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PESTS NOT KNOWN TO OCCUR IN THE UNITED STATES OR OF LIMITED DISTRIBUTION, NO. 63: PEAR LEAF BLISTER MOTH

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Pest

PEAR LEAF BLISTER MOTH
Leucoptera malifoliella (O. G. Costa)

Selected Synonyms

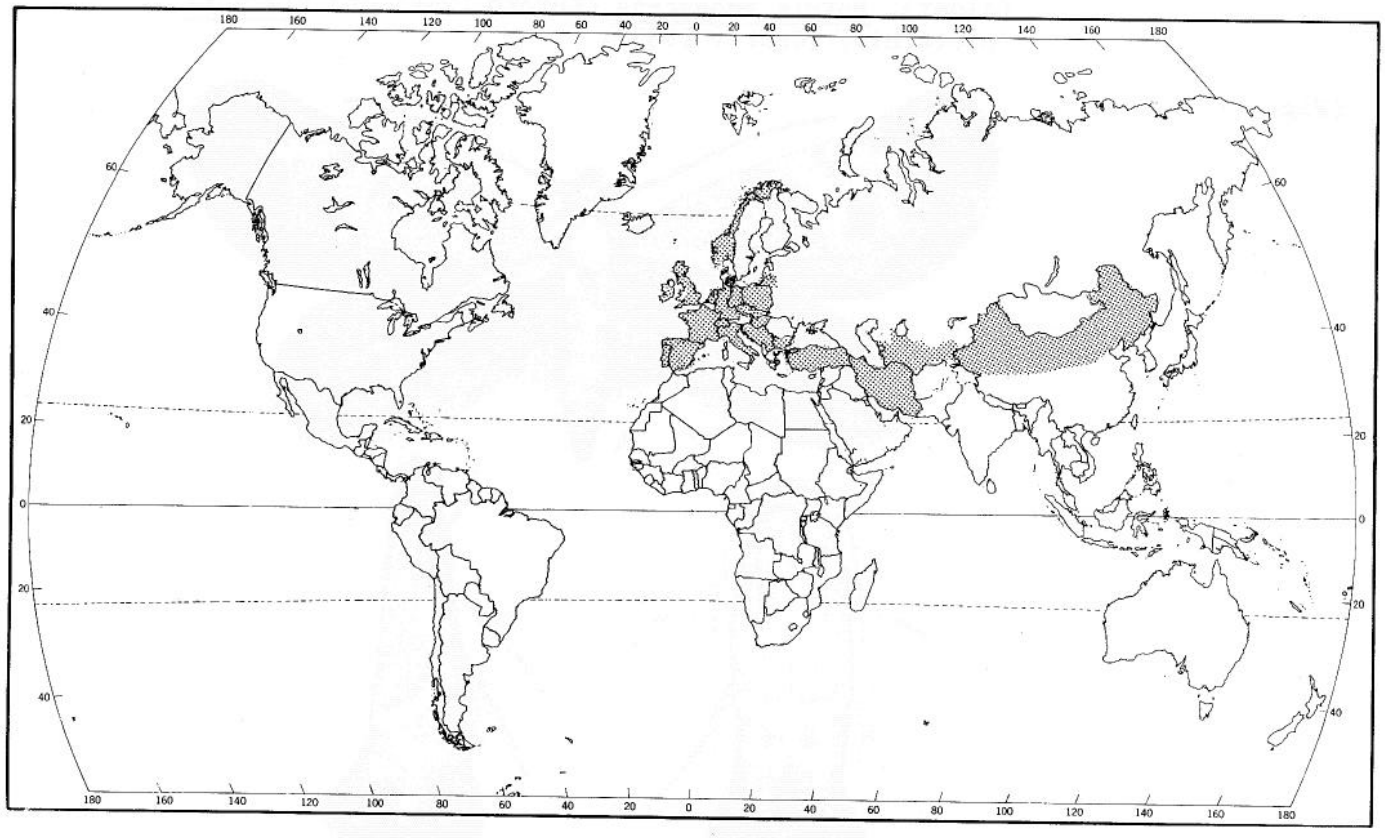
Cemiostoma scitella (Zeller)
Leucoptera scitella (Zeller)

Order: Family

Lepidoptera: Lyonetiidae

Economic Importance

Larvae of *L. malifoliella* mine leaves of pome fruit trees, especially apple and pear. Population buildup during a long growing season, leads to injured leaves dropping prematurely. Most intense leaf drop occurred with 7-9 mines per leaf (Celli and Burchi 1984). Premature loss of leaves from fruiting trees shortened the storage life of apples (Ferro 1961). Continuous defoliation weakened trees (Alford 1984, Jimenez-Alvarez 1966).



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

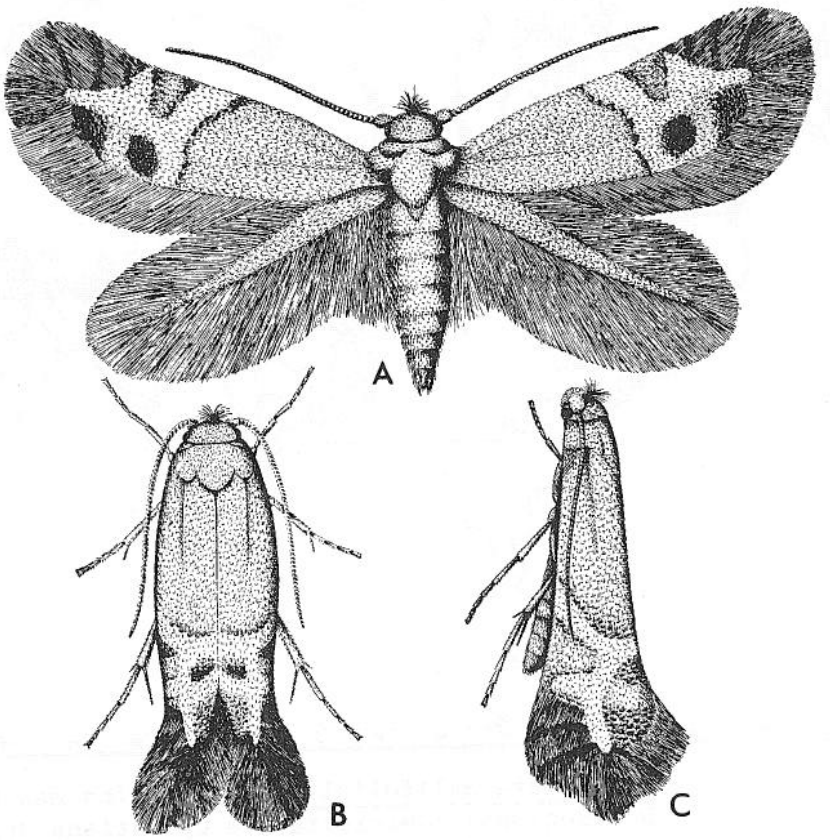
General Distribution

Ferro (1961), unless otherwise cited, compiled the following countries from the literature: Bulgaria (Ivanov 1967), northern China (Kuroko 1964), Czechoslovakia (Hrubý 1964), East Germany, France, Hungary (Molnar 1982), Iran (Gentry 1965), Ireland (Emmet 1985), Italy, Netherlands, Norway, Poland, Portugal (Guimarães 1977), Soviet Union (Central Asia, Crimea (Kholchenkov 1972), Lithuania (Ivinskis 1982)), Spain (Jimenez-Alvarez 1966), Switzerland, Turkey (Briolini and Marri 1978), United Kingdom (England, Scotland, Wales) (Emmet 1985), West Germany, and Yugoslavia (Živanović 1967).

Hosts

Mostly members of the Rosaceae: Amelanchier, Chaenomeles, Cotoneaster, Crataegus oxyacantha, Cydonia, Malus baccata, M. prunifolia, M. sieboldii, M. sylvestris (apple), Mespilus, Prunus spp. (cherry, plum), Prunus spinosa (blackthorn), Pyrus communis (pear), and Sorbus aucuparia (rowan) (Alford 1984, Briolini and Marri 1978, Ferro 1961, Kuroko 1964, Molnar 1982, Stainton 1855). Host genera from other families include Alnus (alder), Betula pubescens (Kuroko 1964) and Pistacia (pistachio) (Gentry 1965).

(Fig. 1)

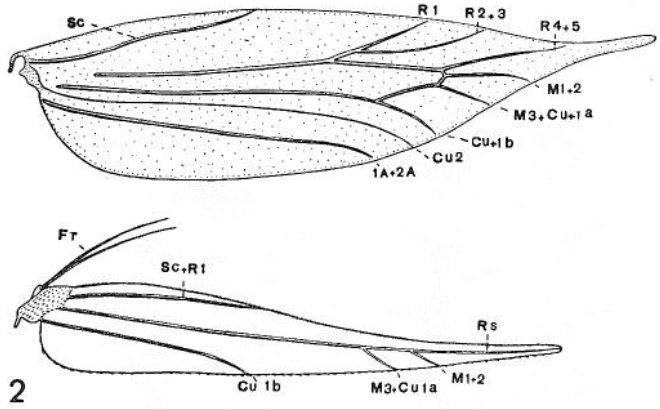


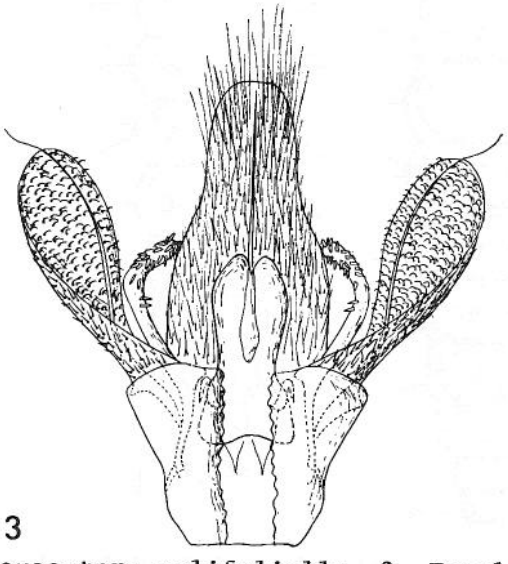
Leucoptera malifoliella adult. A. Wings expanded, dorsal view, B. At rest, dorsal view, C. Lateral view (From Ferro 1961).

Characters

ADULTS (Fig. 1) - Overall shiny metallic gray. Vertex of head with tuft of hair; antenna long and filiform, scape forms eye-cap, antennal segments 28-32 in female, 28-30 in male. Female wingspan 7-8 mm, body length 2.6-3.0 mm; male wingspan 5.5-6.0 mm, maximum body length 2.0-2.3 mm (Ferro 1961). Forewing lanceolate; outer and posterior margin fringed; at rest, apex pointed, upturned in lateral view, divergent outwards in dorsal view (Emmet 1981); fringe with 4 radiating black lines: 2 toward costa, 3d horizontal, 4th directed posteriorly about 45° from long axis of wing; apical half, orange, enclosing 2 white, dark-edged costal spots and post tornal pale violet-golden spot strongly black-margined on both sides (Meyrick 1928, Stainton 1855). Hind wing narrowly lanceolate, evenly leaden gray, fringe longer than width of wing (Réal 1966). Wing venation (Fig. 2). Male genitalia (Fig. 3). Female ovipositor (Fig. 4).

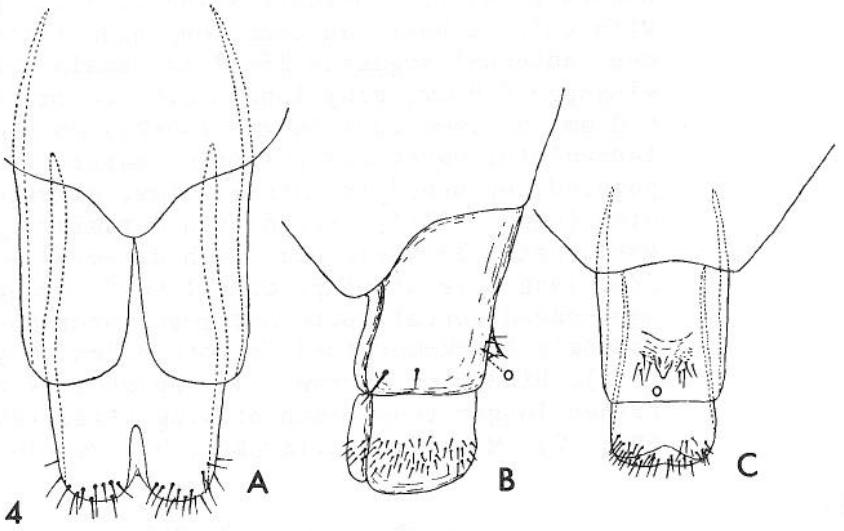
(Figs. 2-3)

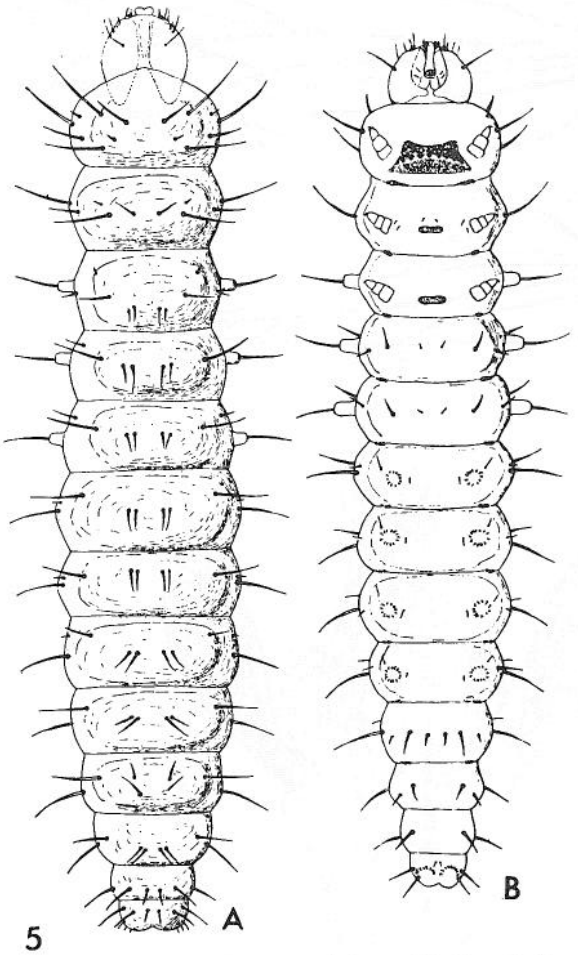




Leucoptera malifoliella. 2. Female wing venation. 3. Male genitalia, ventral view (2 from Ferro 1961; 3 from Zangheri and Ravelli 1957).

(Figs. 4-5)





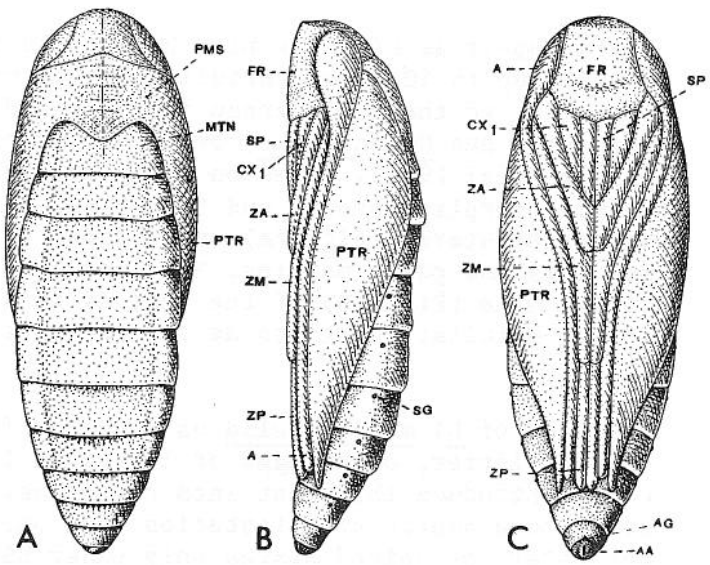
Leucoptera malifoliella. 4A-C. Ovipositor. A. Dorsal, B. Lateral, C. Ventral views. 5A-B. Last-instar larva. A. Dorsal view. B. Ventral view (From Zangheri and Ravelli 1957).

EGGS - Diameter 0.3 mm, discoid, brownish (Alford 1984).

LARVAE* (Fig. 5) - Head and prothoracic shield yellow, body greenish white turning darker near pupation. Full-grown length 4 mm. Head flattened with front and adfrontal sutures extending to vertical triangle. Thoracic segments and abdominal segments A1-7 broadly rounded giving larva moniliform appearance. Prothorax with lateral setae widely separated. Thoracic legs present. Abdominal segments A1-7 with setae D1 and D2 laterad and very close together, D1 lateral to and only slightly anterior to D2; setae L1 and L2 widely spaced below spiracle with L1 well behind spiracle. Abdominal prolegs A3-6 with uniserial circle of 12-15 crochets, anal prolegs with 10-11 crochets.

PUPAE* (Fig. 6) - Brown to dark brown, length 3 mm, usually clustered in flattened silk cocoons. Body with appendages soldered down and no movable abdominal segments. Maxillary and labial palps absent. Wings, antennae, and metathoracic legs extending to posterior margin of abdominal segment 7.

(Fig. 6)



Leucoptera malifoliella pupa. A. Dorsal, B. Lateral, C. Ventral views (From Ferro 1961).

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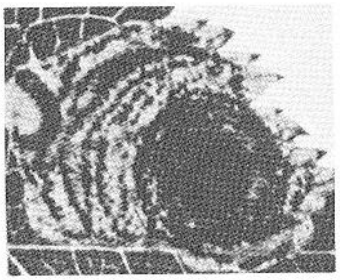
* Prepared by D. M. Weisman, Systematic Entomology Laboratory, Insect Identification and Beneficial Insect Introduction Institute, Agricultural Research Service, USDA, c/o U.S. National Museum of Natural History, Washington, DC 20560

(Fig. 7)

A



B

Leucoptera malifoliella leaf damage. A. Blistered leaves B. Spiral mine with larva (A from Kremer 1971; B from de Pietri-Tonelli et al. 1958).

Characteristic Damage

Mines appear as circular blotches, up to 2 cm wide. Leaves may contain up to 50 mines (Briolini 1960). Mine colors differ according to the host: green in Alnus and Betula, brown in Crataegus and Cotoneaster, brownish red or violet in other plants (Réal 1966). Mines on apple and pear are brownish, later turning purplish brown, and then black (Alford 1984). Mines may appear blistered (Fig. 7A) or scorched with darker spiral markings and paler margins. The larva may be seen at the edge of the mine (Fig. 7B) if the leaf is backlighted (Stainton 1855). Defoliation starts at the top of the trees.

Detection Notes

Movement of L. malifoliella as pupae on fruits, nursery stock, or leaf litter, or as eggs or larvae on infested nursery stock could introduce this pest into new areas. Fresh fruits that could be a source of infestation from where this pest occurs, may enter the United States only under USDA permit and are subject to inspection as specified in Title 7, Part 319.56 of the Code of Federal Regulations. Plants or plant parts of many of its hosts intended for propagation enter only for scientific purposes under USDA permit or are subject to inspection and postentry quarantine under Part 319.37.

PPQ has intercepted L. malifoliella 57 times from 1974 to 1984 at U.S. ports of entry. Interceptions were made mainly on Malus spp. (apple) and Pyrus communis (pear) in stores (39 times), baggage (13), and permit cargo (5). Countries of origin

included Bulgaria, France, Italy, Portugal, Soviet Union, Spain, Switzerland, United Kingdom, West Germany, and Yugoslavia. Interceptions from Greece, Morocco, and Thailand (countries not specifically cited in the literature) may represent transshipments from other areas.

It may be detected in the following ways.

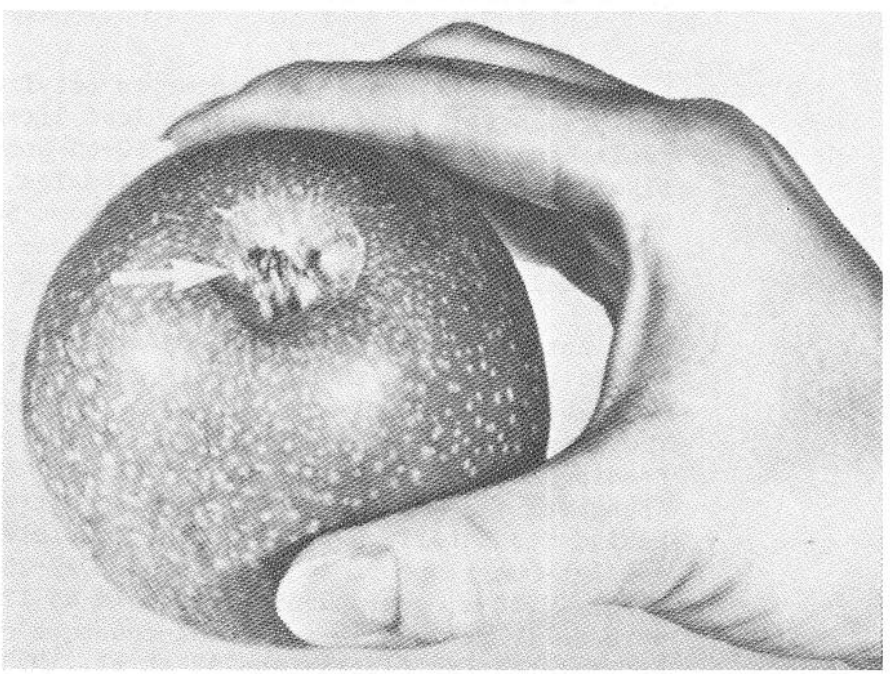
1. Examine crevices in bark, fruit (Fig. 8), or leaves for the small (6-7 mm long) X-shaped, white cocoons (Fig. 9).

2. Look at the leaves for round spiral mines. Note tiny shiny adults resting on the undersurface of leaves. Adults flutter for short distances but are difficult to arouse.

3. Look for larvae dangling on threads from the tree before they pupate.

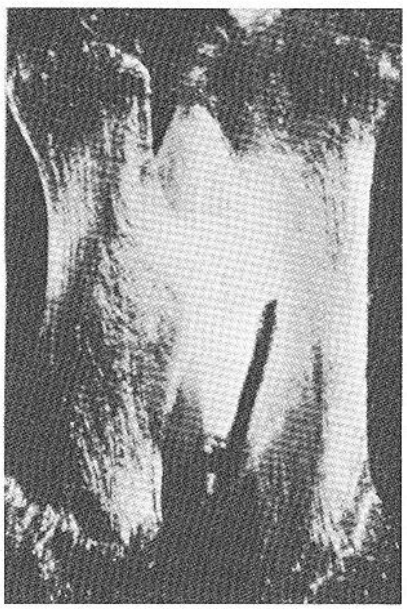
For identification, submit killed adults mounted on minuten nadeln, and larvae and pupae killed in boiling water and preserved in 70-80 percent alcohol. Label all specimens.

(Fig. 8)



Leucoptera malifoliella cocoon in apple calyx (Courtesy Agriculture Canada).

(Fig. 9)



Leucoptera malifoliella cocoon with black cast larval skin (From de Pietri-Tonelli et al. 1958).

Biology

L. malifoliella pupae overwinter in crevices of bark on trunks and branches (Ivanov 1967) or in leaf litter (Molnar 1982). Adults emerge in spring and mate 50-60 hours later. They can fly for 4-5 m. Males live 5 days; females, 8-10 days (Zangheri and Ravelli 1957). The female lays about 50 eggs singly on the undersides of leaves, rarely on the upper surface (Ferro 1961). One female laid 85 eggs in the laboratory (Sinel'nikova 1936).

Eggs hatch in an average of 8.6 days at 27-28° C (Sinel'nikova 1936). Larvae bore through their egg shell directly into the leaf and penetrate leaf tissues in 8-10 hours (Ferro 1961). They mine under the upper epidermal layer (Molnar 1982), each feeding in a widening, round spiral mine in the parenchyma (Zangheri and Ravelli 1957), leaving a trail of dark excrement behind it, until the sixth instar completes its growth. Larvae complete development in 13.1 days at 27-28° C (Sinel'nikova 1936). With a development threshhold of 12° C, larvae in Italy were fully grown when a thermal constant of 181 degree days was accumulated (de Pietri-Tonelli et al. 1958). A recent study of the effects of temperature on development of the egg and other stages was reported by Boureau (1982).

Fully grown larvae leave the mines through the upper leaf surface, crawl about or dangle from a silk thread, and seach for pupation sites (Réal 1966). Larvae of the early generations pupate mostly on leaves; later generations, especially the last, pupate in crevices in bark on trunks or branches, or in fruit (Ferro 1961, Injac and Dulić 1983, Zangheri and Ravelli 1957). Larvae often pupate in groups (Réal 1966). Pupation is completed in an average of 9.7 days at 27-28° C (Sinel'nikova 1936). The adults then emerge to start a new generation.

Larvae of successive generations mine leaves from early spring into autumn, a long growing season resulting in more generations. Depending on the climate, the number of generations varies from five in Spain (Jimenez-Alvarez 1966) to one in the United Kingdom (Alford 1984). Studies in Italy showed that one generation completed development when a thermal constant of 348 degree days was accumulated at a development threshhold of 15° C (de Pietri-Tonelli et al. 1958).

Control

The control threshold for larvae on apples in Italy is 2-3 mines per leaf (2 mines correspond to 65 percent mined leaves), but this number may have to be balanced by the 5-6 larvae per leaf needed to increase parasite levels (Bonvicini and Briolini 1973-1975, Celli 1970). Still, treatments timed to catch the stages susceptible to pesticide will spare the parasites that become active when larvae are in the second and third instar. Sprays were effectively applied to lower leaf surfaces between first-generation larval hatch and leaf entry. A second treatment might be needed (Ciglar 1981, Ivanov 1978, Jimenez-Alvarez 1966, Pezzanil and Ruffini 1971, Sinel'nikova 1936).

Natural Control

Studies revealed some active parasites, all eulophid wasps. Tetrastichus pospjelovi Kurdjumov parasitized 92-95 percent of the overwintering pupae in Italy (Ciampolinii in Réal 1966). Five other wasps, Omphale coilus Walker, Chrysocharis orchestis Ratzeburg, Pediobius pyrgo Walker, Geniocerus amethystinus Ratzeburg and Tetrastichus vacuna Walker, parasitized an average of 50 percent of L. malifoliella (Zangheri and Ravelli 1957). Chrysocharis nitetis Walker was the most effective of several parasites studied in one orchard (Celli 1970). Closterocerus trifasciatus Westwood, Chrysocharis pentheus (Walker), and Chrysocharis assis (Walker) parasitized 19.6-31.8 percent of the larvae in Bulgaria (Ivanov 1978).

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