MICROPROPAGATION OF TREE FRUITS

D. COHEN AND S.S. BHOJWANI

Plant Physiology Division, D.S.I.R.
Palmerston North, New Zealand

Over the last few years, there has been significant progress in the micropropagation of a number of tree fruits including apples, pears and peaches and plums.

Commercial nurseries have been established in Oregon and British Columbia to produce both rootstocks and scions. A number of advantages of micropropagation have been suggested:

(a) to assist the passage of new plants through quarantine
(b) to build-up plant numbers rapidly following quarantine
(c) to respond more quickly to orchardists' demands for specific types of trees
(d) to enable hard-to-root cultivars to be grown on their own roots

Despite the enthusiasm for micropropagation of tree fruits, very few plants have been grown in the field to check for uniformity of fruit. Furthermore, the economics of production have yet to be compared with the costs of conventional procedures. The research and development costs incurred to date have largely been born by government research stations or by universities. Operating costs for micropropagation must be kept as low as possible if the method is to compete with conventional propagation for established cultivars. The small rooted plantlets coming out of culture are only the first stage in a production sequence. If the methods are to be successfully adapted by the nursery industry the whole sequence from culture vessel to final tree needs to be reviewed.

At the Plant Physiology Division we have recently extended our micropropagation programme to include a range of tree fruits including apples, pears, peaches, Asian pears, persimmons and grapes. We aim to test suggested procedures, where available, on cultivars of interest to our industry and to develop new procedures where needed. Once methods have been established, it will be necessary to test whether they can be fitted into the production requirements of the nursery and fruit industries.

With regard to the proposed advantages of micropropagation the following points should be considered:

1. **Obtaining high-health plants.** Although meristem-tip culture, sometimes in conjunction with thermotherapy, is very useful for elimination of viruses, it does not remove the need for thorough indexing. In the case of some of the tree viruses, the only known indexing procedures require at least two growing seasons.

The existing thermotherapy procedures for tree fruit viruses appear to be working well.

2. **Quarantine.** Most quarantine services will insist on re-indexing fruit trees to ensure freedom from virus. There is always the possibility that:

(a) a virus has been present, but in too low a concentration to be detected in the test used in another country
(b) reinfection in the field has taken place, or
(c) a virus of concern was not included in the indexing programme of the originating country

3. **Initial multiplication following release from quarantine.** In exactly the same way that cultivars may differ in vigour, growth habit or ease of rooting, so the requirements in micropropagation will often vary. The amount of material released from quarantine is usually limited. If existing procedures work well, then rapid bulking to several thousand plants should be readily obtained within a year. If a cultivar is difficult to handle, the small amount of plant available for tests may limit an investigation of requirements and delay propagation by a year.

4. **Genetic stability.** There is no evidence to suggest that the genetic stability of plants being propagated by axillary bud proliferation will be any different than with other procedures. Some of the red sports of apple cultivars are known to be unstable and scion wood should only be collected from fruiting trees which are regularly inspected for trueness-to-type. With such cultivars, care willl be needed in micropropagation to avoid adventitious bud induction.

In the scheme suggested by Cheng (1) a high rate of shoot multiplication (30 fold per month) is considered desirable. In this case adventitious buds are likely to be induced and are difficult to distinguish from axillary buds. It may be better to use lower cytokinin levels in which shoot elongation is greater and to subculture only those shoots which clearly arise from an axillary position. A multiplication rate of 5 or 10 fold/month might still be achieved.

5. **Rootstocks versus cutting-grown trees.** Rootstocks are used for three main reasons:

(a) when scion cultivars are difficult to root
(b) for control of plant vigour and fruitfulness
(c) for resistance to adverse soil conditions or pathogens

Although many scions cultivars can be rooted using micropropagation it may still be desirable to use a rootstock for the latter two reasons. A number of apple, pear, plum and cherry rootstocks are being cultured by laboratories overseas.

It would be desirable to micropropagate new promising rootstock or scion cultivars as soon as they are released from quaran-

tine. Sufficient plants could be propagated so that within 1 to 2 years several blocks of about 0.5 hectare could be established on growers' properties in each of the main fruit-growing regions. If these trees were inspected by MAF[1] inspectors any off-types could be marked and only true-to-type trees used for further propagation. This scheme has the advantage that blocks large enough for cultivar evaluation would be rapidly established and the suitability of the cultivar for micropropagation could be established. If the cultivar was needed for large scale planting the trial blocks could provide sufficient scionwood for propagation by either conventional means or by micropropagation. In the case of rootstocks, these trials would supply information on suitability for different regions. If the rootstock was needed in large numbers either micropropagation, stools or cuttings could be used.

REFERENCES

1 Cheng, T-Y. 1978 Clonal propagation of woody plant species through tissue culture techniques *Proc Inter Plant Prop. Soc* 28 139-155

2 McComb, J A 1978 Clonal propagation of woody plant species with special reference to apples *Proc. Inter Plant Prop Soc* 28 413-426

3 Zimmerman, M 1978 Tissue culture of fruit trees and other fruit plants *Ibid* 28· 539-545

[1] Ministry of Agriculture and Fisheries

APPLICATION OF MICROPROPAGATION METHODS FOR BLUEBERRIES AND TAMARILLOS

D. COHEN

Plant Physiology Division, D.S.I.R.
Palmerston North, New Zealand

At last year's annual meeting I presented a paper (1) outlining procedures for the micropropagation of high bush blueberries and tamarillo (tree tomato). Over the past year, we have applied these methods to a range of cultivars and several commercial laboratories are now using the methods. In this paper I wish to bring you up-to-date with our progress.

BLUEBERRIES (*Vaccinium corymbosum*)

Incubation Conditions. The standard conditions in our culture room are as follows: temperature 26 ± 1°C with lights on for 16 hr/day. Illumination is supplied by 40-watt cool-white fluorescent tubes mounted 40 cm above each shelf. Two rows of two tubes illuminate a shelf of 2,400 × 1,200 mm.