

# Heat treatment of

## Heat treatment of pome fruit planting material has been means, how it is carried out or realise the benefits.



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**In industry circles the myth has been that “heat treatment makes red apples green”. In reality nothing could be further from the truth.**

Heat treatment has been standard procedure for virus elimination in Europe and North America for the past 30 years. It was adopted to eliminate the viruses of economic significance.

Research in this area showed that there were significant improvements to orchard yields if trees were not infected. The certification systems that were setup to assure the virus status of planting material are still in operation and widely supported.

Like all specialised operations there needs to be careful control of the process to ensure that mistakes are not made. There is now a large volume of evidence that shows that no detrimental pomological changes occur to the rootstocks and varieties that are heat-treated.

### Heat treatment process

Heat treatment is a fairly straightforward process. It is conducted as follows:

- The infected rootstock or variety is propagated onto a vigorous rootstock (usually seedling) and growth established in a hot house.
- The tree is then introduced into a growth cabinet where temperature and light are controlled.
- After a period of acclimatisation the temperature is increased so that it averages 37°C for a minimum of 70 consecutive days with light for around 16 hours per day.

In this environment the ability of the viruses to develop is hindered to the point that they are unable to spread to the growing tips on the tree. The result is the growing tips are potentially uninfected by the viruses.

- A number of tips are removed and shoot tip grafted onto virus-tested rootstocks (usually seedlings) and grown in a hot house.
- Once established these new trees are tested to see if the viruses have been removed.

Several trees of each variety or rootstock are heat treated to ensure that there are plenty of tips to test as some may still be infected.

- From there the trees are planted in the field and encourage to crop to check trueness to type.

### Benefits

The benefits of certified propagating material

were clearly described in a research project that was completed in Australia in 1988 (*Comparative Performance of Three Apple Clones Derived from a Virus-Tested Scheme, with Clones Infected with Latent Viruses and a Mycoplasma*, L.J Penrose, K.C Davis & B.J Valentine). This trial,

“Compared the performance of three apple culti-

**In nearly all characteristics both varieties were close to or very much the same.**

**Only in stem length and shoot growth were significant differences seen, but these are in line with climatic influence of the very hot climate of Monash in South Australia, and the fact the Monash**



Pink Lady™ Lenswood



Pink Lady™ Monash

Characteristic	Cripps Pink after H/T of 92 days (Monash)	Cripps Pink Standard from Adelaide Hills (Lenswood)
<b>TREE</b>	<b>AP001 / Cripps Pink</b>	<b>Cripps Pink</b>
Shape	Strongly upright – compact	Upright
Annual growth	Strong, thick, internodes short.	Strong, medium, internodes medium.
Leaves	Large–Broadly acute–Green–upward folding–underside slightly downy.	Large–Broadly acute–Deep green–upward folding–underside slightly downy.
<b>FRUIT</b>	<b>Pink Lady™</b>	<b>Pink Lady™</b>
Shape	Oblong	Oblong
Basin	Deep	Deep
Stalk/Stem	Short – doesn't protrude beyond base	Medium – protrudes beyond base
Lenticels	Prominent	Prominent
Colour	Bright pinkish/red over yellow/green background	Bright pinkish/red over yellow/green background
Stripe	Not prominent	Not prominent
Sepals	Erect convergent	Erect convergent
Calyx	Mostly open	Mostly closed
Tube	Cone shaped	Cone shaped
Stamens	Basal	Basal
Coreline	Median	Median
Core	Small – median	Small - median
Axis	Axile – closed	Axile - closed
Cells	Elliptical	Elliptical
Seeds	Acute	Acute
Fruit Pressure	7.4kg	9.5kg
Fruit Sugars (%TSS)	13.8	12.5



# Cripps Pink and Cripps Red

misunderstood in Australia—few people know what it

vars (Jonathon, Richared Delicious & Granny Smith) propagated from using budwood and rootstocks from a virus-tested scheme with trees propagated from sources known to be latently infected with viruses and a mycoplasma.

Over a three-season period VT Jonathon trees out yielded infected trees by 56%, VT Richared Delicious out

yielded them by 40%, and VT Granny Smith by 41%. The VT trees were slightly larger than the infected trees.

Because of the structure of the trial, it was not possible to apportion the differences noted between those due to virus/mycoplasma diseases, and those due to clonal variations. However, it is clear that the use of selected scions

*“There is now a large volume of evidence which shows that no detrimental pomological changes occur to rootstocks and varieties that are heat-treated.”*

trees are on seedling rootstocks.

Pressure and sugar levels showed the influence of the Monash climate. It appears that the Heat Treatment (H/T) has had no effect on the variety character of either.



Sundowner™ Lenswood



Sundowner™ Monash

Characteristic	Cripps Red after H/T for 92 days (from Monash)	Cripps Red (Sundowner™) Standard from Adelaide Hills (Lenswood)
<b>TREE</b>	<b>AP 002 / Cripps Red</b>	<b>Cripps Red</b>
Shape	Strongly upright – compact	Upright - spreading
Annual growth	Strong, thick, internodes short.	Medium, thin, internodes medium.
Leaves	Medium–Acute–Green–upward folding–underside slightly downy.	Medium–Acute–Green–upward folding –underside slightly downy.
<b>FRUIT</b>	<b>Sundowner™</b>	<b>Sundowner™</b>
Shape	Round	Round
Basin	Medium depth – ribbed	Medium depth - ribbed
Stalk/Stem	Short – doesn't protrude beyond base	Medium – protrudes beyond base
Lenticels	Prominent	Prominent
Colour	Bright mottled red over green	Bright mottled red over green
Stripe	Narrow - prominent	Narrow - prominent
Sepals	Erect convergent	Erect convergent
Calyx	Mostly closed	Mostly closed
Tube	Cone shaped	Cone shaped
Stamens	Basal	Basal
Coreline	Basal clasping	Basal clasping
Core	Medium sized – median	Medium sized - median
Axis	Axile – closed	Axile - closed
Cells	Round	Round
Seeds	Acute	Acute
Fruit Pressure	7.6kg	10.7kg
Fruit Sugars (%TSS)	14.0	13.0

and rootstocks from the VT scheme provided a significant increase in fruit yield, with only a small increase in overall tree size, and therefore such a scheme can be of considerable advantage to industry”.

European research in the 1970s and 1980s confirmed that yield benefits were evident in all varieties that were heat-treated.

### APFIP and heat treatment

APFIP introduced a range of industry standard varieties and rootstocks into heat treatment in the winter of 1998.

Crop Health Services at Knoxfield were contracted to complete this task and they used the services of the AQIS plant quarantine station at Knoxfield to undertake the heat-treatment.

All the varieties and rootstocks entered into heat-treatment by APFIP are given an alphanumeric number, which identifies the clone so that it can be traced back to the original source.

The heat-treated clones AP001 & AP002 (Cripps Pink and Cripps Red) were the first two varieties to fruit for the second time this season. The following data (Table 1 and Table 2) clearly shows that no ill effects have resulted from the process. It is worthwhile noting that all Pink Lady™ and Sundowner™ apples produced in North America and Europe are produced from heat treated Cripps Pink and Cripps Red.

### APFIP Certification system

The APFIP certification system requires that all trees used for bud/scion wood production test negative for a range of viruses and be fruiting to ensure true-ness to type.

Trees will be propagated from our fruited heat-treated varieties onto certified rootstocks and planted into demonstration sites around the country to show the benefits of certified nursery trees.

The first grower demonstration sites will be planted in 2005 where will be able to collect data on comparative yields.