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POLLEN TRANSPORT OF *CHEILOSIA ALBIPILA* MEIGEN, 1838 (DIPTERA: SYRPHIDAE)

P. RADIŠIĆ, A. VUJIĆ, S. ŠIMIĆ AND S. RADENKOVIĆ

Institute of Biology, PMF, University of Novi Sad,
Trg Dositeja Obradovića 2, YU-21000 Novi Sad

This paper presents an examination of the pollen transport behavior of adults of *Cheilosia albipila* Meigen, 1838 on the Fruška Gora mountain in Serbia (Yugoslavia). The qualitative and quantitative analysis of pollen collected from insects' integument has been done. The results showed that the pollen of *Salix* spp. species is the most abundant one among the pollen of 22 plant taxa collected from *C. albipila*.

KEY WORDS: Syrphidae, *Cheilosia albipila*, pollen, transport

INTRODUCTION

Cheilosia albipila Meigen, 1838 is distributed in Fennoscandinavia south to the Pyrenees; in Ireland eastwards through much of northern and central Europe into European parts of Russia and in central Siberia Europe and Siberia (SPEIGHT, 1998). On the Balkan Peninsula, populations of this species were found in Slovenia, Croatia, Bosnia and Herzegovina, Montenegro, Serbia, Macedonia, Bulgaria and Greece (VUJIĆ, 1996).

The adults of *C. albipila* appear from March to July on the Balkan Peninsula. The earliest record was noted on 6 March in the village Stari Ledinci, located at 200m on the mountain Fruška gora. The latest record is from the 9 July in the canyon Sušica, located at 1100m on the mountain Durmitor. *C. albipila* seems to prefer environments and habitats in the vicinity of rivers, streams, lakes and marshes in associations with the Saliceto-Populetum s. l., oak and beech woods. Males of *C. albipila* hover at 2-5 meters near to the crown of willows, whereas females visit the rosettes of *Cirsium* sp. when they are actively ovopositing.

According to the literature data the adults of *C. albipila* have been collected at the flowers of the following species of plants: *Anemone nemorosa* L. (TORP, 1994), *Caltha palustris* L. (BRADESCU, 1994), *Ficaria verna* Huds. (TORP, 1994), *Petasites albus* (L.) Gaertn. (TORP, 1994), *Prunus spinosa* L. (KORMAN, 1988; SPEIGHT, 1998), *Salix caprea* L. (KORMAN, 1988), *Salix cinerea* L., *Salix repens* L. (TORP, 1994) and *Tussilago farfara* L. (KORMAN, 1988; TORP, 1994). More general, *C. albipila* has been associated with *Caltha* sp., *Cardamine* sp. (SPEIGHT, 1998), *Chrysosplenium* sp. (TORP, 1994), *Salix* spp. (VUJIĆ & ŠIMIĆ, 1994), *Salix* sp., *Taraxacum* sp., *Tussilago* sp., *Vaccinium* sp. (SPEIGHT, 1998).

In order to improve and augment the data on the biology and pollen-feeding behavior of adults of *C. albipila*, the qualitative and quantitative composition of pollen collected from the integument of adults collected during this study was determined.

MATERIAL AND METHODS

The investigated area presents a wide swampy area, located on the Danube, at the foot of the Fruška Gora mountain, Serbia. Forest vegetation, presented by the association of the Saliceto-Populetum s.l., is under a strong anthropogenic influence. The fen meadow vegetation and vegetation of stagnant and slow-flowing waters are also present here.

Specimens of analyzed species were collected in the Karlovac-Petrovaradin marsh during flight period. The following data pertains to the specimens examined in this study: 23.03.1991, 6((; 26.03.1991, 6((; 5.04.1991, 12((, 2((; 15.04. 1991, 2((; 30.04 1991, 1(; 10.05.1991, 1(; leg. Radišić P.

Insects were captured by an entomological net and preserved in separate vials. Pollen was collected using vacuum method of Radišić et al. (1992), and the permanent preparations of pollen were made in glycerin-gelatin.

Pollen and other plant material found at the same localities as insects' was also collected.

Pollen was analyzed from 30 specimens (24 males and 6 females) of species *C. albipila*. Pollinogical material was determined at least to subfamily by using keys and atlases (ERDTMAN, 1952; MOOR & WEBB, 1978) and deductively by means of the collected herbarium material.

The two parameters were calculated concerning the pollen:

1. Presence of one type of pollen in relation to the total number of pollen (parameter 1 on the table 2).

It is defined as a ratio between the total count of pollen grains of one plant taxon and total count of pollen grains of all registered plant taxa. The number of pollen grains for each plant taxon used for this ratio is the pooled data from all specimens examined during this study and presented as a percentage in table 2.

2. Constancy of presence of one pollen type (parameter 2 on the table 2).

This parameter is defined as the percentage of individual adults from the investigated population that have particular type of pollen. Four intervals of pollen constancy were established:

- euconstant type, which was present on 81-100% of the population sample;
- constant type, which was present on 61-80% of the population sample;
- accessory type which was present on 41-60% of the population sample;
- accidental type which was present on 0-40% of the population sample.

RESULTS, DISCUSSION AND CONCLUSIONS

Examination of the pollen collected from the integument of 30 individuals of *C. albipila* revealed pollen from 22 plant taxa and fungal spores of Alternaria type (Table I).

All distinguished plant taxa are plants with high productivity of pollen grains. Most of them are anemophiles or with great participation of anemophily.

The analysis of pollen constancy shows the existance of following pollen types: 2 euconstant, 3 constant, 3 accesory and 14 accidental ones (Table I).

Distinguished types of pollen has been classified into 3 groups according to detected abundance and previous literatural data (Table II):

1. *Salix* species comprise the first group of plant taxa. Specimens of *C. albipil*a are caught on the flower catkins of willow according to the literature data (KORMAN, 1988; TORP, 1994; VUJIĆ & ŠIMIĆ, 1994; SPEIGHT, 1998) and results from this investigation. Pollen grains of *Salix* spp. were found on all 30 specimens of *C. albipila*, in whose it contributed 95,32% of the total pollen count (euconstant type of pollen) (Table II). The flower catkins of Salix species have distinct stamens and high productivity of pollen and present the strongest attractant on the area of Karlovac-Petrovaradin marsh during flight period when determine the spatial distribution of the specimens of *C. albipila.*

2. The second group includes plant taxa with a lesser contribution in the total count of pollen grains and various constancy of pollen (Table II). The members of

Table I.
Qualitative and quantitative composition of pollen collected from the integument of adults of *Cheilosia albipila* Meigen, 1838

Flight period III-V 1991.	No speci (male/female)	*Salix* spp.	*Corylus avelana*	Poaceae	*Carex* spp.	Artemisia type	*Chenopodiace* ??	*Taraxac ump.*	Rosaceae	*Morus* ssp.	*Tussilago farfara*	*Ulmus* sp.
23. 03.	1(m)	76	2	0	4	2	1	0	0	4	3	2
	2(m)	10	5	1	0	1	1	0	5	0	13	1
	3(m)	187	1	1	0	1	1	0	1	17	0	1
	4(m)	366	1	0	5	4	1	1	1	3	0	2
	5(m)	3000	1	1	0	8	0	1	0	0	0	8
	6(m)	1373	3	1	18	3	1	0	0	1	0	0
26. 03.	7(m)	837	2	1	17	1	0	0	60	0	0	0
	8(m)	827	1	2	68	2	2	0	2	0	0	0
	9(m)	413	6	2	23	2	1	0	6	1	0	0
	10(m)	1260	4	0	1	3	1	0	10	0	0	0
	11(m)	95	1	1	38	1	1	0	0	0	0	0
	12(m)	2461	6	0	9	1	0	0	7	0	0	3
05. 04.	13(m)	3211	1	1	7	0	4	1	4	0	0	0
	14(m)	2532	2	2	8	0	0	3	7	0	0	0
	15(m)	3886	4	0	4	0	0	0	0	0	0	1
	16(m)	3579	0	1	4	0	1	1	0	0	0	2
	17(m)	4777	0	3	6	1	1	0	1	0	0	2
	18(m)	1175	4	1	4	1	0	0	0	0	0	1
	19(m)	7000	1	1	0	0	0	0	0	0	0	0
	20(m)	54	2	3	0	1	0	0	1	0	0	0
	21(m)	4313	3	0	5	2	1	0	1	0	0	0
	22(m)	8900	0	1	0	0	0	0	0	0	0	0
	23(m)	5632	1	2	33	0	0	0	0	0	0	1
	24(m)	626	3	1	11	1	0	4	0	0	0	1
	25(m)	2836	2	2	0	1	0	4	129	0	0	0
	26(m)	2780	3	4	0	1	1	1	25	0	0	1
15. 04.	27(m)	2341	1	1	0	0	0	0	19	0	0	0
	28(m)	68	0	4	0	0	0	53	36	0	0	0
30. 04.	29(f)	200	3	3	0	0	0	0	4	0	0	0
10. 05.	30(f)	73	3	2	0	0	0	1	121	0	0	0
S pol. grains		64888	66	42	265	37	18	70	440	26	16	26
Parametar 1		95317	0.097	0.062	0.389	0.054	0.026	0.103	0.646	0.038	0.024	0.038
S specimens with grains		30	28	24	18	19	14	10	19	5	2	13
Parametar 2		100.00	93.33	80.00	60.00	63.33	46.67	33.33	63.33	16.67	16.67	43.33

Table I.
Qualitative and quantitative composition of pollen collected from the integument of adults of *Cheilosia albipila* Meigen, 1838 (continuiti)

Flight period III-V 1991.	No speci (male/female)	Ranunculaceae	Polipanto-porate	Undetermi-nated 2	Undetermi-nated 3	Vesiculate	Galium sp.	Tetrazonopo-rate	Undetermi-nated 4	Carduus type	Tillia sp.	Fingal spore Altemaria type
23. 03.	1(m)	0	0	0	0	0	0	0	0	0	0	2
	2(m)	0	0	0	0	0	0	0	0	0	0	1
	3(m)	0	0	0	0	0	0	0	1	0	0	2
	4(m)	0	0	0	0	0	0	0	0	0	1	2
	5(m)	1965	21	0	0	0	0	0	0	0	0	1
	6(m)	0	0	25	4	0	0	0	0	0	0	2
26. 03.	7(m)	0	0	0	0	0	0	0	0	0	0	1
	8(m)	0	0	0	0	0	0	0	0	0	0	7
	9(m)	0	0	0	0	0	0	0	0	0	0	1
	10(m)	0	0	0	0	0	0	0	0	0	0	0
	11(m)	0	0	0	0	0	0	0	0	0	0	5
	12(m)	0	0	0	0	0	0	0	0	0	0	1
05. 04.	13(m)	0	0	0	0	0	0	0	0	0	0	1
	14(m)	12	0	0	0	0	0	0	0	0	1	1
	15(m)	0	0	0	0	0	0	0	0	5	0	2
	16(m)	0	0	0	0	0	0	0	0	0	0	2
	17(m)	12	0	0	0	0	0	0	0	0	0	0
	18(m)	4	0	0	0	0	0	0	0	0	0	1
	19(m)	0	0	0	0	0	0	0	0	0	0	1
	20(m)	0	0	0	0	0	0	0	0	0	0	1
	21(m)	0	0	0	0	0	0	0	0	0	0	1
	22(m)	0	0	0	0	0	0	0	0	0	0	0
	23(m)	0	0	0	0	0	0	0	0	0	0	1
	24(m)	0	0	0	0	0	0	0	0	0	0	1
	25(m)	0	0	0	0	0	0	0	0	0	0	0
	26(m)	0	0	0	0	0	0	0	0	0	0	0
15. 04.	27(m)	0	0	0	0	0	0	0	0	0	0	0
	28(m)	0	0	0	0	0	0	0	0	0	0	0
30. 04.	29(f)	0	0	0	0	0	0	0	0	0	0	0
10. 05.	30(f)	0	17	0	0	0	0	0	0	0	0	2
S pol. grains		1993	39	27	4	3	1	1	1	5	39	
Parametar 1		2.928	0.057	0.040	0.006	0.004	0.001	0.001	0.001	0.007	0.057	
S specimens with grains		4	3	2	1	3	1	1	1	1	2	
Parametar 2		13.33	10.00	6.67	3.33	10.00	3.33	3.33	3.33	3.33	6.67	

this group are mentioned in the literature data as flower visited of *C. albipila*: pollen of family Rosaceae (KORMAN, 1988; SPEIGHT, 1998), Ranunculaceae (TORP, 1994; BRADESCU, 1994; SPEIGHT, 1998), genera *Taraxacum* (SPEIGHT, 1998) and *Tussilago* (KORMAN, 1988; TORP, 1994; SPEIGHT, 1998). Blooming of this plants also has influence on spatial distribution of investigated species.

3. *Corylus avelana*, species of genera *Carex*, *Ulmus*, and *Euphorbia*, species of families Poaceae and Chenopodiaceae form the third group of plant taxa, characterized by a proportional small contribution to the total count of pollen grains. Plant taxa in this group display very different constancies of pollen on specimens of *C. albipila* examined in this study (Table II) and are partly or wholly anemophilous. Specimens of *C. albipila* have never been associated with flowers of these plant species, but the existance of pollen on the integument of species examined in this study reveals that adults do come into contact with these plants.

Table II
Distinguished type of pollen (plant taxa)

Type of pollen	Parameter 1	Parameter 2
	Proportional presence of pollen	Constancy of pollen (%)
	The first group of plant taxa	
Salix spp.	95,317	euconstant type (100%)
	The second group of taxa	
Rosaceae	0,645	constant type (63,33%)
Taraxacum sp.	0,103	accidental type (33,33%)
Ranunculaceae	2,97	accidental type (13,33%)
	The third group of taxa	
Corylus avelana	0,97	euconstant type (86,67%)
Poaceae	0,059	constant type (80%)
Artemisia type	0,054	constant type (63,33%)
Carex spp.	0,389	accesory type (60%)
Chenopodiaceae	0,026	accesory type (46,67%)
Ulmus sp.	0,038	accesory type (43,33%)
Euphorbia sp.	0,101	accesory type (3,33%)

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ТРАНСПОРТ ПОЛЕНА ВРСТЕ *CHEILOSIA ALBIPILA MEIGEN, 1838* (DIPTERA: SYRPHIDAE)

П. РАДИШИЋ, А. ВУЈИЋ, С. ШИМИЋ И С. РАДЕНКОВИЋ

Извод

Еуросибирска врста *Cheilosia albpila* Meigen, 1838, констатована је на Балканском полуострву у: Словенији, Хрватској, Босни и Херцеговини, Црној Гори, Србији, Македонији, Бугарској и Грчкој. (ВУЈИЋ, 1996.)

У овом раду је анализиран полен са интегумента 30 јединки ове врсте са подручја Петроварадинско-Карловачког рита и одређен је његов квалитативни и квантитативни састав. Утврђена су 22 биљна таксона и споре типа Alternaria. Издвојене су три групе полена:

Поленова зрна *Salix* spp. учествују са 95.32% у укупној количини полена и регистрована су на свим анализираним примерцима - еуконстантни тип полена (Табела II). Јединке врсте *C. albila* су и у досадашњим истраживањима претежно ловљене на цветним ресама врбе (КОРМАН, 1988; ТОРП, 1994; ВУЈИЋ & ШИМИЋ, 1994; СПЕИГХТ, 1998).

Другу групу полена чине биљке на чијим су цветовима и у претходним истраживањима констатовани примерци врсте *C. albipila*: полен фамилије Rosaceae (KORMAN, 1988; SPEIGHT, 1998), Ranunculaceae (BRADESCU, 1994; TORP, 1994; SPEIGHT, 1998), родови *Taraxacum* (SPEIGHT, 1998) и *Tussilago* (KORMAN, 1988; TORP, 1994; SPEIGHT, 1998). Карактерише их релативно мало процентуално учешће поленових зрна у укупној количини полена (параметар 1), и разноликост у степену присутности (израженог у процетима) једног типа полена на испитиваним примерцима (параметар 2) (Табела II).

Полен врсте *Corylus avelana*, полен врста родова *Carex, Ulmus* и *Euphorbia*, полен врста фамилија Poaceae и Chenopodiaceae и Артемисиа тип полена чине трећу групу биљака. Карактерише их релативно мало процентуално учешће поленових зрна у укупној количини полена (параметар 1); и велика разноликост у степену присутности (израженог у процетима) једног типа полена на испитиваним примерцима (параметар 2) (Табела II). На цветовима ових биљка у досадашњим истраживањима нису забележени примерци врсте *C. albipila*, али присуство полена на интегументу указује на могући контакт адултних облика испитиване врсте са овим биљкама.

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