

## THE PARASITOID COMPLEX OF *Eupoecilia ambiguella* (LEPIDOPTERA: TORTRICIDAE) IN A VINEYARD OF SOUTHERN ROMANIA

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**Abstract.** Investigating the rearing of the grape moth *Eupoecilia ambiguella* from the larvae and pupae collected in a vineyard of southern Romania, 6 hymenopterans species have been obtained as primary parasitoids. The role played by these parasitoids in the limitation of the host populations is 11.39%. The small number of species identified and the reduced efficiency of the parasite complex of the species *E. ambiguella* in that vineyard can be caused by the poor representation of the host population due to the rather unpropitious climatic conditions for the development of the species, as well as by the treatments conducted over the years, which prevented the gradual strengthening of a set of specific host-parasitoid relationships. *Dibrachys boarmiae* - *E. ambiguella* relationship is new to science. To conclude, the parasitoid complex of the species *Eupoecilia ambiguella* is still insufficiently known in Romania.

**Keywords:** grape moth, parasitoids, percentage of parasitizing, relationship.

**Rezumat. Complexul parazitoid al speciei *Eupoecilia ambiguella* (Lepidoptera: Tortricidae) într-o vie din sudul României.** 6 specii de himenoptere parazitoide au fost obținute ca parazitoizi primari în urma creșterii de larve și pupe ale moliei strugurilor *E. ambiguella* colectate dintr-o podgorie din sudul României. Rolul jucat de acești parazitoizi în reducerea populațiilor gazdei este de 11,39%. Numărul mic de specii identificate și eficiența redusă a complexului parazitar al speciei *E. ambiguella* în această podgorie pot fi cauzate de slaba reprezentare a populației gazdă, datorită condițiilor climatice mai puțin favorabile, precum și a tratamentelor efectuate de-a lungul anilor, fapt ce nu a permis întărirea în timp a unor relații specifice gazdă – parazitoid. Relația *Dibrachys boarmiae* - *E. ambiguella* este nouă pentru știință. În concluzie, complexul de parazitoizi al speciei *Eupoecilia ambiguella* rămâne puțin cunoscut în România.

**Cuvinte cheie:** molia strugurilor, parazitoizi, procentaj de parazitare, relație.

### INTRODUCTION

Polyphagous microlepidoptera *Eupoecilia ambiguella* (HÜBNER 1796) or *Cochylis* have caused significant damage to European vineyards over the centuries. For effective control of their population, research on the pest has also targeted the natural enemy complex. Laborde, in 1900 (VOUKASSOVITCH, 1924), was the first to signal the role of the Ichneumonidae in destroying hibernating chrysalides, with 31-35%. Catoni in the early 20<sup>th</sup> century (GALET, 1982) studied in Italy the *Cochylis* complex of parasitoids and identified 26 species. Subsequently, in France, VOUKASSOVITCH (1924) found that, largely, parasitoids are similar to those of the *Lobesia botrana* (DENIS & SCHIFFERMÜLLER, 1776) species.

THOMSON (1957) synthesized the parasitoid species signalled so far in the world and submitted a list of 58 species of Hymenoptera and Diptera-Tachinidae.

Geoffrion (in GALET, 1982) noted in 1951 that chrysalis parasitism of *E. ambiguella* in the Loire Valley reached 85%, situation suspected by Gallet as exaggerated. Coscolla & Dalla Monta submitted a list of the grape moth parasitoids, the most abundant species being *Dibrachys affinis* MASI, 1907, which can parasitize up to 8a5% of the hibernating chrysalides of *E. ambiguella* and *L. botrana* (ROEHRICH & SCHMID, 1979). In Germany, SENGONCA & LEISSE (1988) obtained four species of parasitoids from pupae of *Cochylis*.

SCHIRRA & LOUIS (1995), on the occasion of the study on parasitoids of the *Sparganothis pilleriana* (DENIS & SCHIFFERMÜLLER, 1776) species, found that in the German vineyards over 43% of the hibernating *Cochylis* pupae had been parasitized, the Ichneumonidae having the largest weight. COLOMBERA *et al.* (2001) studied the parasitoids of *E. ambiguella* and *L. botrana* in northwestern Piedmont (Italy) and obtained 16 species from larvae and pupae of both hosts.

In Romania, data on *Cochylis* parasitoids come from Moldavia, as a result of significant populations registered in those vineyards. Thus, LEON (1912) obtained from the host larvae and pupae, the *Itopectis alternans* (GRAVENHORST, 1829), *Pimpla instigator* (FABRICIUS, 1793), *Aritranis confector* (GRAVENHORST, 1829), *Campoplex difformis* (GMELIN, 1790) species. PETCU (1978) obtained the *Diadegma tenuipes* (THOMSON, 1887) species from the host larvae.

LUCA (1981) and ALI (1982), following the research carried out in the vineyards of Bucium, obtained 4 species of ichneumonidae: *Itopectis alternans* GRAV., *I. maculator* (FABRICIUS, 1775), *Diadegma armillata* (GRAVENHORST, 1829) and *D. varians* (BRISCHKE, 1880). The percentage of parasitizing ranged between 8 and 34%.

Such studies allow highlighting the species of parasitoids with an important role in reducing the host populations. Their subsequent use in biological pest fight programs contributes to the reduction of pesticide used. Consequently, the environmental damage is greatly diminished and thus the quality of food and life increases.

## MATERIAL AND METHODS

The observations were carried out in the Ștefănești vineyard, Argeș County, situated in South-Central part under the Southern Carpathian Mountains and characterized by a temperate climate; the grape moth has two generations and a small population (BĂRBUCEANU & ANDRIESCU, 2005). The samples have been taken from three (3) vineyards with different neighbourhoods. Thus, Ștefănești-Valea Mare vineyard is located next to the forest, while Ștefănești-Viișoara and Ștefănești-Fitotron are located on a plateau surrounded by other vineyards. The vineyard was treated intensively with pesticides in that period (Table 1). The collection was done during the whole period of activity, in winter including, when the host lives as chrysalis. Only 79 larvae and pupae were growing under laboratory conditions, after isolated and observed until the apparition of adult parasitoids. Subsequently, microlepidoptera populations have decreased substantially, so that in 2009-2010, from those vineyards there were collected only two (2) larvae; none was parasitized.

Table 1. Insecticide treatments regime in the vineyard of Ștefănești.  
Tabel 1. Regimul tratamentelor cu insecticide în podgoria din Ștefănești.

Year	Date of treatment	Generation*	Insecticide
1997	May 26-31	G <sub>1</sub>	Neoron 0.600 l/ha
	June 23-26	G <sub>2</sub>	Danirun 0.600 l/ha
1998	June 1-7	G <sub>1</sub>	Kelthane 1.2 l/ha
1999	May 24-29	G <sub>1</sub>	Mitigan 0.2%/ha
2000	May 25-31	G <sub>1</sub>	Neoron 0.250 ml/ha
	June 19-26	G <sub>2</sub>	Mitigan 0.2%/ha
2001	May 26-31	G <sub>1</sub>	Neoron 0.600 l/ha
	June 23-26	G <sub>2</sub>	Danirun 0.600 l/ha

Legend: G<sub>1</sub> and G<sub>2</sub> are the generations of grape moth *Eupoecilia ambiguella* and *Lobesia botrana*.

## RESULTS AND DISCUSSIONS

From the collected larvae and pupae of *Eupoecilia ambiguella*, we obtained 6 species of primary parasitoids belonging to the Hymenoptera. Among them, 5 species belongs to the Ichneumonidae and one species to the Pteromalidae. A single species was obtained as larval parasitoids - *Endromopoda detrita* (HOLMGREN, 1860). For the first time, for 5 of them there are presented quantitative aspects of the parasitic performance in a vineyard from Romania.

During the period of investigation, these species were found parasitizing 11.39% from the larvae and pupae of grape moth (Table 2). The family Ichneumonidae has the largest contribution to reducing the *Eupoecilia ambiguella* population in Ștefănești-Argeș vineyards, with a percentage of parasitizing of 10.13%. *Scambus vesicarius* (RATZEBURG, 1844) and *Pimpla spuria* GRAVENHORST, 1829 were the most important parasitoids.

The data about the recorded parasitoids have been arranged in the following order: locality/stage of host/collecting date/date of emergence/individuals (♀ and ♂) obtained.

## ICHNEUMONIDAE family

*Endromopoda detrita* (HOLMGREN, 1860) was reared as a larval, solitary, primary ectoparasitoid in Ștefănești-Valea Mare/larva/June 27, 1998/July 11, 1998/1♂.

It is known from this host by CATONI in 1910 (GALET, 1982). This polyphagous species is known as primary parasitoid from many species of Curculionidae, Aegeriidae, Tortricidae, Pyralidae (Lepidoptera), Chloropidae (Dip.), and Cynipidae (Hymenoptera).

In Romania it was obtained from *Lixus elegantulus* BOHEMAN, 1842 (Curculionidae) (PISICĂ, 2001) and *E. ambiguella* (PISICĂ & PĂȘESCU-BĂRBUCEANU, 2002).

Upon collection, the larva of *E. ambiguella* was almost sucked and presented an ectoparasite larva of about 6 mm, white-pink. In laboratory conditions, the ectoparasite larva kept on feeding, and on July 1, 1998, it began to make up its cocoon for nymphosis. After one day, it was ready and the nymphosis lasted nine (9) days, until July 11, when the adult hatched.

The role of this parasitoid in limiting of the host populations was 1.27% (Fig. 1).

*Scambus vesicarius* (RATZEBURG, 1844) was reared as a pupal, solitary, primary endoparasitoid in: Ștefănești-Valea Mare/pupa/June 27, 1998/July 8, 1998/1♂; Ștefănești-Valea Mare/pupa/June 27, 1998/July 9, 1998/1♂.

It is a polyphagous species known from species of Tischeriidae, Tortricidae, (Lepidoptera), Tenthredinidae and Cynipidae (Hymenoptera). HOFFMANN & MICHL (2002) had mentioned it as parasitoid of *L. botrana* and *E. ambiguella*.

In Romania, it was obtained from *Malacosoma neustria* (LINNAEUS, 1758) (PISICĂ, 2001) and *E. ambiguella* (PISICĂ & PĂȘESCU-BĂRBUCEANU, 2002).

In the summer of 1998, in the vineyard Ștefănești-Valea Mare, it reduces the host population by 12.5%.

*Itopectis alternans* (GRAVENHORST, 1829) was reared as a pupal, solitary, primary endoparasitoid in: Ștefănești-Viișoara/pupa/February 11, 1997/February 24, 1997/1♂.

It is known from this host as primary parasitoid in Italy (CATONI, 1910 in GALET, 1982; MARCHESINI & MONTA, 1994). In Germany, according to SENGONCA & LEISSE (1988) it was the most important parasite making up to 75 per cent of all parasites.

This polyphagous species is known in Romania as primary parasitoid from many Lepidoptera (PISICĂ, 2001) and as secondary parasitoid from Ichneumonidae, Braconidae and Tachinidae cocoons (DIACONU, 1999; PISICĂ, 2001).

It was obtained in Moldova by LEON (1912), LUCA (1981) and ALI (1982) from *E. ambiguella* pupae.

The parasitizing ratio was only 1.27%.

*Pimpla contemplator* (MÜLLER, 1776) was reared as a pupal, solitary, primary endoparasitoid in: Ștefănești-Valea Mare/pupa/June 27, 1998/July 9, 1998/1♀.

It is a polyphagous species, obtained in Romania as primary parasitoid from many Lepidoptera (PISICĂ, 2001) and as secondary parasitoid from a cocoon of *Macrocentrus pallipes* NEES, 1811 (Braconidae) (DIACONU, 1999).

THOMSON (1957) did not mention it among the parasitoids of this host.

According to PISICĂ & PĂIȘESCU-BĂRBUCEANU (2002), the host-parasitoid relationship is new to science.

The role of this parasitoid in limiting of the host populations was reduced: 1.27%.

*Pimpla spuria* GRAVENHORST, 1829 was reared as a pupal, solitary, primary endoparasitoid in: Ștefănești-Viișoara/pupa/February 11, 1997/March 21, 1997/1♂; Ștefănești-Viișoara/pupa/February 11, 1997/March 21, 1997/1♂.

It is a polyphagous species reared from this host in Europe (CATONI, 1910) (in GALET, 1982). HOFFMANN & MICHL (2002) had mentioned it as parasitoid of *L. botrana* and *E. ambiguella*.

In Romania it is known from several Lepidoptera (PISICĂ, 2001). According to PISICĂ & PĂIȘESCU-BĂRBUCEANU (2002), the host-parasitoid relationship is new for Romania.

These pupae were parasitized during fall, when parasitoids seek hosts for winter, which explains the extensivity of infestation: 18.18%. Thereby, VOUKASSOVITCH (1924) states that the most of the parasitoid species are reared from *E. ambiguella* and *L. botrana* hibernating pupae.

The parasitizing ratio of *E. ambiguella* populations was 2.53%.

#### **PTEROMALIDAE family**

*Dibrachys boarmiae* (WALKER, 1863) was reared as a pupal, gregarious, primary endoparasitoid in: Ștefănești-Viișoara/pupa/February 11, 1997/February 26, 1997/5 ♀♀; 3♂♂.

It is a polyphagous species, known as primary parasitoid from species of Pyralidae, Oecophoridae (Lepidoptera), Anobiidae, Ptinidae, Bruchidae (Coleoptera), and as secondary parasitoid from cocoons of Braconidae (TRJAPITZYN, 1978).

Eight larvae, of about 1 mm and white-coloured, were found in a pupa of *E. ambiguella* collected on February 11, 1997 in the locality of Ștefănești, its content being entirely consumed. In laboratory conditions, after about seven (7) days the larvae turned into nymphs and after another week, turned into adults. *D. boarmiae* hibernates as mature larva in the hibernating stages of the hosts.

The parasitizing ratio was 1.27% (Fig. 1).

In Romania, this species was obtained for the first time by rearing.

The host-parasitoid relationship is new to science.

#### **The effect of chemical treatments on *Eupoecilia ambiguella* parasitoids**

In the Ștefănești locality, chemical treatments and unfavourable climate contributed to the reduction of the population of these microlepidoptera.

In terms of the year 1998, favourable to the development of the *E. ambiguella* species (BĂRBUCEANU & ANDRIESCU, 2005) there were identified two sites of collection: the vineyard of the Ștefănești-Viișoara, where a parasitizing percentage of only 3.85% was achieved and the vineyard of the Ștefănești-Valea Mare village with a parasitizing percentage of 25% (Table 1). Although both sites belonged to the Ștefănești vineyard research station and were subjected to the same regime of chemical treatments, the parasitizing difference was due to different ecological neighbourhoods. In this case, the forest, which is located near the vineyard of the Valea Mare, could be, on the one hand, a refuge for parasitoid species of that vineyard, and on the other hand, a source of repopulating the vineyard with the parasitoids living there.

Thus, the forest edge or protection curtains may constitute temporary feeding and sheltering sites for entomofauna and, at the same time, effective sources of repopulating the cultures depleted by treatments.

However, as GALET (1982) noted due to the monocultural character of most vineyards where *E. ambiguella* is found, parasitism that can affect the eggs, larvae and chrysalides remains insignificant and insufficient to play a considerable limiting role.

Table 2. Primary parasitoids obtained from the larvae and pupae of *Eupoecilia ambiguella* and their role in the limitation of host populations in Ștefănești (Argeș) vineyard. Tabel 2. Parazitizii primari obținuți din larve și pupe de *E. ambiguella* și rolul lor în reducerea populațiilor gazdei în podgoria Ștefănești (Argeș).

Place	Date of collection	No. of ind.	Primary parasitoids														PTEROMALIDAE			
			ICHNEUMONIDAE														Dibrachys boarmiae			
			No.	%	No.	%	Endromopoda detrita		Scambus vesicarius		Itopectis alternans		Pimpla spuria		P. contemplator		Ihn. non-emerging		No.	%
Ștefănești-Viișoara	11.02.1997	11	4	36.36	-	-	-	-	1	9.09	2	18.18	-	-	-	-	-	-	1	9.09
	19.06.1997	2	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>TOTAL 1997</b>		13	4	30.76	3	23.07	-	-	1	7.69	2	15.38	-	-	-	-	-	1	7.69	
Ștefănești-Viișoara	8.06.1998	2	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	11.06.1998	8	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	15.06.1998	10	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	22.06.1998	1	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
<b>SUBTOTAL 1998</b>		5	1	20.00	1	20.00	-	-	-	-	-	-	-	-	-	-	-	1	20.0	
Ștefănești-Valea Mare	27.06.1998	16	4	25.00	4	25	1	6.25	2	12.5	2	12.5	1	6.25	1	6.25	-	1	3.85	
	<b>TOTAL 1998</b>	42	5	11.90	5	11.90	1	2.38	2	4.76	2	4.76	1	2.38	1	2.38	-	1	2.38	
Ștefănești-Viișoara	2.06.2000	5	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	9.06.2000	4	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
<b>TOTAL 2000</b>		9	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Ștefănești-Fitotron	25.07.2001	3	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	11.09.2001	6	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	31.07.2001	1	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Ștefănești-Viișoara	1.08.2001	2	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	21.08.2001	2	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	13.12.2001	1	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
<b>TOTAL 2001</b>		15	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
<b>TOTAL</b>		79	9	11.39	8	10.13	1	1.27	2	2.53	2	2.53	1	1.27	1	1.27	1	1.27	1	1.27

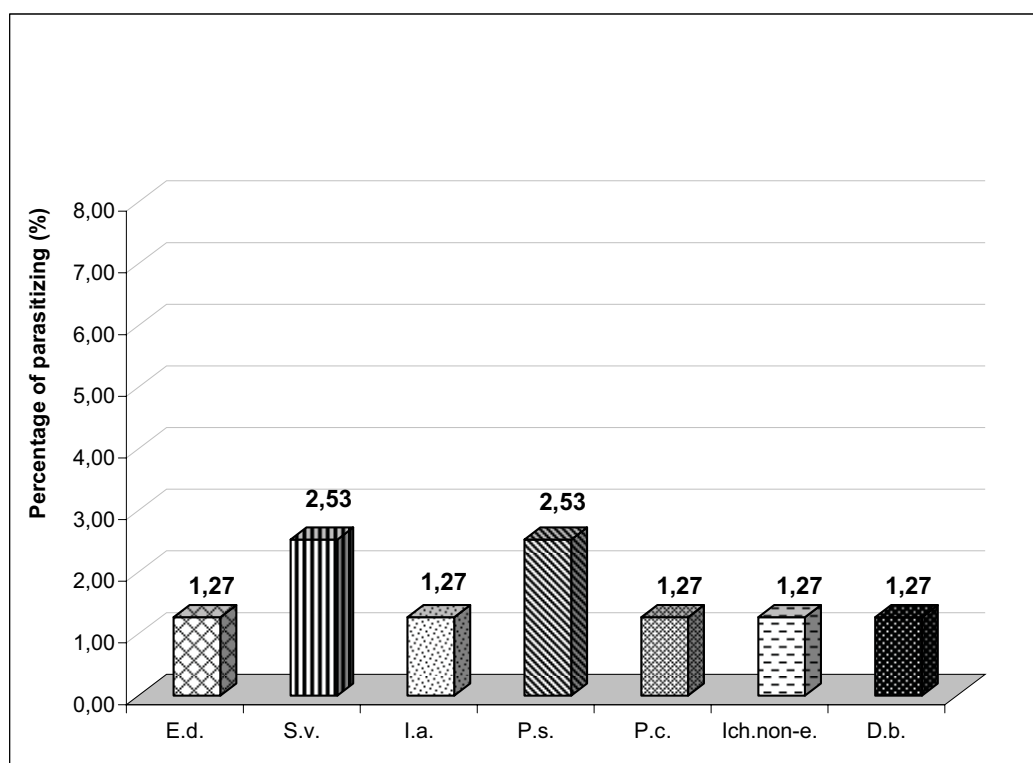


Figure 1. The importance of primary parasitoids in limiting the *Eupoecilia ambiguella* populations.

Figura 1. Importanța paraziților primari în reducerea populațiilor de *E. ambiguella*.

**Legend:** E.d. – *Endromopoda detrita*; S.v. – *Scambus vesicarius*; I.a. – *Itopectis alternans*; P.s. – *Pimpla spuria*; P.c. – *Pimpla contemplator*; Ich.non-e. – non-emerging Ichneumonidae; D.b. – *Dibrachys boarmiae*

## CONCLUSIONS

Since in this region, the pest populations remains low, it will be controlled by a small number of parasitoids, generally by polyphagous species that also find other alternative hosts in that area.

Of the six (6) species of parasitoids obtained, only *Itopectis alternans* GRAV. has already been mentioned in Romania.

The small number of species identified and the reduced efficiency of the parasite complex of the species *Eupoecilia ambiguella* in that vineyard can be caused by the poor representation of the host population due to the rather unpropitious climatic conditions for the development of the species, as well as by the treatments conducted over the years, which prevented the gradual strengthening of a set of specific host-parasitoid relationships.

On the other hand, despite the chemical treatment, parasitoids still remain in the vineyards, but with small parasitizing percentages, to them also contributing the location of the vineyards where observations were made, near the forest.

To conclude, the parasitoid complex of the species *Eupoecilia ambiguella* is still insufficiently known in Romania.

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