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The European grapevine moth (EGVM), *Lobesia botrana* ([Denis & Schiffermüller]), is one of the most destructive grape pests in the Palearctic. Larvae cause damage to grapes by feeding on fruit, resulting in direct damage and secondary infection of feeding sites by botrytis bunch rot (gray mold; Fungi). *Lobesia botrana* was discovered infesting grapes in Napa Valley, California in 2009; it has not been reported from North America outside of California.

Lobesia botrana is a member of the Tortricidae, a large family of moths (Lepidoptera) that includes many pest species. In North America there are approximately 1,200 species of tortricids, which are often referred to as “leafrollers” because the larvae of some species feed inside a rolled leaf. Most tortricid moths are small and brown with a wingspan of approximately 10-30 mm. Adults of *L. botrana* can be distinguished from most other North American tortricids by their wing pattern and small size; however, other species of *Lobesia* and related *Paralobesia* are present in North America, and most species in these genera have very similar wing patterns. The grape-feeding *P. viteana*, present from the East Coast to western Colorado, is nearly identical to *L. botrana* and a genitalic dissection is necessary to separate the two species. Larvae of *L. botrana* and *P. viteana* cannot be separated without molecular diagnostics.

This aid is designed to assist in the screening and identification of *L. botrana* adults collected from sticky traps in the United States. It covers basic sorting of traps along with first and second level screening, all based on morphological characters. Basic knowledge of Lepidoptera morphology is necessary to screen for *L. botrana*. See the following for more information on this and other pest tortricids:

Gilligan, T. M. and M. E. Epstein. 2012. TortAI, Tortricids of Agricultural Importance to the United States (Lepidoptera: Tortricidae). Identification Technology Program (ITP), USDA-APHIS-PPQ-S&T, Fort Collins, CO. (<http://idtools.org/id/leps/tortai>).



Fig. 1: Adult *L. botrana*. Wing pattern is very consistent with no obvious difference between males and females.



Fig. 2: Adult *L. botrana* showing color variation between individuals.



Fig. 3: *Lobesia botrana* larva feeding on grapes.

Sorting

European Grapevine Moth *Lobesia botrana* ([Denis & Schiffermüller])

Lobesia botrana pheromone traps should be sorted initially for the presence of moths of the appropriate size, color, and shape. Traps that contain moths meeting all of the following requirements should be moved to Level 1 Screening (Page 3):

- 1) Moths are approximately 4-7 mm (0.15-0.3 inches) long.
- 2) Moths have an overall shape that is similar to the outline depicted in Fig. 4. Note that moths caught on their side or back may have a different outline.
- 3) Moth forewings are a shade of brown with light and dark markings (Figs. 1-2, 6-7).

Note that the appearance of moths caught in sticky traps can vary substantially depending on the amount of sticky glue on the moth (most individuals usually appear darker when covered in glue). For this reason, any small, tortricidlike moth meeting the above criteria should be sent forward to Level 1 Screening.

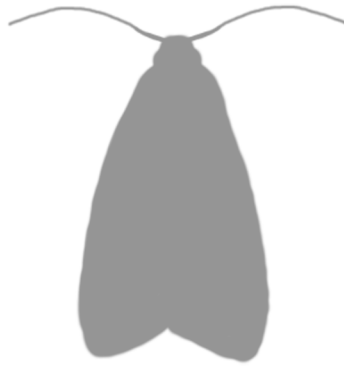


Fig. 4: Outline of *L. botrana* in resting position. Overall length of the moth is 4-7 mm.



Fig. 5: Actual size of *L. botrana* adult (4-7 mm forewing length).

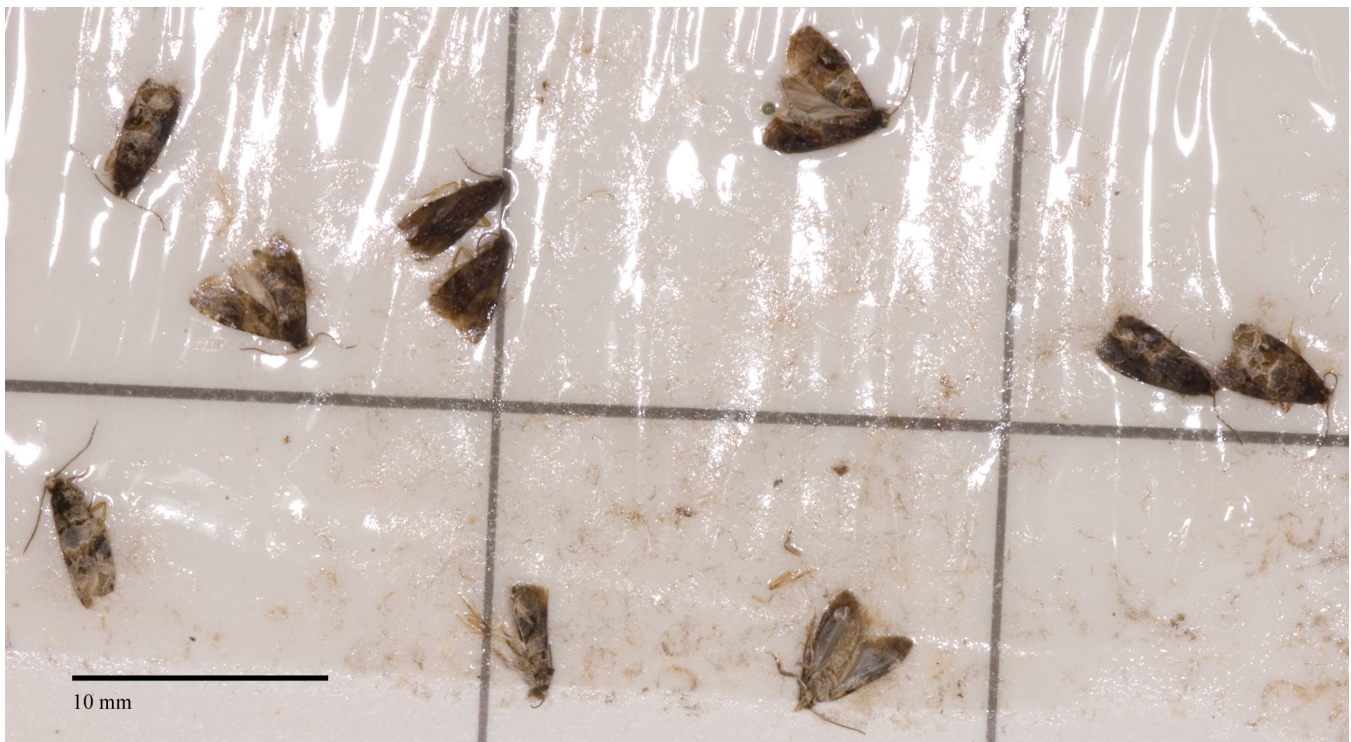


Fig. 6: *Lobesia botrana* adults caught in a sticky trap.

Level 1 Screening

European Grapevine Moth *Lobesia botrana* ([Denis & Schiffermüller])

Moths that meet the sorting requirements should be screened for suspect tortricids. Level 1 Screening is difficult for small moths (like tortricids) and may need to be performed by a trained Lepidopterist. When in doubt distinguishing or evaluating first-level screening characters, forward traps that have passed the sorting requirements to a trained taxonomist. Suspect tortricids in traps should not be manipulated or removed for screening unless expertise is available.

Tortricid moths can be identified by the following combination of characters (note that some characters may be difficult to see on specimens coated in sticky trap glue):

- 1) Antennae simple, threadlike, and never pectinate (feathery).
- 2) Tympanum absent. Pyraloidea and Geometridae have a tympanum at the base of the abdomen. Noctuoidea have a tympanum on the thorax near the junction with the abdomen. Tympanal organs may be difficult to see without manipulating the specimen.
- 3) Labial palpi pointed and projecting forwards. Some families (especially in the Gelechioidea) have long labial palpi that curve upwards over the head - these are not tortricids.
- 4) Maxillary palpi are very reduced and not visible in tortricids. Maxillary palpi are conspicuous in some commonly captured pyraloid species.
- 5) Proboscis (tongue) unscaled. Members of the Gelechioidea and Pyraloidea have a scaled proboscis.
- 6) Chaetosema (patch of bristle-like setae) present above the compound eye behind the ocellus. Note that chaetosemata may be difficult to see without a high-quality microscope.

Moths meeting the above criteria should be moved to Level 2 Screening (Page 4). Traps to be forwarded to another facility for Level 2 Screening should be carefully packed following the steps outlined in Fig. 8. Traps should be folded, with glue on the inside, making sure the two halves are not touching, secured loosely with a rubber band or a few small pieces of tape. Plastic bags can be used unless the traps have been in the field a long time or contain large numbers of possibly rotten insects. Insert 2-3 styrofoam packing peanuts on trap surfaces with no moths to cushion and prevent the two sticky surfaces from sticking during shipment to taxonomists. DO NOT simply fold traps flat or cover traps with transparent plastic wrap (or other material), as this will guarantee specimens will be seriously damaged or pulled apart – making identification difficult or impossible.



Fig. 7: Male *L. botrana* in a sticky trap.

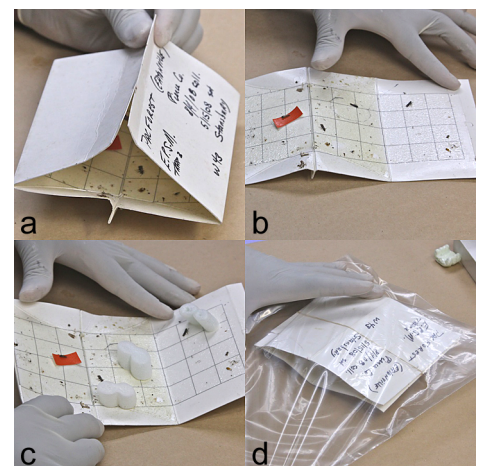


Fig. 8: Recommended packing method for shipment of sticky traps: a & b) open and unfold trap; c) place 2-3 packing peanuts in areas of trap with no moths; d) fold trap, secure with rubber band, and place in plastic bag (Photos by E. LaGasa, WSDA).

Level 2 Screening

European Grapevine Moth *Lobesia botrana* ([Denis & Schiffermüller])

Suspect tortricids should be cleaned to identify suspect *L. botrana* individuals. Instructions on cleaning specimens caught in sticky traps can be found here: <http://idtools.org/id/leps/tortai/dissections.html>.

Cleaned specimens should be pinned and labeled. Level 2 Screening is based on wing pattern, which varies little between individuals. *Lobesia botrana* and close relatives can be separated from most other Nearctic tortricids by a combination of the following wing characters (depicted in red in Figs. 9 & 10); note that male *L. botrana* lack a forewing costal fold:

Forewing Pattern

All *L. botrana* individuals have a prominent leaden-gray bar that runs across the middle of the forewing (Fig. 9). Often this bar is outlined in white. In a resting individual these markings form a complete, transverse, gray bar across the middle of the specimen (Fig. 10).

Many *L. botrana* individuals have a prominent inverted “Y” in the outer half of the forewing. This “Y” is formed from leaden-gray scales outlined in white (Figs. 9 & 10). This feature may be lacking in some specimens, especially those that are worn; however close examination should reveal some remnants of this wing pattern element.

Non-targets

Non-targets likely to be encountered in *L. botrana* traps are illustrated on Page 5. These non-targets include other species of *Lobesia*, *Paralobesia*, and several smaller tortricids.

Paralobesia viteana (Figs. 11-12) is a native pest of grape that is very closely related to *L. botrana*. This species occurs throughout eastern North America and has been recorded as far west as western Colorado; it does not occur in California. *Lobesia botrana* and *P. viteana* have nearly identical wing patterns and cannot be separated using wing pattern characters. Trapping data seems to indicate that adult *P. viteana* are only encountered where they are locally abundant: *P. viteana* was commonly found in recent western Colorado surveys (B. Hammon, pers. comm.) but no individuals of that species were encountered during surveys in Massachusetts and Florida (J. Brambila, pers. comm.). In areas where *P. viteana* is common, species-level identification will be much more difficult because dissection is required to separate *P. viteana* from *L. botrana*.

Episimus argutanus (Fig. 13) is commonly attracted to *P. viteana* pheromone traps; fresh specimens can be identified using wing pattern; however, worn specimens may need to be dissected. Other species of *Lobesia* and *Paralobesia* (Figs. 17-20) are present in the East, although it is not expected that any of these would be associated with grape and they are not commonly recorded in pheromone traps.

In California, only two species of *Paralobesia* have been recorded. Neither are likely to be associated with grape, neither are widespread, and neither have been found in *L. botrana* pheromone traps. *Clepsis peritana* (Figs. 14-15) and *Platynota stultana* (Fig. 16) are two common non-target tortricids encountered in *L. botrana* traps in California. Both species are easily separated from *L. botrana* based on wing pattern and coloration.



Fig. 9: Diagnostic *L. botrana* forewing pattern elements (highlighted in red): prominent leaden-gray bar across the middle of the forewing and an inverted “Y” on the outer half of the forewing. Closely related *Paralobesia* share these same markings and cannot be separated from *L. botrana* by wing pattern alone.

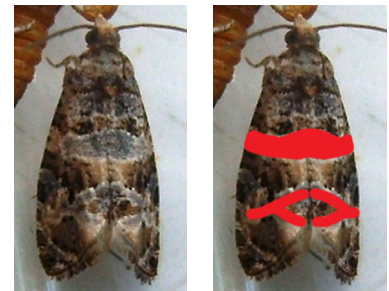


Fig. 10: Diagnostic *L. botrana* wing pattern markings (highlighted in red) in a resting individual or specimen on a sticky trap.

Level 2 Non-targets

European Grapevine Moth *Lobesia botrana* ([Denis & Schiffermüller])



Fig. 11: *Paralobesia viteana*.*



Fig. 12: *Paralobesia viteana*.*



Fig. 13: *Episimus argutanus*.*



Fig. 14: *Clepsip peritana*.*



Fig. 15: *Clepsip peritana*.*

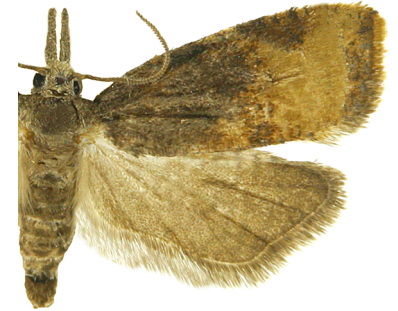


Fig. 16: *Platynota stultana*.*



Fig. 17: *Lobesia carduana*.

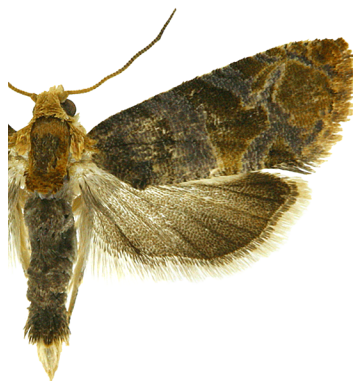


Fig. 18: *Paralobesia lireodendrana*.



Fig. 19: *Paralobesia monotropana*.



Fig. 20: *Paralobesia yaracana*.

Suspect *L. botrana* specimens (small tortricids with wing pattern and coloration similar to those in Figs. 1-2 and 6-7, and 9-10) should be sent forward for identification. Specimens must be labeled and carefully packed to avoid damage during shipping.

Final species-level identification must be performed by a specialist using genitalic characters. Ensure that all specimens forwarded for identification have intact abdomens; if the abdomen has been separated from the specimen, store it in a gelatin capsule on the same pin as the specimen.

* Species marked with an asterisk are confirmed non-targets in various regions of the U.S.

Key to Sort and Screen *Lobesia botrana* Suspects in the United States

1. Moths approximately 4-7 mm long; overall shape is typical for a small tortricid (Fig. 4); and forewings are a shade of brown with light and dark markings (Figs. 6-7)..... 2
- 1'. Moths larger or smaller than 4-7 mm long; overall shape not typically tortricid; or forewing color different from that in Figs. 6-7.....Not *L. botrana*
2. Abdominal or thoracic tympana absent; antennae simple; labial palpi projecting forward; proboscis not scaled; and chaetosemata present 3
- 2'. Abdominal or thoracic tympana present; antennae pectinae; labial palpi upcurved; proboscis scaled; or chaetosemata absent.....Not *L. botrana*
3. Forewing costal fold absent; and forewing pattern with leaden-gray markings outlined in white consisting of a bar across the wing and an inverted “Y” (Figs. 9-10)..... ***L. botrana suspect***
- 3'. Forewing costal fold present; or forewing pattern drastically different than those illustrated in Figs. 9-10Not *L. botrana*

Citation

Gilligan, T. M., S. C. Passoa, M. E. Epstein and O. C. Sage. 2014. Screening aid: European grapevine moth, *Lobesia botrana* ([Denis & Schiffermüller]). Identification Technology Program (ITP), USDA-APHIS-PPQ-S&T, Fort Collins, CO. 6 pp.

References for more information on *L. botrana* and non-targets

Gilligan, T. M., D. J. Wright and L. D. Gibson. 2008. Olethreutine moths of the midwestern United States, an identification guide. Ohio Biological Survey, Columbus, Ohio. 334 pp.

Gilligan, T. M. and M. E. Epstein. 2012. TortAI, Tortricids of Agricultural Importance to the United States (Lepidoptera: Tortricidae). Identification Technology Program (ITP), USDA-APHIS-PPQ-S&T, Fort Collins, CO. (<http://idtools.org/id/leps/tortai>).

Gilligan, T. M., M. E. Epstein, S. C. Passoa, J. A. Powell, O. C. Sage and J. W. Brown. 2011. Discovery of *Lobesia botrana* ([Denis & Schiffermüller]) in California: an invasive species new to North America (Lepidoptera: Tortricidae). Proceedings of the Entomological Society of Washington. 113: 14-30.

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