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Treatment Manual

Nonchemical Treatments

Heat • Vapor Heat and Forced Hot Air Treatment

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Introduction

Vapor Heat (VH) and Forced Hot Air (FHA) treatments use heated air to warm fruit to temperatures that are lethal to target pests, primarily fruit flies. Generally, VH treatment differs from FHA only in the relative humidity of the air in the treatment chamber; higher humidity levels may preserve fruit quality. Unless otherwise noted, information in this chapter applies to both VH and FHA treatments for fruits and vegetables.

This chapter describes processes for routine (commercial) treatments for fresh fruits and vegetables at VH and FHA facilities. [See “Certification of Forced Hot Air and Vapor Heat Treatment Facilities” on page-6-6-1](#) for VH and FHA certification and equipment requirements.

VH treatment schedules can be found in [“T106—Vapor Heat” on page-5-2-64](#). FHA treatment schedules can be found in [“T103—High Temperature Forced Air” on page-5-2-54](#).

Procedures

Before any treatments are conducted at a facility, the authorized PPQ official should familiarize themselves with the facility and the way the chamber functions. The official should also carefully review the treatment schedule for the commodity(ies) that will be treated, and any special requirements specified during certification, in the workplan or in the compliance agreement.

Pretreatment

Prior to treatment, the PPQ official must ensure that the facility and the chamber are in good working order and the permanent temperature sensors are functioning properly. Conduct a brief facility inspection before any other steps in the treatment process are taken. During this inspection, the official verifies that all safeguarding and quarantine measures are in place and that there are no obvious problems that may affect the treatment. If any deficiencies are found, correct them prior to treatment. After the inspection, the official will assist facility personnel in the calibration of the permanent temperature sensors. Refer to the section [“Calibrating the Permanent Temperature Sensors” on page-6-6-4](#) " for calibration procedures.

Before treatment, the PPQ official ensures that the commodity meets the requirements specified in the Treatment Manual, the certification conditions, the workplan and/or the compliance agreement. These requirements generally include:

- ◆ **Fruit size and weight requirements:** The process and/or equipment used to sort the fruit should be verified by measuring or weighing the fruit that is to be treated. Sampling rates may be provided in the workplan, compliance agreement or certification conditions. If no rates are provided, weigh and measure 30 suspect fruit per treatment lot. If fruit are found that do not meet the size and weight requirements, the sorting process and/or equipment should be evaluated and the fruit resorted.
- ◆ **Fruit pulp temperature:** There are no specific pretreatment fruit pulp temperature requirements. However, the temperature of the fruit pulps within the treatment lot should not vary by more than 3.0°C (5.0°F). The PPQ official verifies that the pulp temperatures meet this requirement prior to treatment.
- ◆ **Pest inspection:** The PPQ official conducts pest inspections required by the workplan and/or compliance agreement.

Loading

Load the fruit into containers (crates, lugs, or bins) according to the requirements in the certification conditions or workplan. Generally, these requirements will indicate whether or not the fruit must be sorted and the volume of fruit allowed in each container.

Load the containers onto pallets or into cabinets according to the requirements in the certification conditions or workplan. These requirements may specify that containers with larger fruit must be located in the colder areas of the stack or that certain layers of containers are left empty when partial loads are treated.

The permanent temperature sensors are placed in the largest fruit in the treatment lot as it is being loaded into the containers. Insert the tip of the sensor into an area of the fruit pulp that will take the longest to reach treatment temperature. The PPQ official monitors the placement of the permanent sensors and verifies that the probes are placed in the locations required by the certification conditions.

Conducting the Treatment

After all the fruit is loaded into the containers and onto the pallets, and the permanent probes are properly installed, load the fruit into the chamber. The chamber doors should be closed and locked to prevent accidental openings. The PPQ official (and the NPPO official, if required by the work plan or compliance agreement) must initial the treatment temperature record and the chamber operator can then initiate the treatment.

During the treatment, the PPQ official must monitor the permanent temperature sensor data to ensure the treatment is proceeding in the approved manner. The PPQ official must also check the chamber for leaks or other problems during the treatment.

Verifying the Treatment

The PPQ official must review the treatment temperature record after the treatment is complete. The official must ensure that the temperature and recording interval requirements have been met. Additionally, the official must verify that the requirements for the duration of the run up and dwell times are conducted according to the treatment schedule. Time requirements for the run up and dwell time are continuous. Once the PPQ official determines that all the treatment requirements are met, the PPQ official must sign and date the treatment record.

Important Treatment Terminology

The following terms are referred to in the treatment schedules:

- ◆ **Heat up time:** the minimum time allowed for all the temperature probes to reach the prescribed minimum pulp temperature (may also be referred to as the approach or run-up time)
- ◆ **Heat up recording interval:** the time interval required for recording temperatures during the heat up time
- ◆ **Minimum air temperature:** the minimum temperature required for the air in the chamber
- ◆ **Minimum pulp temperature at end of heat up:** the minimum temperature required for all fruit pulp temperature probes
- ◆ **Dwell time:** the length of time all pulp temperature probes must maintain the minimum pulp temperature

- ◆ **Dwell recording interval:** the time interval required for recording temperatures during the dwell time
- ◆ **Cooling method:** optional and may be either hydrocooling or air cooling

TABLE 3-5-1 Example of a Treatment Schedule

Heat Up Time:	4 hours
Heat Up Recording Interval:	5 minutes
Minimum Air Temperature:	N/A
Minimum Pulp Temperature at End of Heat Up:	47.2 °C/117.0 °F
Dwell Time:	5 minutes
Dwell Recording Interval:	5 minutes
Cooling Method:	Forced air or Hydrocooling



"N/A" in any of the requirements in the Treatment Schedule indicates that PPQ has no requirement.

Post Treatment Handling

After the treatment is complete, move the fruit from the chamber into the quarantine area. Cool the fruit according to the requirements listed in the treatment schedule.

Record Keeping

Keep all treatment records at the treatment facility for one year after treatment. The facility must also maintain a record of all problems and/or breakdowns and any maintenance performed on the chamber. All the records listed above must be made available to the PPQ official upon request.

Common Problems and Failure Points

If the temperature recording intervals and minimum temperature requirements are not met, the treatment fails. The only exception to this is that a probe may record no data for a single recording interval during the treatment. (Note: This does not mean the temperature may be out of range, only that the data may be missing). After reviewing the treatment data, the official should sign and date the data.

If a problem arises during treatment, such as a probe stops recording data or the temperature drops below the required temperature, the treatment will fail. The facility manager must determine if the fruit will be re-treated or will be removed from the chamber into the non-quarantine area.