Handling of Propagation Material: the Nursery Perspective

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There is no doubt the most significant development to occur, in my 43 years as a propagator of grapevines, has been the organisation of the production and distribution of superior selections of Vitis species.

When I moved from the field of research to commercial propagation in 1962 I found, to my dismay, that there was only one variety, of the one hundred or so in commercial demand, for which it was possible for me to source scientifically proven genetically superior propagated. That variety was Sultana and the selection work was conducted by CSIRO scientists. This work continues on a multitude of varieties to this day.

The viticultural industries have now developed a network of vine improvement associations fostering the multiplication and distribution of genetically superior propagules of known health status. In this year, 1995, we are about to embark on a national accreditation scheme which will give the industry quality assurance hitherto unavailable.

By using material obtained through the accreditation scheme and by applying the skills of nursery propagation grapegrowers will be able to maximise the potential of new plantings. The following information provides further insight into techniques to maximise the potential of planting material from the point of entering the nursery as accredited material, through the nursery process and as nursery material is planted in the final vineyard site.

Key factors into the nursery

Genetically superior selections
As a professional plantsman, relying upon the performance of my plants for a livelihood, I can today be assured of an increase in fruit yield of as much as 25% by taking my cuttings from the right mother-vine.

Mother-vine health
Viticulture is a big numbers game. We need large numbers of mother-vines to produce large numbers of cuttings in order to plant vineyards at densities as high as 2,200 vines per hectare or in the case of some situations as many as 4540 vines per hectare.

To produce cuttings from registered mother vine plantings the industry is totally reliant upon individual vineyard managers in all grape-growing regions of Australia, upon whose properties these plantings are established. The managers concerned have a sense of responsibility to the industry and a dedication to quality management in producing well nourished disease free cuttings.

Storage of plant material
It is important to remember that dormant vine material is a respiring organism and requires particular care to ensure its future viability. Key factors in this storage include:

- Humidity. The key issue is maintaining the water content of the cutting and a high humidity minimises potential water loss.

- Fungi and bacteria. Conditions of high humidity can be conducive to growth of fungi and bacteria.

The use of controlled environment cool rooms run at 2-3°C with 100% relative humidity has revolutionised the storage of dormant plant material. When compared with previous techniques — e.g. sawdust and sand storage — the costs of storage have been greatly reduced and the viability of stored tissue extended considerably.

Surface sterilisation of cooled cuttings by steeping in Chinosol (see Appendix) solutions is under review by large commercial nurseries. Alternative fungicides and bactericides are being trialled, together with storage at 100% relative humidity.

Key factors out of the nursery

Key factors into the nursery

Professional integrity and accreditation have been discussed above and provide a constant theme. These issues are mandatory in ensuring the development of a viable commercial vineyard.

Hot water treatment
Hot water treatment of cuttings and rootings, for the suppression of crown gall and surface sterilisation prior to grafting, is becoming a more widely used technique. However, extremely accurate temperature control and timing of exposure is imperative to success (see Appendix). Death of plant tissue or ineffective treatment are the consequences of incorrect procedure.

Key factors out of the nursery

Liaison
Communication between the grower and nurseryman is critical in ensuring the successful establishment of a new vineyard. Key issues include timing and the need for optimal conditions for:

- Soil temperature. A soil temperature of between 12 and 15°C is critical to ensure initiation of root growth.

- Water availability. Water must be available as the new vine requires. At planting the vine occupies as little as 0.01% of its available soil volume, which increases to almost 1% in the first 6 weeks of growth; clearly this leaves a very small margin for error in watering.

- Hot water treatment. Hot water treatment of field produced plants and cuttings for interstate movement are now mandatory requirements.

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Storage hydration. Rehydration of stored plant material is an essential step in both propagation and field transplantation. Plant material steeped in chlorinated water for up to 24 hrs ensures an adequate moisture supply within the plant tissue to ensure active growth. With 98% of the vine's weight being water, it is obvious that dessication in any form is a major contributor to ineffectiveness in success in both propagation and transplantation.

Preparation. Full preparedness at planting is a major factor in success in vine establishment. Soil moisture levels, irrigation systems ready to operate, adequate windbreaks all help ensure maximal vineyard growth.

Conclusion
Professional nurserymen view their responsibility to the viticultural industry with great concern and use their skills to bring their clients the most improved material in the healthiest state. Nurseries must use methods which maximise the chances for vine establishment and provide a key link between improved planting material and the grape grower.

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To take cuttings, handle, cool store, etc. the cost is about 10 cents per cutting. Vine improvement society material is about 20 cents per cutting (Table 2). The cost difference for superior VIS propagation material is $1.85 per hectare, less than 1% of total vineyard development costs. When this difference is compared with the yield differences between good and bad planting material which could range from 20 to 40%, the argument for VIS cutting material is very strong.

Risk management
There are a number of factors that can affect vine performance and if they can be measured or assessed at the cutting or nursery stage, future problems may be reduced or eliminated.

If you purchase cuttings or rootlings of (say) Shiraz, can you assess or measure the factors which are important for maximum productivity of your vineyard? Table 3 presents some of these factors and indicate whether they can be measured and treated for cuttings and rootlings. Treatment with hot water for crown gall, nematodes, and some viruses can eliminate the problem, but prevention of the problem in the first place is the best course of action.

This leads to the recommendation of use of vine improvement society cuttings grown by a reputable nursery using good nursery procedures. Accreditation systems are currently being developed by AVIA and some nurseries to ensure that the highest quality planting material is available.

In vineyard development, like other horticultural activities, it is rarely possible to do everything perfectly. Aim towards the best possible practices and minimise the risks of things going wrong. If some compromises have to be made, make sure you are fully aware of the risks and consequences involved.

Remember that poor quality planting material will be around to haunt you for the life of the vineyard, at least 25 years!

APPENDIX

Hot water treatment
The most common uses of hot water treatment are to reduce nematodes and phylloxera on roots of dormant rootlings, or to reduce infections of crown gall in dormant cuttings. It should be noted that hot water treatment is likely to reduce infestations of some of the other nursery transmissible pests and diseases in addition to its primary target, and thus benefit the grape grower.

Cuttings
Recommended hot water treatments are as follows:

| Rootstocks | 50°C for 30 minutes |
| Vinifera cuttings | 50°C for 20 minutes |
| Single bud cuttings | 50°C for 15 minutes |

Rootlings

| Bare rooted material | 52°C for 5 minutes |

Cuttings must be fully dormant, as hot dipping will severely affect cutting viability on material which is starting to move out of dormancy. Hot dipping should be undertaken as follows:

- After hydration of bundles for material which is not to be stored.
- After hydration of bundles and prior to dipping in Chinosol® for material destined for cool storage.
- After cool storage, when cuttings have been acclimatised to ambient temperature but still fully dormant, and prior to grafting
- Immediately after the prescribed period the bundles should be removed from the hot dipping tank and plunged into clean water at ambient temperature for 20–30 minutes.

Soil pasteurisation
Media used for vine propagation should be pasteurised at 60°C for 30 minutes.

Chlorination of water

| Washing water | 500 ppm chlorine |
| Soaking water | 5-10 ppm chlorine |

Chinosol® dipping

Chinosol® (8-hydroxyquinoline sulphate) dipping requires the following procedure:

- A 0.5% solution of Chinosol® is prepared in an inert container, e.g. plastic (metal inactivates the compound).
- Earth filtering the solution after each batch of cuttings is recommended.
- pH should be maintained at 3.85–4.0 by addition of acid.
- The concentration may be monitored by use of test strips (from the manufacturer) and should be maintained above 0.25%.
- Following hydration, bundles are soaked in Chinosol®: Scionwood for 5–7 hours. Rootstocks and cuttings for 12–15 hours.

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