

**COLPOCLYPEUS FLORUS (WALKER) (HYMENOPTERA: EULOPHIDAE), A
PARASITOID OF GRAPE LEAF-ROLLER SPARGANOTHIS PILLERIANA (DEN. ET
SCHIFF.) (LEPIDOPTERA: TORTRICIDAE) LARVAE IN SOUTHERN
VINEYARDS OF ROMANIA**

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Abstract. *Colpoclypeus florus* (WALKER 1839) is a primary, larval, and gregarious ectoparasitoid, obtained as a result of the rearing of grape leaf-roller *Sparganothis pilleriana* larvae collected from two vineyards, Ștefănești (Argeș) and Dăbuleni (Dolj) in 2000-2003. The parasitizing of the host occurred during the month of May and the first half of June. Sex-ratio has a sub-unit value: 0.21. The contribution of that parasitoid to the limitation of grape leaf-roller larvae is of 2.43%. The higher value of the parasitization ratio, 11.2%, was recorded in the Ștefănești vineyards, where the local climate is more favourable to the development of the species. In the specific conditions of the year 2003, the parasitoid developed, in Ștefănești, two generations on the same generation of the host larvae. The host-parasitoid relationship is new to Romania. Although polyphagy and the gregarious behaviour recommend this species for the programmes of biological control conducted elsewhere in the world, this aspect is debatable in the Romanian vineyards.

Keywords: vineyards, host larvae, ectoparasitoid, percentage of parasitization.

Rezumat. *Colpoclypeus florus* (WALKER) (Hymenoptera: Eulophidae), un parazitoid al larvelor de *Sparganothis pilleriana* (DEN. et SCHIFF.) (Lepidoptera: Tortricidae) în viile din sudul României. *Colpoclypeus florus* (WALKER 1839) este un ectoparazitoid primar, larvar și gregar obținut în urma creșterii larvelor de *Sparganothis pilleriana* colectate între anii 2000-2003 în două podgorii din sudul României, Ștefănești (AG) și Dăbuleni (DJ). Parazitarea gazdei a avut loc în cursul lunii mai și în prima jumătate a lunii iunie. Sex-ratio are valoare subunitară: 0,21. Contribuția parazitoidului la reducerea larvelor moliei frunzelor viței de vie a fost de 2,43%. Cea mai ridicată valoare a parazitării, 11,2%, s-a înregistrat în Ștefănești, unde microclimatul este mai favorabil dezvoltării acestuia. În condițiile anului 2003, la Ștefănești, parazitoidul a dezvoltat două generații pe larvele aceleiași generații ale gazdei. Relația gazdă-parazitoid este nouă pentru România. Deși polifagia și comportamentul gregar recomandă această specie pentru programele de combatere biologică în lume, în viile din România acest aspect este discutabil.

Cuvinte cheie: podgorie, larva gazdă, ectoparazitoid, procentaj de parazitare.

INTRODUCTION

Most chalcidoids that live on the expense of the tortricides are hiperparazitoid, developing on the larvae or pupae of the primary parasitoids. However, the family Eulophidae includes species that develop as primary parasitoids on the larvae of tortricides.

Colpoclypeus florus (WALKER 1839) (= *silvestrii* LUCHESE) is a primary, larval and gregarious ectoparasitoid. The eggs are laid at the shelter given by the larva, or even on the surface of the latter's body. In order to immobilize the larva in its shelter, the parasitoid provokes the larva by giving it repeated stings with the ovipositor, to weave a thick shelter, where it will subsequently be retained (CARL, 1974). It is a polyphagous species, obtained from the numerous species of tortricides, including the grape moths, *Eupoecilia ambiguella* (HÜBNER 1796) and *Lobesia botrana* (DENIS & SCHIFFERMÜLLER 1775) (TRJAPIŢĂN, 1978; MARCHESINI & MONTA, 1994).

In Romania, DIACONU et al. (2006) obtains it from eight species of tortricides that are pests to the apple tree.

Its being polyphagous and its gregarious behaviour have generated numerous studies concerning the biology of the host (CARL, 1974; EVENHUIS, 1977; GRUYS & VAAL, 1984; MILONAS & SAVOPOULOU-SOULTANI, 2000), the efficiency of the parasitizing, the tolerance to certain classes of pesticides (BRUNNER et al., 2001), with a view to using it in the programmes of biological control.

Although THOMPSON (1954) does not mention it among the parasitoids present in *Sparganothis pilleriana* (DENIS & SCHIFFERMÜLLER 1775), PYKHOVA (1968), he considers it one of the main parasitoids of the grape leaf-roller in the Ukraine.

MATERIAL AND METHODS

The observations were carried out in two vineyards in southern Romania, Ștefănești and Dăbuleni. The vineyards of Ștefănești, located in the central southern region of the Wallachian hills, and characterized, over the period of the observations, by a rather wet and cool climate, present a small *Sparganothis pilleriana* population. This microlepidopteran was identified and observed in a vineyard of about 3 hectares in the plot growing the "Fetească regală" variety, and the attack occurred within an area of about 1 hectare. Up to the year 2000, intensive chemical treatments were conducted there. In the vineyards of Dăbuleni, located in southern Oltenia near the Danube, with a climate characterized by Mediterranean influences, the *S. pilleriana* population is well developed. The observations were carried out, in a vineyard of about 2 hectares, on the variety called "Roșioară", the only one sensitive to the attack

of moth. The samplings were done, randomly, from the stocks that exhibited the attack, over the period of activity of the host, i.e. May to July, in the years 1998, 2000-2003. Except for the year 1998 and 2001, the other years were characterized by thermal values exceeding the average. The larvae of *S. pilleriana* were reared in laboratory conditions, after being isolated in glass containers in order to retain the possible parasitoids. The larvae were fed, daily, with vine leaves. Out of the 20 larvae of *S. pilleriana* parasitized, 116 ♀♀, 24 ♂♂ of *Colpoclypeus florus* were obtained.

RESULTS AND DISCUSSIONS

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.

Data obtained in Dăbuleni: immature larva / immature larva / May 26, 2000 / June 7, 2000 / 6♀♀; larva remains /nymph / May 26, 2000 / June 14, 2000 / 2♀♀; immature larva / immature larva / May 26, 2000 / June 10, 2000 / 4♀♀; mature larva / immature larva / May 17, 2002 / June 25, 2002/1♀;

Data for Ștefănești: larva remains / nymph / June 2, 2000/June 12, 2000/2♀♀; immature larva / immature larva / June 2, 2000/June 19, 2000 / 4♀♀, 2 ♂♂; larva remains / nymph / June 9, 2000 / June 14, 2000 / 3♀♀; larva remains /nymph / June 16, 2001 / August 18, 2001 / 2♀♀; immature larva / immature larva / June 1, 2003/June 23, 2003 / 6♀♀; immature larva / immature larva / June 1, 2003/June 23, 2003 / 5♀♀, 1♂; mature larva / immature larva / June 1, 2003 / June 15, 2003 / 6♀♀, 2♂♂; mature larva/immature larva / June 1, 2003 / June 16, 2003 / 3♀♀, 3♂♂; mature larva / immature larva / June 1, 2003 / June 11, 2003 / 2♀♀; immature larva / immature larva / June 1, 2003 / June 21, 2003 / 3♀♀; mature larva / mature larva / June 17, 2003 / June 29, 2003 / 16♀♀; mature larva / immature larva / June 17, 2003 / June 29, 2003 / 6♀♀, 2♂♂; mature larva/immature larva / June 17, 2003 / July 2, 2003/16♀♀; mature larva/ immature larva / June 17, 2003 / July 2, 2003 / 18♀♀; mature larva/immature larva / June 17, 2003 / July 5, 2003 / 10♀♀, 5♂♂; larva exuvia / nymph / June 17, 2003 / June 18, 2003/6♀♀.

On the 6th of June 2002, a mature larva of *S. pilleriana* was collected, in Dăbuleni, with 2 ectoparasitic larvae. Out of those, a female of *Elasmus viridiceps* (THOMSON 1878) and a female of *Colpoclypeus florus* resulted, which realized a multiple parasitism.

Aspects of the biology of the species *Colpoclypeus florus* (WALKER)

From the literature in the field (EVENHUIS, 1977), it is known that the species hibernates at the stage of mature larva, in the shelter provided by the hosts, formation of the cocoon occurs in the spring, and the first adults appear in early May. Because the species *S. pilleriana* overwinters as a 1st age larva, it is rather improbable that the parasitoid should spend winter in the shelter formed by the former, so it finds alternative hosts in its habitation area.

The appearance of the adults of *C. florus* in the spring occurs at the moment when in the vineyard there are larvae of various ages, and thus the period when the host is exposed to the action of the parasitoid is long.

In the present case, the data revealed by the sampling show that the parasitizing of the host occurred during the month of May and in he first half of June.

In accordance with our observations, the larvae of *C. florus* that were just hatched migrate along the body of the host, where they feed ectoparasite, so that, when their length is about 3 mm, the host is killed (Fig. 1).



Figure 1. The mature larvae of *Colpoclypeus florus* near the remains of *Sparganothis pilleriana* caterpillar (original).

Figura 1. Larve mature de *Colpoclypeus florus* lângă resturile larvei de *Sparganothis pilleriana* (original).

In the year 2003, in laboratory conditions, the larval development lasted for 6 days, and the pupal one for 8 days.

The number of the adults of *C. florus* which develop on a larva of *Sparganothis pilleriana* varies in keeping with the size of the host. Thus, from larvae of small ages, the 2nd and the 3rd, 2-3 specimens are obtained, on larvae of the 4th age, 2-6 specimens develop, and from mature larvae, measuring 20-24 mm, 6-18 individuals; 16-18 individuals could frequently be obtained.

Sex-ratio

From the literature in the field it can be gathered that the number of the females is much larger than that of the males. BRUNNER et al. (2001) mention a percentage of 71.8% for females, and DIACONU et. al. (2006) obtained a sex-ratio of 5 females / 1 male.

In full agreement with the above data, in the year 2003, in Ștefănești, from 12 larvae of *S. pilleriana* parasitized, 119 individuals of *C. florus* developed and the females were much more numerous than the males, so the sex-ratio had a sub-unit value (Table 1).

Table 1. Sex-ratio for the species *Colpoclypeus florus*, Ștefănești, 2003.
Tabel 1. Raportul sexelor la specia *Colpoclypeus florus*, Ștefănești, 2003.

♂♂		♀♀		♂♂/♀♀	
No.	%	No.	%	No.	%
21	17.65	98	82.35	21/98	0.21

Period of activity of the parasitoid

In Ștefănești, in the climatic conditions of the year 2003, the parasitization of the host occurred at the end of May and in June. The dates of collecting the parasitized larvae were June 1 and 17. On the 12th of June, upon collecting, no larvae were found of the host parasitized by *C. florus*.

The flight of the adults of *C. florus* was a few days earlier than that of the moths of *S. pilleriana* (Fig. 2).

At the time when the adults of the new generation of *Colpoclypeus florus* appeared, there were numerous mature larvae of *S. pilleriana* in the vineyard, and during the 17th of June collecting, eggs were found on some host larvae, and on others, recently hatched larvae of *C. florus* were found. It is probable that in that year, characterized by extremely high temperatures in early May, the high percentage of the parasitizing was caused by the fact that the new generation of parasitoids appeared on the 13th of June had conditions for parasitizing the mature larvae of *S. pilleriana* that were to be found in the vineyard, as well. A similar situation was reported by CARL (1974) for Northern Italy, in *Argyrotaenia ljugiana* THUNBERG 1797: the parasitoid had favourable conditions of growth and development, so it had two generations on the larvae of only one generation of *A. ljugiana*.

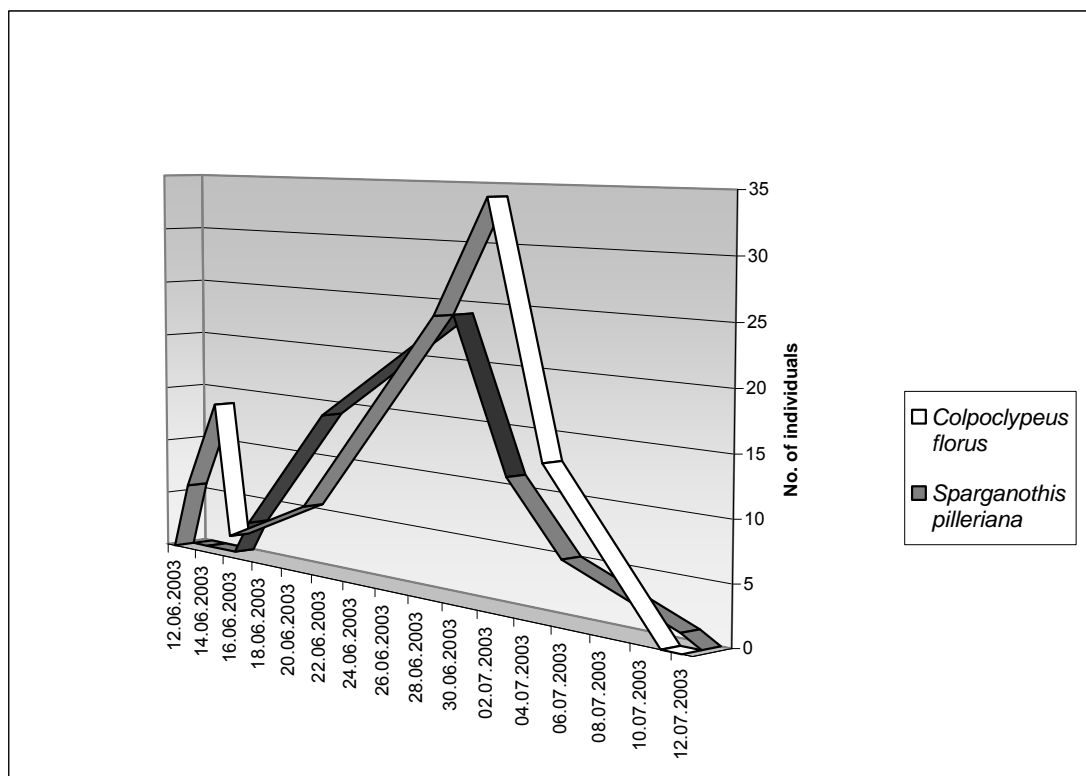


Figure 2. The dynamics of the occurrence of the adults of *Colpoclypeus florus* and *Sparganothis pilleriana* out of caterpillars collected at Ștefănești, 2003

Figura 2. Dinamica apariției adulților de *Colpoclypeus florus* și *Sparganothis pilleriana* din larve colectate la Ștefănești, 2003

Through the fact that it attacks larvae of various ages, and because it is a gregarious species, *Colpoclypeus florus* holds an important role in reducing the populations of *Sparganothis pilleriana*.

The importance of the species within the complex of parasitoids of the species *S. pilleriana* is by 1.67%, the top position being held by the chalcidid *Brachymeria intermedia* (NEES 1834), with 3.6% (BĂRBUCEANU & ANDRIESCU 2009).

The parasitoid recorded a percentage of 2.43% in parasitizing the larvae of *Sparganothis pilleriana* (DEN. et SCHIFF.) (Table 2), lower than the one achieved by another parasitoid of the larvae of *S. pilleriana*, the ichneumonid *Diadegma germanica* HORST. - 3.4% (BĂRBUCEANU & ANDRIESCU 2008).

The activity of the parasitoid in Dăbuleni was minor, as it only manifested its presence in the years 2000 and 2002.

According to MILONAS & SAVOPOULOU-SOULTANI (2000) the development of the species *Colpoclypeus florus* unfolds optimally at an average temperature of 20°C. That aspect can be the cause of the higher parasitization percentages recorded in Ștefănești as against those recorded in Dăbuleni, where the temperatures are much higher, and so, less favourable to the species. Actually, in Ștefănești its presence is remarkable in the year 2003, with a parasitization percentage of 11.2% (Fig. 3). The low parasitization percentages in the other years can be accounted for the small size of the host population, as the parasitoid prefers other hosts, and also for an insufficient number of samples.

According to the observations made by DIACONU et al. (2006), the species shows higher parasitization percentages, of 1-5%, in the hosts that hibernate in the stage of eggs. Although *S. pilleriana* overwinter as a 1st age larva, when the *C. florus* adults appear in spring, they find host larvae of different ages in the vineyard, and thus parasitization is favoured.

Table 2. Importance of *Colpoclypeus florus* in reducing the larvae of *Sparganothis pilleriana*.
Tabel 2. Importanța speciei *Colpoclypeus florus* în reducerea larvelor de *Sparganothis pilleriana*.

Locality	Year	No. of collected larvae	No. of parasitized larvae	%	<i>Colpoclypeus florus</i>	
					No.	%
Ștefănești (AG)	1998	24	4	16.67	-	-
	2000	48	9	18.75	3	6.25
	2001	103	10	9.71	1	0.97
	2002	118	13	11.02	-	-
	2003	107	24	22.43	12	11.2
Subtotal		400	60	15	16	4
Dăbuleni (DJ)	2000	152	33	21.71	3	1.97
	2001	140	31	22.14	-	-
	2002	131	13	9.92	1	0.76
Subtotal		423	77	18.2	3	0.7
Total		823	137	16.65	20	2.43

CONCLUSIONS

Colpoclypeus florus (WALKER) is a primary, larvary and gregarious ectoparasitoid, obtained from larvae of *Sparganothis pilleriana* during the observations conducted in the years 2000-2003 in two vineyards in southern Romania.

The number of the adults of *C. florus* that develop on a larva of *S. pilleriana* varies in keeping with the size of the host, as the mature hosts can provide as many as 16-18 individuals.

The females are much more numerous than the males, so the sex-ratio has a sub-unit value: 0.21

The contribution of that parasitoid to the limitation of grape leaf-roller larvae is of 2.43%. The higher value of the parasitization ratio (11.2%) was recorded in Ștefănești vineyards, where the local climate is more favourable to the species.

The observations show the fact that, in the specific conditions of the year 2003, in Ștefănești, two generations of *C. florus* developed on the caterpillars of the same generation of *S. pilleriana*.

The host-parasitoid relationship is new to Romania.

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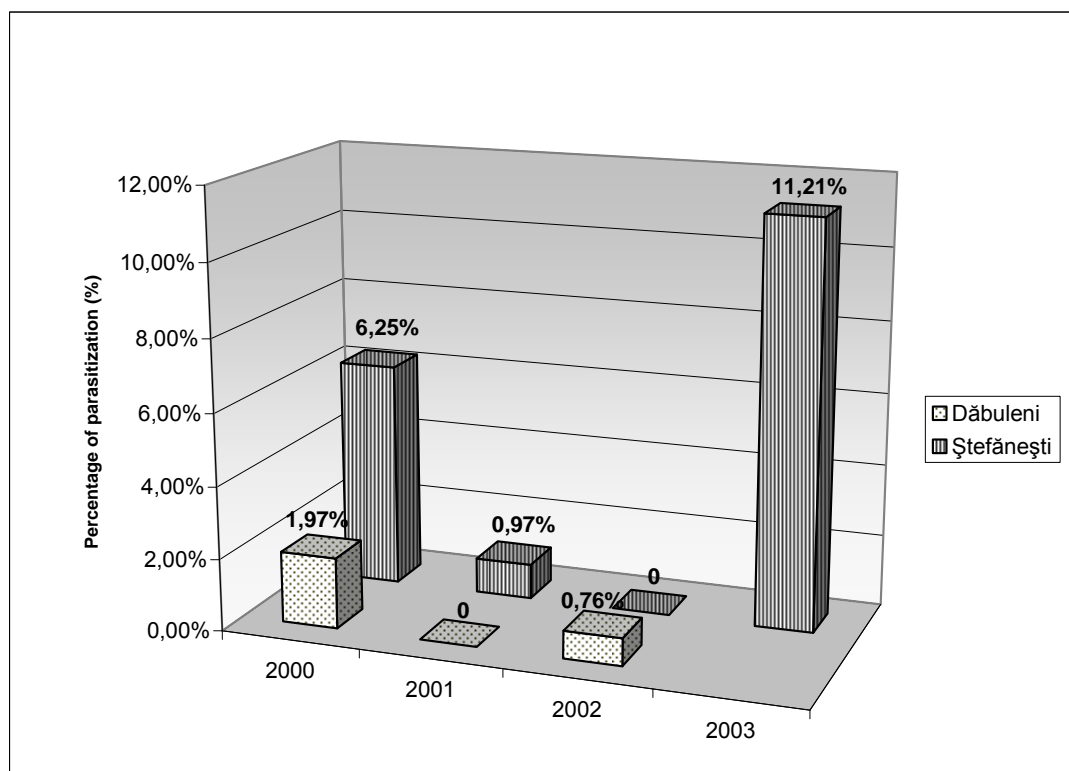


Figure 3. The role of the species *Colpoclypeus florus* in parasitizing of *Sparganothis pilleriana* caterpillars.
 Figura 3. Rolul speciei *Colpoclypeus florus* (WALKER) în parazitarea larvelor de *Sparganothis pilleriana*.

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