pick the capsules when they first begin to split or show colour when exposed by cutting. Split open fully to remove seed from capsules, squash the flesh or remove from around the seed. Some growers recommend washing the oil from the seed with detergent in case this inhibits germination. The only species for which we find this may be necessary is *Michelia champaca*, which has been difficult to germinate. Most varieties germinate easily if the seed is fresh. The seed should not be allowed to dry out as viability drops markedly. Under

Australian conditions the seed can either be sown inside or outdoors. Inside provides greater environmental control and may be necessary for colder regions. No pregermination treatments are required. Netting may be necessary to prevent losses to birds.

CUTTINGS

Most *Michelia* and *Manglietia* strike well but there are exceptions. Young stock plants are important to obtain good results. Stock plants should be clean and free of mites and other pests. Terminal or side shoots both strike but the maturity of the wood is the limiting factor. Cutting material is usually taken in January and February, however this will vary according to climatic region. The material is cut to 10 to 15 cm lengths with 2 or 3 leaves which have been trimmed to reduce size. A shallow side cut is made in the base and the cuttings are then dipped in 0.75% IBA talc. The cuttings are stuck into the propagation media and watered in with Previcur fungicide or similar product. These are placed under mist with or without bottom heat. Strike rate varies from 40% to 60%, sometimes higher. However, disaster can also occur with rates as low as 5% to 10%. Stock kept in the same light level as the propagation house may help to prevent leaf drop which often occurs quickly after cuttings are made. High humidity in the first 1 to 2 weeks is essential to prevent cutting stress.

AERIAL LAYERING

Aerial layering is traditionally used in Asia but is very time consuming. Needs constant checking to prevent drying out. Not a technique to use when large quantities of plants are required. Scoring or etiolating the stem before tying the cover may hasten root development.

GRAFTING OR BUDDING

This is a successful method of propagation for *Michelia*, however, *Manglietia* has not yet been tried to any extent. The graft type used varies depending on stem thickness. Scions of some species are thick and pithy, making them awkward to work with. Others are thin with very few side buds, e.g. *Michelia alba*. Side veneer is best due to the thin cambium and pithy centre, although other methods could be used with careful understock and scion selection. Understocks should be vigorous and healthy. Grafting onto *Magnolia*, although initially successful, has had long term problems with overgrowing. More research into the selection of *Magnolia* understocks is required.

Budding works well with those varieties which have thicker stems and large buds. Some varieties have tiny buds and thin wood making budding difficult. A chip bud is usually used. Buds should be cut shallow and leaves are usually removed from the bud or scion but with a piece of petiole left on the buds to act as a handle, these can then be stored in the refrigerator until needed. The graft should be tied with plastic or rubber ties. Budded or grafted plants should initially be kept shaded and in a humid environment. After 1 or 2 weeks these can be hardened off.

TISSUE CULTURE

This is a definite possibility for these genera as many *Magnolia* species are now routinely micropropagated. This technique will require some initial research to

avoid weaknesses or distortions occurring in the resultant plants. These problems have restricted micropropagation of *Rhododendron*, *Kalmia*, and other genera. This method may not be the cheapest but has great advantages in building up numbers quickly and in the export of material overseas.

Propagation Techniques for a New Flower Bulb Crop (*Lachenalia*)

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A NEW CROP

Lachenalia is a bulbous genus endemic to the south western Cape in South Africa (SA) and belongs to the Liliaceae family. The genus comprises approximately 110 species and a number of these are grown commercially on a small scale, e.g. *L. aloides*. ARC-Roodeplaat developed, through breeding and selection, a number of cultivars which are currently being test marketed in Europe as both garden and potted bulbs.

CHALLENGES REGARDING PROPAGATION

Lachenalia, like *Ornithogalum*, is susceptible to Ornithogalum mosaic virus (OMV) and to a lesser extent tobacco necrotic virus (TNV). Unfortunately the disfiguring symptoms are displayed soon after infection. Compounding this, is that OMV generally occurs in the natural habitats and in bulbs of commercial growers in SA who are situated mostly in the northern provinces of the country. Experimental plantings became totally infected after 2 years. ARC-Roodeplaat had to successfully overcome this problem if *Lachenalia* was to be introduced into the very competitive international flowering bulb market.

SOLUTION

Although the propagation of *Lachenalia* is presently insignificant, a plant improvement scheme consisting of four stages has been implemented. The problem of viral infection appears to have been solved. Fortunately the system was developed at a very early stage in the commercial production of this genus.

The scheme consists of the following phases:

I) Through selection and repeated testing for virus, virus-free nuclear plants have been isolated and are being maintained in an insect-free greenhouse where the guidelines of the European and Mediterranean Plant Protection Organisation are applied.

II) In vitro propagation of virus-free stock plants.

III) Production of propagation material by means of leaf cuttings. Tissue-cultured plants are transplanted into a gauze house some 2 km away from other plantings.

IV) Bulblets produced during phase III are further multiplied by leaf cuttings, chipping and natural offsets. No other bulbs are grown in a radius of 5 km from this nursery.