Propagation of Grape Vines by Micrografting

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INTRODUCTION

The French have a world patent on the green-grafting process. Green grafting has been used in commercial production of grape vines in both France and California. A personal interest in the work being done in France led me to apply for a Churchill Fellowship. This award allowed me to travel to California, Italy, France, Holland, and Germany during 1994 and witness the process of green grafting.

THE METHOD OF GREEN GRAFTING

All rootstock and scion selections are screened for viruses and have certified health status prior to introduction to the growing house. The growing house is a strictly controlled environment. Lights control day length and ventilation controls the temperature and humidity. Rockwool, is used as a hydroponic-type substrate for the vines which receive a constant nutrient feed. The rootstock is ready to graft when the stems reach a length of 1.5 to 2.0 m and are 2 to 4 mm in diameter. Rootstock and scion are sprayed with a systemic fungicide 3 days prior to green grafting. Grafting material is collected as close to the time of grafting as possible. Scions are cut to 3 cm in length with one bud. Rootstocks are cut to 30 cm in length with two to three internodes. One leaf per scion and rootstock is retained but the area is reduced to half. Grafting is carried out using green grafting machines. The machines use a V-shaped knife to cut scion and rootstock. The machine manufactured in Germany uses an aluminum tape to wrap the graft, while the French machine uses a peg to hold the new graft together. After grafting the vine cuttings are incubated in a callusing house for 5 to 7 days. Humidity is maintained at 90% with the temperature between 28 to 30C. Rockwool, is used as the growing media. Fluorescent lights with dimmer switches are used to slowly increase the light intensity as the vines callus. After 7 to 10 days the temperature is reduced to 20 to 24C but humidity is maintained at 90%. After 14 days rooting is sufficient to transfer the graftlings to a growing house to harden off. This growing house is ventilated but the temperature is maintained at 20 to 25C, light levels are still low with screens being used to provide 90% shade. The light levels are slowly increased to normal levels. The graftlings are then carefully potted into individual containers, watered, and left in the growing house for a further 3 to 4 weeks. The remaining leaf on the rootstock, including the bud, is removed at this stage. This ensures that no suckering occurs below the graft union. Finally the grafted vines are placed in a shaded area to grow on until they lignify, which can occur as early as 4 months from grafting.

DISCUSSION

Green-grafting technology allows rootstock and scion mother vines to produce green cutting material all year round by optimising growing conditions. With this technique the time required to get commercial numbers of new clones or cultivars into the field is significantly reduced. The virus status of the graftlings is known

as the parent material is tested and constantly monitored. A green-graft union knits better than with dormant grafting because the cambium layers are joined together while actively growing. The resultant plant has a significantly stronger graft union which is often difficult to detect with the eye after one years growth.

CONCLUSION

There are several advantages to the green-graft system. Firstly, due to the efficiency of the technique only a small number of stock mother vines are required and, therefore, have to be tested for disease. Pathogen-free clones can be preserved in vitro. In vitro culture results in high multiplication rates. During production, infection of graftlings by virus or bacteria can be excluded. Production can take place 12 months of the year, significantly increasing the number of plants produced. Finally, green grafting offers propagators a viable alternative to quickly multiply clean clonal planting material and keep up with the constant cultivar changes.

Improving Grafting Techniques for Apples

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This paper examines minor systems changes to the grafting techniques of old aimed at obtaining better grafting results with a variety of types of grafts on apples. Specific reference will be given to the use of open-ended, humidified plastic caps over the grafts to protect the graft, and to increase the humidity within the graft environment to prevent the graft scions from dying due to dehydration.

INTRODUCTION

The basic grafting techniques, such as, "T" budding, cleft grafting, chip budding, patch budding, whip and tongue, peg grafting and most of the methods used today were in effect the best of the techniques used by the original experimental grafters. Most of the literature available on budding and grafting techniques repeat this early information, e.g., R. J. Garner's *Grafters Handbook*, and add slightly to the systems used within the grafting techniques. Only a few books discuss the merits of the use of open-ended plastic coverings over apple grafts to increase humidity, and very few papers discuss specific effects.

METHODS

Field trials were conducted over a period of 3 years at various locations in Melbourne, Australia, but primarily in the apple orchard of the National Trust property Rippon Lea. Grafting took place at different times of the year to test the seasonal effect. Selection of budding and grafting wood at different times of the year was made and traditional grafting techniques employed. These included early and late scion grafting, summer and late summer budding, and chip budding at various times of the year.