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PESTS NOT KNOWN TO OCCUR IN THE UNITED STATES OR OF LIMITED DISTRIBUTION, NO. 60: EUROPEAN GRAPE VINE MOTH

Prepared by K. Whittle, Biological Assessment Support Staff, PPQ, APHIS, USDA, Federal Building Room 634, Hyattsville, MD 20782

Pest

EUROPEAN GRAPE VINE MOTH
Lobesia botrana (Denis & Schiffermüller)

Selected Synonym

Lobesia rosmariana (Millière)

Order: Family

Lepidoptera: Tortricidae

Economic Importance

The European grape-berry moth is a serious pest in the warm vine-growing countries where it is normally found. Larvae feed on flower buds, developing berries, and most destructively, on the ripening fruit of grape. The primary damage to grape berries attracts other insects and predisposes the fruit to fungal infection. Loss of up to one-third of the vintage has been reported in areas of the Soviet Union, Syria, and Yugoslavia (U.S. Department of Agriculture 1957).

Losses in Israel sometimes reach 40-50 percent among table grapes and up to 80 percent or more for wine grapes. Further loss is due to the time and labor spent in cleaning the bunches. When infestations are heavy, the work days spent in cleaning the fruit account for 30-40 percent of the time of those involved in harvesting (Avidov and Harpaz 1969).

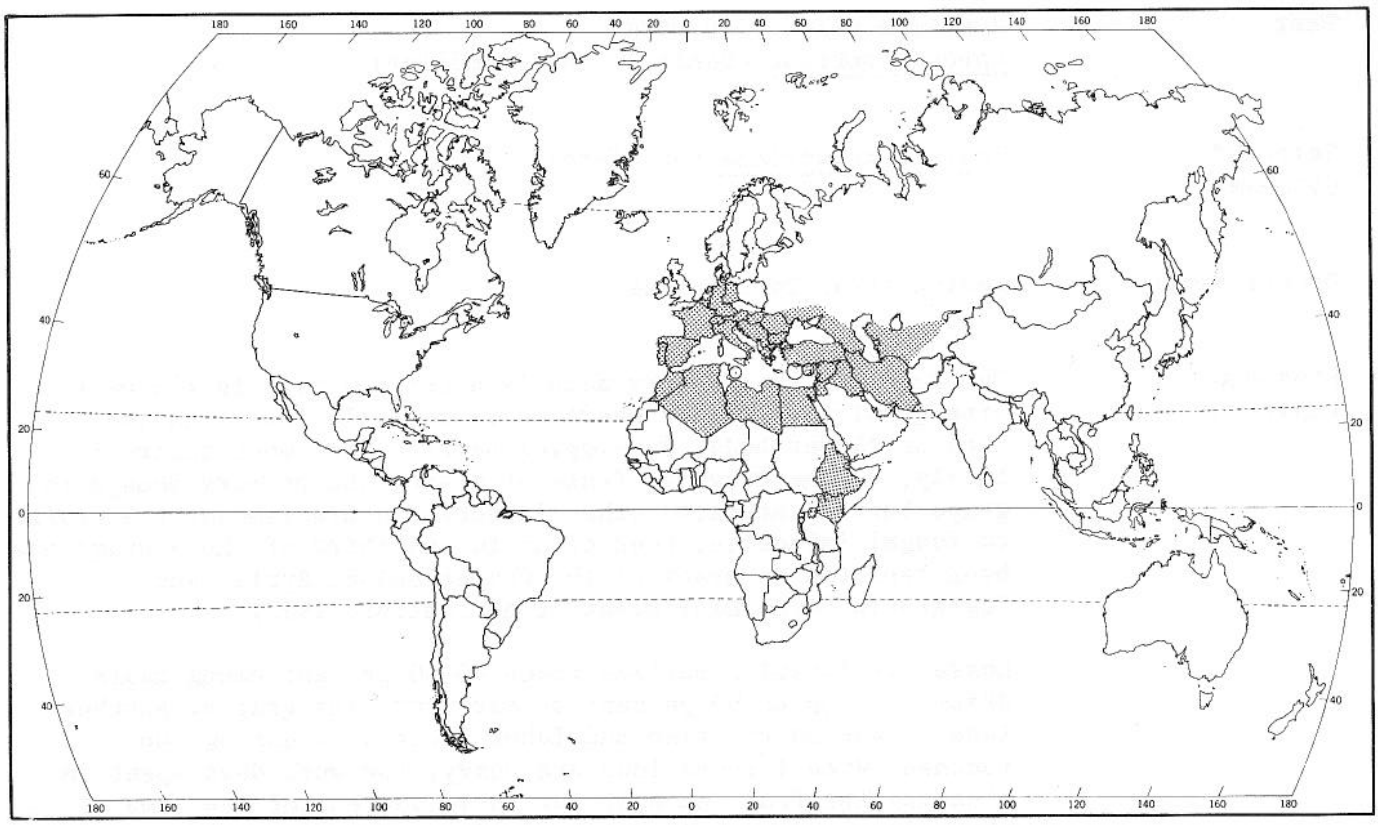
General Distribution

This pest occurs in the following countries: AFRICA - Algeria, Egypt, Ethiopia, Kenya, Libya, and Morocco; ASIA - Cyprus, Iran, Iraq, Israel, Japan, Jordan, Lebanon, Syria, and Turkey; EUROPE - Austria, Bulgaria, France (including Corsica), Germany, Greece, Hungary, Italy (including Sicily), Luxembourg, Malta, Portugal, Romania, Spain, Switzerland, and Yugoslavia; and in SOVIET UNION - Astrakhan, Azerbaijan, Batumi, Bessarabia, Crimea, European Soviet Union (Caucasus), Lower Povolzh'e, Soviet Central Asia, Transcaucasia, Turkmenistan, Ukraine (south-west), and Uzbekistan (Commonwealth Institute of Entomology (1974)).

Recently reported in Britain, this species may be a temporary resident (Agassiz 1977). Three adults were taken at light traps in July 1976 in Middlesex (Bradley et al. 1979).

Hosts

This species prefers *Vitis* spp. (grapes). Grape cultivars with prolonged blossoming or late-ripening berries are usually more heavily infested than short-flowering or early ripening varieties (Avidov and Harpaz 1969). *L. botrana* has been recorded



Lobesia botrana distribution map (Prepared by Non-Regional Administrative Operations Office and Biological Assessment Support Staff, PPQ, APHIS, USDA).

from many other hosts. Among these are Arbutus unedo (strawberry tree), Berberis vulgaris (European barberry), Clematis vitalba (travelersjoy), Cornus sp. (dogwood), Cornus alba (tartarian dogwood), Cornus mas (cornelian cherry), Cornus sanguinea (blood-twig dogwood), Daphne gnidium (spurgeflax daphne), Diospyros virginiana (persimmon), Galium mollugo (smooth bedstraw), Hedera helix (English ivy), Lamium amplexicaule (henbit), Ligustrum vulgare (privet), Lonicera tatarica (tatarian honeysuckle), Lonicera xylosteum (fly honeysuckle), Mahonia aquifolium (Oregon-grape), Medicago sativa (alfalfa), Olea europaea (olive), Parthenocissus quinquefolia (Virginia-creeper), Prunus domestica (plum), Prunus spinosa (blackthorn), Pyrus communis (pear), Rhus glabra (smooth sumac), Ribes nigrum (black currant), Ribes rubrum (red currant), Ribes uva-crispa (European gooseberry), Rosa sp. (rose), Rosmarinus officinalis (rosemary), Rubus dumetorum (European dewberry), Rubus fruticosus (European blackberry),

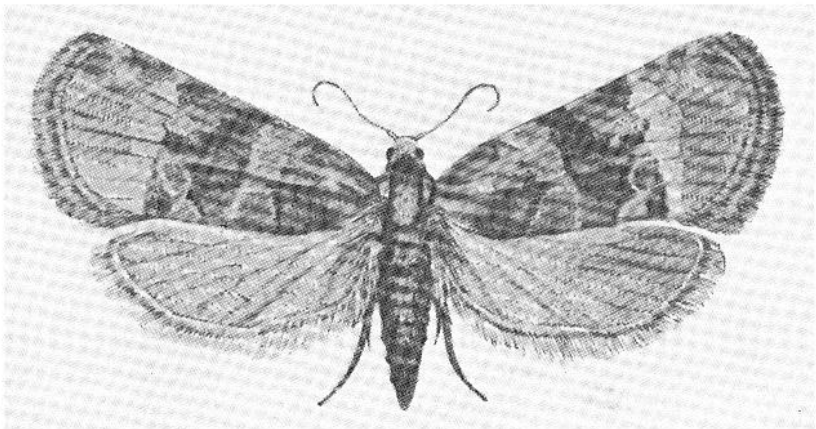
Silene vulgaris (bladder campion), Solanum tuberosum (potato), Syringa vulgaris (lilac), Tanacetum vulgare, Trifolium pratense (red clover), Viburnum lantana (wayfaring-tree), and Ziziphus jujuba (jujube) (Agassiz 1977, Avidov and Harpaz 1969, Balachowsky 1966, Bradley et al. 1979, Castro 1943, Dobrodeev 1915, Stoeva 1982, U.S. Department of Agriculture 1957). This species possibly infests certain species of Magnolia sp. (magnolia) and Tulipa gesnerana (tulip) (Dobrodeev 1915). In laboratory rearings in Israel, the pest attacked pears and plums (Avidov and Harpaz 1969).

Characters

ADULTS - Wingspan 10-17 mm, color variable. Sexual dimorphism moderate (Bradley et al. 1979). Body length about 7 mm (Avidov and Harpaz 1969). Head and thorax white mixed with ferruginous, thorax posterior with crest of ferruginous scales (Agassiz 1977).

Male (Fig. 1). Forewing ground color cream white, weakly overlaid with ochreous, dorsomedially heavily suffused with plumbeous between sub-basal and median fasciae and in costal and dorsal areas beyond median fascia, costa obscurely strigulate with black; fasciate marks moderately well defined but diffuse, ochreous suffused with light olive brown, with mixture of black; basal and sub-basal fasciae usually coalescent forming basal patch, its outer edge shallowly convex and irregular; median fascia narrow on costa and dorsum, produced distad at middle, strong admixture of black in outer margin from costa to near middle which sometimes forms patch above medial projection; pre-tornal marking obsolete or indicated by small dark brown spot; tornal marking moderately well developed and usually distinct, subtriangular; subterminal fascia arising from middle of termen and forming large quadrate

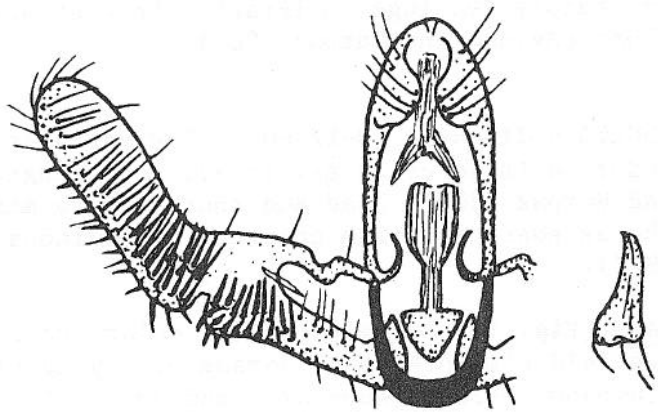
(Fig. 1)



Lobesia botrana adult male, dorsal view (From Castro 1943).

patch in upper part of distal area; cilia cream white, apexes suffused with ochreous, gray sub-basal line. Hindwing white, weakly scaled, translucent basally, infuscate distally, most strongly in apical area; cilia white, apices suffused gray, dark gray sub-basal line (Bradley et al. 1979). See genitalia in Fig. 2.

(Fig. 2)



Lobesia botrana male genitalia, dorsal view (From Hannemann 1961).

Female. Forewing color and marks similar to male, but hindwing entirely dark grayish fuscous (Bradley et al. 1979). See genitalia in Fig. 3.

EGGS - Lenticular, at first yellowish, later opalescent gray (Bradley et al. 1979), 0.7 by 0.6 mm (Avidov and Harpaz 1969).

LARVAE* (Fig. 4) - Length 10-12 mm. Head amber with dark pigmentation in ocellar area and at genal juncture. Prothoracic shield amber with darker coloring along lateral and posterior margins. Thoracic legs brownish. Body pale (in living larvae yellowish green or brownish white). Pinaculi and anal shield pale. Integument finely granulose. Anal fork well developed with 6-8 spines.

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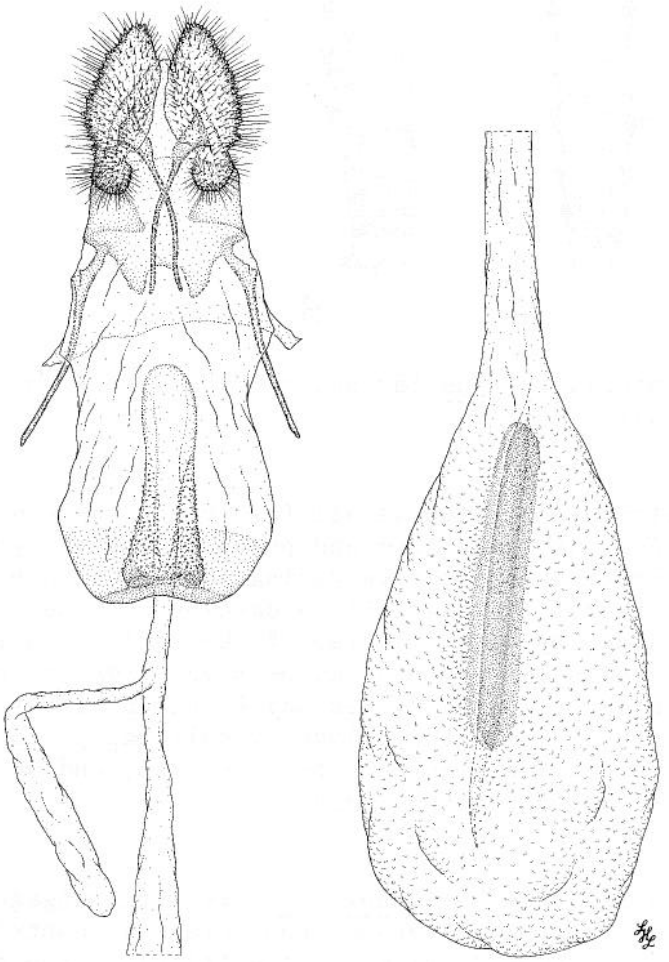
*Prepared by D. M. Weisman, Systematic Entomology Laboratory (SEL), Insect Identification and Beneficial Insect Introduction Institute (IIBIII), Agricultural Research Service (ARS), USDA, c/o U.S. National Museum of Natural History, Washington, DC 20560

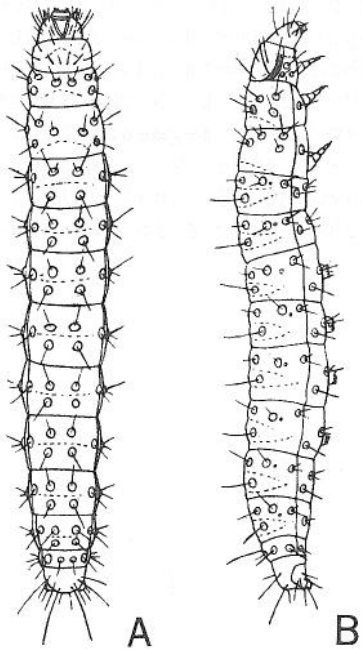
Head with ocellus 2 closer to ocellus 3 than to ocellus 1. Prothorax with prespiracular setae almost in line, seta L1 closer to seta L2 than to seta L3. Abdomen with spiracles on segments A1-7 hardly larger than the insertion of seta SD1; subventral setal formula on segments 1, 2, 7, 8, and 9 is 3, 3, 3, 2, 1; on segment A9, setae V1 are about 1 1/2 times as far apart as those on segment A8. Anal shield rounded. Abdominal prolegs with about 35 crochets in biordinal circle.

(Fig. 3)



Lobesia botrana female genitalia, ventral view (Courtesy SEL, IIBIII, ARS, USDA. Drawn by L. H. Lawrence).

(Fig. 4)



Lobesia botrana larvae: A. Dorsal view. B. Lateral view (From Castro 1943).

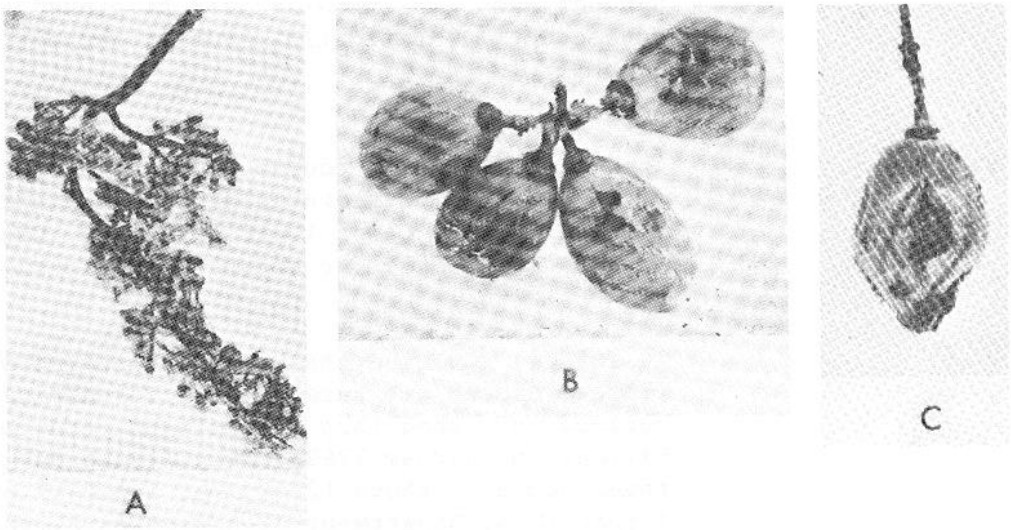
Characteristic Damage

First-generation larval feeding on the buds or flowers (Fig. 5A) webs them and prevents further growth. If heavy flower damage occurs during the first moth generation, the affected flowers fail to develop and the yield will be low. Damage by summer larvae of the second and third generations results in many nibbled berries (Figs. 5B and C), which later shrivel. These berries may be eaten either partly (leading to rot) or completely (leaving only empty skins at the tip of the bunch). Sometimes the berries drop, and only the stalks remain (Avidov and Harpaz 1969).

Detection Notes

Larvae of Lobesia botrana move with baggage or cargo shipments in the fruit of grape from infested countries. Once this pest is introduced, climatic conditions in the major grape-growing areas of the United States favor the establishment of L. botrana. Entry requirements (treatments) for grapes because of fruit flies and L. botrana prevent its establishment in the United States. Should these requirements become less stringent, L. botrana could become a more serious threat. The movement of its hosts, fresh fruits, into the United States is regulated under Title 7, Part 319.56 of the Code of Federal Regulations.

(Fig. 5)



Lobesia botrana larval damage to grapes: A. First-generation feeding on buds or flowers. B. Second-generation feeding in grapes. C. Third-generation lesions (From Castro 1943).

Lobesia botrana has been intercepted 61 times at U.S. ports of entry during the past 10 years. This pest is most frequently intercepted in Vitis sp. in baggage from Italy. Interceptions have been made in baggage on Astrophytum capricorne (goathorn starcactus), Malus sp., M. sylvestris (apple), Prunus sp., Punica granatum (pomegranate), Pyrus communis, Rosa sp., Vitis sp., and V. vinifera from France, Greece, Iran, Israel, Italy, Jordan, Morocco, Portugal, Spain, and Yugoslavia. In stores, one interception each was made on Vitis sp. and Geonoma sp. (shadowpalm). Astrophytum capricorne, Geonoma sp., Malus sylvestris, and Punica granatum are not recorded as hosts in the available references.

This species may be detected in the following ways.

1. Inspect for eggs on flower buds or pedicels of vines and grape.

2. Look for webbed bud clusters or flowers where the spring generation larvae feed.

3. Inspect for pupae under rolled leaves in spring.

4. Cut open grapes and search for summer generation larvae and pupae.

Suspect adult specimens should be pinned and labeled for subsequent identification. Submit suspect larvae or pupae in alcohol.

Biology

The first flight of adults emerges in spring when the daily average air temperature is above the minimal threshold temperature of 10° C for 10-12 days (U.S. Department of Agriculture 1984). The second flight period begins in summer (Rezwani 1981).

In Israel, adults appear in the vineyard when grapevines flower. Adults are hard to discover during the day and may be noticed only when they take flight after being disturbed (Avidov and Harpaz 1969). They fly at dusk whenever the temperature is above 12° C, but rainfall or wind will reduce flight (U.S. Department of Agriculture 1984). Adults usually prefer hot, dry places protected from the wind, so they fly mainly between the first rows of grapevines close to windbreaks, and on slopes facing the sun (Avidov and Harpaz 1969).

Within a day or two of mating, females begin to oviposit on the blossoms, leaves, and tender twigs of the grapevine (Talhouk 1969). The female lays 300 or more eggs singly at a rate of more than 35 per day (Avidov and Harpaz 1969). During rearing experiments under laboratory conditions in Czechoslovakia, the optimum temperatures for oviposition were 20-27° C (Gabel 1981). First generation eggs are laid on the flower buds or pedicels of the vine while second generation eggs are laid on individual grapes (U.S. Department of Agriculture 1984). Eggs hatch in 7-11 days in spring and 3-5 days in summer (Avidov and Harpaz 1969).

First-generation larvae feed on bud clusters or flowers and spin webbing around them before pupating inside the web or under the rolled leaf. Second-generation larvae enter the grapes and feed before pupating inside the grape (U.S. Department of Agriculture 1984). Larvae of the third generation, the most damaging, feed on ripening grapes, migrating from one to another and spinning webs (U.S. Department of Agriculture 1957). These third-generation larvae leave the fruit and shelter under the bark, among dead leaves, or between clods of earth, where they pupate before overwintering (Rezwani 1981). Few of these larvae pupate before harvest, and many are gathered with the grapes (U.S. Department of Agriculture 1957). Larvae develop in 4-5 weeks in spring and 2-3 weeks in summer. Pupation lasts 9-12 weeks in spring, 5-7 days in summer, and up to 6 months in winter (Avidov and Harpaz 1969).

In the hill region in Israel, this species produces three generations a year, and in the valleys, four generations. On the Coastal Plain, a generation develops in 7 weeks in spring, 4 weeks in summer, and 8 months or more in winter when the insect undergoes a pupal diapause. Below 11° C, development ceases. Heavy winter rain favors adult reproduction in the next growing season (Avidov and Harpaz 1969).

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