

The New Zealand Citrus Budwood Scheme

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A scheme to supply New Zealand citrus propagators with superior, virus indexed budwood is being established. Superior clones of major citrus cultivars are being selected in orchards and will be indexed for citrus tristeza virus (CTV) and citrus viroids. These trees will provide budwood for the next 5 to 6 years. Budwood supply blocks have been planted with indexed cultivars, and will supply all budwood when mature. Imported CTV free cultivars are now maintained in an aphid-proof glasshouse until suitable mild strains of CTV can be found for preimmunization.

INTRODUCTION

Traditionally the New Zealand citrus industry has been a relatively small horticultural sector, supplying some 20 to 30 thousand tonnes of fruit to the domestic market; exports have been erratic and account for only a small percentage of annual production. During the past decade, however, a significant change in attitude has occurred amongst citrus producers, prompted by initiatives from growers, researchers, and marketers which have aimed to lift the professionalism of the industry and increase the production of export quality fruit.

These initiatives include cultivar and rootstock introduction, breeding of new easy peeling selections, integrated pest management studies, and nutrition and orchard microclimate research. This change in the perceived potential of citrus production in New Zealand has spurred a replanting phase. Large new orchards are now being planted expressly for export production. To ensure that this new wave of plantings is based on the best available plant material, it is essential that only true-to-type, virus-indexed budwood is used during propagation.

To fulfill this requirement, an ambitious project has been started by citrus growers, nurserymen, and researchers which is of great importance to the future of the citrus industry in New Zealand. The New Zealand Citrus Budwood Scheme is a joint venture between the New Zealand Fruitgrowers Federation and the Horticulture & Food Research Institute. This paper describes how a scheme is being established for the supply of superior citrus buds, buds which will later become superior citrus trees.

CITRUS VIRUS AND VIROID PROBLEMS

Citrus suffers from many virus and virus-like diseases, most of which are transmitted in budwood. If a budwood supply tree is infected, then so are all the trees propagated each year from its buds. Fortunately, New Zealand is free of many of the debilitating virus diseases which occur overseas. However, we do have two areas of concern: citrus tristeza virus (CTV)(Mooney and Harty, 1992) and the citrus viroids, which include citrus exocortis (CEV) (Harty, 1991) and cachexia.

CTV is the most destructive of all the virus and virus-like diseases of citrus, and is widespread in New Zealand orchards. CTV is spread in the field by aphids. The



Figure 1. Tristeza stem pitting on wood collected from orchards in Te Puke and Kerikeri.

most efficient vector, the black citrus aphid (*Toxoptera citricida*) is ubiquitous in New Zealand, complicating the control of this disease. Different strains of CTV are known to exist, which may be responsible for symptoms ranging from slow decline, stunting, and, in the extreme case, death of the tree (Bar-Joseph et al., 1981). In a recent survey of the Kerikeri district, stem pitting symptoms were detected in all of the citrus cultivars screened, with symptoms ranging from severe to mild (Fig. 1).

In order to control CTV, we need to be aware of two factors: (1) the need to stringently prevent the introduction of any further tristeza strains, and (2) the need for mild strain protection in the future. Mild strain protection works on the basis that trees inoculated with mild CTV isolates, and later infected with a severe strain, will not express the symptoms of the severe isolate. Increasing use of preimmunized plant material in any region may lead to a change in the composition of the field CTV isolates, resulting in the mild strain predominating. This also has the advantage that a decrease occurs in infection pressure from the severe isolates.

The development of mild strain protection is of particular importance for all new cultivar imports, which are determined free of CTV before their release from quarantine. Local strains of CTV which are not particularly severe in the majority of currently grown citrus cultivars could prove fatal to these new importations. Therefore, until such time as we are able to preimmunize these cultivars with selected mild strains, two trees of each virus free cultivar will be housed in an aphid-proof glasshouse at Kerikeri Research Centre.

Citrus exocortis viroid (Fig. 2) and other citrus viroids (CV) are only spread through infected budwood and on infected cutting tools, e.g. secateurs, clippers, and budding knives. There is no evidence that they are transmitted by insects or in citrus seed, but they can be spread from infected to neighbouring trees within an orchard by root grafting (P. Barkley, pers. comm.). Transmission in nurseries is mainly through use of infected budwood and contaminated budding knives and



Figure 2. Typical exocortis symptoms on trifoliolate stock of a young satsuma tree.

digging tools, while in orchards, blades of clippers, secateurs, and implements such as mechanical hedgers can spread the disease. Fortunately, because of the limited ways in which they can be transmitted, the spread of CEV and CV is easily prevented through the use of clean budwood and simple hygiene techniques.

INFERIOR BUDLINE PROBLEMS

Citrus trees have a fairly high rate of natural mutation, and tend to throw “sports” quite commonly. The most obvious of these mutations are sectoral chimeras which can be seen on trees as fruit with ridges, or variegated leaves. Very occasionally, a sport is an improvement on the original parent, but the majority of mutations result in a reduction in quality. If budwood is cut from trees which are not regularly inspected for fruit quality, then there is a high risk of propagating new trees which are derived from inferior sports. Citrus budwood is usually cut when there is no fruit on the tree, so it is very difficult to see whether poor sports are present.

When walking through many New Zealand orchards, it is apparent that many trees have been grown from inferior budwood selections. Yields and pack-out of fruit could be dramatically improved in many orchard blocks at no extra effort other than ensuring that each tree was grown from a superior selected bud.

SOLVING BUDWOOD PROBLEMS

Firstly, the very best clones of each commercial citrus cultivar will be selected in the Kerikeri, Bay of Plenty, and Gisborne districts. This selection process was begun this year, and good progress has been made. Secondly, a glasshouse (Fig. 3) and laboratory at Kerikeri Research Centre have been set up for virus and viroid indexing, and we will begin checking each selected cultivar for viroids and CTV. Biological and biochemical techniques are used in the indexing procedures: Etrog citron and sPAGE for viroids, and Eureka lemon and sweet orange bioassays and ELISA for CTV.

If good viroid-free clones cannot be found for some cultivars, then we will carry out shoot tip grafting on these cultivars to free them of viroids and CTV. A shoot tip grafting laboratory is due to be set up in 1993. All selected cultivars will be shoot tip grafted to free the material of CTV, prior to immunization with mild CTV strains.

For the next 5 to 6 years, budwood will be cut from the selected, indexed trees on orchards. Meanwhile, we have begun planting budwood blocks at Kerikeri Research Centre (Fig. 4). Cultivars which have been imported from overseas, and have been checked for viruses and viroids in quarantine, have already been planted. As the selected cultivars from the districts are certified free of viroids, then they will also be planted in these blocks.

Our intention is to eventually supply budwood of all citrus cultivars through the Budwood Scheme. However, while the Scheme is still in its infancy, we will viroid index cultivars in order of priority, based on numbers of buds required by nurserymen. All new citrus cultivars from overseas introductions will be released through the Budwood Scheme. The Citrus Sector of New Zealand Fruitgrowers Federation has introduced 60 new cultivars during the past four years, and these are now being released from plant quarantine. New selections from the citrus



Figure 3. Etrog citron indicator plants in the insect proof house at Kerikeri Research Centre.

breeding programme will also be released via the Budwood Scheme. Our breeding programme has expanded significantly in the last three years, and we now have 4,500 hybrid seedlings under evaluation. Already one selection, a Clementine mandarin \times seminole tangelo hybrid, is being prepared for commercial release.



Figure 4. Viroid free trees in the budwood multiplication blocks at Kerikeri Research Centre.

CONCLUSION

Superior, disease-free propagating material is the foundation stone of all successful plant industries. By starting a budwood scheme, the citrus industry of New Zealand has put into motion a project to ensure that our citrus orchards of the future are based upon the very best available planting material. Although the effort required to establish the scheme is large, the benefits reaped in the future will be correspondingly great.

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