Australian phytosanitary treatment application standard for vapour heat treatment

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1 Introduction

The objective of phytosanitary treatment is to prevent the introduction or spread of regulated pests. Effective phytosanitary treatments are critical to managing Australia's plant biosecurity risks and safeguarding trade. The Australian treatment application standards ensure that treatments:

- are carried out in a consistent and effective manner
- reach the required efficacy every time they are applied.

This treatment application standard applies to the use of vapour heat treatment (VHT) as a phytosanitary measure for imported product as well as exported and domestically traded product.

VHT uses water vapour-saturated air to heat the product for a specific period of time in order to effectively control live infestations of certain pests. Because of the high heat energy of hot moist air, VHT is capable of raising the commodity temperature faster than dry air can, allowing shorter treatment times. Additionally, as VHT can readily penetrate to the interior of the commodity being treated, it can be applied to products of any shape or size. The required temperature and humidity must be reached and maintained throughout the consignment being treated. This is verified by monitoring of the core temperature of the product and air humidity.

VHT is used primarily for products such as tropical fruit that are hosts of fruit fly and are resistant to high moisture and vulnerable to drying out.

Responsible certifying authorities must ensure, through audit or verification, that treatment facilities can demonstrate that they meet requirements to effectively deliver VHT. This may include registration, or approval arrangements by third parties.

1.1 Scope

1.1.1 This standard describes the effective application of VHT as a phytosanitary measure for regulated pests on fresh fruit and vegetables for human consumption.

1.1.2 The following is out of scope:

- other heat treatment methods
- specific import requirements
- target temperatures and durations for specific pests
- operational instructions including requirements for facility registration, certification, approval of arrangements, etc.

1.1.3 The import requirements for trade with Australia can be found on the department's website at www.agriculture.gov.au. The Biosecurity Import Conditions (BICON) database contains the requirements for imports to Australia and the Manual of Importing Country Requirements (MICoR) lists known conditions for exports from Australia. The specific State and Territory Department of Agriculture websites for domestic trade can be found on the relevant state websites.
2 Requirements

2.1 Treatment facility

2.1.1 The treatment facility must have purpose built chambers for conducting VHT, the chambers must be located within the treatment facility.

2.1.2 All treatment facilities used for VHT must have:

- systems in place to maintain the facility in a hygienic condition
- pest control systems in place
- a treatment chamber fit for purpose
- a pest free, secure area for cooling, packing and storing products after treatment. All openings must be sealed or covered in mesh with a gauge no greater than 1.6mm (hypotenuse) to prevent potential infestation from occurring
- systems in place to reduce the entry of pests into the treatment and packing areas (for example, air lock or double door entry system, spraying area between doors, electronic insect zappers, vertical plastic strips, or positive air flow curtains)
- data collection and storage system for treatment tracking to ensure treatment specifications are met.

2.1.3 The treatment facility must comply with any additional requirements of the responsible certifying authority or importing authority.

2.2 Treatment chamber

2.2.1 The VHT treatment chamber must:

- be clean and pest free
- be capable of reaching and maintaining the temperature and relative humidity within the limits prescribed for the range of products being treated
- be able to monitor air temperature, product temperature, and relative humidity of the chamber
- have separate lockable or sealable entry and exit doors to ensure that the treatment cannot be compromised by the doors being opened during the treatment
- be custom built for the purpose of treating commercial product.

2.3 Temperature and humidity recording equipment

2.3.1 All treatment recording systems must:

- have tamper proof or tamper evident, computer controlled and monitored temperature and humidity recording equipment
- accommodate the required number of sensors (air and product temperatures, and humidity sensors), in accordance with the chamber manufacturer's specifications, or as specified by product treatment requirements
• not be affected by ambient high/low air temperatures, vibration etc.
• record the treatment facility where the treatment was undertaken
• identify each sensor and its position within the treatment load
• record data continuously for the duration of the treatment process
• produce treatment data read outs, hard copy and/or electronically
• record readings of all temperature and humidity sensors at least every 5 (five) minutes for the duration of the treatment process.

2.4 Temperature sensors

2.4.1 Temperature sensors must:
• have an overall accuracy of ±0.3°C in the range of 37 – 52°C with a resolution of 0.1°C in the normal operating and environmental conditions in which they will be used. Some product/market specific variations to these specifications may be permitted
• be functional and calibrated.
3 Procedures

3.1 Thermal Mapping – Initial and annual operation

3.1.1 Initial chamber commissioning tests, and annual tests thereafter must be carried out (in accordance with the manufacturer’s specifications) by the treatment facility and verified by the responsible certifying authority to determine the coldest points (thermal mapping) within the treatment chamber. These tests must be used to develop a sensor placement plan showing precise locations for placement of each sensor determined by the coldest points within the treatment chamber.

3.1.2 The product selected for the thermal mapping tests must be similar in size, ripeness, and variety. The difference between the heaviest and lightest product must not be more than 5 percent of higher of the heaviest product by weight.

3.2 Number of sensors

3.2.1 The number of sensors required is dependent on both the make and model of the VHT unit and the results of the thermal mapping to identify the coldest points.

3.3 Calibration of sensors

3.3.1 The calibration of treatment sensors may be supervised by the responsible certifying authority or their representative.

3.3.2 Calibration will be performed by placing all temperature sensors in a hot water vat.

3.3.3 Each sensor must sit separately within the vat (that is, not touching another sensor or the surfaces of the vat).

3.3.4 The temperature of water in the vat must be stabilised to 47°C against a reference thermometer before commencing the calibration test.

3.3.5 The temperature sensors must read within ±0.3°C of 47°C.

3.3.6 Each sensor must be calibrated three times to show repeatability of readings, this involves removing the sensors from the vat and allowing their readings to move away from 47°C before returning them to the vat and re-stabilising to 47°C.

3.3.7 Sensors must be calibrated at least once a month or otherwise specified by the responsible certifying authority.

3.3.8 The reference thermometer for calibration must be NATA certified every 3 years.

3.4 Loading

3.4.1 Prior to or during the loading of the treatment chamber, the heaviest samples of product must be identified and used for sensor placement.

3.5 Placement of temperature sensors

3.5.1 Temperature sensors must be placed in the heaviest samples of product as identified in section 3.4.1 and placed in the identified coldest spots of the treatment chamber as per the sensor placement plan (section 3.1).

3.5.2 The sample products must be uniformly consistent in size as is practically possible.

3.5.3 Temperature probes must be inserted into the pulp of the selected product:
3.5 • into the centre of the fruit, or
• as close to the seed without touching the seed.

3.5.4 In addition, temperature sensors must be placed within the following specified products:
• Pawpaw (papaya) – sensors must be inserted through the stem into the approximate centre of the seed cavity
• Mango – sensor tips must be placed next to (but not touching) the seed at the point of maximum pulp thickness.

3.5.5 A tool with aperture narrower than the probe may be used to plot the insertion path of the probe.

3.6 Treatment

3.6.1 The treatment period must only commence when:
• all temperature sensors indicate the pulp temperature of the product has reached the prescribed treatment temperature for the nominated treatment schedule, and
• the humidity has been maintained at the required humidity level for one hour.

3.6.2 The temperature must be maintained at or above the prescribed treatment temperature continually for the duration of the treatment.

3.6.3 The total time of the treatment process must take 2 hours or longer. This must include:
• the warm-up phase (time from when the product is in the chamber and the VHT unit is turned on to when the treatment temperature is reached), and
• the prescribed treatment time, and
• the cool-down time.

3.6.4 During the period stated in 3.6.3, the product in the VHT chamber must be exposed to the required relative humidity level, or higher for one hour before treatment can commence.

3.7 Sealing treatment chambers

3.7.1 Loaded treatment chambers must be sealed with a numbered seal. The treatment chamber details and seal number must be recorded.
4 Verification of treatment

4.0.1 After treatment, the humidity and product temperature sensor time and temperature readings may be required by the responsible certifying authority to facilitate completion of any required treatment certification. This may be provided in hard copy or electronically depending on the temperature recording equipment.

4.1 Treatment failure

4.1.1 A treatment is considered a failure if the following has occurred:

- the treatment chamber has been unlocked or seals have been tampered with at any point during the treatment
- the sensors are placed incorrectly in the product or in an incorrect location within the treatment chamber
- temperature records show that the temperature and time required by the prescribed treatment schedule have not been maintained
- the relative humidity was not maintained at or above the required humidity level throughout the treatment process.

4.1.2 Failed treatment lots must not enter the secure area of the facility.
5 Phytosanitary security measures

5.0.1 Treatment facilities must have a phytosanitary security system in place and the identity and integrity of each consignment must be maintained.

5.1 Phytosanitary security

5.1.1 Phytosanitary security must be maintained during and after treatment. The responsible certifying authority may determine specific phytosanitary security measures. The methods of securing product against pests are:

- using a secure area with product segregation and traceability
- using secure packaging
- a combination of both.

5.1.2 Procedures must be in place to identify and segregate treated product and allow for movement without the risk of it mixing with any other product.

5.1.3 The procedures must cover all processes that pose a phytosanitary security risk to the treated goods including receivals, storage and dispatch. The procedures must enable consignments to be linked to a specific treatment and be traced back to a packhouse and grower if required.

5.1.4 Treated product must be identified as treated (for example, product labelling or separate storage areas for treated product only).
6 Documentation

6.1 Procedures

6.1.1 The following documents must be kept and made available to the responsible certifying authority when requested:

- treatment procedures
- phytosanitary security procedures.

6.1.2 Procedures must reflect current practices and be compliant with this standard.

6.2 Records

6.2.1 The following records must be kept and made available to the responsible certifying authority when requested:

- all records pertaining to the treatment including:
  - treatment facility number or name
  - recorder serial number
  - date and time (local) the sensors were last calibrated
  - results from sensor calibration with a minimum of three temperature readings for each and correction factor
  - sensor placements in the treated product
  - date and time treatment chamber was sealed
  - treatment chamber seal number
  - link to certification (such as lot or batch number or Phytosanitary certificate)
  - treatment relative humidity, temperature and time recordings

- documentation of any failed treatments

- any additional records required by the responsible certifying authority or importing authority.

6.2.2 All records must be retained for a minimum of 2 years, unless otherwise specified by responsible certifying authority or importing authority.
# Glossary

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Import requirements</td>
<td>Specific phytosanitary measures prescribed by an importing authority, concerning consignments moving into that territory.</td>
</tr>
<tr>
<td>Product</td>
<td>The plant product to be treated.</td>
</tr>
<tr>
<td>Responsible certifying authority</td>
<td>The National Plant Protection Organisation (NPPO) and State/Territory Departments of Agriculture and potentially any other party approved under the authority of the NPPO or State/Territory Departments of Agriculture.</td>
</tr>
<tr>
<td>Sensor</td>
<td>Equipment/probe for monitoring treatment parameters, including the product/air temperature or humidity.</td>
</tr>
<tr>
<td>Tamper evident</td>
<td>Equipment or system that is designed to reveal any interference with data including manual variations to treatment parameters or changes to treatment data.</td>
</tr>
<tr>
<td>Treatment</td>
<td>Official procedure for the killing, inactivation or removal of pests, or for rendering pests infertile or for devitalization.</td>
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<tr>
<td>Treatment chamber</td>
<td>Any enclosed space where vapour heat treatment is applied to the product.</td>
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<tr>
<td>Treatment schedule</td>
<td>A humidity and temperature/time combination, for example: 90% relative humidity at 47°C for 15 minutes.</td>
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<tr>
<td>Vapour heat treatment</td>
<td>A treatment that uses water vapour-saturated air to heat a product for a specific period of time.</td>
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</tbody>
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References


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