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Lepidopterous larvae and pupae and their parasites, collected on Pomaceous Fruit trees in Israel *

by

H. N. PLAUT

Introduction

The Lepidoptera *Cydia pomonella* L. (Tortricidae), *Zeuzera pyrina* L. (Cossidae), *Spodoptera littoralis* Bois. (Noctuidae) and *Lyonetia clerkella* L. (Lyonetidae) are common pests of pome trees in Israel.

In the literature up to 1950, Bodenheimer (1930) mentioned 19 and Schweig (1950) two additional species and subspecies of Lepidoptera which had been occasionally encountered feeding on apple or pear trees. Most of those mentioned by Bodenheimer were collected at Qirjat Anavim (700 m), in the mountains near Jerusalem.

Since about 1960, farmers have occasionally complained of different types of feeding injury to apple and pear fruit, which in some instances reached proportions of economic damage. These cases were, and still are, usually reported after the causal factor has disappeared.

Small lepidopterous larvae often infest grafts in orchards and prevent their acceptance. They are called graft-moths by the growers, who are well acquainted with their delicate dark frass. They have not been identified.

Since the nineteen-fifties, the habit of keeping the soil as clear as possible of weeds has gradually given way to different degrees of non-tillage, which has given rise to abundant undergrowth of diverse floral composition, in many groves. The fauna which subsists on this undergrowth is an additional comparatively new factor in the ecosystem of the commercial grove, which must be taken into consideration when the possibilities of integrated pest control are being examined. Lepidoptera feeding on the weeds may play the useful role of some « indifferent » organisms, being in themselves neither directly harmful or useful, but

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serving as food for predators and parasites which have the potential of reducing pests of the trees.

Other possible causes for current changes in abundance and species-composition of Lepidoptera in pome-fruit groves are changing irrigation and pest control practices, changes in the nature of neighbouring crops, areal spread, and biological adaptation.

Thus, it seemed worthwhile to update our knowledge of the lepidopterous fauna of pome trees. A summary of the findings since 1962 is herewith presented.

Methods

Foliage of apple and pear trees was scanned visually, and sometimes branches were tapped. Growers and extension personnel were encouraged to report cases of feeding on the trees, especially the fruit. A current research program on the use of burlap bands on trunks of trees for the indication of population density and flight of the codling moth, also yielded information on other species of lepidoptera, which were collected systematically at Newe Ya'ar and Nahalal, and occasionally sent in from commercial groves.

Most material was collected within, or in the vicinity, of the Yizre'el Valley, but some of it came from as far north as the Huleh Valley in Upper Galilee, or as far south as Sa'ad in the southern coastal plain and Tse'elim in the western Negev. Elevations were usually lower, and in a few cases a little higher, than 200 m above sea level.

Whenever the collected material could not be directly identified, it was reared or kept, to obtain imagines. Emerging parasites were also identified, but in most cases they could not with certainty be related to their host species.

Most Lepidoptera were identified by Mr. J. Palmoni, of the Gordon Institute, Deganya Alef, and by Dr. W. Sauter, of the Department of Entomology, E.T.H., Zuerich. Dr. Sauter was very helpful in updating some of the zoological nomenclature.

Dr. Aubert, Dr. Delucchi, Dr. Fisher and Mr. J. R. Stephen, through the Center of Identification of Entomophagous Insects of the C.I.L.B., Geneva, identified most of the Ichneumonidae, Pteromalidae, Braconidae and Chalcididae, respectively.

Dr. D. Rosen, of the Hebrew University of Jerusalem, and Dr. Y. Kougler of the Tel-Aviv University, helped with the identification of some of the parasites.

Results

The results are summarized in tables 1 and 2.

TABLE I

Lepidoptera collected in the larval or pupal stage on pome fruit trees during 1963-1970 (excluding common pests)

Species	Habitat of the collected specimens (burlap traps are on trunks)	Frequency of encounter (+ rare, + + + + common)
GRACILLARIIDAE		
<i>Lithocolletis blancardella</i> F.	Apple, pear : leaves (minor)	+ + + +
TORTRICIDAE		
<i>Lobesia botrana</i> DEN. & SCHIFF.	Pear : fruit	+ +
<i>Crociosema plebejana</i> Z.	Apple : burlap traps	+
<i>Acleris variegana</i> Den. & SCHIFF.	Quince : burlap traps	+
PYRALIDAE		
<i>Cryptoblabes gnidielia</i> MILL.	Apple : fruit and burlap traps Pear : fruit, burlap traps, and feeding at base of young growth	+ + + +
<i>Euzophera bigella</i> Z.	Quince : fruit and burlap traps Pear : callus on bark wounds Apple : burlap traps	+ + +
<i>Ectomyelois ceratoniae</i> Z.	Quince : fruit Apple : fruit mummies	+
<i>Lamoria anella</i> SCHIFF.	Apple : burlap traps	+ + +
<i>Antiercta ornatalis</i> DUP.	» » »	+ +
<i>Herculia fulvociliialis</i> DUP.	Rat nests on pear trees	+ +
<i>Ulotricha egregialis</i> H. + S.	» » » » »	+ +
PTEROPHORIDAE		
<i>Stenoptilia bipunctatidactyla</i> HW.	Apple : burlap traps	+ + +
DREPANIDAE		
<i>Cilix asiatica</i> B.-H.	Apple : leaves	+ + +
GEOMETRIDAE		
<i>Sterrha allongata</i> STGR.	Apple : fruit	+
<i>Gymnoscelis pumilata</i> HB.	Apple : fruit and burlap traps	+ + +
<i>Rhodometra sacraria</i> L.	Apple : burlap traps	+
<i>Boarmia selenaria</i> DEN. & SCHIFF.	Apple : leaves, burlap traps Pear : leaves	+ +
<i>Nychiodes palaestinensis</i> WAGN.	Apple : burlap traps	+ +
NOCTUIDAE		
<i>Euxoa temera</i> f. <i>viliersi</i> GN.	Apple : seedlings	+
<i>Scotia segetum</i> SCHIFF.	Apple : burlap traps	+

Species	Habitat of the collected specimens (burlap traps are on trunks)	Frequency of encounter (+ rare, + + + + common)
NOCTUIDAE (continued)		
<i>Scotia crassa lata</i> TR.	Apple : burlap traps	+
<i>Scotia trux</i> SCHIFF.	Apple : stock-sucker	+
<i>Peridroma saucia ochreacosta</i> HAW.	Apple : burlap traps	
<i>Mamestra persicariae accipitrina</i> ESP.	» » »	+ +
<i>Mythimna unipuncta</i> HAW.	» » »	+ + + +
<i>Mythimna loreyi</i> DUP.	» » »	+ + + +
<i>Apatele psi</i> L.	Apple : burlap traps	+ +
<i>Apatele rumicis</i> L.	Apple : fruit, burlap traps Pear : leaves, burlap traps	+ + +
<i>Apatele rumicis pallida</i> ROTHSCH.	Apple : fruit	+
<i>Cryphia ochsi</i> BRSN.	Pear : burlap traps	+
<i>Spodoptera exigua</i> HB.	Apple : leaves, burlap traps Pear : leaves	+ +
<i>Chloridea peltigera</i> SCHIFF.	Apple : leaves, fruit	+ +
<i>Chloridea armigera</i> HB.	Apple : leaves, fruit	+ +
<i>Chloridea nubigera</i> H. S.	Apple : leaves, fruit	+
<i>Porphyria cochylionides</i> GUEN.	Apple : burlap traps	+
<i>Trichoplusia ni</i> HBN.	Apple : burlap traps	+
<i>Autographa gamma</i> L.	Apple : leaves, burlap traps	+ +
<i>Syngrapha circumflexa</i> L.	» » » »	+
<i>Chrysodeixis chalcytes</i> ESP.	Apple : burlap traps	+
<i>Grammodes bifasciata</i> PET.	Apple, pear : burlap traps	+
<i>Dysgonia torrida</i> GN.	Quince : burlap traps	+
LYMANTRIIDAE		
<i>Lymantria dispar</i> L.	Apple : leaves	+ +
ARCTIIDAE		
<i>Phragmatobia fuliginosa fervida</i> STGR.	Apple, pear : burlap traps	+

TABLE 2

Parasites reared from larvae and pupae of Lepidoptera collected on pome fruit trees

ICHNEUMONIDAE : <i>Pimpla spuria</i> GRAV. <i>nilotica</i> SCHMK. <i>Exochus coronatus</i> GRAV. <i>meridionator</i> AUBERT <i>Herpestomus arridens</i> GRAV. <i>Diadegma</i> sp.	BRACONIDAE : <i>Microplitis mediana</i> RUTHE <i>M. brachycera</i> THOMS. <i>Apanteles ruficrus</i> HAL. <i>Meteorus rubens</i> NEES <i>Rogas ductor</i> THNBG. <i>R. bicolor</i> SPIN.
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 ICHNEUMONIDAE (continued):

Campoplex ensator GRAV.
C. orientalis SCHMK.
Meloboris velox HOLM.
Gelis meridianator AUBERT
Nepiera collector THBG.
Hyposoter didymator THBG.
Campoletis annulata GRAV.
f. maculipes TCHEK.

BRACONIDAE (continued):

R. testaceus SPIN.
Bracon erythrostictus MARSH.

CHALCIDIDAE:

Invreia rufitarsis ILL.

PTEROMALIDAE:

Dibrachys sp.
D. bruceanus RATZEBURG

TACHINIDAE:

Voria ruralis FALL.

Discussion

In their relation to the fruit trees, the listed Lepidoptera can be divided into three groups — those feeding on the tissue of the trees (fruit, leaves or bark), those feeding on material positioned on the trees (rat nests, lichens), and those seeking shelter, without feeding on the trees.

From the agricultural-economic viewpoint, the most immediately significant findings concern the fruit-feeders, of which *L. botrana*, *C. gnidiella* and *G. pumilata* were found to cause some economic damage.

L. botrana is a common pest of the grapevine in Israel and many other Mediterranean countries. During recent years, it has been found by the author causing some economic damage to Japanese plums, and by KOTTLER (1966) to roses in commercial greenhouses. The recent pressure of *L. botrana* on new hosts may be a result of the uprooting of a large percentage of the winegrape acreage, which forces whole populations of the pest to search for alternative hosts. In this survey it was found causing shallow scarring to pear fruit.

C. gnidiella in Israel is a well-known pest of citrus, and common on the fruits of grapevine and pomegranate and on corn cobs. It is of Mediterranean distribution. Its seasonal occurrence has been traced by AVIDOV and GOTTHILF (1960) on these and other hosts, leaving a gap for April and May. Our findings close this seasonal gap, at least partly, and add apple and pear to the list of known hosts. *C. gnidiella* seems to be responsible for much of the shallow scarring found on apple and pear fruit which is caused during May and June. In the Negev, it was also found to cause damage at the bases of young pear shoots (as reported by Mr. M. J. Berlinger).

G. pumilata had previously been found to be common among the pistils ("silk") of corn cobs in Israel (Plaut, unpublished data). It has

been recorded as destroying flowers of many hosts, (e.g. citrus, olives, roses, dalias, sorghum, corn) in Mediterranean countries (Marocco, Italy, Spain, Turkey). In this survey, it was found in five localities on apple trees; in one case it caused some economic damage by boring deeply into fruits of the Golden Delicious variety.

Three species of *Chloridea* were collected on apple trees, feeding on leaves, and mainly on fruit, but no case of anything approaching economic damage was actually encountered. Growers and extension workers have repeatedly reported damage to apple fruit by what they consider to be *Chloridea* spp., but no such case has been verified by a specialist. The possibility of such damage is plausible, in the light of our findings.

E. bigella was collected in considerable numbers from infested quince fruits, from burlap traps on quince and apple trees, and from callus on healing wounds on pear trees. It was not found feeding on apple fruit in orchards, but in the laboratory several generations were raised on otherwise unimpaired apple fruit (Plaut, 1965). It has been reported as cortiphagous on olive and other trees in Europe and northwestern Africa (Silvestri 1943), and as noxious on apple, apricot and other fruit in southern Russia (Gerasimov, 1930; Pavlowsky and Stakelberg, 1955). It is probably one of our "graft moths".

In a few isolated cases, *S. allongata*, *A. rumicis* and *A. rumicis pallida* were found feeding on apple fruit.

Of the leaf feeders, *B. selenaria* warrants some attention. It was found in small numbers, but widely distributed on apple trees, voraciously feeding on the leaves. In the laboratory it was raised on apple fruit. According to Shoham (1965) the number of adults of *B. selenaria*, caught in a mercury vapor light trap near an apple grove in upper Galilee, was negligible in 1960-1962, but rose steeply from year to year during 1963-1965. The species has been mentioned from Japan, Burma, India, Madagascar, South Africa and Sicily on a variety of hosts.

In a few cases, *S. exigua* and *L. dispar* were found feeding in large numbers on apple leaves.

The small leafminer *L. blankardella* was common on apple and pear in the Yizre'el Valley, but does not yet seem to have been identified from this region.

L. anella was found feeding heavily on the bark of apple trees under burlap bands.

Of species found in burlap bands and not feeding on arboreal tissue *C. ochsi* BRSN. probably subsists on lichens. The host of *A. ornatalis* and *S. bipunctatidactyla* was *Convolvulus* sp., and of *Mythimna* spp. unidentified species of Gramineae. Most of the others — mainly Noctuidae — are well known polyphagous species which feed mainly on weeds and reach the burlap bands searching for shelter. This group of Lepidoptera could play a useful role in an integrated control program, being harmless to the trees but serving as an alternative food supply for

predators and parasites of fruit tree pests. STEINER (1962) has expounded on the probable usefulness of "indifferent" arthropods in apple orchards in Germany.

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Summary

Lepidopterous larvae and pupae were studied on pomaceous fruit trees during 1962–1970, by visual examination, branch tapping, collection from burlap bands around tree trunks, and on information on unusual types of fruit injury.

Of 42 species identified, apart from common pests, ten were found feeding on fruit, most of them recorded for the first time as such in Israel.

Of the fruit feeders, *Lobesia botrana* DEN. and SCHIFF., *Cryptoblabes gnidiella* MILL. and *Gymnoscelis pumilata* HB. caused economic damage, and *Chloridea* spp. are suspected of doing so. *Euzophera bigella* Z. seems to be a potential pest of fruits, and *Boarmin selenaria* DEN. and SCHIFF. of leaves.

Lamoria anella SCHIFF. was found feeding heavily on the bark of apple trunks, under burlap traps. The leaf minor *Lithocolletis blancardella* F. is recorded for the first time from pometrees in Israel.

Among the species coming to burlap brands from weeds for shelter, *Mythimna unipuncta* HAW., *Mythimma loreyi* DUP. and *Stenoptilia bipunctatidactyla* HW. were common. This group is considered potentially useful — especially if integrated control is attempted — as a reservoir of food for parasites and predators, which is little affected by insecticide applications to the trees.

Dense populations of *Herculia fulvociliatis* DUP. and *Ulotricha egregialis* H. S. were found in rat nests on pear trees. Twenty-three species of parasites were reared from the collected material, among which were twenty two Hymenoptera and one Dipteron.

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