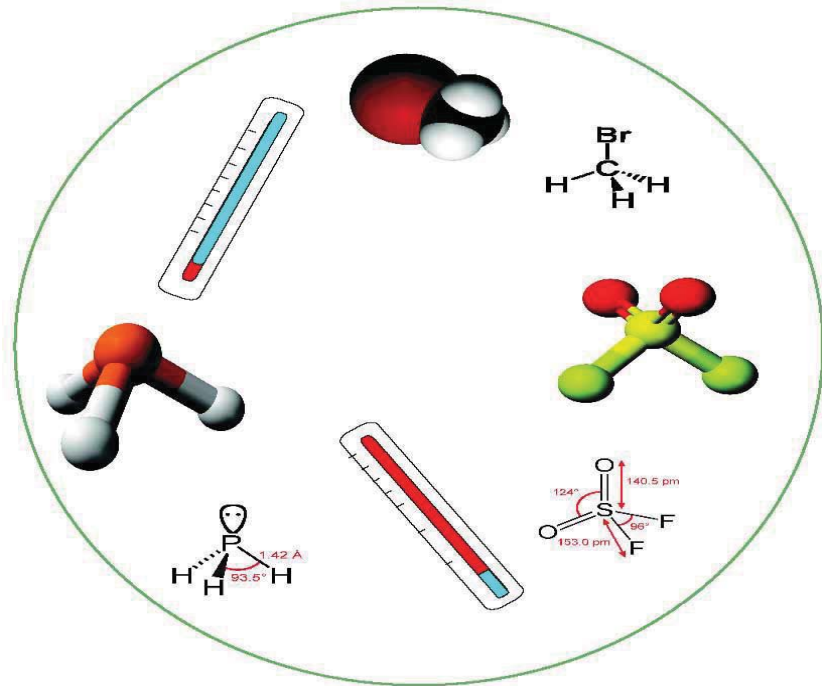


United States Department of Agriculture
Animal and Plant Health Inspection Services
Plant Protection Quarantine
TREATMENT MANUAL – CHAPTER 5



5

Treatment Manual

Treatment Schedules

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5

Treatment Manual

Treatment Schedules

T100 - Schedules for Fruit, Nuts, and Vegetables

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Reporting Commodity Injury

Record any new or unusual observations relating to injury of commodity and report them to Quarantine Policy, Analysis and Support (QPAS) in Riverdale. Give pertinent details of the treatment and conditions regarding its application. In appraising the effect of a particular treatment, take care to distinguish between the actual or apparent effects directly attributable to the treatment and those relating to factors or conditions not subject to PPQ control.

Commodities in the T100 series are intended for consumption as food or feed. These commodities may have to be treated with methyl bromide to control a pest.

FIFRA Section 18 Exemption

Methyl bromide fumigants, except those with “Q” labels, are subject to requirements of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), Section 18 Quarantine Exemption. When commodities intended for food or feed are fumigated with methyl bromide under the FIFRA Section 18 Quarantine Exemption, one additional EPA requirement must be met: PPQ must monitor aeration by sampling the gas concentration to determine when a commodity may be released.

In this manual, fumigation schedules under the FIFRA Section 18 Quarantine Exemption are identified by the following note:



Do **not** use this treatment schedule if its FIFRA Section 18 Exemption has expired. For the current exemption status, call your local State Plant Health Director (SPHD).

Determine the Correct Label for Fumigation

Always use the label of the fumigant to determine if the commodity can be treated. Fumigation schedules in this publication are intended to clarify and expand commercial labels for methyl bromide. The EPA only authorizes fumigation for commodities that are listed on the label of the gas being used for the fumigation. Also, to comply with State regulations, a fumigant must be registered in the State where it is being used.

Although the EPA only authorizes the use of a pesticide on a crop, animal, or site that is listed on the label of a pesticide, specific pests do not have to be listed on the label to use the pesticide. An amendment to FIFRA in 1978 permits the use of a pesticide to control a pest not on the label if the application is to a crop, animal, or site specified on the label, unless mentioned otherwise.

How Fruits and Vegetables Are Listed

Fruits and vegetables that are to be fumigated with methyl bromide (T101s) will be listed in alphabetical order. Each schedule will have an assigned letter, e.g., Apples T101-a-1, Zucchini T101-h-3. For fruits and vegetables that require treatment as a condition of entry, refer to the [Fruits and Vegetables Import Requirement database](#) for the specific treatment.

T101—Methyl Bromide Fumigation

T101-a-1 Apple and Pear¹

Pest: External feeders

Treatment: **T101-a-1** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
80 °F or above	1.5 lbs	19	14
70-79 °F	2 lbs	26	19
60-69 °F	2.5 lbs	32	24
50-59 °F	3 lbs	38	29
40-49 °F	4 lbs	48	38

T101-a-3 Apricot², Peach, Plum, Nectarine

Pest: External feeders

Treatment: **T101-a-3** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
80 °F or above	1.5 lbs	19	14
70-79 °F	2 lbs	26	19
60-69 °F	2.5 lbs	32	24
50-59 °F	3 lbs	38	29
40-49 °F	4 lbs	48	38

- 1 Fumigation may cause **severe** damage to Chinese, Japanese, Asian and Sand Pears. Obtain the importer's consent before fumigation.
- 2 Pluots and plumcots are considered hybrids of apricots and plums and can be treated using T101-a-3 provided they are treated as a **Section 18 Crisis Exemption**.

T101-b-1

Asparagus

Pest: External feeders such as Noctuidae spp., *Thrips* spp. (except *Scirtothrips dorsalis* from Thailand), *Copitarsia* spp.

Treatment: **T101-b-1** MB (“Q” label only) at NAP—tarpaulin or chamber..



Fumigation may cause damage and a reduction in shelf life. Obtain the importers consent before fumigation.

Temperature	Dosage Rate (lb/1000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2.5 hrs
80 °F or above	1.5 lbs	19	14
70-79 °F	2.0 lbs	26	19
60-69 °F	2.5 lbs	32	24
50-59 °F	3.0 lbs	38	29
40-49 °F	4.0 lbs	48	38



Asparagus can be fumigated with T101-b-1 in those states listed in the PPQ 2ee recommendation: California, Florida, Georgia, Illinois, New Jersey, New York, and Texas. In these states, aeration is the fumigator’s responsibility.

If asparagus is to be fumigated in states other than CA, FL, GA, IL, NJ, NY, and TX, contact USDA-APHIS-PPQ at (301)851-2312 or (301)851-2243.

T101-b-1-1

Asparagus from Thailand, Australia, and New Zealand

Pest: *Scirtothrips dorsalis* (Thailand), *Halotydeus destructor* (Australia) (New Zealand)

Treatment: **T101-b-1-1** MB (“Q” label only) at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
80 °F or above	2.5 lbs	32	24
70-79 °F	3 lbs	38	29
60-69 °F	4 lbs	48	38

T101-c-1

Avocado (from Hawaii, Israel, or the Philippines)

Pest: *Ceratitis capitata* (Mediterranean fruit fly), *Bactrocera dorsalis* (Oriental fruit fly), and *Bactrocera cucurbitae* (melon fly)

Treatment: **T101-c-1** MB at NAP—tarpaulin or chamber

This treatment is marginal as to host tolerance and shipper should be warned of possible injury. Treatment approved for issuance of 318.13-4e certification.

Temperature	Dosage Rate (lb/1000 ft ³)	Minimum Concentration Readings (ounces) At:		
		0.5 hr	2 hrs	4 hrs
70 °F or above	2 lbs	26	16	14



Do **not** use this treatment schedule if its FIFRA Section 18 Exemption has expired. For the current exemption status, call your local State Plant Health Director (SPHD).

Alternate Treatment—Fumigation plus refrigeration T108

T101-d-1

Banana

Pest: External feeders such as Noctuidae, *Thrips* spp., *Copitarsia* spp.

Treatment: **T101-d-1** MB at NAP—tarpaulin or chamber

This treatment is marginal as to host tolerance and shipper should be warned of possible injury.

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
80 °F or above	1.5 lbs	19	14
70-79 °F	2 lbs	26	19
60-69 °F	2.5 lbs	32	24
50-59 °F	3 lbs	38	29
40-49 °F	4 lbs	48	38



Do **not** use this treatment schedule if its FIFRA Section 18 Exemption has expired. For the current exemption status, call your local State Plant Health Director (SPHD).

T101-e-1 Bean (except for faba bean), dry

Pest: Bruchidae (seed beetles)

Treatment: **T101-e-1** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:					
		0.5 hr	2 hrs	2.5 hrs	3 hrs	3.5 hrs	4 hrs
70 °F or above	3 lbs	38	—	24	—	—	—
60-69 °F	3 lbs	38	29	—	24	—	—
50-59 °F	3 lbs	38	29	—	—	24	—
40-49 °F	3 lbs	38	29	—	—	—	24

see also T101-k-2 or T101-k-2-1 for fresh beans

T101-g-1 Beet

Pest: Internal feeders

Treatment: **T101-g-1** MB chamber, 15" vacuum—chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
90 °F or above	2 lbs	2 hrs
80-89 °F	2.5 lbs	2 hrs
70-79 °F	3 lbs	2 hrs
60-69 °F	3 lbs	2.5 hrs
50-59 °F	3 lbs	3 hrs
40-49 °F	3 lbs	3.5 hrs



As of October 2008, **no commercial** chambers in the United States are approved for the vacuum fumigation of imported commodities. If vacuum treatment is required as a **condition of entry**, the consignment must be destroyed, reexported or returned to country of origin.

Beet

T101-g-1-1

Pest: External feeders

Treatment: **T101-g-1-1** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:				
		0.5 hr	2 hrs	3 hrs	3.5 hrs	4 hrs
90 °F and above	2 lbs	26	19	19	—	—
80-89 °F	2.5 lbs	32	24	24	—	—
70-79 °F	3 lbs	38	29	24	—	—
60-69 °F	3 lbs	38	29	—	24	—
50-59 °F	3 lbs	38	29	—	—	24

T101-h-1

Blackberry

Pest: External feeders such as Noctuidae, *Thrips* spp., *Copitarsia* spp., Pentatomidae, and *Tarsonemus* spp.

Treatment: **T101-h-1** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
80 °F or above	1.5 lbs	19	14
70-79 °F	2 lbs	26	19
60-69 °F	2.5 lbs	32	24
50-59 °F	3 lbs	38	29
40-49 °F	4 lbs	48	38



Do **not** use this treatment schedule if its FIFRA Section 18 Exemption has expired. For the current exemption status, call your local State Plant Health Director (SPHD).

T101-i-1

Blueberry

Pest: External feeders

Treatment: **T101-i-1** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
80 °F or above	1.5 lbs	19	14
70-79 °F	2 lbs	26	19

T101-i-1-1

Blueberry



Lobesia botrana (European grapevine moth) has been added to this treatment schedule as the result of an emergency action required by PPQ in order to mitigate the pest risk. The emergency action is an interim measure and is pending final regulatory approval. (Federal Order DA-2013-56)

Pest: *Ceratitis capitata* (Mediterranean fruit fly), *Anastrepha fraterculus* (South American fruit fly), and *Lobesia botrana* (European grapevine moth)

Treatment: **T101-i-1-1** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:		
		0.5 hr	2 hrs	3.5 hrs
70 °F or above	2 lbs	26	22	21

T101-i-1-2

Blueberry



Lobesia botrana (European grapevine moth) has been added to this treatment schedule as the result of an emergency action required by PPQ in order to mitigate the pest risk. The emergency action is an interim measure and is pending final regulatory approval. (Federal Order DA-2013-56)

Pest: *Ceratitis capitata* (Mediterranean fruit fly), *Anastrepha fraterculus* (South American fruit fly), and *Lobesia botrana* (European grapevine moth)

Treatment: **T101-i-1-2** MB at NAP—chamber

Temperature	Dosage Rate (lb/1000 ft ³)	Exposure Period
60 °F or above	2.0 lbs	3.5

T101-i-1-3

Blueberry

Pest: *Lobesia botrana* (European grapevine moth)

Treatment: **T101-i-1-3** MB at NAP—tarpaulin

The yellow and black colors of this schedule indicates that the authority to conduct the treatment comes from an emergency action required by PPQ in order to mitigate the pest risk. (Federal Order DA-2014-03) The emergency action is an interim measure and is pending final regulatory approval.

Fumigate after cold storage (34 °F or lower) for a minimum of 10 days. The cold storage is not subject to verification by PPQ nor CBP and is not a quarantine treatment.

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	3 hrs
40–69 °F	4.0	55	45



Important

Do **not** use this treatment schedule if its FIFRA Section 18 Exemption has expired. For the current exemption status, call your local State Plant Health Director (SPHD).



Phytoxicity is unknown. Obtain the importer's consent before fumigation.

T101-i-1-4

Blueberry

Pest: *Lobesia botrana* (European grapevine moth)

Treatment: **T101-i-1-4** MB at NAP—chamber

The yellow and black colors of this schedule indicates that the authority to conduct the treatment comes from an emergency action required by PPQ in order to mitigate the pest risk. (Federal Order DA-29014-03) The emergency action is an interim measure and is pending final regulatory approval.

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period (hours)
50–59 °F	3.5 lbs	3.0
40–49 °F	4.0 lbs	3.0



Important

Do **not** use this treatment schedule if its FIFRA Section 18 Exemption has expired. For the current exemption status, call your local State Plant Health Director (SPHD).



Phytoxicity is unknown. Obtain the importer's consent before fumigation.

T101-n-2

Broccoli (*Brassica oleracea* var. *botrytis*)

Pest: External feeders and leaf miners

Treatment: **T101-n-2** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
70 °F or above	2 lbs	26	14
60-69 °F	2.5 lbs	32	24
50-59 °F	3 lbs	38	29
45-49 °F	3.5 lbs	43	34
40-44 °F	4 lbs	48	38



Important

Do **not** use this treatment schedule if its FIFRA Section 18 Exemption has expired. For the current exemption status, call your local State Plant Health Director (SPHD).

T101-n-2

Broccoli, Chinese (gai lon) (*Brassica alboglabra*)

Pest: External feeders and leaf miners

Treatment: **T101-n-2** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
70 °F or above	2 lbs	26	14
60-69 °F	2.5 lbs	32	24
50-59 °F	3 lbs	38	29
45-49 °F	3.5 lbs	43	34
40-44 °F	4 lbs	48	38



Do **not** use this treatment schedule if its FIFRA Section 18 Exemption has expired. For the current exemption status, call your local State Plant Health Director (SPHD).

T101-n-2

Broccoli raap (rapini) (*Brassica campestris*)

Pest: External feeders and leaf miners

Treatment: **T101-n-2** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
70 °F or above	2 lbs	26	14
60-69 °F	2.5 lbs	32	24
50-59 °F	3 lbs	38	29
45-49 °F	3.5 lbs	43	34
40-44 °F	4 lbs	48	38



Do **not** use this treatment schedule if its FIFRA Section 18 Exemption has expired. For the current exemption status, call your local State Plant Health Director (SPHD).

T101-n-2 Brussels sprouts (*Brassica oleracea* var. *gemmifera*)

Pest: External feeders and leaf miners

Treatment: **T101-n-2** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
70 °F or above	2 lbs	26	14
60-69 °F	2.5 lbs	32	24
50-59 °F	3 lbs	38	29
45-49 °F	3.5 lbs	43	34
40-44 °F	4 lbs	48	38



Important

Do **not** use this treatment schedule if its FIFRA Section 18 Exemption has expired. For the current exemption status, call your local State Plant Health Director (SPHD).

T101-j-1 Cabbage

Includes both European and Chinese cabbage

Pest: External feeders

Treatment: **T101-j-1** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
70 °F or above	2 lbs	26	14
60-69 °F	2.5 lbs	32	24
50-59 °F	3 lbs	38	29
45-49 °F	3.5 lbs	43	34
40-44 °F	4 lbs	48	38

For other *Brassica* spp., use the leafy vegetable schedule, T101-n-2

T101-n-2

Cabbage (*Brassica oleracea*)

Pest: External feeders and leaf miners

Treatment: **T101-n-2** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
70 °F or above	2 lbs	26	14
60-69 °F	2.5 lbs	32	24
50-59 °F	3 lbs	38	29
45-49 °F	3.5 lbs	43	34
40-44 °F	4 lbs	48	38



Important

Do **not** use this treatment schedule if its FIFRA Section 18 Exemption has expired. For the current exemption status, call your local State Plant Health Director (SPHD).

T101-n-2

Cabbage, Chinese (bok choy) (*Brassica chinensis*)

Pest: External feeders and leaf miners

Treatment: **T101-n-2** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
70 °F or above	2 lbs	26	14
60-69 °F	2.5 lbs	32	24
50-59 °F	3 lbs	38	29
45-49 °F	3.5 lbs	43	34
40-44 °F	4 lbs	48	38



Important

Do **not** use this treatment schedule if its FIFRA Section 18 Exemption has expired. For the current exemption status, call your local State Plant Health Director (SPHD).

T101-n-2 Cabbage, Chinese (napa) (*Brassica pekinensis*)

Pest: External feeders and leaf miners

Treatment: **T101-n-2** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
70 °F or above	2 lbs	26	14
60-69 °F	2.5 lbs	32	24
50-59 °F	3 lbs	38	29
45-49 °F	3.5 lbs	43	34
40-44 °F	4 lbs	48	38



Important

Do **not** use this treatment schedule if its FIFRA Section 18 Exemption has expired. For the current exemption status, call your local State Plant Health Director (SPHD).

T101-n-2 Cabbage, Chinese mustard (gai choy) (*Brassica campestris*)

Pest: External feeders and leaf miners

Treatment: **T101-n-2** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
70 °F or above	2 lbs	26	14
60-69 °F	2.5 lbs	32	24
50-59 °F	3 lbs	38	29
45-49 °F	3.5 lbs	43	34
40-44 °F	4 lbs	48	38



Important

Do **not** use this treatment schedule if its FIFRA Section 18 Exemption has expired. For the current exemption status, call your local State Plant Health Director (SPHD).

T101-k-1

Cantaloupe

Pest: External feeders

Treatment: **T101-k-1** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
80 °F or above*	1.5 lbs	19	14
70-79 °F*	2 lbs	26	19
60-69 °F	2.5 lbs	32	24
50-59 °F	3 lbs	38	29
40-49 °F	4 lbs	48	38

* Use “MB 100” at 70 °F or above, use MB “Q” label at 40 °F or above.

For other melons, see T101-o-2

T101-l-1

Carrot

Pest: External feeders

Treatment: **T101-l-1** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:				
		0.5 hr	2 hrs	3 hrs	3.5 hrs	4 hrs
90 °F and above	2 lbs	26	19	19	—	—
80-89 °F	2.5 lbs	32	24	24	—	—
70-79 °F	3 lbs	38	29	24	—	—
60-69 °F	3 lbs	38	29	—	24	—
50-59 °F	3 lbs	38	29	—	—	24

T101-m-1

Carrot

Pest: Internal feeders

Treatment: **T101-m-1** MB, chamber, 15" vacuum

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
90 °F or above	2 lbs	2 hrs
80-89 °F	2.5 lbs	2 hrs
70-79 °F	3 lbs	2 hrs
60-69 °F	3 lbs	2.5 hrs
50-59 °F	3 lbs	3 hrs
40-49 °F	3 lbs	3.5 hrs



As of October 2008, **no commercial** chambers in the United States are approved for the vacuum fumigation of imported commodities. If vacuum treatment is required as a **condition of entry**, the consignment must be destroyed, reexported or returned to country of origin.

T101-n-1

Cassava (*manihot* and *yuca*)

Pest: External feeders and hitchhikers³

Treatment: **T101-n-1** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:			
		0.5 hr	2 hrs	3 hrs	3.5 hrs
90 °F or above	2 lbs	26	19	19	—
80-89 °F	2.5 lbs	32	24	24	—
70-79 °F	3 lbs	38	29	24	—
60-69 °F	3 lbs	38	29	—	24



Do **not** use this treatment schedule if its FIFRA Section 18 Exemption has expired. For the current exemption status, call your local State Plant Health Director (SPHD).

T101-n-2

Cauliflower (*Brassica oleracea* var. *botrytis*)

Pest: External feeders and leaf miners

Treatment: **T101-n-2** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
70 °F or above	2 lbs	26	14
60-69 °F	2.5 lbs	32	24
50-59 °F	3 lbs	38	29
45-49 °F	3.5 lbs	43	34
40-44 °F	4 lbs	48	38



Do **not** use this treatment schedule if its FIFRA Section 18 Exemption has expired. For the current exemption status, call your local State Plant Health Director (SPHD).

³ T101-n-1 should NOT be used for snails, but can be used for slugs.

T101-n-2

Cavalo broccolo (*Brassica oleracea* var. *botrytis*)

Pest: External feeders and leaf miners

Treatment: **T101-n-2** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
70 °F or above	2 lbs	26	14
60-69 °F	2.5 lbs	32	24
50-59 °F	3 lbs	38	29
45-49 °F	3.5 lbs	43	34
40-44 °F	4 lbs	48	38



Important

Do **not** use this treatment schedule if its FIFRA Section 18 Exemption has expired. For the current exemption status, call your local State Plant Health Director (SPHD).

T101-n-1

Celeriac (celery root)

Pest: External feeders

Treatment: **T101-n-1** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:			
		0.5 hr	2 hrs	3 hrs	3.5 hrs
90 °F or above	2 lbs	26	19	19	—
80-89 °F	2.5 lbs	32	24	24	—
70-79 °F	3 lbs	38	29	24	—
60-69 °F	3 lbs	38	29	—	24



Important

Do **not** use this treatment schedule if its FIFRA Section 18 Exemption has expired. For the current exemption status, call your local State Plant Health Director (SPHD).

T101-o-1

Celery (above-ground parts)

Pest: External feeders

Treatment: **T101-o-1** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/ 1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
80 °F or above	1.5 lbs	19	14
70-79 °F	2 lbs	26	19
60-69 °F	2.5 lbs	32	24
50-59 °F	3 lbs	38	29
40-49 °F	4 lbs	48	38



Important

Do **not** use this treatment schedule if its FIFRA Section 18 Exemption has expired. For the current exemption status, call your local State Plant Health Director (SPHD).

For below ground parts, use T101-n-1

T101-p-1

Chayote (fruit only)

Pest: External feeders

Treatment: **T101-p-1** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
80 °F or above	1.5 lbs	19	14
70-79 °F	2 lbs	26	19
60-69 °F	2.5 lbs	32	24
50-59 °F	3 lbs	38	29
40-49 °F	4 lbs	48	38



Important

Do **not** use this treatment schedule if its FIFRA Section 18 Exemption has expired. For the current exemption status, call your local State Plant Health Director (SPHD).

For below ground parts, use T101-a-2 (Dasheen)

T101-r-1

Cherry

Pest: Insects other than fruit flies

Treatment: **T101-r-1** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
80 °F or above	1.5 lbs	19	14
70-79 °F	2 lbs	26	19
60-69 °F	2.5 lbs	32	24
50-59 °F	3 lbs	38	29
40-49 °F	4 lbs	48	38

T101-s-1

Cherry

Pest: *Rhagoletis indifferens* (Western cherry fruit fly) and *Cydia pomonella* (codling moth)

Treatment: **T101-s-1** MB at NAP—chamber only

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
70 °F or above	2 lbs	2 hrs
60-69 °F	2.5 lbs	2 hrs
50-59 °F	3 lbs	2 hrs
40-49 °F	4 lbs	2 hrs

T101-s-1-1

Cherry from Australia

Pest: *Ceratitis capitata* (Mediterranean fruit fly)

Treatment: **T101-s-1-1** MB at NAP—chamber only

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
63 °F or above	2.5 lbs	2 hrs



Run the circulation fans continuously during the entire fumigation.

Do not exceed a 21% (by volume) load factor in the chamber.

T101-t-1

Chestnut

Pest: *Cydia splendana* (nut fruit tortrix) and *Curculio* spp.

Treatment: **T101-t-1** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:					
		0.5 hr	2 hrs	3 hrs	4 hrs	5 hrs	6 hrs
90 °F and above	4 lbs	58	34	34	—	—	—
80-89 °F	4 lbs	58	32	—	32	—	—
70-79 °F	5 lbs	72	42	—	42	—	—
60-69 °F	5 lbs	72	40	—	—	40	—
50-59 °F	6 lbs	85	50	—	—	50	—
40-49 °F	6 lbs	85	48	—	—	—	48

see also T101-u-1

Does **not** include water chestnut

T101-u-1

Chestnut

Pest: *Cydia splendana* (nut fruit tortrix) and *Curculio* spp.

Treatment: **T101-u-1** MB in 26" vacuum—chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
80 °F or above	3 lbs	2 hrs
70-79 °F	4 lbs	2 hrs
60-69 °F	4 lbs	3 hrs
50-59 °F	4 lbs	4 hrs
40-49 °F	4 lbs	5 hrs

Does **not** include water chestnut

T101-v-1

Chicory (above-ground parts)

Pest: External feeders

Treatment: **T101-v-1** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
70 °F or above	2 lbs	26	14
60-69 °F	2.5 lbs	32	24
50-59 °F	3 lbs	38	29
45-49 °F	3.5 lbs	43	34
40-44 °F	4 lbs	48	38



Do **not** use this treatment schedule if its FIFRA Section 18 Exemption has expired. For the current exemption status, call your local State Plant Health Director (SPHD).

see T101-n-1 for below-ground parts

see T101-z-1 for below-ground parts

see T101-a-2 for below-ground parts

T101-n-1

Chicory root

Pest: External feeders

Treatment: **T101-n-1** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:			
		0.5 hr	2 hrs	3 hrs	3.5 hrs
90 °F or above	2 lbs	26	19	19	—
80-89 °F	2.5 lbs	32	24	24	—
70-79 °F	3 lbs	38	29	24	—
60-69 °F	3 lbs	38	29	—	24



Do **not** use this treatment schedule if its FIFRA Section 18 Exemption has expired. For the current exemption status, call your local State Plant Health Director (SPHD).

T101-w-1

Cipollini (bulbs)

Pest: *Exosoma lusitanica* (chrysomelid beetle)

Treatment: **T101-w-1** MB in 15" vacuum—chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
80 °F or above	2 lbs.	2 hrs
70-79 °F	3 lbs.	2 hrs
60-69 °F	4 lbs.	2 hrs
50-59 °F	4 lbs.	3 hrs
40-49 °F	4 lbs.	4 hrs



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T101-w-1-2 Citrus from U.S. (interstate movement)

Pest: *Ceratitis capitata* (Mediterranean fruit fly)

Treatment: **T101-w-1-2** MB at NAP—tarpaulin or chamber
See “*Ceratitis capitata* (Mediterranean fruit fly) D301.32-10(c)” on page-5-8-5.

T101-n-2-1 Clementine, Grapefruit, Lemon, Lime, Orange, Mandarin, and Tangerine from Chile

Pest: External feeders and *Brevipalpus chilensis* (Chilean False Red Mite)

Treatment: **T101-n-2-1** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
80 °F or above	1.5 lbs	19	14
70-79 °F	2 lbs	26	19
60-69 °F	2.5 lbs	32	24
50-59 °F	3 lbs	38	29

T101-j-2-1 Clementine (Tangerine), Grapefruit, Orange from Mexico and quarantine areas of the U.S.

Pest: *Anastrepha* spp.

Treatment: **T101-j-2-1** MB at NAP—chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
80 °F or above ¹	2.5 lbs	2 hrs

¹ The temperature was changed from a minimum of 70 °F to 80 °F administratively in October 2005 due to interceptions of live *Anastrepha* larvae.

Load limit **not** to exceed 80 percent of chamber capacity.

Inspect a representative sample of the fruit. If the level of infestation with fruit flies is more than 0.5 percent for the lot, then the fruit is ineligible for fumigation.

T101-n-2

Coles (Brassica spp.)*

Pest: External feeders and leaf miners

Treatment: **T101-n-2** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
70 °F or above	2 lbs	26	14
60-69 °F	2.5 lbs	32	24
50-59 °F	3 lbs	38	29
45-49 °F	3.5 lbs	43	34
40-44 °F	4 lbs	48	38



Important

Do **not** use this treatment schedule if its FIFRA Section 18 Exemption has expired. For the current exemption status, call your local State Plant Health Director (SPHD).



Important

*Coles (Brassica spp.), EPA Crop Group 5, are restricted to broccoli (Brassica oleracea var. botrytis); broccoli, Chinese (gai lon) (Brassica albogiabra); broccoli raab (rapini) (Brassica campestris); brussels sprouts (Brassica oleracea var. gemmifera); cabbage (Brassica oleracea); Cabbage, Chinese (bok choy) (Brassica chinensis); Cabbage, Chinese (napa) (Brassica pekinensis); cabbage, Chinese mustard (gai choy) (Brassica campestris); cauliflower (Brassica oleracea var. botrytis); cavalo broccolo (Brassica oleracea var. botrytis); collards (Brassica oleracea var. acephala); kale (Brassica oleracea var. acephala); kohlrabi (Brassica oleracea var. gongyiodes); mizuna (Brassica rapa Japonica Group); mustard greens (Brassica juncea); mustard spinach (Brassica rapa Pervirdis Group); rape greens (Brassica napus)

Of these, cabbage (Brassica oleracea) (labeled treatment T101-j-1) is the only vegetable in this group **not** covered by a FIFRA Section 18 Exemption.

T101-n-2

Collard Greens (*Brassica oleracea* var. *acephala*)

Pest: External feeders and leaf miners

Treatment: **T101-n-2** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
70 °F or above	2 lbs	26	14
60-69 °F	2.5 lbs	32	24
50-59 °F	3 lbs	38	29
45-49 °F	3.5 lbs	43	34
40-44 °F	4 lbs	48	38



Do **not** use this treatment schedule if its FIFRA Section 18 Exemption has expired. For the current exemption status, call your local State Plant Health Director (SPHD).

T101-x-1

Copra

(Dried coconuts and whole coconuts without the husk)

Pest: External feeders

Treatment: **T101-x-1** MB (“Q” label only) at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
80 °F or above	1.5 lbs	19	14
70-79 °F	2 lbs	26	19
60-69 °F	2.5 lbs	32	24

T101-x-1-1

Corn-on-the-cob

(Green corn, sweet corn)

Pest: *Ostrinia nubilalis* (European corn borer)

Treatment: **T101-x-1-1** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2.5 hrs
70 °F or above	2.5 lbs	32	24

T101-y-1

Cucumber

Pest: External feeders

Treatment: **T101-y-1** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
80 °F or above	1.5 lbs	19	14
70-79 °F	2 lbs	26	19
60-69 °F	2.5 lbs	32	24
50-59 °F	3 lbs	38	29

T101-z-1

Dasheen

(Eddoe, malanga, tannia, tanya, taro, and yautia)

Pest: External feeders

Treatment: **T101-z-1** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:				
		0.5 hr	2 hrs	3 hrs	3.5 hrs	4 hrs
90 °F or above	2 lbs	26	19	19	—	—
80-89 °F	2.5 lbs	32	24	24	—	—
70-79 °F	3 lbs	38	29	24	—	—
60-69 °F	3 lbs	38	29	—	24	—
50-59 °F	3 lbs	38	29	—	—	24
40-49 °F	4 lbs	48	40	—	—	32



Important

Do **not** use this treatment schedule if its FIFRA Section 18 Exemption has expired. For the current exemption status, call your local State Plant Health Director (SPHD).

T101-a-2

Dasheen

Pest: Internal feeders

Treatment: **T101-a-2** MB chamber, 15" vacuum—chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
90 °F or above	2 lbs	2 hrs
80-89 °F	2.5 lbs	2 hrs
70-79 °F	3 lbs	2 hrs
60-69 °F	3 lbs	2.5 hrs
50-59 °F	3 lbs	3 hrs
40-49 °F	3 lbs	3.5 hrs



Do **not** use this treatment schedule if its FIFRA Section 18 Exemption has expired. For the current exemption status, call your local State Plant Health Director (SPHD).



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T101-b-2

Endive

Pest: External feeders

Treatment: **T101-b-2** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
70 °F or above	2 lbs	26	14
60-69 °F	2.5 lbs	32	24
50-59 °F	3 lbs	38	29
45-49 °F	3.5 lbs	43	34
40-44 °F	4 lbs	48	38



Do **not** use this treatment schedule if its FIFRA Section 18 Exemption has expired. For the current exemption status, call your local State Plant Health Director (SPHD).

T101-c-2 Faba (Fava) bean (dried)

Pest: Bruchidae (seed beetles)

Treatment: **T101-c-2** MB in 26" vacuum—chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
70 °F or above	3 lbs	3.5 hrs
60-69 °F	3 lbs	4 hrs
50-59 °F	3 lbs	4.5 hrs
40-49 °F	3 lbs	5 hrs

T101-d-2 Faba (Fava) bean (dried)

Pest: Bruchidae (seed beetles)

Treatment: **T101-d-2** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:					
		0.5 hr	2 hrs	11 hrs	12hrs	13 hrs	14 hrs
70 °F and above	3.5 lbs	46	28	27	—	—	—
60-69 °F	3.5 lbs	46	28		27		
50-59 °F	3.5 lbs	46	28			27	
40-49 °F	3.5 lbs	46	28				27

If fresh, see Green Pod Vegetables

T101-e-2 Garlic

Pest: *Brachycerus* spp. (garlic beetles) and *Dyspessa ulula* (garlic carpenterworm)

Treatment: **T101-e-2** MB in 15" vacuum—chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
90 °F or above	2 lbs	1.5 hrs
80-89 °F	2 lbs	2 hrs
70-79 °F	2.5 lbs	2 hrs
60-69 °F	3 lbs	2 hrs
50-59 °F	3 lbs	3 hrs
40-49 °F	3 lbs	4 hrs



As of October 2008, **no commercial** chambers in the United States are approved for the vacuum fumigation of imported commodities. If vacuum treatment is required as a **condition of entry**, the consignment must be destroyed, reexported or returned to country of origin.

Load limit **not** to exceed 80 percent of chamber capacity

T101-f-2

Ginger (rhizome)

Pest: Internal feeders

Treatment: **T101-f-2** MB in 15" vacuum—chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
90 °F or above	2 lbs	3 hrs
80-89 °F	2.5 lbs	3 hrs
70-79 °F	3 lbs	3 hrs
60-69 °F	3 lbs	3.5 hrs



Do **not** use this treatment schedule if its FIFRA Section 18 Exemption has expired. For the current exemption status, call your local State Plant Health Director (SPHD).



As of October 2008, **no commercial** chambers in the United States are approved for the vacuum fumigation of imported commodities. If vacuum treatment is required as a **condition of entry**, the consignment must be destroyed, reexported or returned to country of origin.

T101-g-2

Ginger (rhizome)

Pest: External feeders

Treatment: **T101-g-2** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:			
		0.5 hr	2 hrs	3 hrs	3.5 hrs
90 °F or above	2 lbs	26	19	19	—
80-89 °F	2.5 lbs	32	24	24	—
70-79 °F	3 lbs	38	29	24	—
60-69 °F	3 lbs	38	29	—	24



Do **not** use this treatment schedule if its FIFRA Section 18 Exemption has expired. For the current exemption status, call your local State Plant Health Director (SPHD).

T101-h-2

Grape

Pest: *Lobesia botrana* (European grapevine moth)

Treatment: **T101-h-2** MB at NAP—tarpaulin (4 lbs.) or chamber (3.5 lbs.)
The yellow color of this treatment indicates that the authority to conduct the treatment comes from an emergency action required by PPQ in order to mitigate the pest risk. The emergency action is an interim measure and is pending final regulatory approval.

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	3 hrs
50 °F and above	3.5 lbs ¹	50	40
40 °F and above	4.0 lbs ²	55	45

- 3.5 lb. dosage: must be conducted in a chamber with a commodity load not to exceed 50%.
- 4.0 lb. dosage: must be used in conjunction with cold storage (34 °F or lower for a minimum of 10 days). The fumigation may be conducted under tarp.

T101-h-2-1

Grape

Pest: *Ceratitis capitata* (Mediterranean fruit fly)⁴

Treatment: **T101-h-2-1** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:					
		0.5 hr	2 hrs	2.5 hrs	3 hrs	3.5 hrs	4 hrs
70 °F or above	2 lbs	26	22	22	—	21	—
65-69 °F	2 lbs	26	22	22	—	—	19

T101-i-2

Grape

Pest: External feeders and insects other than *Ceratitis capitata* (Mediterranean fruit fly) and mealybugs⁴

Treatment: **T101-i-2** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
80 °F or above	1.5 lbs	19	14
70-79 °F	2 lbs	26	19
60-69 °F	2.5 lbs	32	24
50-59 °F	3 lbs	38	29
40-49 °F	4 lbs	48	38

⁴ Effective November 19, 2010, PPQ suspended the use of T101-h-2-1 and T101-i-2 against *Lobesia botrana*. Use T101-h-2 if *Lobesia botrana* is detected.

T101-i-2-1

Grape, Baby kiwi (*Actinidia arguta*), and Pomegranate

Pest: *Brevipalpus chilensis* (Chilean false red mite)

Treatment: **T101-i-2-1** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb./1000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	3 hrs ¹
80 °F or above	1.5 lbs	19	14
70-79 °F	2 lbs	26	19
60-69 °F	2.5 lbs	32	24
50-59 °F	3.0 lbs	38	29
40-49 °F	4.0 lbs	48	38

¹ If the treatment is conducted in a chamber, decrease the total fumigation time to 2.5 hours.



Baby kiwi and pomegranate must be treated as FIFRA Section 18 treatments. Do **not** use this treatment schedule if its FIFRA Section 18 Exemption has expired. For the current exemption status, call your local State Plant Health Director (SPHD).

T101-i-2-2

Fig (*Ficus carica*)

Pest: *Brevipalpus chilensis* (Chilean false red mite)

Treatment: **T101-i-2-2** MB at NAP—chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period (hours)
70°F and above	2.5 lbs	3
60-69 °F	3.0 lbs	3
50-59 °F	3.5 lbs	3



Do **not** use this treatment schedule if its FIFRA Section 18 Exemption has expired. For the current exemption status, call your local State Plant Health Director (SPHD).

T101-j-2

Grapefruit and other kinds of citrus

Pest: *Aleurocanthus woglumi* (citrus blackfly)

Treatment: **T101-j-2** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
80 °F or above	1.5 lbs	16	12
70-79 °F	1.5 lbs	19	15
65-69 °F	1.75 lbs	23	17

T101-k-2

Green pod vegetables

Snap, string, yard-long beans, peas, pigeon peas, and lablab beans

Two alternative treatments, T101-k-2 or T101-k-2-1

Pest: *Cydia fabivora*, *Crocidosema aporema*, *Maruca vitrata* (exotic legume pod borers), *Melanagromyza obtusa* (pigeon pea pod fly), and leaf miners

Treatment: **T101-k-2** MB in 15" vacuum—chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
90 °F or above	0.5 lb	1.5 hrs
80-89 °F	1 lb	1.5 hrs
70-79 °F	1.5 lbs	1.5 hrs
60-69 °F	2 lbs	1.5 hrs
50-59 °F	2.5 lbs	1.5 hrs
40-49 °F	3 lbs	1.5 hrs

T101-k-2-1

Green pod vegetables

Snap, string, yard-long beans, peas, pigeon peas, and lablab beans

Two alternative treatments, T101-k-2 or T101-k-2-1

Pest: *Cydia fabivora*, *Crocidosema aporema*, *Maruca vitrata* (exotic legume pod borers), *Melanagromyza obtusa* (pigeon pea pod fly), and leaf miners

Alternative treatment: **T101-k-2-1** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
80 °F or above	1.5 lbs	19	14
70-79 °F	2 lbs	26	19
60-69 °F	2.5 lbs	32	24
50-59 °F	3 lbs	38	29

The term “green pod vegetables” refers to legumes, **not** peppers nor okra.

T101-n-2-1-1

Dried Herbs, Spices, and Mint (*Mentha* spp.⁵) (all plant parts and seeds)

Pest: Various stored product pests, **not** including khapra beetle⁶

Treatment: T101-n-2-1-1 MB (“Q” label only) at NAP-tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:			
		0.5 hr	4 hrs	16 hrs	24 hrs
70 °F or above	2 lbs	24	16	10	—
60-69 °F	2 lbs	24	16	—	10
50-59 °F	3 lbs	36	24	15	—
40-49 °F	3 lbs	36	24	—	15



Dried herbs and spices are restricted to Allspice, (*Pimenta dioica*), Angelica (*Angelica archangelica*), Anise (Anise seed) (*Pimpinella anisum*), Anise star (*Illicium verum*), Annatto (seed), Balm (Lemon balm) (*Melissa officinalis*), Basil (*Ocimum basilicum*), Borage (*Borago officinalis*), Bumet (*Sanguisorba minor*), Camomile (*Anthemis nobilis*), Caper buds (*Capparis spinosa*), Caraway (*Carum carvi*), Curaway, black (*Nigelia sativa*), Cardamom (*Elettaria cardamomum*), Cassia bark (*Cinnamomum aromaticum*), Cassia buds (*Cinnamomum aromaticum*), Catnip (*Nepeta cataria*), Celery seed (*Apium graveolens*), Chervil (dried) (*Anthriscus cerefolium*), Chive (*Allium schoenoprasum*), Chive, Chinese (*Allium tuberosum*), Cinnamon (*Cinnamomum verum*), Clary (*Salvia sciarea*), Clove buds (*Eugenia caryophyllata*), Coriander (cilantro or Chinese parsley) (leaf) (*Coriandrum sativum*), Coriander (cilantro) (seed) (*Coriandrum sativum*), Costmary (*Chrysanthemum balsamita*), Culantro (leaf) (*Eryngium foetidum*), Culantro (seed) (*Eryngium foetidum*), Cumin (*Cuminum cyminum*), Curry (leaf) (*Murraya koenigii*), Dill (dillweed) (*Anthemum graveolens*), Dill (seed) (*Anthemum graveolens*), Fennel (common) (*Foeniculum vulgare*), Fennel, Floronce (seed) (*Foeniculum vulgare Azoricum* group), Fenugreek (*Trigonella foenumgraecum*), Grains of paradise (*Aframomum melgueta*), Horehound (*Marrubium vulgare*), Hyssop (*Hyssopus officinalis*), Juniper berry (*Juniperus communis*), Lavender (*Lavandula officinalis*), Lemongrass (*Cymbopogon citratus*), Lovage (leaf) (*Levisticum officinale*), Lovage (seed) (*Levisticum officinale*), Mace (*Myristica fragrans*), Marigold (*Calendula officinalis*), Marjoram (*Origanum* spp.) (includes sweet or annual marjoram, wild marjoram, or oregano, and pot marjoram), Mustard (seed) (*Brassica juncea*, *B. hirta*, *B. nigra*), Nasturtium (*Tropaeolum majus*), Nutmeg (*Myristica fragrans*) Parsley (dried) (*Petroselinum crispum*), Pennyroyal (*Mentha pulegium*), Pepper, black (*Piper nigrum*), Poppy (seed) (*Papaver somniferum*), Rosemary (*Rosemarinus officinalis*), Rue (*Ruta graveolens*), Saffron (*Crocus sativus*), Sage (*Salvia officinalis*), Savory summer and winter (*Saturega* spp.), Sweet bay (bay leaf) (*Laurus nobilis*), Tansy (*Tanacetum vulgare*), Tarragon (*Artemisia dracuncululus*), Thyme (*Thymus* spp.), Vanilla (*Vanillia planifolia*), Wintergreen (*Gaultheria procumbens*), Woodruff (*Galium odorata*), Wormwood (*Artemisia absinthium*).

5 Mint (*Mentha* spp.) **must** be fumigated as a Section 18 exemption.

6 If khapra beetle is intercepted on herbs and spices (dried), do **not** use this schedule. Contact USDA-APHIS-PPQ-S&T-CPHST-AQI, tel: 1-919-855-7450.

T101-n-2

Fresh Herbs, Spices, and Mint (*Mentha* spp.) (all plant parts except seeds)

Pest: External feeders and leaf miners

Treatment: T101-n-2 MB at NAP-tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
70 °F or above	2 lbs	26	14
60-69 °F	2.5 lbs	32	24
50-59 °F	3 lbs	38	29
45-49 ° F	3.5 lbs	43	34
40-44 ° F	4 lbs	48	38



Do **not** use this treatment schedule if its FIFRA Section 18 Exemption has expired. For the current exemption status, call your local State Plant Health Director (SPHD).



Fresh herbs and spices are restricted to Allspice, (*Pimenta dioica*), Angelica (*Angelica archangelica*), Anise (Anise seed) (*Pimpinella anisum*), Anise star (*Illicium verum*), Annatto (seed), Balm (Lemon balm) (*Melissa officinalis*), Basil (*Ocimum basilicum*), Borage (*Borago officinalis*), Burnet (*Sanguisorba minor*), Camomile (*Anthemis nobilis*), Caper buds (*Capparis spinosa*), Caraway (*Carum carvi*), Curaway, black (*Nigelia sativa*), Cardamom (*Elettaria cardamomum*), Cassia bark and buds (*Cinnamomum aromaticum*), Catnip (*Nepeta cataria*), Celery seed (*Apium graveolens*), Chervil (dried) (*Anthriscus cerefolium*), Chive (*Allium schoenoprasum*), Chive, Chinese (*Allium tuberosum*), Cinnamon (*Cinnamomum verum*), Clary (*Salvia sciarea*), Clove buds (*Eugenia caryophyllata*), Coriander (cilantro or Chinese parsley) (leaf, seed) (*Coriandrum sativum*), Costmary (*Chrysanthemum balsamita*), Culantro (leaf, seed) (*Eryngium foetidum*), Cumin (*Cuminum cyminum*), Curry (leaf) (*Murraya koenigii*), Dill (dillweed, dill seed) (*Anthemum graveolens*), Fennel (common) (*Foeniculum vulgare*), Fennel, Floronce (seed) (*Foeniculum vulgare* Azoricum group), Fenugreek (*Trigonella foenumgraecum*), Grains of paradise (*Afromomum melgueta*), Horehound (*Marrubium vulgare*), Hyssop (*Hyssopus officinalis*), Juniper berry (*Juniperus communis*), Kaffir lime leaves (*Citrus hystrix*), Lavender (*Lavendula officinalis*), Lemongrass (*Cymbopogon citratus*), Lovage (leaf, seed) (*Levisticum officinale*), Mace (*Myristica fragrans*), Marigold (*Calendula officinalis*), Marjoram (*Origanum* spp.) (includes sweet or annual marjoram, wild marjoram, or oregano, and pot marjoram), Mustard (seed) (*Brassica juncea*, *B. hirta*, *B. nigra*), Nasturtium (*Tropaeolum majus*), Nutmeg (*Myristica fragrans*), Parsley (dried) (*Pestroselinum crispum*), Pennyroyal (*Mentha pulegium*), Pepper, black (*Piper nigrum*), Poppy (seed) (*Papaver somniferum*), Rosemary (*Rosemarinus officinalis*), Rue (*Ruta graveolens*), Saffron (*Crocus sativus*), Sage (*Salvia officinalis*), Savory summer and winter (*Saturega* spp.), Sweet bay (bay leaf) (*Laurus nobilis*), Tansy (*Tanacetum vulgare*), Tarragon (*Artemisia dracuncululus*), Thyme (*Thymus* spp.), Vanilla (*Vanillia planifolia*), Wintergreen (*Gaultheria procumbens*), Woodruff (*Galium odorata*), Wormwood (*Artemisia absinthium*).

T101-I-2

Horseradish

Pest: *Baris lepidii* (imported crucifer weevil)

Treatment: **T101-I-2** MB in 15" vacuum—chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
90 °F or above	2 lbs	2 hrs
80-89 °F	2.5 lbs	2 hrs
70-79 °F	3 lbs	2 hrs



As of October 2008, **no commercial** chambers in the United States are approved for the vacuum fumigation of imported commodities. If vacuum treatment is required as a **condition of entry**, the consignment must be destroyed, reexported or returned to country of origin.

T101-n-2

Kale (*Brassica oleracea* var. *acephala*)

Pest: External feeders and leaf miners

Treatment: **T101-n-2** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
70 °F or above	2 lbs	26	14
60-69 °F	2.5 lbs	32	24
50-59 °F	3 lbs	38	29
45-49 °F	3.5 lbs	43	34
40-44 °F	4 lbs	48	38



Do **not** use this treatment schedule if its FIFRA Section 18 Exemption has expired. For the current exemption status, call your local State Plant Health Director (SPHD).

T101-m-2

Kiwi

Three alternative treatments, depending on the pest.

Pest: External feeders (except *Brevipalpus chilensis*), *Nysius huttoni* (wheat bug)

Treatment: **T101-m-2** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
80 °F or above	1.5 lbs	19	14
70-79 °F	2 lbs	26	19
60-69 °F	2.5 lbs	32	24
50-59 °F	3 lbs	38	29
40-49 °F	4 lbs	48	38



Important

Do **not** use this treatment schedule if its FIFRA Section 18 Exemption has expired. For the current exemption status, call your local State Plant Health Director (SPHD).

T101-m-2-1

Kiwi

Pest: *Ceratitis capitata* (Mediterranean fruit fly)

Treatment: **T101-m-2-1** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:			
		0.5 hr	2 hrs	3.5 hrs	4 hrs
70 °F or above	2 lbs	26	22	21	—
65-69 °F	2 lbs	26	22	—	19



Important

Do **not** use this treatment schedule if its FIFRA Section 18 Exemption has expired. For the current exemption status, call your local State Plant Health Director (SPHD).

T101-m-2-2

Kiwi

The yellow color of this treatment indicates that the authority to conduct the treatment comes from an emergency action required by PPQ in order to mitigate the pest risk. The emergency action is pending final regulatory approval.

Pest: *Brevipalpus chilensis* (Chilean false red mite)

Treatment: **T101-m-2-2** MB at NAP—tarpaulin or chamber⁷

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	3 hrs
80 °F or above	1.5 lbs	19	14
70-79 °F	2 lbs	26	19
60-69 °F	2.5 lbs	32	24
50-59 °F	3 lbs	38	29
40-49 °F	4 lbs	48	38



Important

Do **not** use this treatment schedule if its FIFRA Section 18 Exemption has expired. For the current exemption status, call your local State Plant Health Director (SPHD).

T101-n-2

Kohlrabi (*Brassica oleracea* var. *gongyiodes*)

Pest: External feeders and leaf miners

Treatment: **T101-n-2** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
70 °F or above	2 lbs	26	14
60-69 °F	2.5 lbs	32	24
50-59 °F	3 lbs	38	29
45-49 °F	3.5 lbs	43	34
40-44 °F	4 lbs	48	38



Important

Do **not** use this treatment schedule if its FIFRA Section 18 Exemption has expired. For the current exemption status, call your local State Plant Health Director (SPHD).

⁷ If the treatment is conducted in a chamber, decrease the total fumigation time to 2.5 hours.

T101-n-3 Kumquat (*Fortunella japonica*)

Pest: *Ceratitis capitata* (Wiedemann) and *Anastrepha fracterculus* (Wiedemann)

Treatment: **T101-n-3** MB at NAP—chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
80 °F or above	3 lbs	2 hours

T101-n-2 Leafy vegetables

Pest: External feeders and leaf miners

Treatment: **T101-n-2** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
70 °F or above	2 lbs	26	14
60-69 °F	2.5 lbs	32	24
50-59 °F	3 lbs	38	29
45-49 °F	3.5 lbs	43	34
40-44 °F	4 lbs	48	38



Important

Do **not** use this treatment schedule if its FIFRA Section 18 Exemption has expired. For the current exemption status, call your local State Plant Health Director (SPHD).



Important

Leafy vegetables, EPA Crop Group 4, (Except *Brassica* Vegetables) are restricted to amaranth (leafy amaranth, Chinese spinach, tampala) (*Amaranthus* spp.); arugula (Roquette) (*Eruca sativa*); cardoon (*Cynara cardunculus*); celery (*Apium graveolens* var. *dulcea*); celery, Chinese (*Apium graveolens* var. *secalinum*); celtuce (*Lactuca sativa* var. *angustana*); chervil (*Anthriscus cerefolium*); chrysanthemum, edible-leaved (*Chrysanthemum coronarium* var. *coronarium*); chrysanthemum, garland (*Chrysanthemum coronarium* var. *spatiosum*); corn salad (*Valerianella locusta*); cress garden (*Lepidium sativum*); cress upland (yellow rocket, winter cress) (*Barbarea vulgaris*); dandelion (*Taraxacum officinale*); dock (sorrel) (*Rumex* spp.); endive (escarole) (*Cichorium endivia*); fennel, Florence (finocchio) (*Foeniculum vulgare* Azoricum Group); lettuce, head and leaf (*Lactuca sativa*); Orach (*Atriplex hortensis*); parsley (*Petroselinum crispum*); purslane, garden (*Portulaca oleracea*); purslane, winter (*Montia perfoliata*); radicchio (red chicory) (*Cichorium intybus*); rhubarb (*Rheum rhabarbarum*); spinach (*Spinacia oleracea*); spinach, New Zealand (*Tetragonia tetragonioides*, *T. expansa*); spinach, vine (Malabar spinach, Indian spinach) (*Basella alba*); swiss chard (*Beta vulgaris* var. *cicia*). Reference 40 CFR 180.34 (f)(a)(iv)(A)

T101-q-2

Leeks

Pest: Internal feeders (including leafminers)

Treatment: **T101-q-2** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:				
		0.5 hr	2 hrs	2.5 hrs	3 hrs	3.5 hrs
90 °F or above	2 lbs	26	19	—	—	—
80-89 °F	2.5 lbs	32	24	—	—	—
70-79 °F	3 lbs	38	29	—	—	—
60-69 °F	3 lbs	38	26	26	—	—
50-59 °F	3 lbs	38	26	—	26	—
40-49 °F	3 lbs	38	26	—	—	26

T101-e-1

Lentils (Dry)

Pest: Bruchidae (seed beetles)

Treatment: **T101-e-1** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:					
		0.5 hr	2 hrs	2.5 hrs	3 hrs	3.5 hrs	4 hrs
70 °F or above	3 lbs	38	—	24	—	—	—
60-69 °F	3 lbs	38	29	—	24	—	—
50-59 °F	3 lbs	38	29	—	—	24	—
40-49 °F	3 lbs	38	29	—	—	—	24

T101-n-2

Lettuce from Spain

Pest: *Autographa gamma*, *Helicoverpa armigera*, *Mamestra brassicae*,
Spodoptera littoralis

Treatment: **T101-n-2** MB at NAP—tarpaulin or chamber (see [Leafy vegetables](#) for treatment schedule)

T101-b-1-1

Lychee (Litchi)

Pest: Mealybugs (Pseudococcidae)

Treatment: **T101-b-1-1** MB (“Q” label only) at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
80 °F or above	2.5 lbs	32	24
70-79 °F	3 lbs	38	29
60-69 °F	4 lbs	48	38



Important

T101-b-1-1 is **not** a substitute for the mandatory cold treatment of lychee from China and Taiwan, T107-h, which targets the pests *Bactrocera dorsalis* (Oriental fruit fly), *Bactrocera curubita* (melon fly) and *Conopomorpha sinensis* (lychee fruit borer). Because mealybugs are **not** controlled by T107-h, T101-b-1-1 can be used as a follow-up treatment if mealybugs are found.

T101-o-2

Melons

(Including honeydew, muskmelon, and watermelon)

Pest: External feeders such as Noctuidae spp., *Thrips* spp., *Copitarsia* spp.

Treatment: **T101-o-2** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
80 °F or above*	1.5 lbs	19	14
70-79 °F*	2 lbs	26	19
60-69 °F*	2.5 lbs	32	24
50-59 °F	3 lbs	38	29
40-49 °F	4 lbs	48	38

* Use “MB 100” at 60 °F or above, use MB “Q” label at 40 °F or above

For cantaloupe, see T101-k-1

T101-n-2

Mizuna (*Brassica rapa Japonica* Group)

Pest: External feeders and leaf miners

Treatment: **T101-n-2** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
70 °F or above	2 lbs	26	14
60-69 °F	2.5 lbs	32	24
50-59 °F	3 lbs	38	29
45-49 °F	3.5 lbs	43	34
40-44 °F	4 lbs	48	38



Important

Do **not** use this treatment schedule if its FIFRA Section 18 Exemption has expired. For the current exemption status, call your local State Plant Health Director (SPHD).

T101-n-2

Mustard greens (*Brassica juncea*)

Pest: External feeders and leaf miners

Treatment: **T101-n-2** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
70 °F or above	2 lbs	26	14
60-69 °F	2.5 lbs	32	24
50-59 °F	3 lbs	38	29
45-49 °F	3.5 lbs	43	34
40-44 °F	4 lbs	48	38



Important

Do **not** use this treatment schedule if its FIFRA Section 18 Exemption has expired. For the current exemption status, call your local State Plant Health Director (SPHD).

T101-n-2 Mustard spinach (*Brassica rapa Perviridis* Group)

Pest: External feeders and leaf miners

Treatment: **T101-n-2** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
70 °F or above	2 lbs	26	14
60-69 °F	2.5 lbs	32	24
50-59 °F	3 lbs	38	29
45-49 °F	3.5 lbs	43	34
40-44 °F	4 lbs	48	38



Do **not** use this treatment schedule if its FIFRA Section 18 Exemption has expired. For the current exemption status, call your local State Plant Health Director (SPHD).

T101-a-3 Nectarine

Pest: External feeders

Treatment: **T101-a-3** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
80 °F or above	1.5 lbs	19	14
70-79 °F	2 lbs	26	19
60-69 °F	2.5 lbs	32	24
50-59 °F	3 lbs	38	29
40-49 °F	4 lbs	48	38

T101-p-2

Okra*

Pest: *Pectinophora gossypiella* (pink bollworm)

Treatment: **T101-p-2** MB at NAP—chamber only

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
90 °F or above	1 lb	2 hrs
80-89 °F	1.5 lbs	2 hrs
70-79 °F	2 lbs	2 hrs
60-69 °F	2.5 lbs	2 hrs
50-59 °F	3 lbs	2 hrs
40-49 °F	3.5 lbs	2 hrs

*Okra may be injured by fumigation if moisture is present. The term “okra” does **not** include Chinese okra (*Luffa* spp.), which is a cucurbit.

T101-q-2

Onion*

Pest: Internal feeders (and leaf miners)

Treatment: **T101-q-2** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:				
		0.5 hr	2 hrs	2.5 hrs	3 hrs	3.5 hrs
90 °F or above	2 lbs	26	19	—	—	—
80-89 °F	2.5 lbs	32	24	—	—	—
70-79 °F	3 lbs	38	29	—	—	—
60-69 °F	3 lbs	38	26	26	—	—
50-59 °F	3 lbs	38	26	—	26	—
40-49 °F	3 lbs	38	26	—	—	26

*The term “onion” includes dry bulbs. It also includes leeks, shallots and chives for both above ground and below ground parts.

T101-g-1

Parsnip

Pest: Internal feeders

Treatment: **T101-g-1** MB chamber, 15" vacuum—chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
90 °F or above	2 lbs	2 hrs
80-89 °F	2.5 lbs	2 hrs
70-79 °F	3 lbs	2 hrs
60-69 °F	3 lbs	2.5 hrs
50-59 °F	3 lbs	3 hrs
40-49 °F	3 lbs	3.5 hrs



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T101-a-3

Peach

Pest: External feeders

Treatment: **T101-a-3** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
80 °F or above	1.5 lbs	19	14
70-79 °F	2 lbs	26	19
60-69 °F	2.5 lbs	32	24
50-59 °F	3 lbs	38	29
40-49 °F	4 lbs	48	38

T101-a-1

Pear⁸

Pest: External feeders

Treatment: T101-a-1 MB at NAP-tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
80 °F or above	1.5 lbs	19	14
70-79 °F	2 lbs	26	19
60-69 °F	2.5 lbs	32	24
50-59 °F	3 lbs	38	29
40-49 °F	4 lbs	48	38

T101-e-1

Peas (Dry)

Pest: Bruchidae (seed beetles)

Treatment: **T101-e-1** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:					
		0.5 hr	2 hrs	2.5 hrs	3 hrs	3.5 hrs	4 hrs
70 °F or above	3 lbs	38	—	24	—	—	—
60-69 °F	3 lbs	38	29	—	24	—	—
50-59 °F	3 lbs	38	29	—	—	24	—
40-49 °F	3 lbs	38	29	—	—	—	24

see T101-k-1 or T101-k-2 for fresh peas

⁸ Fumigation may cause **severe** damage to Chinese, Japanese, Asian and Sand Pears. Obtain the importer's consent before fumigation.

T101-a-3 Peppers

Pest: Internal pests (except fruit flies) and External pests (except mealy bugs)

Treatment: T101-a-3 MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
80 °F or above	1.5 lbs	19	14
70-79 °F	2 lbs	26	19
60-69 °F	2.5 lbs	32	24
50-59 °F	3 lbs	38	29
40-49 °F	4 lbs	48	38



This treatment is **not** effective against fruit flies or mealy bugs. For fruit flies, use T106-b (vapor heat). For mealy bugs, use T104-a-2 (fumigation). Certain varieties of peppers are sensitive to methyl bromide and may develop darkening of the seed cavity.

T101-r-2 Pineapple

Pest: Internal feeders

Treatment: **T101-r-2** MB (“Q” label only) at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:		
		0.5 hr	2 hrs	6 hrs
70 °F or above	2 lbs	26	22	16

T101-s-2 Pineapple

Pest: External feeders

Treatment: **T101-s-2** MB (“Q” label only if under 70 °F (21.1 °C)) at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
80 °F or above*	1.5 lbs	19	14
70-79 °F*	2 lbs	26	19
60-69 °F	2.5 lbs	32	24
50-59 °F	3 lbs	38	29
40-49 °F**	4 lbs	48	38

* Use “MB 100” at 70 °F or above, use MB “Q” label at 40 °F or above

** 40–49°F temperature range may cause pineapple core to turn purple.

T101-t-2

Plantain

Pest: External feeders such as Noctuidae spp., *Thrips* spp., *Copitarsia* spp.

Treatment: **T101-t-2** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
80 °F or above	1.5 lbs	19	14
70-79 °F	2 lbs	26	19
60-69 °F	2.5 lbs	32	24
50-59 °F	3 lbs	38	29
40-49 °F	4 lbs	48	38



Important

Do **not** use this treatment schedule if its FIFRA Section 18 Exemption has expired. For the current exemption status, call your local State Plant Health Director (SPHD).

T101-a-3

Plum

Pest: External feeders

Treatment: **T101-a-3** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
80 °F or above	1.5 lbs	19	14
70-79 °F	2 lbs	26	19
60-69 °F	2.5 lbs	32	24
50-59 °F	3 lbs	38	29
40-49 °F	4 lbs	48	38

T101-u-2

Potato (white or Irish)

Pest: *Graphognathus* spp. (white fringed beetles)

Treatment: **T101-u-2** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
80 °F or above	2.5 lbs	30	20
70-79 °F	3 lbs	36	24

T101-v-2 Potato (white or Irish)

Pest: *Ostrinia nubilalis* (European corn borer) and *Phthorimaea operculella* (potato tuberworm)

Treatment: **T101-v-2** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
70 °F or above	2.75 lbs	33	22

T101-e-1 Pulses, dried

Pest: Bruchidae (seed beetles)

Treatment: **T101-e-1** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:					
		0.5 hr	2 hrs	2.5 hrs	3 hrs	3.5 hrs	4 hrs
70 °F or above	3 lbs	38	—	24	—	—	—
60-69 °F	3 lbs	38	29	—	24	—	—
50-59 °F	3 lbs	38	29	—	—	24	—
40-49 °F	3 lbs	38	29	—	—	—	24

T101-w-2 Pumpkin

Pest: External feeders

Treatment: **T101-w-2** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
80 °F or above	1.5 lbs	19	14
70-79 °F	2 lbs	26	19
60-69 °F	2.5 lbs	32	24

T101-g-1

Radish

Pest: Internal feeders

Treatment: **T101-g-1** MB chamber, 15" vacuum—chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
90 °F or above	2 lbs	2 hrs
80-89 °F	2.5 lbs	2 hrs
70-79 °F	3 lbs	2 hrs
60-69 °F	3 lbs	2.5 hrs
50-59 °F	3 lbs	3 hrs
40-49 °F	3 lbs	3.5 hrs



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T101-n-2

Rape greens (*Brassica napus*)

Pest: External feeders and leaf miners

Treatment: **T101-n-2** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
70 °F or above	2 lbs	26	14
60-69 °F	2.5 lbs	32	24
50-59 °F	3 lbs	38	29
45-49 °F	3.5 lbs	43	34
40-44 °F	4 lbs	48	38



Do **not** use this treatment schedule if its FIFRA Section 18 Exemption has expired. For the current exemption status, call your local State Plant Health Director (SPHD).

Of these, cabbage (*Brassica oleracea*) (labeled treatment T101-j-1) is the only vegetable in this group **not** covered by a FIFRA Section 18 Exemption.

T101-x-2

Raspberry

Pest: External feeders such as Noctuidae spp., *Thrips* spp., *Copitarsia* spp., Pentatomidae spp.

Treatment: **T101-x-2** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
80 °F or above	1.5 lbs	19	14
70-79 °F	2 lbs	26	19
60-69 °F	2.5 lbs	32	24
50-59 °F	3 lbs	38	29
40-49 °F	4 lbs	48	38



Do **not** use this treatment schedule if its FIFRA Section 18 Exemption has expired. For the current exemption status, call your local State Plant Health Director (SPHD).

T101-q-2

Shallots

Pest: Internal feeders (including leaf miners)

Treatment: **T101-q-2** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:				
		0.5 hr	2 hrs	2.5 hrs	3 hrs	3.5 hrs
90 °F or above	2 lbs	26	19	—	—	—
80-89 °F	2.5 lbs	32	24	—	—	—
70-79 °F	3 lbs	38	29	—	—	—
60-69 °F	3 lbs	38	26	26	—	—
50-59 °F	3 lbs	38	26	—	26	—
40-49 °F	3 lbs	38	26	—	—	26

T101-y-2

Squash* (winter, summer, and chayote)**

Pest: External feeders

Treatment: **T101-y-2** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
80 °F or above	1.5 lbs	19	14
70-79 °F	2 lbs	26	19
60-69 °F	2.5 lbs	32	24
50-59 °F	3 lbs	38	29
40-49 °F	4 lbs	48	38

* If zucchini, see [T101-h-3](#). If pumpkin, see [T101-w-2](#).

** Chayote is not covered on any MB label and must be treated as a FIFRA crisis exemption. (see [T101-p-1](#))

T101-z-2

Strawberry

Pest: External feeders

Treatment: **T101-z-2** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
80 °F or above	1.5 lbs	19	14
70-79 °F	2 lbs	26	19
60-69 °F	2.5 lbs	32	24
50-59 °F	3 lbs	38	29

T101-b-3-1 Sweet Potato (*Ipomoea*)

Pest: External and internal feeders

Treatment: **T101-b-3-1** MB at NAP—tarpaulin or chamber

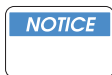
This treatment is also required for the interstate movement from Hawaii.

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:		
		0.5 hr	2 hrs	4.0 hrs
90 °F or above*	2.5 lbs	32	20	20
80-89 °F*	3 lbs	38	24	24
70-79 °F*	3.5 lbs	44	28	28
60-69 °F	4 lbs	50	32	32

* Use “MB 100” at 70°F or above, use MB “Q” label at 60 °F or above



Temperatures below 70 °F may cause injury to sweet potatoes. Fumigation below 70 °F is to be made only on specific request from the importer.



Sweet potatoes should be cured, free from surface moisture, and held at the fumigation temperature for 24 hours following treatment. This is **not** mandatory; however, following this advise will help maintain the quality of the fumigated product.

T101-c-3 Tomato (from quarantine areas in the United States)

Pest: *Ceratitis capitata* (Mediterranean fruit fly)

Treatment: **T101-c-3** MB at NAP—tarpaulin or chamber

See “*Ceratitis capitata* (Mediterranean fruit fly) D301.32-10(c)” on page-5-8-5.

T101-c-3-1 Tomato (from Chile)

Pest: *Tuta absoluta* (tomato fruit moth) and *Rhagoletis tomatis* (tomato fruit fly)

Treatment: **T101-c-3-1** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
70 °F or above	3 lbs	43	33

T101-d-3

Tuna (Opuntia) and all other fruits from cacti (prickly pear, pitahaya, pitaya, dragon fruit)

Pest: *Ceratitidis capitata* (Mediterranean fruit fly)

Treatment: **T101-d-3** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:		
		0.5 hr	2 hrs	3.5 hrs
70 °F or above	2 lbs	26	21	21



Important

Do **not** use this treatment schedule if its FIFRA Section 18 Exemption has expired. For the current exemption status, call your local State Plant Health Director (SPHD).

T101-e-3

Tuna (Opuntia) and all other fruits from cacti (prickly pear, pitahaya, pitaya, dragon fruit)

Pest: External feeders and leaf miners

Treatment: **T101-e-3** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
80 °F or above	1.5 lbs	19	14
70-79 °F	2 lbs	26	19
60-69 °F	2.5 lbs	32	24
50-59 °F	3 lbs	38	29
40-49 °F	4 lbs	48	38



Important

Do **not** use this treatment schedule if its FIFRA Section 18 Exemption has expired. For the current exemption status, call your local State Plant Health Director (SPHD).

T101-g-1

Turnip

Pest: Internal feeders

Treatment: **T101-g-1** MB chamber, 15" vacuum—chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
90 °F or above	2 lbs	2 hrs
80-89 °F	2.5 lbs	2 hrs
70-79 °F	3 lbs	2 hrs
60-69 °F	3 lbs	2.5 hrs
50-59 °F	3 lbs	3 hrs
40-49 °F	3 lbs	3.5 hrs



As of October 2008, **no commercial** chambers in the United States are approved for the vacuum fumigation of imported commodities. If vacuum treatment is required as a **condition of entry**, the consignment must be destroyed, reexported or returned to country of origin.

T101-f-3

Yam (*Dioscorea* spp.)

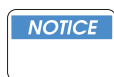
Pest: Internal and external feeders

Treatment: **T101-f-3** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:		
		0.5 hr	2 hrs	4 hrs
90 °F or above	2.5 lbs	32	20	20
80-89 °F	3 lbs	38	24	24
70-79 °F	3.5 lbs	44	28	28
60-69 °F	4 lbs	50	32	32



Temperatures below 70 °F may cause injury to yams. Fumigation below 70 °F is to be made only on specific request from the importer.



Sweet potatoes and yams should be cured, free from surface moisture, and held at the fumigation temperature for 24 hours following treatment. This is **not** mandatory; however, following this advise will help maintain the quality of the fumigated product.

T101-h-3

Zucchini

Pest: External feeders

Treatment: **T101-h-3** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
80 °F or above	1.5 lbs	19	14
70-79 °F	2 lbs	26	19
60-69 °F	2.5 lbs	32	24

If another variety of squash, see T101-y-2

T102—Water Treatment



Whenever water comes into contact with fresh produce, the water's quality dictates the potential for pathogen contamination. To reduce the risk of food-borne illnesses, the water used for washing, treatments, and cooling must be fortified with sodium hypochlorite (household bleach), and constantly maintained at a chlorine level **not** to exceed 200 ppm.

T102-b

Cherimoya from Chile

Pest: *Brevipalpus chilensis* (Chilean false red mite)

Treatment: **T102-b** Soapy water and wax

1. Immerse fruit for 20 seconds in soapy water bath of one part soap solution (such as Deterfruit) to 3,000 parts water.
2. Follow the soapy bath with a pressure shower rinse to remove all the soapy excess.
3. Immerse fruit for 20 seconds in an undiluted wax coating (such as Johnson's Wax Primafresh 31 Kosher fruit coating). The wax coating should cover the entire surface of the fruit.



At the port of entry, the PPQ Officer should check to make sure the wax coating covers the entire surface of the fruit.

T102-c

Durian and other large fruits such as breadfruit

Pest: External Feeders

Treatment: **T102-c** Warm, soapy water and brushing

1. Add detergent (such as Deterfruit) to warm water (110° to 120 °F) at the rate of one part detergent or soap to 3,000 parts water.
2. Immerse the fruit for at least 1 minute in the warm detergent water.
3. Using a brush with stiff bristles, have the importer or the importer's agent scrub each fruit to remove any insects.
4. Using a pressure shower, have the importer or the importer's agent rinse the fruit free from residue (detergent and dead insects).
5. Inspect each brushed and cleaned fruit. Pay particular attention to external feeders such as mealybugs and scales. If any insects remain, have the fruit retreated or have it destroyed.

T102-e

Limes

Pest: Mealybugs (Pseudococcidae) and other surface pests

Treatment: **T102-e** Hot water immersion

1. Fruit must be treated in a certified hot water immersion treatment tank, and the treatment must be monitored by an inspector.
 - A. Fruit must be submerged at least 4 inches below the water's surface.
 - B. Water must circulate continually and be kept at 120.2 °F (or above) for 20 minutes. Treatment time begins when the water temperature reaches at least 120.2 °F in all locations of the tank.
2. Cooling and waxing the fruit are both optional, and are the sole responsibility of the processor.



Phytotoxic damage (increased yellowing) may occur if the temperature reaches 125.6 °F or if the treatment duration significantly exceeds 20 minutes.

T102-b-1

Limes from Chile

Pest: *Brevipalpus chilensis* (Chilean false red mite)

Treatment: **T102-b-1** Soapy water and wax

1. Immerse fruit for 20 seconds in soapy water bath of one part soap solution (such as Deterfruit) to 3,000 parts water.
2. Follow the soapy bath with a pressure shower rinse to remove all the soapy excess.
3. Immerse fruit for 20 seconds in an undiluted wax coating (such as Johnson's Wax Primafresh 31 Kosher fruit coating). The wax coating should cover the entire surface of the fruit.



At the port of entry, the PPQ Officer should check to make sure the wax coating covers the entire surface of the fruit.

T102-d-1

Longan fruit from Hawaii

Pest: *Ceratitis capitata* (Mediterranean fruit fly) and
Bactrocera dorsalis (Oriental fruit fly)

Treatment: **T102-d-1** Hot water immersion



Fruit must be at ambient temperature before the treatment begins

1. Submerge the fruit at least 4 inches below the water's surface in a hot water immersion treatment tank certified by APHIS.
2. Keep the fruit submerged for 20 minutes after the water temperature reaches at least 120.2 °F in all locations of the tank. The water must circulate continually and be kept at 120.2 °F (or above) for the duration of the treatment.



Phytotoxic damage (increased yellowing) may occur if the temperature exceeds 121.1 °F.

3. Cool the fruit to ambient temperature. Hydrocooling for 20 minutes at 75.2 °F is recommended, though **not** required, to prevent injury to the fruit from the hot water immersion treatment.

T102-d

Lychee (litchi) fruit from Hawaii

Pest: *Ceratitis capitata* (Mediterranean fruit fly) and *Bactrocera dorsalis* (Oriental fruit fly)

Treatment: T102-d Hot water immersion

1. Lychees must be thoroughly examined at the packinghouse by an inspector and found free of *Cryptophlebia spp.* (Lychee fruit moth) and other plant pests⁹
2. Fruit must be grown and treated in Hawaii, under monitoring of an inspector, in a certified hot water immersion treatment tank.¹⁰
 - A. Fruit must be submerged at least 4 inches below the water's surface.

⁹ Because *Eriophyes litchii* (lychee mite) cannot be effectively detected by inspection, and would **not** be effectively eliminated by hot water immersion, the lychees may **not** be shipped into Florida. Each carton must be stamped "**Not** for importation into or distribution in Florida."

¹⁰ Use of Treatment T102-d is at the risk of the shipper. Limited research on fruit quality after treatment application indicated that fruit quality varies among cultivars. 'Kaimana' and 'Kwai Mi' ('Tai So') tolerate the treatment better than 'Brewster' and 'Groff'; no other cultivars were tested.

- B.** Water must circulate constantly, and be kept at 120.2 °F (or above) for 20 minutes. Treatment time begins when the water temperature reaches at least 120.2 °F in all locations throughout the tank.¹¹

Temperatures exceeding 121.1 °F can cause phytotoxic damage.

- 3.** Hydrocooling for 20 minutes at 75.2 °F is recommended, though **not** required, to prevent injury to the fruit from the hot water treatment.

T102-a

Mango

Pest: *Ceratitis capitata* (Mediterranean fruit fly), *Anastrepha spp.*,
Anastrepha ludens (Mexican fruit fly)

Treatment: **T102-a** Hot water immersion

Treat the fruit in the country of origin at a certified facility under the monitoring of APHIS personnel.

- 1.** Pre-sort mangoes by weight class. Treatment of mixed loads is **not** allowed.
- 2.** Pulp temperature must be 70 °F or above before start of treatment.
- 3.** Submerge fruit at least 4 inches below the water's surface.
- 4.** Water must circulate constantly and be kept at least 115 °F throughout the treatment with the following tolerances:
 - ◆ **During the first 5 minutes of a treatment**—Adjusted Tank Temperatures from *Figure 6-5-1* on **page 6-5-3** that are below 113.7 °F are allowed during the first 5 minutes of a treatment only if the temperature is at least 115 °F at the end of the 5 minute period.
 - ◆ **For treatments lasting 65 to 75 minutes**—Adjusted Tank Temperatures from *Figure 6-5-1* on **page 6-5-3** may fall as low as 113.7 °F for no more than 10 minutes under emergency conditions.
 - ◆ **For treatments lasting 90 to 110 minutes**—Adjusted Tank Temperatures from *Figure 6-5-1* on **page 6-5-3** may fall as low as 113.7 °F for no more than 15 minutes under emergency conditions.

¹¹ Treatment does **not** begin until after the fruit is immersed and the water temperature recovers to 120.2 °F (or above). Therefore, before the start of the treatment, fruit pulp temperatures of 70 °F (or above) are recommended to minimize water temperature recovery time and the overall time fruit are immersed in heated water. Fruit quality of treated lychees with initial pulp temperatures below 68 °F has **not** been studied.

5. Determine the dip time from **Table 5-2-1**.



Dip times for T102-a are valid if the fruit is **not** hydrocooled within 30 minutes of removal from the hot water immersion tank.

However, if hydrocooling starts immediately after the hot water immersion treatment, then the original dip time must be extended for an additional 10 minutes.

(Hydrocooling is optional and may be done only at temperatures of 70°F or above, for any length of time, or **not** at all.)

Table 5-2-1 Hot Water Dip Time Based on Weight of Fruit¹

If the weight of the mango (in grams) is:	Then the dip time (in minutes) is:
Up to 375	65
376 to 500	75
501 to 700	90
701 to 900	110

¹ Valid if the fruit is **not** hydrocooled within 30 minutes of removal from the hot water immersion tank.

T102-b-2

Passion Fruit from Chile

Pest: *Brevipalpus chilensis* (Chilean false red mite)

Treatment: **T102-b-2** Soapy water and wax

1. Immerse fruit for 20 seconds in soapy water bath of one part soap solution (such as Deterfruit) to 3,000 parts water.
2. Follow the soapy bath with a pressure shower rinse to remove all the soapy excess.
3. Immerse fruit for 20 seconds in an undiluted wax coating (such as Johnson’s Wax Primafresh 31 Kosher fruit coating). The wax coating should cover the entire surface of the fruit.



At the port of entry, the PPQ Officer should check to make sure the wax coating covers the entire surface of the fruit.

T103—High Temperature Forced Air

T103-a-1 Citrus from Mexico and infested areas in the United States

Pest: *Anastrepha* spp.

Treatment: T103-a-1 High temperature forced air

Heat Up Time:	90 minutes
Heat Up Recording Interval:	2 minutes
Minimum Air Temperature:	N/A
Minimum Pulp Temperature at End of Heat Up:	44 °C/111.2 °F
Dwell Time:	100 minutes
Dwell Recording Interval:	2 minutes
Cooling Method:	Hydrocooling optional

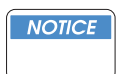
Size Restrictions	Standard Count bushel	Max. Weight/Fruit		Max. Diameter
		grams	ounces	inches
Navel Orange	100 per 1 2/5	450	15.9	3 3/16
Orange (other than Navel)	100 per 1 2/5	468	16.4	3 13/16
Tangerine	120 per 4/5	245	8.6	—
Grapefruit	70 per 1 2/5	536	18.8	4 5/16

T103-b-1 Citrus from Hawaii

Pest: *Ceratitis capitata* (Mediterranean fruit fly), *Bactrocera dorsalis* (Oriental fruit fly), and *Bactrocera cucurbitae* (melon fly)

Treatment: T103-b-1 High temperature forced air

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



Tolerance of Citrus to Treatment—Users of this treatment for citrus should test the specific cultivar to determine how well it will tolerate the required heat treatment. Of all citrus species tested to date, grapefruit showed the highest tolerance to this treatment. The tolerance of citrus treated in excess of 7 hours has **not** been determined. Although the method of cooling fruit after treatment is optional, research indicated that forced air cooling using ambient air temperature produced the least fruit injury.

T103-c-1

Mango from Mexico

Pest: *Anastrepha ludens* (Mexican fruit fly), *Anastrepha obliqua* (West Indian fruit fly), and *Anastrepha serpentina* (black fruit fly)

Treatment: T103-c-1 High temperature forced air

Heat Up Time:	N/A
Heat Up Recording Interval:	2 minutes
Minimum Air Temperature:	50.0 °C/122.0 °F
Minimum Pulp Temperature at End of Heat Up:	48.0 °C/118.0 °F
Dwell Time:	2 minutes
Dwell Recording Interval:	2 minutes
Cooling Method:	Forced air or Hydrocooling
Size Restrictions:	Fruit weight must not exceed 1 1/2 lbs. (700 grams)

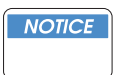
T103-d

Mountain Papaya from Chile (T103-d-1) and Papaya from Belize and Hawaii (T103-d-2)

Pest: *Ceratitis capitata* (Mediterranean fruit fly), *Bactrocera dorsalis* (Oriental fruit fly), and *Bactrocera cucurbitae* (melon fly)

Treatment: T103-d-1 High temperature forced air

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 (If papayas are hydrocooled with water lower than 54.5 °F (12.5° C), the fruit may be damaged.)



Tolerance of Papayas to Treatment—To enable the papayas to tolerate the treatment, the fruit may first have to be conditioned. Such conditioning is the responsibility of the shipper and at the shipper’s risk.

T103-e

Rambutan from Hawaii

Pest: *Ceratitis capitata* (Mediterranean fruit fly), and *Bactrocera dorsalis* (Oriental fruit fly)

Treatment: T103-e-1 High temperature forced air

Heat Up Time:	1 hour
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:	20 minutes
Dwell Recording Interval:	5 minutes
Cooling Method:	Optional

T104—Pest Specific/Host Variable

For the treatments that follow, never exceed the labeled or Section 18 dosage and time for the specific commodity at the given temperature. Moreover, the specific commodity being treated determines if the schedule is a labeled treatment or one authorized under a Section 18 exemption. For example, oranges cannot be treated for hitchhikers using T104-a-1 at 40-49 °F because this schedule requires 4 lbs. of methyl bromide/1,000 ft³. Whereas, the methyl bromide “Q” label allows a maximum of only 3 lbs. at this temperature range. Therefore, the oranges would have to be heated to at least 50 °F before fumigation because at 50 °F a dosage of only 3 lbs./1,000 ft³ is required.

Although the following treatments are pest specific, the treatment schedule for the associated host will determine if and when a pest specific treatment can be used. Always check the schedule for the host before selecting the proper treatment schedule. Also, consult the methyl bromide labeling brochure, and do **not** exceed the restrictions on dosage and exposure time.

T104-a-1

Various Commodities

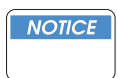
Pest: Hitchhikers and surface pests such as: thrips, aphids, scale insects, leaf miners, spider mites (*Tetranychidae*)¹², lygaeid bugs, ants, earwigs, surface-feeding caterpillars and slugs¹³

Treatment: **T104-a-1** MB at NAP—tarpaulin or chamber.

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
80 °F or above	1.5	19	14
70-79 °F	2	26	19
60-69 °F	2.5	32	24
50-59 °F	3	38	29
40-49 °F	4	48	38

To comply with dosage and temperature restrictions on methyl bromide labels, **ONLY** the fruits and vegetables listed may be fumigated with T104-a-1. If you have a commodity that is not in the list, it may be listed elsewhere in the T100 schedules for a different pest complex. Refer to the Index for a complete list of commodities for which there are approved treatment schedules. Refer to [Appendix I](#) (or 40 CFR 180.41) for a list of EPA crop groups and commodities.

The **bolded** commodities in the list are under FIFRA Section 18 Exemption.



Do not use T104-a-1 if the FIFRA Section 18 exemption has expired. For any questions concerning the exemption status, call your State Plant Health Director or Regional Treatment Program Manager.

The commodities that are **not bold** are covered on the label. There may be some commodities that are on the label at one dosage and duration, and are also covered in the Section 18 at a different dosage and duration.

EXAMPLE: Coffee bean (roasted) is on the Chemtura MB-Q label and can be treated up to 3.0 lbs. for 24 hours. However, the Section 18 allows for coffee bean (unroasted) to be treated up to 9 lbs. for 12 hours.

12 DO NOT use T104-a-1 for Chilean False Red Mite (*Brevipalpus chilensis*).

13 Quarantine-significant slugs of the families Agriolimacidae, Arionidae, Limacidae, Milacidae, Philomycidae, and Veronicellidae, including the following genera: *Agriolimax*, *Arion*, *Colosius*, *Deroceras*, *Diplosolenodese*, *Leidyula*, *Limax*, *Meghimatium*, *Milax*, *Pallifera*, *Pseudoveronicella*, *Sarasinula*, *Semperula*, *Vaginulus*, *Veronicella*. **Treat slugs at 60 F (2.5 lbs.) or above .**

List of Commodities Approved for Fumigation With T104-a-1:



Fumigation may cause damage to some commodities and is at the risk of the importer.

- ◆ 70 °F or above (maximum dosage 2 lbs./1000 ft³): **avocado**, beet (root), blueberry, cocoa bean
- ◆ 60 °F or above (maximum dosage 2.5 lbs./1000 ft³): **coconut (unprocessed without husk)**, pimento, pumpkin, zucchini squash
- ◆ 50 °F or above (maximum dosage 3 lbs./1000 ft³): clementine, coffee bean (roasted), copra (coconut), corn-on-the-cob (sweet corn), edible podded legumes, grapefruit, kumquat, lemon, lime, mandarin, **Malvaceae seeds for food use, including kenaf and hibiscus, mint (dried)**, okra, onion, orange, parsnip, potato, radish, **root and tuber crop group**, rutabaga, salsify root, strawberry, sugar beet, tangelo, tangerine, tomato, turnip root
- ◆ 40 °F or above (maximum dosage 4 lbs./1000 ft³): apple, apricot, asparagus, **banana (fruit and leaf)**, beans (fresh), **blueberry**, cabbage, **cactus fruit (tuna)**, cantaloupe, carrot, **chayote**, cherry, chestnut, citron, **coffee bean (unroasted)**, **cottonseed**, cucumber, **cucurbit seed (unprocessed)**, **dasheen**, **edible podded legumes**, eggplant, fava (faba) bean (dried), **fresh figs**, **genip**, grapes, herbs (dried), honeydew melon, **ivy gourd**, Jerusalem artichoke, **kaffir lime leaves**, **kola nuts**, **longan**, **lorocco flower**, **lychee**, **mint (fresh)**, **mango**, muskmelon, nectarine, **okra**, **opuntia**, peach, pear, peas and beans (dried), pepper, **persimmon**, pineapple, **pitaya/pitahaya/dragon fruit**, **plantain**, plum, **pomegranate**, **pointed gourd**, prune, quince, **rambutan**, **snow peas**, squash (summer, winter), **squash flower**, sweet potato, watermelon, yam
- ❖ ANY OTHER UNLABELED commodities from the following crop groups¹⁴ are treated under **FIFRA exemption: berry and small fruits, Brassica leafy vegetables, bulb vegetables, cucurbit vegetables, fresh herbs and spices, fruiting vegetables, leafy vegetables, leaves of legumes, leaves of roots and tubers, oilseed, stone fruits including their hybrids**

¹⁴ Crop groups are defined by the Environmental Protection Agency (EPA) in [40CFR 180.41](#) and are provided for quick reference in [Appendix I](#) in this manual.

T104-a-2

Various Commodities

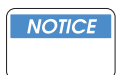
Pest: Mealybugs (Pseudococcidae)

Treatment: **T104-a-2** MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
80 °F or above	2.5	32	24
70-79 °F	3	38	29
60-69 °F	4	48	38

To comply with dosage and temperature restrictions on methyl bromide labels, **ONLY** the fruits and vegetables listed may be fumigated with T104-a-2. If you have a commodity that is not listed, it may be elsewhere in the T100 schedules for a different pest complex. Refer to the Index for a complete list of commodities for which there are approved treatment schedules. Refer to [Appendix I](#) (or [40 CFR 180.41](#)) for a list of EPA crop groups and commodities.

The **bolded** items are under FIFRA Section 18 Exemption.



Do not use T104-a-2 if the FIFRA Section 18 quarantine exemption has expired. For any questions concerning the exemption status, call your State Plant Health Director or Regional Treatment Program Manager.

The commodities that are **not bold** are covered on the label. There may be some commodities that are on the label at one dosage and duration, and are also covered in the Section 18 at a different dosage and duration.

EXAMPLE: Coffee bean (roasted) is on the Chemtura MB-Q label and can be treated up to 3.0 lbs. for 24 hours. However, the Section 18 allows for coffee bean (unroasted) to be treated up to 9 lbs. for 12 hours.

List of Commodities Approved for Fumigation With T104-a-2:



Fumigation may cause damage to some commodities and is at the risk of the importer.

- ◆ 80 °F or above (maximum dosage 2.5 lbs./1000 ft³): **coconut (unprocessed without husk)**, pimento, pumpkin, zucchini squash
- ◆ 70 °F or above (maximum dosage 3.0 lbs./1000 ft³): **avocado**, bean, carrot, clementine, coffee bean (roasted), copra (coconut), corn-on-the-cob (sweet corn), edible podded legumes, eggplant, grapefruit, kumquat, lemon, lime, mandarin, **Malvaceae seeds for food use including kenaf and hibiscus, dried mint**, okra, onion, orange, parsnip, potato, radish, **root and tuber crop group**, rutabaga, salsify, strawberry, sugar beet, tangelo, tangerine, tomato, turnip root
- ◆ 60 °F or above (maximum dosage 4.0 lbs./1000 ft³): apple, apricot, asparagus, **banana (fruit and leaf)**, **blueberry**, cabbage, **cactus fruit (tuna)**, cantaloupe, carrot, **chayote**, cherry, chestnut, citron (ethrog), **coffee bean (unroasted)**, **cottonseed**, cucumber, **cucurbit seed (unprocessed)**, **dasheen**, **edible podded legumes**, fava bean (dried), **fresh figs**, **genip**, grapes, herbs (dried), honeydew melon, **ivy gourd**, Jerusalem artichoke, **kaffir lime leaves**, **kola nuts**, **longan**, **lorocco flower**, **lychee fruit**, **mango**, **mint (fresh)**, muskmelon, nectarine, **opuntia**, **okra**, peach, pear, peas and beans (dried), pepper, **persimmon**, pineapple, **pitaya/pitahaya/dragon fruit**, **plantain**, plum, **pomegranate**, **pointed gourd**, prune, quince, **rambutan**, **snow peas**, squash (summer, winter), **squash flower**, sweet potato, watermelon, yam
- ❖ ANY OTHER UNLABELED commodities from the following crop groups¹⁵ are treated under FIFRA exemption: **berry and small fruits**, **Brassica leafy vegetables**, **bulb vegetables**, **cucurbit vegetables**, **fresh herbs and spices**, **fruiting vegetables**, **leafy vegetables**, **leaves of legumes**, **leaves of roots and tubers**, **oilseed**, **stone fruits including their hybrids**

¹⁵ Crop groups are defined by the Environmental Protection Agency (EPA) in [40CFR 180.41](#) and are provided for quick reference in [Appendix I](#) in this manual.

T105—Irradiation

Irradiation (IR) is an approved treatment for all imported fruits and vegetables and for fruits and vegetables moved interstate from Hawaii, Puerto Rico, and the U.S. Virgin Islands. In addition, irradiation can be used against particular pests (Refer to [Table 5-2-2](#) on [page 5-2-70](#)) of cut flowers and foliage, however, some damage may occur.

Treatment must be conducted at approved facilities in a foreign country, Hawaii, Puerto Rico, US Virgin Islands or any area in the US mainland that does **not** support fruit flies (any state except AL, AZ, CA, FL, GA¹⁶, KY, LA, MS¹⁷, NV, NM, NC¹⁷, SC, TN, TX, or VA).

Refer to chapter [Certifying Irradiation Treatment Facilities](#) on [page 6-8-1](#) of this manual for facility certification requirements.



When designing the facility's dosimetry system and procedures for its operation, the facility operator must address guidance and principles from American Society for Testing Materials (ASTM) standards or an equivalent standard recognized by the Administrator of APHIS.

(The American Society for Testing and Materials (ASTM) publication, ISO/ASTM 51261-2002 (E), "**Standard Guide for Selection and Calibration of Dosimetry Systems for Radiation Processing**" is available from: ASTM, 100 Barr Harbor Drive, West Conshohocken, Pennsylvania, USA 19428-2959).

¹⁶ IR facilities may be located at the airport of Atlanta, GA, maritime ports of Gulfport, MS, and Wilmington, NC, provided the conditions listed in CFR 305.31(b) are met.

The following table lists pest-specific minimum absorbed doses for use on any fruit, vegetable, cut flower or foliage:

Table 5-2-2 Pest-Specific Minimum absorbed dose (Gy)

Scientific Name	Common Name	Minimum Absorbed Dose (Gy)
<i>Anastrepha ludens</i>	Mexican fruit fly	70
<i>Anastrepha obliqua</i>	West Indian fruit fly	70
<i>Anastrepha serpentina</i>	Sapote fruit fly	100
<i>Anastrepha suspensa</i>	Caribbean fruit fly	70
<i>Aspidiotus destructor</i>	Coconut scale	150
<i>Bactrocera cucurbitae</i>	Melon fruit fly	150
<i>Bactrocera dorsalis</i>	Oriental fruit fly	150
<i>Bactrocera jarvisi</i>	Jarvis fruit fly	100
<i>Bactrocera tryoni</i>	Queensland fruit fly	100
<i>Brevipalpus chilensis</i>	Chilean false red mite	300
<i>Ceratitidis capitata</i>	Mediterranean fruit fly	100
<i>Conotrachelus nenuphar</i>	Plum curculio	92
<i>Copitarsia declora</i>		100
<i>Cryptophlebia ombrodelta</i>	Litchi fruit moth	250
<i>Cryptophlebia illepida</i>	Koa seedworm	250
<i>Cylas formicarius elegantulus</i>	Sweet potato weevil	150
<i>Cydia pomonella</i>	Codling moth	200
<i>Euscepes postfasciatus</i>	West Indian sweet potato weevil	150
<i>Grapholita molesta</i>	Oriental fruit moth	200
<i>Omphisa anastomosalis</i>	Sweet potato vine borer	150
<i>Pseudaulacaspis pentagona</i>	White peach scale	150
<i>Rhagoletis pomonella</i>	Apple maggot	60
<i>Sternochetus frigidus</i> (Fabr.)	Mango pulp weevil	165
<i>Sternochetus mangiferae</i>	Mango seed weevil	300
	All other fruit flies of the family Tephritidae which are not listed above	150
	Plant pests of the class Insecta not listed above, except pupae and adults of the order Lepidoptera	400

The minimum absorbed dose for the most-tolerant unmitigated pest is required if more than one pest is present. Refer to *Table 5-2-2* on **page 5-2-70** to determine the required minimum absorbed dose. For example, if a shipment of grapes is infested with both Mediterranean fruit fly and codling moth, the commodity would be irradiated using a minimum dose of 200 Gy.

Commodities that are currently admissible with a treatment or systems approach could also use irradiation as an alternative treatment, provided all the pests targeted by the treatment or systems approach are neutralized by the irradiation dose. Use of irradiation in place of a systems approach or another treatment must be approved and appear in the this manual and FAVIR prior to use.

T105-a-1

Various Commodities

Treatment:T105-a-1 (IR @ 150 Gy)

Pests: All fruit flies from the family Tephritidae (Refer to [Table 5-2-3](#) for other pests that can be treated at 150 Gy or less.) Treat using a minimum absorbed dose of 150 Gy, **not** to exceed 1000 Gy.



Refer to the [Hawaii Manual](#) for detailed inspection procedures and additional entry requirements for pests **not** managed by 150 Gy or when a 400 Gy dose may be used instead.

Table 5-2-3 Origin and Approved Commodity List for 150 Gy

Origin	Commodity
Hawaii	Abiu, Atemoya, Banana, Breadfruit, <i>Capsicum</i> spp., Carambola, Citrus, <i>Cucurbita</i> spp., Dragon fruit (pitahaya. pitaya), Eggplant, Jackfruit, Litchi, Longan, Mangosteen, Melon, Moringa pods (Drumstick), Papaya, Pineapple, Rambutan, Sapodilla, Sweet Potato, and Tomato
Jamaica	Mango
Mexico	Carambola, Clementine/Mandarin/Tangerine (<i>Citrus reticulata</i>), Fig, Grapefruit (<i>Citrus paradisi</i>), Mango, Manzano Pepper (<i>Capsicum pubescens</i>), Pitahaya (Pitaya, Dragon fruit), Pomegranate, Sweet lime (<i>Citrus limetoides</i>), Sweet Orange (<i>Citrus sinensis</i>), Tangelo (<i>Citrus tangelo</i>)
Peru	Fig, Pomegranate
Philippines	Mango

T105-a-2

Various Commodities

Treatment: T105-a-2 (IR @ 400 Gy)

Pests: Fruit flies from the family Tephritidae and all insect pests **except** adults and pupae of the order Lepidoptera

Treat using a minimum absorbed dose of 400 Gy, **not** to exceed 1000 Gy.

Table 5-2-4 Origin and Approved Commodity List for 400 Gy

Origin	Commodity
Australia	Litchi
Dominican Republic	Mango
Ghana	Eggplant, Okra, Pepper
Hawaii	Banana, Breadfruit, Cowpea (pod), Curry Leaf, Dragon fruit (pitahaya, pitaya), Guava, Jackfruit, Mangosteen, Melon, Moringa pods (Drumstick), and Sweet Potato Cut flowers and leis
India	Mango, Pomegranate
Malaysia	Carambola (Star fruit), Jackfruit, Papaya, Pineapple, Rambutan
Mexico	Guava
Pakistan	Mango
Philippines	Litchi, Longan, Rambutan
South Africa	Grape, Litchi, Persimmon
Thailand	Dragon Fruit (pitahaya, pitaya), Litchi, Longan, Mango, Mangosteen, Pineapple, Rambutan
Viet Nam	Dragon Fruit (pitahaya, pitaya), Litchi, Longan, Rambutan

T105-a-3

Various Commodities

Treatment: T105-a-3 (IR @ 300 Gy)

Pests: *Sternochetus mangiferae* (Mango seed weevil), and all fruit flies from the family Tephritidae

Treat using a minimum absorbed dose of 300 Gy, **not** to exceed 1000 Gy.

Table 5-2-5 Origin and Approved Commodity List for 300 Gy

Origin	Commodity
Australia	Mango
Hawaii	Mango
Philippines	Mango

105-a-4

Various Commodities

Treatment: T105-a-4 (IR @ 165 Gy)

Pests: *Sternochetus frigidus* (Mango pulp weevil)

Treat using a minimum absorbed dose of 165 Gy, **not** to exceed 1000 Gy.

Table 5-2-6 Origin and Approved Commodity List for 165 Gy

Origin	Commodity
Philippines	Mango

T106—Vapor Heat

T106-a

Various Commodities from Mexico: Clementine (T106-a-1), Grapefruit (T106-a-2), Mango (Manilla variety only; T106-a-3), Orange (T106-a-4)

Pest: *Anastrepha* spp. (includes Mexican fruit fly, *A. ludens*)

Treatment: T106-a Vapor heat

Heat Up Time:	8 hours
Heat Up Recording Interval:	5 minutes
Minimum Air Temperature:	N/A
Minimum Pulp Temperature at End of Heat Up:	43.3 °C/110.0 °F
Dwell Time:	6 hours
Dwell Recording Interval:	5 minutes
Cooling Method:	N/A

T106-b

Bell Pepper (T106-b-1), Eggplant (T106-b-2), Mountain papaya (T106-b-3), Papaya (T106-b-4), Pineapple (T106-b-5), Squash (T106-b-6), Tomato (T106-b-7), Zucchini (T106-b-8)

Pest: *Ceratitis capitata* (Mediterranean fruit fly), *Bactrocera dorsalis* (Oriental fruit fly), and *Bactrocera cucurbitae* (melon fly)

Treatment: T106-b Vapor heat

Heat Up Time:	N/A
Heat Up Recording Interval:	N/A
Minimum Air Temperature:	112.0 F
Minimum Pulp Temperature at End of Heat Up:	44.4 °C/112.0 °F
Dwell Time:	8.75 hours
Dwell Recording Interval:	5 minutes
Cooling Method:	Optional



Commodities should be exposed at 112 °F to determine tolerance to the treatment before commercial shipments are attempted.

T106-a-1-1

Clementine or Orange from Mexico

Treatment: T106-a-1-1 Vapor heat

Heat Up Time:	6 hours ¹
Heat Up Recording Interval:	5 minutes
Minimum Air Temperature:	N/A
Minimum Pulp Temperature at End of Heat Up:	43.3 °C/110.0 °F
Dwell Time:	4 hours
Dwell Recording Interval:	5 minutes
Cooling Method:	N/A

1 During the initial raising of fruit temperature, the temperature should be raised rapidly in the first 2 hours; the increase over the next 4 hours should be gradual.

T106-f

Litchi and Longan from Hawaii

Pest: *Ceratitis capitata* (Mediterranean fruit fly), and *Bactrocera dorsalis* (Oriental fruit fly)

Treatment: T106-f Vapor heat

Heat Up Time:	1 hour
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:	20 minutes
Dwell Recording Interval:	5 minutes
Cooling Method:	Cool water spray

T106-d-1

Mango from the Philippines (the island of Guimaras only)

Pest: *Bactrocera occipitalis*, *Bactrocera cucurbitae*, and *Bactrocera philippinensis*

Treatment: T106-d-1 Vapor heat

Heat Up Time:	4 hours
Heat Up Recording Interval:	5 minutes
Minimum Air Temperature:	N/A
Minimum Pulp Temperature at End of Heat Up:	46.0 °C/114.8 °F
Dwell Time:	10 minutes
Dwell Recording Interval:	1 minute
Cooling Method:	Hydrocooling optional

T106-d

Mango from Taiwan

Pest: *Bactrocera dorsalis* (Oriental fruit fly) and *Bactrocera cucurbitae*

Treatment: T106-d Vapor heat

Heat Up Time:	N/A
Heat Up Recording Interval:	N/A
Minimum Air Temperature:	N/A
Minimum Pulp Temperature at End of Heat Up:	47.5 °C/115.7 °F
Dwell Time:	30 minutes
Dwell Recording Interval:	5 minute
Cooling Method:	Cooling required

T106-c

Papaya

Pest: *Ceratitis capitata* (Mediterranean fruit fly), *Bactrocera dorsalis* (Oriental fruit fly), and *Bactrocera cucurbitae* (melon fly)

Treatment: T106-c Vapor heat

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:	N/A
Dwell Recording Interval:	N/A
Cooling Method:	Optional

T106-e Yellow Pitaya (*Hylocereus megalanthus*) from Colombia

Pest: *Ceratitis capitata* (Mediterranean fruit fly), *Anastrepha fraterculus* (South American fruit fly)

Treatment: T106-e Vapor heat

Heat Up Time:	4 hours
Heat Up Recording Interval:	5 minutes
Minimum Air Temperature:	N/A
Minimum Pulp Temperature at End of Heat Up:	46.0 °C/114.8 °F
Dwell Time:	20 minutes
Dwell Recording Interval:	5 minutes
Cooling Method:	Hydrocooling optional ¹

¹ If post-treatment cooling is conducted, wait 30 minutes after the treatment to start the forced cooling process.

T106-g Rambutan from Hawaii

Pest: *Ceratitis capitata* (Mediterranean fruit fly), and *Bactrocera dorsalis* (Oriental fruit fly)

Treatment: T106-g Vapor heat

Heat Up Time:	1 hour
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:	20 minutes
Dwell Recording Interval:	5 minutes
Cooling Method:	Optional

T106-h

Sweet Potato from Hawaii

Pest: *Cylas formicarius* (Sweet potato weevil), *Euscepes postfasciatus* (West Indian sweet potato weevil), and *Omphisa anastomosalis* (Sweet potato vine borer)

Treatment: T106-h Vapor heat

Heat Up Time:	240 minutes
Heat Up Recording Interval:	N/A
Minimum Air Temperature at Start of Heat Up:	31 °C
Minimum Air Temperature at End of Heat Up:	44 °C
Dwell Time:	190 minutes
Dwell Recording Interval:	5 minutes
Minimum Dwell Time Air Temperature:	48 °C
Minimum Dwell Time Pulp Temperature:	47 °C
Cooling Method:	N/A



The relative humidity in the chamber should be 95% or greater during the heat up interval (from 31 °C to 44 °C). Relative humidity requirements are for commodity quality. Failure to reach 95% relative humidity may decrease the quality of the commodity, but does not result in a treatment failure.

T107—Cold Treatment

Pulp of the Fruit

The pulp of the fruit must be at or below the indicated temperature at time of beginning treatment for all cold treatments.

Fruits for Which Cold Treatment Is Authorized

The following cold treatment schedules are authorized by Plant Protection and Quarantine (PPQ) for the control of specific pests associated with shipments of fruit. The cold treatment schedule that must be used for a specific commodity from a specific country is listed in the Fruits and Vegetables Import Requirement database ([FAVIR](#)). These cold treatment schedules indicate the specific pests for which they are designed to control.

Treatment upon arrival may be accomplished at authorized ports as named in the permits.

Treatment in transit may be authorized for specifically equipped and approved vessels or containers and from approved countries, for entry at ports named in the permits. Intransit cold treatment authorization must be preceded by a visit to the country of origin by a PPQ Official to explain loading, inspection, and certification procedures to designated certifying officials of country of origin. Refrigerated compartments on carrying vessels and cold storage warehouse must have prior certification by PPQ. Authorization of cold treatments from countries with direct sailing time less than the number of days prescribed for intransit refrigeration treatment must be contingent on importer understanding that prescribed intransit refrigeration period must be met before arrival of vessel at the approved U.S. port.

Gaps in the cold treatment data print-out for pulp sensors and air sensors shall be allowed or disallowed on a case-by-case basis, taking into account the number of gaps, the length of each gap, and the temperatures before and after. Air temperatures may occasionally exceed treatment temperatures during defrost cycles; however, fruit temperatures should **not** rise appreciably during this time. During non-defrost times, the temperatures of the air sensors should never exceed the maximum allowable treatment temperature.



The fruit must be precooled at or below the target treatment temperature prior to loading. A certified USDA representative must sample the fruit pulp temperatures during loading in all sections of the lot until precooling has been accomplished.

T107-a

Apple, Apricot¹⁷, Avocado, Blueberry, Cape Gooseberry, Cherry, Citrus¹⁸, Ethrog, Grape, Kiwi, Loquat, Litchi (Lychee), Nectarine, Orange, Ortanique, Peach, Pear, Persimmon, Plum, Plumcot, Pomegranate, Pummelo, Quince, Sand Pear,

Pest: *Ceratitis capitata* (Mediterranean fruit fly) and *Ceratitis rosa* (Natal fruit fly)

Treatment: T107-a Cold treatment

Temperature	Exposure Period
34 °F (1.11 °C) or below	14 days
35 °F (1.67 °C) or below	16 days
36 °F (2.22 °C) or below	18 days



Pretreatment conditioning for avocado (heat shock or 100.4 °F (38 °C) for 10 to 12 hours) is optional and is the responsibility of the shipper. The pretreatment conditioning, which may improve fruit quality, is described in HortScience 29 (10): 1166-1168. 1994. and 30(5): 1052-1053 (1995)

T107-a-1

Apple, Apricot¹⁷, Blueberry, Cherry, Grape, Grapefruit, Kiwi, Mandarin, Nectarine, Orange, Peach, Pear, Plum, Pomegranate, Quince, Sweet Orange, Tangelo, Tangerine (includes Clementine)

Pest: *Ceratitis capitata* (Mediterranean fruit fly) and species of *Anastrepha* (other than *Anastrepha ludens*)

Treatment: T107-a-1 Cold treatment

Temperature	Exposure Period
34 °F (1.11 °C) or below	15 days
35 °F (1.67 °C) or below	17 days

T107-a-2

Orange (*Citrus sinensis*) and Tangor (*Citrus nobilis*) from Australia

Pest: *Ceratitis capitata* (Mediterranean fruit fly)

Treatment: T107-a-2 Cold treatment

Temperature	Exposure Period
37.4 °F (3.0 °C) or below	20 days

¹⁷ Pluots and plumcots are considered hybrids of plums and apricots and can be treated using T107-a.

¹⁸ Citrus includes clementine, grapefruit, lime, lemon, mandarin, orange, satsuma, tangor, tangerine, and other fruits grown from *Citrus reticulata* or its hybrids.

T107-a-3 **Lemon (*Citrus limon*) from Australia**

Pest: *Ceratitis capitata* (Mediterranean fruit fly)

Treatment: T107-a-3 Cold treatment

Temperature	Exposure Period
35.6 °F (2.0 °C) or below	16 days
37.4 °F (3.0 °C) or below	18 days

T107-b **Apple, Apricot¹⁹, Cherry, Ethrog, Grapefruit, Litchi, Longan, Orange, Peach, Persimmon, Plum, Pomegranate, Tangerine (includes Clementine), White Zapote**

Pest: *Anastrepha ludens* (Mexican fruit fly)

Treatment: **T107-b** Cold treatment

Temperature	Exposure Period
33 °F (0.56 °C) or below	18 days
34 °F (1.11 °C) or below	20 days
35 °F (1.67 °C) or below	22 days

T107-c **Apple, Apricot²⁰, Carambola, Cherry, Grape, Grapefruit, Orange, Pomegranate, Tangerine (includes Clementine)**

Pest: Species of *Anastrepha* (other than *Anastrepha ludens*)

Treatment: **T107-c** Cold treatment

Temperature	Exposure Period
32 °F (0 °C) or below	11 days
33 °F (0.56 °C) or below	13 days
34 °F (1.11 °C) or below	15 days
35 °F (1.67 °C) or below	17 days

19 **Pluots** and **plumcots** are considered hybrids of plums and apricots and can be treated using T107-b.

20 **Pluots** and **plumcots** are considered hybrids of plums and apricots and can be treated using T107-c.

T107-d Apple, Citrus²¹, Kiwi, Pear

Pest: *Bactrocera tryoni* (Queensland fruit fly)

Treatment: **T107-d** Cold treatment

Temperature	Exposure Period
32 °F (0 °C) or below	13 days
33 °F (0.56 °C) or below	14 days
34 °F (1.11 °C) or below	18 days
35 °F (1.67 °C) or below	20 days
36 °F (2.22 °C) or below	22 days

T107-d-1 Cherry from Australia

Pest: *Bactrocera tryoni* (Queensland fruit fly)

Treatment: **T107-d-1** Cold treatment

Temperature	Exposure Period
33.8 °F (1 °C) or below	14 days
37.4 °F (3 °C) or below	15 days

T107-d-2 Orange (*Citrus sinensis*), Tangerine/Clementine/Mandarin (*Citrus reticulata*), and Tangor (*Citrus nobilis*) from Australia

Pest: *Bactrocera tryoni* (Queensland fruit fly)

Treatment: **T107-d-2** Cold treatment

Temperature	Exposure Period
32 °F (0 °C) or below	13 days
33 °F (0.56 °C) or below	14 days
37.4 °F (3.0 °C) or below	16 days

T107-d-3 Lemon (*Citrus limon*) from Australia

Pest: *Bactrocera tryoni* (Queensland fruit fly)

Treatment: **T107-d-3** Cold treatment

Temperature	Exposure Period
37.4 °F (3.0 °C) or below	14 days

²¹ Citrus includes clementine, grapefruit, lime, lemon, mandarin, orange, satsuma, tangor, tangerine, and other fruits grown from *Citrus reticulata* or its hybrids.

T107-e Apricot²², Citrus²³, Grape, Nectarine, Peach, Plum

Pest: *Thaumatotibia leucotreta* (false codling moth), *Ceratitis capitata* (Mediterranean fruit fly), *C. quinaria* (five-spotted, Rhodesian, or Zimbabwean fruit fly), *C. rosa* (Natal fruit fly), and *Bactrocera invadens*²⁴

Treatment: **T107-e** Cold treatment

Temperature	Exposure Period
31 °F (-0.55 °C) or below ¹	22 days

1 The treatment shall **not** commence until all sensors are reading 31 °F (-0.55 °C) or below. If the temperature exceeds 31.5 °F (-0.27 °C), the treatment shall be extended one-third of a day for each day or part of a day the temperature is above 31.5 °F (-0.27 °C). If the exposure period is extended, the temperature during the extension period must be 34 °F (1.11 °C) or below. If the temperature exceeds 34 °F (1.11 °C) at any time, the treatment is nullified. Also, some freeze damage to the fruit may occur if the pulp temperature is allowed to drop below approximately 29.5 °F (-1.38 °C) (This varies with the commodity.)

T107-h Carambola, Litchi (Lychee), Longan, Sand Pear

Pest: *Bactrocera dorsalis* (Oriental fruit fly), *Bactrocera curcubitae* (melon fly) and *Conopomorpha sinensis* (lychee fruit borer)

Treatment: **T107-h** Cold treatment

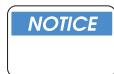
Temperature	Exposure Period
33.8 °F (0.99 °C) or below	17 days
34.5 °F (1.38 °C) or below	20 days

T107-j Carambola, Litchi (Lychee), Longan, Sand Pear

Pest: *Bactrocera dorsalis* (Oriental fruit fly)

Treatment: **T107-j** Cold treatment

Temperature	Exposure Period
33.8 °F (0.99 °C) or below	15 days
34.5 °F (1.38 °C) or below	18 days



Use T107-j when *Bactrocera dorsalis* is the **ONLY** pest of concern that is identified by APHIS PPQ import requirements.

22 Pluots and plumcots are considered hybrids of plums and apricots and can be treated using T107-e.

23 Consignments that received treatment T107-e may **only** arrive at Houston, TX, Newark, NJ, Philadelphia, PA, or Wilmington, DE.

24 The addition of this pest is pending regulatory approval.

T107-g Pecans and Hickory Nuts

Pest: *Curculio caryae* (Pecan weevil)

Treatment: **T107-g** Cold treatment

Temperature	Exposure Period
0 °F (-17.78 °C) or below	7 days

T107-f Ya Pear from China

Treatment: **T107-f** Cold treatment

Temperature	Exposure Period
32 °F (0 °C) or below	10 days
33 °F (0.56 °C) or below	11 days
34 °F (1.11 °C) or below	12 days
35 °F (1.67 °C) or below	14 days

T107-i Barhi Date (*Phoenix dactylifera* L. 'Barhi')

Pest: *Ceratitis capitata* (Mediterranean fruit fly)

Treatment: **T107-i** Cold treatment

Temperature	Exposure Period
34 °F (1.11 °C) or below	14 days
35 °F (1.67 °C) or below	16 days
36 °F (2.22 °C) or below	18 days

T107-L Orange (*Citrus sinensis*) and Tangerine/Clementine/Mandarin (*C. reticulata*)

Pest: *Bactrocera zonata* (Peach fruit fly), *Ceratitis capitata* (Mediterranean fruit fly), *C. rosa* (Natal fruit fly), and *Anastrepha* spp. (other than *A. ludens*)

Treatment: **T107-L** Cold treatment

Temperature	Exposure Period
35.0 °F (1.67 °C) or below	18 days

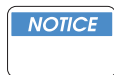
T108—Fumigation Plus Refrigeration of Fruits

Fruits for Which Fumigation Followed by Cold Treatment Is Authorized

The following treatment schedules (fumigation followed by cold treatment) are authorized by Plant Protection and Quarantine (PPQ) for the control of specific pests associated with shipments of fruit. The treatment schedule that must be used for a specific commodity from a specific country is listed in the Fruits and Vegetables Import Requirement database ([FAVIR](#)). These treatment schedules indicate the specific pests for which they are designed to control.



For Hawaiian-grown avocados, research has shown that, during the process of cold treatment (T108-a), a single transient heat spike of no greater than 39.6 °F (4.2 °C) and no longer than 2 hours, during or after 6 days of cold treatment, does **not** affect the efficacy of the treatment. However, in the absence of supporting research, such a tolerance for heat spikes shall **not** be extended to other fruits.



Some varieties of fruit may be injured by exposure to MB. Importers should be encouraged to treat small samples of fruit to determine tolerance levels before shipping commercial quantities. The USDA is **not** liable for damages caused by quarantine.

T108-a

Apple, Apricot²⁵, Avocado, Cherry, Grape, Kiwi, Nectarine, Peach, Pear²⁶, Plum, Quince

Pest: *Bactrocera cucurbitae* (melon fly), *Bactrocera dorsalis* (Oriental fruit fly), *Bactrocera tryoni* (Queensland fruit fly), *Brevipalpus chiliensis* (Chilean false red mite), *Ceratitis capitata* (Mediterranean fruit fly)

Treatment: **T108-a** Fumigation plus Cold treatment
Three alternative schedules based upon the fumigation exposure time



Pretreatment conditioning for avocado (heat shock or 100.4 °F (38 °C) for 10 to 12 hours) is optional and is the responsibility of the shipper. The pretreatment conditioning, which may improve fruit quality, is described in HortScience 29 (10): 1166-1168. 1994. and 30(5): 1052-1053 (1995)



Check the Fruits and Vegetables Import Requirement database (FAVIR) to determine the required treatments for a commodity from a specific country.



Some varieties of fruit may be injured by the 3-hour exposure. Importers should be encouraged to test treat small quantities to determine tolerance before shipping commercial quantities



Time lapse between fumigation and start of cooling **not** to exceed 24 hours.

25 **Plumcot** and **pluot** are considered hybrids of plums and apricots and may also be treated using T108-a provided they are treated under **Section 18 Crisis exemption**.

26 Fumigation may cause **severe** damage to Chinese, Japanese, Asian and Sand Pears. Obtain the importer's consent before fumigation.

T108-a-1

Treatment: **T108-a-1**²⁷ MB at NAP—tarpaulin or chamber followed by cold treatment

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
70 °F (21.11 °C) or above	2 lbs	25	18
Followed by cold treatment			

Refrigeration	
Temperature	Exposure Period
33 to 37 °F (0.56 to 2.77 °C)	4 days
OR 38 to 47 °F (3.33 to 8.33 °C)	11 days

T108-a-2

Treatment: **T108-a-2**²⁸ MB at NAP—tarpaulin or chamber followed by cold treatment

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:		
		0.5 hr	2 hrs	2.5 hrs
70 °F (21.11 °C) or above	2 lbs	25	18	18
Followed by cold treatment				

Refrigeration	
Temperature	Exposure Period
34 to 40 °F (1.11 to 4.44 °C)	4 days
OR 41 to 47 °F (5.0 to 8.33 °C)	6 days
OR 48 to 56 °F (8.88 to 13.33 °C)	10 days

27 **DO NOT** use T108-a-1 for Chilean False Red Mite (*Brevipalpus chilensis*). Use T108-a-3.

28 **DO NOT** use T108-a-2 for Chilean False Red Mite (*Brevipalpus chilensis*). Use T108-a-3.

T108-a-3

Treatment: **T108-a-3** MB at NAP—tarpaulin or chamber followed by cold treatment

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:			
		0.5 hr	2 hrs*	2.5 hrs	3 hrs
70 °F (21.11 °C) or above	2 lbs	25	18	18	17
Followed by cold treatment					

Refrigeration	
Temperature	Exposure Period
43 °F to 47 °F (6.11 to 8.33 °C)	3 days
OR 48 °F to 56 °F (8.88 to 13.33 °C)	6 days

T108-b

Apple, Grape, and Pear²⁹

Pest: *Austrotortrix* spp. and *Epiphyas* spp. (light brown apple moth complex), *Bactrocera tryoni* (Queensland fruit fly), *Ceratitis capitata* (Mediterranean fruit fly) and other fruit flies

Treatment: T108-b MB at NAP—tarpaulin or chamber followed by cold treatment

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
50 °F (10 °C) or above	1.5 lbs	23	20
40-49 °F (4.44 to 9.44 °C)	2 lbs	30	25
Followed by cold treatment			

Temperature	Exposure Period
33 °F (0.56 °C) or below	21 days



Important

Load **not** to exceed 80 percent of chamber capacity. Time lapse between fumigation and start of cooling **not** to exceed 24 hours.

²⁹ Fumigation may cause **severe** damage to Chinese, Japanese, Asian and Sand Pears. Obtain the importer's consent before fumigation.

T109—Cold Treatment Plus Fumigation of Fruits

T109-d-1 Apple, Grape, and Pear³⁰ from Australia

Pest: *Austrotortrix* spp. and *Epiphyas* spp. (light brown apple moth complex), *Bactrocera tryoni* (Queensland fruit fly), *Ceratitis capitata* (Mediterranean fruit fly) and other fruit flies

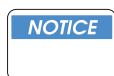
Treatment: T109-d-1 Cold treatment followed by MB at NAP—tarpaulin or chamber

Temperature	Exposure Period
33 °F (0.56 °C) or below	21 days
Followed by MB at NAP—tarpaulin or chamber	

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
70 °F (21.11 °C) or above	2 lbs	30	25
60 to 69 °F (15.55 to 20.55 °C)	2.5 lbs	36	28
40 to 59 °F (4.44 to 15 °C)	3 lbs	44	36

Alternate treatment for *Austrotortrix* and *Epiphyas* is fumigation plus refrigeration ([T108-b](#) on [page 5-2-89](#)).

Alternate treatment for grapes from Australia as a fruit fly precautionary treatment for *Bactrocera tryoni* and *Ceratitis capitata* is fumigation plus refrigeration ([T108-a](#) on [page 5-2-87](#) and [T108-b](#) on [page 5-2-89](#)).



Load **not** to exceed 80 percent of capacity.

³⁰ Fumigation may cause **severe** damage to Chinese, Japanese, Asian and Sand Pears. Obtain the importer's consent before fumigation.

T109-a

Apple ('Fuji' Apple from Japan and Korea)

Pest: *Carposina niponensis* (peach fruit moth), *Conogethes punctiferalis* (yellow peach moth), *Tetranychus viennensis* (fruit tree spider mite), *Tetranychus kanzawai* (Kanzawa mite)

Two alternative schedules based on type of container

T109-a-1

Treatment: **T109-a-1** (apples in plastic field bins at maximum load factor 50 percent or less) Cold treatment followed by MB at NAP—tarpaulin or chamber

Temperature	Exposure Period
34 °F (1.11 °C) or below	40 days
Followed by MB at NAP—tarpaulin or chamber	

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
50 °F or (10 °C) above	3 lbs	44	36

T109-a-2

Treatment: **T109-a-2** (apples in only cardboard cartons at maximum load factor 40 percent or less) Cold treatment followed by MB at NAP—tarpaulin or chamber

Temperature	Exposure Period
34 °F (1.11 °C) or below	40 days
Followed by MB at NAP—tarpaulin or chamber	

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
59 °F (15 °C) above	2 lbs 6 oz	35	29

T110—Quick Freeze

Under Development: See “Quick Freeze Guidelines” on page-3-7-21 for operational guidelines and equipment specifications.



Never use this treatment for the control of bruchid beetles in dried beans. Research has shown that a treatment of -18.0 °C (-0.4 °F) for 14 days would be needed to be efficacious.

T110-a

Treatment: T110-a — Quick Freeze

1. Initially, lower the commodity’s temperature to 0 °F (-17.77 °C) or below.
2. Hold the commodity’s temperature at 20 °F (-6.66 °C) or below for at least 48 hours.

The commodity may be transported during the 48-hour treatment period, but at no time may the commodity’s temperature rise above 20 °F (-6.66 °C) prior to release.

Certain fruits and vegetables are admissible from all foreign countries after receiving this treatment in accordance with 7CFR 319.56-12. Also, interstate movement of all fruits and vegetables from offshore areas of the United States (except mango from Hawaii) is authorized in the frozen state after being quick frozen.

T110-b

Treatment: T110-b — Quick Freeze for Destruction



T110-b may ONLY be used with permission from CPHST-AQI.

Contact 919-855-7450 for official approval.

1. Initially, lower the commodity’s temperature to 0 °F (-17.77 °C) or below.
2. Hold the commodity’s temperature at 20 °F (-6.66 °C) or below for at least 48 hours.

The commodity may be transported during the 48-hour treatment period, but at no time may the commodity’s temperature rise above 20 °F (-6.66 °C) prior to release.

3. After treatment, transport the commodity to a landfill for deep burial.

T110-c

Miscellaneous Food/Feed Commodities



Historically these treatments have been used on nonfood/nonfeed commodities. Be aware that the treatment may result in severe damage to food or feed commodities. T110-c schedules may ONLY be used with permission from CPHST-AQI. Contact 919-855-7450 for official approval.

T110-c-1

Pest: Quarantine-significant snails of the families Bradybaenidae, Geomitridae, Helicidae, Helicellidae, Hygromiidae, and Succineidae, including the following genera:

<i>Bradybaena</i>	<i>Cochlicella</i>	<i>Trochoidea</i>
<i>Candidula</i>	<i>Helicella</i>	<i>Xerolenta</i>
<i>Cepaea</i>	<i>Helicostyla</i>	<i>Xeropicta</i>
<i>Cathaica</i>	<i>Theba</i>	<i>Xerosecta</i>
<i>Cernuella</i>	<i>Trishoplita</i>	<i>Xerotricha</i>

Treatment: T110-c-1—Cold Treatment

Temperature	Exposure Period
0 °F	48 hrs

T110-c-2

Pest: Quarantine-significant snails of the family Helicidae, including the following genera:
Helix, Otaia

Treatment: T110-c-2—Cold Treatment

Temperature	Exposure Period
0 °F	32 hrs
10 °F	48 hrs

T110-c-3

Pest: Quarantine-significant snails of the family Achatinidae, including the following genera:

<i>Achatina</i>	<i>Lignus</i>
<i>Archachatina</i>	<i>Limicolaria</i>

Treatment: T110-c-3—Cold Treatment

Temperature	Exposure Period
0 °F	8 hrs
10 °F	16 hrs
20 °F	24 hrs

5

Treatment Manual

Treatment Schedules

T200 - Schedules for Propagative Plant Material

Contents

The following schedules of the T200 series are arranged by category such as a specifically named plant, type of plant, character of growth, or pest.



Plant and plant parts treated under the T200 series schedules are **not** to be used for food or feed purposes.

T201—Plants

T201-q Aquatic plants infested with freshwater snails 5-3-3

T201-e-1 and T201-e-2 Bromeliads 5-3-3

T201-f-1 and T201-f-2 Cacti and other succulents 5-3-4

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T201-a-1 and T201-a-2 Deciduous woody plants (dormant) 5-3-7

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T201-b-1 Evergreens*, (Broadleaved genera, such as *Azalea*, *Berberis*, *Camellia*, *Ilex*, and *Photinia*) 5-3-9

T201-k-1 Foliated hosts plants of *Dialeurodes citri* (citrus whitefly), excluding *Osmanthus americanus* 5-3-10

T201-c-1 and T201-c-2 Greenhouse-grown plants, herbaceous plants and cuttings, and greenwood cuttings of woody plants 5-3-10

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T201-k-2 Nonfoliated hosts plants of *Dialeurodes citri* (citrus whitefly), excluding *Osmanthus americanus* 5-3-13

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T201-p Plant material not tolerant to fumigation 5-3-19

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T203-m Avocado (seeds only, without pulp) 5-3-28

T203-e or T203-e-1 Chestnuts (does not include water chestnuts) and Acorns 5-3-28

T203-i-1, T203-i-2, or T203-i-3 Conifer seeds (species with small seeds, such as *Picea* spp., *Pinus sylvestris*, and *Pinus mugo*) 5-3-29

T203-i-3 Cottonseed—bagged, packaged, or in bulk 5-3-31

T203-k or T203-k-1 Macadamia nuts (as seeds) 5-3-33

T203-g-1 Pods and seed of Kenaf, Hibiscus, and Okra 5-3-32

T203-k Macadamia nuts (as seeds) 5-3-33

T203-h—*Rosmarinus* seeds 5-3-34

T203-l Seeds 5-3-34

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T203-a-1, T203-a-2, or T203-a-3 Seeds not specifically listed in the T203 Schedules 5-3-35

T203-o-1 Seeds of *Casuarina* 5-3-36

T203-p Seeds of Citrus (*Rutaceae* family) 5-3-39

T203-j or T203-j-1 Seeds of *Hevea brasiliensis* (rubber tree) 5-3-37

T203-o-3, T203-c, T203-o-4-1, or T203-o-4-2 Seeds of Leguminosae (*Fabaceae*) 5-3-38

T203-d-1 Seeds of Leguminosae (*Fabaceae*), excluding *Vicia faba* 5-3-38

T203-o-5 Seeds of *Lonicera* and Other seeds 5-3-39

T203-p Seeds of Citrus (*Rutaceae* family) 5-3-39

T203-o-2 Seeds of *Umbelliferae* 5-3-39

T203-c-1 or T203-d-2 Seeds of *Vicia* spp. (vetch seeds) including seeds of *Vicia faba* (*Faba* or *Fava* bean) 5-3-40

T203-n Seeds with infested pulp 5-3-40

The condition of the plants at the time of treatment may have a bearing on reaction to treatment.

Any new or unusual observations relating to treatment tolerance of treated material should be recorded and reported to the USDA-APHIS-PPQ-S&T-CPHST-AQI, giving details of the treatment and the conditions of application. In appraising the effects of a particular treatment, take care to distinguish between the actual or apparent effects attributable to the treatment and those **not** related to the treatment.

NOTICE

Containers. Give boxes, crates, and other propagative containers the same treatment as the propagative material with which they are associated. Exceptions are necessary, however, when significant pests are found infesting containers or packing materials that would not be controlled by the treatment required for the contents.

T201—Plants

NOTICE

Plant Tolerance. In general, nursery stock should be fumigated in a normal atmospheric pressure (NAP) chamber. Damage may occur when treatment is performed under a tarpaulin. When selecting a treatment for a particular pest, consider the tolerance of the plant material to the treatment. Refer to the “Handbook of Plant Tolerances to Quarantine Treatments” to determine if a genus or species is tolerant to treatment.

T201-q

Aquatic plants infested with freshwater snails

Pest: Snails of the following families: Amphulariidae, Bulinidae, Limnaeidae, Planorbidae, Viviparidae

Treatment: T201-q—Hot water treatment 112 °F for 10 minutes. *Elodea densa* and *Cabomba caroliniana* plants not tolerant to this treatment. Inspection stations should refer to their reference report guide for host tolerances to the hot water treatment.

T201-e-1

Bromeliads

Pest: External feeders

Treatment: T201-e-1 MB (“Q” label only) at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
90-96 °F	2 lbs	1.5 hrs
80-89 °F	2 lbs	2 hrs
70-79 °F	3 lbs	2 hrs
60-69 °F	3 lbs	2.5 hrs
50-59 °F	3 lbs	3 hrs

T201-e-2

Bromeliads

Pest: Internal feeders such as borers and miners

Treatment: T201-e-2 MB (“Q” label only) at 15" vacuum

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
90-96 °F	2 lbs	1.5 hrs
80-89 °F	2 lbs	2 hrs
70-79 °F	3 lbs	2 hrs
60-69 °F	3 lbs	2.5 hrs
50-59 °F	3 lbs	3 hrs

T201-f-1

Cacti and other succulents

Two schedules based on type of pest

Pest: External feeders (other than soft scales) infesting collected dormant and nondormant plant material

Treatment: T201-f-1 MB (“Q” label only) at NAP—tarpaulin or chamber)

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period:	
		<i>Brachyrhinus</i> larvae	All others
90-96 °F	2 lbs	2.5 hrs	2 hrs
80-89 °F	2.5 lbs	2.5 hrs	2 hrs
70-79 °F	3 lbs	2.5 hrs	2 hrs
60-69 °F	3 lbs	3 hrs	2.5 hrs
50-59 °F	3 lbs	3.5 hrs	3 hrs
40-49 °F	3 lbs	4 hrs	3.5 hrs

T201-f-2

Cacti and other succulents

Two schedules based on type of pest

Pest: Borers and soft scales

Treatment: T201-f-2 MB (“Q” label only) in 15" vacuum

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period:	
		<i>Brachyrhinus</i> larvae	All others
90-96 °F	2 lbs	2.5 hrs	2 hrs
80-89 °F	2.5 lbs	2.5 hrs	2 hrs
70-79 °F	3 lbs	2.5 hrs	2 hrs
60-69 °F	3 lbs	3 hrs	2.5 hrs
50-59 °F	3 lbs	3.5 hrs	3 hrs
40-49 °F	3 lbs	4 hrs	3.5 hrs



Vacuum fumigation requires prior consent of the importer. If consent is denied, entry should be refused unless hand removal plus 100 percent inspection is feasible.

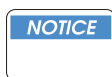


Obtain consent of the importer prior to treatment of the following plants since some damage may occur:

- Bromeliads, see [T201-e-3-1](#) on page 5-3-15
- Kalenchoe synsepala, see [T201-p](#) on page 5-3-19
- Sedum adolphi, see [T201-p](#) on page 5-3-19

T201-g-1

Chrysanthemum spp., rooted and unrooted cuttings



Obtain consent of the importer prior to fumigation since some damage may occur.

Pest: Aphids

Treatment: T201-g-1 MB (“Q” label only) at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
70 °F or above	0.75 lb	2 hrs

T201-g-2

Chrysanthemum spp., rooted and unrooted cuttings

DO NOT USE this treatment schedule.
The schedule is not authorized for use and will be removed or revised following a Federal Register notice according to 7 CFR 305.3.

May 01, 2012

Pest: External feeders

Treatment: T201-g-2 Malathion-carbaryl chemical dip—Hand removal of pests of infested parts *plus* a malathion-carbaryl chemical dip. Solution prepared by adding 3 level tablespoons of 25 percent malathion wettable powder and 3 level tablespoons of 50 percent carbaryl wettable powder to each gallon of water. The addition of a sticker-spreader formulation may be required for hard to wet plants. Use fresh chemicals and prepare dip for the same day use. Plants, including the roots, should be entirely submerged in the chemical dip for 30 seconds.

T201-g-3

***Chrysanthemum* spp., rooted and unrooted cuttings**

Pest: Leafminers, aphids, mites, etc.*

Treatment: T201-g-3—Hot water at 110-111 °F for 20 minutes

*This treatment is marginal as to host tolerance.



Chrysanthemum spp. from the Dominican Republic and Colombia when infested with Agromyzid leaf miners requires no treatment unless destined to Florida.

T201-I

Commodities infested with quarantine-significant slugs

Pest: Quarantine significant slugs of the families Agriolimacidae, Arionidae, Limacidae, Milacidae, Philomycidae, and Veronicellidae, including the following genera:

<i>Agriolimax</i>	<i>Leidyula</i>	<i>Pseudoveronicella</i>
<i>Arion</i>	<i>Limax</i>	<i>Sarasinula</i>
<i>Colosius</i>	<i>Meghimatium</i>	<i>Semperula</i>
<i>Deroceras</i>	<i>Milax</i>	<i>Vaginulus</i>
<i>Diplosolenodes</i>	<i>Pallifera</i>	<i>Veronicella</i>

Treatment: T201-I MB (“Q” label only) at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
90-96 °F	1 lb	12	9
80-89 °F	1.25 lbs	15	12
70-79 °F	1.5 lbs	18	15
60-69 °F	1.75 lbs	22	19

T201-h-1

Cycads—excluding *Dioon edule* (chestnut dion)

Pest: External feeders

Treatment: T201-h-1 MB (“Q” label only) in 15" vacuum

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
90-96 °F	2 lbs	2 hrs
80-89 °F	2.5 lbs	2 hrs
60-79 °F	3 lbs	2 hrs
40-59 °F	3 lbs	2.5 hrs

T201-a-1

Deciduous woody plants (dormant)

Pest: External feeders

Treatment: T201-a-1 MB (“Q” label only) at NAP

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period:	
		<i>Brachyrhinus</i> larvae	All others
90-96 °F	2 lbs	2.5 hrs	2 hrs
80-89 °F	2.5 lbs	2.5 hrs	2 hrs
70-79 °F	3 lbs	2.5 hrs	2 hrs
60-69 °F	3 lbs	3 hrs	2.5 hrs
50-59 °F	3 lbs	3.5 hrs	3 hrs
40-49 °F	3 lbs	4 hrs	3.5 hrs

For gypsy moth egg masses, use [T313-a](#) on [page 5-4-38](#) or [T313-b](#) on [page 5-4-38](#).



If treating for mealybugs, use [T305-c](#) on [page 5-4-19](#).



This schedule is not entirely satisfactory for use against egg masses of *Yponomeuta malinellus* (apple ermine moth).

T201-a-2

Deciduous woody plants (dormant)

root cuttings, scion wood cuttings, and nonfoliated citrus whitefly host—such as *Acer*, *Berberis*, *Fraxinus*, *Philadelphus*, *Rosa*, *Spiraea*, and *Syringa*

Pest: Borers

Treatment: T201-a-2 MB (“Q” label only) in 26" vacuum

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period:	
		<i>Brachyrhinus</i> larvae	All others
90-96 °F	2 lbs	2.5 hrs	2 hrs
80-89 °F	2.5 lbs	2.5 hrs	2 hrs
70-79 °F	3 lbs	2.5 hrs	2 hrs
60-69 °F	3 lbs	3 hrs	2.5 hrs
50-59 °F	3 lbs	3.5 hrs	3 hrs
40-49 °F	3 lbs	4 hrs	3.5 hrs



Citrus whitefly hosts, see [T201-k-1](#) on [page 5-3-10](#) Evergreens* broadleaved genera

T201-h-2 **Dioon edule (chestnut dioon)**

For other cycads see cycads

Pest: External feeders

Treatment: T201-h-2 MB (“Q” label only) in 26" vacuum

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
90-96 °F	2 lbs	2 hrs
80-89 °F	2.5 lbs	2 hrs
60-79 °F	3 lbs	2 hrs
40-59 °F	3 lbs	2.5 hrs

T201-i-1 **Dieffenbachia spp., Dracaena spp., Philodendron spp. (plants and cuttings)**

Pest: External feeders

Treatment: T201-i-1 MB (“Q” label only) at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1000 ft ³)	Minimum Concentration Readings (ounces) At:				
		0.5 hr	1.5 hrs	2 hrs	2.5 hrs	3 hrs
90-96 °F	2 lb	24	16	—	—	—
80-89 °F	2 lbs	24	—	16	—	—
70-79 °F	3 lbs	36	—	24	—	—
60-69 °F	3 lbs	36	—	—	24	—
50-59 °F	3 lbs	36	—	—	—	24



Important

This treatment may cause leaf tip burn in *Dieffenbachia* (dumbcane).

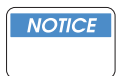
T201-i-2 **Dieffenbachia spp., Dracaena spp., Philodendron spp. (plants and cuttings)**

Pest: Internal feeders

Treatment: T201-i-2 MB (“Q” label only) in 26" vacuum

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
90-96 °F	2 lbs	1.5 hrs
80-89 °F	2 lbs	2 hrs
70-79 °F	3 lbs	2 hrs
60-69 °F	3 lbs	2.5 hrs
50-59 °F	3 lbs	3 hrs

Immature and tender plants and cuttings, and species and varieties known or considered to be affected by MB, should **not** be fumigated without consent of the importer. Without such consent, REFUSE entry.



This schedule may cause leaf tip burn in *Dieffenbachia* (dumbcane).

T201-b-1

Evergreens*, (Broadleaved genera, such as *Azalea*, *Berberis*, *Camellia*, *Ilex*, and *Photinia*)

(Coniferous genera, such as *Cedrus*, *Cupressus*, *Juniperus*, *Podocarpus*, *Thuja*, and *Taxus*)

Pest: External feeder

Treatment: T201-b-1 MB (“Q” label only) at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³):		Exposure Period:	
	<i>Brachyrhinus</i> larvae	All others	<i>Brachyrhinus</i> larvae	All others
90-96 °F	2 lbs	1.5 lbs	2.5 hrs	2 hrs
80-89 °F	2.5 lbs	2 lbs	2.5 hrs	2 hrs
70-79 °F	3 lbs	2.5 lbs	2.5 hrs	2 hrs
60-69 °F	3 lbs	2.5 lbs	3 hrs	2.5 hrs
50-59 °F	3 lbs	2.5 lbs	3.5 hrs	3 hrs
40-49 °F	3 lbs	2.5 lbs	4 hrs	3.5 hrs



*If treating for mealybugs, fumigate at 60 °F or above.

Exceptions:

- Araucaria* spp., see [T201-c-1](#) on **page 5-3-10**
- Azalea indica*, see [T201-c-2](#) on **page 5-3-11**
- Cycads, see [T201-l](#) on **page 5-3-6**
- Citrus whitefly hosts, see [T201-k-1](#) on **page 5-3-10**
- Daphne* spp., see [T201-c-1](#) on **page 5-3-10**
- Lavandula* spp., see [T201-p-1](#) on **page 5-3-19**
- Osmanthus americanus*, see [T201-p-2](#) on **page 5-3-20**
- Pinus* from Canada to certain States, see [T201-j](#) on **page 5-3-16**
- Peanuts with gypsy moth egg masses, see [T313-a](#) on **page 5-4-38**



Some species and varieties of evergreens, particularly in *Azalea* and *Juniperus* have low tolerances and should be fumigated as in schedule T201-c; those known or believed to be intolerant should be handled under T201-p. For tolerance data, see Handbook of Plant Tolerances to Quarantine Treatments.

T201-k-1

Foliated hosts plants of *Dialeurodes citri* (citrus whitefly), excluding *Osmanthus americanus*

For *Osmanthus americanus*, see T201-p

Pest: *Dialeurodes citri* (citrus whitefly)

Treatment: T201-k-1 MB (“Q” label only) at NAP

Temperature	Dosage Rate (lb/1,000 ft ³):		Exposure Period:
	<i>Brachyrhinus</i> larvae	All others	
85-96 °F	1.5 lbs	1 lb	4 hrs
80-84 °F	2.5 lbs	2 lbs	2.5 hrs
70-79 °F	2 lbs	2 lbs	3.5 hrs

T201-c-1

Greenhouse-grown plants, herbaceous plants and cuttings, and greenwood cuttings of woody plants

For cut flowers and greenery, use T305-a, which is identical to this schedule).

Pest: External feeders*, leaf miners, thrips

Treatment: T201-c-1 MB (“Q” label only) at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
80-90 °F	1.5 lbs	19	12
70-79 °F	2 lbs	24	16
60-69 °F	2.5 lbs	30	20
50-59 °F	3 lbs	36	24
40-49 F	3.5 lbs	41	27



Important

*If treating for mealybugs, fumigate with 2.5 lbs. at 60 °F or above.

T201-c-2

Greenhouse-grown plants, herbaceous plants and cuttings, and greenwood cuttings of woody plants

Pest: Borers, soft scales



For cut flowers and greenery, use [T305-b](#) on [page 5-4-18](#), which is identical to this schedule.

Treatment: T201-c-2 MB (“Q” label only) in 15" vacuum

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
80-90 °F	2.5 lbs	2 hrs
70-79 °F	3 lbs	2 hrs
60-69 °F	3 lbs	2.5 hrs
50-59 °F	3 lbs	3 hrs
40-49 °F	3 lbs	3.5 hrs

Vacuum fumigation requires prior consent of the importer. If consent is denied, refuse entry unless T201-c-1, plus hand removal of these pests is feasible. For shipments of a size to permit 100 percent inspection, plants with these pests may be handled separately. Vacuum fumigation is **not** required for soft scales known to be widely distributed in the United States.



Exceptions to Schedules T201-c-1 and 2

- Bromeliads, see [T201-e-3-1](#) on [page 5-3-15](#)
- Cacti and other succulents, see [T201-j](#) on [page 5-3-16](#)
- Chrysanthemum* spp., see [T201-g-1](#) on [page 5-3-5](#)
- Cycads, see [T201-l](#) on [page 5-3-6](#)
- Cyclamen mites, [T201-a-2](#) on [page 5-3-7](#)
- Dieffenbachia* spp., *Dracaena* spp., and *Philodendron* spp., see [T201-i-1](#) on [page 5-3-8](#)
- Kalanchoe synsepala*, see [T201-p-1](#) on [page 5-3-19](#)
- Lavandula* spp., see [T201-p-2](#) on [page 5-3-20](#)
- Orchids, see [T201-d-1](#) on [page 5-3-14](#)
- Osmanthus americanus*, see [T201-p](#) on [page 5-3-19](#)
- Pelargonium* spp., see [T201-p](#) on [page 5-3-19](#)
- Sedum adolphi*, see [T201-p](#) on [page 5-3-19](#)
- Plants infested with *Succinea horticola*, see [T201-o-1](#) on [page 5-3-12](#)
- Plants infested with *Veronicella* or other slugs, see [T201-l](#) on [page 5-3-6](#)

T201-n

Host plants of *Aleurocanthus woglumi* (citrus blackfly)

Pest: *Aleurocanthus woglumi* (citrus blackfly)

Treatment: T201-n MB (“Q” label only) at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
85 °F or above	1 lb	13	9
80-85 °F	1.25 lbs	16	12
70-79 °F	1.5 lbs	19	15
65-69 °F	1.75 lbs	23	17

Precautions within citrus blackfly quarantine areas:

- ◆ Conduct tarpaulin fumigations in shaded areas, if possible, to prevent the development of high space temperatures within the tarpaulin enclosure.
- ◆ Fumigate 4 to 5 days after plants are dug, balled, and burlapped, if possible.
- ◆ Roots and soil should be moist prior to fumigation. Watering should be deferred for 12 hours after fumigation unless there is wilting, in which case, water as needed.
- ◆ Avoid excessive air circulation during fumigation or during the post-treatment aeration period.
- ◆ Avoid placing plants in direct sunlight after fumigation.

T201-o-1

Host plants of *Omalonyx unguis* and *Succinea spp.* (snails)



These treatments are for use on plants that may **not** tolerate fumigation. Use either of the following treatments.

Pest: *Omalonyx unguis* and *Succinea spp.* (snails)

Treatment: T201-o-1 Water Spray—Use a high-pressure water spray on the foliage to flush snails from the plants. Care should be taken **not** to spray the root systems of conifers since they will be damaged. The run-off drain must be screened to catch snails before drainage into the sewer system. Reinspect plants after wash.

T201-o-2

Host plants of *Omalyonx unguis* and *Succinea* spp. (snails)

**DO NOT USE this treatment schedule.
The schedule is not authorized for use and
will be removed or revised following a
Federal Register notice according to
7 CFR 305.3.**

May 01, 2012

Treatment: **T201-o-2** Chemical Dip—Dip plants with a Malathion-carbaryl chemical dip. Solution prepared by adding 3 level tablespoons of 25 percent Malathion wettable powder and 6 level teaspoons of 50 percent carbaryl wettable powder per gallon of water with a sticker-spreader formulation.

T201-k-2

Nonfoliated hosts plants of *Dialeurodes citri* (citrus whitefly), excluding *Osmanthus americanus*

Pest: *Dialeurodes citri* (citrus whitefly)

Treatment: T201-k-2 MB (“Q” label) at NAP

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period:	
		<i>Brachyrhinus</i> larvae	All others
90-96 °F	2 lbs	2.5 hrs	2 hrs
80-89 °F	2.5 lbs	2.5 hrs	2 hrs
70-79 °F	3 lbs	2.5 hrs	2 hrs
60-69 °F	3 lbs	3 hrs	2.5 hrs
50-59 °F	3 lbs	3.5 hrs	3 hrs
40-49 °F	3 lbs	4 hrs	3.5 hrs

T201-d-1 Orchids, plants, and cuttings

Pest: External feeders, other than soft scales

Collected: Dormant or nondormant

Treatment: T201-d-1 MB (“Q” label only) at NAP tarpaulin or chamber,

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period:	
		<i>Brachyrhinus</i> larvae	All others
90-96 °F	2 lbs	2.5 hrs	2 hrs
80-89 °F	2.5 lbs	2.5 hrs	2 hrs
70-79 °F	3 lbs	2.5 hrs	2 hrs
60-69 °F	3 lbs	3 hrs	2.5 hrs
50-59 °F	3 lbs	3.5 hrs	3 hrs
40-49 °F	3 lbs	4 hrs	3.5 hrs



Some varieties of Orchids may be sensitive to methyl bromide (MB) treatments. These varieties include *Cymbidium*, *Cypripedium*, and *Phalaenopsis*. For alternatives, see [T201-p](#) on page 5-3-19.



If treating for mealybugs, use [T305-c](#) on page 5-4-19.

T201-d-2 Orchids, plants, and cuttings

Pest: External feeders (other than soft scales) infesting greenhouse-grown plant material

Treatment: T201-d-2 MB (“Q” label only) at NAP tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
90-96 °F	1 lb	2 hrs
80-89 °F	1.5 lbs	2 hrs
70-79 °F	2 lbs	2 hrs
60-69 °F	2.5 lbs	2 hrs
50-59 °F	3 lbs	2 hrs
40-49 °F	3.5 lbs	2 hrs

T201-d-3 Orchids, plants, and cuttings

Pest: Borers, cattleya fly, *Mordellistena* spp., soft scales, *Vinsonia* spp.

Treatment: T201-d-3 MB (“Q” label only) in 15" vacuum

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
90-96 °F	3 lbs	1 hr
80-89 °F	3 lbs	1.5 hrs
70-79 °F	3 lbs	2 hrs
60-69 °F	3 lbs	2.5 hrs
50-59 °F	3 lbs	3 hrs
40-49 °F	3 lbs	3.5 hrs

For nondormant plants, collected or greenhouse grown, vacuum fumigation requires prior consent of the importer. If consent is denied, REFUSE entry unless T201-a-1 plus hand removal of these pests is feasible. Plant shipments of a size to permit 100 percent inspection and pest removal may be handled separately.

T201-d-4 Orchids, plants, and cuttings

Pest: Cecidomyid galls

Treatment: **T201-d-4** Excised in all cases

T201-d-5 Orchids, plants, and cuttings

Pest: Leaf miner, *Eurytoma* spp., infesting *Rhynchosyilis*

Treatment: T201-d-5 Hot water—118 °F for 0.5 hour followed by a cool water bath

T201-e-3-1 Pineapple slips

Two alternative schedules

Pest: Various

Treatment: T201-e-3-1 MB (“Q” label only) at NAP

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
90-96 °F	1.5 lbs	2 hrs
80-89 °F	2 lbs	2 hrs
70-79 °F	2.5 lbs	2 hrs
60-69 °F	3 lbs	2 hrs

T201-e-3-2

Pineapple slips

Alternative schedule

Treatment: T201-e-3-2 MB (“Q” label only) in 26" vacuum

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
90-96 °F	1.5 lbs	1.5 hrs
80-89 °F	2 lbs	1.5 hrs
70-79 °F	2.5 lbs	1.5 hrs
60-69 °F	3 lbs	1.5 hrs



Some varieties of bromeliads may be sensitive to methyl bromide (MB) treatments. These varieties include *Aechmea* spp., *Billbergia* spp., *Guzmania* spp., *Nidularium* spp., *Vriesia* spp., and other broad shiny-leaved types, and thin-leaved types. For alternatives, see [T201-p](#) on **page 5-3-19**.

T201-j

Pines (*Pinus* spp.) from Canada

Destined to California, Idaho, Oregon, and Utah

Pest: *Rhyacionia buoliana* (European pine shoot moth)

Treatment: T201-j MB (“Q” label only) at NAP

Dosage rate for all schedules is 4 lbs MB (51 oz. minimum concentration)

Temperature	Exposure Period	Temperature	Exposure Period
75 °F	2 hrs	59 °F	2 hrs 41 min
74 °F	2 hrs 1 min	58 °F	2 hrs 43 min
73 °F	2 hrs 2 min	57 °F	2 hrs 46 min
72 °F	2 hrs 4 min	56 °F	2 hrs 49 min
71 °F	2 hrs 7 min	55 °F	2 hrs 52 min
70 °F	2 hrs 9 min	54 °F	2 hrs 55 min
69 °F	2 hrs 11 min	53 °F	2 hrs 58 min
68 °F	2 hrs 14 min	52 °F	3 hrs 1 min
67 °F	2 hrs 16 min	51 °F	3 hrs 5 min
66 °F	2 hrs 19 min	50 °F	3 hrs 8 min
65 °F	2 hrs 22 min	49 °F	3 hrs 12 min
64 °F	2 hrs 25 min	48 °F	3 hrs 15 min
63 °F	2 hrs 28 min	47 °F	3 hrs 19 min
62 °F	2 hrs 31 min	46 °F	3 hrs 24 min
61 °F	2 hrs 35 min	45 °F	3 hrs 28 min
60 °F	2 hrs 38 min		



This is a precautionary treatment for pine trees with or without roots and twigs and branches of all *Pinus* species. Christmas trees and other pine decorative materials are exempt from the fumigation requirement during the period November 1 through December 31.

Prior consent of the importer is required for fumigation at temperatures above 65 °F or below 50 °F and also for all bare-rooted pines, since some damage may occur.

T201-m-1

Plant cuttings (Scion wood)*

Pest: External feeders

Treatment: T201-m-1 MB (“Q” label only) at NAP—tarpaulin or chamber



*See exceptions to plant cuttings.

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period:	
		<i>Brachyrhinus</i> larvae	All others
90-96 °F	2 lbs	2.5 hrs	2 hrs
80-89 °F	2.5 lbs	2.5 hrs	2 hrs
70-79 °F	3 lbs	2.5 hrs	2 hrs
60-69 °F	3 lbs	3 hrs	2.5 hrs
50-59 °F	3 lbs	3.5 hrs	3 hrs
40-49 °F	3 lbs	4 hrs	3.5 hrs

T201-m-2

Plant cuttings (greenwood cuttings of woody plants and herbaceous plant cuttings)*

Pest: External feeders

Treatment: T201-m-2 MB (“Q” label only) at NAP—tarpaulin or chamber



*See exceptions to plant cuttings.

Temperature	Dosage Rate (lb/1000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
80-90 °F	1.5 lbs	19	12
70-79 °F	2 lbs	24	16
60-69 °F	2.5 lbs	30	20
50-59 °F	3 lbs	36	24
40-49 °F	3.5 lbs	41	27

T201-m-3

Plant cuttings (root cuttings)*

Pest: External feeders

Treatment: T201-m-3 MB (“Q” label only) at NAP—chamber



*See exceptions to plant cuttings.

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period:	
		<i>Brachyrhinus</i> larvae	All others
90-96 °F	2 lbs	2.5 hrs	2 hrs
80-89 °F	2.5 lbs	2.5 hrs	2 hrs
70-79 °F	3 lbs	2.5 hrs	2 hrs
60-69 °F	3 lbs	3 hrs	2.5 hrs
50-59 °F	3 lbs	3.5 hrs	3 hrs
40-49 °F	3 lbs	4 hrs	3.5 hrs

T201-m-4

Plant cuttings (root cuttings)*

Pest: External feeders

Treatment: T201-m-4 MB (“Q” label only) at NAP—tarpaulin

Temperature	Dosage Rate (lb/1000 ft ³)	Minimum Concentration Readings (ounces) At:				
		0.5 hr	2.5 hrs	3 hrs	3.5 hrs	4 hrs
90-96 °F	2 lbs	24	16	—	—	—
80-89 °F	2.5 lbs	30	20	—	—	—
70-79 °F	3 lbs	36	24	—	—	—
60-69 °F	3 lbs	36	—	24	—	—
50-59 °F	3 lbs	36	—	—	24	—
40-49 °F	3 lbs	36	—	—	—	24



Important

*See exceptions to plant cuttings.



Important

Exceptions to Plant Cutting Commodities Treated with T201-m-1, T201-m-2, T201-m-3, and T201-m-4:

- Avocado, see [T201-p](#) on [page 5-3-19](#)
- Chrysanthemum, see [T201-g-1](#) on [page 5-3-5](#)
- Dieffenbachia, see [T201-i-1](#) on [page 5-3-8](#)
- Dracaena, see [T201-i-2](#) on [page 5-3-8](#)
- Lavandula, see [T201-p](#) on [page 5-3-19](#)
- Orchids, see [T201-d-1](#) on [page 5-3-14](#)
- Philodendron, see [T201-i-1](#) on [page 5-3-8](#)

T201-p

Plant material not tolerant to fumigation

Three treatments based on pest

Propagative material known to be sensitive to fumigation (see Handbook of Plant Tolerance to Quarantine Treatments) should be handled by the following methods for “quarantine action” pests. The selection of the method will depend upon the character of the plant material and the type of pests that may be found.

T201-p-1

Plant material not tolerant to fumigation

Pest: Actionable Pests Excluding Scale Insects

Treatment: **T201-p-1** Hand removal—With the exception of scale insects, hand removal of pests or infested parts and detailed inspection to ensure plants are pest free. If the characteristics of the plant growth, volume, or the type of pest are such that hand removal plus inspection may **not** provide a pest free shipment, then see [T201-p-2](#) on [page 5-3-20](#) or [T201-p-3](#) on [page 5-3-20](#).

T201-p-2

Plant material not tolerant to fumigation

DO NOT USE this treatment schedule.
The schedule is not authorized for use and
will be removed or revised following a
Federal Register notice according to
7 CFR 305.3.

May 01, 2012

Pest: Actionable Pests

Treatment: **T201-p-2** Hand removal plus chemical dip—Hand removal of pests of infested parts *plus* a malathion-carbaryl chemical dip. Solution prepared by adding 3 level tablespoons of 25 percent malathion wettable powder and 3 level tablespoons of 50 percent carbaryl wettable powder to each gallon of water. The addition of a sticker-spreader formulation may be required for hard to wet plants. Use fresh chemicals and prepare dip for the same day use. Plants, including the roots, should be entirely submerged in the chemical dip for 30 seconds.



When the actionable pests are scale insects or their immature crawlers, prepare the solution by adding 4 level tablespoons of 25 percent malathion wettable powder (if the label allows) and 3 level tablespoons of 50 percent carbaryl wettable powder to each gallon of water. Labels registered for this concentration are currently available from the following companies:

Micro-Flo Company LLC
Memphis, TN
Product: Malathion 25-WP
EPA Registration No. 051036-00033
(Tel 901-432-5131)

Cheminova Inc.
Oak Hill Park
1700 Route 23, Suite 210
Wayne, NJ 07470
Product Fyfanon 25 WP
EPA Registration No. 067760-00016
(Tel 201-305-6600)

T201-p-3

Deleted (Docket APHIS-13-009-2, July 21, 2015)

T201-p-4

Plant material not tolerant to fumigation

Pest: **Insects** (Aphidae, Thripidae, Formicidae, Coccidae, Pseudococcidae, Diaspididae, Pyralidae, Tortricidae, Syrphidae, Scarabaeidae, Cucurlionidae, Tenebrionidae)

Snails (Ampullariidae, Planorbidae)

Mites (Acaridae, Tarsonemidae, Tetranychidae, Tydeidae)

Nematodes (*Pratylenchus* (genus only))

Treatment: T201-p-4 Hand removal plus hot water treatment—Hot water at 52 °C/125 °F for 30 minutes

If hand removal is **not** feasible, allow the importer to fumigate at their own risk or return the commodity to the country of origin.

Under Development: See “**Plant Material Not Tolerant to Fumigation**” on **page-3-3-15** for operational guidance and equipment specifications.

T202—Bulbs, Corms, Tubers, Rhizomes, and Roots

T202-b

Astilbe roots

Pest: *Brachyrhinus* larvae

Treatment: T202-b MB (“Q” label only) in 26" vacuum

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
70-96 °F	4 lbs	2 hrs
60-69 °F	4 lbs	2.5 hrs
50-59 °F	4 lbs	3 hrs
40-49 °F	4 lbs	4 hrs

For roots received in large cases packed in peat moss, temperatures apply to packing materials, if lower than root temperatures.

T202-c

Banana roots

Pest: External feeders

Treatment: T202-c Hot water 110 °F for 30 minutes as pretreatment followed by 120 °F for 60 minutes. Requires consent of importer. Deny entry without consent unless 100 percent inspection plus pest removal is feasible.

T202-j

Garlic

Pest: *Brachycerus* spp. (garlic beetles) and *Dyspessa ulula* (Bkh.)
(onion/garlic carpenterworm)

Treatment: T202-j MB (“Q” label only) in 15" vacuum

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
90-96 °F	2 lbs	1.5 hrs
80-89 °F	2 lbs	2 hrs
70-79 °F	2.5 lbs	2 hrs
60-69 °F	3 lbs	2 hrs
50-59 °F	3 lbs	3 hrs
40-49 °F	3 lbs	4 hrs



Load limit **not** to exceed 80 percent of chamber.

T202-j-1

Garlic

Pest: *Brachycerus* spp. (garlic beetles) and *Dyspessa ulula* (Bkh.)
(onion/garlic carpenterworm)

Treatment: T202-j-1 MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:				
		0.5 hr	2 hrs	2.5 hrs	3 hrs	3.5 hrs
90 °F or above	2 lbs	26	19	—	—	—
80-89 °F	2.5 lbs	32	24	—	—	—
70-79 °F	3 lbs	38	29	—	—	—
60-69 °F	3 lbs	38	26	26	—	—
50-59 °F	3 lbs	38	26	—	26	—
40-49 °F	3 lbs	38	26	—	—	26



This treatment is a precautionary requirement for *Brachycerus* spp. (garlic beetles) and *Dyspessa ulula* (Bkh.) (onion/garlic carpenterworm).

T202-e-1

***Gladiolus* spp.**

Two alternative schedules

Pest: *Taeniothrips simplex* (gladiolus thrips)

Treatment: T202-e-1 MB (“Q” label only) at NAP

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
90-96 °F	2 lbs	3 hrs
80-89 °F	2.5 lbs	3 hrs
70-79 °F	3 lbs	3 hrs
60-69 °F	3 lbs	3.5 hrs
50-59 °F	3 lbs	4 hrs
40-49 °F	3 lbs	4.5 hrs

T202-e-2

***Gladiolus* spp.**

Pest: *Taeniothrips simplex* (gladiolus thrips)

Treatment: T202-e-2 MB (“Q” label only) in 26" vacuum

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
90-96 °F	2 lbs	2 hrs
80-89 °F	2.5 lbs	2 hrs
70-79 °F	3 lbs	2 hrs
60-69 °F	3 lbs	2.5 hrs
50-59 °F	3 lbs	3 hrs
40-49 °F	3 lbs	3.5 hrs

T202-f

Horseradish roots

Pest: External feeders

Treatment: T202-f MB in 15" vacuum

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period:	
		<i>Brachyrhinus</i> larvae	All others
90-96 °F	2 lbs	2.5 hrs	2 hrs
80-89 °F	2.5 lbs	2.5 hrs	2 hrs
70-79 °F	3 lbs	2.5 hrs	2 hrs
60-69 °F	3 lbs	3 hrs	2.5 hrs
50-59 °F	3 lbs	3.5 hrs	3 hrs
40-49 °F	3 lbs	4 hrs	3.5 hrs

T202-g

Lily bulbs packed in subsoil

Pest: Internal feeders

Treatment: T202-g MB (“Q” label only) at NAP

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
90-96 °F	2 lbs	3 hrs
80-89 °F	2.5 lbs	3 hrs
70-79 °F	3 lbs	3 hrs
60-69 °F	3 lbs	3.5 hrs
50-59 °F	3 lbs	4 hrs
40-49 °F	3 lbs	4.5 hrs

Load limit 50 percent of chamber volume. Remove all wooden case covers. Overnight or longer aeration advisable.

T202-h

Lycoris

Pest: *Taeniothrips eucharii*

Treatment: T202-h MB in 26" vacuum

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period:	
		<i>Brachyrhinus</i> larvae	All others
90-96 °F	2 lbs	2.5 hrs	2 hrs
80-89 °F	2.5 lbs	2.5 hrs	2 hrs
70-79 °F	3 lbs	2.5 hrs	2 hrs
60-69 °F	3 lbs	3 hrs	2.5 hrs
50-59 °F	3 lbs	3.5 hrs	3 hrs
40-49 °F	3 lbs	4 hrs	3.5 hrs

T202-i-1

Narcissus

Pest: *Steneotarsonemus laticeps* (bulb scale mite)

Treatment: T202-i-1 MB (“Q” label only) at NAP

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
90-96 °F	3 lbs	2 hrs
80-89 °F	3.5 lbs	2 hrs
70-79 °F	4 lbs	2 hrs
60-69 °F	4 lbs	2.5 hrs
50-59 °F	4 lbs	3 hrs
40-49 °F	4 lbs	3.5 hrs

T202-i-2

Narcissus

Pest: *Steneotarsonemus laticeps* (bulb scale mite)

Treatment: T202-i-2 MB (“Q” label only) in 26" vacuum chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
90-96 °F	2 lbs	2 hrs
80-89 °F	2.5 lbs	2 hrs
70-79 °F	3 lbs	2 hrs
60-69 °F	3 lbs	2.5 hrs
50-59 °F	3 lbs	3 hrs
40-49 °F	3 lbs	3.5 hrs

T202-i-3

Narcissus

Pest: *Steneotarsonemus laticeps* (bulb scale mite)

Treatment: T202-i-3 Hot water, 110-111 °F for 1 hour



Important

Exposure measured from time bulbs reach 110 °F pulp temperature. Hot water should be applied *within 1 month after normal harvest*, or flower bud injury may develop.

T202-a-1

Selaginella spp. (Resurrection plants)

Pest: External feeders

Treatment: T202-a-1 MB (“Q” label only) at NAP—Chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period:	
		<i>Brachyrhinus</i> larvae	All others
90-96 °F	2 lbs	2.5 hrs	2 hrs
80-89 °F	2.5 lbs	2.5 hrs	2 hrs
70-79 °F	3 lbs	2.5 hrs	2 hrs
60-69 °F	3 lbs	3 hrs	2.5 hrs
50-59 °F	3 lbs	3.5 hrs	3 hrs
40-49 °F	3 lbs	4 hrs	3.5 hrs

T202-a-2

***Selaginella* spp. (Resurrection plants)**

Pest: External feeders

Treatment: T202-a-2 MB (“Q” label only) at NAP—Tarpaulin

Temperature	Dosage Rate (lb/1000 ft ³)	Minimum Concentration Readings (ounces) At:				
		0.5 hr	2.5 hrs	3 hrs	3.5 hrs	4 hrs
90-96 °F	2 lbs	24	16	—	—	—
80-89 °F	2.5 lbs	30	20	—	—	—
70-79 °F	3 lbs	36	24	—	—	—
60-69 °F	3 lbs	36	—	24	—	—
50-59 °F	3 lbs	36	—	—	24	—
40-49 °F	3 lbs	36	—	—	—	24

T202-a-3

***Selaginella* spp. (Resurrection plants)**

Pest: Internal feeders

Treatment: T202-a-3 MB (“Q” label only) in 26" vacuum—chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period:	
		<i>Brachyrhinus</i> larvae	All others
90-96 °F	2 lbs	2.5 hrs	2 hrs
80-89 °F	2.5 lbs	2.5 hrs	2 hrs
70-79 °F	3 lbs	2.5 hrs	2 hrs
60-69 °F	3 lbs	3 hrs	2.5 hrs
50-59 °F	3 lbs	3.5 hrs	3 hrs
40-49 °F	3 lbs	4 hrs	3.5 hrs

T202-d

Yams (*Dioscorea* spp.) and Sweet Potatoes (*Ipomoea* spp.)

Pest: Internal and external feeders

Treatment: T202-d MB (“Q” label only) at NAP—Tarpaulin

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:		
		0.5 hr.	2.0 hrs	4 hrs
90 and above °F	2.5 lbs	32	20	20
80-89 °F	3 lbs	38	24	24
70-79 °F	3.5 lbs	44	28	28
60-69 °F	4 lbs	50	32	32

NOTICE

Temperatures below 70 °F may cause injury to yams. Fumigations below 70 °F should only be made with consent of importer. The tuberous roots should be cured, free from surface moisture, and held at fumigation temperatures for 24 hours following treatment. Mandatory for yams for all foreign countries except Japan, Dominican Republic into Puerto Rico, and all of the West Indies into the U.S. Virgin Islands. Also, for interstate movement of sweet potatoes from Hawaii.

T203—Seeds



Seeds for Propagation. Precautionary treatment for small lots of seeds (1 lb or less) is **not** required if you can inspect 100 percent of the seeds and you do **not** find any pests.



Methyl bromide fumigation of seeds for propagation may effect germination. Obtain the importers consent prior to fumigation.

T203-m

Avocado (seeds only, without pulp)

Pest: Avocado seed weevils (*Conotrachelus* spp., *Heilipus lauri*, and *Caulophilus latinasus*); avocado stem weevil (*Copturus aguacatae*), and avocado seed moth (*Stenoma catenifer*)

Treatment: T203-m MB (“Q” label only) in 26" vacuum

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
90-96 °F	2 lbs	2 hrs
80-89 °F	3 lbs	2 hrs
70-79 °F	4 lbs	2 hrs
60-69 °F	4 lbs	3 hrs
50-59 °F	4 lbs	4 hrs
40-49 °F	4 lbs	5 hrs

T203-e

Chestnuts (does not include water chestnuts) and Acorns

From all countries except Canada and Mexico

Pest: Internal feeders

Treatment: T203-e MB (“Q” label only) in 26" vacuum

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
80-96 °F	3 lbs	2 hrs
70-79 °F	4 lbs	2 hrs
60-69 °F	4 lbs	3 hrs
50-59 °F	4 lbs	4 hrs
40-49 °F	4 lbs	5 hrs

T203-e-1

Chestnut (does not include water chestnuts) and Acorns*

Pest: *Cydia splendana* (nut fruit tortrix) and *Curculio* spp.

Treatment: T203-e-1 MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:					
		0.5 hr	2 hrs	3 hrs	4 hrs	5 hrs	6 hrs
90 °F and above	4 lbs	58	34	34	—	—	—
80-89 °F	4 lbs	58	32	—	32	—	—
70-79 °F	5 lbs	72	42	—	42	—	—
60-69 °F	5 lbs	72	40	—	—	40	—
50-59 °F	6 lbs	85	50	—	—	50	—
40-49 °F	6 lbs	85	48	—	—	—	48



Important

*It is a label violation to treat acorns at dosage rates greater than 4 lbs. Treat acorns only at 80 °F or above.

T203-i-1

Conifer seeds (species with small seeds, such as *Picea* spp., *Pinus sylvestris*, and *Pinus mugo*)

For species with small seeds, such as *Picea* spp., *Pinus sylvestris*, and *Pinus mugo*, in bags containing 75 lbs. draw an initial vacuum of at least 24 inches. Once the MB is introduced, then reduce the vacuum to NAP. This procedure is necessary for efficient penetration and distribution of the fumigant. Conifer seeds in bags of more than 75 lbs. each should be aerated in a well ventilated area for 24 hours, small seeds should be aerated for 48 hours.

Pest: External feeders

Treatment: T203-i-1 MB (“Q” label only) at NAP

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
80-96 °F	2.5 lbs	2.5 hrs
70-79 °F	3 lbs	2.5 hrs
60-69 °F	3 lbs	3 hrs
50-59 °F	3 lbs	3.5 hrs
40-49 °F	3 lbs	4 hrs



Important

Load limit is 30 percent of chamber space. Moisture should **not** be added in fumigation of dry seeds.

T203-i-2

Conifer seeds (species with small seeds, such as *Picea* spp., *Pinus sylvestris*, and *Pinus mugo*)

Pest: Internal feeders, nutlike seeds, or when seeds are tightly packed so as to make fumigant penetration questionable.

Treatment: T203-i-2 MB (“Q” label only) in 26" vacuum

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
80-96 °F	2.5 lbs	2.5 hrs
70-79 °F	3 lbs	2.5 hrs
60-69 °F	3 lbs	3 hrs
50-59 °F	3 lbs	3.5 hrs
40-49 °F	3 lbs	4 hrs



Load limit is 50 percent of chamber space. Plastic or impermeable liners should be removed or well perforated. This schedule is **not** entirely effective against some species of Chalcid wasps.

T203-i-3

Conifer seeds (species with small seeds, such as *Picea* spp., *Pinus sylvestris*, and *Pinus mugo*)

Pest: External feeders

Treatment: T203-i-3 MB (“Q” label only) tarpaulin

The yellow color of this treatment indicates that the authority to conduct the treatment comes from an emergency action required by PPQ in order to mitigate the pest risk. The emergency action is an interim measure and is pending final regulatory approval.

Temperature (°F)	Dosage Rate (lbs./1000 ft ³)	Minimum Concentration Readings (ounces) At (x) hrs.:						
		0.5	2	4	5	6	8	10
80-96	2.5	30	25	25	–	–	–	–
70-79	3	36	30	25	18	–	–	–
60-69	3	36	30	25	–	17	–	–
50-59	3	36	30	25	–	17	17	–
40-49	3	36	30	25	–	17	17	17



The commodity must not exceed 30 percent of the entire tarped enclosure. Refer to [Fumigants • Methyl Bromide • Tarpaulin Fumigation](#) for instructions on calculating the enclosure size. Moisture should **not** be added in fumigation of dry seeds. Normally, dry seed shipments arriving in wet or damp condition may be injured.

T203-f-1

Cottonseed—bagged, packaged, or in bulk

Four alternative schedules

Pest: External feeders

Treatment: T203-f-1 MB (“Q” label only) at NAP—chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
60 °F or above	6 lbs	12 hrs
OR	3 lbs	24 hrs
40-59 °F	7 lbs	12 hrs
OR	4 lbs	24 hrs



Important

Load limit is 50 percent of chamber volume.

T203-f-2

Cottonseed—bagged, packaged, or in bulk

Pest: External feeders

Treatment: T203-f-2 MB (“Q” label only) at NAP—tarpaulin

Temperature	Dosage Rate (lb/1000 ft ³)	Minimum Concentration Readings (ounces) At:			
		0.5 hr	2 hrs	12 hrs	24 hrs
60 °F or above	7 lbs	54	56	27	—
OR	5 lbs	40	40	—	20
40-59 °F	8 lbs	64	64	32	—
OR	6 lbs	48	48	—	24

T203-f-3

Cottonseed—bagged, packaged, or in bulk

Pest: External feeders

Treatment: T203-f-3 MB (“Q” label only) in 26" vacuum—chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
40 °F or above	4 lbs	2 hrs



Important

Load limit is 50 percent of chamber volume.

T203-f-4

Cottonseed—bagged, packaged, or in bulk

Pest: External feeders

Treatment: T203-f-4 Phosphine at NAP

Temperature	Dosage Rate (gms/1000 ft ³)	Minimum Concentration Readings (ppm) At:	
		72 hrs	120 hrs
50 °F or above	60 ¹ g	225 ²	50 or above

- 1 60 g/1000 ft³ (28.3 m³) is equivalent to 2.1 g/m³.
- 2 An average reading with no reading less than 50 ppm.

Relative humidity must be 40 percent or higher when commodity enclosed.

Aerate minimum of 24 hours.

T203-g-1

Pods and seed of Kenaf, Hibiscus, and Okra

Three alternative schedules

Pest: Internal feeders

Treatment: T203-g-1 MB (“Q” label only) at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1000 ft ³)	Minimum Concentration Readings (ounces) At:		
		0.5 hr	12 hrs	24 hrs
60-96 °F	2 lbs	24	12	—
OR	1 lb	12	—	5
40-59 °F	3 lbs	36	17	—
OR	2 lbs	24	—	10

T203-g-2

Pods and seeds of Kenaf, Hibiscus, and Okra

Pest: Internal feeders

Treatment: T203-g-2 MB (“Q” label only) in 26" vacuum—chamber (kenaf and okra seed only)

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
40 °F or above	4 lbs	2 hrs



Load limit is 50 percent of chamber volume.

T203-g-3

Pods and seed of Kenaf, Hibiscus, and Okra

Pest: Internal feeders

Treatment: T203-g-3 Phosphine at NAP

Temperature	Dosage Rate (gms/1000 ft ³)	Minimum Concentration Readings (ppm) At:	
		72 hrs	120 hrs
50 °F or above	60 ¹ g	225 ²	50

1 60 g/1000 ft³ (28.3 m³) is equivalent to 2.1 g/m³.

2 An average reading with no reading less than 50 ppm.

Relative humidity must be 40 percent or higher when commodity enclosed.

Aerate minimum of 24 hours.

T203-k

Macadamia nuts (as seeds)

Pest: *Cryptophlebia illepid*a (koa seedworm)

Treatment: T203-k MB (“Q” label only) at NAP

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
70 °F or above	2 lbs	2 hrs
60-69 °F	2.5 lbs	2 hrs
50-59 °F	3 lbs	2 hrs
40-49 °F	3.5 lbs	2 hrs

T203-k-1

Macadamia nuts (as seeds)

Pest: *Cryptophlebia illepidia* (koa seedworm)

Treatment: T203-k-1 MB (“Q” label only) tarpaulin

The yellow color of this treatment indicates that the authority to conduct the treatment comes from an emergency action required by PPQ in order to mitigate the pest risk. The emergency action is an interim measure and is pending final regulatory approval.

Temperature (°F)	Dosage Rate (lbs./1000 ft ³)	Minimum Concentration Readings (ounces) At (x) hrs.:		
		0.5	2	4
70-79	2	24	16	16
60-69	2.5	30	20	20
50-59	3	36	24	24
40-49	3.5	42	28	28



The commodity must not exceed 30 percent of the entire tarped enclosure. Refer to [Fumigants • Methyl Bromide • Tarpaulin Fumigation](#) for instructions on calculating the enclosure size.

Moisture should **not** be added in fumigation of dry seeds. Normally, dry seed shipments arriving in wet or damp conditions may be injured.

T203-h

Rosmarinus seeds

Pest: Juvenile *Helicella* spp. (snails) or Internal Feeders

Treatment: T203-h MB (“Q” label only) at 26" vacuum

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
70 °F or above	4 lbs	4 hrs

T203-l

Seeds

Pest: *Trogoderma granarium* (khapra beetle)

Treatment: T203-l MB (“Q” label only) at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1000 ft ³)	Minimum Concentration Readings (ounces) At:			
		0.5 hr	2 hrs	4 hrs	12 hrs
90 °F or above	2.5 lbs	30	20	20	15
80-89 °F	3.5 lbs	42	30	30	20

T203-b

Seeds excluding seeds of *Vicia* spp.

Pest: Bruchidae (seed beetles)

Treatment: T203-b MB (“Q” label only) in 26" vacuum

Temperature	Dosage Rate (lb/1,000 ft ³):		Exposure Period:	
	<i>Caryedon</i> spp.	All others	<i>Caryedon</i> spp.	All others
70-96 °F	5 lbs	3 lbs	2 hrs	2.5 hrs
60-69 °F	—	3 lbs	—	3 hrs
50-59 °F	—	3 lbs	—	3.5 hrs
40-49 °F	—	3 lbs	—	4 hrs

T203-o

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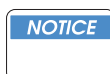
T203-a-1

Seeds not specifically listed in the T203 Schedules

Pest: External feeders

Treatment: T203-a-1 MB (“Q” label only) at NAP

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
80-96 °F	2.5 lbs	2.5 hrs
70-79 °F	3 lbs	2.5 hrs
60-69 °F	3 lbs	3 hrs
50-59 °F	3 lbs	3.5 hrs
40-49 °F	3 lbs	4 hrs



Load limit is 30 percent of chamber space. Moisture should **not** be added in fumigation of dry seeds. Normally, dry seed shipments arriving in wet or damp condition may be injured. This schedule may scald coconut husks. (Some tropical or nutlike seeds are usually shipped damp.)

T203-a-2

Seeds not specifically listed in the T203 Schedules

Pest: Internal feeders, except *Megastigmus* spp.

Treatment: T203-a-2 MB (“Q” label only) in 26" vacuum

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
80-96 °F	2.5 lbs	2.5 hrs
70-79 °F	3 lbs	2.5 hrs
60-69 °F	3 lbs	3 hrs
50-59 °F	3 lbs	3.5 hrs
40-49 °F	3 lbs	4 hrs



Load limit is 50 percent of chamber space. Plastic or impermeable liners should be removed or well perforated.

T203-a-3

Seeds not specifically listed in the 203 Schedules

Pest: External feeders

Treatment: T203-a-3 MB ("Q" label only) tarpaulin

The yellow color of this treatment indicates that the authority to conduct the treatment comes from an emergency action required by PPQ in order to mitigate the pest risk. The emergency action is an interim measure and is pending final regulatory approval.

Temperature (°F)	Dosage Rate (lbs./1000 ft ³)	Minimum Concentration Readings (ounces) At (x) hrs.:							
		0.5	2	4	5	6	7	8	10
80-96	2.5	30	20	20	15	—	—	—	—
70-79	3	36	24	24	18	—	—	—	—
60-69	3	36	24	24	—	—	17	—	—
50-59	3	36	24	24	—	17	—	17	—
40-49	3	36	24	24	—	17	—	17	17



The commodity must not exceed 30 percent of the entire tarped enclosure. Refer to [Fumigants • Methyl Bromide • Tarpaulin Fumigation](#) for instructions on calculating the enclosure size.

Moisture should **not** be added in fumigation of dry seeds. Normally, dry seed shipments arriving in wet or damp conditions may be injured. This schedule may scald coconut husks. (Some tropical or nutlike seeds are usually shipped damp.)

T203-o-1

Seeds of *Casuarina*

Pest: *Bootanomyia* spp. (in *Casuarina*)

Treatment: T203-o-1 MB ("Q" label only) in 26" vacuum

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
70 °F or above	3.5 lbs	6 hrs

T203-j

Seeds of *Hevea brasiliensis* (rubber tree)

Pest: Seed-boring insects

Treatment: T203-j MB (“Q” label only) at NAP

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
80-96 °F	2.5 lbs	2 hrs
70-79 °F	3 lbs	2 hrs
60-69 °F	3 lbs	2.5 hrs

T203-j-1

Seeds of *Hevea brasiliensis* (rubber tree)

Pest: Seed-boring insects

Treatment: T203-j-1 MB (“Q” label only) tarpaulin

The yellow color of this treatment indicates that the authority to conduct the treatment comes from an emergency action required by PPQ in order to mitigate the pest risk. The emergency action is an interim measure and is pending final regulatory approval.

Temperature (°F)	Dosage Rate (lbs./ 1000 ft ³)	Minimum Concentration Readings (ounces) At (x) hrs.:			
		0.5	2	4	6
80-96	2.5	30	20	20	–
70-79	3	36	24	24	–
60-69	3	36	24	24	17



The commodity must not exceed 30 percent of the entire tarped enclosure. Refer to [Fumigants • Methyl Bromide • Tarpaulin Fumigation](#) for instructions on calculating the enclosure size.

Moisture should **not** be added in fumigation of dry seeds. Normally, dry seed shipments arriving in wet or damp conditions may be injured.

T203-o-3

Seeds of Leguminosae (Fabaceae)

Pest: *Bruchophagus* spp., *Eurytoma* spp.

Treatment: T203-o-3 MB (“Q” label only) in 26" vacuum

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
70 °F or above	4 lbs	4 hrs

T203-c Seeds of Leguminosae (Fabaceae)

Pest: *Caryedon* spp.

Treatment: T203-c MB (“Q” label only) at NAP

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
50 °F or above	2 lbs	24 hrs

T203-o-4-1 Seeds of Leguminosae (Fabaceae)

Pest: *Caryedon* spp. (in or with, etc.)

Treatment: T203-o-4-1 MB (“Q” label only) in 26" vacuum

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
50 °F or above	2 lbs	24 hrs

T203-o-4-2 Seeds of Leguminosae (Fabaceae)

Pest: *Caryedon* spp. (in or with, etc.)

Treatment: T203-o-4-2 MB (“Q” label only) in 26" vacuum

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
70 °F or above	3.5 lbs*	3 hrs

T203-d-1 Seeds of Leguminosae (Fabaceae), excluding *Vicia faba*

Pest: Bruchidae (seed beetles) excluding the beetles of *Caryedon* spp.

Treatment: T203-d-1 MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:					
		0.5 hr	2 hrs	2.5 hrs	3 hrs	3.5 hrs	4 hrs
70 °F or above	3 lbs	38	—	24	—	—	—
60-69 °F	3 lbs	38	29	—	24	—	—
50-59 °F	3 lbs	38	29	—	—	24	—
40-49 °F	3 lbs	38	29	—	—	—	24

Use T203-c-1 or T203-d-2 for seeds of *Vicia faba*.

T203-o-5

Seeds of *Lonicera* and Other seeds

Pest: *Rhagoletis cerasi* (European cherry fruit fly) pupae (Diptera: Tephritidae)

Treatment: T203-o-5 MB (“Q” label only) at NAP

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
70 °F or above	4 lbs*	8 hrs



*If seed is intended for propagation, the dosage rate may damage seed by sterilization.

T203-p

Seeds of Citrus (Rutaceae family)

Pest: Citrus Canker (*Xanthomonas axonopodis*)

Treatment: T203-p Hot water plus Chemical Dip

1. Wash the seed if any mucilaginous material, such as pulp, is adhering to the seed.
2. Immerse the seed in water heated to 125 °F (51.6 °C) or higher for 10 minutes.
3. Then, immerse the seed in a solution containing 200 parts per million sodium hypochlorite at a pH of 6.0 to 7.5 for at least 2 minutes.

T203-o-2

Seeds of *Umbelliferae*

Pest: *Systole* spp. (in Umbelliferae)

Treatment: T203-o-2 MB (“Q” label only) in 26" vacuum

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
80-86 °F	2.5 lbs	3.5 hrs
70-79 °F	3 lbs	3.5 hrs
60-69 °F	3 lbs	4 hrs
50-59 °F	3 lbs	4.5 hrs
40-49 °F	3 lbs	5 hrs

T203-c-1

Seeds of *Vicia* spp. (vetch seeds) including seeds of *Vicia faba* (Faba or Fava bean)

Pest: Bruchidae (seed beetles)

Treatment: T203-c-1 MB (“Q” label only) tarpaulin or chamber

Temperature	Dosage Rate (lb/1000 ft ³)	Minimum Concentration Readings (ounces) At:					
		0.5 hr	2 hrs	11 hrs	12 hrs	13 hrs	14 hrs
70 °F or above	3.5 lbs	46	28	27	—	—	—
60-69 °F	3.5 lbs	46	28	—	27	—	—
50-59 °F	3.5 lbs	46	28	—	—	27	—
40-49 °F	3.5 lbs	46	28	—	—	—	27

T203-d-2

Seeds of *Vicia* spp. (vetch seeds) including seeds of *Vicia faba* (Faba or Fava bean)

Pest: Bruchidae (seed beetles)

Treatment: T203-d-2 MB (“Q” label only) in 26" vacuum

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period:	
		<i>Vicia faba</i>	All others
70-96 °F	3 lbs	3.5 hrs	2.5 hrs
60-69 °F	3 lbs	4 hrs	3 hrs
50-59 °F	3 lbs	4.5 hrs	3.5 hrs
40-49 °F	3 lbs	5 hrs	4 hrs



Seed shipments arriving wet or damp may be injured.

T203-n

Seeds with infested pulp

Pest: Fruit flies and other pulp-infesting insects

Treatment: T203-n Depulping

1. Place seed in wire basket.
2. Immerse in water at 118-125 °F for 25 minutes.
3. Remove pulp from seed under running tap water.



This treatment is effective only for fruit flies, as well as some other pulp infesting insects. Fumigation may also be required for seed weevils and other internal and external feeding insects.

5

Treatment Manual

Treatment Schedules

T300 - Schedules for Miscellaneous Plant Products

Contents

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Important

Exposure period may be extended for any commodity which cannot be used for food or propagation. This extension is only a matter of convenience for the importer and is intended only for the purpose of reducing treatment costs. The request for extension must come from the importer or his authorized representative and should be confirmed in writing. A letter is not required for each treatment. A single blanket request should be considered as acceptable and renewed each year as required.

During the extended exposure period, the concentrations must remain stable and the prescribed minimums be met at the end of the extension. Otherwise, the treatment may be voided and retreatment required. Examples of commodities for which extended exposure periods may be approved include: cotton piece goods, baled cotton, bagging, wood, marble, soil as such, etc. Examples of commodities for which *no* extension may be approved include: cottonseed, grain, tobacco, etc. An extension of exposure period for other purposes is not permitted except as may be prescribed in various schedules for concentration readings below minimum.

Additional safety precautions, including additional aeration, may be required because of the extended exposure period. The PPQ officer or the commercial fumigator will specify any needed precautions.

T301—Cotton and Cotton Products

T301-a-3 Baled lint or linters

Pest: *Pectinophora* spp.

Treatment: T301-a-3—MB (“Q” label only) at NAP—tarpaulin

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:			
		0.5 hr	2 hrs	12 hrs	24 hrs
40 °F or above	7 lbs	84	60	30	—
OR	4 lbs	60	40	—	20

T301-b-1-1 Baled lint, linters, waste, piece goods, gin trash

Two alternative treatments

Pest: *Trogoderma granarium* (khapra beetle)

Treatment: T301-b-1-1—MB (“Q” label only) at NAP—tarpaulin

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:		
		0.5 hr	2 hrs	24 hrs*
60 °F or above	8 lbs	96	64	35
40-59 °F	11 lbs	132	88	50

*In addition to the space concentration readings, you must take a commodity concentration reading. The minimum concentration reading for commodity reading is as follows: For 60 °F or above—25 oz.; for 40-59 °F—30 oz.



Load limit is 50 percent of chamber volume. Concentration readings may be omitted for chamber fumigations.

T301-b-1-2 Baled lint, linters, waste, piece goods, gin trash

Pest: *Trogoderma granarium* (khapra beetle)

Treatment: T301-b-1-2—MB (“Q” label only) at NAP—chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
60 °F or above	8 lbs	3 hrs
40-59 °F	9 lbs	3 hrs

T301-a-7

Cottonseed (samples and bulk)

Pest: *Pectinophora* spp.

Treatment: T301-a-7—Acid delinting and heat treatment (alternative treatment)

Cottonseed delinting is primarily intended for the elimination of surface-borne disease organisms. It is also effective against insects. To be completely effective against insects, this treatment must be carried out at approximately 145 °F (by the application of sufficient heat to the seed, or acid, or both) or by raising the temperature of the delinted seed during the subsequent drying process to 145 °F for a period of not less than 45 seconds or at least 140 °F for a period of not less than 8 minutes.

T301-b-2

Cottonseed, cottonseed products, or samples

Pest: *Trogoderma granarium* (khapra beetle)

Treatment: T301-b-2—MB (“Q” label only) at NAP—tarpaulin

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:		
		0.5 hr	2 hrs	12 hrs
90 °F or above	2.5 lbs	30	20	15
80-89 °F	3.5 lbs	42	30	20

The sorptive rates of commodities vary. When a commodity is known or suspected to be sorptive, take more gas readings than normal. Additional fumigant is added as prescribed on *Special Procedures for Adding Gas and Extending Exposure Period* on **page 2-4-30**.



Items known to be sorptive or items whose sorptive properties are unknown are **not** to be fumigated in chambers at NAP unless gas readings are taken.

When both woodborers and khapra beetles are involved, use schedule **T404-d** on **page 5-5-20**.

T301-b-3

Cottonseed meal (not for food or feed)

Pest: *Trogoderma granarium* (khapra beetle)

Treatment: T301-b-3—MB (“Q” label only) at NAP



Important

Cottonseed meal treated under this schedule is **not** to be used for food or feed.

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:				
		0.5 hr	2 hrs	24* hrs	28* hrs	32* hrs
90 °F or above	4 lbs	48	32	25	—	—
80-89 °F	6 lbs	72	48	30	—	—
70-79 °F	8 lbs	96	64	35	—	—

*In addition to the space concentration readings, you must take a commodity concentration reading. The minimum concentration reading for commodity reading is as follows: For 90-96 °F—10 oz.; for 80-89 °F—15 oz.; and for 70-79 °F—20 oz.

**Optional



Important

Concentration readings should be obtained within the commodity.
 Concentration readings **not** required for chamber fumigations.

T301-c

Cotton and cotton products

Pest: *Globodera rostochiensis* (golden nematode)

Treatment: T301-c—MB (“Q” label) at NAP—chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
40 °F or above	8 lbs	16 hrs
	10.5 lbs	12 hrs

T301-d-1-1

Cotton and cotton products

Two alternative treatments

Pest: *Anthonomus grandis* (boll weevil)

Treatment: T301-d-1-1—MB (“Q” label only) at NAP—tarpaulin

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:				
		0.5 hr	2 hrs	3 hrs	4 hrs	8 hrs
90 °F or above	2.5 lbs	30	20	—	—	—
80-89 °F	3 lbs	36	28	—	—	—
70-79 °F	4 lbs	48	36	—	—	—
60-69 °F	4 lbs	50	—	34	—	—
55-59 °F	5 lbs	64	—	48	—	—
50-54 °F	5.5 lbs	70	—	—	50	—
40-49 °F	6 lbs	80	—	—	54	40

T301-d-1-2

Cotton and cotton products

Pest: *Anthonomus grandis* (boll weevil)

Treatment: T301-d-1-2—Phosphine at NAP—tarpaulin or chamber

Temperature	Dosage Rate (g/1,000 ft ³)	Minimum Concentration Readings (ppm) At 72 hours:
50 °F or above	36 g*	225**

*36g/1,000ft³ (28.3m³) is equivalent to 1.27 g/m³.

**An average reading with no reading less than 50 ppm.



Refer to the Equipment Section for a description of the MityVac® pump and the Port-a-sens phosphine detector.



Refer to [Table 5-4-4](#) on [page 5-4-41](#) for data on amount of phosphine liberated by various products.

T301-a-1-1

Lint, linters, cottonseed meal and hulls, gin trash, waste, or other baled or bulk commodities (except samples)

Pest: *Pectinophora* spp.

Treatment: T301-a-1-1—MB (“Q” label only) at NAP—chamber

Temperature	Dosage Rate (lb/1,000 ft ³) for:		Exposure Period
	Bulk shipments	Other than bulk shipments	
60 °F or above	6 lbs	6 lbs	12 hrs
OR	4 lbs	3 lbs	24 hrs
40-59 °F	7 lbs	7 lbs	12 hrs
OR	5 lbs	4 lbs	24 hrs

T301-a-1-2

Lint, linters, cottonseed meal and hulls, gin trash, waste, or other baled or bulk commodities (except samples)

Pest: *Pectinophora* spp.

Treatment: T301-a-1-2—MB (“Q” label only) in 26" vacuum—chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
60 °F or above	8 lbs	3 hrs
40-59 °F	9 lbs	3 hrs



For propagative seed cotton, refer to [T203-i-3](#) on page 5-3-30 through [T203-f-4](#) on page 5-3-32.

T301-a-6

Lint, linters, and cottonseed (bulk, sacked, or packaged cottonseed, lint or linters, cottonseed hulls, gin trash, and all other baled or bulk cotton commodities)

Pest: *Pectinophora* spp.

Treatment: T301-a-6—Phosphine at NAP

Temperature	Dosage Rate (g/1,000 ft ³)	Minimum Concentration Readings (ppm) At:	
		72 hrs	120 hrs
50 °F or above	60 g*	225**	50***

* 60 g/1,000ft³ (28.3m³) is equivalent to 2.1g/m³.

** An average reading with no reading less than 50 ppm.

***An average of 50 PPM or more.

Aerate commodity 24 hours and/or make appropriate tests for presence of gas.



Refer to [Table 5-4-4](#) on [page 5-4-41](#) for data on amount of phosphine liberated by various products.
Refer to [Equipment](#) on [page 8-1-1](#) for a description of the MityVac® pump and the Port-a-sens phosphine detector.

T301-a-2

Lint (except baled lint or linters), cottonseed hulls and meal, gin trash, waste, or other baled or bulk commodities (excluding samples)

Pest: *Pectinophora* spp.

Treatment: T301-a-2—MB (“Q” label only) at NAP—tarpaulin

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:			
		0.5 hr	2 hrs	12 hrs	24 hrs
40 °F or above	7 lbs	84	60	30	—
OR	5 lbs	60	40	—	20

T301-a-4

Packaged cottonseed

Pest: *Pectinophora* spp.

Treatment: T301-a-4—MB (“Q” label only) at NAP—tarpaulin

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:			
		0.5 hr	2 hrs	12 hrs	24 hrs
40 °F or above	7 lbs	84	60	30	—
OR	5 lbs	60	40	—	20

T301-a-5-1

Samples of cotton and cotton products

Two alternative treatments

Pest: *Pectinophora* spp.

Treatment: T301-a-5-1—MB at NAP—chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
40 °F or above	3 lbs	24 hrs

T301-a-5-2

Samples of cotton and cotton products

Pest: *Pectinophora* spp.

Treatment: T301-a-5-2—MB in 26" vacuum—chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
40 °F or above	4 lbs	2 hrs

T301-e Cottonseed for Food or Feed

Pest: *Fusarium oxysporum* f. sp. *vasinfectum* strains VCG 01111 and VCG 01112

Treatment: T301-e—MB at NAP—tarpaulin

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:						
		2 hrs	4 hrs	6 hrs	12 hrs	24 hrs	36 hrs	48 hrs
40 °F or above	7 lbs	60	50	50	35	20	—	—
	5 lbs	20	—	20	20	15	15	15

T302—Grains and Seeds Not Intended for Propagation



Important

If grain and seeds **are for propagation**, use appropriate treatment in T203 schedules

T302-g-1 Acorns not intended for propagation

Two alternative treatments

Pest: *Cydia splendana* (nut fruit tortrix) and *Curculio* spp. (weevils)

Treatment: T302-g-1—MB at NAP—tarpaulin, chamber, or van container

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:					
		0.5 hr	2 hrs	3 hrs	4 hrs	5 hrs	6 hrs
90-95 °F	4 lbs	58	32	34	—	—	—
80-89 °F	4 lbs	58	32	—	34	—	—
70-79 °F	5 lbs	72	40	—	42	—	—
60-69 °F	5 lbs	72	40	—	—	40	—
50-59 °F	6 lbs	85	48	—	—	50	—
40-49 °F	6 lbs	85	48	—	—	—	48

T302-g-2

Acorns not intended for propagation

Pest: *Cydia splendana* (nut fruit tortrix) and *Curculio* spp. (weevils)

Treatment: T302-g-2—MB in 26" vacuum—chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
80-96 °F	3 lbs	2 hrs
70-79 °F	4 lbs	2 hrs
60-69 °F	4 lbs	3 hrs
50-59 °F	4 lbs	4 hrs
40-49 °F	4 lbs	5 hrs



Important

Either T302-g-1 or T302-g-2 required from all countries except Canada and Mexico. Treated commodity **not** to be used for food or feed.

T302-a-1-1

Ear corn

Two alternative treatments

Pest: Borers

Treatment: T302-a-1-1—MB at NAP—chamber only

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
70 °F or above	2 lbs	6 hrs

T302-a-1-2

Ear corn

Pest: Borers

Treatment: T302-a-1-2—Dry heat

168 °F minimum air temperature for not less than 2 hours; ears spread in single layers on slats or wire shelves.

T302-c-1 Grains and seeds not intended for propagation (e.g., guar “gum”)

Pest: *Trogoderma granarium* (khapra beetle)

Treatment: T302-c-1—MB (“Q” gas only) at NAP—tarpaulin.

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:		
		0.5 hr	2 hrs	12 hrs
90 °F or above	2.5 lbs	30	20	15
80-89 °F	3.5 lbs	42	30	20
70-79 °F	4.5 lbs	54	40	25
60-69 °F	6 lbs	72	50	30
50-59 °F	7.5 lbs	90	60	35
40-49 °F	9 lbs	108	70	40

The sorptive rates of commodities vary. When a commodity is known or suspected to be sorptive (see [T307-a](#) on [page 5-4-22](#)), take more gas readings than normal. Additional fumigant is added as prescribed on [Aerating Sorptive Commodities in Containers—Indoors and Outdoors](#) on [page 2-4-45](#).



Important

Items known to be sorptive or items whose sorptive properties are unknown are **not** to be fumigated in chambers at NAP unless gas readings are taken.

When both woodborers and khapra beetles are involved, use schedule [T404-d](#) on [page 5-5-20](#).

T302-c-2 Grains and seeds not intended for propagation(e.g., guar “gum”)

NOTE: Load limit is 75 percent of chamber volume.

Pest: *Trogoderma granarium* (khapra beetle)

Treatment: T302-c-2—MB (“Q” label gas) in 26” vacuum—chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
60 °F or above	8 lbs	3 hrs
40-59 °F	9 lbs	3 hrs

T302-c-3 Grains and seeds not intended for propagation (e.g., guar “gum”)

Pest: *Trogoderma granarium* (khapra beetle)

Treatment: T302-c-3—MB (“Q” gas only) in 26" NAP—chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
90-96 °F	2.5 lbs	12 hrs
80-89 °F	3.5 lbs	12 hrs
70-79 °F	4.5 lbs	12 hrs
60-69 °F	6 lbs	12 hrs
50-59 °F	10 lbs	12 hrs
40-49 °F	12 lbs	12 hrs

The sorptive rates of commodities vary. When a commodity is known or suspected to be sorptive (see *T307-a* on page 5-4-22), take more gas readings than normal. Additional fumigant is added as prescribed on *Special Procedures for Adding Gas and Extending Exposure Period* on page 2-4-30.



Important

Items known to be sorptive or items whose sorptive properties are unknown are **not** to be fumigated in chambers at NAP unless gas readings are taken.

When both woodborers and khapra beetles are involved, use schedule T404-d.

T302-d

Grains and seeds not intended for propagation and contaminated with cottonseed

Pest: *Pectinophora* spp.

Treatment: See Cotton and Cotton Products, *T301-a-1-1* on page 5-4-6 or *T301-a-1-2* on page 5-4-6.



Important

Alternate method—screening for removal of cotton seed contamination.

T302-e-1

Grains and seeds not intended for propagation

Three alternative treatments

Pest: Insects other than *Trogoderma granarium* (khapra beetle)

Treatment: T302-e-1—MB (“Q” label only) at NAP—chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
80-96 °F	2.5 lbs	2.5 hrs
70-79 °F	3 lbs	2.5 hrs
60-69 °F	3 lbs	3 hrs
50-59 °F	3 lbs	3.5 hrs
40-49 °F	3 lbs	4 hrs

T302-e-2

Grains and seeds not intended for propagation

Pest: Insects other than *Trogoderma granarium* (khapra beetle)

Treatment: T302-e-2—MB (“Q” label only) at 26" vacuum—chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
80-96 °F	2.5 lbs	2.5 hrs
70-79 °F	3 lbs	2.5 hrs
60-69 °F	3 lbs	3 hrs
50-59 °F	3 lbs	3.5 hrs
40-49 °F	3 lbs	4 hrs



Important

Load limit is 50 percent of chamber volume. This vacuum treatment primarily for material so packed or packaged as to make fumigant penetration questionable.

T302-e-3

Grains and seeds not intended for propagation

Pest: Insects other than *Trogoderma granarium* (khapra beetle)

Treatment: T302-e-3—MB (“Q” label only) tarpaulin

The yellow color of this treatment indicates that the authority to conduct the treatment comes from an emergency action required by PPQ in order to mitigate the pest risk. The emergency action is an interim measure and is pending final regulatory approval.

Temperature (°F)	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:							
		0.5 hr	2 hrs	4 hrs	5 hrs	6 hrs	7 hrs	8 hrs	10 hrs
80-96 °F	2.5 lbs	30	20	20	15				
70-79 °F	3 lbs	36	24	24	18				
60-69 °F	3 lbs	36	24	24	–	–	17		
50-59 °F	3 lbs	36	24	24	–	17	–	17	
40-49 °F	3 lbs	36	24	24	–	17	–	17	17



The commodity must not exceed 30 percent of the entire tarped enclosure. Refer to [Fumigants • Methyl Bromide • Tarpaulin Fumigation](#) for instructions on calculating the enclosure size.

Moisture should **not** be added in fumigation of dry seeds. Normally, dry seed shipments arriving in wet or damp conditions may be injured.

T302-f

Grains and seeds (excluding Rosmarinus seed) not intended for propagation

Pest: Snails

Treatment: T302-f—Mechanical separation by screening or hand removal. If **not** feasible, entry should be denied when snails are of agricultural or public health significance, or treat using appropriate schedule as listed in T403-a.



For *Rosmarinus* seed use [T203-h](#) on [page 5-3-34](#)

T302-b-1-1

Shelled corn

Treatment: T302-b-1-1 *Reserved*

T302-b-1-2

Shelled corn contaminated with cottonseed

Pest: *Pectinophora* spp.

Treatment: T302-b-1-2



Important

See [T301-a-1-1](#) on page 5-4-6 or [T301-a-1-2](#) on page 5-4-6



Important

Shelled corn treated with T301 is **not** to be used for food or feed.

T303—Rice

T303-a

T303-a-1 through T303-a-3 have been removed

Effective November 1 2011, APHIS reclassified Panicle Rice Mite (*Steneotarsonemus spinki*, PRM) to a non-quarantine pest.

T303-d-1

Articles made with rice straw

Two alternative treatments

Pest: Fungous diseases of rice or internal feeders

Treatment: T303-d-1—Dry heat at 180-200 °F for 2 hours

T303-d-2

Articles made with rice straw

Pest: Fungous diseases of rice or internal feeders

Treatment: T303-d-2—Steam sterilization

Temperature	Pressure	Exposure Period
260 °F	20 lbs	15 minutes
250 °F	15 lbs	20 minutes

T303-d-2-1

Articles made with rice straw

Pest: Fungous diseases of rice or internal feeders

Treatment: T303-d-2-1—Steam sterilization, use [T303-b-1](#) on page 5-4-16

T303-d-2-3

Articles made with rice straw for indoor use only

Pest: Internal feeders

Treatment: T303-d-2-3—MB (“Q” label only) at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:			
		0.5 hr	2 hrs	4 hrs	24 hrs
60 °F or above	2.5 lbs	30	20	20	15
50-59 °F	3 lbs	36	25	24	20
40-49 °F	4 lbs	48	35	32	25

T303-d-2-2 Articles made with rice straw for indoor use only

Pest: Internal feeders

Treatment: T303-d-2-2—MB (“Q” label only) in 26" vacuum

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
60 °F or above	2.5 lbs	2.5 hrs
50-59 °F	3.5 lbs	2.5 hrs
40-49 °F	5 lbs	2.5 hrs

T303-b-1 Rice straw and hulls imported for purposes other than approved processing

Two alternative treatments based on how commodity is packed

Pest: Fungous diseases of rice

Treatment: T303-b-1—Steam sterilization, for closely packed commodity

Introduce the live steam into a 28" vacuum until pressure reaches 10 lbs and hold for 20 minutes. (Steam sterilization is **not** practical for the treatment of bales having a density greater than 30 lbs. per cubic foot.)

T303-b-2 Rice straw and hulls imported for purposes other than approved processing

Pest: Fungous diseases of rice

Treatment: T303-b-2—Steam sterilization, for commodity packed as loose masses

Use [T303-b-1](#) on [page 5-4-16](#) or, if without initial vacuum, bleed air until steam vapor escapes.

T303-c-1 Rice straw and hulls imported in small lots of 25 lbs. or less



T303-c-1 is suspended until further notice. (01-14-08)

Pest: Fungous diseases of rice

Treatment: T303-c-1—Dry heat at 212 °F for 1 hour

T304—Alpha (alfa) Grass and Handicrafts (*Stipa tenacissima*, *Ampelodesma mauritanicus*)

T304-a Alpha (alfa) grass and handicrafts (*Stipa tenacissima*, *Ampelodesma mauritanicus*)

Two alternative treatments

Pest: Infested with *Harmolita* spp. (jointworms)

Treatment: T304-a—MB at NAP—chamber only

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
60 °F or above	2.5 lbs	32 hrs
50-59 °F	3.5 lbs	32 hrs
40-49 °F	4.5 lbs	32 hrs

T304-b Alpha (alfa) grass and handicrafts (*Stipa tenacissima*, *Ampelodesma mauritanicus*)

Treatment: T304-b—MB in 26" vacuum

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
60 °F or above	2.5 lbs	2.5 hrs
50-59 °F	3.5 lbs	2.5 hrs
40-49 °F	5 lbs	2.5 hrs

T305—Cut Flowers and Greenery

T305-a Cut flowers and greenery



Important

The “external pests” controlled by this schedule do **not** include dormant snails. Refer to [T201-o-1](#) on [page 5-3-12](#) or [T201-p](#) on [page 5-3-19](#).

Pest: External feeders, leafminers, hitchhikers, surface pests, and slugs¹

Treatment: T305-a—MB (“Q” label only) at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
80-89 °F	1.5 lbs	19	12
70-79 °F	2 lbs	24	16
60-69 °F	2.5 lbs	30	20
50-59 °F	3 lbs	36	24
40-49 °F*	3.5 lbs	41	27

* For leafminers, use the initial dosage rate of 4 lbs/1,000 ft³.

T305-b Cut flowers and greenery

Pest: Borers or soft scales

Treatment: T305-b—MB (“Q” label only) in 15" vacuum



Important

Vacuum fumigation requires prior consent of the importer. If consent denied, refuse entry unless T305-a plus hand removal of these pests is feasible. Vacuum fumigation is **not** required for soft scales known to be widely distributed in the U.S.

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
80-90 °F	2.5 lbs	2 hrs
70-79 °F	3 lbs	2 hrs
60-69 °F	3 lbs	2.5 hrs
50-59 °F	3 lbs	3 hrs
40-49 °F	3 lbs	3.5 hrs

¹ Quarantine-significant slugs of the families Agriolimacidae, Arionidae, Limacidae, Milacidae, Philomycidae, and Veronicellidae, including the following genera: *Agriolimax*, *Arion*, *Colosius*, *Deroceras*, *Diplosolenodese*, *Leidyula*, *Limax*, *Meghimatium*, *Milax*, *Pallifera*, *Pseudoveronicella*, *Sarasinula*, *Semperula*, *Vaginulus*, *Veronicella*. **Treat slugs at 60 F (2.5 lbs.) or above .**

T305-c **Cut flowers and greenery**

Pest: Mealybugs

Treatment: T305-c—MB (“Q” label only) at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
80 °F or above	2.5 lbs	32	24
70-79 °F	3 lbs	38	29
60-69 °F	4 lbs	48	38

T306—Bags and Bagging Material, Covers

T306-a **Bags and bagging material or covers used to contain root crops**

Pest: *Globodera rostochiensis* (golden nematode)

Treatment: T306-a—MB (“Q” label only) in 26" vacuum

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
40 °F or above	8 lbs	16 hrs
	10.5 lbs	12 hrs
	16 lbs	8 hrs

T306-b **Bags and bagging material or covers used for cotton only**

Pest: *Pectinophora* spp.

Treatment: T306-b—MB at NAP—chamber

Temperature	Dosage Rate (lb/1,000 ft ³) for:		Exposure Period
	Bulk shipments	Other than bulk shipments	
60 °F or above	6 lbs	6 lbs	12 hrs
60 °F or above	4 lbs	3 lbs	24 hrs
40-59 °F	7 lbs	7 lbs	12 hrs
40-59 °F	5 lbs	4 lbs	24 hrs

T306-c-1 Bags and bagging material or covers

Two alternative treatments

Pest: *Trogoderma granarium* (khapra beetle)

Treatment: T306-c-1—MB (“Q” label only) at NAP



Concentration readings should be obtained within the commodity.
Concentration readings **not** required for chamber fumigations.

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:				
		0.5 hr	2 hrs	24 ¹ hrs	28 ¹ hrs	32 ¹ hrs
90 °F or above	4 lbs	48	32	25	—	—
80-89 °F	6 lbs	72	48	30	—	—
70-79 °F	8 lbs	96	64	35	—	—
60-69 °F	12 lbs	144	96	50	—	—
50-59 °F	12 lbs	144	96	50	50	—
40-49 °F	12 lbs	144	96	50	50 ²	50

1 In addition to the space concentration readings, commodity concentration reading must be taken. The minimum concentration reading for commodity reading is as follows: For 90-96 °F—10 oz.; for 80-89 °F—15 oz.; and for 70-79 °F—20 oz.

2 Optional

T306-c-2 Bags and bagging material or covers

Pest: *Trogoderma granarium* (khapra beetle)

Treatment: T306-c-2—MB (“Q” label only) in 26" vacuum

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
60 °F or above	8 lbs	3 hrs
40-59 °F	9 lbs	3 hrs

T306-d-1

Bagging from unroasted coffee beans

Two alternative treatments

Pest: Various

Treatment: T306-d-1—MB (“Q” label only) at NAP



Concentration readings should be obtained within the commodity.
Concentration readings **not** required for chamber fumigations.

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:				
		0.5 hr	2 hrs	24* hrs	28* hrs	32* hrs
90 °F or above	4 lbs	48	32	25	—	—
80-89 °F	6 lbs	72	48	30	—	—
70-79 °F	8 lbs	96	64	35	—	—
60-69 °F	12 lbs	144	96	50	—	—
50-59 °F	12 lbs	144	96	50	50	—
40-49 °F	12 lbs	144	96	50	50	50

*In addition to the space concentration readings, you must take a commodity concentration reading. The minimum concentration reading for commodity reading is as follows: For 90-96 °F—10 oz.; for 80-89 °F—15 oz.; and for 70-79 °F—20 oz.

T306-d-2

Bagging from unroasted coffee beans

Two alternative treatments

Pest: Various

Treatment: T306-d-2—MB (“Q” label only) in 26" vacuum

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
60 °F or above	8 lbs	3 hrs
40-59 °F	9 lbs	3 hrs



Load limit maximum 75 percent of chamber volume.

T307—Khapra Beetle Infested Material

T307-a Feeds and milled products heated as a part of the processing procedure, or other commodities that can be subjected to heat

Pest: Khapra beetle

Treatment: T307-a—Heat treatment



This treatment should **not** be used except when specifically authorized in each case by the Quarantine Policy, Analysis and Support (QPAS), Riverdale, MD, office.

180 °F in any part of a processing procedure or at 150 °F for a total of 7 minutes, the commodity being moved through or manipulated in the heated area in a manner to ensure that all parts meet the time and temperature requirements.

Miscellaneous products infested with Khapra beetle

Pest: Khapra beetle

Treatment: Summary of fumigation treatments for infested material



Bags and bagging, see [T306-c-1](#) on [page 5-4-20](#)
Cotton products, see [T301-b-1-1](#) on [page 5-4-2](#)
Finely ground oily meals, see [T306-c-1](#) on [page 5-4-20](#)
Grains and seeds, see [T302-c-1](#) on [page 5-4-10](#)
Flour, see [T306-c-1](#) on [page 5-4-20](#)
Sorptive materials, see [T302-g-1](#) on [page 5-4-8](#).
Goatskins, lambskins, sheepskins (skins and hides), see “T416” on [T416—Goatskins, Lambskins, Sheepskins \(Skins and Hides\)](#) on [page 5-5-51](#)



The following commodities have shown relatively high sorption:
Carpet backing, Cinnamon quill, Cocoa mats, Cocoa powder, Lumber, Myrobalan, Pistachio nuts, Polyimide waste, Potato starch, Rubber (crepe or crude) Vermiculite, Wool (raw, except pulled)

All other commodities, see [T302-g-1](#) on [page 5-4-8](#)

T308—Tobacco

T308-e Blended strip tobacco

Pest: *Lasioderma serricorne* (Cigarette beetle) and *Ephestia elutella* (Tobacco moth)

Treatment: T308-e—Vacuum-steam flow method

1. Evacuate the chamber to the wet bulb temperature of 35 °F (0.2 in. Hg. absolute or 29.8 in. Hg. vacuum) to remove air from the tobacco mass and facilitate steam penetration.
2. Introduce steam until 160 °F is reached while maintaining vacuum to evacuate gases pushed ahead of the steam. Hold at 160 °F for 3 minutes to allow the steam to condense within the tobacco mass for the temperature to equilibrate.
3. Re-evacuate to 110 °F.
4. Introduce steam to 135 °F for 3 minutes to allow the steam to condense within the tobacco mass and for the temperature to equilibrate.

T308-c Leaf tobacco

Pest: *Lasioderma serricorne* (cigarette beetle) and *Ephestia elutella* (tobacco moth)

Treatment: T308-c—Vacuum-steam flow process followed by reconditioning

For leaf tobacco—flowing steam at 170 °F for 15 minutes in 23" vacuum. Followed by reconditioning of the tobacco to 12 to 13 percent moisture content.

T308-d Stored tobacco

Pest: *Lasioderma serricorne* (cigarette beetle) and *Ephestia elutella* (tobacco moth)

Treatment: T308-d—Kabat[®] (active ingredient—methoprene) is an insect growth regulator applied at the rate of 0.2 lbs. (3.9 fluid oz.) per 1,000 lbs. of tobacco.

Application should be made directly to tobacco immediately prior to compaction in hogsheads. Assure complete coverage by using multi-directional sprays and tumbling. Kabat[®] may be applied by use of a proportional dilution apparatus or by preparation of a dilute spray solution. Follow mixing and application instructions on the label. Zoecon Corporation will be responsible for ensuring that receivers in foreign countries will accept this treatment in lieu of fumigation.

In most cases, indication of Kabat[®] treatment need not be shown on the phytosanitary certificate. PPQ prefers that tobacco exporting firms utilize the letterhead certification of treatment rather than relying on the phytosanitary certificate to convey this information to foreign receivers. However, if requested, an additional declaration may be made showing application rates as supplied by the exporter if it has been determined through periodic inspection of a firm's facilities that application of the protectant is an integral part of the processing procedure.

T308-a-1

Tobacco (flue-cured and burley in hogshead and cases; turkish in bales; cigar filler/binder in cases or bales; and cigar wrappers in bales)

Four alternative treatments

Pest: *Lasioderma serricorne* (cigarette beetle) and *Ephestia elutella* (tobacco moth)

Treatment: T308-a-1—MB in 28" vacuum

Flue-cured and burley in hogshead and cases; Turkish in bales; cigar filler/binder in cases or bales; and cigar wrappers in bales

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
70 °F or above	4 lbs	4 hrs

T308-a-2

Tobacco (flue-cured and burley in hogshead and cases; turkish in bales; cigar filler/binder in cases or bales; and cigar wrappers in bales)

Treatment: T308-a-2—MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
70 °F or above	1.25 lbs	72 hours
45-69 °F	2 lbs	72 hrs

T308-b-1

Tobacco (flue-cured and burley in hogshead and cases; turkish in bales; cigar filler/binder in cases or bales; and cigar wrappers in bales)

Treatment: T308-b-1—Phosphine at NAP—Tarpaulin or freight containers

Temperature	Dosage Rate (g/1,000 ft ³)	Minimum Concentration Readings (ppm) At:	
		96 hrs	144 hours
Greater than 68 °F	33 g*	200	—
61-68 °F	33 g*	—	300

* 33g/1,000 ft³ is equivalent to 1.17 g/m³.



Important

The tobacco industry's Sanitation Committee considers “starting time” as the time when the minimum concentration reading is reached. It is recommended that concentration monitoring be done every 6 hours leading up to “starting time,” then again at completion (96 or 120 hours later). [Note that this concept differs from the “starting time” in other phosphine fumigation schedules. In those cases, “starting time” starts when the aluminum phosphide or magnesium phosphide are first introduced.]



Gas concentration readings and temperature readings must be taken in the middle of a tightly packed bale. The fumigation does **not** begin until the gas concentration readings reach minimum required levels.



Important

Refer to the Equipment Section of this manual for a discussion of the MityVac® hand-operated gas sampling pump and the Port-a-sens phosphine monitor. See [Table 5-4-4](#) on [page 5-4-41](#) for data on amount of phosphine liberated by various products.

T308-b-2

Tobacco (flue-cured and burley in hogshead and cases; turkish in bales; cigar filler/binder in cases or bales; and cigar wrappers in bales)

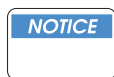
Treatment: T308-b-2—Phosphine at NAP—Warehouses

Temperature	Dosage Rate (g/1,000 ft ³)	Minimum Concentration Readings (ppm) At:	
		96 hrs	144 hours
Greater than 68 °F	20 g*	200	—
61-68 °F	20 g*	—	300

* 20g/1,000 ft³ is equivalent to 0.71 g/m³.



The tobacco industry's Sanitation Committee considers “starting time” as the time when the minimum concentration reading is reached. It is recommended that concentration monitoring be done every 6 hours leading up to “starting time,” then again at completion (96 or 120 hours later). [Note that this concept differs from the “starting time” in other phosphine fumigation schedules. In those cases, “starting time” starts when the aluminum phosphide or magnesium phosphide are first introduced.]



Gas concentration readings and temperature readings must be taken in the middle of a tightly packed bale. The fumigation does **not** begin until the gas concentration readings reach minimum required levels.



Refer to [Table 5-4-4](#) on [page 5-4-41](#) for the amount of phosphine liberated by various products

T309—Broomcorn and Broomcorn Articles

T309-a

Broomcorn and broomcorn articles

Four alternative schedules

Pest: *Ostrinia nubilalis* (European corn borers), ticks, and saw flies

Treatment: T309-a—MB in 26" vacuum

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period for:	
		Sawflies	Other than sawflies
60 °F or above	2.5 lbs	5 hrs	2.5 hrs
50-59 °F	3.5 lbs	5 hrs	2.5 hrs
40-49 °F	5 lbs	5 hrs	2.5 hrs

T309-b-1

Broomcorn and broomcorn articles

Pest: *Ostrinia nubilalis* (European corn borers), ticks, and saw flies

Treatment: T309-b-1—MB at NAP—chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
60 °F or above	2.5 lbs	16 hrs
50-59 °F	3.5 lbs	16 hrs
40-49 °F	4.5 lbs	16 hrs

T309-b-2

Broomcorn and broomcorn articles

Pest: *Ostrinia nubilalis* (European corn borers), ticks, and saw flies

Treatment: T309-b-2—MB at NAP—Railroad car, reefer, highway van, tarpaulin

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:			
		0.5 hr	2 hrs	4 hrs	24 hrs
60 °F or above	3 lbs	36	24	20	15
50-59 °F	5 lbs	60	40	30	20
40-49 °F	7 lbs	84	56	40	25

T309-c

Broomcorn and broomcorn articles

Pest: *Ostrinia nubilalis* (European corn borers), ticks, and saw flies

Treatment: T309-c—Steam sterilization (alternate treatment)

Introduce live steam into 25" vacuum until pressure reaches 10 psi and 240 °F, then hold for 20 minutes.

T310—Tick-Infested Materials (Nonfood)

T310-a

Nonfood materials

Three alternative treatments

Pest: Ticks

Treatment: T310-a—MB (“Q” label only) at NAP

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:							
		0.5 hr	2 hrs	3 hrs	4 hrs	5 hrs	7 hrs	8 hrs	16 hrs
90 °F or above	4 lbs	55	45	45	—	—	—	—	—
80-89 °F	5 lbs	65	52	52	—	—	—	—	—
70-79 °F	6 lbs	75	50	—	50	—	—	—	—
60-69 °F	7 lbs	88	60	—	—	60	—	—	—
50-59 °F	8 lbs	100	70	—	—	—	70	—	—
40-49°F	8 lbs	100	65	—	—	—	—	65	50



Always check the fumigant label for the proper dosage used on the commodity being treated.

T310-b Nonfood materials

Treatment: T310-b—MB (“Q” label only) in 26" vacuum

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
80 °F or above	3 lbs	2.5 hrs
70-79 °F	3 lbs	3.5 hrs
60-69 °F	4 lbs	4 hrs
50-59 °F	5.5 lbs	5 hrs



For all fumigations with MB, if commodity temperature is known or considered to have been below the temperature range during the previous 48 hours, use the next lower range to calculate dosage.

T310-c Nonfood materials

Treatment: T310-c (*Vacant*)

T310-d Nonfood materials

Treatment: T310-d—Sulfuryl fluoride at NAP

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:		
		0.5 hr	2 hrs	24 hrs
70 °F or above	2 lbs	25	16	20
50-69 °F	2.5 lbs	32	20	24
40-49 °F	3 lbs	40	24	28



Fumigations below 50 °F to be used only on an emergency basis and specifically authorized by Quarantine Policy, Analysis and Support (QPAS) in Riverdale MD.

T311—Hay, Baled

T311

Baled hay

Pest: *Mayetiola destructor* (Hessian fly), *Oulema melanopus* (cereal leaf beetle)

Treatment: T311 Phosphine at NAP

Temperature	Dosage Rate (g/1,000 ft ³)	Minimum Concentration Readings (ounces) At:			
		0.5 hr	2 hrs	24 hrs	168 hrs
50 °F or above	60	45	30	15	15

Aerate 24 hours or until a level at or below 0.3 ppm is determined.

See [Table 5-4-4](#) on [page 5-4-41](#) for data on amount of phosphine liberated by various products.

T312—Oak Logs and Lumber

There are two alternative treatments for the MB fumigation of Oak logs, T312-a and T312-a-Alternative. Do **not** combine the schedules.

Special Procedures for Adding Gas to Oak Logs Using T312 or T312-a-Alternative on page 5-4-32 provides specific instructions for the correct actions to take at each gas concentration reading. Refer to **Table 5-4-2 on page-5-4-33** and **Table 5-4-3 on page-5-4-36** for every reading.

The following is a list of IMPORTANT items to remember when conducting either of these treatments:

- ◆ Take gas concentration readings 30 minutes after adding gas and record the readings in the CPHST-AQI electronic 429 Fumigation database.
 - ❖ To access the 429 database go to:
<http://cphst.aphis.usda.gov/tqau/>
- ◆ Run the fans for 30 minutes and take gas concentration readings whenever additional gas is added.
- ◆ Ensure that the gas concentration readings **do not differ more than 4 ounces among the sampling lines**. If they do, run the fans for 30 more minutes to equalize the gas.
- ◆ Use DriRite® and Ascarite® during the fumigation. Replace the DriRite® when it changes color from blue to pink. Replace the Ascarite® when the granules become hard or moist.
- ◆ Aerate the logs for a minimum of 48 hours. Follow aeration procedures under sections *Aerating Sorptive Commodities in Containers—Indoors and Outdoors* on **page 2-4-45** and *Aerating Sorptive, Noncontainerized Cargo—Indoors and Outdoors* on **page 2-4-43**.
- ◆ Add additional time onto the end of the fumigation and record the gas concentration reading in the electronic 429 database. Explain the reason the treatment was extended in the Remarks section of the PPQ Form 429.



The 72 hour reading MUST be taken even if the fumigation has been extended. Take the 72 hour reading and then take the extra reading as required by **Table 5-4-2 on page-5-4-33** or **Table 5-4-3 on page-5-4-36** in the section *Special Procedures for Adding Gas to Oak Logs Using T312 or T312-a-Alternative on page 5-4-32*.

Refer to **Table 5-4-1** for metric equivalents for T312-a.

Table 5-4-1 Metric Equivalents for T312-a

Temperature (°F)	Dosage Rate (lb/1000 ft ³)	Temperature (°C)	Dosage Rate (g/m ³)
40 or above	15	4.4 or above	240

T312-a

Oak logs

Pest: Oak Wilt Disease

Treatment T312-a—MB (“Q” label only) at NAP

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At ¹ :						
		0.5 hr ²	2 hrs ³	12 hrs	24 ⁴ hrs	36 hrs	48 hrs	72 hrs
40 °F or above	15 lbs	240	240	200	240	160	120	80

- 1 Refer to [Table 5-4-2](#) for adding gas at each reading.
- 2 If the fumigation is conducted in a closed-door container, take the first reading at 1 hour instead of 0.5 hours.
- 3 If the fumigation is conducted in a closed-door container, take the second reading at 2.5 hour instead of 2 hours.
- 4 After 24 hours, add enough fumigant to bring the concentration up to 240 oz.

T312-a- Alternative

Oak logs-Alternative

Pest: Oak Wilt Disease

Treatment T312-a-Alternative—MB (“Q” label only) at NAP

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At ¹ :				
		0.5 hr ²	2 hrs ³	24 hrs ⁴	48 hrs	72 hrs
40 °F or above	15 lbs	240	240	240	140	100

- 1 Refer to [Table 5-4-3](#) for adding gas at each reading.
- 2 If the fumigation is conducted in a closed-door container, take the first reading at 1 hour instead of 0.5 hours.
- 3 If the fumigation is conducted in a closed-door container, take the second reading at 2.5 hour instead of 2 hours.
- 4 After 24 hours, add enough fumigant to bring the concentration up to 240 oz.

T312-b

Oak lumber

Pest: Oak Wilt Disease

Treatment T312-b—MB (“Q” label only) at NAP

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:					
		0.5 hr ¹	2 hrs ²	12 hrs	24 ³ hrs	36 hrs	48 hrs
40 °F or above	15 lbs	240	160	100	40	120	80

- 1 If the fumigation is conducted in a closed-door container, take the first reading at 1 hour instead of 0.5 hours.
- 2 If the fumigation is conducted in a closed-door container, take the second reading at 2.5 hour instead of 2 hours.
- 3 After 24 hours, add enough fumigant to bring the concentration up to 240 oz.

Special Procedures for Adding Gas to Oak Logs Using T312 or T312-a-Alternative

There are two alternative treatments for the MB fumigation of Oak logs. Refer to [Table 5-4-2](#) and [Table 5-4-3](#) for actions to take during the fumigation of Oak Logs using T312-a or T312-a-Alternative.

Use the following formula to calculate the amount of gas to add to the enclosure:

$$1.6 \times (\text{number of oz. below the required minimum}) \times (\text{volume in ft}^3) / 1,000 \text{ ft}^3 \\ = \text{oz. of gas to add.}$$

After adding gas, run the fans for 30 minutes and take additional gas concentration readings.

Refer to [Table 5-4-2](#) if using T312-a and [Table 5-4-3](#) if using T312-a-Alternative to determine how much additional time must be added to the fumigation to compensate for the low gas concentrations.

EXAMPLE: The treatment schedule is T312-a-Alternative. The size of the enclosure is 2400 ft³. The required reading at 48 hours must be a minimum of 140 ounces. The actual lowest reading is 132 ounces. Calculate the amount of gas to add to the enclosure using the formula:

$$1.6 \times (\text{the number of ounces below 140}) \times (\text{volume in ft}^3) / 1000 \text{ ft}^3$$

ANSWER:

$$140 - 132 = 8$$

$$1.6 \times 8 \times 2400 = 30,720 / 1000 = 30.72 \text{ ounces of gas to add}$$

$$30.72 / 16 = 1.92 \text{ pounds of gas to add}$$

Determine the amount of time to add by referring to [Table 5-4-3](#). In this example, 1 hour will be added to the total fumigation time.

Take the regularly scheduled reading at 72 hours (the minimum should be 100 ounces.)

Take another reading at 73 hours (the minimum should be 100 ounces.)

If the minimum is **not** 100 ounces, add more gas and time according to [Table 5-4-3](#).

Instructions for Adding Gas and Time to Schedule T312-a

Do **not** combine Schedules T312-a and T312-a-Alternative. The treatment must be aborted if any individual gas concentration reading is 50 percent or more below the minimum required concentration.


Table 5-4-2 Determine Gas Concentration Values and Corrections for Oak Log Fumigations using Schedule T312-a

0.5 hour ¹	121-239	1. ADD gas, and 2. EXTEND exposure by 0.5 hour
	0-120	ABORT
2 hours ²	160-239	1. ADD gas, and 2. EXTEND exposure by 0.5 hour
	121-159	1. ADD gas, and 2. EXTEND exposure by 1.0 hour
	0-120	ABORT
12 hours	190-199	1. ADD gas, and 2. EXTEND exposure by 0.5 hour
	180-189	1. ADD gas, and 2. EXTEND exposure by 1.0 hour
	170-179	1. ADD gas, and 2. EXTEND exposure by 1.5 hours
	160-169	1. ADD gas, and 2. EXTEND exposure by 2.0 hours
	150-159	1. ADD gas, and 2. EXTEND exposure by 2.5 hours
	140-149	1. ADD gas, and 2. EXTEND exposure by 3.0 hours
	130-139	1. ADD gas, and 2. EXTEND exposure by 3.5 hours
	120-129	1. ADD gas, and 2. EXTEND exposure by 4.0 hours
	110-119	1. ADD gas, and 2. EXTEND exposure by 4.5 hours
	101-109	1. ADD gas, and 2. EXTEND exposure by 5.0 hours
	0-100	ABORT

Table 5-4-2 Determine Gas Concentration Values and Corrections for Oak Log Fumigations using Schedule T312-a (continued)

24 hours	120-239	1. Add gas to bring the total concentration to 240 ounces. 2. DO NOT ADD TIME.
	110-119	1. ADD gas, and 2. EXTEND exposure by 1.0 hour
	100-109	1. ADD gas, and 2. EXTEND exposure by 2.0 hours
	90-99	1. ADD gas, and 2. EXTEND exposure by 3.0 hours
	80-89	1. ADD gas, and 2. EXTEND exposure by 4.0 hours
	70-79	1. ADD gas, and 2. EXTEND exposure by 5.0 hours
	61-69	1. ADD gas, and 2. EXTEND exposure by 6.0 hours
	0-60	ABORT
36 hours	150-159	1. ADD gas, and 2. EXTEND exposure by 1.0 hour
	140-149	1. ADD gas, and 2. EXTEND exposure by 1.5 hours
	130-139	1. ADD gas, and 2. EXTEND exposure by 2.5 hours
	120-129	1. ADD gas, and 2. EXTEND exposure by 3.0 hours
	110-119	1. ADD gas, and 2. EXTEND exposure by 4.0 hours
	100-109	1. ADD gas, and 2. EXTEND exposure by 4.5 hours
	90-99	1. ADD gas, and 2. EXTEND exposure by 5.5 hours
	81-89	1. ADD gas, and 2. EXTEND exposure by 6.0 hours
	0-80	ABORT

Table 5-4-2 Determine Gas Concentration Values and Corrections for Oak Log Fumigations using Schedule T312-a (continued)

48 hours	110-119	1. ADD gas, and 2. EXTEND exposure by 1.0 hour
	100-109	1. ADD gas, and 2. EXTEND exposure by 2.0 hours
	90-99	1. ADD gas, and 2. EXTEND exposure by 3.0 hours
	80-89	1. ADD gas, and 2. EXTEND exposure by 4.0 hours
	70-79	1. ADD gas, and 2. EXTEND exposure by 5.0 hours
	61-69	1. ADD gas, and 2. EXTEND exposure by 6.0 hours
	0-60	ABORT
72 hours	70-79	1. ADD gas, and 2. EXTEND exposure by 3.0 hours
	60-69	1. ADD gas, and 2. EXTEND exposure by 6.0 hours
	50-59	1. ADD gas, and 2. EXTEND exposure by 9.0 hours
	41-49	1. ADD gas, and 2. EXTEND exposure by 12.0 hours
	0-40	ABORT
<div style="display: flex; align-items: center;">  <div style="margin-left: 10px;"> <p>Important</p> <p>If additional time has been added to the treatment, the 72 hour reading AND the extended time reading MUST be taken. If the minimum of 80 ounces is not met, time and gas MUST be added according to this Table.</p> </div> </div>		

- 1 If the fumigation is conducted in a closed-door container, take the first reading at 1 hour instead of 0.5 hours.
- 2 If the fumigation is conducted in a closed-door container, take the second reading at 2.5 hour instead of 2 hours.


Instructions for Adding Gas and Time to Schedule T312-a-Alternative

Do **not** combine schedules T312-a and T312-a-Alternative.

Table 5-4-3 Determine Gas Concentration Values and Corrections for Oak Log Fumigations using schedule T312-a-Alternative

0.5 hours ¹	121-239	1. ADD gas, and 2. DO NOT EXTEND exposure.
	0-120	ABORT
2 hours ²	160-239	1. ADD gas, and 2. DO NOT EXTEND exposure
	121-159	1. ADD gas, and 2. EXTEND exposure by 1.0 hour
	0-120	ABORT
24 hours	140-239	1. Add gas to bring the total concentration to 240 ounces. 2. DO NOT ADD TIME.
	130-139	1. ADD gas, and 2. EXTEND exposure by 1.0 hour
	120-129	1. ADD gas, and 2. EXTEND exposure by 2.5 hours
	110-119	1. ADD gas, and 2. EXTEND exposure by 4.0 hours
	100-109	1. ADD gas, and 2. EXTEND exposure by 5.5 hours
	90-99	1. ADD gas, and 2. EXTEND exposure by 7.0 hours
	80-89	1. ADD gas, and 2. EXTEND exposure by 8.5 hours
	71-79	1. ADD gas, and 2. EXTEND exposure by 10.0 hours
	0-70	ABORT

Table 5-4-3 Determine Gas Concentration Values and Corrections for Oak Log Fumigations using schedule T312-a-Alternative (continued)

48 hours	130-139	1. ADD gas, and 2. EXTEND exposure by 1.0 hour
	120-129	1. ADD gas, and 2. EXTEND exposure by 2.5 hours
	110-119	1. ADD gas, and 2. EXTEND exposure by 4.5 hours
	100-109	1. ADD gas, and 2. EXTEND exposure by 6.0 hours
	90-99	1. ADD gas, and 2. EXTEND exposure by 8.5 hours
	80-89	1. ADD gas, and 2. EXTEND exposure by 9.5 hours
	71-79	1. ADD gas, and 2. EXTEND exposure by 11 hours
	0-70	ABORT
72 hours	90-99	1. ADD gas, and 2. EXTEND exposure by 1.5 hours
	80-89	1. ADD gas, and 2. EXTEND exposure by 4.0 hours
	70-79	1. ADD gas, and 2. EXTEND exposure by 7.5 hours
	60-69	1. ADD gas, and 2. EXTEND exposure by 8.5 hours
	51-59	1. ADD gas, and 2. EXTEND exposure by 11.0 hours
	0-50	ABORT
 <p>Important</p> <p>If additional time has been added to the treatment, the 72 hour reading AND the extended time reading MUST be taken. If the minimum of 100 ounces is not met, time and gas MUST be added according to this Table.</p>		

- 1 If the fumigation is conducted in a closed-door container, take the first reading at 1 hour instead of 0.5 hours.
- 2 If the fumigation is conducted in a closed-door container, take the second reading at 2.5 hour instead of 2 hours.

T313—Christmas Trees



Cut trees at least 2 weeks prior to treatment in order to reduce possible damage by the fumigant to the trees.

T313-a

Cut conifer Christmas trees

Pest: *Lymantria dispar* (gypsy moth) egg masses

Treatment: T313-a—MB (“Q” label only) at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:				
		0.5 hr	2.5 hrs	3 hrs	4 hrs	4.5 hrs
75 °F or above	1.5 lbs	18	12	—	—	—
70-74 °F	2 lbs	24	16	—	—	—
60-69 °F	2.5 lbs	30	—	24	—	—
60-69 °F	3 lbs	36	24	—	—	—
50-59 °F	3 lbs	36	—	—	24	—
50-59 °F	4 lbs	48	32	—	—	—
40-49 °F	3.5 lbs	42	—	—	—	28
40-49 °F	5 lbs	60	40	—	—	—

T313-b

Cut pine Christmas trees and pine logs

Pest: *Tomicus piniperda* (pine shoot beetle)

Treatment: T313-b—MB (“Q” label only) at NAP—chamber or tarpaulin

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:			
		2 hrs	3 hrs	3.5 hrs	4 hrs
60 °F or above	3 lbs	43	—	—	36
60 °F or above	4 lbs	57	48	—	—
50-59 °F	3.5 lbs	50	—	—	42
50-59 °F	4 lbs	57	—	48	—
40-49 °F	4 lbs	57	—	—	48



If treating pine Christmas trees for both gypsy moth egg masses and the pine shoot beetle, use the schedule for the pine shoot beetle since it is more potent.

T314—Logs and Firewood

These heat treatment procedures may employ steam, hot water, kilns, or any other method that raises the temperature of the **center** of the log to the minimum required temperature for the time specified. Procedures for obtaining internal log temperature can be found in the chapter "Methyl Bromide-Tarpaulin", section *Logs and Lumber* on page 2-4-21.

The heat treatment must be performed at an approved facility that maintains a current compliance agreement. The PPQ official will review facility treatment records to ensure the treatment temperature and duration requirements have been met.

Contact USDA-APHIS-CPHST-PPQ Pest Survey Detection and Exclusion Laboratory at 508-563-9303 ext. 259 for a list of approved facilities, temperature monitoring equipment and operational guidelines.



For annual facility certification guidelines, follow the procedures in "*Certifying Facilities for the Heat Treatment of Firewood* on page 6-9-1.

T314-a

Regulated Wood Articles², including *Fraxinus* (Ash Logs and firewood) and all Hardwood Firewood from Emerald Ash Borer quarantine areas

Pest: *Agrilus planipennis* (Emerald Ash Borer)

Treatment: T314-a—Heat treatment

Unit	Temperature	Time (minutes)
°F	140.0	60
°C	60.0	60

T314-b

All logs (including firewood) from Gypsy Moth quarantine areas³

Pest: *Lymantria dispar* (Gypsy Moth egg masses)

Treatment: T314-b—Heat treatment

Unit	Temperature	Time (minutes)
°F	132.8	30
°C	56.0	30

2 Emerald Ash Borer regulated articles include: firewood of all hardwood (non-coniferous) species; nursery stock, green lumber, and other material living, dead, cut, or fallen, including logs, stumps, roots, branches, and composted and uncomposted chips of the genus *Fraxinus*. (7 CFR 301.53-2)

T314-c

Regulated Wood Articles⁴

Pest: Various Wood Pests

Treatment: T314-c—Heat treatment

Unit	Temperature	Time (minutes)
°F	160.0	75
°C	71.1	75

- 3 If the regulated article originates from areas quarantine for BOTH gypsy moth and emerald ash borer, use T314-a.
- 4 Regulated wood articles are considered to be unprocessed logs; lumber; any whole tree; any cut tree or any portion of a tree not solely consisting of leaves, flowers, fruits, buds, or seeds; bark; cork; laths; hog fuel; sawdust; painted raw wood products; wood mulch; wood shavings; pickets; stakes; shingles; solid wood packing materials; humus; compost; and litter. (7 CFR 319.40-1)

Table 5-4-4 Amount of Phosphine Liberated by various Products. Calculate amount of product needed by using the amount of phosphine released as shown in the right column.

Product	Type	Unit and weight in grams	Grams of phosphine ¹
Degesch Fumi-Cel [®]	MP	1 plate; 117.0	33.0
Degesch Fumi-Strip [®]	MP	16 plates; 1872.0	528.0
Degesch Phostoxin [®]	AP	1 tablet; 3.0	1.0
Degesch Phostoxin [®] Tablet Prepac Rope	AP	1 prepac; 99.0 (strip or rope of 33 tablets)	33.0
Detia	AP	1 tablet; 3.0	1.0
Detia Rotox AP	AP	1 pellet; 0.6	0.2
Detia Gas EX-B	AP	1 bag or sachet; 34.0	11.4
Fumiphos tablets	AP	1 tablet; 3.0	1.0
Fumiphos pellets	AP	1 pellet; 0.6	0.2
Fumiphos bags	AP	1 bag; 34.0	11.0
Fumitoxin	AP	1 tablet; 3.0	1.0
Fumitoxin	AP	1 pellet; 0.6	0.2
Fumitoxin	AP	1 bag; 34.0	11.0
Gastoxin	AP	1 tablet; 3.0	1.0
Gastoxin	AP	1 pellet; 0.6	0.2
"L" Fume	AP	1 pellet; 0.5	0.18
	AP	1 pellet; 0.6	0.22
Phos-Kill	AP	1 tablet; 3.0	1.1
Phos-Kill	AP	1 pellet; 0.6	0.22
Phos-Kill	AP	1 bag; 34.0	12.0

1 Reacts with moisture in the air to yield grams of phosphine.

5

Treatment Manual

Treatment Schedules

T400 - Schedules for Miscellaneous Products

Contents

Commodities treated with the following schedules are **not** to be used for food or feed.

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Exposure period may be extended for any commodity which cannot be used for food or propagation. This extension is only a matter of convenience for the importer and is intended only for the purpose of reducing treatment costs. The request for extension must come from the importer or his authorized representative and should be confirmed in writing. A letter is not required for each treatment. A single blanket request should be considered as acceptable and renewed each year as required.

During the extended exposure period, the concentrations must remain stable and the prescribed minimums be met at the end of the extension. Otherwise, the treatment may be voided and retreatment required. Examples of commodities for which extended exposure periods may be approved include cotton piece goods, baled cotton, bagging, wood, marble, soil as such, etc. Examples of commodities for which *no* extension may be approved include cottonseed, grain, tobacco, etc. An extension of exposure period for other purposes is **not** permitted except as may be prescribed in various schedules for concentration readings below minimum.

Additional safety precautions, including additional aeration, may be required because of the extended exposure period. The PPQ officer or the commercial fumigator will specify any needed safety precautions.

T401—Railroad Cars (Empty)

T401-a Railroad cars (empty)

Pest: *Pectinophora gossypiella* (pink bollworm) and fruit flies

Treatment: T401-a—MB (“Q” label only) at NAP

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
40 °F or above	4 lbs	12 hrs
OR	8 lbs	3 hrs

T401-b Railroad cars (empty)

Pest: *Trogoderma granarium* (khapra beetle)

Treatment: T401-b—MB (“Q” label only) at NAP—tarpaulin covered car

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:		
		0.5 hr	2 hrs	12 hrs
90 °F or above	2.5 lbs	30	20	15
80-89 °F	3.5 lbs	42	30	20
70-79 °F	4.5 lbs	54	40	25
60-69 °F	6 lbs	72	50	30
50-59 °F	7.5 lbs	90	60	35
40-49 °F	9 lbs	108	70	40

T401-c Railroad cars (empty)

Pest: For nematode cysts

Treatment: T401-c—High pressure steam cleaning. The debris and/or runoff from the cleaning procedure must be handled in a manner approved by local and port authority guidelines.

T402—Miscellaneous Areas Where Fumigation is Not Possible



These schedules use insecticides that may be toxic to fish, aquatic invertebrates, small mammals, birds, and bees. Do **not** apply directly to water, or to areas where surface water is present or to intertidal areas below the mean high water mark. Do **not** apply where runoff is likely to occur. Do **not** apply these insecticides or allow them to drift to blooming crops or weeds if bees are visiting the treatment area. ALWAYS refer to the labels for specific environmental, physical and chemical hazards, mixing and application instructions.

Apply these insecticides according to the manufacturer's labels and all state and local restrictions. Direct the spray to areas where the insects congregate, with special attention to corners, cracks, and crevices. Before using any insecticide, verify that it is registered for use in YOUR city, state, or county.

T402-b-3-2

Deleted

T402-b-3-1

Pest: *Trogoderma granarium* (khapra beetle)

Treatment: T402-b-3-1—General surface, perimeter, spot, mist, or crack and crevice treatment

Refer to [Table 5-5-4](#) for a partial site list. Always refer to the manufacturer's label for specific areas of use.

Active Ingredient ¹	Examples of Trade Names and EPA Registration Numbers (list not all inclusive) ²
Deltamethrin 4.75% a.i.	Suspend SC, K-Othrine® SC (#432-763) D-FENSE SC, Delta SC (#53883-276)
Malathion 57% EC	Clean Crop Malathion (#34704-108)

¹ Apply at the highest rate allowed for the site on the label. (active ingredient = a.i.)

² No endorsement is intended of the particular items listed and no discrimination is intended toward those products or companies that may not be listed. Use other formulations as long as the application method, site, and rate are listed on the label.

T402-d

Pests: Miscellaneous hitchhiking insects (e.g., crickets, scarab beetles, ants, Africanized honeybee swarms)

Treatment: T402-d—General surface, perimeter, spot, mist, or crack and crevice treatment

Refer to [Table 5-5-4](#) for a partial site list. Always refer to the manufacturer’s label for specific areas of use.

Active Ingredient ¹	Examples of Trade Names and EPA Registration Numbers (list not all inclusive) ²
Chlorpyrifos	Whitmire PT®, Duraguard ME (#499-367)
β-Cyfluthrin 11.8 % a.i.	Tempo Ultra® SC (#432-1363)
Cyfluthrin 6% a.i.	Cy-Kick® CS, OPTEM® (#499-304)
Cypermethrin 25.3% a.i.	Demon® EC (#100-1004)
Deltamethrin 4.75% a.i.	Suspend SC, K-Othrine® (#432-763) D-FENSE™ SC, Delta SC (#53883-276)
Lambda-Cyhalo- thrin 9.7% a.i.	Cyonara™ 9.7, Cyzmic™ CS, Demand® CS (#100-1066)
Malathion 57% EC	Clean Crop Malathion (#34704-108)

- 1 Apply at the highest rate allowed for the site on the label. (active ingredient = a.i.)
- 2 No endorsement is intended of the particular items listed and no discrimination is intended toward those products or companies that may not be listed. Use other formulations as long as the application method, site, and rate are listed on the label.

T402-c

Empty holds (precautionary treatment for grain exports)

Pest: Without khapra beetle infestation

Treatment: T402-b—MB at NAP

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
60 °F or above	1 lb	10 hrs
50-59 °F	1 lb	12 hrs
40-59 °F	1.5 lbs	12 hrs



Important

Operate fans during gas introduction and for 30 minutes thereafter. During exposure period, operate fans for 30 minutes every 3 hours.



Important

If khapra beetle is present, see [T401-b](#) on [page 5-5-2](#).

T402-a-1

Ship holds and any nonplant cargo material within holds

Pest: Quarantine-significant snails of the family Achatinidea, including the following genera:

Achatina *Lignus*
Archachatina *Limicolaria*

Treatment: T402-a-1—MB (“Q” label only) at NAP

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:		
		0.5 hr	2 hrs	24 hrs
55 °F or above	8 lbs	96	65	35

T402-a-2

Ship holds and any nonplant cargo material within holds

Pest: Quarantine-significant snails of the families Geomitridae and Hygromiidae, including the following genera:

Candidula *Monacha* *Xeropicta*
Cernuella *Platytheba* *Xerosecta*
Cochlicella *Pseudotrachia* *Xerotricha*
Helicella *Trochoidea*
Helicopsis *Xerolenta*

Treatment: T402-a-2—MB (“Q” label only) at NAP

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:				
		0.5 hr	2 hrs	24 hrs	48 hrs	72 hrs
55 °F or above	8 lbs	95	64	62	60	40

T402-a-3

Ship holds and any nonplant cargo material within holds

Pest: Quarantine-significant snails of the families Helicidae and Succineidae, including the following genera:

Caracollina *Omalonyx*
Cepaea *Otala*
Cryptomphalus *Succinea*
Helix *Theba*

Treatment: T402-a-3—MB (“Q” label only) at NAP

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:					
		0.5 hr	2 hrs	10 hrs	12 hrs	16 hrs	24 hrs
80 °F or above	6 lbs	70	48	40	—	—	—
55-79 °F	6 lbs	70	48	—	—	40	—
40-54 °F	8 lbs	96	64	—	—	—	39

T402-b-1

Ship holds and storerooms that do not contain finely milled products such as flour or appreciable quantities of tightly packed cargo such as baled materials

Pest: *Trogoderma granarium* (khapra beetle)

Treatment: T402-b-1—MB (“Q” label only) at NAP—tarpaulin covered car

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:		
		0.5 hr	2 hrs	12 hrs
90 °F or above	2.5 lbs	30	20	15
80-89 °F	3.5 lbs	42	30	20
70-79 °F	4.5 lbs	54	40	25
60-69 °F	6 lbs	72	50	30
50-59 °F	7.5 lbs	90	60	35
40-49 °F	9 lbs	108	70	40

T402-b-2

Ship holds and storerooms that contain milled products, or with appreciable quantities of tightly packed or baled material

Pest: *Trogoderma granarium* (khapra beetle)

Treatment: T402-b-2—MB (“Q” label only) at NAP

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:		
		0.5 hr	4 hrs	24* hrs
90-96 °F	4 lbs	48	35	25
80-89 °F	6 lbs	72	50	30
70-79 °F	8 lbs	96	65	35

*In addition to the space concentration readings, you must take a commodity concentration reading. The minimum concentration reading for commodity reading is as follows: For 90-96 °F—10 oz.; for 80-89 °F—15 oz.; for 70-79 °F—20 oz.;



Concentration readings not required for chamber fumigation.



Some ships' masters or agents prefer to abandon flour or other finely milled products to qualify for the 12 hours schedule ([T401-b](#) on [page 5-5-2](#)). This practice should not be discouraged if PPQ approved incineration or steam sterilization facilities are available within the port city. Small quantities may be burned or boiled on board the vessel, but in no case should the material be removed from treatment in PPQ facilities. Such articles must be left in the storeroom during the 12-hour fumigation and then removed under PPQ safeguards. This will serve to reduce the possibility of pest dispersal when the articles are removed under PPQ supervision.

T403—Miscellaneous Cargo (Nonfood, Nonfeed Commodities)

T403-a-1 Miscellaneous cargo (nonfood, nonfeed commodities)

Pest: Quarantine-significant snails of the family Achatinidae, including the following genera:

Achatina *Lignus*
Archachatina *Limicolaria*

Treatment: T403-a-1—use T402-a-1 for temperatures of 55 °F and above, use T403-a-6 for temperatures below 55 °F



Commodity or product temperature must reach treatment temperature before exposure time begins.

T403-a-2-1 Miscellaneous cargo (nonfood, nonfeed commodities)

Three alternative treatments

Pest: Quarantine-significant snails of the families Geomitridae and Hygromiidae, including the following genera:

Candidula *Monacha* *Xeropicta*
Cernuella *Platytheba* *Xerosecta*
Cochlicella *Pseudotrichia* *Xerotricha*
Helicella *Trochoidea*
Helicopsis *Xerolenta*

Treatment: T403-a-2-1—MB (“Q” label only) at NAP

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:				
		0.5 hr	2 hrs	24 hrs	48 hrs	72 hrs
55 °F or above	8 lbs	95	64	60	60	40

T403-a-2-2 Miscellaneous cargo (nonfood, nonfeed commodities)

Treatment: T403-a-2-2—MB in 26" vacuum

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
70 °F or above	8 lbs	16 hrs

T403-a-2-3 Miscellaneous cargo (nonfood, nonfeed commodities)

Treatment: T403-a-2-3—Cold treatment (for temperatures below 55 °F)

Temperature	Exposure Period
0 °F	48 hrs

T403-a-3 Miscellaneous cargo (nonfood, nonfeed commodities)

Pest: Quarantine-significant slugs of the families Agriolimacidae, Arionidae, Limacidae, Milacidae, Philomycidae, and Veronicellidae, including the following genera:

<i>Agriolimax</i>	<i>Leidyula</i>	<i>Pseudoveronicella</i>
<i>Arion</i>	<i>Limax</i>	<i>Sarasinula</i>
<i>Colosius</i>	<i>Meghimatium</i>	<i>Semperula</i>
<i>Deroceras</i>	<i>Milax</i>	<i>Vaginulus</i>
<i>Diplosolenodes</i>	<i>Pallifera</i>	<i>Veronicella</i>

Treatment: T403-a-3—MB at NAP

Temperature	Dosage Rate (lb/1000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
90-96 °F	1 lb	12	9
80-89 °F	1.25 lbs	15	12
70-79 °F	1.5 lbs	18	15
60-69 °F	1.75 lbs	22	19

T403-a-4-1 Miscellaneous cargo (nonfood, nonfeed commodities)

Three alternative schedules

Pest: Quarantine-significant snails of the family Helicidae, including the following genera:

<i>Caracollina</i>	<i>Helix</i>
<i>Cepaea</i>	<i>Otala</i>
<i>Cryptomphalus</i>	<i>Theba</i>

Treatment: T403-a-4-1—MB at NAP

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:					
		0.5 hr	2 hrs	10 hrs	12 hrs	16 hrs	24 hrs
80 °F or above	6 lbs	70	48	40	—	—	—
55-79 °F	6 lbs	70	48	—	—	40	—
40-54 °F	8 lbs	96	64	—	—	—	39



Important

If the fumigation is done at a temperature range of 40 to 54°F, use Methyl Bromide Q gas only.

T403-a-4-2 Miscellaneous cargo (nonfood, nonfeed commodities)

Treatment: T403-a-4-2—MB (“Q” label only) in 26" vacuum

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
70 °F or above	6 lbs	6 hrs

T403-a-4-3 Miscellaneous cargo (nonfood, nonfeed commodities)

Treatment: T403-a-4-3—Cold treatment, use [T403-a-6-1](#) on **page 5-5-10** for temperatures below 55 °F

T403-a-5-1 Miscellaneous cargo (nonfood, nonfeed commodities)

Three alternative treatments

Pest: Quarantine-significant snails of the families Bradybaenidae and Succineidae, including the following genera:

Bradybaena *Omalonyx*
Cathaica *Succinea*
Helicostyla *Trishoplita*

Treatment: T403-a-5-1—MB (“Q” label only) at NAP

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:			
		0.5 hr	2 hrs	10 hrs	16 hrs
80 °F or above	6 lbs	72	48	40	—
40-79 °F	6 lbs	70	48	—	40

T403-a-5-2 Miscellaneous cargo (nonfood, nonfeed commodities)

Treatment: T403-a-5-2—MB (“Q” label only) in 26" vacuum

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
40 °F or above	6 lbs	6 hrs

T403-a-5-3 Miscellaneous cargo (nonfood, nonfeed commodities)

Treatment: T403-a-5-3—Cold Treatment, use [T403-a-6-1](#) on **page 5-5-10** for temperatures below 40 °F



Commodity or product must reach treatment temperature before exposure time begins.

T403-a-6-1 Miscellaneous cargo (nonfood, nonfeed commodities)

Three alternative treatments

Pest: Quarantine-significant snails sensitive to Cold Treatment, members of the families Bradybaenidae, Geomitridae, Helicidae, Helicellidae, Hygromiidae, and Succineidae, including the following genera:

<i>Bradybaena</i>	<i>Cochlicella</i>	<i>Trochoidea</i>
<i>Candidula</i>	<i>Helicella</i>	<i>Xerolenta</i>
<i>Cepaea</i>	<i>Helicostyla</i>	<i>Xeropicta</i>
<i>Cathaica</i>	<i>Theba</i>	<i>Xerosecta</i>
<i>Cernuella</i>	<i>Trishoplita</i>	<i>Xerotricha</i>

Treatment: T403-a-6-1—Cold Treatment

Temperature	Exposure Period
0 °F	48 hrs

T403-a-6-2 Miscellaneous cargo (nonfood, nonfeed commodities)

Pest: Quarantine-significant snails sensitive to Cold Treatment, certain members of the family Helicidae, including the following genera:
Helix *Otala*

Treatment: T403-a-6-2—Cold Treatment

Temperature	Exposure Period
0 °F	32 hrs
10 °F	48 hrs

T403-a-6-3 Miscellaneous cargo (nonfood, nonfeed commodities)

Pest: Quarantine-significant snails sensitive to Cold Treatment, of the family Achatinidae, including the following genera:

<i>Achatina</i>	<i>Lignus</i>
<i>Archachatina</i>	<i>Limicolaria</i>

Treatment: T403-a-6-3—Cold Treatment

Temperature	Exposure Period
0 °F	8 hrs
10 °F	16 hrs
20 °F	24 hrs

T403-b Miscellaneous cargo (nonfood, nonfeed commodities)

Pest: *Trogoderma granarium* (khapra beetle)

Treatment: T403-b—MB at NAP, use T401-b or T402-b-2

T403-c Miscellaneous cargo (nonfood, nonfeed commodities)

Pest: *Globodera rostochiensis* (golden nematode)

Treatment: T403-c—MB (“Q” label only) in 26" vacuum

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
40 °F or above	8 lbs	16 hrs
	10.5 lbs	12 hrs
	16 lbs	8 hrs

T403-d Miscellaneous cargo (nonfood, nonfeed commodities)

Pest: Wood Borers or termites

Treatment: T403-d see T404 schedules

T403-e-1-1 Miscellaneous cargo (nonfood, nonfeed commodities) that is not sorptive or difficult to penetrate

Pest: Quarantine-significant insects not specifically provided for elsewhere in nonfood or nonfeed commodities

Treatment: T403-e-1-1—MB (“Q” label only) at NAP—tarpaulin

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:		
		0.5 hr	2 hrs	12 hrs
90 °F or above	2.5 lbs	30	20	15
80-89 °F	3.5 lbs	42	30	20
70-79 °F	4.5 lbs	54	40	25
60-69 °F	6 lbs	72	50	30
50-59 °F	7.5 lbs	90	60	35
40-49 °F	9 lbs	108	70	40

T403-e-1-2

Miscellaneous cargo (nonfood, nonfeed commodities) that is sorptive or difficult to penetrate

Pest: Quarantine-significant insects not specifically provided for elsewhere in nonfood or nonfeed commodities

Treatment: T403-e-1-2—MB (“Q” label only) at NAP

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:				
		0.5 hr	4 hrs	24 hrs	28 hrs	32 hrs
90-96 °F	4 lbs	48	35	25*	—	—
80-89 °F	6 lbs	72	50	30*	—	—
70-79 °F	8 lbs	96	65	35*	—	—
60-69 °F	12 lbs	144	95	50*	—	—
50-59 °F	12 lbs	144	95	—	50*	—
40-49 °F	12 lbs	144	95	—	—	50*

*In addition to the space concentration readings, you must take a commodity concentration reading. The minimum concentration reading for commodity reading is as follows: For 90-96 °F—10 oz.; for 80-89 °F—15 oz.; for 70-79 °F—20 oz.; for 60-69 °F—30 oz.; for 50-59 °F—30 oz.; and 40-49 °F—30 oz.

This fumigation schedule may be used, for example, on finely milled products and on material that is tightly packed or baled.

T403-e-2

Miscellaneous cargo (nonfood, nonfeed commodities) that is not sorptive or difficult to penetrate

Pest: Quarantine-significant pests other than insects



Important

This would include quarantine-significant snails of the families Helicarionidae, Streptacidae, Subulinidae, and Zonitidae, as well as other noninsect pests.

Treatment: T403-e-2—MB (“Q” label only) at NAP tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:			
		0.5 hr	2 hrs	24 hrs	48 hrs
40 °F or above	10 lbs	140	130	120	80

T403-f

Miscellaneous cargo (nonfood, nonfeed commodities)

Pest: *Pieris* spp. (cabbageworms—all life stages) and all other *Lepidoptera**. Also hitchiking insects, including non-*Lepidoptera*.

Treatment: T403-f—MB at NAP

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	3 hrs
70 °F or above	3 lbs	36	16
60-69 °F	3.5 lbs	40	19
50-59 °F	4 lbs	45	21
45-49 °F	4.5 lbs	49	24
40-44 °F	5 lbs	54	27



*A 3-hour exposure easily kills all Lepidopterous hitchhikers, including gypsy moth, and is preferred over using the much longer schedules that are aimed more at khapra beetles (T404-b-1 and T402-b-2). This schedule should not be used for mollusks (snails and slugs) or for any insect with cryptic habits (e.g., ants or borers), or for insects in diapause.

T404—Wood Products Including Containers¹

T404-b-5-1

Surface spray for the following pests: Borers (wood wasps, Anobiidae, Bostrichiadae, Cerambycidae, and Lyctidae), carpenter ants, and other wood infesting ants, carpenter bees and termites

Treatment: T404-b-5-1—Surface application

Refer to **Table 5-5-4** for a partial list of label-approved surfaces. Always refer to the manufacturer’s label for specific areas of use.

Active Ingredient ¹	Examples of Trade Names and EPA Registration Numbers (list not all inclusive) ²
Chlorpyrifos	Whitmire PT, Duraguard ME (#499-367)
Cypermethrin 25.3% a.i.	Demon® EC (#100-1004)

- 1 Apply at the highest rate allowed for the site and the pest on the label. (active ingredient = a.i.)
- 2 No endorsement is intended of the particular items listed and no discrimination is intended toward those products or companies that may not be listed. Use other formulations as long as the application method, site, and rate are listed on the label.

1 Use Treatment Schedule T404-d on page 5-5-20 for the fumigation of any bamboo products.

T404-a Wood products including containers

Pest: *Globodera rostochiensis* (golden nematode)

Treatment: T404-a—MB (“Q” label only) in 26" vacuum

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
40 °F or above	8 lbs	16 hrs
	10.5 lbs	12 hrs
	16 lbs	8 hrs

T404-b-2 Wood products including containers

Pest: Borers (wood wasps, carpenter ants, carpenter bees, and termites)

Treatment: T404-b-2—SF at NAP

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:						
		0.5 hr	2 hrs	4 hrs	12 hrs	16 hrs	24 hrs	32 hrs
70 °F or above	4 lbs	48	45	40	—	32	—	—
60-69 °F	4 lbs	48	45	40	36	—	32	—
50-59 °F	5 lbs	60	56	52	48	—	40	—
40-49 °F	6.5 lbs	76	71	66	60	—	52	—
OR	5 lbs	60	57	53	49	—	44	40



Do not use a filter containing sodium hydroxide (Ascarite[®]) with this fumigant.

Sulfuryl Fluoride (SF) is **NOT** an approved quarantine treatment for wood-boring beetles because SF has difficulty in penetrating insect eggs; therefore, many eggs will still hatch following fumigation. SF treatment of wood should be authorized only for brood-tending species of insects such as termites, bees, wasps, and ants. Even if all eggs are not killed, the hatching larvae will die of starvation, due to lack of care.

T404-b-1-1

Wood products including containers



An Ascarite[®] filter must be mounted on the T/C Analyzer when taking concentration readings for T404-b-1-1 treatment.

Three alternative treatments

Pest: See the pest list in [Table 5-5-2](#)

Treatment: T404-b-1-1—MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:			
		0.5 hr ¹	2 hrs ²	4 hrs	16 hrs ³
70 °F or above	3 lbs	36	30	27	25
40-69 °F	5 lbs	60	51	46	42

- 1 If the fumigation is conducted in a closed-door container, take the first reading at 1 hour instead of 0.5 hours.
- 2 If the fumigation is conducted in a closed-door container, take the second reading at 2.5 hours instead of 2 hours.
- 3 If the 4- and 16-hour readings would occur outside of normal working hours, then the fumigation may be extended to a total of 24 hours, instead of 16. In that case, the 24-hr minimum concentration reading would be 25 (for the initial 3-lb dosage), or 42 (for the initial 5-lb dosage).

Refer to [Table 5-5-1](#) for metric equivalents for T404-b-1-1.

Table 5-5-1 Metric Equivalents for T404-b-1-1

Temperature (°F)	Dosage Rate (lb/1000 ft ³)	Temperature (°C)	Dosage Rate (g/m ³)
70 or above	3	27 or above	48
40-69	5	5-20	80

T404-b-1-2

Wood products including containers

Pest: See the pest list in [Table 5-5-2](#)

Treatment: T404-b-1-2—MB in 26" vacuum

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
70 °F or above	4 lbs	4 hrs
40-69 °F	4 lbs	5 hrs

T404-b-4

Wood products including containers

Pest: See the pest list in [Table 5-5-2](#)

Treatment: T404-b-4—Kiln Sterilization

Dry bulb temperature (°F)	Wet bulb depression (°F)	Relative humidity (%)	Moisture content (%)	Thickness of lumber (inches)	Treatment Time After Kiln Reaches Conditions (hours)
140	7	82	13.8	1 i	3
				2	5
				3	7
130	16	60	9.4	1	10
				2	12
				3	14
125	15	61	9.7	1	46
				2	48
				3	50

Table 5-5-2 Pest list for T404-b-1-1, T404-b-1-2, and T404-b-4

<p>Coleoptera (beetles):</p> <ul style="list-style-type: none"> ◆ Bostrichidae (branch and twig borers) ◆ Buprestidae (metallic or flat-headed borers) ◆ Cerambycidae (long-horned or round-headed borers) ◆ Curculionidae (wood-boring and root-feeding weevils) ◆ Lyctidae (powder-post beetles) ◆ Lymexylonidae (ship timber beetles) ◆ Passalidae (bess beetles) ◆ Platypodidae (pin-hole borers) ◆ Rhizophagidae (root-eating beetles) ◆ Salpingidae (narrow-wasted bark beetles) ◆ Scolytidae (bark/engraver beetles; also ambrosia/timber beetles) ◆ Trogositidae (bark-gnawing beetles)
<p>Hymenoptera (bees, wasps, and ants):</p> <ul style="list-style-type: none"> ◆ Formicidae (carpenter ants) ◆ Orussidae (parasitic wood wasps) ◆ Siricidae (wood wasps) ◆ Syntexicae (incense-cedar wood wasps) ◆ Xylocopidae (carpenter bees) ◆ Xyphydriidae (wood wasps)
<p>Isoptera (termites)</p>
<p>Lepidoptera (moths):</p> <ul style="list-style-type: none"> ◆ Cossidae (carpenter worms) ◆ Sesiidae (clear-winged moths)



1. Minimum concentration must be met in chamber fumigations of sorptive materials. (Refer to [Sorption on page 2-3-10.](#))
2. For fumigating of hardboard (Masonite), an initial dosage of 10 lb/1,000 ft³ is recommended. Inspector should be prepared to provide extra attention to maintaining minimum concentrations when fumigating this commodity.
3. If both termites and borers are present at 40-69 °F, use the schedule for borers with exposure extended to 20 hours. Use same minimum concentrations.
4. Use an Ascarite filter (in addition to a Drierite filter) if any of the following conditions apply:
 - The wood is uncured (“green”).
 - The wood is manifested as guatamba wood.In the two cases above, water vapor or other gases may be evolved during the fumigation, which give false (additive) readings on the gas analyzer.
5. If the 4- and 16-hour readings would occur outside of normal working hours, then the fumigation may be extended to a total of 24 hours, instead of 16. In that case, the 24-hr minimum concentration reading would be 25 (for the initial 3-lb dosage), or 42 (for the initial 5-lb dosage).
6. When conducting the fumigation with the container doors **open**, resume use of fans anytime a difference of **4 oz.** or more occurs between the highest and lowest reading.
7. When conducting the fumigation with the container doors **closed**, resume use of fans anytime a difference of **10 oz.** or more occurs between the highest and lowest reading.
8. Readings more than 5 oz. below minimum at end of exposure negates treatment. For readings less than 5 oz. below minimum at the end of exposure period, add 2 oz/1,000 ft³ for each ounce below minimum and extend exposure for 4 hours.
9. A reduction in dosage is allowed when fumigating nonsorptive commodities such as marble, shells, metal containers, etc., which have infested crating associated with them providing the following additional conditions are met:
 - Use only new 4-mil or 6-mil tarpaulins.
 - No truck trailer, van, or railroad car fumigations are permitted unless the carrier is covered with a 6-mil tarpaulin which is then sealed to the ground.
 - Use five or more sampling leads to determine minimum concentrations.
10. When fumigating wood commodities (e.g., dunnage, crating, logs) the proper fumigation temperature may be determined by inserting the tip of a dial thermometer or other temperature probe in a hole in the wood. A hole can be made with an electric or hand-powered drill or an awl. The hole diameter should be just large enough to insert the probe shaft (to lessen the influence of surrounding air). The depth should be 2 inches or half the thickness of the wood. Different areas of the load should be probed and the lowest temperature used in determining fumigation temperature. Determine the wood temperature 5 to 10 minutes after drilling the hole to allow the heat generated during drilling to dissipate.

T404-c-1-1

Wood products including containers



If using a T/C analyzer, an Ascarite® filter must be mounted when taking concentration readings for T404-c-1-1.

Pest: Termites

Three alternative treatments:

Treatment: T404-c-1-1—MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:				
		0.5 hr	2 hrs	4 hrs	16 hrs	24 hrs
40 °F or above	3 lbs	36	30	27	25	24



Important

- ◆ Minimum concentration must be met in NAP chamber fumigations of sorptive materials. (see [Sorption](#) on [page 2-3-10](#) for a list of sorptive materials.)
- ◆ If both **termites** and **borers** are present at 40 °F–60 °F, use the schedule for borers with exposure extended to 20 hours. Use same minimum concentrations.

T404-c-1-2

Wood products including containers

Pest: Termites

Treatment: T404-c-1-2—MB in 26" vacuum

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
70 °F or above	4 lbs	3 hrs
40-69 °F	4 lbs	4 hrs

T404-c-2

Wood products including containers

Pest: Termites

Treatment: T404-c-2—SF at NAP (Do not use filters containing Ascarite with this fumigant.)

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:			
		0.5 hr	2 hrs	16 hrs	24 hrs
70 °F or above	1 lb	12	8	8	—
60-69 °F	1.5 lbs	18	12	—	8
50-59 °F	2.5 lbs	32	20	—	20

T404-d

Wood products including containers



If using a T/C Analyzer, an Ascarite® filter must be mounted when taking concentration readings for the following MB-NAP treatments.

Pest: Borers and *Trogoderma granarium* (khapra beetle)

Treatment: T404-d—MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:				
		0.5 hr ¹	2 hrs ²	4 hrs	16 hrs ³	24 hrs
80 °F or above	3.5 lbs	36	33	30	25	17
70-79 °F	4.5 lbs	50	45	40	25	22
60-69 °F ⁴	6 lbs	65	55	50	42	29
50-59 °F	7.5 lbs	80	70	60	42	36
40-49 °F ⁵	9 lbs	85	76	70	42	42

- 1 If the fumigation is conducted in a closed-door container, take the first reading at 1 hour instead of 0.5 hours.
- 2 If the fumigation is conducted in a closed-door container, take the second reading at 2.5 hour instead of 2 hours.
- 3 If the 16-hour reading is **not** performed, the 24-hour reading **must** have the following minimum concentrations: For 80 °F or above—25 oz.; for 70-79 °F—25 oz.; for 60-69 °F—42 oz; for 50-59 °F—42 oz; and 40-49 °F—42 oz.
- 4 Due to label restrictions, MB-100 gas may not be used at 60 °F or below.
- 5 MB Q-gas may be used at any temperature above 40 °F.

Refer to [Table 5-5-3](#) for metric equivalents for T404-d.

Table 5-5-3 Metric Equivalents for T404-d

Temperature (°F)	Dosage Rate (lb/1000 ft ³)	Temperature (°C)	Dosage Rate (g/m ³)
80 or above	3.5	27 or above	56
70-79	4.5	21-26	72
60-69	6	16-20	96
50-59	7.5	10-15	120
40-49	9	5-9	144

When fumigating containerized bamboo:

- ◆ If the bamboo is packaged, the packaging must be permeable to methyl bromide. If it is not permeable, require the fumigator to remove or puncture the packaging.

- ◆ Bamboo **must be on pallets** or have at least 2 inches (") of clearance at the bottom of the container. If the bamboo is being fumigated in a refrigerated container, the 2" clearance **cannot** be created by the I-beam floor of the container, the bamboo bundles, or by steel poles.



Photo Courtesy of USDA APHIS PPQ

Figure 5-5-1 Example of Inadequate Spacing Under Bamboo Bundles



Photo Courtesy of USDA APHIS PPQ

Figure 5-5-2 Example of Inadequate Spacing Under Bamboo Bundles

- ◆ There must be at least 18" of clearance on the top of the commodity to allow for gas circulation and introduction fans.



Figure 5-5-3 Example of Adequate Space Above the Bamboo Bundles

Partial Site List for Chemical Treatments

Always refer to the manufacturer’s label for specific areas of use. **Table 5-5-4** is **not** all-inclusive and is intended as a quick reference for PPQ officials. The label of the chemical you are using must list the site you want to treat.

Table 5-5-4 Partial Site List

Active Ingredient	Partial Site List
Deltamethrin	Food/feed and non-food/non-feed areas of: aircraft (cargo only), apartment buildings, bakeries, bottling facilities, breweries, buses, cafeterias, candy plants, canneries, dairy product processing plants, food manufacturing plants, food processing plants, food service establishments, granaries and grain mills, hospitals, hotels, houses, industrial buildings, installations, kitchens, laboratories, mausoleums, meat, poultry, and egg processing and packaging plants, mobile and motor homes, nursing homes, offices, railcars, restaurants, schools, ships and vessels, trailers, trucks, warehouses, wineries
Chlorpyrifos	Indoors, pet kennels, general surface application, barrier application, spot or crack and crevice applications, general outdoor treatment, perimeter treatments, turf grass, ornamentals, commercial ornamentals, greenhouses, and nurseries
β-Cyfluthrin	Food/feed and non-food/non-feed areas of: aircraft (cargo only), apartment buildings, bakeries, bottling facilities, breweries, buses, cafeterias, candy plants, canneries, dairy product processing plants, food manufacturing plants, food processing plants, food service establishments, granaries and grain mills, hospitals, hotels, houses, industrial buildings, installations, kitchens, laboratories, mausoleums, meat, poultry, and egg processing and packaging plants, mobile and motor homes, nursing homes, offices, outdoor pest control, perimeter spray, railcars, restaurants, schools, ships and vessels, trailers, trucks, warehouses, wineries
Cyfluthrin	In and around buildings and structures; on residential, commercial and recreational areas of turf; on ornamentals in landscapes and interior plantscapes; modes of transport; wood infesting pests; apartments, calf hutches, calving pens and parlors, campgrounds, empty chicken houses, dairy areas, dog kennels, food storage areas, grain mills, granaries, hog barns, homes, horse barns, hospitals, hotels, meat packing plants, food processing plants, milkrooms, motels, nursing homes, rabbit hutches, resorts, restaurants and other food handling establishments, schools, supermarkets, transportation equipment (buses, boats, ships, trains, trucks, planes-cargo area only), utilities, warehouses, commercial and industrial buildings
Cypermethrin	Buildings and structures and immediate surroundings, modes of transport, industrial buildings, houses, apartment buildings, laboratories, buses, greenhouses, and nonfood/feed areas of stores, warehouses, vessels, railcars, trucks, trailers, aircraft (cargo areas only), schools, nursing homes, hospitals (non patient areas), restaurants, hotels and food manufacturing, processing, and servicing establishments, outdoor surfaces, barrier treatment, treatment of preconstruction lumber and logs
Lambda-Cyhalothrin	Perimeter treatments, indoor and outdoor treatments, aircraft (cargo and other noncabin areas only), apartment buildings, boiler rooms, buses, closets, correctional facilities, decks, entries, factories, fencing, floor drains (that lead to sewers), food granaries, food grain mills, food manufacturing, processing and serving establishments; furniture, garages, garbage rooms, greenhouses (non-commercial), hospitals, hotels and motels; houses, industrial buildings, laboratories, livestock/poultry housing, landscape vegetation, locker rooms, machine rooms, mausoleums, mobile homes, mop closets, mulch, nursing homes, offices, patios, pet kennels, porches, railcars, restaurants, storage rooms, schools, sewers (dry), stores, trailers, trees, trucks, utility passages, vessels, vestibules, warehouses, wineries and yards
Malathion	Perimeter barrier treatments, outdoor surfaces, ornamentals, turf, mushroom houses, grain elevators and silos being prepared to store barley, corn, oats, rye, or wheat

T404-e—Approved marking for regulated wood packing material

The wood packing material² must be stamped in a visible location on each article, with a legible and permanent mark that indicates the article has met the treatment required. The mark must be approved by the International Plant Protection Convention (IPPC). The currently approved mark is shown in [Figure 5-5-4](#). XX would be replaced by the country code, 000 by the producer number, and YY by the treatment type (HT or MB).

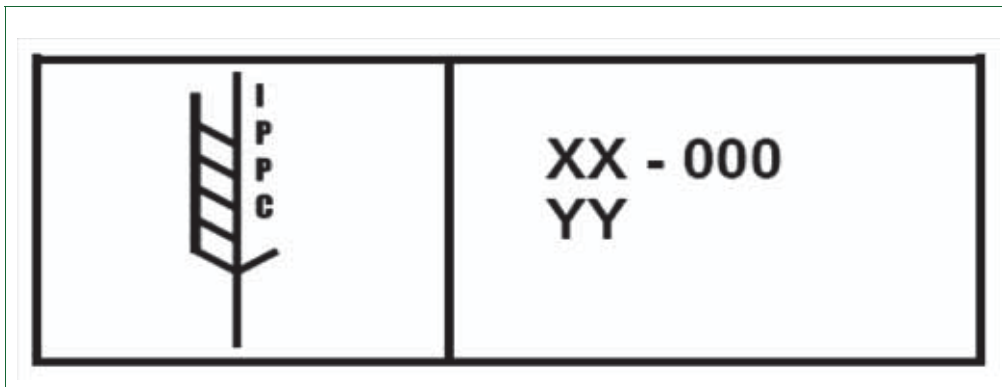


Figure 5-5-4 Example of International Plant Protection Convention Marking

T404-e-1

Regulated wood packing material (WPM)

Two alternative treatments

Pest: Various

Treatment: T404-e-1—MB at NAP—tarpaulin

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:				
		0.5 hr ¹	2 hrs ²	4 hrs	16 hrs	24 hrs
69.8 °F or above	3 lbs	36	36	31	28	24
61°-69.8 °F	3.5 lbs	42	42	36	32	28
51.8°-61 °F	4 lbs	48	48	42	36	32

- 1 If the fumigation is conducted in a closed-door container, take the first reading at 1.0 hour instead of 0.5 hours.
- 2 If the fumigation is conducted in a closed-door container, take the second reading at 2.5 hour instead of 2 hours.

- 2 Regulated wood packing material is defined as all types of wood packaging materials used for or for use with cargo to prevent damage, including, but not limited to, dunnage, crating, pallets, packing blocks, drums, cases, and skids. Excluded from the definition of wood packaging materials are:
 - ◆ Pieces of wood that are less than 6mm or 0.24 inches in any dimension
 - ◆ Loose wood packing materials, such as wood shavings, excelsior, etc.
 - ◆ Processed wood packing materials that have received more than primary processing, such as plywood, corrugated board, fiberboard, veneer, whiskey and wine barrels, oriented strand boards, etc.

Refer to [Table 5-5-5](#) for metric equivalents for T404-e-1.

Table 5-5-5 Metric Equivalents for T404-e-1

Temperature (°F)	Dosage Rate (lb/1000 ft ³)	Temperature (°C)	Dosage Rate (g/m ³)
69.8 or above	3	21 or above	48
61-69.8	3.5	16-20.9	56
51.8-61	4	11-15.9	64

T404-e-2

Regulated wood packing material (WPM)

Pest: Various

Treatment: T404-e-2

Heat treatment to achieve a minimum core temperature of 56 °C (132.8 °F) for a minimum of 30 minutes. Treatments must be conducted in USDA-approved facilities. Contact CPHST-AQI in Raleigh, NC for facility specifications.

T404-f

***Pinus radiata* wood chips from Chile and *Eucalyptus* wood chips from South America**

Treatment: T404-f—Surface Pesticide

Refer to [Table 5-5-6](#) for the chemical name and percentage of active ingredients. Spray the wood chips with the pesticide mixture so that all the chips are completely exposed to the chemicals. To prevent against infestation by plant pests, safeguard the wood chips during the interval between treatment and export.

Table 5-5-6 Pesticide Treatment for *Pinus radiata* and *Eucalyptus* Wood Chips

Percentage of Active Ingredient (a.i.)	Pesticide
64.8	didecyl dimethyl ammonium chloride
7.6	3-iodo-2-propynyl butylcarbamate
44.9	chlorpyrifos phosphorothioate

T405—Bags and Bagging Material

See T306 schedules

T406—Golden Nematode Contaminations

T406-a Miscellaneous cargo (nonfood, nonfeed commodities)

Pest: *Globodera rostochiensis* (golden nematode)

Treatment: T406-a—MB in 26" vacuum, use T403-c

T406-c Piers, barges, railroad cars, automobiles, used farm equipment, etc.

Pest: *Globodera rostochiensis* (golden nematode)

Treatment: T406-c—Steam Cleaning

Steam at high pressure until all soil is removed. Treated surfaces should be thoroughly wet and heated. The debris and/or runoff from the cleaning procedure must be handled in a manner approved by local and port authority guidelines.

T406-b Used farm equipment, construction equipment, containers, etc.

Pest: *Globodera rostochiensis* (golden nematode)

Treatment: T406-b—MB (“Q” label only) at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/ 1,000 ft ³)	Minimum Concentration Readings (ounces) At:		
		0.5 hr	2 hrs	24 hrs
60 °F or above	15 lbs	180	120	120



Soil should be easily crumbled but not wet. The soil should not exceed 12 inches in the smallest dimension.

T406-d

Used farm equipment (without cabs), construction equipment (without cabs), and used containers

Pest: *Globodera rostochiensis* (golden nematode)

Treatment: T406-d—Steam at NAP—tarpaulin, or tent

Steam heat for 60 minutes after all temperature sensors reach 140°F (60°C).
(see sensor placement and other requirements below)



This treatment must be conducted under the following minimum ambient air temperatures, which will vary with the volume of the treatment enclosure:

- ◆ For treatment enclosures of 4,000 ft³ or less, the minimum air temperature is 40 °F.
- ◆ For treatment enclosures greater than 4,000 ft³ and less than or equal to 6,000 ft³, the minimum air temperature is 60 °F.

This treatment is not recommended for treatment enclosures greater than 6,000 ft³.

Step 1—Determine if the temperature and volume requirements can be met

If you cannot meet the temperature and enclosure volume requirements, do not use this treatment.

Step 2—Assemble articles to be treated

Articles to be treated should be placed as close together as possible. Arrange articles to allow space for placement of the steam distribution manifold.

Step 3—Place the steam distribution manifold pipe beneath articles to be treated

The steam distribution manifold should be assembled and placed beneath the articles to be treated in order to facilitate steam distribution. A flexible steam introduction hose, approximately 20 feet in length, connects the steam generator to a 10 foot long U-shaped pipe capped at the ends, with 0.5 inch holes every 12 inches. This pipe serves as the steam distribution manifold.

Step 4—Place temperature recording sensors on the article to be treated

When the treatment is being conducted in enclosures 4,000 ft³ or less, use at least four temperature recording sensors in addition to the sensor on the steam generator. Place sensors in hard-to-treat cracks or crevices on the equipment or containers. Position sensors in the following locations:

1. Front high—near the top of the front of the equipment or load

Enclosures of 4,000 ft³ or less

2. Center middle—midway from the top and bottom of the center of the equipment or load
3. Center bottom—bottom of the center of the equipment or load, but at least 3 inches above the floor if the equipment is flush with the floor
4. Rear bottom—bottom of the rear of the equipment, but at least 3 inches above the floor if the equipment is flush with the floor

**Enclosures
greater than
4,000 ft³ and less
than or equal to
6,000 ft³**

When the treatment is being conducted in enclosures greater than 4,000 ft³ and less than or equal to 6,000 ft³, use at least eight temperature recording sensors in addition to the sensor on the steam generator. Again, place sensors in hard-to-treat cracks or crevices on the equipment or containers. Position probes in the following locations:

1. Front high—near the top of the left side of the front of the equipment or load
2. Front low—bottom of the right side of the front of the equipment or load, but at least 3 inches above the floor if the equipment is flush with the floor
3. Center high—near the top of the center of the equipment or load on the right side
4. Center middle—midway from the top and bottom of the center of the equipment or load
5. Center low—bottom of the center of the equipment or load on the left side, but at least 3 inches above the floor if the equipment is flush with the floor
6. Rear high—near the top of the rear of the equipment on the right side
7. Rear middle—midway from the top and bottom of the rear of the equipment
8. Rear low—bottom of the rear of the equipment or load on the left side, but at least 3 inches above the floor if the equipment is flush with the floor.

Step 5—Enclose the article to be treated with a tarpaulin or tent

If a tarpaulin (6 mil plastic) is used instead of a tent, pad sharp edges of the equipment or containers before covering with the tarp.

If the equipment or containers will be moved into an enclosure, such as a tent, it may be more practical to place the temperature sensors after this step. In either case, the front of the equipment or load and the front of the enclosure should face in the same direction.

Step 6—Place the steam generator at an open end of the enclosure and seal the enclosure

The steam generator is placed approximately 20 feet from the front of the enclosure and connected to a steam introduction line (hose.) The steam introduction line is connected to the steam distribution manifold pipe which is situated under the articles to be treated. The enclosure is sealed at the base including the point at which the introduction line enters the enclosure. An airtight seal is not essential for steam treatment; therefore small pinholes are acceptable.

Step 7—Steam heat the enclosure for 60 minutes after all temperature sensors reach a minimum 140°F (60°C)



Use only a steam generator approved by APHIS.

The maximum temperature in the enclosure should not exceed 160°F (71°C).

The temperature should be recorded once every 2 minutes during the treatment.

T407—Mechanical Cotton Pickers and Other Cotton Equipment

T407

Mechanical cotton pickers and other cotton equipment

Pest: *Pectinophora gossypiella* (pink bollworm)

Treatment: T407—MB (“Q” label only) at NAP—tarpaulin, chamber, railroad car, or van

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:				
		0.5 hr	2 hrs	3 hrs	4 hrs	12 hrs
40 °F or above	4 lbs	48	—	—	—	21
	8 lbs	96	—	64	—	—



This treatment is designed to kill exposed larvae, larvae within green cotton bolls or single locks of seed cotton, or loose trash. Any materials such as sacked or bulked seed, cotton waste, lint, linters, or any packaged commodity shall be treated in accordance with T301.

T408—Soil as Such and Soil Contaminating Durable Commodities

T408-e-1 Herbarium specimens of mosses and liverworts in soil and originating in golden nematode-free countries

Pest: (Precautionary)

Treatment: T408-e-1—MB (“Q” label only) in 26" vacuum (Precautionary fumigation)

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
70 °F or above	2 lbs	3.5 hrs

T408-e-2 Herbarium specimens of mosses and liverworts in soil and originating in golden nematode-free countries

Pest: *Globodera rostochiensis* (golden nematode)

Treatment: T408-e-2—MB (“Q” label only) in 26" vacuum

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
40 °F or above	8 lbs	16 hrs
	10.5 lbs	12 hrs
	16 lbs	8 hrs

T408-a

Soil as such

Two alternative treatments

Pest: Various pests and pathogens found in soil (including striga)

Treatment: T408-a—Dry heat

Temperature	Exposure Period
230 °F to 249 °F	16 hours
250 °F to 309 °F	2 hours
310 °F to 379 °F	30 minutes
380 °F to 429 °F	4 minutes
430 °F to 450 °F	2 minutes

Spread soil evenly throughout the treatment chamber. Soil depth **must not** exceed 6 inches. Take temperature readings using a calibrated temperature probe at various locations throughout the entire mass. The exposure period does not begin until the entire mass reaches treatment temperature, as verified by a calibrated temperature probe.



Contact CPHST AQI Raleigh for information regarding placement and number of temperature probes.

T408-b

Soil as such

Pest: Various pest and pathogens found in soil

Treatment: T408-b—Steam—250 °F at 15 lbs pressure (p.s.i.) for 0.5 hour

Preheat laboratory autoclaves. Restrict soil depth to 2 inches when treating quantities of soil in trays. Restrict each package weight to 5 lbs. or less when treating individual packages. Load with adequate spacing. Large commercial steam facilities which operate at pressures up to 60 lbs. psi will permit treatment of greater soil depth.

T408-b-1

Soil contaminating durable commodities (e.g., equipment, cobblestone, marble)

Pest: Various pests and pathogens found in soil

Treatment: Steam Cleaning

Steam at high pressure until all soil is removed. Treated surfaces should be thoroughly wet and heated. The debris and/or runoff from the cleaning procedure must be handled in a manner approved by local and port authority guidelines.

T408-c-1

Soil as such

Two alternative treatments

Pest: *Globodera rostochiensis* (golden nematode)

Treatment: T408-c-1—MB (“Q” label only) in 26" vacuum,
see **T403-c** on **page 5-5-11** for loose and friable material only.

Soil to be fumigated in containers—no dimensions of which can exceed 24 inches.

T408-c-2

Soil as such

Pest: *Globodera rostochiensis* (golden nematode)

Treatment: T408-c-2—MB (“Q” label only) at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/ 1,000 ft ³)	Minimum Concentration Readings (ounces) At:		
		0.5 hr	2 hrs	24 hrs
60 °F or above	15 lbs	180	120	72



Soil should be friable, moist, but not wet. Soil must not be more than 12 inches in depth. If stacked in containers, 12 inches of space must be left between levels.

T408-d-1

Soil as such

Two alternative treatments

Pest: Insects

Treatment: T408-d-1—Screening through 16 mesh screens will remove most larvae and pupae, except smaller types.

T408-d-2

Treatment: T408-d-2—Freezing—0 °F for 5 days

T408-f

Soil contaminated durable commodities (e.g., equipment, cobblestone, marble)(precautionary treatment)

Pest: Soil fungi, nematodes, and certain soil insects

Treatment: T408-f—Steam Cleaning

Steam at high pressure until all soil is removed. Treated surfaces should be thoroughly wet and heated.

The debris and/or runoff from the cleaning procedure must be handled in a manner approved by local and port authority guidelines.

T408-g-1

Soil contaminated nonfood or nonfeed commodities

Two alternative treatments

Pest: *Striga* spp. (witchweed)

Treatment: T408-g-1—MB (“Q” label only) (tarpaulin)

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
60 °F or above	10 lbs	24 hrs
	20 lbs	15.5 hrs

T408-g-2

Soil contaminated nonfood or nonfeed commodities

Pest: *Striga* spp. (witchweed)

Treatment: T408-g-2—MB (“Q” label only) (tarpaulin)

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:		
		0.5 hr	2 hrs	24 hrs
60 °F or above	15 lbs	164	120	72



Soil must be friable, moist, but not wet. The soil shall not exceed 12 inches in least dimension.

T409—Aircraft

Refer to the Chemical Treatments section for *Aerosols on page 2-12-1* for application information.

The aircraft volumes in *Table 5-5-7* on **page 5-5-36** through *Table 5-5-29* on **page 5-5-46** represent standard configurations of aircraft. Check with the captain or contact the following manufacturers to determine if the aircraft has been modified from the standard configuration and determine the actual volume.

Airbus Industries of North America, Inc.

Website: <http://www.airbus.com/en/corporate/>

Boeing (includes McDonald Douglas aircraft)

Website: <http://www.boeing.com>

European Aeronautic Defense and Space Company-EADS (merger of Aerospatiale, Daimler Chrysler Aerospace, and Casa)

Web site: <http://www.eads.com>

T409-a

Aircraft

Pest: *Trogoderma granarium* (khapra beetle)

Treatment: T409-a—General surface, perimeter, spot, mist, or crack and crevice using Deltamethrin 4.75% a.i.

The yellow color of this treatment indicates that the authority to conduct the treatment comes from an emergency action required by PPQ in order to mitigate the pest risk. The emergency action is pending final regulatory approval

Active Ingredient ¹	Examples of Trade Names and EPA Registration Numbers (list not all inclusive) ²
Deltamethrin 4.75% a.i.	Suspend SC, K-Othrine® SC (#432-763) D-FENSE SC, Delta SC (#53883-276)

- 1 Apply at the highest rate allowed for the site on the label. (active ingredient = a.i.) Follow application instructions on the label.
- 2 No endorsement is intended of the particular items listed and no discrimination is intended toward those products or companies that may not be listed. Use other formulations provided the application method, site, and rate are listed on the label.

T409-b

Aircraft

Pest: Hitchhiking insect pests, except khapra beetle

Two alternative treatments—T409-b-1 and T409-b-3.



No endorsement is intended of the particular items listed and no discrimination is intended toward those products or companies that may not be listed. Use other formulations provided the application method, site, and rate are listed on the label.



Do not subject these chemicals to extreme temperatures.

Refer to **Table 5-5-7** through **Table 5-5-29** for spray times of a variety of commercial aircraft. If the aircraft you are treating is not listed, refer to the formula in **Figure 2-12-1 on page-2-12-2** to calculate the spray time.

T409-b-1

Treatment: T409-b-1—d-phenothrin aerosol (10 percent) (EPA reg# 10308-21)



10% d-phenothrin is **not** approved for use in California, **except** in Federal installations such as military airports.

Application Rate (g/1000 ft ³)	Spray Rate (g/sec)	Turn off ventilation system and seal the cargo space for (x) minutes	Ventilate the space for (x) minutes
8	5 ¹	15 minutes	15 - 30

1 To control the spray time within smaller spaces, use the red extender tube on the nozzle of the aerosol can. When the extender tube is used, the spray rate is 2.5 grams per second.



Aerosol disinfestation of U.S. military aircraft must conform to requirements in the "DEPARTMENT OF DEFENSE CUSTOMS AND BORDER CLEARANCE POLICIES AND PROCEDURES" DoD 4500.9-R (Defense Transportation Regulation Part V).

T409-b-2

This is a placeholder for a future treatment.

T409-b-3

Treatment: T409-b-3—2% d-phenothrin + 2% permethrin (EPA reg# 83795-1—Callington 1-Shot™)



Do **not** apply in the passenger cabin area of the aircraft or when passengers or crew are present.

The yellow color of this treatment indicates that the authority to conduct the treatment comes from an emergency action required by PPQ in order to mitigate the pest risk. The emergency action is pending final regulatory approval.

Application Rate (g/1000 ft ³)	Spray Rate (g/sec)	Turn off ventilation system and seal the cargo space for (x) minutes	Ventilate the space for (x) minutes
40	2	15 minutes	30

Table 5-5-7 Airbus Industries

Aircraft, model, and series	Area	Volume ft ³	1,000 ft ³ Units	Aerosol Calculations	
				T409-b-1 Spray Time in Seconds	T409-b-3 Cans/ Spray Time in Seconds
A300	Cabin	27,100	27.1	43.5	7 cans + 17 sec
	Pit-#1	3,722	3.7	6.0	1 can
	Pit-#2	1,265	1.3	2.0	26 sec
	Pit-#3	565	0.6	1.0	12 sec
A300-600R (passenger) (long-range)	Cabin	?	?	?	?
	Forward	1,134	1.1	2.0	22 sec
	Aft	1,134	1.1	2.0	22 sec
	Bulk	400	0.4	0.5	8 sec
A300-600 (freighter)	Main	9,950	10.0	16.0	2 cans + 50 sec
	Pit-Fwd	1,900	1.9	3.0	38 sec
	Pit-Aft	2,250	2.2	3.5	44 sec
A300-600 (FEDEX)	Main	19,069	19.1	30.5	5 cans + 7 sec
	Pit-Fwd	2,684	2.7	4.5	54 sec
	Pit-Aft	2,154	2.2	3.5	44 sec
	Pit-Back	742	0.7	1.0	14 sec
A300 (convertible)	Main	11,943	11.9	19.0	3 cans + 13 sec
A300B4 (freighter)	Main	9,950	10.0	16.0	2 cans + 50 sec
	Pit-Fwd	1,900	1.9	3.0	38 sec
	Pit-Aft	1,850	1.9	3.0	38 sec
A310 (freighter)	Main	7,950	8.0	13.0	2 cans + 10 sec
	Pit-Fwd	1,260	1.3	2.0	26 sec
	Pit-Aft	1,550	1.6	2.5	32 sec
A310 (FEDEX)	Main	14,650	14.7	23.5	3 cans + 69 sec
	Pit-Fwd	1,942	1.9	3.0	38 sec
	Pit-Aft	1,271	1.3	2.0	26 sec
	Pit-Back	742	0.7	1.0	14 sec
A320-200 (passenger)	N/A	982	0.9	1.5	18 sec

Table 5-5-8 Antonov

Aircraft, model, and series	Area	Volume ft ³	1,000 ft ³ Units	Aerosol Calculations	
				T409-b-1 Spray Time in Seconds	T409-b-3 Cans/ Spray Time in Seconds
AN 124 and 126	N/A	26,485	26.5	42.5	7 cans + 5 sec

Table 5-5-9 ATR

Aircraft, model, and series	Area	Volume ft ³	1,000 ft ³ Units	Aerosol Calculations	
				T409-b-1 Spray Time in Seconds	T409-b-3 Cans/ Spray Time in Seconds
ATR 42 (CTO) (Container Transport Option)	Bulk	890	0.9	1.5	18 sec
ATR 72 (CTO)	Bulk	1,285	1.3	2.0	26 sec

Table 5-5-10 BAC (British Aircraft Corp)

Aircraft, model, and series	Area	Volume ft ³	1,000 ft ³ Units	Aerosol Calculations	
				T409-b-1 Spray Time in Seconds	T409-b-3 Cans/ Spray Time in Seconds
111-200, 300, and 400	Cabin	4,056	4.1	6.5	1 can + 7 sec
	Pit-Fwd	380	0.4	0.5	8 sec
	Pit-Aft	154	0.2	0.5	4 sec
111-500	Cabin	5,094	5.1	8.0	1 can + 27 sec
	Pit-Fwd	451	0.5	1.0	10 sec
	Pit-Aft	260	0.3	0.5	6 sec
VC 10	Cabin	6,750	6.8	11.0	1 can + 61 sec
	Pit-Fwd	744	0.7	1.0	14 sec
	Pit-Aft	820	0.8	1.5	16 sec
Super VC 10	Cabin	7,850	7.9	12.5	2 cans + 8 sec
	Pit-Fwd	744	0.7	1.0	14 sec
	Pit-Aft	820	0.8	1.5	16 sec

Table 5-5-11 BAC (Aerospatiale)

Aircraft, model, and series	Area	Volume ft ³	1,000 ft ³ Units	Aerosol Calculations	
				T409-b-1 Spray Time in Seconds	T409-b-3 Cans/ Spray Time in Seconds
Concorde	Cabin	5,100	5.1	8.0	1 can + 27 sec
	Pit-Fwd	241	0.2	0.5	10 sec
	Pit-Aft	468	0.5	1.0	20 sec

Table 5-5-12 Boeing

Aircraft, model, and series	Area	Volume ft ³	1,000 ft ³ Units	Aerosol Calculations	
				T409-b-1 Spray Time in Seconds	T409-b-3 Cans/ Spray Time in Seconds
707-120, 120B, and 220	Cabin	7,484	7.5	12.0	2 cans
	Pit-Fwd	755	0.8	1.5	16 sec
	Pit-Aft	910	0.9	1.5	18 sec
	Fl.Deck	451	0.5	1.0	10 sec
707-320C	Bulk	7,548	7.5	12.0	2 cans
707-320, 420	Cabin	8,074	8.0	13.0	10 sec
	Pit-Fwd	870	0.9	1.5	18 sec
	Pit-Aft	905	0.9	1.5	18 sec
	Fl. Deck	451	0.5	1.0	10 sec
720	Cabin	6,860	6.9	11.0	1 can + 63 sec
	Pit-Fwd	688	0.7	1.0	14 sec
	Pit-Aft	690	0.7	1.0	14 sec
	Fl. Deck	451	0.5	1.0	10 sec
727-100C	Bulk	4,168	4.2	7.0	1 can + 9 sec
727-100 (passenger)	Cabin	4,560	4.6	7.5	1 can + 17 sec
	Pit-Fwd	900	0.9	1.5	17 sec
	Pit-Aft	425	0.4	0.5	18 sec
	Fl. Deck	451	0.5	1.0	10 sec
727-200C	Bulk	8,032	8.0	13.0	2 cans + 10 sec
727-200 (passenger)	Cabin	6,561	6.6	10.5	1 can + 57 sec
	Pit-Fwd	690	0.7	1.0	14 sec
	Pit-Aft	760	0.8	1.5	16 sec
	Fl. Deck	451	0.5	1.0	10 sec
737-100	Cabin	4,636	4.6	7.5	1 can + 17 sec
	Pit-Fwd	280	0.3	0.5	6 sec
	Pit-Aft	406	0.4	0.5	8 sec
737-200 (passenger)	Cabin	4,636	4.6	7.5	1 can + 17 sec
	Pit-Fwd	370	0.4	0.5	8 sec
	Pit-Aft	505	0.5	1.0	10 sec
737-200C	Bulk	3,602	3.6	6.0	1 can
737-300	Cabin	4,900	4.9	8.0	1 can + 23 sec
	Pit-Fwd	425	0.4	1.0	8 sec
	Pit-Aft	650	0.7	1.0	14 sec
	Fl. Deck	225	0.3	0.5	6 sec
737-400	Cabin	5,600	5.6	9.0	1 can + 37 sec
	Pit-Fwd	600	0.6	1.0	12 sec
	Pit-Aft	770	0.8	1.5	16 sec
	Fl. Deck	225	0.2	0.5	4 sec
737-500	Cabin	4,340	4.3	7.0	1 can + 11 sec
	Pit-Fwd	290	0.3	0.5	6 sec
	Pit-Aft	535	0.5	1.0	10 sec
	Fl. Deck	255	0.3	0.5	6 sec
747 Combi	—	6,886	6.9	11.0	1 can + 63 sec
747F	—	22,952	23.0	37.0	6 cans + 10 sec

Table 5-5-12 Boeing (continued)

Aircraft, model, and series	Area	Volume ft ³	1,000 ft ³ Units	Aerosol Calculations	
				T409-b-1 Spray Time in Seconds	T409-b-3 Cans/ Spray Time in Seconds
747-100, 200	Cabin	27,650	27.7	44.5	7 cans + 29 sec
	Pit-Fwd	3,485	3.5	6.0	70 sec
	Pit-Aft	3,015	3.0	5.0	60 sec
	Fl. Deck	920	0.9	1.5	18 sec
	U. Deck	1,370	1.4	2.0	28 sec
	Belly	1,000	1.0	1.5	20 sec
747-300,400	Cabin	27,650	27.7	44.5	7 cans + 29 sec
	Pit-Fwd	3,485	3.5	5.5	70 sec
	Pit-Aft	3,015	3.0	5.0	60 sec
	Fl. Deck	920	0.9	1.5	18 sec
	U. Deck	2,800	2.8	4.5	56 sec
	Belly	1,000	1.0	1.5	20 sec
757-200 (passenger)	Pit-Fwd	652	0.6	1.0	12 sec
	Pit-Aft	1,086	1.1	2.0	22 sec
757-200PF	Bulk	8,405	8.4	13.5	2 cans + 18 sec
767-200	Main	14,255	14.3	23.0	3 cans + 61 sec
	Pit-Fwd	1,470	1.5	2.5	30 sec
	Pit-Aft	1,470	1.5	2.5	30 sec
767-300 (passenger)	Cabin	10,497	10.5	17.0	2 cans + 60 sec
	Pit-Fwd	1,920	1.9	3.0	38 sec
	Pit-Aft	1,680	1.7	2.5	34 sec
	Aft+Bulk	430	0.4	0.5	8 sec
777-200	Cabin	20,700	20.7	33.0	5 cans + 39 sec
	Pit-Fwd	280	0.3	0.5	6 sec
	Pit-Aft	4,630	4.6	7.5	1 can + 17 sec
	Aft+Bulk	4,220	4.2	6.5	1 can + 9 sec

Table 5-5-13 Canadair

Aircraft, model, and series	Area	Volume ft ³	1,000 ft ³ Units	Aerosol Calculations	
				T409-b-1 Spray Time in Seconds	T409-b-3 Cans/ Spray Time in Seconds
CL-44	Bulk	6,235	6.2	10.0	1 can + 49 sec
CL-440	Bulk	13,798	13.8	22.0	3 cans + 51 sec

Table 5-5-14 Casa

Aircraft, model, and series	Area	Volume ft ³	1,000 ft ³ Units	Aerosol Calculations	
				T409-b-1 Spray Time in Seconds	T409-b-3 Cans/ Spray Time in Seconds
C-212	N/A	777	0.8	1.5	16 sec
ATR 72 (CTO)	N/A	1,528	1.5	2.5	30 sec

Table 5-5-15 Cessna

Aircraft, model, and series	Area	Volume ft ³	1,000 ft ³ Units	Aerosol Calculations	
				T409-b-1 Spray Time in Seconds	T409-b-3 Cans/ Spray Time in Seconds
Caravan	N/A	452	0.5	1.0	10 sec

Table 5-5-16 Convair

Aircraft, model, and series	Area	Volume ft ³	1,000 ft ³ Units	Aerosol Calculations	
				T409-b-1 Spray Time in Seconds	T409-b-3 Cans/ Spray Time in Seconds
240	Cabin	1,650	1.7	2.5	34 sec
	Pit-Fwd	193	.2	0.5	4 sec
	Belly	88	.1	--- ¹	2 sec
340 & 44-	Cabin	1,816	1.8	3.0	36 sec
	Pit-Fwd	158	0.2	0.5	4 sec
	Pit-Aft	193	0.2	0.5	4 sec
	Belly	78	0.1	--- ¹	2 sec
880 & 800M	Cabin	5,802	5.8	9.5	1 can + 41 sec
	Pit-Fwd	415	0.4	0.5	8 sec
	Pit-Aft	488	0.5	1.0	10 sec
990	Cabin	6,336	6.3	10.0	1 can + 51 sec
	Pit-Fwd	488	0.5	1.0	10 sec
	Pit-Aft	497	0.5	1.0	10 sec

1 In these small volume spaces, use the extender and calculate the application time using a rate of 2.5 grams per second. At a rate of 2.5 grams per second, the following table will give the spray time:

1,000 ft³ Units Spray Time in Seconds

- 0.10.5
- 0.20.5
- 0.31.0
- 0.41.5

Table 5-5-17 de Havilland

Aircraft, model, and series	Area	Volume ft ³	1,000 ft ³ Units	Aerosol Calculations	
				T409-b-1 Spray Time in Seconds	T409-b-3 Cans/ Spray Time in Seconds
Dash 7, Series 100 (all cargo)	N/A	240	0.2	0.5	4 sec
DHC-6 Twin	Fwd	38	0.1	--- ¹	2 sec
Otter, Series 300 (cargo version)	Aft	88	0.1	--- ¹	2 sec
	Bulk	384	0.4	0.5	8 sec
Dash 7, Series 100, Combi (50 passengers)	N/A	240	0.2	0.5	4 sec

Table 5-5-17 de Havilland (continued)

Aircraft, model, and series	Area	Volume ft ³	1,000 ft ³ Units	Aerosol Calculations	
				T409-b-1 Spray Time in Seconds	T409-b-3 Cans/ Spray Time in Seconds
Dash 7, Series 100, Combi (18 passengers)	N/A	240	0.2	0.5	4 sec
Dash 8, Series 300, Combi (49 passengers)	N/A	400	0.4	0.5	8 sec
Dash 8, Series 100, Combi (37 passengers)	N/A	300	0.3	0.5	6 sec
Dash 8, Series 100, Combi (20 passengers)	N/A	775	0.8	1.5	16 sec

1 In these small volume spaces, use the extender and calculate the application time using a rate of 2.5 grams per second. At a rate of 2.5 grams per second, the following table will give the spray time:

1,000 ft³ Units Spray Time in Seconds

0.10.5
0.20.5
0.31.0
0.41.5

Table 5-5-18 Dornier

Aircraft, model, and series	Area	Volume ft ³	1,000 ft ³ Units	Aerosol Calculations	
				T409-b-1 Spray Time in Seconds	T409-b-3 Cans/ Spray Time in Seconds
228-212	N/A	642	0.6	1.0	12 sec

Table 5-5-19 Embraer

Aircraft, model, and series	Area	Volume ft ³	1,000 ft ³ Units	Aerosol Calculations	
				T409-b-1 Spray Time in Seconds	T409-b-3 Cans/ Spray Time in Seconds
EMB-120 Brasilia	N/A	1,193	1.2	2.0	24 sec
EMB-110 Brasilia	N/A	523	0.5	1.0	10 sec

Table 5-5-20 Fairchild

Aircraft, model, and series	Area	Volume ft ³	1,000 ft ³ Units	Aerosol Calculations	
				T409-b-1 Spray Time in Seconds	T409-b-3 Cans/ Spray Time in Seconds
Expediter	NA	580	0.6	1.0	12 sec
Metro II & IIA	NA	580	0.6	1.0	12 sec
F27	Cabin	2,900	2.9	4.5	58 sec
	Pit	192	0.2	0.5	4 sec
FH11227	Cabin	3,200	3.2	5.0	64 sec
	Pit	192	0.2	0.5	4 sec

Table 5-5-21 Fokker

Aircraft, model, and series	Area	Volume ft ³	1,000 ft ³ Units	Aerosol Calculations	
				T409-b-1 Spray Time in Seconds	T409-b-3 Cans/ Spray Time in Seconds
F27	N/A	198	0.2	0.5	4 sec
F28	N/A	290	0.3	0.5	6 sec
F100C	Bulk	2,070	2.0	3.0	40 sec

Table 5-5-22 Lockheed

Aircraft, model, and series	Area	Volume ft ³	1,000 ft ³ Units	Aerosol Calculations	
				T409-b-1 Spray Time in Seconds	T409-b-3 Cans/ Spray Time in Seconds
Electra	Cabin	5,160	5.2	8.5	1 can + 29 sec
	Pit-Fwd	254	0.3	0.5	6 sec
	Pit-Aft	274	0.3	0.5	6 sec
L1011 (100) (200) (250)	Cabin	23,100	23.1	37.0	6 cans + 12 sec
	Pit-Fwd	1,600	1.6	2.5	32 sec
	Pit-Ctr	1,600	1.6	2.5	32 sec
	Pit-Aft	700	0.7	1.0	14 sec
	Galley	1,380	1.4	2.0	28 sec
L-1011-1	Cargo Holds	3,900	3.9	6.0	1 can + 3 sec
L-100-30	N/A	6,057	6.1	10.0	1 can + 47 sec

Table 5-5-23 McDonnell-Douglas

Aircraft, model, and series	Area	Volume ft ³	1,000 ft ³ Units	Aerosol Calculations	
				T409-b-1 Spray Time in Seconds	T409-b-3 Cans/ Spray Time in Seconds
DC-3	Bulk	1,300	1.3	2.0	26 sec
DC-6 (cargo)	Bulk	3,354	3.4	5.5	68 sec

Table 5-5-23 McDonnell-Douglas (continued)

Aircraft, model, and series	Area	Volume ft ³	1,000 ft ³ Units	Aerosol Calculations	
				T409-b-1 Spray Time in Seconds	T409-b-3 Cans/ Spray Time in Seconds
DC-6 (passengers)	Cabin	4,332	1.3	7.0	26 sec
	Pit-Fwd	200	0.2	0.5	4 sec
	Pit-Aft	173	0.2	0.5	4 sec
DC-6A	Cabin	4,375	4.4	7.0	1 can + 13 sec
	Pit-Fwd	267	0.3	0.5	6 sec
	Pit-Aft	300	0.3	0.5	6 sec
DC-6B	Cabin	4,375	4.4	7.0	1 can + 13 sec
	Pit-Fwd	276	0.3	0.5	6 sec
	Pit-Aft	242	0.2	0.5	4 sec
DC-7B	Cabin	4,612	4.6	7.0	1 can + 17 sec
	Pit-Fwd	267	0.3	0.5	6 sec
	Pit-Aft	364	0.4	0.5	8 sec
DC-7C	Cabin	4,778	4.8	7.5	1 can + 21 sec
	Pit-Fwd	312	0.3	0.5	6 sec
	Pit-Aft	339	0.3	0.5	6 sec
DC-8-50	Cabin	12,911	12.9	20.5	3 cans + 33 sec
	Pit-Fwd	690	0.7	1.0	14 sec
	Pit-Aft	700	0.7	1.0	14 sec
DC-8-54F	Main	5,984	6.0	9.5	1 can + 45 sec
	Pit-Fwd	690	0.7	1.0	14 sec
	Pit-Aft	700	0.7	1.0	14 sec
DC-8-55F	Main	5,878	5.9	9.5	1 can + 43 sec
	Pit-Fwd	690	0.7	1.0	14 sec
	Pit-Aft	700	0.7	1.0	14 sec
DC-8-61 & 63	Cabin	15,955	16.0	25.5	4 cans + 20 sec
	Pit-Fwd	1,290	1.3	2.0	26 sec
	Pit-Aft	1,210	1.2	2.0	24 sec
DC-8-62	Cabin	13,739	13.7	22.0	3 cans + 49 sec
	Pit-Fwd	799	0.8	1.5	16 sec
	Pit-Aft	816	0.8	1.5	16 sec
DC-8-62CF	Main	6,442	6.4	10.0	1 can + 53 sec
	Pit-Fwd	800	0.8	1.5	16 sec
	Pit-Aft	815	0.8	1.5	16 sec
DC-8-63F and DC-8-73F	Main	10,350	10.4	16.5	2 cans + 58 sec
	Pit-Fwd	1,290	1.3	2.0	26 sec
	Pit-Aft	1,210	1.2	2.0	24 sec
DC-8-71CF	Main	8,148	8.1	13.0	2 cans + 12 sec
	Pit-Fwd	1,290	1.3	2.0	26 sec
	Pit-Aft	1,210	1.2	2.0	24 sec
DC-8-61CF & 71CF	Main	15,472	15.5	25.0	4 cans + 10 sec
	Pit-Fwd	1,290	1.3	2.0	26 sec
	Pit-Aft	1,210	1.2	2.0	24 sec
DC-9-10	Cabin	4,056	4.1	6.5	1 can + 7 sec
	Pit-Fwd	1,000	1.0	1.5	20 sec
	Pit-Aft	619	0.6	1.0	12 sec

Table 5-5-23 McDonnell-Douglas (continued)

Aircraft, model, and series	Area	Volume ft ³	1,000 ft ³ Units	Aerosol Calculations	
				T409-b-1 Spray Time in Seconds	T409-b-3 Cans/ Spray Time in Seconds
DC-9-10AF	Main	2,386	2.4	4.0	48 sec
	Pit-Fwd	373	0.4	0.5	8 sec
	Pit-Aft	327	0.3	0.5	6 sec
DC-9-30	Cabin	5,094	5.1	8.0	1 can + 27 sec
	Pit-Fwd	1,386	1.4	2.0	28 sec
	Pit-Aft	832	0.8	1.5	16 sec
DC-9-32AF	Main	3,300	3.3	5.5	66 sec
	Pit-Fwd	562	0.6	1.0	12 sec
	Pit-Aft	333	0.3	0.5	6 sec
DC-9-33CF	Main	2,944	2.9	4.5	58 sec
	Pit-Fwd	562	0.6	1.0	12 sec
	Pit-Aft	333	0.3	0.5	6 sec
DC-40	Cabin	5,535	5.5	9.0	1 can + 35 sec
	Pit-Fwd	1,290	1.3	2.0	26 sec
	Pit-Aft	1,040	1.0	1.5	20 sec
DC-10-10CF & 10F, also DC-10-30CF & 30F	Main	12,236	12.2	19.5	3 cans + 19 sec
	Pit-Fwd	3,020	3.0	5.0	60 sec
	Pit-Ctr	1,935	1.9	3.0	38 sec
	Pit-Aft	510	0.5	1.0	10 sec
MD 8-61/63	Main	11,173	11.2	18.0	3 cans
	Pit-Fwd	1,290	1.3	2.0	26 sec
	Pit-Aft	1,210	1.2	2.0	24 sec
MD8-62	Main	8,862	8.9	14.0	2 cans + 28 sec
	Pit-Fwd	800	0.8	1.5	16 sec
	Pit-Aft	815	0.8	1.5	16 sec
MD9-10	Main	3,582	3.6	6.0	1 can
	Pit-Fwd	393	0.4	0.5	8 sec
	Pit-Aft	254	0.3	0.5	6 sec
MD9-30	Main	4,525	4.5	7.0	1 can + 15 sec
	Pit-Fwd	562	0.6	1.0	12 sec
	Pit-Aft	333	0.3	0.5	6 sec
MD9-40	Main	4,926	4.9	8.0	1 can + 23 sec
	Pit-Fwd	618	0.6	1.0	12 sec
	Pit-Aft	350	0.4	0.5	8 sec
MD-11F	Main Deck	15,530	15.5	25.0	4 cans + 10 sec
	Lower Deck	4,976	5.0	8.0	1 can + 25 sec
MD-11 Combi	Main	5,822	5.8	9.5	1 can + 41 sec
	Pit-Fwd	3,655	3.7	6.0	1 can
	Pit-Ctr	2,685	2.7	4.5	54 sec
	Pit-Aft	510	0.5	1.0	10 sec
MD-80 JT8D-217	Lower Hold	1,253	1.3	2.0	26 sec
MD-80 JT8D-219	Lower Hold	1,013	1.0	1.5	20 sec
MD 81 & 82	Cargo	1,253	1.3	2.0	26 sec
MD-83	Cargo	1,013	1.0	1.5	20 sec

Table 5-5-23 McDonnell-Douglas (continued)

Aircraft, model, and series	Area	Volume ft ³	1,000 ft ³ Units	Aerosol Calculations	
				T409-b-1 Spray Time in Seconds	T409-b-3 Cans/ Spray Time in Seconds
MD-87	Cargo	938	0.9	1.5	18 sec
		or 697	0.7	1.0	14 sec
MD-88	Cargo	1,013	1.0	1.5	20 sec
		or 1,253	1.3	2.0	26 sec

Table 5-5-24 SAAB

Aircraft, model, and series	Area	Volume ft ³	1,000 ft ³ Units	Aerosol Calculations	
				T409-b-1 Spray Time in Seconds	T409-b-3 Cans/ Spray Time in Seconds
340 B/QC	N/A	1,303	1.3	2.0	26 sec

Table 5-5-25 Shorts

Aircraft, model, and series	Area	Volume ft ³	1,000 ft ³ Units	Aerosol Calculations	
				T409-b-1 Spray Time in Seconds	T409-b-3 Cans/ Spray Time in Seconds
330	N/A	1,230	1.2	2.0	24 sec
360 and 360-F	N/A	1,450	1.5	2.5	30 sec

Table 5-5-26 Sidely

Aircraft, model, and series	Area	Volume ft ³	1,000 ft ³ Units	Aerosol Calculations	
				T409-b-1 Spray Time in Seconds	T409-b-3 Cans/ Spray Time in Seconds
Carvelle	Cabin	5,600	5.6	9.0	1 can + 37 sec
	Pit-Fwd	258	0.3	0.5	6 sec
	Pit-Aft	116	0.1	--- ¹	2 sec

1 In these small volume spaces, use the extender and calculate the application time using a rate of 2.5 grams per second. At a rate of 2.5 grams per second, the following table will give the spray time:

1,000 ft³ Units Spray Time in Seconds

- 0.10.5
- 0.20.5
- 0.31.0
- 0.41.5

Table 5-5-27 Tupolev

Aircraft, model, and series	Area	Volume ft ³	1,000 ft ³ Units	Aerosol Calculations	
				T409-b-1 Spray Time in Seconds	T409-b-3 Cans/ Spray Time in Seconds
TU-154	Bulk	5,000	5.0	8.0	25 sec

Table 5-5-28 Vickers

Aircraft, model, and series	Area	Volume ft ³	1,000 ft ³ Units	Aerosol Calculations	
				T409-b-1 Spray Time in Seconds	T409-b-3 Cans/ Spray Time in Seconds
Merchantman	Bulk	5,040	5.0	8.0	1 can + 25 sec
Viscount	Bulk	3,000	3.0	5.0	60 sec

Table 5-5-29 Military Aircraft

Aircraft, model, and series	Area	Volume ft ³	1,000 ft ³ Units	Aerosol Calculations	
				T409-b-1 Spray Time in Seconds	T409-b-3 Cans/ Spray Time in Seconds
C-5A	Main	46,651	46.7	74.5	12 cans + 34 sec
	U. Deck Fwd. & Fl. Deck	6,147	6.1	10.0	1 can + 47 sec
	U. Floor	5,147	5.1	8.0	1 can + 27 sec
		6,294	6.3	10.0	1 can + 51 sec
C-17	Main	20,875	20.9	33.5	5 cans + 43 sec
C-26	Cabin	500	0.5	1.0	10 sec
	Pit	198	0.2	0.5	4 sec
C-130	Main	8,340	8.3	13.5	2 cans + 16 sec
C-130 LG382		4,737	4.7	7.5	1 can + 19 sec
C-130 LG385-G		6,057	6.1	10.0	1 can + 47 sec
C-135	Cabin	6,000	6.0	9.5	1 can + 45 sec
C-141	Main	12,000	12.0	19.0	3 cans + 15 sec
C-141B	Main	13,701	13.7	22.0	3 cans + 49 sec
KC-10	Cabin	4,056	4.1	6.5	1 can + 7 sec
	Pit-Fwd	1,000	1.0	1.5	20 sec
	Pit-Aft	619	0.6	1.0	12 sec

T410—Tick Infestations

T410 Nonplant articles (i.e., bat guano, fence posts, etc.)

Pest: Ticks

Treatment: Use T310 schedules, Tick-infested materials (nonfood)

T411—Ant Infestations—Nonplant Products

T411 Pest: Ants

Treatment: T411—MB at NAP

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:				
		0.5 hr	2.5 hrs	3 hrs	3.5 hrs	4 hrs
90-96 °F	2 lbs	24	16	—	—	—
80-89 °F	2.5 lbs	30	24	—	—	—
70-79 °F	3 lbs	36	24	—	—	—
60-69 °F	3 lbs	36	—	24	—	—
50-59 °F	3 lbs	36	—	—	24	—
40-49 °F	3 lbs	36	—	—	—	24

T412—Noxious Weed Seeds (Devitalization Treatment)

T412-a *Guizotia abyssinica* (niger seed)

Pest: Weed seeds of the following genera:
Asphodelus fistulosus (onionweed)
Digitaria spp. (includes African couchgrass)
Oryza spp. (red rice)
Paspalum scrobiculatum (Kodo-millet)
Prosopis spp. (includes mesquites)
Solanum viarum (tropical soda apple)
Striga spp. (witchweed)
Urochloa panicoides (liver-seed grass)

Treatment: T412-a—Dry Heat Treatment at 248°F (120°C) for 15 minutes



Do not start counting time until the entire mass reaches the required temperature.

T412-b-1 Noxious weed seeds (devitalization treatment)

Pest: *Cuscuta* spp.

Two alternative treatments

Treatment: T412-b-1—Dry heat—commodity heated to 212°F (100°C) for 15 minutes

T412-b-2 Noxious weed seeds (devitalization treatment)

Pest: *Cuscuta* spp.

Treatment: T412-b-2—Steam heat—commodity heated to 212°F (100°C) for 15 minutes

T412-b-3 Deleted

T413—Brassware from Mumbai (Bombay), India

T413-a Brassware from Mumbai (Bombay), India

Two alternative treatments

Pest: *Trogoderma granarium* (khapra beetle)

Treatment: T413-a—MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:		
		0.5 hr	2 hrs	12 hrs
90 °F or above	2.5 lbs	30	20	15
80-89 °F	3.5 lbs	42	30	20
70-79 °F	4.5 lbs	54	40	25
60-69 °F ¹	6 lbs	72	50	30
50-59 °F	7.5 lbs	90	60	35
40-49 °F ²	9 lbs	108	70	40

- 1 Use MB 100 gas at 60 °F or above.
- 2 Use MB "Q" gas at 40 °F or above.



When both woodborers and khapra beetles are involved, use schedule [T404-d](#) on [page 5-5-20](#).

T413-b

Brassware from Mumbai (Bombay), India

Treatment: T413-b—MB in 26" vacuum

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
60 °F or above ¹	8 lbs	3 hrs
40-59 °F ²	9 lbs	3 hrs

- 1 Use MB 100 gas at 60 °F or above.
- 2 Use MB "Q" gas at 40 °F or above.



Load limit is 75 percent of chamber volume.

T414—Inanimate, Nonfood Articles with Gypsy Moth Egg Masses

T414

Inanimate, nonfood articles with Gypsy Moth egg masses

Pest: Gypsy Moth egg masses

Treatment: T414—MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:				
		0.5 hr	4 hrs	8 hrs	12 hrs	16 hrs
50 °F or above	3.5 lbs	42	28	—	—	—
	2.5 lbs	30	20	14	—	—
	2 lbs	24	16	12	12	10
40-49 °F	4.5 lbs	54	36	—	—	—
	3.25 lbs	38	26	18	—	—
	2.25 lbs	30	20	14	14	12



For *Lymantria dispar* (gypsy moth) egg masses on such items as outdoor household articles, quarry products, lumber, logs, and timber products.

T415—Garbage

Three alternative treatments are approved. The treatments can be used for commodity destruction.

T415-a

Garbage

Pest: Insect pest and pathogens

Treatment: T415-a—Heat Treatment- Incinerate to ash.



Caterers under compliance agreement using an incinerator for garbage must comply with the following conditions:

- ◆ Incinerator must be capable of reducing garbage to ash
- ◆ Incinerator must be maintained adequately to assure continued operation

T415-b

Garbage

Pest: Insect pest and pathogens

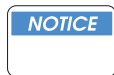
Treatment: T415-b—Dry heat or Steam- commonly heated to internal temperature of 212 °F (100 °C) for 30 minutes followed by burial in a landfill.



Caterers under compliance agreement using a sterilizer must comply with the following conditions:

The sterilizer must be capable of heating garbage to an internal temperature of 212° F and maintaining it at that temperature for a minimum of 30 minutes.

Reevaluate and adjust the sterilization cycle twice a year using a thermocouple to recalibrate the temperature recording device. Adjusting the sterilization cycle semiannually will assure that all garbage processed is heated to a minimum internal temperature of 212° F for at least 30 minutes, and that the temperature recording device accurately reflects the internal temperature of the sterilizer.



Observe all reevaluations and adjustments.

The operator is to date and initial time/temperature records for each batch of garbage sterilized. The supervisor is to review and sign each time/temperature record. The facility must retain records for 6 months for review by PPQ.

Clean the drain in the bottom of the sterilizer between each cycle to assure proper heat circulation

T415-c

Garbage

Pest: Insect pest and pathogens
Treatment: T415-c—Grinding and discharge into an approved sewage system



Grinding and discharging is allowed into an approved sewage system. An approved sewage system is designed and operated in such a way as to preclude the discharge of sewage effluents onto land surfaces or into lagoons or other stationary waters, is adequate to prevent the dissemination of plant pests and livestock or poultry diseases, and is certified by an appropriate government official as currently complying with the applicable laws for environmental protection.

T416—Goatskins, Lambskins, Sheepskins (Skins and Hides)

Three alternative treatments



Fur, horsehair articles, and leather goods (skins and hides), may cause off-odors that may be unacceptable when exposed to methyl bromide (MB).



Items known to be sorptive or items whose sorptive properties are unknown are not to be fumigated in chambers at NAP unless gas concentration readings are taken.

T416-a-1

Goatskins, lambskins, sheepskins (skins and hides)

Pest *Trogoderma granarium* (khapra beetle)
Treatment MB (“Q” gas only) at NAP—tarpaulin

Temperature	Dosage Rate (lb/ 1,000 ft ³)	Minimum Concentration Readings (ounces) At:		
		0.5 hr	2 hrs	12 hrs
90 °F or above	2.5 lbs	30	20	15
80-89 °F	3.5 lbs	42	30	20
70-79 °F	4.5 lbs	54	40	25
60-69 °F	6 lbs	72	50	30
50-59 °F	7.5 lbs	90	60	35
40-49 °F	9 lbs	108	70	40

The sorptive rates of commodities vary. When a commodity is known or suspected to be sorptive (see *Sorption* on page 2-3-10), take more gas readings than normal. Additional fumigant is added as prescribed in *Additional Readings* on page 2-4-29.

When both woodborers and khapra beetles are involved, use schedule *T404-d* on page 5-5-20.

T416-a-2

Goatskins, lambskins, sheepskins (skins and hides)



Load limit is 75 percent of chamber volume.

Pest *Trogoderma granarium* (khapra beetle)

Treatment MB (“Q” label gas) in 26” vacuum

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
60 °F or above	8 lbs	3 hrs
40-59 °F	9 lbs	3 hrs

T416-a-3

Goatskins, lambskins, sheepskins (skins and hides)

Pest *Trogoderma granarium* (khapra beetle)

Treatment MB (“Q” gas only) in 26” vacuum—chamber

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
90-96 °F	2.5 lbs	12 hrs
80-89 °F	3.5 lbs	12 hrs
70-79 °F	4.5 lbs	12 hrs
60-69 °F	6 lbs	12 hrs
50-59 °F	10 lbs	12 hrs
40-49 °F	12 lbs	12 hrs

Amount of Phosphine liberated by various products

Calculate amount of product needed by using the amount of phosphine released as shown in the right column.

Table 5-5-30 Amount of Phosphine Liberated by Various Products

Product	Type	Unit and weight in grams	Grams of phosphine*
Degesch Fumi-Cel [®]	MP	1 plate; 117.0	33.0
Degesch Fumi-Strip [®]	MP	16 plates; 1872.0	528.0
Degesch Phostoxin [®]	AP	1 tablet; 3.0	1.0
Degesch Phostoxin [®] Tablet Prepac Rope	AP	1 prepac; 99.0 (strip or rope of 33 tablets)	33.0
Detia	AP	1 tablet; 3.0	1.0
Detia Rotox AP	AP	1 pellet; 0.6	0.2
Detia Gas EX-B	AP	1 bag or sachet; 34.0	11.4
Fumiphos tablets	AP	1 tablet; 3.0	1.0
Fumiphos pellets	AP	1 pellet; 0.6	0.2
Fumiphos bags	AP	1 bag; 34.0	11.0
Fumitoxin	AP	1 tablet; 3.0	1.0
Fumitoxin	AP	1 pellet; 0.6	0.2
Fumitoxin	AP	1 bag; 34.0	11.0
Gastoxin	AP	1 tablet; 3.0	1.0
Gastoxin	AP	1 pellet; 0.6	0.2
"L" Fume	AP	1 pellet; 0.5	0.18
	AP	1 pellet; 0.6	0.22
Phos-Kill	AP	1 tablet; 3.0	1.1
Phos-Kill	AP	1 pellet; 0.6	0.22
Phos-Kill	AP	1 bag; 34.0	12.0

*Reacts with moisture in the air to yield grams of phosphine.

5

Treatment Manual

Treatment Schedules

T500 - Schedules for Plant Pests or Pathogens

Contents

The following Schedules are listed by plant pest or pathogen

General Schedules

- T501—Pest: *Chrysomyxa* spp. 5-6-3
Pest: *Chrysomyxa* spp. 5-6-3
Pest: *Cercospora* spp. 5-6-4
Pest: *Phoma chrysanthemi* 5-6-3
- T502—Pest: Potato cyst nematode 5-6-4
- T503—Pest: Diseases listed in 7CFR 319.24: Downy Mildews and Physoderma diseases of Maize 5-6-5
- T504—Pest: Flag smut 5-6-5
- T505—T505—Treatment for Infestation of *Chrysomyxa* spp. on various commodities 5-6-6
- T506—Pest: Potato cyst nematode 5-6-7
- T507—Pest: *Phyllosticta bromeliae*, *Uredo* spp. (when destined to Florida, refuse entry) 5-6-8.
Pest: *Septoria gentianae* 5-6-8
- T508—Pest: Rusts 5-6-8
- T509—**Pest: *Cylindrosporium camelliae* 5-6-9**
Pest: *Hemileia* spp. *Leptosphaeria* spp. *Mycosphaerella* spp. *Opiodothella orchidearum* *Phomopsis orchidophilia* *Phyllachora* spp. *Phyllosticta* spp. *Sphenospora* spp. *Sphaerodothis* spp. *Uredo* spp. (except *U. scabies*) 5-6-9
- T510—Pest: Various corn-related diseases 5-6-9
- T511—T511—Precautionary treatment for Citrus Canker (*Xanthomonas axonopodis*) 5-6-10
- T512—(Deleted) 5-6-11
- T513—Pest: *Ascochyta* spp. 5-6-11
- T514—**Pest: *Xanthomonas albilineans* and *X. vasculorum* 5-6-11**
- T515—Pest: Various sugarcane-related diseases 5-6-12
- T516 (Deleted) 5-6-12)
- TT517 (Deleted) 5-6-12)
- T518—Pest: Various rice-related diseases 5-6-12
- T519—Pest: Various rice-related diseases 5-6-13
- T520—**Pest: *Verticillium albo-atrum* 5-6-14**
- T521—**Pest: Various Plant Pathogenic Fungi and Bacteria 5-6-14**

Hot Water Treatments

- T551—Pest: **Globodera rostochiensis, G. pallida** 5-6-15
- T552—Pest: **Bulb nematodes: Ditylenchus dipsaci, D. destructor** 5-6-15
- T553—Pest: Root-knot nematodes (*Meloidogyne* spp.) 5-6-16
Pest: Lesion nematodes (*Pratylenchus* spp.) 5-6-16
Pest: Golden nematodes (*Globodera rostochiensis* and *G. pallida*)
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Pest: Foliar nematodes (*Aphelenchoides fragariae*) 5-6-16
Pest: Cyst nematodes (*Heterodera humuli*) 5-6-16
- T554—Pest: Bulb nematodes—*Ditylenchus dipsaci* and *D. destructor*
5-6-16
- T555—Pest: Bulb nematodes—*Ditylenchus dipsaci* 5-6-17
- T556—Pest: Root-knot nematodes (*Meloidogyne* spp.) 5-6-17
- T557—Pest: *Meloidogyne* spp. and *Pratylenchus* spp. 5-6-17
- T558—Pest: *Pratylenchus* spp. (surface diseases) 5-6-17
- T559—Pest: White tip nematode (*Aphelenchoides besseyi*) 5-6-18
- T560—Pest: *Meloidogyne* spp. 5-6-18.
- T561—Treatment for Infestations of *Cercospora mamaonis* and *Phomopsis carica-papayae* on Papayas 5-6-18
- T562—(deleted) 5-6-19
- T563—(deleted) 5-6-19
- T564—Pest: Foliar nematodes (*Aphelenchoides fragariae*) 5-6-21
- T565—Pest: ***Ditylenchus destructor*** 5-6-19
Pest: *Ditylenchus dipsaci* 5-6-20i
Pest: *Aphelenchoides subtenuis, Ditylenchus destructor* 5-6-19
Pest: *Globodera rostochiensis, G. pallida* 5-6-20
- T566—Pest: Precautionary treatment for corn-related diseases 5-6-20
Pest: *Aphelenchoides fragariae* 5-6-20
- T567—Pest: Bulb nematodes (*Ditylenchus dipsaci*) 5-6-20
- T568—Pest: Foliar nematodes (*Aphelenchoides fragariae*) 5-6-21
- T569—Pest: Foliar nematodes (*Aphelenchoides fragariae*) 5-6-21
- T570—Pest: *Pratylenchus* spp. 5-6-21.
Pest: *Aphelenchoides fragariae* spp. 5-6-21

The following section lists the recommended treatments or actions to be applied to items or commodities found infected with various diseases, or infested with various plant pests including nematodes. Commodities may include cut flowers and greenery, propagative plant materials, as well as entire plants. Due to recent restrictions and prohibitions on the use of certain chemicals, every effort has been made to substitute the best alternative treatment available to us. The diseases and commodities for which these treatments are recommended are listed in the Index to Schedules and with the following treatment schedules. Ports should endeavor to make post-treatment examinations or arrange to have the consignee or importer submit data concerning the material following the treatment. Ports should forward any information of this nature to:

USDA-APHIS-PPQ-S&T-CPHST-AQI
1730 Varsity Drive, Suite 300
Raleigh, NC 27606

T501—Treatment for infestation of *Chrysomyxa* spp., *Cercospora* spp., and *Phoma chrysanthemi* on various commodities

T501-1

Azalea

Pest: *Chrysomyxa* spp.

Treatment: T501-1 Remove infected parts and treat all plants of same species in shipment with 4-4-50 Bordeaux dip or spray.



See alternative treatment [T505-1](#) for *Chrysomyxa* spp.

T501-2

Azaleodendron

Pest: *Chrysomyxa* spp.

Treatment: T501-2 Remove infected parts and treat all plants of same species in shipment with 4-4-50 Bordeaux dip or spray.



see alternative treatment [T505-1](#) for *Chrysomyxa* spp.

T501-4

Chrysanthemum

Pest: *Phoma chrysanthemi*

Treatment: T501-4 Remove infected parts and treat all plants of same species in shipment with 4-4-50 Bordeaux dip or spray.

T501-5 Christmas trees

Pest: *Phoma chrysanthemi*

Treatment: T501-5 Remove infected parts and treat all plants of same species in shipment with 4-4-50 Bordeaux dip or spray.

T501-3 Orchid

Pest: *Cercospora* spp.

Treatment: T501-3 Remove infected parts and treat all plants of same species in shipment with 4-4-50 Bordeaux dip or spray.

T501-6 Rhododendron

Pest: *Chrysomyxa* spp.

Treatment: T501-6 Remove infected parts and treat all plants of same species in shipment with 4-4-50 Bordeaux dip or spray.



see alternative treatment [T501-2](#) for *Chrysomyxa* spp.

T502—Treatment for infestation of Potato cyst nematode on various commodities

T502-1 Bags and bagging used for commodities grown in soil

Pest: Potato cyst nematode

Treatment: T502-1 Methyl bromide—8 lbs/1,000 ft³ for 16 hours in 26" vacuum at 40 °F or above.

T502-2 Covers used for commodities grown in soil

Pest: Potato cyst nematode

Treatment: T502-2 Methyl bromide—8 lbs/1,000 ft³ for 16 hours in 26" vacuum at 40 °F or above.

T502-3 Soil

Pest: Potato cyst nematode

Treatment: T502-3 Methyl bromide—8 lbs/1,000 ft³ for 16 hours in 26" vacuum at 40 °F or above.

T503—Treatments for Infestations of Downy Mildews and *Physoderma* diseases of Maize

T503-1 **Bags and bagging (used) for small grains**

Pest: Diseases listed in 7CFR 319.24: Downy Mildews and *Physoderma* diseases of Maize

Alternative treatments:

Treatment: T503-1-2 Hot water treatment—soak in water slightly below boiling (212 °F) for 1 hour.

Treatment: T503-1-3 Live steam for 10 minutes at 240 °F, NAP. For baled material, live steam at 10 pounds pressure for 20 minutes.

Treatment: T503-1-4 Dry heat at 212 °F for 1 hour. Treat small bales only.

T503-2 **Covers used for small grains**

Pest: Diseases listed in 7CFR 319.24: Downy Mildews and *Physoderma* diseases of Maize

Alternative treatments:

Treatment: T503-2-2 Hot water treatment—soak in water slightly below boiling (212 °F) for 1 hour.

Treatment: T503-2-3 Live steam for 10 minutes at 240 °F, NAP. For baled material, live steam at 10 pounds pressure for 20 minutes.

Treatment: T503-2-4 Dry heat at 212 °F for 1 hour. Treat small bales only.

T504—Treatment for Infestation of Flag Smut on various commodities

T504-1 **Bags and bagging (used) for small grains**

Pest: Flag smut

Alternative treatments:

Treatment: T504-1-1 Dry heat at 212 °F for 1 hour. Treat small bales only.

Treatment: T504-1-2 Steam at 10 pounds pressure at 242 °F (114 °C) for 20 minutes.

T504-2 **Covers used for wheat**

Pest: Flag smut

Alternative treatments:

Treatment: T504-2-1 Dry heat at 212 °F for 1 hour. Treat small bales only.

Treatment: T504-2-2 Steam at 10 pounds pressure at 242 °F (114 °C) for 20 minutes.

T505—Treatment for Infestation of *Chrysomyxa* spp. on various commodities

T505-1 **Azaleodendron**

Pest: *Chrysomyxa* spp.

Alternative treatments:

Treatment: T505-1-1 Treat with mancozeb or other approved fungicide of equal effectiveness. (Use label instructions for treatment.)

Treatment: T505-1-2 see alternative treatment T501

T505-2 **Rhododendron**

Pest: *Chrysomyxa* spp.

Alternative treatments:

Treatment: T505-2-1 Treat with mancozeb or other approved fungicide of equal effectiveness. (Use label instructions for treatment.)

Treatment: T505-2-2 see alternative treatment T501-1

T506—Treatment for Infestation of Potato Cyst Nematode on various commodities

T506-1

Containers

Pest: Potato cyst nematode

Alternative treatments:

Treatment: T506-1-1 MB (“Q” label only) in 26" vacuum

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
40 °F or above	8 lbs	16 hrs
OR	10.5 lbs	12 hrs
OR	16 lbs	8 hrs

Treatment: T506-1-3 High pressure steam. See T506-2-3.

T506-2

Nonplant articles

Pest: Potato cyst nematode

Alternative treatments:

Treatment: T506-2-1 MB (“Q” label only) in 26" vacuum

Temperature	Dosage Rate (lb/1,000 ft ³)	Exposure Period
40 °F or above	8 lbs	16 hrs
OR	10.5 lbs	12 hrs
OR	16 lbs	8 hrs

Treatment: T506-2-3 High pressure steam

Live steam is introduced into a closed chamber containing the material to be treated until the required temperature and pressure are indicated. The temperature/pressure relationship is maintained at or above this point for the required exposure period. The exposure period will depend on the nature of the material, quantity, and its penetrable condition.

For loosely packed material which permit rapid and complete penetration of steam to all parts of the mass, no initial vacuum is needed but air must be released until steam vapor escapes, and exposure at 20 pounds pressure for 10 minutes, 15 pounds for 15 minutes, or 10 pounds for 20 minutes is sufficient.

For tightly packed material, such as soil, special measures are needed to ensure rapid heat penetration to all parts of the material. Soil, if in large containers, will not allow adequate treatment under normal sterilization exposure periods.

Quicker penetration of the steam is obtained by first exhausting the air in the chamber to a high vacuum and then introducing live steam until the required positive pressure is reached.

T507—Treatment for Infestation of *Phyllosticta bromeliae*, *Uredo* and *Septoria gentianae* on various commodities

T507-1

Bromeliads

Pest: *Phyllosticta bromeliae*, *Uredo* spp. (when destined to Florida, refuse entry)

Treatment: T507-1 Remove infected leaves and treat all plants of same species in shipment with Captan following label directions.



Advise importer or consignee that treatment may cause commodity damage.

T507-2

Gentiana

Pest: *Septoria gentianae*

Treatment: T507-2 Remove infected leaves and treat all plants of same species in shipment with Captan following label directions.



Advise importer or consignee that treatment may cause commodity damage.

T508—Treatment for Infestation of Rusts on various commodities

T508-1

Orchids (to Florida)

Pest: Rusts

Treatment: T508-1 ***For rust-infected shipments to Florida:*** Refuse entry to all infected plants and all other plants of the same species or variety in the shipment. Treat other orchid species in the shipment (which may have become contaminated) with Captan. Repackage treated orchids in clean shipping containers. For rusts on orchids to States other than Florida, follow the procedures in T509.

T509—Treatment for Infestation of Various Plant Pests of Camellia and Orchids

T509-1

Camellia

Pest: *Cylindrosporium camelliae*

Alternative treatments:

Treatment: T509-1-1 **Light infection:** Remove infected leaves and dip or spray plant with 4-4-50 Bordeaux. Dry quickly and thoroughly before release.

Treatment: T509-1-2 **Heavy infection:** Refuse entry.

T509-2

Orchids

Pest: *Hemileia* spp.
Leptosphaeria spp.
Mycosphaerella spp.
Opiodothella orchidearum
Phomopsis orchidophila
Phyllachora spp.
Phyllosticta spp.
Sphenospora spp.
Sphaerodothis spp.
Uredo spp. (except *U. scabies*)

Alternative treatments:

Treatment: T509-2-1 **Light infection:** Remove infected leaves and dip or spray plant with 4-4-50 Bordeaux. Dry quickly and thoroughly before release.

Treatment: T509-2-2 **Heavy infection:** Refuse entry.

T510—Treatment for Infestation of Various Corn-Related diseases

T510-1

Corn (seed) (Commercial lots (not for propagation))

Pest: Various corn-related diseases

Treatment: T510-1 Live steam from jet or nozzle into loose masses of material until all parts reach 212 °F.

T510-2 Corn (seed) (Small lots for propagation but not for food, feed, or oil purposes)

Pest: Various corn-related diseases
Treatment: T510-2 Treat seeds with a dry application of Mancozeb in combination with Captan. Disinfect bags by: 1) Dry heat at 212 °F for 1 hour. Treat small bales only; or 2) Steam at 10 pounds pressure at 40 °F for 20 minutes.

T511—Precautionary treatment for Citrus Canker (*Xanthomonas axonopodis*)

T511-1 Seeds of *Citrus* spp., *Fortunella* spp., *Clausena lansium*, and *Poncirus trifoliata* (and all cultivars, varieties, and hybrids)

Pest: Citrus Canker (*Xanthomonas axonopodis* pv. *citri*)
Treatment: T511-1

Treat seeds for possible infection with citrus canker bacteria by first washing the seeds to remove the pulp. Next, immerse the seeds in water at 125 degree F or higher for 10 minutes. Then immerse seed for a period of at least 2 minutes in a 0.525 percent sodium hypochlorite solution at a pH of 6.0 to 7.5. Drain, dry and repack near original moisture content.

T511-2 Fruit of *Citrus* spp., *Fortunella* spp., *Clausena lansium*, and *Poncirus trifoliata* (and all cultivars, varieties, and hybrids)

Pest: Citrus Canker (*Xanthomonas axonopodis*)
Treatment: T511-2

There are three chemical treatments approved for use **as part of a systems approach at an approved packing house in the exporting country.**

Table 5-6-1 Citrus Canker Chemical Treatments

Chemical Name	Concentration
Sodium hypochlorite	200 ppm (pH = 6.0 - 7.5)
Sodium o-phenyl phenate	1.86 - 2.0% of the total solution
Peroxyacetic acid	85 ppm

T512—(Deleted)

T513—Treatment for Infestations of *Ascochyta* on various commodities

T513-1 Orchids

Pest: *Ascochyta* spp.

Treatment: T513-1 Defoliate if leaf-borne only; refuse entry if pseudo-bulbs infected.

T514—Treatment for Infestations of *Xanthomonas albilineans* and *X. vasculorum*

T514-1 Saccharum (sugarcane) (seed pieces)

Pest: *Xanthomonas albilineans* and *X. vasculorum*

Treatment: T514-1 Presoak in water at room temperature for 24 hours then immerse in water at 122 °F for 3 hours.

This treatment may damage sprouted cane.

T514-2 Saccharum (sugarcane) (True seed (fuzz))

Pest: *Xanthomonas albilineans* and *X. vasculorum*

Treatment: T514-2 Immerse in 0.525 percent sodium hypochlorite solution for 30 minutes followed by at least 8 hours air drying before packaging. (Dilute 1 part Clorox or similar solution containing 5.25 percent sodium hypochlorite in 9 parts of water. If using “ultra strength” chlorine bleach, use only 3/4 as much bleach).

T514-3 Saccharum (sugarcane) (Bagasse)

Pest: *Xanthomonas albilineans* and *X. vasculorum*

Treatment: T514-3 Dry heat treatment for 2 hours at 158 °F.

T514-4 Saccharum (sugarcane) (Field and processing equipment)

Pest: *Xanthomonas albilineans* and *X. vasculorum*

Treatment: T514-4 Remove all debris and soil from equipment with water at high pressure (300 pounds per square inch minimum) or with steam.

T515—Treatment for Infestations of various Sugarcane-Related diseases

T515-1 Sugarcane (Baled)

Pest: Various sugarcane-related diseases

Alternative treatments:

Treatment: T515-1 Introduce live steam into 25" vacuum until pressure reaches 15 to 20 pounds. Hold until center of bale is 220 °F–230 °F and maintain for 30 minutes.

T515-2-1 Sugarcane (Loose Sugarcane)

Treatment: T515-2-1 Introduce steam into 25" vacuum (or if with initial vacuum, “bleed” air until steam vapor fills chamber).

T515-2-3 Sugarcane (Loose Sugarcane)

Treatment: T515-2-3 Dry heat—212 °F for 1 hour.

T515-2-4 Sugarcane (Loose Sugarcane)

Treatment: T515-2-4 Remove the pulp in water at 190 °F–205 °F, followed by drying at 212 °F for 1 hour.

T515-2-5 Sugarcane (Loose Sugarcane)

Treatment: T515-2-5 Flash heated to 1,000 °F (Arnold dryer).

T516 (Deleted)

T517 (Deleted)

T518—Treatment for Infestations of Various Rice-Related diseases

T518-1 Brooms made of rice straw

Pest: Various rice-related diseases

Treatment: T518-1 Dry heat at 170 °F for 4.5 hours—may take 2 hours to reach this temperature.

T518-2-1 Novelties made of rice straw

Two alternative treatments

Pest: Various rice-related diseases
Treatment: T518-2-1 Dry heat at 180 °F–200 °F for 2 hours

T518-2-2

Novelties made with rice straw

Pest: Various rice-related diseases
Treatment: T518-2-2 Steam sterilization

Temperature	Pressure	Exposure Period
260 °F	20 lbs	15 minutes
250 °F	15 lbs	20 minutes

T519—Treatment for Infestations of Various Rice-Related diseases

T519-1

Closely packed rice straw and hulls

Pest: Various rice-related diseases
Treatment: T519-1 Introduce steam into 28" vacuum until pressure reaches 10 pounds and hold for 20 minutes.

T519-2

Loose rice straw and hulls

Pest: Various rice-related diseases
Treatment: T519-2 Introduce steam into 28" vacuum (or if without initial vacuum, “bleed” air until steam vapor escapes) until pressure reaches 20 pounds AND temperature 259 °F and hold for 10 minutes (OR 10 pounds and 240 °F for 20 minutes).



see also [T518-1](#).

T520—Treatment for Infestation of *Verticillium albo-atrum* on various commodities

T520-1 **Seeds of alfalfa (*Medicago falcata*, *M. gaetula*, *M. glutinosa*, *M. media*, and *M. sativa*) from Europe**

Pest: *Verticillium albo-atrum*

Alternative treatments:

Treatment: T520-1-1 Dust with 75 percent Thiram at the rate of 166 grams per 50 kilograms of seed (3.3g/kg).

Treatment: T520-1-2 Treat with a slurry of Thiram 75 WP at a rate of 166 grams per 360 milliliters of water per 50 kilograms of seed (3.3g pesticide/7.2ml water/kg seed).

T521—Treatment for Infestation of Plant Pathogenic Fungi and Bacteria on Articles Made with Dried Plant Material

T521 Pest: Various Plant Pathogenic Fungi and Bacteria

Dried plant material includes, but is not limited to, lemon grass, bamboo leaf decorations, grass arrangements, bundles, and baskets..

Conditions	Temperature	Time (hours)
Moist heat (air with high levels of water vapor, as from steam)	80 °C (176 °F)	1
Dry heat (air free of water vapor)	80 °C (176 °F)	2

Treatment time does not start until the entire commodity has reached treatment temperature. Warn the importer of the possibility of damage to the commodity prior to treatment. Ensure that the commodity does not come in contact with heating elements or open flame. The treatment facility must be approved by USDA-APHIS-PPQ-S&T-CPHST-AQI, certified on an annual basis by PPQ, and have a Compliance Agreement with PPQ.

Under Development: See “Heat • Steam Treatments” on page-3-4-1 for operational procedures and equipment guidelines.

T551—Treatment for Infestation of *Globodera rostochiensis* and *G. pallida* (Nematodes) on *Convallaria* (pips)

T551-1 Convallaria (pips)

Pest: *Globodera rostochiensis*, *G. pallida*

Treatment: T551-1 Keep pips frozen until time for treatment, then thaw enough to separate bundles one from another just before treatment begins. Without preliminary warm-up, immerse in hot water at 118 °F for 30 minutes, following with a 5 minute drain, finishing with 5 minutes cooling dip or hosing with tap water.

T552—Treatment for Infestation of *Ditylenchus dipsaci* and *D. destructor*

T552-1 Allium, Amaryllis, and Bulbs (NSPF)

Pest: Bulb nematodes: *Ditylenchus dipsaci*, *D. destructor*

Treatment: T552-1 Presoak bulbs in water at 75 °F for 2 hours, then at 110 °F–111 °F for 4 hours.

T553—Treatment for Infestations of Nematodes on various plant commodities

T553-1 *Achimenes*, *Actinidia*, *Agapanthus*, *Aloe*, *Amorphophallus* (bulbs), *Ampelopsis*, *Anchuse*, *Anemone*, *Astilbe*, *Begonia* (tubers), *Bletilla hyacinthina* (bulbs) (NSPF), *Cactus*, *Calliopsis*, *Campanula*, *Cestrum*, *Cimicifuga*, *Cissus*, *Clematis*, *Convolvulus japonicus*, *Corytholoma*, *Curcuma* (turmeric), *Cyclamen*, *Cytisus*, *Dahlia* (tubers), *Dracaena*, *Epimendium pinnatum* (only; other spp. not tolerant), *Euonymus alata* (only), *Eupatorium*, *Euphorbia*, *Fragaria* (strawberry), *Gardenia*, *Gentiana*, *Gerbera*, *Gesneria*, *Geum*, *Gladiolus*, *Heliopsis*, *Helleborus*, *Hibiscus*, *Hosta*, *Hoya*, *Iris*, *Jasminum*, *Kaempferia*, *Kohleria*, *Naegelia*, *Orchid*, *Ornithogalum*, *Paeonia*, *Passiflora*, *Polyanthes* (tuberose),

Primula, Reichsteineria, Sansevieria, Scabiosa, Sedum, Senecio (Lingularis), Thompsonia nepalensis, Tydaea, Verbena, Vitis (grape), Weigela, Zantedeschia, Zingiberaceae

Pest: Root-knot nematodes (*Meloidogyne* spp.)

Treatment: T553-1 Hot water at 118 °F for 30 minutes.

T553-2

Anchusa, Astilbe, Clematis, Dicentra, Gardenia, Helleborus, Hibiscus, Kniphofia, Primula

Pest: Lesion nematodes (*Pratylenchus* spp.)

Treatment: T553-2 Hot water at 118 °F for 30 minutes.

T553-3

Armoracea (horseradish roots), bulbs (NSPF)

Pest: Golden nematodes (*Globodera rostochiensis* and *G. pallida*)

Treatment: T553-3 Hot water at 118 °F for 30 minutes.

T553-4

Bletilla hyacinthina (alternate treatment: T564)

Pest: Foliar nematodes (*Aphelenchoides fragariae*)

Treatment: T553-4 Hot water at 118 °F for 30 minutes.

T553-5

Humulus

Pest: Cyst nematodes (*Heterodera humuli*)

Treatment: T553-5 Hot water at 118 °F for 30 minutes.

T554—Treatment for Infestations of *Ditylenchus dipsaci* and *D. destructor* on Hyacinthus

T554-1

Hyacinthus (bulbs), Iris (bulbs and rhizomes), Tigridia

Pest: Bulb nematodes—*Ditylenchus dipsaci* and *D. destructor*

Alternative treatments

Treatment: T554-1-1 Presoak in water at 70 °F–80 °F for 2.5 hours, followed by hot water immersion at 110 °F–111 °F for 1 hour.

Treatment: T554-1-2 Hot water immersion at 110 °F–111 °F for 3 hours with no presoaking.

T555—Treatment for Infestations of *Ditylenchus dipsaci* on *Narcissus*

T555-1

***Narcissus* (bulbs)**

Pest: Bulb nematodes—*Ditylenchus dipsaci*

Treatment: T555-1 Presoak in water at 70 °F–80 °F for 2 hours, then at 110 °F–111 °F until all bulbs reach that temperature and hold for 4 hours.

T556—Treatment for Infestations of Root-Knot Nematodes (*Meloidogyne* spp.) on *Calla*

T556-1

***Calla* (rhizomes)**

Pest: Root-knot nematodes (*Meloidogyne* spp.)

Treatment: T556-1 Dip in hot water at 122 °F for 30 minutes.

T557—Treatment for Infestations of *Meloidogyne* spp. and *Pratylenchus* spp. on *Chrysanthemum* (not including *Pyrethrum*)

T557-1

***Chrysanthemum* (not including *Pyrethrum*)**

Pest: *Meloidogyne* spp. and *Pratylenchus* spp.

Treatment: T557-1 Dip in hot water at 118 °F for 25 minutes.

T558—Treatment for Infestations of *Pratylenchus* surface diseases on *Fragaria* (strawberry)

T558-1

***Fragaria* (strawberry)**

Pest: *Pratylenchus* spp. (surface diseases)

Treatment: T558-1 Dip in hot water at 127 °F for 2 minutes.

T559—Treatment for Infestations of Foliar Nematodes on *Begonia* and *Oryza* (paddy rice)

T559-1 *Begonia*

Pest: White tip nematode (*Aphelenchoides besseyi*)

Treatment: T559-1 Dip in hot water at 118 °F for 5 minutes.

T559-2 *Oryza* (paddy rice)

Pest: White tip nematode (*Aphelenchoides besseyi*)

Treatment: T559-2 Dip in hot water at 132.8 °F (56 °C) for 15 minutes.

T560—Treatment for Infestations of *Meloidogyne* spp. on *Rosa*

T560-1 *Rosa* spp. (except *multiflora*, which is not tolerant)

Pest: *Meloidogyne* spp.

Treatment: T560-1 Dip in hot water at 123 °F for 10 minutes.

T561—Treatment for Infestations of *Cercospora mamaonis* and *Phomopsis carica-papayae* on Papayas

T561 Papayas

Pest: *Cercospora mamaonis* and *Phomopsis carica-papayae*

Treatment: T561-1 Dip in hot water at 120.2 °F (49 °C) for 20 minutes.

T562—(deleted)

T563—(deleted)

T564—Treatment for Infestations of Foliar Nematodes on various commodities

T564-1 *Astilbe, Bletilla hyacinthina, Cimicifuga, Epimedium pinnatum* (only; other spp. not tolerant), *Hosta, Paeonia*

Pest: Foliar nematode (*Aphelenchoides besseyi*)

Treatment: T564-1 Presoak in water at 68 °F for 1 hour followed by hot water soak at 110 °F for 1 hour. Then dip in cold water and let dry.



see Alternative treatment for *Bletilla hyacinthina*: [T553-1](#)

T565—Treatment for Infestations of Nematodes on various commodities

T565-1 *Amaryllis*

Pest: *Ditylenchus destructor*

Treatment: T565-1 Hot water at 110 °F for 4 hours (should be done immediately after digging)

T565-2 *Crocus*

Pest: *Aphelenchoides subtenuis, Ditylenchus destructor*

Treatment: T565-2 Hot water at 110 °F for 4 hours (should be done immediately after digging)

T565-3 *Gladiolus*

Pest: *Ditylenchus destructor*

Treatment: T565-3 Hot water at 110 °F for 4 hours (should be done immediately after digging)

T565-4

Scilla

Pest: *Ditylenchus dipsaci*

Treatment: T565-4 Hot water at 110 °F for 4 hours (should be done immediately after digging)

T565-5

***Solanum* (potato tubers)**

(see Restricted Entry Orders, Part 321)

Pest: *Globodera rostochiensis*, *G. pallida*

Treatment: T565-5 Hot water at 110 °F for 4 hours (should be done immediately after digging)

T566—Treatment for Infestations of various diseases on Broomcorn, Broomcorn Articles, and Lilium (bulbs)

T566-1

Broomcorn

Pest: Precautionary treatment for corn-related diseases

Treatment: T566-1 Hot water at 102 °F.

T566-2

Broomcorn Articles

Pest: Precautionary treatment for corn-related diseases

Treatment: T566-2 Hot water at 102 °F.

T566-3

Lilium (bulbs)

Pest: *Aphelenchoides fragariae*

Treatment: T566-3 Hot water at 102 °F.

T567—Treatment for Infestations of Bulb nematodes on various commodities

T567-1

***Muscari*, *Ornithogalum*, *Polyanthes* (tuberose)**

Pest: Bulb nematodes (*Ditylenchus dipsaci*)

Treatment: T567-1 Dip in hot water at 113 °F for 4 hours.

T568—Treatment for Infestations of Foliar nematodes on Senecio

T568-1 Senecio (*Lingularis*)

Pest: Foliar nematodes (*Aphelenchoides fragariae*)

Treatment: T568-1 Treat with hot water at 110 °F for 1 hour.

T569—Treatment for Infestations of Foliar nematodes on *Fragaria* (strawberry)

T569-1 *Fragaria* (strawberry)

Pest: Foliar nematodes (*Aphelenchoides fragariae*)

Treatment: T569-1 Hot water at 121 °F for 7 minutes. (National Plant Board Conference, Tennessee, 1968)

T570—Treatment for Infestations of various diseases *Acalypha* and *Aconitum*

T570-1 *Acalypha*

Pest: *Pratylenchus* spp.

Treatment: T570-1 Hot water dip at 110 °F for 50 minutes. (Tolerance **not** established.)

T570-2 *Aconitum*

Pest: *Aphelenchoides fragariae* spp.

Treatment: T570-2 Hot water dip at 110 °F for 50 minutes. (Tolerance **not** established.)

T571—(Deleted)

Domestic Treatments

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Introduction

The treatments listed in this section are to be used **ONLY** for domestic movement of regulated articles and are conducted in conjunction with a systems approach. State and local guidelines may apply.

D301.32-10—Fruit Fly Treatments

The fruit fly treatments are organized by family or genus and species, and then by approved site or commodity.



Several treatments in this section are equivalent to treatments for imported commodities found in **T100 - Schedules for Fruit, Nuts, and Vegetables**.

In these cases, click on the hyperlink provided to go to the appropriate treatment.

**Fruit Fly Family
Tephritidae
D301.32-10(a)**

Soil in Containerized Nursery Stock



Refer to the appropriate EPA-approved document that gives PPQ the authority to treat at the rates described in the treatment schedules. Examples of documents include chemical manufacturer labels, special local need registration (24c or SLN), and Section 18 quarantine exemptions.

Contact the National Fruit Fly Coordinator to find out if the chemicals in the treatment schedules are registered for use in your state.

Treatment: D301.32-10(a-1) — Chemical treatment Diazinon

Application Instructions

Apply to nursery stock using equipment that generates a coarse, low-pressure spray. Soak the entire contents of the nursery stock container. Do not drench to the point of runoff. Do not allow the solution to enter sewers, drains, bodies of water, or aquatic habitats.

Table 5-8-1 Diazinon Dosages for Nursery Stock

Insecticide	Dosage Rate (lb. a.i. per acre)
Diazinon	5.0

Treatment: D301.32-10(a-2) — Chemical treatment Lambda-Cyhalothrin

The yellow and black colors of this schedule indicates that the authority to conduct the treatment comes from an emergency action required by PPQ in order to mitigate the pest risk. The emergency action is an interim measure and is pending final regulatory approval.

Table 5-8-2 Lambda-Cyhalothrin Dosages for Nursery Stock

Insecticide	Dosage Rate (lb. a.i. per acre)
Lambda-Cyhalothrin	0.4

Application Instructions

Apply to nursery stock using equipment that generates a coarse, low-pressure spray. Soak the entire contents of the nursery stock container. Do not drench to the point of runoff. Do not allow the solution to enter sewers, drains, bodies of water, or aquatic habitats.

**Fruit Fly Family
Tephritidae
D301.32-10(a)**

Fruits, Vegetables, Cut Flowers, Foliage

Treatment: D301.32-10 (a-3) — Irradiation using 70–150 Gy (not to exceed 1,000 Gy)

Refer to **Table 5-8-3** for a list of fruit flies that can be irradiated. Treat using the minimum absorbed dose.

Treatments **must** be approved in advance by PPQ Field Operations. Facilities located in AL, AZ, CA, FL, GA, KY, LA, MS, NV, NM, NC, SC, TN, TX, or VA will require additional safeguarding measures described in **7 CFR 305.9(a)**.

Table 5-8-3 Pest-Specific Minimum Absorbed Dose (Gy) for Fruit Fly Irradiation

Scientific Name	Common Name	Minimum Absorbed Dose (Gy)
<i>Anastrepha ludens</i>	Mexican fruit fly	70
<i>Anastrepha obliqua</i>	West Indian fruit fly	70
<i>Anastrepha serpentina</i>	Sapote fruit fly	100
<i>Anastrepha suspensa</i>	Caribbean fruit fly	70
<i>Bactrocera cucurbitae</i>	Melon fruit fly	150
<i>Bactrocera dorsalis</i>	Oriental fruit fly	150
<i>Bactrocera jarvisi</i>	Jarvis fruit fly	100
<i>Bactrocera tryoni</i>	Queensland fruit fly	100
<i>Ceratitis capitata</i>	Mediterranean fruit fly	100
	All other fruit flies of the family Tephritidae which are not listed above	150

***Anastrepha ludens* (Mexican fruit fly)
D301.32-10(b)**

White Sapote (*Casimiroa edulis*)

Treatment: D301.32-10(b-1) — Cold treatment (equivalent to **T107-b**)

Citrus

Treatment: D301.32-10(b-2) — High temperature forced air treatment (equivalent to **T103-a-1**)

Pear, Quince, Citron

Treatment: D301.32-10(b-3) — Cold treatment

Temperature	Exposure Period
33 °F (0.56 °C) or below	18 days
34 °F (1.11 °C) or below	20 days
35 °F (1.67 °C) or below	22 days

Ceratitis capitata
(Mediterranean fruit fly)
D301.32-10(c)

Tomato

Treatment: D301.32-10(c-1) — MB at NAP

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:			
		0.5 hr	2 hrs	3.5 hrs	4 hrs
70 °F or above	2 lbs	26	21	21	—
65-69 °F	2 lbs	26	21	—	19



Host tolerance is marginal. Warn the shipper of possible injury.

Treatment: D301.32-10(c-2) — Vapor heat
(equivalent to **T106-b**)

Citrus

Treatment: D301.32-10(c-3) — MB at NAP—tarpaulin or chamber

Temperature	Dosage Rate (lb/1000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	3.5 ¹ hrs
70 °F or above	2 lbs	26	22

¹ This treatment is currently NOT AUTHORIZED pending EPA-approval to increase the duration to 3.5 hours.

Treatment: D301.32-10(c-4) — Cold treatment
(equivalent to **T107-a**)

Treatment: D301.32-10(c-5) — MB at NAP—tarpaulin or chamber followed by cold treatment

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
70 °F (21.11 °C) or above	2 lbs	25	18
Followed by cold treatment			

Refrigeration	
Temperature	Exposure Period
33 to 37 °F (0.56 to 2.77 °C)	4 days
OR 38 to 47 °F (3.33 to 8.33 °C)	11 days

Treatment: D301.32-10(c-6) — MB at NAP—tarpaulin or chamber followed by cold treatment

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:		
		0.5 hr	2 hrs	2.5 hrs
70 °F (21.11 °C) or above	2 lbs	25	18	18
Followed by cold treatment				

Refrigeration	
Temperature	Exposure Period
34 to 40 °F (1.11 to 4.44 °C)	4 days
OR 41 to 47 °F (5.0 to 8.33 °C)	6 days
OR 48 to 56 °F (8.88 to 13.33 °C)	10 days

Treatment: D301.32-10(c-7) — MB at NAP—tarpaulin or chamber followed by cold treatment

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:			
		0.5 hr	2 hrs*	2.5 hrs	3 hrs
70 °F (21.11 °C) or above	2 lbs	25	18	18	17
Followed by cold treatment					

Refrigeration	
Temperature	Exposure Period
43 °F to 47 °F (6.11 to 8.33 °C)	3 days
OR 48 °F to 56 °F (8.88 to 13.33 °C)	6 days

Bell pepper

Treatment: D301.32-10(c-8) — Vapor heat
(equivalent to **T106-b**)

Bactrocera dorsalis (Oriental fruit fly)
D301.32-10(d)

Tomato

Treatment: D301.32-10(d-1) — MB at NAP

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:		
		0.5 hr	2 hrs	3.5 hrs
70 °F or above	2 lbs	26	21	21



Host tolerance is marginal. Warn the shipper of possible injury.

Treatment: D301.32-10(d-2) — Vapor heat
(equivalent to **T106-b**)

Citrus and Grape

Treatment: D301.32-10(d-3) — MB at NAP—tarpaulin or chamber followed by cold treatment

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
70 °F (21.11 °C) or above	2 lbs	25	18
Followed by cold treatment			

Refrigeration	
Temperature	Exposure Period
33 to 37 °F (0.56 to 2.77 °C)	4 days
OR 38 to 47 °F (3.33 to 8.33 °C)	11 days

Treatment: D301.32-10(d-4) — MB at NAP—tarpaulin or chamber followed by cold treatment

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:		
		0.5 hr	2 hrs	2.5 hrs
70 °F (21.11 °C) or above	2 lbs	25	18	18
Followed by cold treatment				

Refrigeration	
Temperature	Exposure Period
34 to 40 °F (1.11 to 4.44 °C)	4 days
OR 41 to 47 °F (5.0 to 8.33 °C)	6 days
OR 48 to 56 °F (8.88 to 13.33 °C)	10 days

Treatment: D301.32-10(d-5) — MB at NAP—tarpaulin or chamber followed by cold treatment

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:			
		0.5 hr	2 hrs*	2.5 hrs	3 hrs
70 °F (21.11 °C) or above	2 lbs	25	18	18	17
Followed by cold treatment					

Refrigeration	
Temperature	Exposure Period
43 °F to 47 °F (6.11 to 8.33 °C)	3 days
OR 48 °F to 56 °F (8.88 to 13.33 °C)	6 days

Treatment: D301.32-10(d-6) — Cold treatment followed by MB at NAP—tarpaulin or chamber

Temperature	Exposure Period
33 °F (0.56 °C) or below	21 days
Followed by MB at NAP—tarpaulin or chamber	

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:	
		0.5 hr	2 hrs
70 °F (21.11 °C) or above	2 lbs	30	25
60 to 69 °F (15.55 to 20.55 °C)	2.5 lbs	36	28
40 to 59 °F (4.44 to 15 °C)	3 lbs	44	36

Bell pepper

Treatment: D301.32-10(d-7) — Vapor heat
(equivalent to **T106-b**)

*Anastrepha
serpentina*
(Sapote fruit fly)
D301.32-10(e)

Citrus

Treatment: D301.32-10(e-1) — Methyl bromide
(equivalent to **T101-j-2-1**)

D301.50-10

Pine Shoot Beetle (*Tomicus piniperda*)



Cut trees at least 2 weeks prior to treatment in order to reduce possible damage by the fumigant to the trees. APHIS assumes no responsibility for damage due to the phytotoxic effects of these treatments.

D301.50-10(a)

Pine logs and pine lumber with bark attached, pine bark products, and pine stumps

Treatment: D301.50-10(a)—MB at NAP tarp or chamber
(equivalent to **T404-b-1-1**)

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:			
		0.5 hr	2 hrs	4 hrs	16 hrs
70 °F or above	3	36	30	27	25
40 - 69 °F	5	60	51	46	42

D301.50-10(b) Christmas trees, pine nursery stock, raw pine materials for pine wreaths and garlands

Treatment: D301.50-10(b)—Cold Treatment

Temperature	Exposure Period
-0.5 °F (-20.6 °C)	1 hour

Load the commodity into an APHIS-approved refrigeration unit. Do not start the treatment time until the refrigeration unit reaches the treatment temperature.

D301.50-10(c) Christmas trees, raw pine materials for pine wreaths and garlands

Treatment: D301.50-10(c)—MB at NAP tarp or chamber (equivalent to **T313-b**)

Temperature	Dosage Rate (lb/1,000 ft ³)	Minimum Concentration Readings (ounces) At:			
		2 hrs	3 hrs	3.5 hrs	4 hrs
60°F or above	3 lbs	43	—	—	36
60°F or above	4 lbs	57	48	—	—
50-59°F	3.5 lbs	50	—	—	42
50-59°F	4 lbs	57	—	48	—
40-49°F	4 lbs	57	—	—	48

D301.75-11 Citrus Canker (*Xanthomonas axonopodis*)

Conduct treatments at a commercial packinghouse operating under a compliance agreement.



Important

All personnel using these treatments must clean their hands using one of the following disinfectants:

- ◆ Gallex 1027 Antimicrobial Soap
- ◆ Hibiclens
- ◆ Hibistat
- ◆ Sani Clean Hand Soap
- ◆ Seventy Percent Isopropyl Alcohol



Sodium hypochlorite, peroxyacetic acid, and sodium o-phenyl phenate (SOPP) must be applied in accordance with label directions.

Regulated Fruit¹

D301.75-11 (a-1)

Treatment: D301.75-11(a-1) — Chemical Treatment

Thoroughly wet the fruit for at least 2 minutes with a solution containing 200 parts per million sodium hypochlorite. Maintain the solution at a pH of 6.0 to 7.5.

D301.75-11 (a-2)

Treatment: D301.75-11(a-2)— Chemical Treatment

Thoroughly wet the fruit with a solution containing sodium o-phenyl phenate (SOPP) at a concentration of 1.86 to 2.0 percent of the total solution. If the solution has sufficient soap or detergent to cause a visible foaming action, wet for 45 seconds. If the solution does not contain sufficient soap to cause a visible foaming action, wet for 1 minute.

D301.75-11 (a-3)

Treatment: D301.75-11(a-3) — Chemical Treatment

Thoroughly wet the fruit with a solution of 85 parts per million peroxyacetic acid for at least 1 minute.

Regulated Seed²

D301.75-11(b)

Treatment: D301.75-11(b) — Chemical and Heat Treatment
(equivalent to [T511-1](#))

Following extraction from fruit treated as described in D301.75-11(a-1,2,3), the seed must be:

1. Cleaned free of pulp
2. Immersed for 10 minutes in water heated to 125 °F (51.6 °C) or higher

1 Regulated fruit is defined as any fruit, seed, plant, plant part, grass, or tree in all species, clones, cultivars, strains, varieties, and hybrids of the genera *Citrus* and *Fortunella*, and all clones, cultivars, strains, varieties, and hybrids of the species *Clausena lansium* and *Poncirus trifoliata*. The most common of these are: lemon, pummelo, grapefruit, key lime, persian lime, tangerine, satsuma, tangor, citron, sweet orange, sour orange, mandarin, tangelo, ethrog, kumquat, limequat, calamondin, trifoliolate orange, and wampi.

2 Regulated seed is defined as any seed in all species, clones, cultivars, strains, varieties, and hybrids of the genera *Citrus* and *Fortunella*, and all clones, cultivars, strains, varieties, and hybrids of the species *Clausena lansium* and *Poncirus trifoliata*.

Domestic Treatments

Citrus Canker (*Xanthomonas axonopodis*)

3. Immersed for at least 2 minutes in a solution containing 200 parts per million sodium hypochlorite (0.525 percent), with the solution maintained at a pH of 6.0 to 7.5.



Important

Prepare the sodium hypochlorite solution by diluting 1 part Clorox (containing 5.25 percent sodium hypochlorite) in 9 parts of water. If using "Ultra strength" bleach, use only three-fourths as much bleach.

Adjust the pH using acetic acid (vinegar or any dilute acid) under a fume hood or in a well ventilated area.

Vehicles, equipment, and other inanimate articles

D301.75-11(d)

Treatment: D301.75-11(d) — Chemical or Heat Treatment

All vehicles, equipment, and other articles for which treatment is required must be cleaned and disinfected by removing all plants, leaves, twigs, fruit, and other plant parts from all areas of the equipment or vehicles, including in cracks, under chrome strips, and on the undercarriage of vehicles, by wetting all surfaces (including the inside of boxes and trailers), to the point of runoff, with one of the following disinfectants:

- ◆ 200-ppm solution of sodium hypochlorite with a pH of 6.0 to 7.5
- ◆ 0.2-percent solution of a quaternary ammonium chloride (QAC) compound
- ◆ Solution of hot water and detergent, under high pressure (at least 30 pounds per square inch), at a minimum temperature of 160 °F
- ◆ Steam, at a minimum temperature of 160 °F at the point of contact
- ◆ Solution containing 85 parts per million peroxyacetic acid (indoor use only)

D301.76 Asian Citrus Psyllid (*Diaphorina citri* Kuwayama)
D301.76 (a-1) Curryleaf (*Bergera (=Murraya) koenigii*) and other regulated articles for consumption, apparel or similar personal accessory, or decorative use

Origin: Areas without citrus greening (*Citrus huanglongbing* (HLB))³

Treatment: D301.76 (a-1) — MB at NAP tarp or chamber
(equivalent to **T101-n-2**)



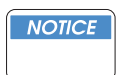
Curry leaf and kaffir lime leaf must be treated as a Section 18 crisis exemption. In addition, clementine, tangerine, mandarin, lemon, lime, orange, tangelo and citron must be treated using 3 pounds at 50 °F. The label does not allow fumigation of these citrus commodities at dosages greater than 3 pounds.

D301.76 (a-2) Treatment: D301.76 (a-2) — Irradiation at 400 Gy
(equivalent to **T105-a-2**)

Treat using a minimum absorbed dose of 400 Gy, **not** to exceed 1000 Gy

D301.76(a-3) Curryleaf (*Bergera (=Murraya) koenigii*), Kaffir lime leaf (*Citrus hystrix*), and Bael leaf (*Aegle marmelos*) for consumption

Treatment: D301.76 (a-3) — Processing



The processing protocol has been added under the authority of [Federal Order DA-2015-04](#), published January 01, 2015 and is pending final regulatory approval. The treatment is subject to change or removal based on public comment. (7 CFR 305.3(b)(2))

Processing includes specific harvesting, washing, rinsing, drying, and packaging requirements. Refer to the [Protocol for Interstate Movement of Fresh, Mature Leaves of Kaffir Lime, Curry, and Bael](#) for detailed instructions. The approved washing products are listed in [Table 5-8-4](#).

Table 5-8-4 Food Grade Washing Products for Leaf Washing for ACP

Product	Rate Per Gallon
Environne	1/4 cup
Rebel Green	1/4 cup
Veggie Wash	1/4 cup

D301.76 (b) Citrus nursery stock and related hosts⁴

Origin: Areas with ACP⁵

Treatment: D301.76(b)—Chemical Treatment

³ Refer to the [USDA Citrus Greening web site](#) for a current list of areas without citrus greening.

Domestic Treatments

Imported Fire Ant (*Solenopsis invicta* and *S.richteri*)

Treat plants with an APHIS-approved soil drench or in-ground granular systemic insecticide, followed by a foliar spray at specified time periods prior to shipment. (Refer to [Table 5-8-5](#).) The treatments will be followed by a visual inspection for living psyllids according to the requirements listed in 7 CFR 301.76 and the [Citrus Nursery Stock Protocol](#).

Table 5-8-5 APHIS-approved Insecticides for Control of Psyllids on Citrus

USDA Approved Soil Drench or In-ground Granular Chemicals:	USDA Approved Foliar Chemicals:
Dinotefuran	Bifenthrin
Imidacloprid	Chlorpyrifos
	Deltamethrin
	Fenprothrin
	Imidacloprid/Cyfluthrin



Apply the SOIL DRENCH or IN-GROUND GRANULAR chemicals no more than 90 days but no less than 30 days prior to interstate movement. All treatments must be applied according to their EPA label, including application directions, restrictions on place of application, and any other precautions and statements pertaining to Worker Protection Standards.

Apply the FOLIAR chemicals no more than 10 days prior to interstate movement. All treatments must be applied according to their EPA label, including application directions, restrictions on place of application, and any other precautions and statements pertaining to Worker Protection Standards.

D301-81-10

Imported Fire Ant (*Solenopsis invicta* and *S.richteri*)

Used Soil Moving Equipment

D301.81-10(1)

Treatment: D301.81-10(1) — Cleaning Treatment

Used soil moving equipment is eligible for movement when an inspector determines that **one** of the following procedures has been done:

- 4 Regulated articles for Asian Citrus Psyllid (ACP) and Citrus Greening (CG) (hosts within the plant family Rutaceae) may be intended for consumption, as apparel or similar personal accessory, or decorative use:
All plants and plant parts (including leaves), except fruit, of the following species: *Aegle marmelos*, *Aeglopsis chevalieri*, *Afraegle gabonensis*, *A. paniculata*, *Amyris madrensis*, *Atalantia* spp. (including *Atalantia monophylla*), *Balsamocitris dawei*, *Bergera* (=Murraya) *koenigii*, *Calodendrum capense*, *Choisya ternate*, *C. arizonica*, *X Citroncirus webberi*, *Citropsis articulata*, *Citropsis gilletiana*, *Citrus madurensis* (=X *Citrofortunella microcarpa*), *Citrus* spp., *Clausena anisum-olens*, *C. excavate*, *C. indica*, *C. lansium*, *Eremocitrus glauca*, *Eremocitrus hybrid*, *Esenbeckia berlandieri*, *Fortunella* spp., *Limonia acidissima*, *Merrillia caloxylon*, *Microcitrus australasica*, *M. australis*, *M. papuana*, *X Microcitronella* spp., *Murraya* spp., *Naringi crenulata*, *Pamburus missionis*, *Poncirus trifoliata*, *Severinia buxifolia*, *Swinglea glutinosa*, *Tetradium rutilcarpum*, *Toddalia asiatica*, *Triphasia trifolia*, *Vepris* (=Toddalia) *lanceolata*, and *Zanthoxylum fagara*.
- 5 Refer to the [USDA Citrus Greening web site](#) for a current list of areas with ACP.

- ◆ It has been brushed free of noncompacted soil
- ◆ It has been washed free of noncompacted soil
- ◆ Noncompacted soil has been removed with air pressure equipment using compressors designed specifically for this purpose. Such compressors must provide free air delivery of no less than 30 ft³ per minute at 200 pounds per in².

Certification Period: The certification will be valid as long as the equipment remains free of noncompacted soil.

Limitations: Regardless of the type of cleaning equipment used, all debris and noncompacted soil must be removed unless it is steam-heated by a “steam jenny” to disinfest the articles. Used soil-moving equipment, such as bulldozers, dirt pans, motor graders, and draglines, are difficult to clean sufficiently to eliminate pest risk.



Steam may remove loose paint and usually is not recommended for use on equipment with conveyor belts and rubber parts.

D301.81-10(2)

Hay and Straw

Baled hay and straw stored in direct contact with the ground is ineligible for movement from the quarantined area to an area outside the quarantine, unless inspected, found free of IFA, and issued a certificate.

D301.81-10(3)

Nursery Stock—Balled or in Containers

There are four application methods for plants in containers or balled and burlaped. The methods are:

- ◆ Method A-Immersion
- ◆ Method B-Drench
- ◆ Method C-Topical
- ◆ Method D-Granular Incorporation

Method A—Immersion

Equipment: You will need an open-top, watertight container sufficiently large to accommodate the treating solution and plants

Procedure: Follow these steps to treat the plants:

Step 1 Choose an appropriate site.

Locate the immersion tank in a well-ventilated place. The location should be covered if possible. Do not remove burlap wrap or plastic containers with drain holes before immersion.

Step 2 Immerse the plants.

Immerse the soil balls and containers, singly or in groups, so that the soil is completely covered by the insecticidal solution. Allow the plants to remain in the solution until bubbling ceases.



Thorough saturation of the plant balls or containers with the insecticide solution is essential!

Step 3 Remove the plants from the dip.

After removal from the dip, set the plants on a drainboard until adequately drained.

Step 4 Add treating mixture.

As treating progresses, add freshly prepared insecticide mixture to maintain the liquid at immersion depth.

Step 5 Dispose of solution.

Dispose of tank contents 8 hours after mixing. Disposal must comply with state and local regulations.



Do not permit runoff of the solution from the treatment area! Dispose of excess and unused solution in accordance with state and local regulations.



Wear rubber gloves, boots, and apron during this operation.

Insecticides, Dosages, and Certification Periods

Refer to **Table 5-8-6** for dosages and certification periods for approved insecticides.

Table 5-8-6 Insecticides for Immersion Treatment of Balled or Containerized Plants

Insecticide (liquid)	Dosage (lb. active ingredient per 100 gallons water)	Certification period (days)
Chlorpyrifos	0.125	30
Bifenthrin	0.115	180
	0.05	120
	0.025	60

Exposure Period: Plants certifiable immediately upon completion of treatment.



Environmental factors significantly affect phytotoxicity. Dwarf yaupon, some varieties of azaleas, camellias, poinsettias, rose bushes, and variegated ivy may show phytotoxicity to chlorpyrifos. It is recommended that a small group of plants be treated at the recommended rate under the anticipated growing conditions and observed for phytotoxic symptoms for at least seven days before a large number of plants are treated.



The professional user assumes responsibility for determining if bifenthrin is safe to treat plants under commercial growing conditions.

Method B—Drench

Equipment: You will need the following pieces of equipment to drench the plants:

- ◆ A large-capacity bulk mixing tank, either pressurized or gravity-flow for mixing and holding the insecticide solution
- ◆ Properly equipped hoses and watering nozzles that can be attached to the mixing tank and used to thoroughly saturate the plant balls with insecticide solution

Containerized Plants

Step 1 Prepare the solution

The volume of the treating solution must be at least 20 percent (1/5) of the volume of the container.

Insecticides and Dosages

Table 5-8-7 Insecticides and Dosages for Drenching Plants in Containers

Insecticide (liquid)	Dosage
Chlorpyrifos (4EC)	4 fl. oz. per 100 gal water
Chlorpyrifos (2EC)	8 fl.oz. per 100 gal water
Bifenthrin	25 parts per million (ppm) ¹

¹ Dose rate for bifenthrin is 25 ppm based on dry weight bulk density of the potting media. Refer to **Table 5-8-8** for bulk density calculations.

Table 5-8-8 Bifenthrin calculations based on Bulk Density

Potting Media Bulk Density (lb/yd ³)	Oz. bifenthrin/100 gal water
200	2.4
400	4.8
600	7.2
800	9.6
1,000	12.0
1,200	14.4
1,400	16.8

Step 2 Apply the solution

Apply solution to the point of saturation one time only. The volume of the solution should be one-fifth the volume of the container.



Important

Thorough saturation of the plant balls or containers with the insecticide solution is essential. Do not permit runoff of the solution from the treatment area! Dispose of excess and unused solution in accordance with state and local regulations.

Exposure Period: Plants are certifiable immediately upon completion of treatment.

Certification period

Table 5-8-9 Certification period for Plants in Containers

Insecticide	Certification Period (days)
Chlorpyrifos	30
Bifenthrin	180

Balled and Burlapped (B&B) Plants

Step 1 Select a site for the treatment

Move the plants to a well-ventilated place normally used to maintain plants prior to shipment. The treatment locations should be covered, if possible. The treatment will be enhanced by adding any agricultural wetting agent or surfactant.

Step 2 Apply the solution

Do not remove burlap wrap or baskets from plants prior to treatment. The total volume of the treating solution must be 20 percent (1/5) the volume of the root ball. Treat plants singly or in groups with the chlorpyrifos solution twice in one day. Apply one-half the total drench solution, wait at least 30 minutes, then rotate the root ball and apply the second one-half drench solution. Rotating or flipping the root ball between drench applications is required to insure all sides of the root ball are sufficiently treated.



Changes to the method for application have been added under the authority of [SPRO-DA-2015-15](#), published March 31, 2015. The revision is subject to change or removal based on public comment. (7 CFR 305.3(b)(2))



Wear rubber gloves, boots, and apron during this operation.

Dosage:

Table 5-8-10 Emulsifiable Chlorpyrifos Dosage for Balled Plants

Chlorpyrifos formulation	Amount of formulation to make 100 gallons of treating solution
1 EC	16 fl. oz. (472 ml)
2 EC	8 fl. oz. (236 ml)
4 EC	4 fl. oz. (118 ml)

Exposure Period: Plants are certifiable immediately upon completion of treatment.

Certification period: 30 days.

Method C—Topical Application

Bifenthrin liquid is the only insecticide and formulation registered for topical application. Use this method only with nursery stock in 3- and 4-quart containers. Penetration of the insecticide in larger containers does not provide sufficient residual activity. Prepare a mix with the appropriate amount of bifenthrin in 1,000 oz. of water based on the container size and the bulk density of potting media. Refer to **Table 5-8-11** for calculations based on bulk density and container size.

Table 5-8-11 Potting Media Bulk Density

Potting Media Bulk Density (lb/yd ³)	Oz. Bifenthrin liquid/1,000 fl. oz. water	
	3-quart Pots	4-quart Pots
200	3.6	5.2
400	7.2	10.4
600	10.8	15.6
800	14.4	20.8
1,000	18.0	26.0
1,200	21.6	31.2
1,400	25.2	36.4

Apply 1 fluid ounce of the mix to each container evenly distributed over the surface of the potting media.

Irrigate all treated containers with 1.5 inches of water following application.



Important

Do not permit runoff of the solution from the treatment area! Dispose of excess and unused solution in accordance with state and local regulations.

Certification period: 180 days.

Method D—Granular Incorporation

There are three granular insecticides registered and approved for incorporation into potting media:

- ◆ Granular bifenthrin
- ◆ Granular tefluthrin
- ◆ Granular fipronil

Use soil mixing equipment that will adequately mix and thoroughly blend the required dosage of insecticide throughout the potting media.

Dosage is based on the bulk density of the potting media and the desired certification period. Dosage is expressed as parts per million (ppm) and calculated by the following formula:

$$\frac{\text{Bulk density of media} \times \text{desired ppm}}{\text{concentration of pesticide}} = \text{lbs. insecticide needed per cubic yard of media}$$

Figure 5-8-1 Formula for Calculating Granular Insecticide for Treating Potting Media for IFA

Table 5-8-12 Application Rates for Incorporation of Granular Insecticides into Potting Media

Insecticide	Dosage (ppm)	Certification period (months after treatment)
Bifenthrin	10	0–6 months
	12	0–12 months
	15	0–24 months
	25	Continuous ¹
Tefluthrin	10	0-18
	25	Continuous ¹
Fipronil	10	0–6 months
	12	0–12 months
	15	0–24 months
	25	Continuous ¹

¹ Continuous certification with 25 ppm dosage when all other provisions of the Imported Fire Ant detection, control, exclusion, and enforcement program for nurseries producing containerized plants are met (7 CFR 301.81-11)

D301.81-10(5)

In-Field Treatment For B&B Stock Prior to Harvest

This in-field treatment is based on a sequential application of abamectin, fenoxycarb, hydramethylnon, metaflumizone, methoprene, or pyriproxyfen bait followed by a broadcast application of chlorpyrifos. The combination treatment is necessary since broadcast application of chlorpyrifos (or other short-term residual insecticides) usually does not eliminate large, mature IFA colonies, and baits are not capable of providing a residual barrier against reinfestation by new queens. Therefore, the approved bait application will drastically reduce the IFA population while chlorpyrifos, applied

Domestic Treatments

Imported Fire Ant (*Solenopsis invicta* and *S. richteri*)

approximately five days later, will destroy any remaining weakened colonies and also leave a residual barrier against reinfestation by new queens for at least 12 weeks.



Abamectin and metaflumizone have been added under the authority of [SPRO-DA-2015-15](#), published March 31, 2015. The treatment is subject to change or removal based on public comment. (7 CFR 305.3(b)(2))

Method: Apply approved bait only when ants are actively foraging using a granular applicator capable of applying the labeled rates (1.0–1.5 lb (0.45–0.68 kg)) of bait per acre. Three to five days after the approved bait application, apply chlorpyrifos broadcast at 6.0 lb (2.7 kg) active ingredient (a.i.) per acre. Treatment area must extend at least 10 feet beyond the base of all plants that are to be certified.

Dosage: Apply approved baits at 1.0–1.5 lb (0.45–0.68 kg) bait/acre. Apply granular chlorpyrifos at 6.0 lb (2.7 kg) a.i./acre.

Exposure Period: 30 days. Plants are certifiable 30 days after treatment.

Certification Period: 12 weeks; an additional 12 weeks of certification can be obtained with a second application of granular chlorpyrifos.

D301.81-10(6)

Blueberries and Other Fruit and Nut Nursery Stocks

Certain states have special local need labeling in accordance with section 24(c) of FIFRA for D-z-n Diazinon AG-500 and D-z-n Diazinon 50W, which APHIS will recognize as a regulatory treatment for containerized nonbearing blueberries and fruit and nut plants. Follow the label directions for use.

D301.81-10(7)

Greenhouse Grown Plants

Greenhouse grown plants are certifiable without treatment if the inspector determines that the greenhouse is constructed of fiberglass, glass, or plastic in such a way that IFA is physically excluded and cannot become established within the enclosure. No other treatment of the plants will be necessary if they are not exposed to infestation.

D301.81-10(8)

Grass—Sod

Method:

Step 1 Apply the insecticide.

- ◆ Chlorpyrifos: apply a single broadcast application of chlorpyrifos with ground equipment
- ◆ Fipronil or bifenthrin: apply two sequential broadcast applications one week apart of granular fipronil or liquid bifenthrin

Table 5-8-13 Pesticide Dosages for Grass Sod

Material	Dosage (lb. a.i. per acre)	Exposure Period	Certification period (after exposure period)
Chlorpyrifos	8.0	48 hours	6 weeks
Fipronil-granular	Apply 0.0125 two times, one week apart for a total dosage of 0.0250.	30 days	20 weeks
Bifenthrin-liquid	Apply a dosage of 0.2 two times, one week apart for a total dosage of 0.4. Apply the first dosage of 0.2 and then 7 days later apply a second dosage of 0.2 (total dosage of 0.4)	4 weeks (28 days)	16 weeks

EXAMPLE: You are applying liquid bifenthrin to 1 acre of fire ant infested grass sod. Using a broadcast applicator, apply 0.2 lb. a.i. per acre and then 7 days later, apply a second dosage of 0.2 lb. a.i. per acre. After 28 days exposure period, you may harvest and ship sod for 16 weeks. After that time to continue harvesting from the same area, you would need to re-treat.

Step 2 Water the treated areas.

Immediately after treatment, water the treated areas with at least ½ inch of water.

D301.81-10(9)

Soil—Bulk

Method: Bulk soil is eligible for movement when heated either by dry or steam heat after all parts of the mass have been brought to the required temperature.

Temperature: 150°F (65.5°C).

Certification Period: As long as protected from recontamination.

D301.81-10(10) Soil Samples

Soil samples are eligible for movement when heated or frozen as follows:

Method: Soil samples are heated either by dry heat or steam heat. All parts of the mass must be brought to the required temperature.

Temperature: 150°F (65.5°C).

Certification Period: As long as protected from recontamination.

Method: Soil samples are frozen in any commercial cold storage, frozen food locker, or home freezer capable of rapidly reducing to and maintaining required temperature. Soil samples will be placed in containers, such as plastic bags—one sample per bag. The containers will be arranged in the freezer in a manner to allow the soil samples to freeze in the fastest possible time. If desired, the frozen samples may be shipped in one carton.

Temperature: -10° to -20°F (-23° to -29°C) for at least 24 hours.

Certification Period: As long as protected from recontamination.

D301.87-10 Sugarcane Leaf Scald and Gummosis disease (*Xanthomonas albilineans* and *X. vasculorum*)

Seed pieces

D301.87-10(a) Treatment: D301.87-10(a) Hot water
(equivalent to **T514-1**)

Presoak in water at room temperature for 24 hours then immerse in water at 122 °F for 3 hours.

True seed (fuzz)

D301.87-10(b) Treatment: D301.87-10(b) Chemical Treatment
(equivalent to **T514-2**)

Immerse in 0.525 percent sodium hypochlorite solution for 30 minutes followed by at least 8 hours air drying before packaging. (Dilute 1 part Clorox or similar solution containing 5.25 percent sodium hypochlorite; if using “ultra strength” chlorine bleach, use only 3/4 as much bleach).

Bagasse

D301.87-10(c) Treatment: D301.87-10(c)—Dry heat treatment
(equivalent to **T514-3**)

Apply dry heat for 2 hours at 158 °F.

Field and processing equipment

D301.87-10(d) Treatment: D301.87-10(d)—High Pressure Wash
(equivalent to **T514-4**)

Remove all debris and soil from equipment with water at high pressure (300 pounds per square inch minimum) or with steam.

Juice

D301.87-10(e) Treatment: D301.87-10(e)—Heat

Heat at 212 °F (100 °C) for 10 minutes or more.

D301.89 Karnal Bunt (*Tilletia indica*)

Equipment, grain elevators, conveyances, and other structures used for storing and handling wheat, durum wheat, or triticale

D301.89-13(a) Treatment: D301.89-13(a)—Chemical Treatment

1. Wet all surfaces to the point of runoff with **one** of the following 1.5 percent sodium hypochlorite solutions:
 - ◆ One part Ultra Clorox brand regular bleach (6 percent sodium hypochlorite; EPA Reg. No. 5813-50) in 3 parts water
 - ◆ One part CPPC Ultra Bleach 2 (6.15 percent sodium hypochlorite; EPA Reg. No. 67619-8) in 3.1 parts water
2. Let stand for 15 minutes.
3. Thoroughly wash down all surfaces after 15 minutes to minimize corrosion.

D301.89-13(b) Treatment: D301.89-13(b)—Steam

Apply steam to all surfaces until the point of runoff, and so that a temperature of 170 °F is reached at the point of contact.

D301.89-13(c) Treatment: D301.89-13(c)—Hot water and high pressure

Clean with a solution of detergent and water at a minimum temperature of 170 °F. Apply under pressure of at least 30 pounds per square inch.

D301.92 *Phytophthora ramorum*

Soil

D301.92-10(a) Treatment: D301.92-10(a)—Heat Treatment

Heat to a temperature of at least 180 °F at the center of the load for 30 minutes in the presence of an inspector.

Wreaths, garlands, and greenery of host material

D301.92-10(b) Treatment: D301.92-10(b)—Hot water

Dip for 1 hour in water that is held at a temperature of at least 160 °F.

Bay leaves

D301.92-10(c) Treatment: D301.92-10(c)—Vacuum heat
(formerly T111-a-1)

1. Place bay leaves in a vacuum chamber.
2. Starting at 0 hour, gradually reduce to 0.133 Kpa vacuum at 8 hours.
3. Maintain the vacuum until the end of the treatment, 22 hours.
4. Gradually increase the temperature in the vacuum chamber from ambient temperature at 0 hour to 60C at 5 hours.
5. After 5 hours, gradually lower the temperature to 30C at 22 hours.

The total length of the treatment is 22 hours.

DA-2013-13
(04/02/2013)

Sweet Orange Scab (SOS), *Elsinoë australis* (Federal Order DA-2013-13)

Regulated Articles⁶

Conduct treatments at a commercial packinghouse operating under a compliance agreement. Regulated fruit can move interstate with a certificate to all States. For interstate movement under a limited permit, refer to the [APHIS-Approved Packing House Procedures](#).



Chemicals and fungicides **must** be applied in accordance with label directions.

Step 1: Wash

Step 2: Brush

Step 3: Surface disinfect using at least one of the chemicals in DA-2013-13.

DA-2013-13
(a-1)

Treatment: DA-2013-13 (a-1) — Chemical Treatment

Thoroughly wet the fruit for at least 2 minutes with a solution containing 200 parts per million sodium hypochlorite. Maintain the solution at a pH of 6.0 to 7.5.

DA-2013-13
(a-2)

Treatment: DA-2013-13 (a-2)— Chemical Treatment

Thoroughly wet the fruit with a solution containing sodium o-phenyl phenate (SOPP) at a concentration of 1.86 to 2.0 percent of the total solution. If the solution has sufficient soap or detergent to cause a visible foaming action, wet for 45 seconds. If the solution does not contain sufficient soap to cause a visible foaming action, wet for 1 minute.

DA-2013-13
(a-3)

Treatment: DA-2013-13(a-3) — Chemical Treatment

Thoroughly wet the fruit with a solution of 85 parts per million peroxyacetic acid for at least 1 minute.

⁶ Regulated articles include fruit, plants, plant products (except seeds) of *Citrus* spp. and *Fortunella* spp. Regulated fruit must be free of leaves, stems that are 1-inch or less in length, or other regulated material.

Step 4: Treat with at least one of the fungicides in Table 5-8-14.

Table 5-8-14 Sweet Orange Scab Approved Fungicides

Chemical Name
Imazalil
Thiabendazole
Combination of fludioxonil plus azoxystrobin

Step 5: Wax.

DA-2012-09
(03/16/2012)

Guignardia citricarpa, fungal pathogen causing the disease Citrus Black Spot (CBS) (Federal Order DA-2012-09)

Regulated Articles⁷

Conduct treatments at a commercial packinghouse operating under a compliance agreement. Regulated fruit can move interstate with a certificate to all States. For interstate movement under a limited permit, refer to the [APHIS-Approved Packing House Procedures](#).



Chemicals and fungicides **must** be applied in accordance with label directions.

Step 1: Wash

Step 2: Brush

Step 3: Surface disinfect using at least one of the chemicals in DA-2012-09

DA-2012-09
(a-1)

Treatment: DA-2012-09(a-1) — Chemical Treatment

Thoroughly wet the fruit for at least 2 minutes with a solution containing 200 parts per million sodium hypochlorite. Maintain the solution at a pH of 6.0 to 7.5.

DA-2012-09
(a-2)

Treatment: DA-2012-09(a-2) — Chemical Treatment

Thoroughly wet the fruit with a solution containing sodium o-phenyl phenate (SOPP) at a concentration of 1.86 to 2.0 percent of the total solution. If the solution has sufficient soap or detergent to cause a visible foaming action, wet for 45 seconds. If the solution does not contain sufficient soap to cause a visible foaming action, wet for 1 minute.

DA-2012-09
(a-3)

Treatment: DA-2012-09(a-3) — Chemical Treatment

Thoroughly wet the fruit with a solution of 85 parts per million peroxyacetic acid for at least 1 minute.

⁷ Regulated articles include fruit, plants, plant products of *Citrus* spp.

Step 4: Treat with at least one of the fungicides in Table 5-8-15.

Table 5-8-15 Citrus Black Spot Approved Fungicides

Chemical Name
Imazalil
Thiabendazole

Step 5: Wax.