

**SPECIES OF CHALCIDOIDS (INSECTA: HYMENOPTERA),
PRIMARY PARASITOIDS OF *SPARGANOTHIS PILLERIANA*
(DEN. ET SCHIFF.) (INSECTA: LEPIDOPTERA) IN VINEYARDS
IN SOUTHERN ROMANIA**

DANIELA BĂRBUCEANU¹, IONEL ANDRIESCU²

¹ University of Pitești, Faculty of Sciences, Târgu din Vale St. 1, 110040, Pitești, Romania, e-mail: daniela_barbuceanu@yahoo.com

² "Al. I. Cuza" University, Faculty of Biology, Copou Bd. 20A, Iași, Romania, e-mail: andriescu_ionel@yahoo.fr

Investigating the rearing of the grape leaf-roller *Sparganothis pilleriana* (Den. et Schiff.) from the larvae and pupae collected between 1998-2003 in two vineyards of southern Romania, 7 chalcidoids species were obtained as primary parasitoids: *Brachymeria intermedia* (Nees), *Pteromalus* sp., *Cyclogastrella deplanata* (Nees), *Dibrachys cavus* (Walker), *Dibrachys* sp., *Colpoclypeus florus* (Walker) and *Elasmus viridiceps* Thomson. These species realized a reduction in the populations of *S. pilleriana* by 6.58%. Of those, the greatest importance is held by *Brachymeria intermedia* as a primary pupal parasitoid (3.6%), and by *Colpoclypeus florus* as a primary larva parasitoid (1.6%). All of the host-parasitoid relationships are new for Romania. A case of multiple parasitism was recorded as well when a female of *Elasmus viridiceps* parasitized with a female of *Colpoclypeus florus*, a mature larva of *S. pilleriana*.

Key words: chalcidoids, parasitoids, vineyards, grape leaf-roller, Romania

INTRODUCTION

Sparganothis pilleriana (Den. et Schiff.) is a polyphagous tortricid that from time to time causes important damage, especially in European vineyards (Bovey 1966).

Interest in the natural enemies which limit the populations of this pest species was manifest more than one hundred years ago. In this respect, it was found that an important role is held by the parasitoid species, to which many belong to the suprafamily Chalcidoidea. The majority of the chalcidoid species that develop at the expense of the tortricids are hyperparasitated, and so they develop on the larvae or pupae of primary parasitoids. Nevertheless, there are species that behave as primary parasitoids, either larval or pupal, and hold a major significance in controlling the pest populations (Mills & Carl 1991). In 1842 in France, Audouin was the first to signal 9 species of chalcidoids as primary and secondary parasitoids for *Sparganothis pilleriana* (Voukassovitch 1924). By raising larvae and pupae of *S. pilleriana*, Voukassovitch (1924) obtained three species of chalcidoids as primary parasitoids, and 11 species as hyperparasitoids.

Studies on the parasitoids of *S. pilleriana* continued throughout the 20th century in various vineyards of Europe (Alfaro-Moreno 1966, Pykhova 1968, Schirra & Louis 1995, Dindo *et al.* 2001, etc.), and numerous species of chalcidoids were identified, many of which are used in programmes which fight that pest biologically.

In Romania, no similar research has so far been conducted on the species of chalcidoids that parasitize the vine-leaf moth.

This paper intends to identify the species of chalcidoids which parasitize, as primary parasitoids, the larvae and pupae of *S. pilleriana* in southern Romanian vineyards, as well as their role in reducing the respective pest populations.

MATERIAL AND METHODS

The observations were carried out in two vineyards in southern Romania, viz. Ștefănești and Dăbuleni. In the vineyards of Dăbuleni, located in southern Oltenia near the Danube, the climate is characterized by Mediterranean influences, while the vineyards of Ștefănești, located in the central southern region of the Wallachian hills, is characterized by a rather cool climate. Except for the year 2001, other years were characterized by thermic values above the average. The warm climate in Dăbuleni is more favourable to the development of *S. pilleriana*, whose local population is much more numerous than that in Ștefănești.

The samplings with larvae and pupae were done randomly from the stocks that exhibited the attack over the period of activity of the host, i.e. May to July, in 1998 and 2000-2003, for the variety “*Royal Fetească*” in Ștefănești, and 2000-2002, for the variety “*Roșioara*” in Dăbuleni. In

Dăbuleni, a chemical treatment conducted to fight the larvae of *S. pilleriana* in June 2002, prevented the continuation of the samplings. 1,170 larvae and pupae of *S. pilleriana* were reared in laboratory conditions after being isolated in glass containers in order to retain the possible parasitoids. The larvae were daily fed with vine leaves. Out of the samples, 243 were parasitized in primary form and of those, 77 by chalcidoids.

The unhatched specimens of parasitoids or hyperparasitized were evinced through dissections.

In this study, we used the following determination keys: Nikolskaia (1960), Graham (1969) and Trjapitzin (1978).

RESULTS AND DISCUSSION

From the larvae and pupae of *Sparganothis pillerina* (Den. et Schiff.) collected, we obtained 7 species of Chalcidoids as primary parasitoids: *Brachymeria intermedia*. Nees, *Pteromalus* sp., *Cyclogastrella deplanata* Nees, *Dibrachys cavus* (Walker), *Dibrachys* sp., *Colpoclypeus florus* (Walker) and *Elasmus viridiceps* Thomson.

If the whole complex of parasitoids contributes to the limitation of the populations of *S. pilleriana* by 20.77%, the chalcidoids boast only a percentage of 6.58% (Table 1).

The species of chalcidoids were much more active in Dăbuleni than in Ștefănești 7.03/5.9%, because the local climate is favourable to the host, and because the chemical treatments conducted in that vineyard were more reduced. Most of chalcidoids species were obtained in Dăbuleni, also.

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

Some of the species were also obtained as secondary parasitoids, which is an aspect that should be discussed in another paper.

Family Chalcididae

Brachymeria intermedia (Nees 1834)

It was obtained as a pupal solitary, primary endoparasitoid in:

Dăbuleni: 27.06.2000 / 3.07.2000 / 1 ♂; 27.06.2000 / 3.07.2000 / 1 ♂; 27.06.2000 / 7.07.2000 / 1 ♂; 27.06.2000 / 10.07.2000 / 1 ♂; 27.06.2000 / 10.07.2000 / 1 ♂; 27.06.2000 / 10.07.2000 / 1 ♀; 27.06.2000 / 10.07.2000 / 1 ♀; 27.06.2000 / 10.07.2000 / 1 ♀; 27.06.2000 / 12.07.2000 / 1 ♀; 27.06.2000 / 14.07.2000 / 1 ♂; 27.06.2000 / 14.07.2000 / 1 ♀; 27.06.2000 / 14.07.2000 / 1 ♀;

Table 1. - Efficiency of the primary chalcidoid parasitoids in limiting the *Sparganothis pilleriana* (Den. et Schiff.) populations.

Places	Year	No. of individ. (larvae and pupae)	Individuals parasitized		C h a l c i d o i d e a															
			No.	%	No.	%	B.i.	Pt.sp.	C.d.	D.c	D.sp.	C.f.	E.v.	C.f.+E.v.						
			No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%		
	1998	27	5	18.51	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
	2000	64	12	18.75	4	6.3	1	1.56	-	-	-	-	3	4.7	-	-	-	-		
Ștefănești	2001	124	18	14.52	6	4.8	3	2.40	-	-	2	1.6	-	1	0.8	-	-	-		
	2002	164	30	18.29	7	4.3	6	3.60	-	-	-	-	-	-	-	1	0.60	-		
	2003	122	34	27.87	13	10.7	1	.81	-	-	-	-	-	12	9.8	-	-	-		
Subtotal		501	99	19.76	30	5.9	11	2.20	-	-	2	0.4	-	16	3.2	1	0.20	-		
	2000	215	61	28.37	26	12.1	23	10.70	-	-	-	-	3	1.4	-	-	-	-		
Dăbuleni	2001	308	67	21.75	20	6.5	8	2.60	1	0.30	3	0.9	7	2.30	-	-	-	-		
	2002	146	16	10.96	1	0.7	-	-	-	-	-	-	-	-	-	-	1	0.70		
Subtotal		669	144	21.52	47	7.03	31	4.63	1	0.14	3	0.4	7	1.04	3	0.4	-	1	0.14	
Total		1170	243	20.77	77	6.58	42	3.60	1	0.09	5	0.4	7	0.60	19	1.6	1	0.09	1	0.09

B. i. *Brachymeria intermedia*
Pt. sp. *Pteromalus* sp.
C. d. *Cyclogastrella deplanata*
D. c. *Dibrachys cavus*

D. sp. *Dibrachys* sp.
C. f. *Colpoclypeus florus*
E. v. *Elasmus viridiceps*
C. f + E. v. *Colpoclypeus florus* and *Elasmus viridiceps*

27.06.2000 / 14.07.2000 / 1 ♀; 27.06.2000 / 15.07.2000 / 1 ♂; 27.06.2000 / 17.07.2000 / 1 ♀; 27.06.2000 / 17.07.2000 / 1 ♀; 27.06.2000 / 19.07.2000 / 1 ♀; 27.06.2000 / 21.07.2000 / 1 ♀; 27.06.2000 / hyperparasitized pupa; 27.07.2000 / 3 unhatched parasitoids; 5.08.2000 / hyperparasitized pupa; 5.07.2001 / 15.07.2001 / 1 ♂; 5.07.2001 / 16.07.2001 / 1 ♂; 5.07.2001 / 16.07.2001 / 1 ♀; 5.07.2001 / 17.07.2001 / 1 ♀; 5.07.2001 / 2 unhatched parasitoids; 1.08.2001 / 2 unhatched parasitoids;

Ștefănești: 25.06.2000 / 17.07.2000 / 1 ♀; 29.06.2001 / 10.07.2001 / 11 ♂♂; 12.07.2001 / 20.07.2001 / 1 ♀; 12.07.2001 / 20.07.2001 / 1 ♀; 28.06.2002 / 5.07.2002 / 1 ♂; 28.06.2002 / hyperparasitized larva; 13.07.2002 / 17.07.2002 / 1 ♂; 13.07.2002 / 26.07.2002 / 1 ♀; 13.07.2002 / 27.07.2002 / 1 ♂; 13.07.2002 / 27.07.2002 / 1 ♀; 11.07.2003 / 16.07.2003 / 1 ♂.

It is known as a primary parasitoid from the pupa of *Pieridae*, *Nymphalidae*, *Tortricidae* (Lepidoptera), as well as the cocoons of the parasitoid Hymenoptera for these species, when it behaves as a secondary parasitoid (Nikolskaia 1960).

This polyphagous species is known in Romania as a primary parasitoid from many hosts: *Aporia crataegi* L., *Zygaena* sp., *Leucoma salicis* L., *Lymantria dispar* L., *Malacosoma neustria* L., *Mamestra suasa* Den. et Schiff., *Tortrix viridana* L., *Aphelia viburnana* (Den. et Schiff.), *Dioryctria abietella* (Den. et Schiff.), *Barbara herrichiana* Obr. (Lep.), *Resseliella piceae* Seitn. (Diptera) (Andriescu 1988).

Voukassovitch (1924) finds it is an important parasitoid of the pupae of *S. pilleriana* in France, and he makes observations on the biology of the species.

As a primary parasitoid, the role of this species in limiting the host populations was 3.6%. The species was much more active in Dăbuleni than in Ștefănești (Table 1).

The host-parasitoid relationship is new for Romania.

Family Pteromalidae

Pteromalus sp.

It was obtained as a pupal gregarious primary endoparasitoid in Dăbuleni: 5.07.2001/ 16.07.2001 / 10♂♂.

Audouin, in 1842, (Voukassovitch 1924) signals several species of *Pteromalus* as primary and secondary parasitoids of *Sparganothis pilleriana*.

Voukassovitch (1924) obtains the species *Pteromalus ovatus* Nees as a primary parasitoid of *Sparganothis pilleriana*.

The role of this species in limiting the host populations was insignificant: 0.09% (Table 1).

The host-parasitoid relationship is new for Romania.

Cyclogastrella deplanata (Nees, 1834)

It was obtained as a pupal gregarious primary endoparasitoid in: Dăbuleni: 5.07.2001 / 17.07.2001 / 28 ♀♀.

This polyphagous species is frequent in Europe, and is known from many species of tortricoids (Graham, 1969).

It was obtained from this host as hyperparasitoid in France by Audouin and Voukassovitch (1924).

The role of this species in limiting the host populations was insignificant: 0.09% (Table 1).

The host-parasitoid relationship is new for Romania.

Dibrachys cavus (Walker, 1835)

The species was obtained as a pupal gregarious primary endoparasitoid in:

Ștefănești: 29.06.2001 / 12.07.2001 / 6 ♀♀; 12.07.2001 / 16.07.2001 / 9 ♀♀;

Dăbuleni: 5.07.2001 / 12.07.2001 / 8 ♀♀, 1♂; 5.07.2001 / 16.07.2001 / 14 ♀♀, 2 ♂♂; 5.07.2001 / 16.07.2001 / 12 ♀♀.

It is a polyphagous species known as primary parasitoid from many Lepidoptera and Coleoptera species, and hyperparasitoid from Ichneumonidae and Braconidae pupae, Tachinidae puparium; it known as a parasitoid of individuals of its own species (Graham, 1969).

In Romania it was reared from many Lepidoptera and Braconidae species (Andriescu, 1973).

According to Dergachev (1995), the primary pupal parasitism occurs only in one-day old pupae. In older pupae secondary parasitism is met with.

As a primary parasitoid, the role of this species in limiting the host populations was 0.4% (Table 1).

The host-parasitoid relationship is new for Romania.

***Dibrachys* sp.**

It was obtained as a pupal gregarious primary endoparasitoid in Dăbuleni: 5.07.2001 / 16.07.2001 / 8 ♀♀; 5.07.2001 / 16.07.2001 / 9 ♀♀, 1 ♂; 5.07.2001 / 18.07.2001 / 16 ♀♀, 2 ♂♂; 5.07.2001 / 21.07.2001 / 12 ♀♀, 3 ♂♂; 5.07.2001 / 22.07.2001 / 14 ♀♀; 5.07.2001 / 26.07.2001 / 8 ♀♀, 1 ♂; 5.07.2001 / 31.07.2001 / 16 ♀♀.

The role of this species in limiting the *Sparganothis pilleriana* populations was 0.6% (Table 1).

The host-parasitoid relationship is new for Romania.

Family Eulophidae

Colpoclypeus florus (Walker 1839)

The species was obtained as a larval gregarious primary ectoparasitoid.

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

It was obtained in:

Dăbuleni: immature larva / immature larva / 26.05.2000 / 7.06.2000 / 6 ♀♀; larva remains / nymph / 26.05.2000 / 14.06.2000 / 2 ♀♀; immature larva / immature larva / 26.05.2000 / 10.06.2000 / 4 ♀♀; mature larva / immature larva / 17.06.2002 / 25.06.2002 / 1 ♀;

Ștefănești: larva remains / nymph / 2.06.2000 / 12.06.2000 / 2 ♀♀; immature larva / immature larva / 2.06.2000 / 19.06.2000 / 4 ♀♀, 2 ♂♂; larva remains / nymph / 9.06.2000 / 14.06.2000 / 3 ♀♀; larva remains / nymph / 16.06.2001 / 18.08.2001 / 2 ♀♀; immature larva / immature larva / 1.06.2003 / 23.06.2003 / 6 ♀♀; immature larva / immature larva / 1.06.2003 / 23.06.2003 / 5 ♀♀, 1 ♂; mature larva / immature larva / 1.06.2003 / 15.06.2003 / 6 ♀♀, 2 ♂♂; mature larva / immature larva / 1.06.2003 / 16.06.2003 / 3 ♀♀, 3 ♂♂; mature larva / immature larva / 1.06.2003 / 11.06.2003 / 2 ♀♀; immature larva / immature larva / 1.06.2003 / 21.06.2003 / 3 ♀♀; mature larva / mature larva / 17.06.2003 / 29.06.2003 / 16 ♀♀; mature larva / immature larva / 17.06.2003 / 29.06.2003 / 6 ♀♀, 2 ♂♂; mature larva / immature larva / 17.06.2003 / 2.07.2003 / 16 ♀♀; mature larva / immature larva / 17.06.2003 / 2.07.2003 / 18 ♀♀; mature larva / immature larva / 17.06.2003 / 5.07.2003 / 10 ♀♀, 5 ♂♂; larva exuvia / nymph / 17.06.2003 / 18.06.2003 / 6 ♀♀.

On 17.06.2002, a mature larva of *S. pilleriana* was collected at Dăbuleni, with 2 ectoparasitic larvae. Out of those, a female of *Elasmus viridiceps* and a female of *Colpoclypeus florus* resulted, which realized a multiple parasitism.

This is a polyphagous species, obtained from over 35 species of tortricids, including the vine-grape moth *Eupoecilia ambiguella* Hb. (Trjapitzin, 1978).

In Romania it has been reared from *Acleris hastiana* L., *Acleris holmiana* L., *Acleris rhombana* Den. et Schiff., *Acleris variegana* Den. et Schiff., *Adoxophyes orana* Fisch. v Rösl., *Archips rosanus* L., *Hedya dimiodalba* Retz., *Hedia pruniana* Hb. and *Rhopobota naevana* Hb. (Diaconu, 1999).

Thompson (1954) fails to mention it among the parasitoids of the moth *Sparganothis pilleriana*, while Pykhova (1968) signals it as being one of the main parasitoids of the vine-leaf moth in Ukraine.

This parasitoid reduces the host populations by 1.67%, being more active in Ștefănești than in Dăbuleni (Table 1).

The host-parasitoid relationship is new for Romania.

Family Elasmidae

Elasmus viridiceps Thomson 1878

The species was obtained as a larval solitary primary ectoparasitoid in:

Ștefănești: 4.06.2002 / 20.06.2002 / 1 ♀ and

Dăbuleni: 17.06.2002 / 25.06.2002 / 1 ♀.

It is a polyphagous species known as primary larval ectoparasitoid from *Coleophora caespitiella* L., *C. fuscedinella* L., *Sparganothis pilleriana*, and hyperparasitoid from cocoons of *Goniozus claripennis* (Först.) (Trjapitzin, 1978).

In Romania it is known as a larval primary ectoparasitoid from *Rhopobota naevana* Hb., *Pandemis heparana* Den. et Schiff., *Adoxophyes orana* (Fisch. v Rösl.) (Diaconu, 1999).

As a primary parasitoid, the role of this species in limiting the host populations was 0.13% (Table 1).

The host-parasitoid relationship is new for Romania.

CONCLUSIONS

Seven species of chalcidoids parasitize, in primary form, the larvae and pupae of *Sparganothis pilleriana* in the vineyards of southern Romania. They realized a 6.58% reduction in the populations of host. Of these, the greatest importance is held by *Brachymeria intermedia*, as a primary pupa parasitoid (3.6%) and *Colpoclypeus florus* as a primary larva parasitoid (1.6%).

A case of multiple parasitism was recorded, as well, when a female of *Elasmus viridiceps* parasitized with a female *Colpoclypeus florus* a mature larva of *S. pilleriana*.

All of the host-parasitoid relationships are new for Romania.

REFERENCES

- Alfaro Moreno, A. (1966): Pequeños ensayos de lucha contra la piral de la vid. Boln. Patol. veg. Ent. Agric. **29**: 45-58. [In: Review of Applied Entomology, 1968, **56**(10)]. [with English abstract]
- Andriescu, I. (1972–1973): Chalcidoidiens (Chalcidoidea, Hym., Insecta) d'importance economice de Roumanie. (Catalogue hôte/parasite, parasite/hôte). In: Lucr. Staț. "Stejarul" Pîngărați (Roumanie) 5: 155-190.
- Andriescu, I. (1988): The Family Chalcididae in Rumania, a Faunistic, Biogeographical and Economic Study. In: Gupta, V. (ed.): Advances in Parasitic Hymenoptera Research. Proceedings of the II Conference on the Taxonomy and Biology of Parasitic Hymenoptera: 259-263. - Leiden, New-York, København, Köln.
- Bovey, P. (1966): Super-familie des Tortricoides. In: Balachowsky, A. S. (ed.): Entomologie Appliquee a l'Agriculture 2, Lepidopteres 1: 859-887. - Masson & Co., Paris.
- Dergachev, D.V. (1995): *Dibrachys* application to control grape leafroller. Zashchita Rastenii **7**: 18-19. [in Rev. of Agric. Ent., 1996, **84**(4)] (abstract)
- Graham, M. W. R. de V. (1969): The Pteromalid of North-Western Europe (Hym.:Chalcidoidea). Bull. Brit. Mus. Nat. Hist. Ent, Suppl. **16**, 908 pp.
- Diaconu, A. (1999): Contributions to the study of parasitoids complexes of tortricoides (Insecta: Lepidoptera, Tortricidae) which damage in the orchards, „Al. I. Cuza” University, Faculty of Biology, Iași. (PhD Thesis, manuscr.) [in Romanian]
- Dindo, M. I., Farneti, R., Baronio, P. (2001): Rearing of the pupal parasitoid *Brachymeria intermedia* on veal homogenate-based artificial diets: evaluation of factors affecting effectiveness. Entomologia Experimentalis et Applicata **100**(1): 53-61.
- Mills, N. J., Carl, K. P. (1991): Natural Enemies and Pathogens. In: Geest van der, L. P. S., Evenhuis, H. H. (eds): Tortricid pests their biology, natural enemies and control, World Crop Pests, 5: 235-252.
- Nikolskaia, M. N. (1960): Pereponciatokriľnĕ. In: Fauna SSSR 7(5). - Moskva, 220 pp.
- Pykhova, V.T. (1968): The control of the grape moth. Zashchita Rastenii **13**(11): 48-49. [In Russian]
- Schirra, K. J., Louis, F. (1995): Auftreten von natuerlichen Antagonisten des Springwurmwicklers *Sparganothis pilleriana* in der Pfalz. Deutsches. Weinbau-Jahrbuch **46**: 129-140.
- Thompson, W.R. (1954.) A Catalogue of the Parasites and Predators of insect pests. Sect. 2. part 3. - Commonwealth Agricultural Bureaux, Commonwealth Institute of Biological Control, Ottawa, Canada.
- Trjapitzin, V. A. (1978): Oprediteli Nasekomikh Evreopeyskoy Chasti SSR. In: Medvedev, G. S. (ed.): Hymenoptera 3. - The Science, Leningrad, 759 pp.
- Voukassovitch, P. (1924): Contribution a l'etude de l'Eudemis (*Polycrosis botrana* Schiff), de la Pyrale de la Vigne (*Cenophthira pilleriana* Schiff.) et de leurs parasites. - These, Libr. Marqueste Ed., Toulouse, 248 pp.

**ВРСТЕ ХАЛЦИДОИДЕА (INSECTA: HYMENOPTERA),
ПРИМАРНИХ ПАРАЗИТА SPARGANTHIS PILLERIANA (DEN.
ET SCHIFF.) (INSECTA: LEPIDOPTERA) У ВИНОГРАДИМА
ЈУЖНЕ РУМУНИЈЕ**

DANIELA BĂRBUCEANU, IONEL ANDRIESCU

РЕЗИМЕ

У раду су представљени резултати истраживања ларви и лутака врсте *Sparganthis pilleriana* (Den. et Schiff.) које су сакупљане у периоду од 1998 до 2003 године у два винограда у Јужном делу Румуније. Нађено је седам врста примарних халцидоидних паразита: *Brachymeria intermedia* (Nees), *Pteromalus* sp., *Cyclogastrella deplanata* (Nees), *Dibrachys cavus* (Walker), *Dibrachys* sp., *Colpoclypeus florus* (Walker) and *Elasmus viridiceps* Thomson. Они су редуковали популацију *S. pilleriana* за 6.58%. Најзначајнија је била врста *Brachymeria intermedia* као примарни паразитоид лутке и *Colpoclypeus florus* као примарни паразитоид ларве.

Забележен је и мултипни паразитизам када је женка врсте *Elasmus viridiceps* паразитирана са женком *Colpoclypeus florus*, паразитирала ларву *Sparganthis pilleriana*.

Сви наведени односи домаћин–паразитоид су нови за Румунију.