

**POLLEN TRANSPORT OF SPECIES *CHEILOSIA FLAVIPES*
(PANZER, 1798) (DIPTERA: SYRPHIDAE)**

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This paper presents an examination of the pollen transport behavior of adults of *Cheilosia flavipes* (Panzer, 1798) on the Kopaonik mountain in Serbia (Yugoslavia) and Jahorina mountain in Bosnia and Herzegovina. The qualitative and quantitative analysis of pollen collected from insects' integument has been done. The results show that the domination of fenestrate and aster type pollen (pollen of plants from family Asteraceae) and pollen of *Salix* spp. species are the most abundant one among the pollen of 23 plant taxa collected from *C. flavipes*.

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

INTRODUCTION

Cheilosia flavipes (Panzer, 1798) is distributed in north and central Europe and Siberia (SPEIGHT, 1998). On the Balkan Peninsula, populations of this species were found in Slovenia, Croatia, Bosnia and Herzegovina, Montenegro, Serbia, Macedonia and Greece (VUJIĆ, 1996).

Larva is still undescribed, but the adult female has been observed (STUKE, 1996) during egg-laying on *Cirsium arvense* and *Taraxacum officinale*.

The adults of *C. flavipes* appear from April to July on the Balkan Peninsula. The earliest record was noted on 2 April on the Iriški Venac, located at 400 m on the mountain Fruška gora. The latest record is from the 3 August in the Samokovska river, located at 1500 m on the mountain Kopaonik.

Preferred environments of this species are both forest and open ground as small open areas in humid *Fagus* forest upwards through the *Picea* zone and into the alpine zone. Adults habitats are clearings, tracksides, etc. Adults fly low, settle on the low-growing vegetation or *Taraxacum* flowers (SPEIGHT, 1998).

According to the literature data the adults of *C. flavipes* have been collected at the flowers of the following species of plants: *Euphorbia palustris*, *Taraxacum officinale*, *Alysum alyssoides* (GLUMAC, 1959); *Caltha palustris*, *Sorbus aucuparia* (SPEIGHT, 1988); *Euphorbia* sp., *Ranunculus* sp., *Taraxacum* sp. (SPEIGHT, 1988), *Salix* sp. and *Taraxacum* spp. (VUJIĆ, 1996).

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

MATERIAL AND METHODS

The investigated localities are located on the following mountains:

Jahorina (1910m) is a mountain in central Bosnia, near Sarajevo. It is covered with beech, mixed and *Picea* forests. MATVEJEV & PUNCER (1989) quoted two landscapes types for this mountain: biome of European, mostly coniferous boreal type woodlands and biome South European, mostly deciduous foothill and montane woodlands.

Kopaonik (2016m) is the most eastern mountain in the Dinaric system and occupies a central position on the Balkan Peninsula. It lies between the rivers Ibar, Župa and the basin of Kosovo. Two landscapes types exist there: biome of South European, mostly deciduous foothill and montane woodlands as well as biome of European, mostly coniferous boreal type woodlands (MATVEJEV & PUNCER, 1989).

Insects were captured by an entomological net. Specimens of analyzed species were collected on the:

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 29 specimens (19 males and 10 females) of species *C. flavipes*. Pollinological material was determined 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. The complete definition of these parameters is given in the previous paper (RADIŠIĆ *et al*, 1998):

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

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

- 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.

Mountain	Localities	Date	Leg.	No. of specimens and sex (Table I) (m-male; f-female)
Jahorina	(1500m)	14.05.1989	Vuji}	1m, 2m, 3m, 4m, 5m, 6m, 7m, 8m,
	(1500m)	26.06.1989	A.	9m, 10m; 11,f, 12f, ,
Kopaonik	Brze}ka river (700m)	27.05.1989	Vuji}	14f
	Jo{ani-ka banja (600m)	29.04.1987	A.	15m
	Jo{ani-ka banja (600m)	02.05.1991	Vuji}	16f
	Gra{eva-ka river (600m)	27.05.1987	A.	17f, 18f, 19m
	Samokovska river (800m)	01.05.1986	Vuji}	20m, 21m, 22m, 23m; 24f
	Samokovska river (1500m)	22.06.1991	A.	26f
	Rado{i}e (600m)	29.04.1991	Vuji}	27f
	Gobeljska river (800m)	25.05.1987	A.	28m, 29m, 30m

Table I
Qualitative and quantitative composition of pollen collected from the integument of adults of *Cheilosia flavipes* (Panzer, 1798)

No. of specimens	Sex	Fenestrate	Aster type	<i>Euphorbia</i>	<i>Tilia</i>	<i>Corylus avellana</i>	Undetermined 1	<i>Artemisia</i> type	<i>Carduus</i> type	<i>Salix</i>	Undetermined 3	Chenopodiaceae	Cupresaceae	Heksazonocolpate
1	m	127	48	6	1	1	15	5	1	525	6	3	0	0
2	m	76	47	39	0	2	0	4	1	54	0	0	3	1
3	m	63	50	13	0	4	16	8	1	17	0	6	0	0
4	m	105	7	4	2	0	0	2	0	11	0	1	1	0
5	m	97	19	0	0	1	0	4	0	18	0	0	1	0
6	m	72	19	7	0	0	18	0	1	7	0	0	1	1
7	m	84	21	3	0	0	13	3	0	13	0	1	1	0
8	m	238	56	8	0	0	30	0	1	7	0	0	3	0
9	m	170	21	5	0	0	24	0	0	8	0	1	0	0
10	m	108	163	1	0	3	0	0	3	77	0	0	0	0
11	f	141	294	21	2	0	28	0	2	410	0	2	1	0
12	f	161	153	9	0	2	189	0	0	242	0	2	0	0
13	f	35	22	0	0	1	2	1	0	55	0	0	0	0
14	f	45	2	0	0	1	20	0	0	21	0	1	1	0
15	m	90	0	0	0	3	0	0	0	194	0	0	0	0
16	f	2	2	0	0	0	0	0	0	7	0	0	0	0
17	f	809	4	0	0	0	0	0	0	7	0	0	0	0
18	f	1210	22	0	0	0	0	0	0	30	0	2	0	0
19	m	924	0	0	0	2	0	0	0	254	0	2	2	0
20	m	427	2	20	0	0	0	0	0	83	0	0	2	0
21	m	1099	17	2	0	0	0	0	0	21	0	0	0	0
22	m	12	4	5	0	0	0	0	0	36	0	1	0	0
23	m	119	0	26	0	0	0	3	0	48	0	2	2	0
24	f	235	6	48	0	2	0	0	0	162	0	0	0	0
26	f	34	10	9	0	0	16	4	0	14	0	0	1	1
27	f	147	7	1	0	0	5	0	0	26	0	0	1	0
28	m	1539	1	0	0	0	9	0	0	24	0	0	0	0
29	m	1374	13	0	0	0	0	4	0	22	0	0	0	0
30	m	1026	14	0	0	0	6	3	0	26	0	0	0	0
		Sum of pollen grains of each type of pollen												
Parametar 1		10569	1024	227	5	22	391	41	10	2419	6	24	20	3
		68.91	6.68	1.48	0.03	0.14	2.55	0.27	0.07	15.77	0.04	0.16	0.13	0.02
		Sum of specimens with each type of pollen												
Parametar 2		29	26	18	3	11	14	11	7	29	1	12	13	3
		100.00	89.66	62.07	10.34	37.93	48.28	37.93	24.14	100.00	3.45	41.38	44.83	10.34

Table I (cont.)

No. of specimens	Sex	Apiaceae	Rosaceae	Undetermined 4	Undetermined 5	Undetermined 6	Saccate	Hexazonocolpate	Cyperaceae	Poliporate 2	Trizonoporate	Fungal spore Alternaria type	Total of type of pollens	Total of pollen grains
1	m	0	0	0	0	0	0	0	0	0	0	2	14	738
2	m	0	0	0	0	2	0	0	0	0	0	2	14	229
3	m	3	1	0	0	20	0	0	0	0	0	3	13	202
4	m	1	1	0	0	35	0	0	0	0	0	3	14	170
5	m	0	3	0	0	9	0	0	0	0	0	4	12	152
6	m	0	1	0	0	28	0	0	0	0	0	1	14	155
7	m	0	2	1	0	28	0	0	0	0	0	2	15	170
8	m	1	0	1	46	89	0	0	0	0	0	3	15	480
9	m	0	0	0	0	8	0	0	0	0	0	2	11	237
10	m	0	0	0	0	2	1	1	0	0	0	3	13	359
11	f	2	0	0	0	0	0	0	0	0	0	1	12	903
12	f	0	0	0	0	0	0	0	2	0	0	1	10	760
13	f	7	113	0	0	0	0	0	0	0	0	0	10	236
14	f	1	0	0	0	0	0	0	0	0	0	1	8	92
15	m	0	8	0	0	0	0	0	4	0	0	0	6	299
16	f	0	0	0	0	0	1	0	0	0	0	1	4	12
17	f	0	6	0	0	0	0	0	0	0	1	2	5	827
18	f	0	6	0	0	0	0	0	0	2	2	3	8	1274
19	m	0	6	0	0	0	1	0	0	1	7	2	10	1199
20	m	0	0	0	0	0	0	0	0	0	0	3	5	534
21	m	0	1	0	0	0	0	0	0	8	1	3	7	1149
22	m	0	0	0	0	0	0	0	0	0	0	1	6	58
23	m	0	0	0	0	0	0	0	0	1	0	2	7	201
24	f	1	0	0	0	0	0	0	0	1	0	1	7	455
26	f	87	10	0	0	0	2	0	0	0	1	0	13	189
27	f	1	1	0	0	0	0	0	0	0	0	1	9	189
28	m	0	0	0	0	0	0	0	0	1	0	1	6	1574
29	m	1	0	0	0	0	0	0	1	0	0	1	7	1415
30	m	0	4	0	0	0	0	0	0	1	0	1	8	1080
Sum of pollen grains of each type of pollen														
		105	163	2	46	221	5	1	7	15	12	50		15338
Parameter 1		0.68	1.06	0.01	0.30	1.44	0.03	0.01	0.05	0.10	0.08	0.33		
Sum of specimens with each type of pollen														
		5	14	2	1	9	4	1	3	7	5	26		
Parameter 2		17.24	48.28	6.90	3.45	31.03	13.79	3.45	10.34	24.14	17.24	89.66		

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		
Fenestrate type	68,91%	euconstant type (100%)
<i>Salix</i> spp.	15,77%	euconstant type (100%)
Aster type	6,68%	euconstant type (89,66%)
The second group of plant taxa		
<i>Euphorbia</i> sp.	1,48%	constant type (62,07%)
Rosaceae	1,06%	accessory type (48,28%)
The third group of taxa		
Undetermined 1	2,55%	accessory type (48,28%)
Cupresaceae	0,13%	accessory type (44,83%)
Chenopodiaceae	0,16%	accessory type (41,38%)

RESULTS, DISCUSSION AND CONCLUSIONS

Examination of the pollen collected from the integument of 29 individuals of *C. flavipes* revealed pollen from 23 plant taxa and fungal spores of *Alternaria* type (Table I).

Minimum of 12 and maximum of 1574 pollen grains, and minimum of 6 and maximum of 15 types of pollen grains have been registered on analyzed samples.

The analysis of pollen constancy shows the existence of following pollen types: 3 euconstant, 1 constant, 4 accessory and 17 accidental ones (Table I).

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

The first group of plant taxa includes species on whose flowers specimens of *C. flavipes* have been caught in the former investigations. This group consists of three taxa that are represented with great number of pollen grains on each sample (Table II). Adults of *C. flavipes* keep a considerable amount of pollen grains on their integument while search for food (pollen and nectar) on capitate inflorescence (fenestrate and aster type of pollen) and flower catkins (*Salix*) that have distinct stamens and high productivity of pollen.

The strongest attractant on mountains Jahorina and Kopaonik during investigated period are capitate inflorescence of plant species from family Asteraceae (fenestrate and aster type of pollen) and flower catkins of *Salix* species. Blooming of this plants has influence on spatial distribution of investigated species.

Visited plants that have already been registered in the former investigations comprise the second group. However, these taxa are with a proportional small contribution to the total count of pollen grains and various constancy of pollen (Table II). Blooming of these species also determine the spatial distribution of the specimens of *C. flavipes*.

Plant taxa that are registered for the first time as visited flowers for the species *C. flavipes* form the third group, characterized by a proportional small contribution to the total count of pollen grains and small constancy of pollen (accidental type) (Table II).

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ТРАНСПОРТ ПОЛЕНА ВРСТЕ *CHEILOSIA FLAVIPES*
PANZER, 1798 (DIPTERA: SYRPHIDAE)

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И з в о д

Cheilosia flavipes (Panzer, 1798), је распрострањена у северној и централној Европи и Сибиру (SPRENGT, 1998). На Балканском полуострву је забележена у Словенији, Хрватској, Босни и Херцеговини, Црној Гори, Србији, Македонији и Грчкој (Вулић, 1996.).

У овом раду је одређен квалитативни и квантитативни састав полена са интегумента 29 јединки врсте *C. flavipes* сакупљених на Јахорини и Копаонику. Утврђена су 23 биљна таксона од којих су 3 еуконстантни, 1 константани, 4 акцесорна и 17 акцедентних типови полена. Биљни таксони су сврстани у 3 групе:

Прву групу биљних таксона представљају биљке на чијим су цветовима у досадашњим истраживањима хватани примерци *C. flavipes*. Чине је три таксона који се налазе на сваком примерку са великим бројем поленових зрна. (Табела II). Примерци испитиване врсте задржавају велику количину полена на интегумету јер се у потрази за храном (полен и нектар) крећу по галвичастим цвастима (фенестратни и астер тип полена) и цветним ресама (врсте рода *Salix*) које имају истакнуте прашнике и велику продукцију полена.

На подручју Јахорине и Копаоника у току испитиваног периода најачи атрактанти су главичасте цвасти биљака фамилије Asteraceae (фенестратни и астер тип полена) и цветне ресе врста рода *Salix* које одређују просторну дистрибуцију јединки врсте *C. flavipes*.

Другу групу биљних таксона чине биљке на чијим су цветовима у досадашњим истраживањима такође констатовани примерци врсте *C. flavipes*. Међутим њих карактерише релативно мало процентуално учешће поленових зрна у укупној количини полена, и разноликост у константности (Табела II).

Цветање ових биљака такође одређује просторну дистрибуцију адултних облика врсте *C. flavipes*.

Трећа група биљних таксона чине биљке на чијим цветовима у досадашњим истраживањима нису констатовани примерци врсте *C. flavipes*. Карактерише их мало процентуално учешће поленових зрна у укупној количини полена и мала константност (акцедентни тип) (Табела II).

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