

BOX TREE MOTH - BEST MANAGEMENT PRACTICES

Box tree moth, *Cydalima perspectalis*, is a foliar pest of boxwood (*Buxus* spp.) and is found in the Crambidae family. Box tree moth (BTM) was first confirmed in Toronto, ON, in the fall of 2018. Since then, significant monitoring has taken place to determine the scope of the infestation. CFIA, OMAFRA, University of Toronto, University of Guelph, Landscape Ontario, Canadian Nursery Landscape Association, and the City of Toronto have worked collaboratively to survey the pest and to develop programs to maintain export opportunities to the USA. In May 2021, USDA-APHIS updated their Federal Order for this pest; all species and cultivars (including any plant parts for production) within the *Buxus*, *Euonymus* and *Ilex* genera¹ are now prohibited from Canada. The following best management practices (BMPs) are recommended to reduce the risk of importing and spreading BTM.

Insect Epidemiology and Diagnosis

Life Cycle

- To access the *Box Tree Moth Biology and Detection Webinar*, please see: <https://horttrades.com/box-tree-moth-webinar-and-online-discussion>
- There are two generations of adult moths per year in Ontario, with outdoor adult emergence starting as early as June 22nd and finishing by September 15th. Recommended adult monitoring period is therefore from May through to September.
- Active larval stages can occur between mid-April and late September (temperature dependant) on infested boxwood plants in outdoor-grown crops.
- For host plants grown indoors (either in a greenhouse or in a poly-covered cold frame), active larval stages may occur between April and September (OMAFRA observed that >12h day length is required for pest activity).
- Dormant, overwintering larvae (~5mm long) can be found in a protected hibernarium or cocoon of webbing, up against a leaf, from early September to early May.

Infestation Evidence & Diagnostics

- On host plants, leaves will be the main sites of damage.
- Young larvae are small and can only consume the epidermis of the leaves.
- Older larvae can chew entire leaves, leaving only the leaf margin behind.
- Where unmanaged, established, severe larval populations have consumed 100% of the plant foliage; hungry larvae may chew on branches and stems, causing plant mortality.
- In addition to chewing damage, webbing of foliage with pellet-shaped frass and empty exoskeletons may be observed on host plants.
- If the pest is suspected, suspend shipments until the identification of the pest is confirmed by an accredited laboratory². It is recommended that CFIA also be contacted, particularly if BTM is detected outside of the 'known' infested area. If the pest identification is confirmed to be box tree moth, execute, and document the appropriate actions described in the section below entitled, 'Eradication Procedures'.

¹ APHIS federal order: https://www.aphis.usda.gov/import_export/plants/plant_imports/federal_order/downloads/2021/da-2021-11.pdf

² CFIA approved laboratories: <https://www.inspection.gc.ca/science-and-research/our-laboratories/eng/1494878032804/1494878085588>, <https://afl.uoguelph.ca>, <https://www2.gov.bc.ca/gov/content/industry/agriculture-seafood/animals-and-crops/plant-health/plant-health-laboratory>

Insect Management at the Nursery

Traceability and Documentation

For traceability, records should be maintained for at least three years. Addresses and maps of all production facilities should indicate where activities (e.g., receiving, shipping, propagation, potting, etc.) take place. A modified Google map can be used. Other records include receiving, movement, and shipping documents, and scouting & trapping, pest management, and control/eradication activities.

Incoming Plants

On-site, self-propagation from a clean, regularly- inspected (see Pest Monitoring section below) source is the most effective strategy to prevent box tree moth from being introduced into a facility via plant material. If purchasing from outside sources, additional risk-prevention measures should be in place. The history of received host plants should include the supplier source and information regarding the BTM-BMPs under which the plants have been grown. This information should be included on or with the receiving documentation. Select suppliers located in areas where BTM is not known to occur.

Process for Received Host Plants

- Wherever possible, avoid receiving host plants during high-risk windows, for example, when adults are flying, and eggs may be present.
- Incoming host plants must be inspected before being moved into production areas.
- A separate holding area should be prepared to receive host plants. The area should be separated from the production facility to protect from potential larval movement between hosts by a three (3) metre (canopy to canopy) host-free buffer. Host plants from different suppliers/sources should be separated from each other, until thorough inspections are completed and documented to verify the plants are BTM-free. Screening or other exclusion practices are necessary for prevention of potential adult BTM movement.
- Host plants should be randomly sampled and visually scouted for signs of BTM or for symptoms of pest damage under adequate light levels and scouting conditions
- The inspection of incoming host plants should be recorded
- Maintain purchasing records

Returns

- No host plants should be returned to the nursery after leaving the farm property.

Production Practices

Training:

- Early pest detection by nursery staff is critical to minimize spread before infested plant hosts are moved around the production facility areas.
- Train appropriate staff regarding BTM pest biology, identification & detection, including risk of pest spread by natural means, staff, equipment, pruning tools, plants, and plant debris. The *Box Tree Moth Biology and Detection Webinar*, mentioned in the Life Cycle section, is a useful resource. Check with your local association for additional training opportunities.
- Ensure staff know who to contact in the case of a suspected BTM find.
- Designated staff should be trained regarding pheromone lure and trap setup and maintenance.

Production:

- Use only new media for host plant production.
- A preventative spray program is strongly recommended. Refer to OMAFRA guidelines³ for spray program information.

³ OMAFRA Publication 840: <http://www.omafra.gov.on.ca/english/crops/pub840/p840order.htm> (French Version: <http://www.omafra.gov.on.ca/french/crops/pub840/p840order.htm>)

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- If infested plants are suspected even in just one block, manage all production blocks as if they were infested until pest presence can be determined and delineated.
- To minimize the chance of pest spread, keep production blocks of host plants apart from each other with a 3-metre buffer (canopy to canopy) of non-host plants, or no plants between.

Pest Monitoring:

- Practise regular and thorough inspections by trained staff of all host plants (production and stock blocks) throughout production; keep records of damage, sightings and resulting actions.
- Inspection frequency should be at least weekly during flight period conditions (for outdoor production May 1 to September 30, and April 1 and October 15 for greenhouse or polyhouse production), and every two weeks during remainder of the production period of the plants. Additional inspections are recommended for facilities within the known pest infestation areas.
- Pheromone traps⁴ are strongly recommended to be placed around the perimeter of the host plant production area at a density of 4 traps per hectare or spaced at no less than one every 100m. Lures should be replaced according to manufacturer specifications and inspected weekly with documentation of results. Trap placement and removal should be coordinated with the weekly inspections; traps should be placed out by May 1 (outdoor) and remain until September 30. For indoor production use April 1 to October 15 dates. See more details about traps at the end of this bulletin.
- Maintain monitoring records, pheromone trap inspections, diagnostic reports, pest management records and any follow-up details for at least 3 years.

Biosecurity

- Establish entry, movement and sanitation or exclusion restrictions for visitors and workers in host plant production areas.
- Ensure footwear, clothing and equipment are free of all BTM life stages.
- Implement a process for handling BTM infested material, including pest identification, confirmation, and disposal protocols.
- Maintain areas relatively free of leaf litter and other host plant debris (e.g., production & shipping areas, delivery trucks) to reduce habitat that could harbour the pest.

Movement and Shipping of Host Plants

- During the adult flight period: avoid shipping where there is an active adult population as indicated by pheromone trap catch on the property (i.e., eggs may be present but not be easily detected during flight season). Domestic shipments may resume after 18 days if:
 - i. no adult box tree moths are caught in the pheromone traps for 14 days after first adult detection
 - ii. larvicidal treatments are applied starting on day 15
 - iii. inspections 3 days after larval treatment reveal no live larvae (i.e., by day 18)
- Perform a thorough inspection of host plants before moving host plants to a new production area or the shipping area, verifying that no evidence of BTM is on the plants.
- Inspections prior to shipping should be within 2 days of the expected ship date.
- Maintaining host plants after the shipping inspection:
 - Host plants should be held in managed staging areas (maintained relatively free of debris and plant waste) and avoid placing host plants in areas within proximity (i.e., 3m or 10') to inbound or un-inspected host plants.

⁴ Göttig, S and A Herz. 2017. Observations on the seasonal flight activity of the box tree pyralid *Cydalima perspectalis* (Lepidoptera: Crambidae) in the Rhine-Main Region of Hesse. Journal Für Kulturpflanzen 69 (5): 157-165.

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- In infested zones during the adult flight periods: The inspected host plants should be protected from infestation by either storing in a screenhouse or a closed shipping vehicle (or have other appropriate exclusion measures to prevent BTM infesting the plants).
- In infested zones outside the adult flight periods: it is recommended to stage inspected outbound host plants in a segregated area to prevent infestation, for example, a separate area or dock, or at least 3m (10') away from other host plants
- Maintain records of the documentation and results of the outbound visual inspection and relevant shipping documents.
- Clean all plant debris from trailers before loading host plants.

Procedures After a Suspected and/or Positive BTM Find

In the event of a suspected BTM find, assume the pest is BTM and follow these recommendations:

- Take a sample for identification verification, and if positive for BTM, it is recommended you contact CFIA if the detection was outside of the 'known' area of infestation from the previous year's survey.
- Cease shipping of host plants until eradication procedures are completed. This action is recommended for domestic shipments. Export shipments to the US are currently prohibited.
- Assess the severity of infestation (inspections, records, etc. to trace forward & back).
- Minimize traffic in/through the infested block.
- Determine the scope of eradication actions required. Trap monitoring, inspections and a spray program are recommended actions. Refer to OMAFRA guidelines for spray program information.
- Ensure complete cleanup and containment of plant debris, especially foliage.
- Dispose or destroy the infested material and debris by:
 - Deep burial: to a depth of 1 meter covered by soil
 - Incineration to ash
 - Heat treatment – plant material placed in a sealed plastic bag and exposed to 48 hours of direct sunlight. Following heat treatment, the sealed bag will be disposed of in a landfill through the facility's regular waste stream.
- OMAFRA is currently recommending a minimum of an 18-day window post-adult detection before domestic shipping can resume (see above, "Movement and Shipping of Host Plants").
- Keep a record of the actions taken.

Disclaimer

These BMPs are recommendations for nursery growers to enable rapid identification and eradication of any potential BTM finds in wholesale nursery production facilities. Implementation of these measures cannot guarantee that nurseries will remain free of BTM. This document is based upon the most current information available. As the science of box tree moth management evolves and new control measures are introduced, these BMPs will change.

For further information about BTM in your area, contact your provincial government agricultural ministry office, your regional office of the Canadian Food Inspection Agency, or your local nursery growers' association.

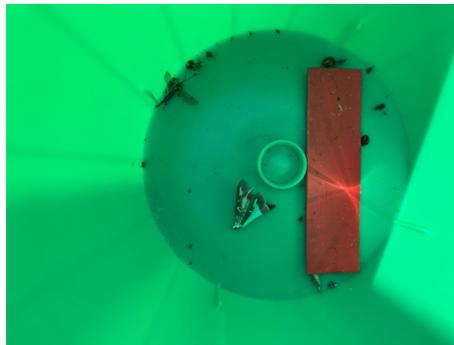
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Information on Pheromone Traps for BTM

Traps with BTM pheromones are effective at attracting adult males. Either trap system (milk carton with sticky trap liner, or the Unitrap with VaporTape) is acceptable – the key is to use the correct pheromones and replace them at the appropriate time. Supplies can be ordered from Solida.ca as well as Kam’s Grower Supply Inc. (1-877-821-1684). See below for details, modified from the ONnursery Blog 2021-05-06 by Jennifer Llewellyn (OMAFRA): <https://onnurserycrops.com/2021/05/06/box-tree-moth-larvae-are-starting-to-feed-in-toronto/#more-5295>.



On the left is the **Spongy moth trap** from Solida.ca (**milk carton style**, Item #2050500). You can also use Solida’s re-usable plastic **Unitrap** (right photo); it is very effective at catching adult box tree moths (Solida.ca item #301Y602). Inside, use a Box Tree Moth Box T Pro Gel Lure (3 months, inject gel pheromone inside trap to attract BTM early-May to mid-August, Item # 40M2001). Then after 3 months, drop in a Box Tree Moth Septa Lure (1 month, drop septa impregnated with pheromone, Item #40IPS04) every 30 days to attract BTM adults until the end of September (or use a second 3-mo lure). Note: you can use the 3- and 1-mo lures interchangeably.



A sticky card inserted inside the milk carton traps will capture the moths but ensure that the cards are replaced before they are full of insects. Vaportapes can be used (VaporTapell, Item #301H800) to kill the moths in lieu of sticky cards where crop control products are eligible for use but must be replaced after 16 weeks. Either trap system (milk carton with sticky trap liner, or the Unitrap with VaporTape) is acceptable – the key is to use the correct pheromones and replace them at the appropriate time.

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The 3-month lure comes as a creamy-looking gel in a small syringe. The compound in the syringe cures and hardens when exposed to air. While the gel lures are soft, they shouldn't leak out of the basket or trap. Even exposure to a bit of rain through the 3 months won't be an issue for the lure - it stiffens and shrinks fully after about 1-2 days and will not be affected by water from a sprinkler.

1. Plan ahead – prepare the lure a day or two in advance
2. Cut off the tip of the syringe
3. Empty the contents of the syringe onto a piece of plastic or waxed paper and let it cure for at least 12h
4. Once firm, place the lure into the milk carton trap or trap basket on the Unitraps (you can remove the septa lure if there's one there)

Optimal trap location: Install trap 1 meter from the ground near the periphery of boxwood production areas. Use a shepherd's hook or mounting pole or hang the trap from a purlin of a hoop house.

For traps mounted where they get excessive irrigation water entering, you can:

- a) paper clip the Vaportape to the side of the bucket so it's not submerged, or
- b) cut or drill a couple drain holes in the bottom of the trap to drain away any collected water



Milk Carton Trap modification to increase efficacy: Cut the trap opening on the side of the carton such that the 2 openings become 1 larger opening (see photo) to facilitate BTM adults entering trap.