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CONTRIBUTION TO THE PHENOLOGY OF LEAF MINERS (NEPTICULA NEAR PULVEROSELLA STAINT: NEPTICULIDAE AND LYONETIA CLERKELLA L.: LYONETIIDAE-LEPIDOPT.) ON ALMOND IN ISRAEL

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ABSTRACT

A phenological survey of two leaf-mining moths (Nepticula near pulverosella Staint, and Lyonetia clerkella L.) was conducted in the southern arid region (Negev) of Israel. Both species raised six generations per year, and occasiona- lly one additional generation in the winter. The periods of appearance of the generations of both species overlap, and reach a peak from July to October. The two species were not found on the same leaf. N. nr pulverosella attacked almond and peach leaves; L. clerkella attacked, in addition, apricot, Japanese plum and apple. Both species were found throughout the Negev region wherever host trees are grown.

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Introduction

Over the last few years, heavy damage to almond trees by leaf mining moths has been reported (Gur and Lieberman 1960, Meisner and Grinberg 1967). This damage was previously attributed to Lyonetia clerkella L., familiar in Israel for many years (Bodenheimer 1937, Schweig 1950, Avidov 1961). In the course of a phenological survey and experiments on the control of leaf mining moths, a new species was discovered on almonds, identified as Nepticula near pulverosella Staint, (Meisner and Grinberg 1967). This moth constituted, according to the authors, an important component of the mining moth population in almond leaves, but since it was observed incidentally during the above mentioned survey, it was impossible to determine, in retrospect, the phenology of each individual leaf miner species. The aim of the present work was to study the appearance dates, their occurrence on different varieties of almond and other rosaceous fruit trees, and their geographical distribution in the Negev where research was carried out in irrigated almond orchards from 1969-1971.

Method of leaf sampling and examination

Leaves were sampled at a height of 0.5 - 1.5 m. above ground. At each sampling about 150 leaves were picked at random from each of 10 marked trees in each orchard. In the laboratory, a second random sampling of 100 out of the 150 leaves was made, so that 1000 leaves were examined each time.

The survey was carried out routinely in the following almond orchards:

Migda: Ten unsprayed trees, planted in 1958, were marked for sampling: 5 of Ne Plus Ultra (N.P.U.), 4 of Poriyya - 10 and one of the Greek varieties.

Helez: The 10 trees sampled were of Poriyya-10 variety, planted in 1961. This orchard received conventional treatments against insects and diseases.

Gilat: An unsprayed observation orchard, containing various stone fruits (Apricot, Almond, Peach and Japanese plum) and pome fruits (Pear and Apple). The trees were planted in 1964. Routine leaf examinations, 400 leaves from each tree species, were carried out.

Results

The occurrence of the larvae of Nepticula near pulverosella and of Lyonetia clerkella on almonds.

The larvae of both species appeared simultaneously (Fig. 1). Six generations per year, in March-April, in May-June, in July, in August, in September-October and in November-December, were observed. In the relatively warm winter of 1969-70, when leaf shedding was delayed, an additional seventh generation appeared in December-February.

The degree of infestation by the leaf-mining moth varied according to the location and the year.

Although both species had the same number of generations per year, with the larval generations occuring simultaneously, only two occasions were recorded when the same leaf was infested by both species (Migda, 1969). Otherwise, each individual leaf was infested by the larvae of one species only.

At the beginning of the season (March to May), the populations of both species were similar (Fig. 1), but from July until autumn the population of N. nr pulverosella was much greater than that of L. clerkella. In the winter of 1969-1970, the populations of both species were again similar in the two survey locations.

It must be stated that on almond, no significant varietal differences in susceptibility to attack by either moth species could be recognized.

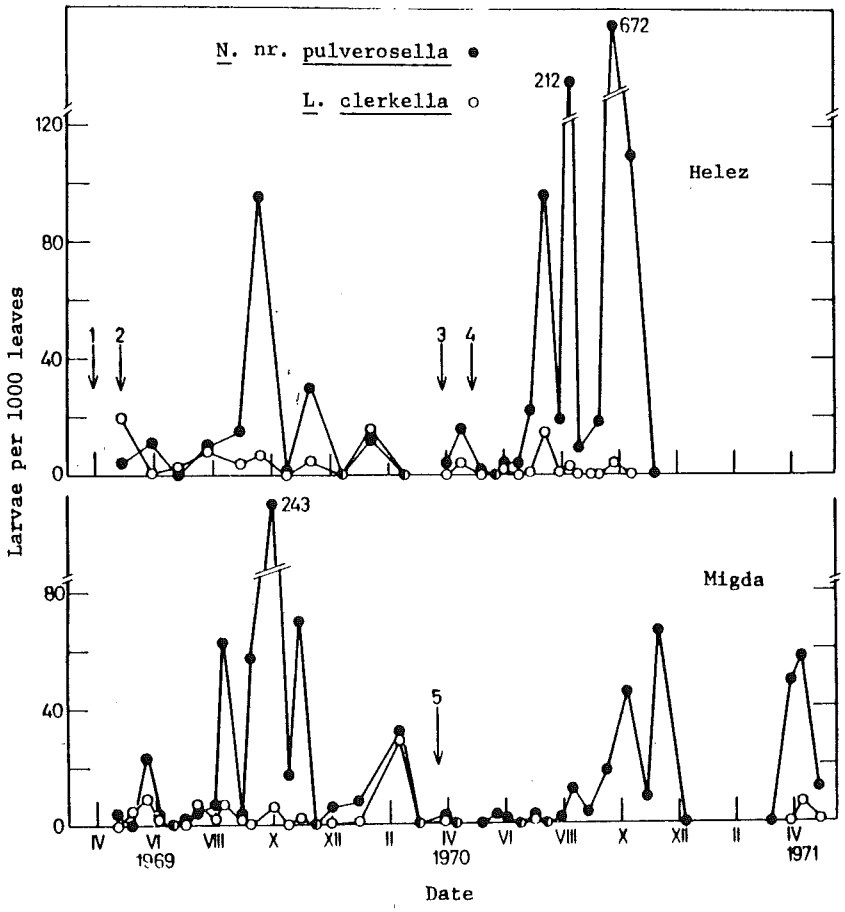

Fig. 1: The occurence of Nepticula near pulverosella and Lyonetia clerkella Larvae on almond leaves in the Helez and Migda orchards, 1969-1970.

The arrows indicate sprayings: 1) Phosphamidon 0.1% - Manzidan 0.15%

2) Cotnion 0.2% - Manebgan 0.15% 3) Phosphamidon 0.1%-Manebgan 0.15%

4) Cotnion 0.2% - Manebgan 0.15% 5) Cotnion 0.2% - Manzidan 0.15%

TABLE 1. Occurrence of N. nr pulverosella and L. clerkella in various rosaceous fruit trees in 1969-1970 at Gilat.

Number of observations in which infested leaves were found, out of 17 or 11, each observation based on a sample of 1600 leaves taken from 4 trees.

Moth species		Nepticula near pulverosella		Lyonetia clerkella	
Year		1969	1970	1969	1970
Total No. of observations		17	11	17	11
Stone Fruits	Almond	10	10	8	6
	Peach	5	2	3	4
	Apricot	0	0	4	1
	Japanese-plum	0	0	3	0
Pome Fruits	Apple	0	0	2	1
	Pear	0	0	0	0

Both species attacked the almond leaves, whereas the larvae of L. clerkella were found on apricot, Japanese plum and apple, in addition to almond and peach trees (Tble 1).

On 18.7.71 a sample of 400 leaves were taken from 4 trees. As regarded to N. nr. pulverosella 32 tunnesl on almond and one on peach were found, but none on apricot, Japanese plum, apple or pear. On the other hand 6 tunnels of L. clerkella on almond, 17 on peach, 17 on apricot, 4 on Japanese-plum, 478 on apple and none on pear were found.

In conclusion it may be stated that 1) The host range of N. nr pulverosella is narrower than that of L. clerkella. 2) The almond, and to a lesser extent the peach, are common hosts to both species.

Both species were found (with N. nr. pulverosella constituting over 80% of the population), with a geographical distribution ranging over the Coastal plain (Helez), the western Negev (Mivtahim), the northern Negev lowlands (Migda and Gilat), the southern Neveg lowlands (Shivta and Revivim) and the Negev highlands (Avdat, Sede Boqer and Dimona).

During routine examinations of leaves it was found occasionally that they contained dead larvae in their tunnesl, surrounded by a zone of necrotic cells. This circular necrotic spot eventually became detached and dropped, leaving a hole about 3 mm in diameter in the leaf blade. The appearance of these "shot holes" was associated with both leaf mining species.

Discussion

L. clerkella had been for many years, the only leaf mining moth on rosaceous fruit trees in Israel (Bodenheimer 1937, Avidov and Harpaz 1969). Several years ago a new species, Nepticula near pulverosella, invaded Israel by an unknown rout.

In our survey, Nepticula near pulverosella was found mainly in almond leaves and to a lesser extent in peach leaves, but not in other rosaceous fruit trees. This species raised 6 generations per year on almond trees, and an additional winter generation when leaf shedding was delayed in 1970. As a rule the population of N. nr. pulverosella was greater than that of L. clerkella, which also attacked almonds. L. clerkella was found on peaches, apricots, Japanese plums and apples too. Bodenheimer, (quoted in Avidov and Harpaz 1969) found this moth

on the leaves of apple, pear, quince, almond, cherry and Japanese plum; it raised 4 generations on apple leaves (Schweig 1950, Talhouk 1969). In our survey it raised 6 generations per year. The number of generations depends on climate (Hering, 1951; Blunk 1953) and on host tree phenology. Thus the first generation on almonds appeared earlier than on apples. A similar dependence of insect phenology on host phenology was observed in another pest of stone fruits (Berlinger 1969).

In view of the data above, the similarity between the two moth species as regards yearly number of generations, dates of generation appearance and geographical range of distribution in the Negev region indicate a similarity in their ecological requirements. Nevertheless it was noted that the two species did not usually infest the same leaf although both were found on different leaves of the same tree.

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