

Degreening for optimal results

By John Golding

Key points

Air circulation, room ventilation critical

Ethylene generators safer option

Ideal humidity 95%

In the last issue of *Australian Citrus News* (Autumn 2017, page 37), the article *Essentials of Degreening – Part 1* focussed on the best practice tips for degreening. The most important aspect of these degreening tips was to ensure that the fruit are mature enough for successful degreening. Never pick immature dark green fruit for treatment.

Degreening is used at many times of the year, but especially early in the season when most early season varieties are internally mature before the fruit skin loses all of its green colour.

As the season progresses and the colder weather begins, the need for degreening treatment is reduced.

Colour development of the fruit skin in the orchard is promoted by cool overnight temperatures (<15°C), meaning the citrus will naturally degreen more readily during the winter and therefore degreening after harvest becomes unnecessary.

This follow-up article, *Essentials of Degreening – Part 2*, outlines the practical aspects of degreening in the packing shed to optimise its use.

Whilst many growing regions are already well into degreening mandarins and early season navels, this update outlines the best practice guidelines to optimise degreening in the shed.

Degreening rooms require careful monitoring and management of:

- Air circulation and room ventilation
- Temperature
- Relative humidity
- Ethylene levels



TOP: Generating high humidity in degreening rooms is essential.

ABOVE: There are a range of methods of using ethylene to degreen citrus; with cylinders or using ethylene generators.

Air circulation and room ventilation

Degreening rooms need good air circulation through the fruit load to ensure the ethylene gas is evenly distributed throughout the room. Too much or too little air flow will result in uneven colouring of fruit after treatment.

An efficient ventilation system is critical to extract the carbon dioxide (CO₂) generated by the fruit during degreening.

Carbon dioxide levels should be monitored and kept below 0-3% CO₂, as high levels are detrimental to fruit quality and also unsafe for workers entering the room.

CO₂ can be measured with calibrated sensors or with gas sampling tubes (see photos). If CO₂ levels cannot be monitored the typical air ventilation recommendation is one room per hour.

Temperature

The optimum temperature for degreening depends on initial fruit colour and local climatic conditions (especially temperature) at the time of harvest.

Current recommendations for Australia are 20-25°C for fruit grown in the Mediterranean type climates of southern Australia and up to 29°C for fruit grown in the humid sub-tropical regions of Queensland.

Relative humidity

Relative humidity in the degreening room should be high, above 90% and ideally 95%. Relative humidity is measured with calibrated sensors in the degreening room.

However, the high humidity combined with warm temperatures of degreening rooms make conditions ideal for the development of postharvest diseases.

Fruit are best treated with a postharvest fungicide prior to degreening. The standard postharvest fungicides are recommended to control postharvest decay during degreening and storage.

Ethylene

The 'trickle system' is the most common method used for the delivery of ethylene gas into the degreening room. This is where ethylene is continuously trickled into the degreening room using an airflow system to evenly distribute the gas.

This is combined with an efficient ventilation system which extracts the CO₂ generated by the fruit. An older ethylene treatment method used a 'shot method' where high levels of ethylene are used for shorter periods, but a continuous application of ethylene has been shown to have the best results.



are reading correctly. The use of the gas sampling tubes (photo) are an alternative way of measuring ethylene levels within the room.

A concentration of ethylene between 1-5 parts per million (ppm) is normally required for degreening. Never exceed 5ppm. Rates of between 1-3ppm are commonly used for mandarins.

Normally the lower the rate of ethylene, the longer the duration of degreening treatment. However exposure of mature mid and late season fruit to ethylene may enhance the accumulation of 'off' flavours.

MORE INFORMATION

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Monitoring and managing both ethylene and carbon dioxide levels are important to successfully degreen citrus. In-line ethylene and carbon dioxide sensors (above left) and gas sampling tubes (such as Kitagawa gas detector tubes) (above right) are a convenient way of measuring important gases such as ethylene and CO₂ in the degreening room.

Some growers are now using ethylene generators. Ethylene generators (e.g. Catalytic Generator™) produce small controlled amounts of ethylene and when used as directed cannot produce explosive levels of ethylene.

They are a safer option than using cylinders of pure ethylene or ethylene mixtures. They can be used in various sized rooms and have the capacity to be used in conjunction with a computerized ripening control system.

The levels of ethylene in the degreening room can be monitored with calibrated ethylene sensors or with gas sampling tubes (see photo). It is important to ensure that the ethylene sensors are regularly calibrated to ensure they

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