Integrated Pest Management and Fumigation Safety Training

January 24–26, 2017
Kansas State University, Manhattan, Kansas
Port Fumigations

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Cardinal Professional Products
Topics of Discussion

- Types of treatments at port locations in the US
- Regulatory requirements
- Basic information on fumigants
- Applications
- Documentation
- Safety
Types of Port Fumigations

Import

- Perishables
  - e.g., Asparagus, Grapes, Citrus, Apples, Tomatoes, Kiwi, Pomegranates, Chestnuts, Ginger, Pineapples, Broccoli, Fresh Berries, Fresh Herbs, Stone Fruit, Garlic, Yams, Squash, Bell Peppers

- Dry Goods
  - Tile, Bamboo, Seeds, Grains, Nuts, others

Export

- Wood Packing Material (ISPM 15)
- Pallets
- Logs
- Nuts
- Grains
- Furniture
- Citrus
- Stone Fruit
A “Quarantine Pest” is a pest of potential economic importance to the area endangered thereby and not yet present there, or present but not widely distributed and being officially controlled.

Example, in the United States, the Mediterranean fruit fly, Ceratitis capital, one of the world’s most destructive fruit pests.
APHIS Treatment Manual - Imports

- United States Department of Agriculture (USDA)
- Animal and Plant Health Inspection Service (APHIS)
- Plant Protection and Quarantine (PPQ)
APHIS Treatment Manual - Imports

- Chemical Treatments
- Nonchemical treatments
- Residue monitoring
- Treatment schedules
- Certifying facilities
- Emergency aid and safety
- Equipment
- Imports of commodities
# APHIS Treatment Schedule

## Broccoli raap (rapini) (*Brassica campestris*)

**Pest:** External feeders and leaf miners  
**Treatment:** T101-n-2 MB at NAP—tarpaulin or chamber

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Dosage Rate (lb/1,000 ft²)</th>
<th>Minimum Concentration Readings (ounces) At:</th>
<th>0.5 hr</th>
<th>2 hrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>70 °F or above</td>
<td>2 lbs</td>
<td>26</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>60-69 °F</td>
<td>2.5 lbs</td>
<td>32</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>50-59 °F</td>
<td>3 lbs</td>
<td>38</td>
<td>29</td>
<td></td>
</tr>
<tr>
<td>45-49 °F</td>
<td>3.5 lbs</td>
<td>43</td>
<td>34</td>
<td></td>
</tr>
<tr>
<td>40-44 °F</td>
<td>4 lbs</td>
<td>48</td>
<td>38</td>
<td></td>
</tr>
</tbody>
</table>

## Miscellaneous cargo (nonfood, nonfeed commodities)

**Three alternative treatments**

**Pest:** Quarantine-significant snails of the families Geomitridae and Hygromiidae, including the following genera:  
- Candidula  
- Cernuella  
- Cochlicella  
- Helicella  
- Helicopsis  
- Xerolenta

**Treatment:** T403-a-2-1—MB ("Q" label only) at NAP

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Dosage Rate (lb/1,000 ft²)</th>
<th>Minimum Concentration Readings (ounces) At:</th>
<th>0.5 hr</th>
<th>2 hrs</th>
<th>24 hrs</th>
<th>48 hrs</th>
<th>72 hrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>55 °F or above</td>
<td>8 lbs</td>
<td>95</td>
<td>64</td>
<td>60</td>
<td>60</td>
<td>40</td>
<td></td>
</tr>
</tbody>
</table>
Export Treatments

Pytosanitary Export Database (PExD)

USDA Phytosanitary Certificate Issuance & Tracking System (PCIT)

www.pcit.aphis.usda.gov/pcit
Treatment is:
- 2.5 g/m³ for 7 days@12-15°C
- Equivalent to 3 Fumi-Cels per 1,000 ft³
- Or 1,767 ppm of ECO₂FUME® (not a labeled dose)
Export Requirement Wheat to Viet Nam

Important Notes:

12/01/2016: Effective December 1, 2016 (bill of lading date), all shipments of wheat, corn, and distillers dried grain (DDG) must be fumigated with methyl bromide prior to entry.

12/04/2016: Effective December 1, 2016 (bill of lading date), all shipments of wheat, corn, and distillers dried grain (DDG) must be fumigated with methyl bromide prior to entry.
DDGs will only be allowed entry through December 16, 2016 (bill of lading date). As of December 17, 2016, (bill of lading date), DDGs will be prohibited into Viet Nam.

11/20/2016: For hardwood lumber only, Viet Nam will accept National Hardwood Lumber Association KD certificate in lieu of a PC.

Commodity Parts:
- Grain (for consumption)

Triticum sp.
Certificate of Fumigation

- Name of Fumigators
- Type of Fumigation
- Commodity
- Country of Origin
- Carrier
- Ship/Container Number
- Date & Time of Application
- Finish Application Date & Time
- Fumigant Used
- Rate, Volume
- Signature/Certification
Fumigations Required By Customer

- If Methyl Bromide requested, cannot certify its use as QPS (Quarantine or Pre-Shipment Exemption)

- Fumigation company or provider fills out a fumigation certificate for documentation
APHIS issues a phytosanitary certificate

Fumigation was conducted in accordance with the plant health standards of importing countries, and according to the APHIS Treatment Manual Treatment Schedules
Phosphine Fumigants
Methyl Bromide
Sulfuryl fluoride – Vikane® & ProFume®
Carbon dioxide – Organic

60%-70% Concentration, 4 days minimum
Choosing a Dose – Aluminum phosphide

### Aluminum phosphide Pesticide Label

<table>
<thead>
<tr>
<th>Product</th>
<th>Per 1,000 ft³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pellets</td>
<td>100-725</td>
</tr>
<tr>
<td>Tablets</td>
<td>20-145</td>
</tr>
</tbody>
</table>

### FGIS Fumigation Handbook Requirements

<table>
<thead>
<tr>
<th>Application Method and Minimum Dosage Rate Per 1,000 Cubic Feet of Storage Space</th>
<th>CARGO HOLD DEPTH IN METERS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt; 6</td>
</tr>
<tr>
<td>Surface Application 45 grams of metal phosphide per 1,000 cu. ft.</td>
<td>9</td>
</tr>
<tr>
<td>Subsurface / Trench-in Application 45 grams of metal phosphide per 1,000 cu. ft.</td>
<td>8</td>
</tr>
<tr>
<td>Recirculation Application Method A 33 grams of metal phosphide per 1,000 cu. ft.</td>
<td>4</td>
</tr>
<tr>
<td>Recirculation Application Method B 45 grams of aluminum phosphide pellets per 1,000 cu. ft.</td>
<td>3.5</td>
</tr>
</tbody>
</table>

* Cargo Hold Depth is the length from the bottom of the hold to the top of the combing.
Exposure Period – Follow Import/Export Requirements

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Pellets</th>
<th>Tablets</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;40° F</td>
<td>Do not fumigate</td>
<td>Do not fumigate</td>
</tr>
<tr>
<td>40-53° F</td>
<td>8 days</td>
<td>10 days</td>
</tr>
<tr>
<td>54-59° F</td>
<td>4 days</td>
<td>5 days</td>
</tr>
<tr>
<td>60-68° F</td>
<td>3 days</td>
<td>4 days</td>
</tr>
<tr>
<td>&gt;68° F</td>
<td>2 days</td>
<td>3 days</td>
</tr>
</tbody>
</table>

Aluminum phosphide Pesticide Label
Export of almonds to Chile requires 2.5 g/m³
Other non-regulated fumigations, follow the label suggestions
Stored Grain Application Methods
Recirculation Method

- Insures even distribution of fumigant
- Workers do not have to enter bin/tank to apply fumigant
- Used for grains already in storage
- System installation can be either permanent or temporary
- Dosage rates can often be reduced
Recirculation Method

Temporary installation using flexible plastic drainage pipe
Recirculation Method
Fumigation of Railcars, Containers, Trucks, Vans and Other Transport Vehicles

Container & Railcar Fumigation

- “Ready-made” fumigation chamber
- Railcars may be fumigated in-transit
- Containers **may not** be fumigated in-transit (except when transported on a railcar or ship)
- Careful inspection required to insure gas-tightness
Check gaskets for excessive wear
Determine all areas that require sealing
If possible, inspect containers prior to loading
Check container floors and walls for holes or damage
Sealing

Seal any vents or other areas noted during inspection
Dosage

- Based on cubic footage
- Normally found on side or door
- Consult manual for rate
- Dustless application -vs- Direct addition
Dustless Application Methods

Use for processed foods or other commodities where contact with fumigant or fumigant dust is undesirable.

Fumi-Disc

Fumi-Kap & Fumi-Bonnet

Fumi-Cel Pouch
Phostoxin® Prepacs can be taped to the interior of the container clear from obstructions.
Fumi-Cels can be placed on the floor or held in a rack
Placed on a cardboard applicator (Fumi-disc)
Monitoring
Sampling lines should be clearly marked
Close & Secure the Doors
Placards

Placard containers front & rear
Efficacy Monitoring

Readings should be taken and documented
Opening Instructions

Opening instructions should be placed on each vehicle in an area most likely to be noticed.
Industrial Hygiene Monitoring

Do not exceed the TLV of 0.3 ppm in any occupied areas
Workers **must** wear respiratory protection if gas concentrations exceed 0.3ppm.

Remove all seals and open doors to allow for aeration.
Sea Containers
Standard Containerized Fumigation
Preparing Containerized Logs for Fumigation
Log Fumigation in Containers
Fumigant Recapture/Scrubbing
Grain Storage at Ports
Inexpensive fumigation chamber
Minimizes amount of fumigant required
Care must be taken to insure a good seal
Corners and floor
Easily subject to damage
Corner boxes, pallets, etc
Requires careful monitoring to insure against exposure to nearby workers, especially during aeration
Sealing Procedures
Sealing Procedures
Sealing Procedures
Sealing Procedures
Under Tarpaulins
Log Fumigations Under Tarpaulin
Fresh Commodities Under Tarpaulin
Why Fumigate Ships?

- Contract requirement of the buyer
- Letter of Credit requirement
- Stipulation in Tender Offer
- Insect Infestation
Government Agencies

- EPA – Label / Applicator’s Manual / Registration / FMP
- Federal Grain Inspection Service (FGIS) Fumigation Handbook
- US Coast Guard  46 CFR 147A
- Department of Transportation (FMCSA) 49 CFR 1.73g
- DOT Rule HM-232
- State & Local Agencies – Department of Agriculture
- Transportation Worker Identification Credential (TWIC)
  - [http://twicinformation.tsa.dhs.gov](http://twicinformation.tsa.dhs.gov)
Transportation Worker Identification Credential (TWIC) is a vital security measure that will ensure individuals who pose a threat do not gain unescorted access to secure areas of the nation’s maritime transportation system.

The TSA will issue a tamper-resistant "Smart Card" containing the worker’s biometric (fingerprint template) to allow for a positive link between the card itself and the individual.
Intransit Shiphold Fumigation
Conditions At Sea
Application Methods

Direct Addition
THE FUMIGANT SHOULD BE APPLIED UNIFORMLY ACROSS THE COMMODITY OR BE PROBED BENEATH THE SURFACE
Application Methods

Dustless
Recirculation in Shipholds
Fumigation Safety Meeting
Example Of Vessel Suitability Statement

Captain or Officer In Charge of (vessel name).

I hereby certify that I have personally inspected the holds or tanks aboard the above named vessel on (date) and found the following to be true regarding the suitability of the holds or tanks for in-transit fumigation:

<table>
<thead>
<tr>
<th>Hold/Tank Number</th>
<th>Suitable</th>
<th>Not Suitable</th>
<th>Reason Not Suitable</th>
</tr>
</thead>
</table>

Signed: ____________________________
(Certified Applicator)

Acknowledged: ____________________________
(Vessel captain or Person in Charge of Vessel)

Example Of Statement of Fumigant Application Compliance

Captain or Officer In Charge of (vessel name).

I hereby certify that phosphine fumigant formulation was applied to the grain on the above referenced vessel on (date). I further certify that the fumigant formulation application was made in accordance with U.S. Environmental Protection Agency, U.S. Coast Guard, and applicable State and local laws and regulations and applicable Federal Grain Inspection Service instructions.

The grain in the following holds or tanks was treated:

<table>
<thead>
<tr>
<th>Hold/Tank Number</th>
<th>Depth</th>
<th>Type and Quantity of Fumigant Formulation Used</th>
<th>Cubic Capacity of Hold/Tank</th>
<th>Method of Application</th>
</tr>
</thead>
</table>

It is my understanding that the above named vessel is destined for (country) with an estimated voyage time of (date).

I certify that immediately following application of the fumigant formulation all openings to the fumigated space were closed and placarded with appropriate warning signs. I further certify that all openings to the fumigated space have been checked and no fumigant gas was leaking at the time of the vessel’s departure.

Signed: ____________________________
(Certified Applicator)

Acknowledged: ____________________________
(Vessel captain or Person in Charge of Vessel)
Fumigant Monitoring Equipment
Fumigant Monitoring Equipment
Fumigant Monitoring Equipment
MRL's, CODEX and Country Requirements

TERMS OF USE
Global MRL Database
The Global MRL Database is an Internet-accessible electronic database containing global chemical regulatory standards and data, including maximum residue limits ("MRLs") for various chemicals in agricultural crops that are applicable in certain legal jurisdictions. The Global MRL Database is maintained and hosted by Bryant Christie Inc. ("BCI"), a Washington corporation with the support of the United States Department of Agriculture and the United States Environmental Protection Agency. These Terms of Use ("TOU") govern use of the Global MRL Database.

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Regulation Details

Mexico / Phosphine / Wheat, grain

Published Regulations for MRLs Currently in Effect

Wheat, grain
0.1 ppm
United States

Residue Definition
Phosphine: Tolerances are established for residues of phosphine in or on raw agricultural commodities (RAOs) resulting from post-harvest fumigation for the control of insects with phosphine gas or phosphate compounds that produce phosphine gas.

Processed food
0.01 ppm
United States

Commodity Note
This tolerance is established for residues resulting from fumigation of processed food.

Residue Definition
Phosphine
Phaseout of Methyl Bromide
CUE Post-Harvest Commodities, Metric Tons

Commodities

- 2005
- 2006
- 2007
- 2008
- 2009
- 2010
- 2011
- 2012
- 2013
- 2014
- 2015

- 89.166
- 87.719
- 78.983
- 58.921
- 45.623
- 19.242
- 10.04
- 4.91

196,431 lbs.
Methyl Bromide QPS, CUE & Pre-phaseout

Quarantine
- Treatments to prevent the introduction, establishment and/or spread of quarantine pests

Pre-shipment
- Those non-quarantine applications [applied] within 21 days prior to export to meet the official requirements of the importing country or existing official requirements of the exporting country

CUE uses...only Ham

Pre-phaseout, no restrictions...follow the label
The Future...Reducing QPS lbs.

ISPM 15, Oak Logs, etc.
The Future...Methyl Bromide???

- Treatment schedules of alternative fumigants
- Need countries to accept alternative control methods
- Sulfuryl fluoride use will increase
  - Expanding sales world-wide
The Future...Phosphine???

- Will phosphine resistance become an issue in the future?
- Will see more fumigation schedules with cylinderized phosphine, ECO$_2$FUME® in the future
Current Regulatory Issues

U.S. JUSTICE DEPARTMENT: CRIMINAL INVESTIGATION

NEW DETAILS
FAMILY POISONED AT CARIBBEAN RESORT?

CNN: ANOTHER Boy Poisoned: bee in Florida, Terminix in HOT Water

BOY HOSPITALIZED AFTER TERMITE FUMIGATION
Man who died after ingesting fumigation pellets identified

By Calvin Men
Santa Cruz Sentinel

WATSONVILLE — A man who died at Watsonville Community Hospital after ingesting fumigation pellets was identified by the Santa Cruz County Coroner’s office as 25-year-old Edward Lundberg.

Lundberg, whom authorities said was a transient, was treated Sunday evening near a homeless encampment on Corralitos Creek by the Safeway on Freedom Boulevard after ingesting fumigation pellets containing aluminum phosphide, said Chris Johnson, Watsonville Fire Division Chief.

The man was quarantined after he was taken to the hospital because there was a fear firefighters, medics and hospital staff could be exposed to the toxin.

Once the pellets become moist, they release a gas that’s used to kill rodents, Johnson said.

Because there was uncertainty about whether the poison could be sweated out or it would seep through his pores, the man was quarantined after he was taken to the hospital.

But officials determined it was safe so long as the man didn’t vomit on anyone and no one was exposed to the toxin, Johnson said.

It is still unclear why Lundberg ate the pellets.

“It’s just hard to say why somebody would pick something up like that and decide to eat it,” Johnson said.

Lundberg told officers at the scene that he found the pellets in an orchard across the street from the Safeway, Watsonville Sgt. Eric Taylor said.

Authorities are investigating why the pellets were discarded there.
The Future (Globally)

- Increase training requirements
- Manufacturers requiring product stewardship
- Using proper safety equipment
- Fumigant detection equipment calibration
- Regulatory inspections
- More cost
Questions?
Thank You!!!

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