Study tour of South African budwood scheme

Tim Herrmann
Auscitrus

Project Number: CT14700

CT14700

This report is published by Horticulture Innovation Australia Ltd to pass on information concerning horticultural research and development undertaken for the citrus industry.

The research contained in this report was funded by Horticulture Innovation Australia Ltd with the financial support of Auscitrus.

All expressions of opinion are not to be regarded as expressing the opinion of Horticulture Innovation Australia Ltd or any authority of the Australian Government.

The Company and the Australian Government accept no responsibility for any of the opinions or the accuracy of the information contained in this report and readers should rely upon their own enquiries in making decisions concerning their own interests.

ISBN 0 7341 3434 7

Published and distributed by:
Horticulture Innovation Australia Ltd
Level 8
1 Chifley Square
Sydney NSW 2000
Telephone: (02) 8295 2300
Fax: (02) 8295 2399

© Copyright 2014

Horticulture Innovation Australia

Contents

Media Summary

A recent Risk Analysis workshop conducted by Auscitrus showed the Australian Citrus Budwood Scheme is at significant risk from an incursion of HuanglongBing (HLB) and/or its insect vector, the Asiatic Citrus Psyllid (ACP).

All current budwood production is in open conditions, as we do not currently have significant insect vectored pathogens in our budwood production regions. This however would mean an incursion of ACP could infect the budwood source trees with HLB, which would restrict the supply of disease tested budwood to Australian citrus nurseries. In the event of an incursion the industry would be heavily reliant on a supply of disease tested budwood to combat the disease, therefore the protection of the budwood source trees is of utmost importance.

It was decided at this workshop that Auscitrus should implement an insect screening program for its budwood blocks as a matter of highest priority. Due to the size of our industry and the capacity of the budwood scheme to supply all Australia's budwood needs, it was decided that the new budwood production system should be modelled on the long running and successful South African budwood scheme. All budwood should be produced under insect screened conditions in a rapid multiplication system, with the goal to produce sufficient volumes to supply 100% of Australia's citrus budwood requirements.

The most significant aspect of this strategy moving forward will be the construction of substantial insect screened structures, followed by the refinement of management techniques to produce budwood under screened conditions.

The production of budwood under screen poses significant challenges, and is a departure from existing Australian budwood practices. The South African budwood scheme closely mirrors the expected operating conditions of the future Australian budwood scheme, and they have been operating in this way for many years.

This study tour allowed the Auscitrus Manager and a member of the Auscitrus Executive Committee to visit the South African facility and discuss all structural and operational issues associated with running their scheme. A number of issues were identified that will affect the construction and operation of a future screened facility in Australia.

The timing of the tour coincided with an invitation to attend the South African Citrus Research International research symposium, adding value to the trip.

Expected outcomes – achievements

The structures used in South Africa are simple steel framed gutter connected polyhouses, utilising single skin poly covers for the roof and insect mesh for the walls. Roll-up walls cover the mesh to maintain temperatures inside the screenhouse.

Figure 1: external view of screenhouses

Figure 2: internal view of screenhouse

Roof vents are not used in these houses due to the difficulty in insect-proofing operable vents. Heat build-up is therefore a concern, so extraction fans are used to draw hot air out of the house. Horizontal Air Flow (HAF) fans are used to circulate air inside the house. The practical length limit for these houses is 50 m to allow for adequate cooling. All houses are 4M gutter height. The screenhouses were supplied by VegTech, but the same structures are distributed by Netafim out of Israel, so should be available in Australia.

Pad/fan positive pressure houses were discussed (as recently seen in the USA). The operational expense (electricity) for the fans was thought to be a concern, as was the need for a backup generator to supply power in the event of a power failure. The South African Manager commented that a saw tooth design with fog cooling would be a good option for hot conditions, while being relatively inexpensive to operate.

The South African scheme has 22,300 square metres of screenhouse in total, holding around 100,000 budwood production trees, producing on average 3.5 million buds per year. This facility supplies around 70% of the industry's needs, with the shortfall being grown in nurseries under regulated conditions. The goal is to supply 100% of buds, but it was accepted that this may not be possible due to variations in demand. Budwood mother trees are held in 50L pots, with the number of trees dependent on demand for the variety. These trees are propagated from pre-immunised foundation trees held at the CRI facility in Nelspruit. The mother trees are then tested routinely for graft transmissible pathogens.

Buds from these mother trees are then budded onto Carrizo citrange seedlings, grown in heated twin skin tunnels in 230mL tubes. From budding to a first harvest of 10 buds is 4-5 months depending on the time of budding.

After this first cut (if required) the trees are potted on into 10L bags and moved into the screenhouses. These trees are kept for many years, with one patch of trees seen having been budded in 1997 and continuously harvested since. Routine tests are done on these trees to ensure freedom from disease. Trees are pruned as they are cut back, but not cut back hard. Simply removing the buds is said to be enough pruning to encourage new budwood growth. If however no buds are harvested for some time they must be pruned to invigorate the flush of the trees.

Trees are laid out in double wide rows, 1.5m between rows. Floors are bare soil with a covering of gravel, with rows of concrete pavers laid to sit the trees on. Irrigation is all via dripper, with constant fertigation all year. Nutrient application rates are similar to those currently used at Auscitrus.

Buds are cut to order, with a stock spreadsheet used to estimate bud demand based on past history and industry feedback. Calculations on tree numbers are based on around 48 buds per tree per year, although it is possible to estimate for 25 buds per tree every 3-4 months during the growing season. This is of course variety dependent.

Certification: South Africa has a formal citrus nursery tree certification scheme, but is currently voluntary – the majority of South Africa's trees are produced within this certification scheme however as growers understand the risk of using non-certified planting material.

The certification scheme covers many aspects beyond graft transmissible diseases, including freedom from phytophthora through management practices and routine testing, as well as standards for tree size and structure.

The certification scheme is run by the staff of the foundation block, which is logical since they have access to confidential records relating to nursery budwood orders. On request from a nursery the Foundation Block staff will provide a tree certificate which shows that the nursery sourced the appropriate number of buds from the scheme to supply a growers order. All bud sales records are matched to tree sales, and so a traceable system exists from the grower back to the original source of the propagation material.

Routine audits are conducted on the nurseries to ensure they comply with the administrative and management requirements of the scheme. Accreditation of nurseries is an additional cost to the nursery, it is not industry funded. Note however that salaries of the Foundation Block staff and all operation costs, as well as the capital for new structures, is sourced from citrus industry through levy funds.

Symposium: The list of speakers at the symposium was long and varied, and there is little to be gained from detailing each item here. A few key points relevant to this report were:

- Global trends include: Increased demand for safe and 'sustainable-sourced 'food; stronger focus on food quality, health, nutrition and wellbeing; increased regulation and registration requirements for crop protection products; rising importance of partnerships along the food value chain; innovation needs to drive integrated crop solutions.
- South Africa is ranked the second largest exporter of citrus in the world with Spain being the largest. Exports are expected to increase to 120m export cartons (15 kg carton equivalents) per annum by 2019). Of the 64 202 hectares planted to date the variety split is as follows: Valencias 42%; Navels 24%; Grapefruit 15%; Mandarins 10% and Lemons 9%. The South African varietal trend is following international trends, with less oranges being planted in favour of more seedless/low seeded mandarins. Navel production generally is steady, with lemon plantings on the increase. Plantings of Valencia and grapefruit are declining
- The South African industry spends a great deal of time and money on developing pre-immunising strains of CTV to protect new plantings. They are identifying strains (or mixtures of strains) specific to varieties, and to growing regions. This presents a challenge for the supply of pre-immunised budwood of the appropriate strain.
- Black Spot is of great concert to them as it affects their access to European markets. There is a general feeling that the science has been ignored that shows that Black Spot is of minimal risk concerning fruit import to the EU. This is an ongoing problem for them and a threat to Australian citrus exports as they are shipping increased volumes of fruit into the Asian markets.
- The increase in the number of new patented citrus varieties in the world has resulted in this becoming a very competitive but controversial trend amongst variety commercialization companies and growers. This was particularly evident in South Africa.

- A number of rootstocks appeared of interest to Australia:
    - C35 – produces trees around 1/3 smaller than Carrizo - this has already been adopted in Australia, but caution must be used with reports of incompatibilities in some varieties (Turkey, Fukumoto, Midknight). It has generally proven successful with mandarin varieties such as Afourer, but is not tolerant of alkaline soils. It produces more off-type seedlings and so must be culled harder in the nursery.
    - X639 (Cleo mandarin x *P trifoliata*) is being used as a rootstock for Eureka lemons in replant situations. Tree size is smaller allowing closer tree spacing. They are not using Benton so it is difficult to compare with Australia's standard Eureka rooststock.
    - US812 is an interesting stock for replant soils that is tolerant of high pH calcareous soils. This may have niche potential in Australia in lieu of Cleo mandarin which has low tolerance of phytophthora.

Results of discussions

The climate in Dareton NSW where the Auscitrus screenhouses will be built is dominated by hot dry summers. The growing season is relatively long, but extremes of heat in summer retard growth as temperatures reach 40+ Degrees C. This is a harsher climate than experienced at the South African budwood facility, which is somewhat milder and more humid.

The South African scheme shows that a high tech actively cooled greenhouse is not necessary in their conditions, but given the scale of their operation it would not be financially viable from both a capital and operational viewpoint in any case.

Auscitrus needs to assess its requirements based on balancing the capital cost of the structure with the requirement for adequate cooling in our climate. The cost of running fans for cooling can be significant and needs to be carefully estimated prior to committing to a design.

The lifespan of a multiplication tree is significantly longer in South Africa than under the current Australian rapid multiplication system (3 years). Auscitrus could reduce its operational costs by extending the life of the tree, but this needs to be balanced with the increased risk of disease and trueness to type errors that come with harvesting budwood from a batch of trees over an extended period. This is currently not an issue in the Auscitrus field budwood system, as trees are tested for disease every three years and fruited to prove trueness to type.

The South African system struggles to keep up with changes in demand. The only way to improve this is by better forecasting, using information fed back from industry on future trends. It will be difficult if not impossible to get this right every year. Auscitrus will face similar problems, especially with newly released varieties that are licensed.

Implications for Australian Horticulture

The Australian citrus budwood scheme is about to undertake a major development to insect proof its budwood source trees, in order to be prepared for any future incursion of HLB/ACP.

This will make management and production of budwood more difficult and intensive for Auscitrus Management. It is likely that this will increase operational costs of the budwood scheme. It is therefore critical that plans for future development take operational costs and efficiencies into consideration.

The Australian budwood scheme is currently fully self-funding apart from the maintenance of Foundation trees which is levy funded under the project CT10008 (funded to June 2015). The South African foundation block, and other budwood schemes around the world, is financially supported by citrus grower levies. The cost of budwood in Australia is significantly more than in South Africa due to the varying levels of support. If grower levies assisted Auscitrus operations it would be possible to lower the budwood price, thereby encouraging more nurseries to utilise tested material and limiting the industries exposure to biosecurity risk.

More research is needed to develop suitable CTV pre-immunising strains for Australian orchards. Auscitrus uses a pre-immunising strain for grapefruits, but it is short lived and not fully tested in all mandarin and orange types. Budwood produced under screen will therefore be completely free of any mild strain CTV, which may make it susceptible to infection by a severe strain. If we were to get a severe orange stem pitting strain of tristeza in the southern growing regions we are currently unprepared. Other countries around the world have all developed/are developing pre-immunising strains so that the budwood they distribute is pre-immunised against stem pitting strains.

Dissemination of information

This report will be distributed to the Auscitrus board and to relevant people in Citrus Australia and Plant Health Australia. A multi-media slide show will be made available to the Auscitrus Executive committee and Citrus industry representatives.

Further detailed information obtained in the tour will be used in ongoing decision making as Auscitrus develops an insect screened budwood facility.

Itinerary

Tue 12-Aug-14 Domestic flight Mildura - Melb –Sydney

Wed 13-Aug-14 International Flight Sydney – Johannesburg

Wed 13-Aug-14 Domestic flight Johannesburg - Port Elizabeth

Thu 14-Aug-14 **Visit Citrus Foundation Block**

Fri 15-Aug-14 **Visit Citrus Foundation Block & nurseries**

Sun 17-Aug-14 Domestic flight Port Elizabeth - Durban

Mon 18-Aug-14 **Citrus Research Symposium**

Tue 19-Aug-14 **Citrus Research Symposium**

Wed 20-Aug-14 Domestic Flight Durban - Johannesburg

Wed 20-Aug-14 International Flight Johannesburg - Sydney

Thu 21-Aug-14 Domestic Flight Sydney - Melb - Mildura

Recommendations

Auscitrus recommendations:

1. All Australian budwood production should be moved into an insect screened facility as soon as financially and physically possible.
2. Consideration should be given to the running costs of whatever system is adopted.
3. A risk analysis of extending the life of multiplication trees should be conducted by the Auscitrus Executive and Management.
4. Seed source trees of X639 and US812 should be established.

Australian citrus industry recommendations:

1. A citrus nursery registration scheme should be implemented, requiring all budwood to be sourced from the Auscitrus scheme.
2. Funds should be obtained from grower levies to fund nursery registration on an ongoing basis.
3. A project to develop effective pre-immunising strains of CTV to protect mandarins and oranges should be supported and levy funded. This will be a long term project.
4. Rootstock varieties X639 and US812 should be included in future rootstock research to assess their performance under Australian conditions.

Acknowledgments

I would like to acknowledge our hosts from the South African Foundation Block, Mr Thys DuToit and Dr Paul Fourie.

I would also like to acknowledge Auscitrus for putting forward the VC component of this project, and to HAL for providing the remaining funding.

Contact List

Citrus Research International Foundation Block

http://www.citrusres.com/about/foundation-block