



Aus Citrus

**Australian Citrus Propagation Association
Incorporated**

ANNUAL REPORT

2018

AUSCITRUS ANNUAL REPORT 2018

CONTENTS

Governance	2
Auscitrus member organisations and delegates	2
Auscitrus Executive Committee.....	2
Chairman's Report.....	3
Manager's report.....	4
Budwood scheme	5
Seed scheme.....	6
Capital works	7
Auscitrus operations at EMAI	8
Appendix 1: Clones of public varieties in the 'National Citrus Repository for High Health Status Clones' as of June 2018	11

AUSCITRUS ANNUAL REPORT 2018

GOVERNANCE

MISSION STATEMENT

Auscitrus will ensure that adequate supplies of healthy, true to type, and certified citrus propagation material are produced in a scientifically sound, efficient, and economically sustainable manner

AUSCITRUS MEMBER ORGANISATIONS AND DELEGATES

Member organisation	Delegate
Citrus Australia Ltd	Tania Chapman (grower)
Nursery and Garden Industry NSW & ACT	Gary Eyles (nursery)
Nursery and Garden Industry NSW & ACT	Mark Engall (nursery)
Nursery and Garden Industry Qld	Wayne Parr (nursery)
Nursery and Garden Industry VIC	Sean Arkinstall (nursery)
Queensland Citrus Improvement Scheme	Nick Ulcoq (grower)
South Australian Citrus Improvement Society	Mike Arnold (grower)
South Australian Citrus Improvement Society	Steve Burdette (grower/nursery)
Sunraysia Citrus Growers	Greg Chislett (grower/nursery)
Sunraysia Citrus Growers	Matt Cottrell (grower)
WA Citrus	Anthony Innes (nursery)

AUSCITRUS EXECUTIVE COMMITTEE

Mike Arnold (Chairman)

Wayne Parr (Vice Chairman)

Gary Eyles (Public Officer)

Steve Burdette

Greg Chislett

AUSCITRUS ANNUAL REPORT 2018

CHAIRMANS REPORT



After 4 years of seeking funding for an improved insect proof screen house at our Dareton facility. the board are happy to announce that funds have been made available through Hort Innovation. By the time of our AGM the screenhouse framework should be nearly completed. Auscitrus thanks the citrus industry and Hort Innovation for their support in making it happen. We will soon have a world class facility for growing our budwood.

Because of the demand for citrus seed we picked six bins at Monash, part of the South Australian Citrus Improvement scheme. The Mildura Fruit Company carted the bins to Dareton for seed extraction. The fruit was picked by staff at the vine improvement site. While the demand is high we will continue to use some of the South Australian seed.

We again had a record sale of seed and budwood, Tim will give more detail in his report. The industry has large export markets which in some cases can't be filled. The demand for seed and budwood is again high. This makes a great change from 5 years ago when Auscitrus really struggled to keep its head above water and helps us to consolidate the foundation of the citrus industry in Australia. It is pleasing to note more nurseries are buying more seed and budwood from us, as most can see if we do get an incursion they will need to get their budwood from an improved source.

During the year we met with Bunnings buyers of nursery trees, explaining to them the importance of buying trees from nurseries which use approved material, this more so when the large citrus areas with a large retail chain have perhaps bought from a non-approved source.

Thanks again to Dr. Nerida Donovan and staff at EMAI for our independent indexing and scientific advice. Tim and his staff who not only had a record demand for budwood and seed but put in many hours in supporting the firm building the screen house. I am sure they will be proud of the end result. Auscitrus thanks the support of the citrus nurseries of Australia helping to keep prices down and making the citrus industry safe from exotic disease.

Mike Arnold A.F.S.M.

Chairman of Auscitrus

AUSCITRUS ANNUAL REPORT 2018

MANAGERS REPORT



Huanglongbing disease (spread by the Asiatic Citrus Psyllid in the photo to left of page) is in neighbouring countries to our north. There was at least one interception of illegal budwood at an international airport this year, which tested positive for HLB, that could potentially have introduced HLB (or any other disease) into Australia.

Citrus Variegated chlorosis (CVC) is caused by the Xylella bacteria, which is also graft and insect transmitted like HLB. Orange Stem pitting disease (a severe tristeza virus strain) was found in Qld some years ago and is being kept out of the southern

regions through interstate quarantine – however we have the insect vector of this in all our growing regions so if it were to escape into the southern growing areas it could spread quickly.

To protect our budwood scheme from these diseases we need to adopt the standards used by other countries already dealing with them, which is primarily excluding insect vectors from the trees and routinely testing mother tree material. It is therefore refreshing to be able to report that we have finally received funding to build an insect screened budwood production greenhouse at our Coomealla site. Funding for the full proposal was provided through Hort Innovation, using Citrus Levy R&D funds and matching government funds. There were a number of people responsible for making this happen, so thank you to all involved. There is a brief summary of the project later in this report.

The Canker outbreak in the NT this year should be a wake-up call for all nurseries to ensure they know the health status of their propagation material, and to ensure their traceability records are robust. Thankfully it was contained to NT and far northern WA, but it could have been far worse if it had been moved interstate through tree movement. Some form of citrus nursery certification program needs to be implemented as soon as possible.

We thought 2016/17 was a big year for seed and bud sales, but 2017/18 has comfortably surpassed that and set new records for both seed and bud sales. As such it has been a very busy year for all Auscitrus staff, who have worked hard to ensure buds are going out in the post every Tuesday and seed is being extracted according to our strict protocols. I will customarily thank them all for their efforts, it genuinely is these individuals that ensure our industry has access to tested budwood – there is no point growing it and disease indexing it if we can't actually get it to the nurseries when it is required.

Of course, there is no point sending it out if it *isn't* disease indexed so we need to recognise the hard work being done by Dr Nerida Donovan and her team to run the Auscitrus indexing program (along with all the additional diagnostic R&D that underpins it). We have however lost our indexing officer, Sylvia Jelinek, who has moved on to other employment, but this has given us the opportunity to restructure the indexing position to strengthen the team at EMAI.

It's an exciting time for our industry being in this growth phase, Auscitrus has a busy year ahead.

Tim Herrmann
Auscitrus Manager

AUSCITRUS ANNUAL REPORT 2018

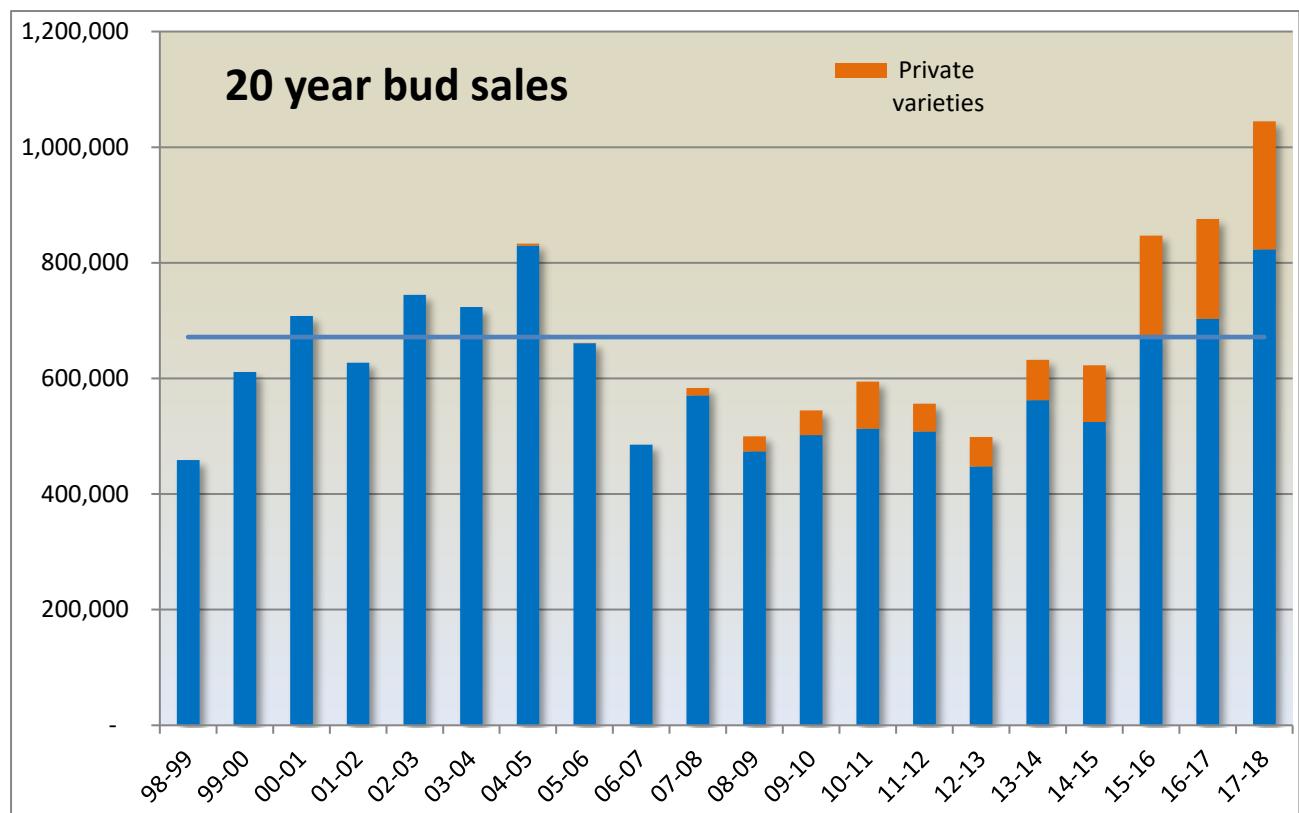
BUDWOOD SCHEME

Bud sales/orders for the full 2017/18 budwood year finished up at 843,992 buds of public varieties, and 223,737 buds of private varieties, for a grand total of 1,067,729, breaking the 1 million bud milestone for the first time in Auscitrus history.

The previous all-time bud sales record was 875,920 last season, and as shown in the chart below sales are on a continual upwards trend year by year. Top selling varieties were:

Variety	Buds sold
W MURCOTT AFOURER	72305
CARA CARA	69249
SALUSTIANA	67000
EUREKA .TAYLOR 3402	65745
WASHINGTON	62995
TAHITI	59850
MURCOTT	39810
KEENAN	39260
MEYER 806	31040
IMPERIAL	29400
EMPEROR	25470
MIDKNIGHT	21150

The trend is strongly upwards:



AUSCITRUS ANNUAL REPORT 2018

SEED SCHEME

Seed sales for the 2017/18 year ended up at 1137kgs, another milestone breaking 1000kg in seed sales. Last seasons seed sales were 952kgs.

A breakdown of rootstock sales is as follows:

Seed variety	Kgs sold
Anjiang ho.	0.8
Benton Citrange	28.4
C35	70.6
Cao sh.	0.8
Carrizo Citrange	179.5
Cleopatra Mandarin	18.2
Cox Mandarin Hybrid	47.7
Donghai	1.3
Flying Dragon	122.4
Ghana	1.3
Macrophylla	0.9
Others	1.0
P Trifoliata	321.3
Rangpur Lime	2.8
Rough Lemon	32.7
Sour Orange	5.0
Sweet Orange	3.2
Swingle Citrumelo	27.5
Tange #6	1.3
Troyer Citrange	175.3
Volkameriana	8.1
West Indian Lime	0.6
Zao Yang	25.3
P trifoliata	61.4
Grand Total	1137.258

Benton was again in short supply due to strong demand, but yields are steadily increasing. All other commercial rootstocks were in surplus.

There is already almost 1400kg of seed sold/on order for 2018/19, with orders continuing to be received. There is an approximately 100kg order to South Africa pending on top of this. Demand at this time of year is unprecedented, and it is likely the citranges will sell out this year. We harvested all the Carrizo from the Monash block under our ongoing agreement this year, and our yields of all varieties (apart from Benton) have been very good.

AUSCITRUS ANNUAL REPORT 2018

CAPITAL WORKS

After many years of planning and chasing funds to build an insect screened greenhouse for budwood production, we have finally received funding through a Hort Innovation Citrus levy funds project.

The site has been cleared and levelled, greenhouse frame erected, and gravel flooring laid down. This project continues to late 2019, however most of the work to allow us to start growing budwood trees under screen will be complete by the end of 2018.

The structure will be twin skin inflated poly with pad and fan cooling. Total growing area will be 2400 square metres, with the capacity to hold around 26,000 trees in 7L pots. This will produce (theoretically) 1.2 million buds per year, however it is impossible to use every bud grown so the actual saleable production will be somewhat less than that. All trees will be in elevated 7L drainage pots, growing in 100% coir with hydroponic feed via drippers.

All openings will be insect screened to keep out any future incursion of Asiatic citrus psyllid, the host of huanglongbing. This new structure will be tied into the existing structures, with the entire nursery complex eventually being insect screened, with positive pressure insect locks at the entrances.

Growing under plastic like this will provide other advantages (longer growing season, controlled climate), but also bring with it some new challenges, so we have a few years of learning and adapting ahead of us. We will be retaining the existing field budwood trees at this stage, so most of the buds will continue to come from the field, at least for the next 2-3 seasons.

The existing budwood shadehouse will remain for now as it is full of budwood trees, but as they are retired over the next few years it will slowly empty, at which point the plans allow for a duplication of this new structure in its place (subject to funding).



AUSCITRUS ANNUAL REPORT 2018

AUSCITRUS OPERATIONS AT EMAI



Citrus is affected by a number of graft-transmissible organisms, which can be spread through propagation of infected plant material or via sap on cutting tools. Some organisms cause serious disease or death whilst others induce only mild symptoms. There is no cure for graft-transmissible diseases therefore it is important to prevent orchard infections by using tested propagation material. The Auscitrus source trees are routinely tested for graft-transmissible diseases.

Independent testing is provided by the NSW Department of Primary Industries (NSW DPI) at the Elizabeth Macarthur Agricultural Institute (EMAI) located on the outskirts of south western Sydney. At EMAI the work is undertaken in quarantine laboratories and a nursery, and is certified by ISO 9001:2015.

Auscitrus is involved in 2 main areas at EMAI:

- National Citrus Repository
- Disease testing of budwood and rootstock seed supply trees.

The following report covers activities during the 2017/18 financial year.

NATIONAL CITRUS REPOSITORY

The 'National Citrus Repository for High Health Status Clones' currently holds 232 citrus accessions with at least 1 tree of each variety held in screen houses in 2 locations; the Auscitrus property at Daretton (in the Sunraysia citrus growing region) and at EMAI (not in a citrus growing region). The repository contains both public (122) and private (110) citrus varieties from imported and local sources.

The 'National Citrus Repository for Inoculated Clones' is housed in a controlled environment green house at EMAI. This repository contains citrus clones that have been inoculated with a mild strain of *Citrus tristeza virus* (CTV). The mild strain serves to protect against more severe strains of the virus that may be introduced to trees in the field by aphids – this control mechanism is called mild strain cross protection.

Before a new variety enters the repository system, a foundation tree is propagated and rigorously tested for graft-transmissible pathogens including citrus viroids, CTV, *Citrus psorosis virus* (CPsV), *Citrus leaf blotch virus* (CLBV) and *Citrus tatterleaf virus* (CTLV). A range of biological, serological and molecular methods are used to check the health status of the tree. If a pathogen is detected it must be eliminated by shoot tip grafting before a variety is allowed to enter the repository system. This ensures the high health status of trees held in the National Citrus Repositories. Imported varieties are tested and undergo pathogen elimination in post-entry quarantine run by the Federal Department of Agriculture and Water Resources. Auscitrus provides the service of pathogen testing and elimination by shoot tip grafting for Australian selections

During the 2017/18 year, 5 Australian selections (1 public and 4 privately owned), and 7 imported, privately owned varieties entered the repository program.

After entering the repository system, foundation trees are re-tested for graft-transmissible pathogens according to a designated schedule. Trees are tested annually for aphid-transmitted CTV but are not tested every year for pathogens which are not transmitted by insect vectors. This is because the risk of infection with non-vectored pathogens is low for trees managed under strict biosecurity protocols in the repository. However, replacements for older trees are tested for all of the aforementioned target endemic pathogens prior to being placed in the repository house at EMAI. This was undertaken for 18 varieties in 2017/18.

The maintenance and testing of public varieties is funded by Horticulture Innovation Australia and Auscitrus via project CT15005 'Protecting Australia's citrus genetic material' from September 2015 to July 2018. The

AUSCITRUS ANNUAL REPORT 2018

maintenance and testing of private varieties is covered by a contract agreement between the private variety owner and Auscitrus and is paid for by the variety owner.

It is important to note that the *high health status* of repository trees means that no viruses or viroids have been detected in these trees using current test methods. These trees have a *high health status* but pathogens may be detected in these trees through improved test methods and the discovery of new pathogens.

TESTING FOR CITRUS DISEASES

Research and development

The high health status of the Australian citrus industry is largely dependent upon accurate testing of propagation material for viruses and viroids which can cause graft-transmissible diseases. NSW DPI and Auscitrus worked together on an industry funded project supported by Horticulture Innovation Australia to find better methods for screening citrus plant material. The project started in October 2014 and was funded until March 2018. Improvements to current protocols were identified through the project and adopted by Auscitrus.

The project allowed for additional scrutiny of varieties held in the National Citrus Repository. New varieties introduced to the repository program were tested for the causal agents of huanglongbing (HLB); one of the most destructive diseases of citrus in the world and one of the major factors limiting citrus production in affected regions, although it has not been found in Australia yet.

Citrus viroids

Auscitrus budwood source trees are scheduled for testing for citrus viroid infection every 5 years. Additional budwood sources may also be used, with trees tested prior to budwood supply.

Trees were previously tested by biological indexing on 'Etrog' citron indicator plants. Viroid testing was completed for 120 Auscitrus budwood supply trees using biological indexing during the 17/18 year. Citrus exocortis viroid (CEVd) was not detected in samples from budwood source trees.

The Auscitrus indexing strategy was revised based on recommendations from the citrus diagnostic project. Re-testing of repository and budwood source trees for citrus viroids will be undertaken using molecular methods. During 2017/18, molecular assays were used to test repository trees for citrus viroids.

Citrus tristeza virus

CTV is graft-transmissible and can be spread by aphids. The repository houses are screened to exclude aphids but every tree in the repository is tested annually for CTV using a serological test called a direct tissue blot immunoassay (DTBIA). This test is used to confirm that the virus is not present in the high health status clones and to confirm that the virus is present in the inoculated trees.

Trees in the Dareton and EMAI screen house repositories were tested for CTV in autumn 2018. No CTV was detected.

All inoculated repository trees tested positive for CTV in autumn 2018. Budwood is only sourced from inoculated trees that test positive for CTV during their last test.

All grapefruit budwood supply trees are tested annually to confirm the presence of the mild isolate of CTV that protects trees against more severe grapefruit stem pitting strains. During the 2017/18 financial year, biological indexing on West Indian lime indicator plants was completed for 77 trees.

AUSCITRUS ANNUAL REPORT 2018

Citrus psorosis virus

Budwood multiplication trees are scheduled for testing for *Citrus psorosis virus* every 9-12 years. During the 17/18 year, psorosis biological indexing was completed for 138 budwood source trees. No psorosis symptoms were observed on the foliage of indicator plants.

After psorosis indexing was complete, the stems were peeled to look for symptoms of CTV stem pitting.

Citrus leaf blotch virus

Rootstock seed supply trees are scheduled for testing every 9-12 years for *Citrus leaf blotch virus*. Testing of 127 rootstock seed supply trees was completed during 2017/18 using a molecular assay with no pathogen detected.

PATHOGEN ELIMINATION

Viruses and viroids can be removed from infected mother trees by shoot tip grafting. Successful shoot tip grafted plants then require testing to determine if the pathogens have been eliminated. Auscitrus provides the service of pathogen testing and elimination for Australian citrus selections.

At the end of the 17/18 year, 12 varieties are currently in the variety testing program for Australian selections and all 12 are undergoing pathogen elimination by shoot tip grafting. Pathogens were successfully eliminated by shoot tip grafting from 4 private varieties and 1 public variety during the 2017/18 year.

STAFF

NSW DPI staff involved with Auscitrus activities at EMAI during the 17/18 financial year:

Sylvia Jelinek	Auscitrus Indexing Officer (1 FTE)
Allise Fail	Nursery Assistant (0.4 FTE)
George Haizer	Nursery Contractor (casual)
Grant Chambers	Technical Advisor (citrus diagnostic research project)
Anna Englezou	Technical Advisor (citrus diagnostic research project)
Nerida Donovan	Citrus Pathologist

AUSCITRUS ANNUAL REPORT 2018

APPENDIX 1: CLONES OF PUBLIC VARIETIES IN THE 'NATIONAL CITRUS REPOSITORY FOR HIGH HEALTH STATUS CLONES' AS OF JUNE 2018

Accession number	Citrus clone
Grapefruit	
I.N.91.0736	Flame
I.N.89.0620	Henderson
A.N.73.0068	Marsh (3970 Druitt)
A.N.91.0632	Marsh (3962 Druitt)
I.N.89.0619	Ray Ruby
I.N.89.0708	Rio Red
I.N.89.0709	Star Ruby
A.N.04.0950	Star Ruby (Cant)
A.N.91.0633	Thompson (N Eagle)
Pummelo	
I.N.01.0925	Namroi
I.N.94.0786	Tambun
Citron	
I.N.01.0926	Bergamia Bergamot Castagnaro
I.N.94.0904	Buddha's Hand
I.N.09.0979	Etrog
Lemon	
I.N.01.0927	Eureka (Allen)
A.N.75.0034	Eureka (Lambert)
A.N.75.0035	Eureka (Taylor)
I.N.89.0703	Fino
A.Q.93.0785	Lemonade
I.N.00.0918	Lisbon (Limoneira 8A)
I.N.75.0036	Lisbon (Prior)
A.Q.91.0631	Lisbon (Queensland)
A.NT.15.1032	Tropical Meyer
I.N.89.0705	Verna
Lime	
A.N.08.0969	Tahiti lime
A.N.90.0771	West Indian lime (Schweppes)
Orange	
<i>Navel</i>	
I.N.86.0600	Atwood
A.Q.78.4021	Benyenda - thorny
A.N.14.0993	Cara cara new
I.N.86.0597	Fisher
I.N.99.0912	Fukumoto
A.S.75.5077	Hockney
A.N.73.0073	Houghton
A.S.92.0772	Hutton
I.N.02.0930	Jaffa
A.N.75.0032	Lanes Late 3976
A.N.73.0072	Leng
A.V.94.0781	Lloyd/3 Leng
I.N.86.0550	Navelate
I.N.87.0546	Navelina Spain 7.5
I.N.93.0899	Navelina 315 ex Italy
A.S.92.0773	Neilson
I.N.86.0598	Newhall California
I.N.87.0551	Newhall 55-1 Spanish
I.N.10.0984	Palmer 1051
A.S.75.5074	Thomson
<i>Valencia</i>	
A.S.75.5095	B/3010
A.Q.75.4022	Benyenda
A.S.94.0782	Berri 3501
A.V.94.0780	CSIRO 5
A.V.93.0774	Jenner 4439
A.N.75.0029	Newton – Keenan 3125

AUSCITRUS ANNUAL REPORT 2018

Accession number	Citrus clone
A.N.75.0030	Newton – Keenan 3247
<i>Other oranges</i>	
I.N.92.0901	Lima 156 (acidless)
A.S.10.0985	Blood orange (Arnold)
I.N.98.0921	Blood orange (Sanguine)
I.N.08.0968	Blood orange (Tarocco Ippolito)
I.N.07.0965	Blood orange (Tarocco Meli C8158)
I.N.07.0966	Blood orange (Tarocco Rosso C4977)
I.N.06.0960	Common orange (Bintangcheng # 2)
I.N.08.0973	Common orange (Bintangcheng Renbin # 5)
I.N.94.0902	Common orange (Delta seedless)
I.N.86.0548	Common orange (Hamlin)
I.N.02.0930	Common orange (Jaffa)
I.N.06.0959	Common orange (Jincheng 447)
I.N.94.0903	Common orange (Midknight)
I.N.92.0900	Common orange (Natal)
I.N.86.0549	Common orange (Parson Brown)
I.N.90.0741	Common orange (Pera Olympia)
I.N.90.0742	Common orange (Pera Limeira)
I.N.87.0547	Common orange (Pineapple)
I.N.93.0860	Common orange (Salustiana)
A.Q.78.4020	Common orange (Smith - Joppa)
I.N.97.0924	Pigmented navel (Cara Cara)
A.S.17.1043	Poorman's Orange
<i>Mandarin</i>	
I.N.99.0909	Afourer
I.N.99.0913	Avana Tardivo
I.N.99.0914	Avana Apireno
I.N.98.0920	Clementine (Caffin)
I.N.89.0704	Clementine (Clementard)
I.N.99.0910	Clementine (Corsica 1)
I.N.99.0911	Clementine (Corsica 2)
I.N.87.0544	Clementine (Fina)
I.N.87.0552	Clementine (Marisol)
I.N.05.0957	Clementine (Nour)
I.N.87.0543	Clementine (Nules)
I.N.04.0955	Clementine (Orogrande)
I.N.87.0545	Clementine (Oroval)
I.N.04.0953	Clementine (Sidi Aissa)
I.N.91.0733	Daisy
I.N.90.0736	Encore
I.N.08.0974	Etna
I.N.89.0707	Fallglo (VI 484)
I.N.90.0695	Fallglo (S-837-4-2)
I.N.93.0859	Fortune
A.Q.94.0787	Fremont
A.N.75.0041	Hickson
A.N.75.0043	Imperial 0043/2
A.Q.94.0778	Nova (Trott)
I.N.91.0734	Nova (Spain)
I.N.04.0951	Parsons Special /2
I.N.86.0599	Pixie
I.N.04.0954	Primosole
A.N.75.0065	Satsuma (Silverhill)
I.N.89.0706	Satsuma (Clausellina)
I.N.91.0852	Satsuma (Okitsu Wase)
I.N.91.0853	Satsuma (Miho Wase)
A.Q.94.0886	Sunburst
A.NT.15.1034	Tropical Emperor
<i>Tangor/elo</i>	
A.N.75.0090	Ellendale (Herps)
	Ellendale / EM3
A.Q.04.0952	Murcott tangor (Benham)
A.Q.90.4149	Murcott tangor (Turner)
I.N.90.0818	Topaz tangor

AUSCITRUS ANNUAL REPORT 2018

Accession number	Citrus clone
Papeda	
I.N.94.0776	Kaffir lime (Malaysia 4669)
A.D.97.0907	Kaffir lime (Nathanael)
I.N.00.0916	Kaffir lime (Eyles)
I.N.15.1020	Sudachi
A.N.13.0991	Yuzu
Kumquat	
A.N.15.1033	Calamondin
I.N.04.0956	Nagami
Rootstock	
A.N.18.1054	Benton citrange