

BIOLOGY, ECOLOGY AND INTEGRATED CONTROL OF THE SPECIES *Lyonetia clerkella* L. (sinuous mining), PEST IN THE APPLE PLANTATION FROM NEAMT COUNTY

BIOLOGIA, ECOLOGIA ȘI COMBATERICA INTEGRATĂ A SPECIEI *LYONETIA CLERCKELLA* L. (MINIERUL SINUOS), DĂUNĂTOR ÎN PLANTAȚIILE DE MĂR DIN JUDEȚUL NEAMȚ

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Abstract. *As a consequence of the researches made in the apple plantations upon the species *Lyonetia clerkella* L., the authors present information regarding the spreading, the morphology, the biology and the ecology of this pest in the conditions of Neamt county. It also presents the integrated pest by agrophytotechnical, biological (parasites) measures, the using of the traps with specific sexual ferromones, of the lighting and alimentary traps, as well as chemically with selective products.*

Rezumat. *În urma cercetărilor efectuate în plantațiile de măr asupra speciei *Lyonetia clerkella* L., autorii prezintă date privind răspândirea, morfologia, biologia și ecologia acestui dăunător în condițiile județului Neamț. De asemenea, se prezintă combaterea integrată prin măsuri agrofitehnice, biologice (paraziți), utilizarea capcanelor cu feromoni sexuali specifici, a curselor luminoase și alimentare, precum și chimic cu produse selective.*

INTRODUCTION

This microlepidoptera, *Lionetia clerkella* L. (sinuous mining), belonging to the Lepidoptera class, Lionetiidae family, is spread all over Europe, Northern Africa, Little Asia, being known as a polyphagous pest, producing damages in the apple, pear, cherry, plum, peach, quince, rose plantations.

In our country it was signaled and studied by Motas C. and Zaharescu V. (1933), then by Dobreanu Ecaterina (1937). In 1957-1959 in "The situation of the animal pest of the tilled plants" was signaled in Suceava, Ilfov (Bucharest), Cluj counties, where the damages were great. Balaj D. and Novac N. (1968) observed in the fruit-growing tank from Falticeni, attacks of 94% at the cherry and 89% at the apple. In 1972-1985 it is signaled in Hunedoara, Cluj, Brasov, Vrancea, Mures, Sibiu, Arges. Moreover, the bioecology and the control of this species were studied by Draghia I. (1968, 1972, 1982, 1985, 1986); then by Hetug Maria (1981, 1986, 1996), as well as by Susea Sonica (1987). Also, Popa Paul (2000) presents biology, ecology and the control of this species (master's degree).

The butterflies have sizes from 7,5 to 9 mm, the fore wings and the posterior ones are reduced to some narrow blades foreseen on the edges with long, perpendicular hair, which form fringes whose breadth is bigger than that of the wings. On the illegible there is a black oval spot and where we can see 2 or 3 small black lines, more or less visible in rest status. The wings are white-silver colour, shiny, satinized, with the limits slightly brown-red; the posterior wings are light grey with fine fringes. After Bender E. (1961), the butterflies of the 3rd generation, the hibernated one, are of a brown hue. The egg is small and it is inserted in the superior epidermis of the leaf. The larva, at its complete growth, has 8-9 mm length; the body is light green, with the dark top of the feet. The pupa is sheltered in a satinized white cocoon, woven in hammock between the edges of the leaf or the bark rugosity.

RESULTS AND DISCUSSIONS

Our observations in 2002, upon the species *Lyonetia clerkella* L., in the ecological conditions of Neamt county, show that the insect hibernates in the adult phase under leaves or under the exfoliated bark of the trees. They start their activity in early spring, between the 18th of April and the 7th of May, for 24 days, at $\Sigma (t_n - t_0) = 80^\circ\text{C}$. After pairing, the females deposit the eggs before the apple blossom, between the 23rd of April and the 10th of May, for 17 days, at $\Sigma (t_n - t_0) = 160^\circ\text{C}$, on the inferior part of the leaves, isolated, in some little holes, dug with the help of the genital casing.

After 5-7 days, the larva appears, and grow between the 8th of April and the 31st of May, for 12-24 days, at $\Sigma (t_n - t_0) = 249^\circ\text{C}$, an activity which is influenced by temperature. At its complete growth, the larva abandons the leaf by a small orifice, passes on a leaf next to it and builds a satinized cocoon in a paralelipipedal shape (hammock), hanging by silk threads which turn into pupa.

The pupa level happens between the 25th of April and the 11th of June and lasts for 16 days at $\Sigma (t_n - t_0) = 545^\circ\text{C}$. After 11-21 days butterflies appear and they will give birth to the 2nd generation (G_2), and these to the 3rd generation (G_3).

In our country there were mentioned 3 generations and a partial 4th one, in the orchards located at heights of 200-300 meters in the north of Arges county; 3 complete generations at heights of 350-550 meters and 1-2 generations at heights of 750-860 meters. In Vrancea county there were 2 generations in 1979 and 3 generations in 1980 (Hertug Maria).

On the basis of the data obtained, following researches upon the ecology of the species *Lyonetia clerckella* L., regarding the biological reserve in the autumns of 2001 and 2002, from the apple plantations in Piatra-Neamt was of 15,40% in 2001 and of 18,26% in 2002.

In Bica, the biological reserve was of 8,60% in 2001 and of 10,80% in 2002. Also, in Roman, the biological reserve was of 20,03% in 2001 and of 20,90% in 2002.

The greatest biological reserve was signaled in Roman, followed by Piatra-Neamt and by Bicaz. All these results recommend preventing measures of the attack of this species, so it could be kept under the economic pest level (PED), which is of 30 mines/100 leaves (table 1).

Table 1

The biological reserve of the species *Lyonetia clerckella* L. in various cities from Neamt county in 2001-2002

City	Biological reserve						Mean %	
	G ₁		G ₂		G ₃		2001	2002
	2001	2002	2001	2002	2001	2002		
Piatra-Neamt	14,5	19,8	16,3	16,6	15,4	18,4	15,40	18,26
Bicaz	10,2	15,7	8,4	8,5	7,2	8,2	8,60	10,80
Roman	18,0	22,7	21,5	19,4	18,2	20,6	20,03	20,90

As for the attack frequency (F%) observed in the same city from Neamt county in 2001 and 2002, they got to the following data (table 2).

Table 2

The frequency of the attack (F%) of the species *Lyonetia clerckella* L. in different cities from Neamt county in 2001 and 2002

City	Biological reserve						Mean %	
	G ₁		G ₂		G ₃		2001	2002
	2001	2002	2001	2002	2001	2002		
Piatra-Neamt	10,2	15,0	12,4	11,5	11,2	12,6	11,26	13,03
Bicaz	6,4	11,2	6,2	5,3	6,1	5,3	6,23	7,57
Roman	12,4	17,4	14,2	13,1	14,1	14,6	13,56	15,03

The frequency of the attack in Piatra-Neamt city was of 11,26% in 2001 and of 13,03% in 2002. In Bicaz it was of 6,23 in 2001 and of 7,57% in 2002. Also, in Roman it was of 13,56% in 2001 and of 15,03% in 2002.

We observe that from this point of view, the greatest frequency of the attack was in Roman, followed by Piatra-Neamt and then Bicaz, and this is because of the various ecological growth in these cities.

As for the attack way, the galleries (mines) are very easy to be seen on the superior part of the leaves, where they present in very prolonged, thin and sinuous shapes, and from here comes the name of "sinuous mining". In the mines we can see, by transparency, the larva defecations, but their tracks are missing in the end part of the mines which is occupied by the larva. When the larva intercepts a rib, a part of the foliar limb gets dry, the sap circulation being interrupted. One leaf may shelter more larvae, sometimes up to 30, but they could count, on one leaf, in case of some strong attacks, up to 10-15 galleries.

The integrated control was realized in the ecological conditions of Piatra-Neamt city, by:

- **Agrophytotechnical measures:** collecting and burning of the fallen leaves, followed by autumn or spring ploughing; trunk or compact branch scraping from the exfoliated bark, moss, lichens, where the larvae turn into pupa.
- **Biological measures:** by using the parasite species: Hymenoptera from Braconidae family or of Chalcididae sub-family (Eulophidae), as well as the using of the specific sexual ferromone Atracter, of the lighting or even elementary sources.
- **Chemical measures:** in 2001, in Piatra-Neamt they experimented the products Decis 2,5 CE (0,025%); Lannete 90WS (0,05%); Rimon 10 EC (0,06%); Dimilin 25 WP (0,03%) and Carbetox 50 EC (0,03%), (table 3).

Table 3

The efficiency of some chemical products in the control of the species *Stigmella mallela* Stt. in Piatra-Neamt in 2001

Product	Substance	Concentration %	Frequency %			Production t/ha
			G ₁	G ₂	G ₃	
Decis 2,5 EC	deltrametrin	0,025	15,9	18,8	19,1	25,4
Lannate 90 WS	metomil	0,05	15,5	17,4	18,7	25,8
Rimon 10 EC	novalorun	0,06	16,5	18,2	18,8	25,3
Dimilin 25 WP	diflubenzuron	0,03	17,2	18,8	20,5	25,5
Carbetox 50 EC	malation	0,30	18,7	18,2	19,6	25,6
Untreated witness						22,0

CONCLUSIONS

The species *Lyonetia clerckella*, in the conditions of Neamt county has 3 year generations (G₁ April-May; G₂ in June-July, G₃ in August-September) and hibernates in the adult phase under the exfoliated bark of the trunks or the more compact branches, moss, lichens, or in the fallen leaves, in the superficial layer of the soil.

In the integrated control they obtained very good results by applying agrofitotechnical, biological (parasites) measures, traps with specific sexual ferromones (Atracter), lighting and alimentary traps.

They also experimented the products: Decis 2,5 Ec (0,025%); Lannete 90 WS (0,05%); Rimon 10 EC (0,06%); Dimilin 25 WP (0,03%); Carbetox 50 EC (0,30%), which were very efficient, leading to productions between 25,3 tones/hectare-25,8 tones/hectare, as opposed to the witness which obtained a production of 22,0% tones/hectare, with benefits between 3,3 and 3,8 tones/hectare.

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