THE COMPLEX OF PARASITOIDS OF THE COCCID *SPHAEROLECANIUM PRUNASTRI* FONSCOLOMBE (HOMOPTERA: COCCIDAE) IN DOBRUDJA

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Abstract. The collectings of the material and the observations were done in the years 1983-1985 and 1992-1994, in 14 localities of Dobrudja. In total, there were analysed 2793 specimens of parasitoids obtained from L_2 and females of *Sph. prunastri*, 378 L_2 and 4672 females of *Sph. prunastri*. The tree species attacked were *Prunus cerasifera*, *P. cerasifera* var. *pissardii*, *P. domestica*, *Armeniaca vulgaris* and *Persica vulgaris*. Five species of primary parasitoids were identified (*Discodes coccophagus*, *Microterys hortulanus*, *Metaphycus silvestrii*, *Coccophagus lycimnia* – ♀♀ and *Coccophagus proximus*) and 6 hyperparasitoid species (*Pachyneuron muscarum*, *Cerapterocerus mirabilis*, *Cheiloneurus claviger*, *Aprostocetus trjapitzini*, *C. lycimnia* – ♂♂ and *Marietta picta*). Regarding the larvae (L_2), the total percentage of parasitisation was 8.5% of which *C. lycimnia* parasitized 7.7% and *M. silvestrii* 0.8%. In females, the total percentages of parasitisation in the samples from June month were between 2.9 and 46.7%. The important parasitoid species were *D. coccophagus* and *M. hortulanus*.

Keywords: Romania, Dobrudja, parasitisation percentage, primary parasitoids, hyperparasitoids, host plant, sex ratio.

Rezumat. Complexul de parazitoizi ai coccidului *Sphaerolecanium prunastri* Fonscolombe (Homoptera: Coccidae) în Dobrogea. Colectările de material şi observaţiile s-au făcut în perioada 1983-1985 şi 1992-1994 în 14 localităţi din Dobrogea. În total au fost analizate 2793 de exemplare de parazitoizi obţinuţi din larve de vârsta a doua hibernante şi din femele de *Sph. prunastri*, 378 de larve şi 4672 de femele de *Sph. prunastri*. Speciile de arbori atacaţi au fost: *Prunus cerasifera*, *P. cerasifera* var. *pissardii*, *P. domestica*, *Armeniaca vulgaris* şi *Persica vulgaris*. Au fost identificate cinci specii de parazitoizi primari (*Discodes coccophagus*, *Microterys hortulanus*, *Metaphycus silvestrii*, *Coccophagus lycimnia* – ♀♀ şi *Coccophagus proximus*) şi şase specii de hiperparazitoizi (*Pachyneuron muscarum*, *Cerapterocerus mirabilis*, *Cheiloneurus claviger*, *Aprostocetus trjapitzini*, *C. Lycimnia* – ♂♂ şi *Marietta picta*). La larve (L_2), procentajul total de parazitare a fost de 8,5% din care 7,7% au fost parazitate de *C. lycimnia*, restul de 0,8% de *M. silvestrii*. La femele, procentajele totale de parazitare, în eşantioanele din luna iunie, au fost cuprinse între 2,9% şi 46,7%. Speciile importante de parazitoizi primari au fost *D. coccophagus* şi *M. hortulanus*.

Cuvinte cheie: România, Dobrogea, procentaj de parazitare, parazitoid primar, hiperparazitoid, plantă gazdă, raportul între sexe, România.

Introduction

Sphaerolecanium prunastri is found in Europe (except the most northern parts), Turkey, Israel, Iran, China, Japan and North America (Kawecki, 1968, Kozar and Viktorin, 1978, Tereznikova, 1981, Kosztarab & Kozar, 1988). In Romania, it lives from the steppe to the mountains (Săvescu 1953, 1982, Minoiu & Lefter, 1987).

Materials and Methods

The observations and the collecting of samples (tree branches with *Sph. prunastri* larvae and females on them) were done in 14 localities from the Dobrudja region which four localities are situated in the Danube Delta, in the years 1983-1985 and 1992-1994. Hibernant larvae of the second stage (L_2) were collected only from Enisala, in early May 1992.

The tree species attacked by *Sph. prunastri* were: *Prunus cerasifera* L., *P. cerasifera* var. *pissardii* Ckschn., *P. domestica L.*, *Armeniaca vulgaris* Lam. and *Persica vulgaris* Mill. The branches with L_2 were introduced in glass jars, covered with thick tissue. The females were put partly in glass test tubes (one female in each tube) and partly in glass jars (a branch with 20-30 females on it). The tubes were covered with cotton wool. Overal, we analysed 378 hibernant L_2, 4672 females of *Sph. prunastri* and 2793 parasitoid specimens.

Results and Discussion

From the L_2 of *Sph. prunastri* we obtained 32 parasitoid specimens and two species were identified: *Coccophagus lycimnia* Walker (♀♀) and *Metaphycus silvestrii* Sugonjaev. From the females we obtained 2761 parasitoid specimens and there were identified 10 species of parasitoids belonging to the Superfamily *Chalcidoidea*, families: *Pteromalidae* (*Pachyneuron concolor* Főrster) *Encyrtidae* (*Discodes coccophagus* Ratzeburg, *Microterys hortulanus* Erdős, *Metaphycus silvestrii* Sugonjaev, *Cerapterocerus mirabilis* Westwood, and *Cheiloneurus claviger* Thomson), *Eulophidae* (*Aprostocetus trjapitzini* Kostjukov) and *Aphelinidae (Coccophagus lycimnia* -♂♂- Walker, *Coccophagus proximus* Jasnosh and *Marietta picta* André) (Table 1).

Table 1. Parasitoid species obtained from *Sph. prunastri* (females) from Dobrudja.

Locality	Host plant	Date of collecting	Primary parasitoids				Hyperparasitoids					
			Dc	Mh	Ms	Cp	Cm	Cl	Pm	Cc	Mp	At
Sulina	*P.c.*	19.6.1993	7				1					
C.A.Rosetti	*P.c.*	16.6.1993	5									
Maliuc	*P.c.p.*	19.5.1992	30	34	4	1		4				
Maliuc	*P.c.p.*	17.6.1993	102	64	12	1	10					
Maliuc	*P.c.*	17.6.1993	18	44	2		6	1				
Sf. Gheorghe	*P.c.*	28.5.1994	2									
Murighiol	*P.v.*	04.6.1994	57	5	3		9					
Mahmudia	*P.c.*	14.6.1993	11	99	4		15	2				
Beştepe	*P.c.*	13.6.1993	54	187	4		55	2				
Agighiol	*A.v.*	12.6.1993	103	4		1	14					
Enisala	*P.c.*	21.5.1992	114	97	22		7	2				
Iancina	*P.c.*	11.6.1993	183	4			12					
Nalbant	*P.d.*	05.6.1994	27				3	1		2	2	
Constanța	*P.c.p*	05.7.1983	198				79		4			
Constanța	*P.c.p*	05.6.1984	68	3	4		35	2				
Constanța	*P.c.*	21.6.1985	262	5			107	4	1			
Constanța	*P.c.*	13.8.1985	39				10		2			
23 August	*P.c.*	04.7.1983	9				21		22			
Mangalia	*P.c.*	13.8.1985	199				229		3			2

P.c. - Prunus cerasifera; P.c.p. - P.c. var. *pissardii; P.d. - Prunus domestica; P.v. – Persica vulgaris; A.v. – A. vulgaris; C.l - Coccophagus. lycimnia; C.p. - C. proximus; C.c. - Cheiloneurus claviger; C.m. - Cerapterocerus mirabilis; D.c. - Discodes coccophagus; M.h. - Microterys hortulanus; M.s. - Metaphycus silvestrii; M.p. - Marietta picta; P.m. – Pachyneuron muscarum; A.t. – Aprostocetus. trjapitzini*

The qualitative structure of the parasitoid complex of the *Sph. prunastri* from Romania is, in general, comparable to that presented by Loukia Argyriou and Paloukis, 1976 in Greece, I.K. Goanță and coll., 1974 in the Moldavia Republic, Nadezda Mitic-

Muzina, 1967 in Jugoslavia, F. Kozar and E.S. Sugonjaev, 1979, in Hungary and by Elzbieta Podsiadlo, 1981 in Poland (Table 2).

Table 2. The parasitoid complex of the coccid *Sph. prunastri* in certain European countries.

No	Species	GR	RO	RM.	YU	H	PL
1.	*Pachyneuron muscarum*	+	+	+	+	+	+
2.	*Eupelmus urozonus*				+		
3.	*Discodes coccophagus*		+	+	+	+	+
4.	*Microterys hortulanus*	+	+	+	+	+	+
5.	*Metaphycus silvestrii*		+	+	+	+	+
6.	*Cerapterocerus mirabilis*		+	+	+	+	+
7.	*Blastothrix sericea*				+		
8.	*Bl. Erythrostethus*		+				
9.	*Cheiloneurus claviger*		+		+		
10	*Aprostocetus trjapitzini*		+				
11.	*Coccophagus lycimnia*	+	+	+	+	+	+
12.	*Coccophagus differens*			+			
13.	*Coccophagus proximus*		+	+			
14.	*Coccophagus excelsus*		+				
15.	*C. palaeolecanii*		+				
16.	*Marietta picta*		+	+	+		

GR - Greece; H – Hungary; PL – Poland; RM – Rep. Moldavia; RO – Romania; YU – Yugoslavia

Among the primary parasitoids obtained from females of *Sph. prunastri* (*D. coccophagus, M. hortulanus, M. silvestrii* and *C. proximus*), the most specimens belonged to species *D. coccophagus* and *Microterys hortulanus,* and among the secondary parasitoids, *C. mirabilis* is dominant (Table 1).

D. coccophagus parasite in the young and adult females of *Sph. prunastri,* were it can lay one or several eggs. In our observations, the maximum number of eggs layed by this parasitoid in a host female was 10. In Romania, in the plaine and hill conditions, *D. coccophagus* has four generations a year (a spring generation and three summer generations). It winters as larva in the last developing stage in the mumified body of the females of *Sph. prunastri*. The sex ratio was comprised between 0.3 ♂♂/1♀ in the samples from Maliuc 1993 on *P. cerasifera* and 16.0 ♂♂/1♀ in those from Maliuc 1993, on *P. cerasifera* var. *pissardii* (Table 3).

M. hortulanus is a oligophagous species and winters in the stage of fecundated female (Goanţă and coll., 1974). In Romania, this parasioid has a generation a year. The sex ratio was comprised between 0.1 ♂♂/1♀ and 2.7 ♂♂/1♀ on *P. cerasifera* from Enisala, 1992 (Table 3).

C. mirabilis is the main parasitoid of the species *D. coccophagus.* In Romania, *C. mirabilis* has as many generations as its hosts. The sex ratio was comprised between 0.3 ♂♂/1♀ on *P. cerasifera* from Beştepe 1993 and 5.0 ♂♂/1♀ on *P. cerasifera* from Iancina 1993 (Table 3).

To Enisala, 1992, on the L_2 the total percentage of parasitisation was 8.5%, of which *C. lycimnia* parasitized 7.7%, and *M. silvestrii,* the rest.

On the *Sph. prunastri* females, in the samples of June, the total percentage of parasitisation varied between 2.9% in the samples from Sfântu Gheorghe and 46.7% in those from Mahmudia (Tab. 4). The main parasitoid species were *D. coccophagus* and *M. hortulanus*. We noticed a concurrential relationship (for host occupation) between these two parasitoid species. *D. coccophagus* parasitized between 2.9% of the analysed females at Sfântu Gheorghe and 35.2% at Iancina, while *M. hortulanus* parasitized between 0% and 41.1% (Table 4).

Table 3. The sex-ratio of the notable parasitoids in *Sph. prunastri*.

No	Locality	Host plant	Year	*M. hortulanus* (no)		*D. coccophagus* (no)		*C. mirabilis* (no)	
				♂♂/ ♀♀	♂♂/ 1♀	♂♂/ ♀♀	♂♂ 1♀	♂♂/ ♀♀	♂♂/1♀
1.	Sulina	*P.c.*	1993			5/2	2.5		
2.	C.A. Rosetti	*P.c.*	1993			3/2	1.5		
3.	Maliuc	*P.c.p.*	1992	34/0		22/8	2.8		
4	Maliuc	*P.c.p.*	1993	18/46	0.4	96/6	16.0	6/4	1.5
5	Maliuc	*P.c.*	1993	4/40	0.1	4/14	0.3	2/4	0.5
6.	Sf. Gheorghe	*P.c.*	1994			1/1			
7.	Murighiol	*P.v.*	1994	3/2	1.5	26/31	1.8	5/4	1.2
8.	Mahmudia	*P.c.*	1993	23/76	0.3	7/4	1.8	6/9	0.7
9.	Beştepe	*P.c.*	1993	28/159	0.2	26/28	0.9	11/44	0.3
10	Agighiol	*A. v.*	1993	1/3	0.3	39/64	0.6	8/6	1.3
11.	Enisala	*P.c.*	1992	71/26	2.7	61/53	1.2	3/4	0.8
12.	Iancina	*P.c.*	1993	4/0		162/21	7.7	10/2	5.0
13.	Nalbant	*P.d.*	1994			13/14	0.9	1/2	0.5
14.	Constanța	*P.c.p.*	1983			102/92	1.1	46/33	1.4
15.	Constanța	*P.c.p.*	1984	½	0.5	33/35	0.9	19/16	1.2
16.	Constanța	*P.c.*	1985	5/0		177/85	2.1	67/40	1.7
17.	Constanța	*P.c.*	1985			26/13	2.0	4/6	0.7
18.	Mangalia	*P.c.*	1985			148/51	2.9	121/108	1.1

A.v. – Armeniaca vulgaris; P.c. – Prunus cerasifera; P.c.p. – Prunus cerasifera var. pisardii; P.d. – P. domestica; *P.v. – Persica vulgaris*

Table 4. The parasitation of *Sph. prunastri* (females).

Locality	Host plant	Date of collection	Analysed	Analysed aspects				
			♀♀ (no)	Parazitized females: (%)				
				Total	of which parasitized by:			
					D. c.	M. h.	M. s.	C. p.
Sulina	*P.c.*	19.6.1993	294	4.1	4.1	0	0	0
C.A. Rosetti	*P.c.*	16.6.1993	27	7.4	7.4	0	0	0
Maliuc	*P.c. p.*	19.5.1992	215	17.7	7.7	9.3	0.5	0.2
Maliuc	*P.c. p.*	17.6.1993	160	28.6	17.5	9.4	1.3	0.6
Maliuc	*P.c.*	17.6.1993	166	30.7	6.6	23.4	0.6	0
Sf. Gheorghe	*P.c.*	28.5.1994	34	2.9	2.9	0	0	0
Murighiol	*P. v.*	4.6.1994	132	29.6	25.8	3.0	0.8	0
Mahmudia	*P.c.*	14.6.1993	246	46.7	4.9	41.1	0.8	0
Bestepe	*P.c.*	13.6.1993	231	37.2	12.1	24.2	0.9	0
Agighiol	*A. v.*	12.6.1993	254	33.8	31.9	1.6	0	0.4
Enisala	*P.c.*	21.5.1992	334	45.8	23.4	21.6	0.9	0
Iancina	*P.c.*	11.6.1993	142	36.6	35.2	1.4	0	0
Nalbant	*P. d.*	5.06.1994	67	38.8	38.8	0	0	0
Constanta	*P.c. p.*	5.07.1983	109	71.6				
Constanta	*P.c. p.*	5.06.1984	178	36.5	34.3	1.1	1.1	
Constanta	*P.c.*	21.6.1985	406	22.2	21.3	0.8	0	0
Constanta	*P.c.*	13.08.1985	449	47.0				
23 August	*P.c.*	4.07.1983	180	19.5				
23 August	*P.c.*	13.08.1985	423	70.9				
Mangalia	*P.c.*	13.08.1985	625	65.3				

A.v.-Armeniaca vulgaris; *P.c.- Prunus cerasifera*; *P.c.p.- P.c. var. pissardii*; *P.d.-P. domestica; P.v.-Persica vulgaris*; *D. c. – Discodes coccophagus; M. h. – Micrtoterys hortulanus; M. s. – Metaphycus silvestrii; C. p. – Coccophagus proximus*

Table 5. The parasitation of *Sph. prunastri* females in certain countries.

No.	Country	Parasitized females (%)		Notable parasitoids
		min.	max.	
1.	Greece[(a)]	small percentages		*C. lycimnia*
2.	Turkey[(b)]		30.0	*D. coccophagus*
3.	Romania	8.4	91.9	*D. coccophagus*; *M. hortulanus*
4.	Moldavia Rep. [(c)]	17.3	80.3	*D. coccophagus*; *M. hortulanus*
5.	Jugoslavia[(d)]	64.2	98.6	D. coccophagus ; M. lunatus
6.	Hungary[(e)]		80.0-90.0	
7.	Poland[(f)]		80.3	D. coccophagus

(a) - after Argyriou & Paloukis (1976); (b) - after Kozar & coll. (1982); (c) - after Goanta & coll. (1974); (d) - after Mitic-Muzina (1967); (e) - after Kozar & Viktorin (1978); (f) - after Podsiadlo (1981)

Our results are generally comparable with those of different authors from certain European countries (Table 5).

Conclusions

1. In this complex we analysed 2793 specimens of parasitoids obtained from L_2 and females of *Sph. prunastri* and were identified five species of primary parasitoids (*Discodes coccophagus, Microterys hortulanus, Metaphycus silvestrii, Coccophagus lycimnia* -♀♀- and *Coccophagus proximus*) and 6 hiperparasitoid species (*Pachyneuron concolor, Cerapterocerus mirabilis, Cheiloneurus claviger, Aprostocetus trjapitzini, C. lycimnia* -♂♂- and *Marietta picta*).

2. In the L_2, the total percentage of parasitisation was 8.5% of which *C. lycimnia* parasitized 7.7% and *M. silvestrii* 0.8%. In females, the total percentages of parasitisation in the samples from June month were between 2.9 and 46.7%. The important parasitoid species were *D. coccophagus* and *M. hortulanus.*

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