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Biometrical investigations in Pear Psyllids *Cacopsylla pyri* and *C. pyrisuga* (*Homoptera:Psyllidae*) populations in Băneasa-Bucharest area

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Summary

This paper presents biometrical features of two Pear *Psylla* populations' species, *Cacopsylla pyri* L. and *C. pyrisuga* FÖRST. occurring on pear trees in Băneasa-Bucharest area. Size differences among the adults of these species have been found, as depending on their morphological type, sex of adults and season. These differences had highly statistic significance for *C. pyrisuga* over the *C. pyri* adults. In both species adults of the overwintering morphotype did not show statistically significant differences between sexes. In the most harmful species *C. pyri* egg-size is presented as well as those of nymphs in all five larval instars.

Rezumat

Cercetări biometrice la populaţiile de psylla părului, *Cacopsylla pyri* şi *C. pyrisuga* (Homoptera: Psyllidae) din zona Băneasa-Bucureşti

În lucrare sunt prezentate aspecte biometrice la populaţiile a două specii de psyla părului *C. pyri* L şi *C. pyrisuga* FÖRST., prezente in zona Băneasa-Bucureşti. S-au găsit diferenţe de mărime între adulţii celor două specii în funcţie de tipul morfologic, sex şi sezon. Aceste diferenţe au avut semnificaţii statistice foarte distincte la adulţii speciei *C. pyrisuga* faţă de cei ai speciei *C. pyri*. Între sexe, adulţii morfotipului hibernant al celor două specii nu au prezentat diferenţieri asigurate statistic. Pentru specia *C. pyri* sunt prezentate şi dimensiunile ouălor şi ale larvelor pentru cele cinci vârste larvare.

Key words: Pear Psylla, *Cacopsylla*, morphological type.

In Pear Psyllid species there is a considerable biometrical variation, outlined in several papers describing eggs, nymphs and adults, fitted to develop identification keys for these species (DOBREANU & MANOLACHE 1962, WHITE & HODKINSON 1982, RIEUX et al. 1983, BURCKHARDT & HODKINSON 1986, LAUTERER & BURCKHARDT 1997). Likewise, biometrical criteria allowed to reveal aspects of sexual dimorphism of nymphs (WILDBOLDZ 1992) or the seasonal dimorphism of adults (BONNEMAISON & MISSONIER 1955, WOJNAROWSKA et. al. 1960, DOBREANU & MANOLACHE 1962, KHARIZANOV 1967, WONG & MADSEN 1967, NGUYEN 1972, RIEUX et al. 1983).

Adults of *Cacopsylla pyri* L. (1758) as *C. pyricola* FÖRST. (the most important pest of cultivated pear in North America), exhibit two morphological types, one in winter and other in summer, as determined by photoperiod. These differ morphologically and biometrically each other being easy to be recognized at once. The winter type is generally larger, dark-coloured and was observed on pear trees from autumn to spring. The summer-form adults were light coloured and were founded from the beginning of spring until autumn.

C. pyrisuga species has only a generation on pear trees on March-June and adults overwintering on conifers.

Our investigations aimed to widening the existing knowledge regarding biometrics of *C. pyri* and *C. pyrisuga* occurring in cropped pears in Băneasa-Bucharest area.

Material and method

Eggs, nymphs and adults of the Pear Psyllids have been collected in 1994 and 1995 in orchards of Băneasa-Bucharest area, geographically placed in the Romanian Plain. Climatically, this zone is marked by temperate-continental trends, rainfall ranging

between 600-700 mm, annual average temperature around 10°C.

Adults have been seasonally collected (in summer, the summer form; in winter and autumn, the winter form), by light shaking pear shoots above cloth bags. Eggs and various instar nymphs needed were brought in laboratory with shoots infested, harvested in orchard.

Measurements have been performed in the every day of extraction from the field biological material. For each *Psylla* species, biometric analysis has been effected on 25 individuals, seasonal and by sexes in adults, eggs and nymphs.

Results

Measurements of adults of *C. pyri* and *C. pyrisuga* species have been noted in table 1.

Table 1

Length (in mm) of Pear Psyllids adults in Băneasa-Bucharest area

Morphological type of adults		Sex	*C. pyri*		*C. pyrisuga*	
			Average ± σ	Limits	Average ± σ	Limits
Summer type		Females	2.58±0.2	2.40-2.90	4.07±0.2	4.03-4.12
		Males	2.43±0.3	1.80-3.2	4.00±0.07	3.9-4.05
Winter type	In Spring	Females	2.94±0.2	2.55-3.20	4.13±0.09	4.05-4.25
		Males	2.68±0.1	2.60-2.90	4.05±0.1	4.00-4.10
	In Autumn	Females	2.77±0.1	2.55-3.15	-	-
		Males	2.61±0.1	2.45-2.95	-	-

The highest average length was found with *C. pyrisuga* between 4.07-4.13 mm in females and 4.00-4.05 mm in males, hence in agricultural practice being known as the Large Pear Psylla. Adults of *C. pyri* recorded average sizes ranging between 2.58-2.94 mm in females and 2.43-2.68 mm in males.

Biometrical differences between Psylla adults led to their statistical examination, in order to assess their significance.

Length of individuals by season and sexes was treated by t-test (Student) for probabilites ∝ of 0.5, 1.0 and 0.1% (tables 2 and 3).

Size differences between *C. pyrisuga* and *C. pyri* adults have been revealed from data in table 2, both in females and males. Except for distinctly significant differences compared to males of winter type, *C. pyrisuga* recorded very dinstinctly significant differences, both when compared to winter type females of and with both sexes of summer type.

Table 2

Analysis of variance of length between females and males of Pear *Psylla* in Băneasa-Bucharest area

Morphological seasonal type	Species	Females		Males	
		Average length	Difference and significance	Average length	Difference and significance
Summer	*C. pyri*	2.58	0	2.43	0
	C. pyrisuga	4.07	$+1.49^{xxx}$	4.00	$+1.57^{xxx}$
			$DL_{5\%}=0.928$ $DL_{1\%}=1.301$ $DL_{0.1\%}=1.389$		$DL_{5\%}=0.433$ $DL_{1\%}=0.519$ $DL_{0.1\%}=0.733$
Winter (In Spring)	*C. pyri*	2.94	0	2.68	0
	C. pyrisuga	4.13	$+1.19^{xxx}$	4.05	$+1.37^{xx}$
			$DL_{5\%}=0.438$ $DL_{1\%}=0.614$ $DL_{0.1\%}=0.868$		$DL_{5\%}=1.000$ $DL_{1\%}=1.045$ $DL_{0.1\%}=1.477$

Table 3 reveals that females were larger than males in two species. In the winter form, average body length was not significantly different by sexes during spring. In summer adults significant

differences were found only for *C. pyrisuga*, while in *C. pyri* females did not differ significantly from males.

Table 3

Analysis of variance of length differences between females and males of Pear Psylla species in Băneasa-Bucharest area.

Morfological seasonal type		Species	Females average length (mm)	Males average length (mm)	Difference M. from F. and significance	Value α 5%
Summer		*C. pyri*	2.58	2.43	-0.15^{ns}	0.602
		C. pyrisuga	4.07	4.00	-0.07^{0}	0.066
Winter	In Spring	*C. pyri*	2.94	2.68	-0.26^{ns}	0.331
		C. pyrisuga	4.13	4.05	-0.08^{ns}	0.138

Within the biometrical study on two *Cacopsylla* species occurring on pear in Băneasa area, major attention has been paid to *C. pyri*, due to its particular economic importance. Our research in this line refers to lenght and width of eggs and nymphs in I to V instars (table 4).

Table 4

Size (in mm) of *Cacopsylla pyri* eggs and nymphs in Băneasa-Bucharest area

Development stage and instar	Length			Width		
	Min.	Max.	$\bar{x} \pm \sigma^2$	Min.	Max.	$\bar{x} \pm \sigma^2$
5th instar nymphs	1.50	1.90	1.61±.008	1.10.	1.30	1.17±0.06
4th instar nymphs	1.20	1.60	1.34±0.10	0.65	1.20	0.94±0.06
3rd instar nymphs	0.90	1.25	1.07±0.10	0.65	0.95	0.73±0.07
2nd instar nymphs	0.35	0.45	0.41±0.02	0.15	0.25	0.20±0.02
1-st instar nymphs	0.25	0.35	0.29±0.02	0.10	0.20	0.14±0.02
Eggs	0.30			0.15		

For each instar the average values are recorded as well as maximum and minimum body limits can be reached. These results are intended to help agricultural practitioners to distinguish Psylla nymphs instar, a very important item for optimizing control application against this pest.

C. pyri eggs reached 0.30 mm length and 0.15 mm width without revealing minimum and maximum sizes when using optical means available in laboratory.

Conclusions

The results of the biometrical study of *C. pyri* and *C. pyrisuga* populations occurring on pear in Bucharest-Băneasa zone allowed the conclusions:

Presence of some intra- and inter- specific differences in the complex of Pear Psyllid species. These differences clearly express sexual dimorphism in two species, as well as seasonal dimorphism in *C. pyri*.

Size differences among the adults by sexes between *C. pyrisuga* and *C. pyri* and are obvious and statistically significant in winter and summer morphological types.

Populations of these Pear Psylla species showed size differences between sexes, as depending on season and morphological type. Females were always larger than males.

C. pyri eggs showed no lenght or width differences. In the same species size differences have been noted among the 5 nymphal instars, as revealed by their standard deviation.

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