

**QUALITATIVE AND QUANTITATIVE ANALYSIS OF CICADAS (HOMOPTERA: AUCHENORRHYNCHA) AT GRAPEVINE IN REGION OF KAVADARCI, REPUBLIC OF MACEDONIA**

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**ABSTRACT**

During the two years examinations (2005 – 2006) of the fauna of Auchenorrhyncha (Homoptera) at the grapevine in region of Kavadarci, Republic of Macedonia, qualitative and quantitative analysis have been done. 27 species of cicadas are identified that belong of two suborders, Fulgoromorpha and Cicadomorpha, and 6 families: Cixiidae, Delphacidae, Dictyopharidae, Cicadidae, Membracidae and Cicadellidae.

In the first year of examination (2005) 16 cicada species were registered, and in the other year of examination 22 cicada species.

The values for active abundance are low for all registered species, and it ranges from 0,08 – 0,83. Curve of population dynamics (Graf. no. 1), suggests that cicada species identified for the region of Kavadarci start to appear in early May. Analysis of parameter dominance shows that in both years of examination *F. florii* is a dominant species, and in 2005 has the highest percentage (16.39%). From the analysis of parameter constancy can be said that there are no species that correlate their existence to grapevine.

*Key words: grapevine, cicadas, qualitative and quantitative analysis.*

**INTRODUCTION**

The grapevine, together with wheat, barley and olive, is one of the oldest grown plant crops. Growing grapevine in Republic of Macedonia has long tradition. According to the last census of agriculture (2007) the grapevine in Republic of Macedonia is represented on area of 17160.42 ha, with an annual production of 210000 tones.

The grapevine is susceptible to attacks of many pest insects and mites. In recent years as pests on grapevine in Republic of Macedonia, are current cicadas (Homoptera: Auchenorrhyncha). Cicadas on grapevine are not studied. In our country the big cicadas, noisemakers, are examined (Homoptera: Auchenorrhyncha: Cicadidae) (G o g a l a et al., 2005), which are not registered as pests in agriculture. The necessity of studying cicadas on grapevine emanates from not enough research work of that species in Republic of Macedonia.

Determination of faunistic review of of cicadas – pests of the grapevine in Republic of Macedonia, which cause direct and indirect damages through transmission of different diseases will be the main goal of our research.

These examinations will indicate the most abundant and the most present cicadas on the grapevine in Republic of Macedonia, which will indicate to their injuriousness. Those results would help in finding rational decision for controlling the population of cicadas that will also prevent transmission of pathogenic microorganisms.

**MATERIAL AND METHODS**

The examinations were conducted in the region of Kavadarci (Republic of Macedonia), on the grapevine varieties Afus Ali, Muskat Italija and Kardinal.

For collecting insects on field yellow water traps were used. The yellow water traps were put on the level of the vine sprouts and the leaves of the grapevine. In the examinations three yellow water traps were put diagonally, on area of 0.5 ha. Collected material was transferred into plastic boxes with 75 % ethanol.

Collecting insects with yellow water traps is done the vegetation of the grapevine, and control of the collected material is done in period of 14 days. The yellow water traps are placed at the beginning of April, and gathered at the end of September.

The quantitative analysis of the determined material is done with some parameters of faunistic researches: active abundance, dynamic of population, active dominance and constancy or frequency.

### RESULTS AND DISCUSION

The results are based on 97 samples of Homoptera: Auchenorrhyncha, collected with yellow water traps in the region of Kavadarci, in both years of examinations.

In the first (2005) year of examination 16 species of cicadas are registered (Table 1).

Table 1. Representation of cicadas in Kavadarci in 2005

Species	Kavadarci	
	Number of individuals	%
<i>Fieberiella florii</i>	10	16,39
<i>Megophthalmus scabripennis</i>	1	1,63
<i>Eupterix sp.</i>	5	8,19
<i>Zyginidia scutellaris</i>	3	4,91
<i>Zygina sp.</i>	3	4,91
<i>Platymethopius sp.</i>	2	3,27
<i>Neoaliturus fenestratus</i>	1	1,63
<i>Anaceratoagalia ribauti</i>	2	3,27
<i>Delphax sp.</i>	2	3,27
<i>Allygidius sp.</i>	1	1,63
<i>Dictyophara europaea</i>	4	6,55
<i>Platymethopius guttatus</i>	1	1,63
<i>Cosmotettix sp.</i>	1	1,63
<i>Phlepsius intricatus</i>	1	1,63
<i>Psammotettix alienus</i>	2	3,27
<i>Hardya tenuis</i>	2	3,27

On the same area, in the second (2006) year of examinations, 22 species of cicadas are registered (Table 2).

The values for active abundance are low for all registered species, in both years of examinations and it is moving from 0,08 – 0,83 (Table 3 and Table 4). The lowest value for active abundance in the first year of examination is determined for *Megophthalmus scabripennis*, *Allygidius sp.*, *Platymethopius guttatus*, *Phlepsius intricatus* and *Cosmotettix sp.*, and the highest for the species *Fieberiella florii*. In the second year of examination the lowest value for active abundance is determined for the species *Eupterix sp.*, *Platymethopius sp.*, *Anaceratoagalia ribauti*, *Dictyophara europaea*, *Allygus modestus*, *Opsius stactogalus*, *Cixius simplex*, *Psammotettix alienus*, *Stictocephala bisonia*, *Typhlocyba zygina* and *Cixius heydenii*, and the highest for the species *Empoasca sp.*

Table 2. Representation of cicadas in Kavadarci in 2006

Species	Kavadarci	
	Number of individuals	%
<i>Fieberiella florii</i>	4	7,14
<i>Megophthalmus scabripennis</i>	6	10,71
<i>Eupterix spp.</i>	1	1,78
<i>Zyginidia scutelararis</i>	3	5,35
<i>Platymethopius spp.</i>	1	1,78
<i>Nealiturus fenestratus</i>	2	3,57
<i>Anaceroatoagalia ribauti</i>	1	1,78
<i>Delphax spp.</i>	6	10,71
<i>Allygidius spp.</i>	4	7,14
<i>Dictyophara europaea</i>	1	1,78
<i>Psammotettix alienus</i>	1	1,78
<i>Selenocephalus spp.</i>	2	3,57
<i>Selenocephalus obsoletus</i>	2	3,57
<i>Opsius stactogalus</i>	1	1,78
<i>Cixius remotes</i>	3	5,35
<i>Cixius simplex</i>	1	1,78
<i>Cixius heydenii</i>	1	1,78
<i>Stictocephala bisonia</i>	1	1,78
<i>Typhlocyba spp.</i>	1	1,78
<i>Allygus modestus</i>	1	1,78
<i>Empoasca vitis</i>	3	5,35
<i>Empoasca spp.</i>	10	17,85

Table 3 – Qualitative composition and quantitative parameters of the structure on the fauna of cicadas in Kavadarci in 2005.

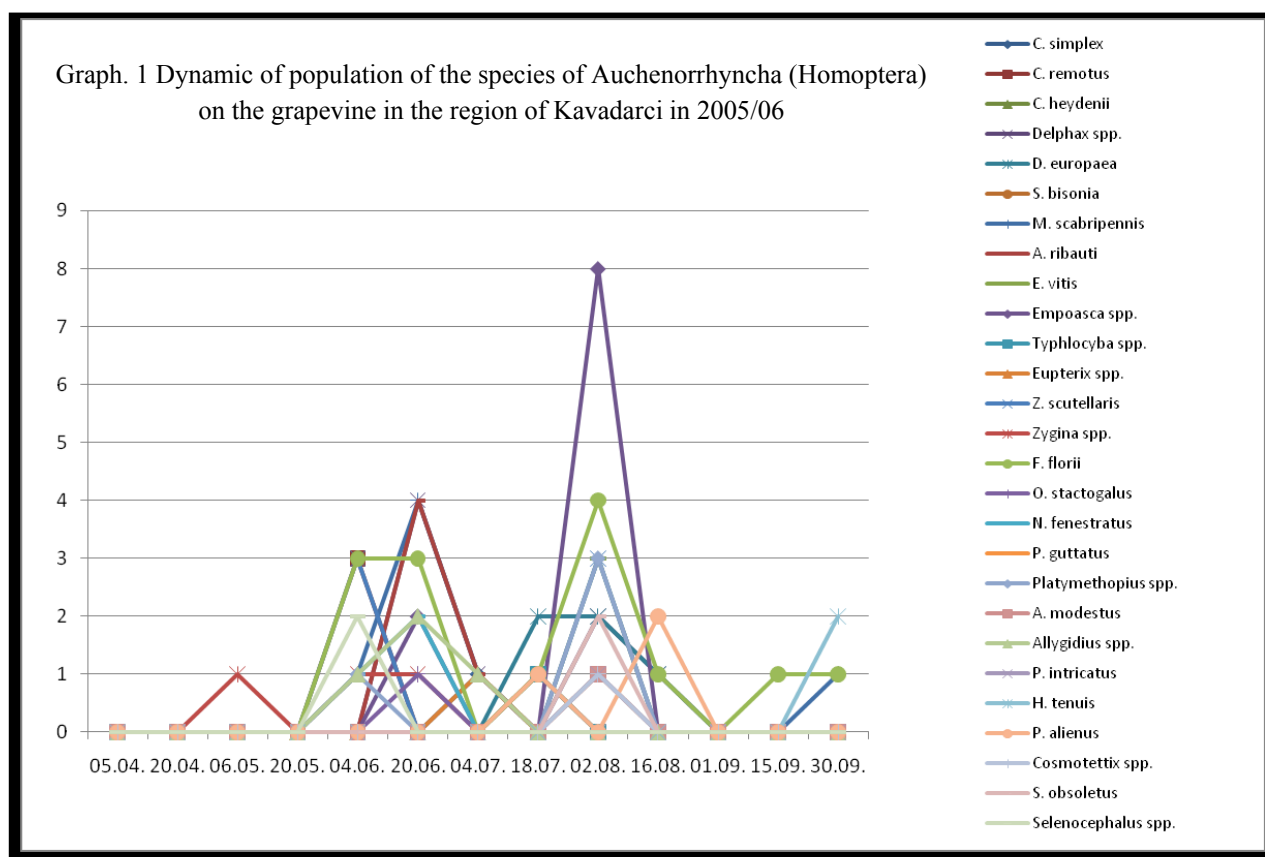
Species	Number of individuals	Active abundance	Active dominancy	Constancy
<b>Dominant:</b>				
<i>Dictyophara europaea</i>	4	0,33	9,75	27,27
<i>Eupterix spp</i>	5	0,41	12,19	9,09
<i>Zyginidia scutelararis</i>	3	0,25	7,31	9,09
<i>Zygina spp.</i>	3	0,25	7,31	27,27
<i>Fieberiella florii</i>	10	0,83	24,39	54,54
<b>Subdominant:</b>				
<i>Megophthalmus scabripennis</i>	1	0,08	2,43	9,09
<i>Platymethopius spp.</i>	2	0,16	4,87	18,18
<i>Nealiturus fenestratus</i>	1	0,08	2,43	9,09
<i>Anaceroatoagalia ribauti</i>	2	0,16	4,87	9,09
<i>Delphax spp.</i>	2	0,16	4,87	18,18
<i>Allygidius spp.</i>	1	0,08	2,43	9,09
<i>Hardya tenuis</i>	2	0,16	4,87	9,09
<i>Cosmotettix spp.</i>	1	0,08	2,43	9,09
<i>Phlepsius intricatus</i>	1	0,08	2,43	9,09
<i>Psammotettix alienus</i>	2	0,16	4,87	9,09
<i>Platymethopius guttatus</i>	1	0,08	2,43	9,09
<b>Recedent:</b>				
<b>Subrecedent:</b>				

The dynamics of population curve (Graph. 1) shows that determined species of cicadas in the region of Kavadarci start to appear in May. Also it could be seen that there are two periods during the vegetation of the grapevine when they reach their maximum number: the first one is during June, and the second is from the middle July to the middle August. Then the number of the population starts to decrease. Seeing that big number of the collected species is represented only with one individual, we cannot talk about right time of appearing of one species, its maximum number and decreasing of the same.

Analysis of parameter dominancy shows that in both years of examination the species *F. florii* is dominant, whereupon in 2005 has the highest percentage representation (16,39 %). Also in the both years of examinations dominant species is *Z. scutellaris* that in 2006 has the highest percentage representation (5,35 %).

In the first year of examinations dominant species are also *D. europaea*, *Eupterix spp.* and *Zygina spp.*, while in the first year of examinations the species *D. europaea*, *Eupterix spp.* are subdominant, and *Zygina spp.* does not meet at all.

In the second year of examinations dominant species are *M. scabripennis*, *Empoasca sp.*, *E. vitis*, *C. remotes*, *Allygidius sp.* and *Delphax sp.*, from which in the first year of examinations, the species *M. scabripennis*, *Allygidius sp.* and *Delphax sp.* are subdominant, and the species *Empoasca sp.*, *E. vitis* and *C. remotes*, do not meet at all.



The quantitative parameter constancy or frequency, with which the grade of tethered of the species with the environment, for both years of examination is given in Table 3 and Table 4. According to the values of the parameter constancy, in the first year of examination the species *F. florii* is constant (50 – 75%), the species *Zygina spp.* and *D. europaea* are accessory (25 – 50%), and the species *Z. scutellaris* and *Eupterix sp.* are accident (0 – 25%).

In the second year of examination accessory are the species *F. florii*, *M. scabripennis*, *Empoasca sp.*, *Allygidius sp.* и *Delphax sp.*, while the species *Z. scutellaris*, *E. vitis* and *C. remotus* are accident.

The rest of the species in both years of examinations are accident (0 – 25 %) except *S. obsoletus* and *Selenocephalus sp.* that in 2006 appear as accessory species, respectfully, are registered in almost 30 % of controlled yellow water traps.

The analysis of parameter constancy shows that there are no species that relate their life with the grapevine.

Table 4 –Qualitative composition and quantitative parameters of the structure on the fauna of cicadas in Kavadarci in 2006.

Species	Number of individuals	Active abundance	Active dominance	Constancy
<b>Dominant:</b>				
<i>Fieberiella florii</i>	4	0,33	7,14	28,57
<i>Megophthalmus scabripennis</i>	6	0,5	10,71	42,85
<i>Zyginidia scutellaris</i>	3	0,25	5,35	14,28
<i>Empoasca spp.</i>	10	0,83	17,85	28,57
<i>Allygidius spp.</i>	4	0,33	7,14	28,57
<i>Cixius remotus</i>	3	0,25	5,35	14,28
<i>Empoasca vitis</i>	3	0,25	5,35	14,28
<i>Delphax spp.</i>	6	0,5	10,71	42,85
<b>Subdominant:</b>				
<i>Eupterix spp.</i>	1	0,08	1,78	14,28
<i>Platymethopius spp.</i>	1	0,08	1,78	14,28
<i>Nealiturus fenestratus</i>	2	0,16	3,57	14,28
<i>Anaceraoagalia ribauti</i>	1	0,08	1,78	14,28
<i>Dictyophara europaea</i>	1	0,08	1,78	14,28
<i>Allygus modestus</i>	1	0,08	1,78	14,28
<i>Selenocephalus spp.</i>	2	0,16	3,57	28,57
<i>Selenocephalus obsoletus</i>	2	0,16	3,57	28,57
<i>Opsius stactogalus</i>	1	0,08	1,78	14,28
<i>Cixius simplex</i>	1	0,08	1,78	14,28
<i>Cixius heydenii</i>	1	0,08	1,78	14,28
<i>Stictocephala bisonia</i>	1	0,08	1,78	14,28
<i>Typhlocyba zygina</i>	1	0,08	1,78	14,28
<i>Psammotettix alienus</i>	1	0,08	1,78	14,28
<b>Recedent:</b>				
<b>Subrecedent:</b>				

## CONCLUSIONS

On base of the results got from the two years examinations (2005/06) in the region of Kavadarci, the following conclusions could be made:

- 27 species of cicadas are identified that belong to two suborders, Fulgoromorpha and Cicadomorpha, and 6 families: Cixiidae, Delphacidae, Dictyopharidae, Cicadidae, Membracidae and Cicadellidae;
- In the first year of examination (2005) 16 cicada species were registered, and in the second (2006) year of examination 22 cicada species;
- The values for active abundance are low for all registered species, and it ranges from 0,08 – 0,83;

- Curve of population dynamics (Graf. no. 1), shows that there are two periods during the vegetation of the grapevine when they reach their maximum number: the first one is during June, and the second is from the middle July to the middle August.
- Analysis of parameter dominance shows that in both years of examination *F. florii* is a dominant species, and in 2005 has the highest percentage (16.39%);
- Analysis of parameter constancy says that there are no species that correlate their existence to grapevine.

#### LITERATURE

1. B i e d e r m a n n, R. & N i e d r i n g h a u s, R. (2004): Die Zikaden Deutschlands. Bestimmungstabellen für alle Arten. WABV Verlag, Scheeßel. 409 S.
2. D i e t r i c h, C. H. (2005): Keys to the families of Cicadomorpha and subfamilies and tribes of Cicadellidae (Hemiptera: Auchenorrhyncha). Florida Entomologist 88 (4): 502 – 517.
3. H o l t z i n g e r, W. E., K a m m e r l a n d e r, I., N i c k e l, H. (2003): The Auchenorrhyncha of Central Europe: Die Zikaden Mitteleuropas. Brill, Leiden – Boston, 673 pp.
4. M a g u d, B. & T o š e v s k i, I. (2004): *Scaphoideus titanus* Ball. (Homoptera, Cicadellidae) Nova Štetočina u Srbiji. Biljni lekar, XXXII, 5: 348 – 351.
5. N i c k e l, H. (2003). The leafhoppers and planthoppers of Germany (Hemiptera, Auchenorrhyncha): Patterns and strategies in a highly diverse group of phytophagous insects. Pensoft publishers, 460 pp.
6. P a l e r m o, S., A r z o n e, A. & B o s c o, D. (2001): Vector-pathogen-host plant relationships of chrysanthemum yellows (CY) phytoplasma and the vector leafhoppers *Macrostelus quadripunctulatus* and *Euscelidius variegatus*. Entomologia Experimentalis et Applicata 99: 347 – 354.
7. R i e d l e – B a u e r, M., S a r a, A., R e g n e r, F. (2008): Transmission of Stolbur phytoplasma by the Agalliinae Leafhopper *Anaceratagalia ribauti* (Hemiptera, Auchenorrhyncha, Cicadellidae). Journal of phytopathology 156 (11 – 12): 687 – 690.
8. S e l j a k, G. (2008): Distribution of *Scaphoideus titanus* in Slovenia: its new significance after the first occurrence of grapevine “flavescence dorée”. Bulletin of Insectology 61 (1): 201-202.
9. W i l s o n, S. W. (2005): Keys to the families of Fulgoromorpha with emphasis on planthoppers of potential economic importance in the southeastern United States (Hemiptera: Auchenorrhyncha). Florida Entomologist 88 (4): 464 – 481.