

Oviposition preference of the overwintering females of *Cacopsylla pyri* L. (Homoptera: Psyllidae) on pear tree branches

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Abstract

Oviposition preference of the *Cacopsylla pyri* L. overwintering form has been examined on various organs of pear tree, at the beginning of pear vegetation period (vegetative and floriferous buds, annual shoots with vegetative buds, short fruiting branches annual and multiannual, vegetative and floriferous rosettes). Winter adults of this species prefer the terminal buds of branches for oviposition (average 11 eggs / bud, maximum 31 eggs / bud). The total number of eggs decreased from terminal to subterminal buds in positions 1-10. There were highly significant differences between the number of eggs laid on floriferous buds over the vegetative ones, the ratio being 2.7: 1. On multiannual fruiting branches size of egg-laying was higher than in the annual ones. Rough bark at the basis of annual formations is chosen for oviposition by the overwintering *C. pyri*, before the smooth parts of these. On the vegetative rosettes an average of 94.6 eggs was recorded on leaves while on the floriferous ones (leaves + buds) 88.63 eggs.

Rezumat

Preferințele pentru ovipozitare în ramurile de păr la femelele hibernante de *Cacopsylla pyri* L. (Homoptera: Psyllidae)

Preferințele de ovipozitare la formele hibernante de *Cacopsylla pyri* L. au fost studiate pe organe variate ale părului, la începutul perioadei de vegetație a acestuia (muguri vegetativi și floriferi, ramuri anuale cu muguri vegetativi, ramurile scurte de rod și rozetele vegetative sau florifere). Adulții hibernanți ai acestei specii preferă mugurii terminali ai ramurilor pentru ovipozitare (aproximativ 11 ouă / mugure, maximum 31 ouă / mugure). Numărul total de ouă descrește de la mugurii terminali la cei subterminali în pozițiile 1 - 10. Au fost diferențe semnificative între numărul de ouă depuse pe mugurii floriferi, față de mugurii vegetativi, în raport de 2,7:1. Pe ramurile de rod multi-aniuale mărimea pontelor a fost mai mare decât pe cele anuale. Scoarța rugoasă de la baza formațiunilor anuale este aleasă pentru ovipozitare de formele hibernante de *C. pyri* față de scoarța netedă.

Keywords: Oviposition, overwintering forms, buds, branches, fruit branches, vegetative rosettes.

Introduction

The common pear psylla, *Cacopsylla pyri* 1761 L. is the most troublesome among *Psylla* species in Romania. Its adults exhibit two different seasonal morphological forms: one has reduced dimensions, lighter in colour and with translucent wings (summer form) and the other larger, dark in colour and with grayish wings (winter form), BONNEMAISON 1961). Winter form pear *Psylla*

begin oviposition very early in spring, before pear vegetation start. Research on oviposition behaviour of overwintering females is known only for *C. pyricola* Först., the principal pear pest in North America and Canada (BUTT and STUART 1986, STUART and col. 1989, HORTON 1990).

Understanding oviposition preference in overwintering *Cacopsylla* species is of particular interest, both theoretical and practical. The theoretical interest consists in contribution to bring

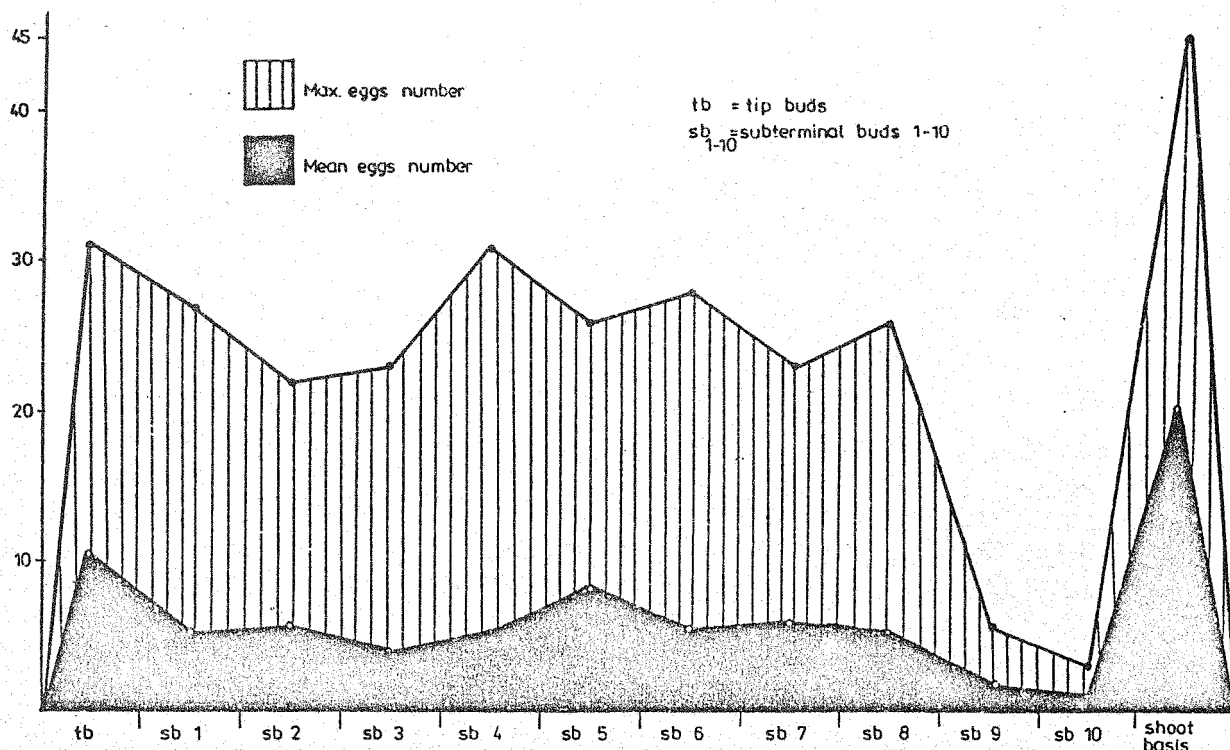


Fig. 1. Graph of maximum and average eggs number laid by *Cacopsylla pyri* on terminal vegetative buds; subterminal 1-10 and at the shoot basis: ▨ Max. eggs number, ■ Mean eggs number, tb = tip buds, sb₁₋₁₀ = subterminal buds 1-10.

new and deeper knowledge on biology of these species, while the practical one allows identification of pear tree organs preferred by females for oviposition and accurate estimation of initial infestation degree, thus giving possibility for a real forecast and to timely establish the protection measures.

In spring, the infestation level of pear branches with *Psylla* eggs is decisive to assess the growth potential of their populations, but also their reduction level following applications of suitable chemical treatments.

In this report we are presenting quantitative data referring to egg-laying by the overwintering *C. pyri* females on pear shoots and buds, and also occurrence of a preference of this species for the kind and age of shoots, or the kind and location of buds on shoot.

Material and method

Investigations have been performed in 1995 and 1996 in a pear orchard of R. I. P. P. Bucharest, Băneasa, in the autumn cultivar, Beurre Hardy. Pear shoots have been collected and observations have been made between the late fortnight of March and early part of April, this moment corresponding to pear budding phase (B-C) until apparition of flower buds (C-D), when the overwintering *C. pyri* females laid. The shoots

have been collected at random in the pear orchard every 1-2 days, 20-25 shoots in all, vegetative or floriferous for each sample. Eggs distribution on shoots has been examined under stereo-microscope, recording frequency of their numbers by classes, according to the kind of shoots (vegetative or floriferous, annual or multiannual) and kind and position of buds (vegetative or floriferous, terminal or subterminal). Significance of eggs amounts and their spread on various pear organs has been made by ANOVA-test and checked with t-test (Student).

Results and discussions

Literature includes few investigations on oviposition behaviour of pear *Psylla*, these referring exclusively to *C. pyricola*. Scientific information obtained, showed female oviposition preference for certain pear vegetative and floriferous organs (BUTT and STUART 1986, HORTON 1990) or preference changes depending on season and photophase (MCMULLEN and JONG 1976). These investigations responded to some practical requirements to increase chemical treatment efficacy in the prefloral pear period, this corresponding to oviposition period of the overwintering *psylla* females.

The same considerations also determined our research with *C. pyri*, a major pest of pear

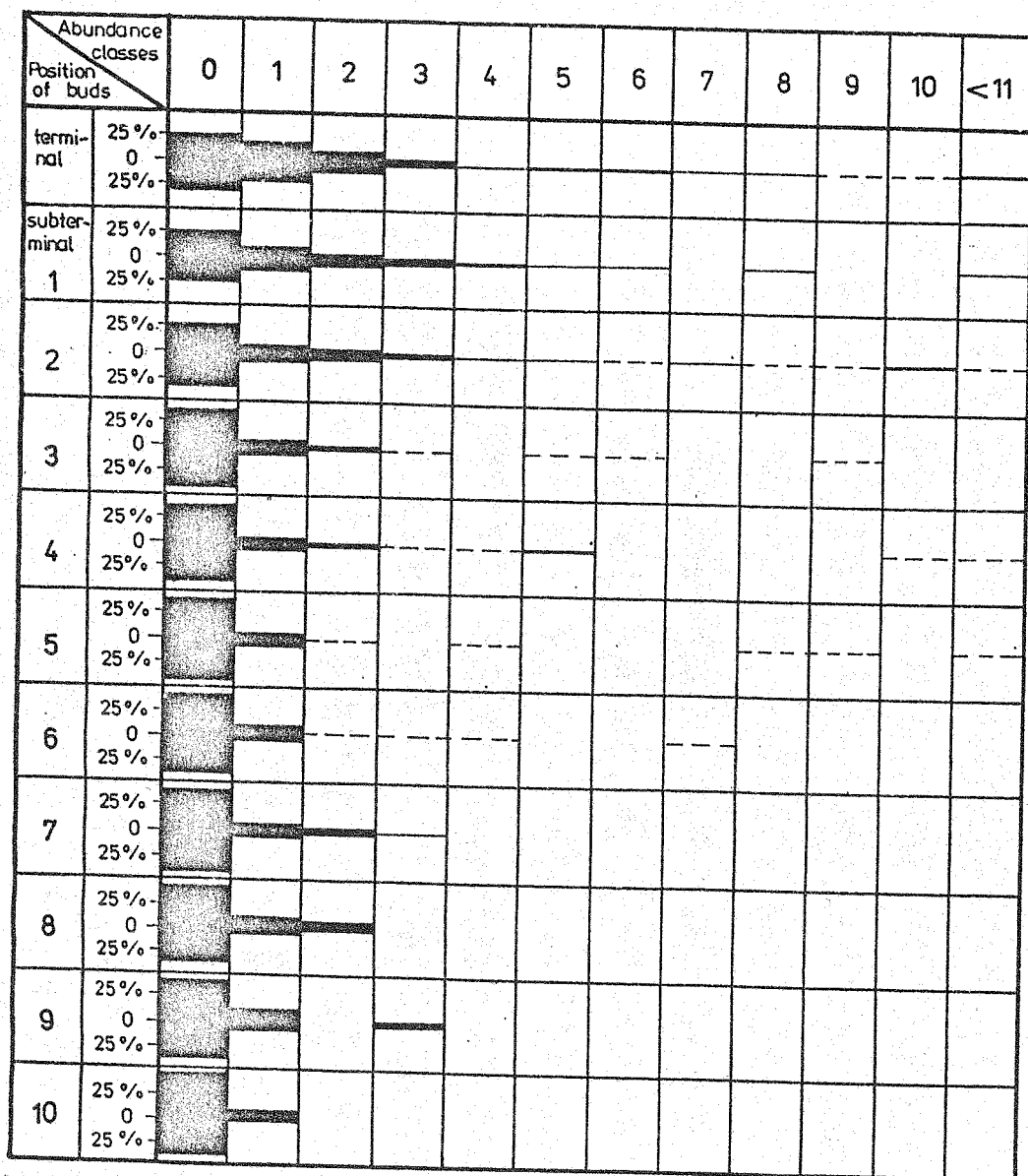


Fig. 2. Relationship between the position of vegetative buds on shoots and the relative abundance of eggs deposited by the overwintering *Cacopsylla pyri* females.

orchards in Romania. Very close similarities between these two psylla species, both morphological and behavioural, made that our results to deepen or supplement those of American investigators.

Data obtained by us, based on observations on field-collected biological material, demonstrated that position of buds on pear shoots has an effect on distribution of *C. pyri* eggs. Vegetative buds with terminal location on long annual shoots are preferred for oviposition by the overwintering females (Fig. 1). The greatest amount of eggs were found on these, on average 11 eggs/terminal bud and maximum 31 eggs/terminal bud.

terminal bud.

Eggs distribution on vegetative buds with subterminal position varied quantitatively, values of their abundance being in general, lower than those of terminal buds. In Graph 1, it could be seen that most oviposition took place at the shoot basis, where the average egg numbers recorded was nearly 20 eggs/shoot and a maximum exceeding 45 eggs/shoot.

If we refer to vegetative buds on shoots and eggs abundance laid by these, our data in Fig. 2 show that the extent of buds without eggs had an ascending tendency from the bud in shoot tip (60%) to those subterminal in position 1-10,

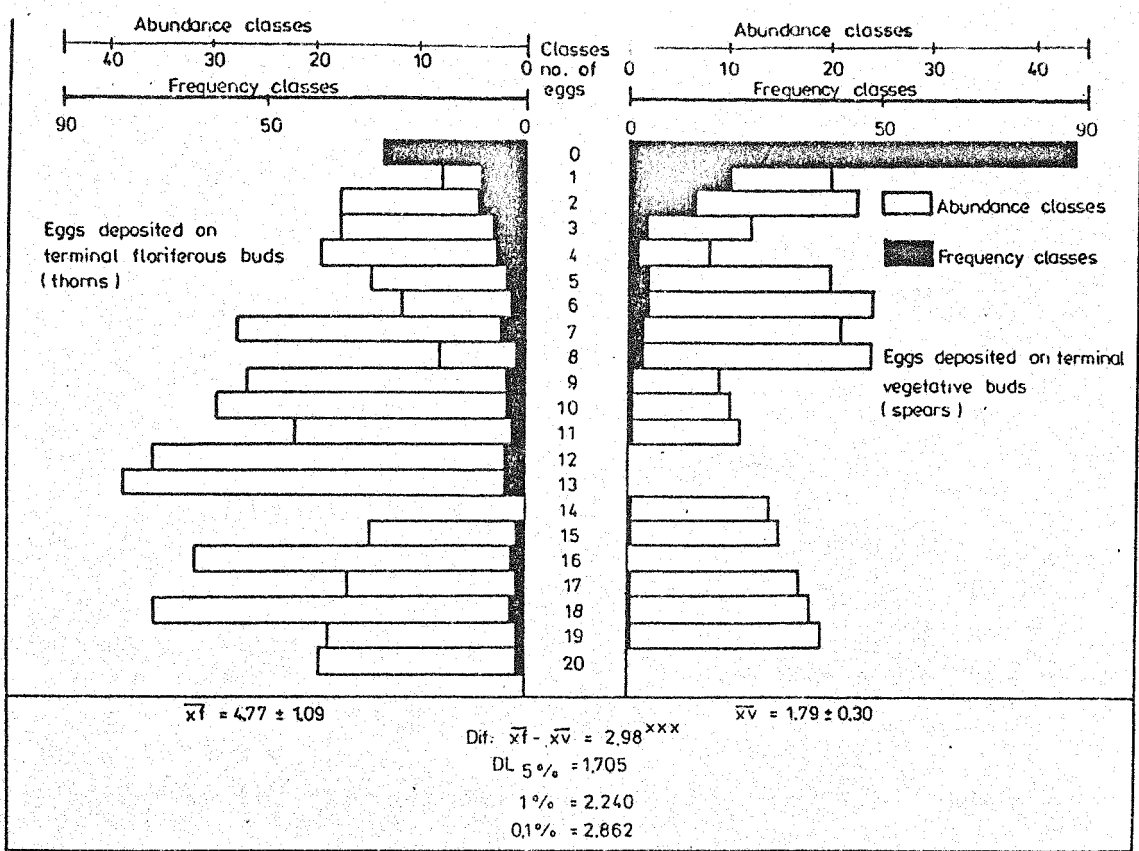


Fig. 3. Comparison between egg frequency and abundance of the overwintering *Cacopsylla pyri* females on terminal floriferous and vegetative buds of pear shoots

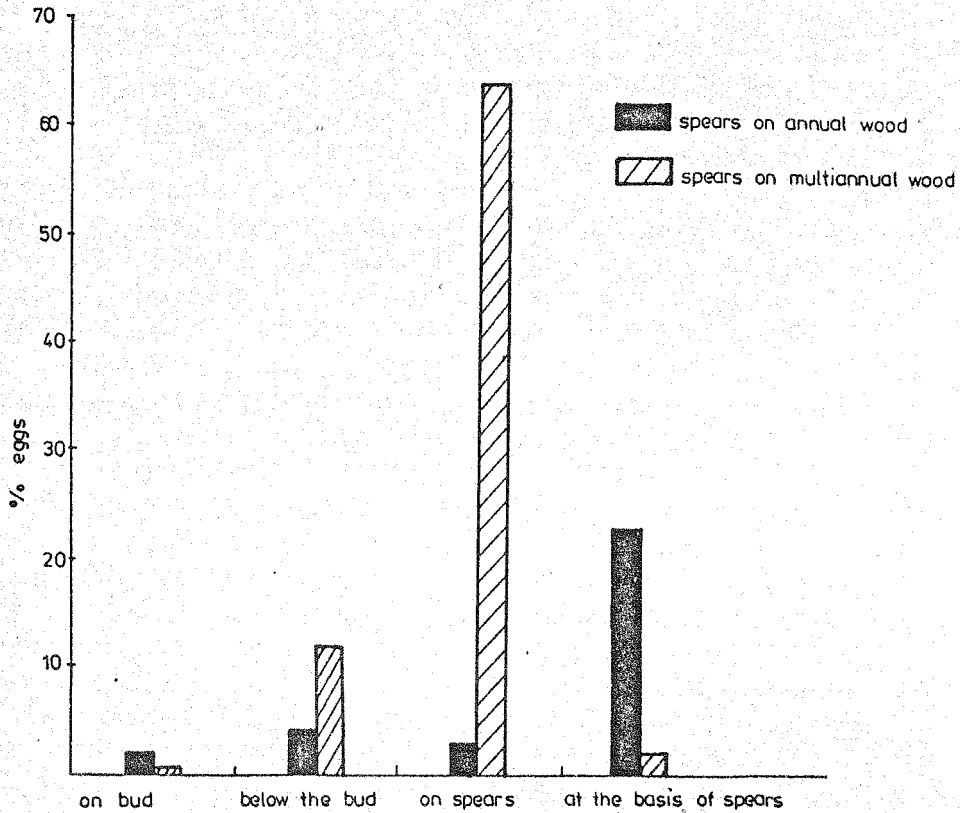


Fig. 4. Rate of oviposition on spears by the overwintering *Cacopsylla pyri* females: ■ spears on annual wood, ▨ spears on multiannual wood.

where absence of eggs reached up to 90%. Only in the first subterminal position, proportion of buds without eggs was by 10% lower than the terminal buds.

Likewise, it was noticed that the terminal buds with 1-3 eggs, and also other with more than

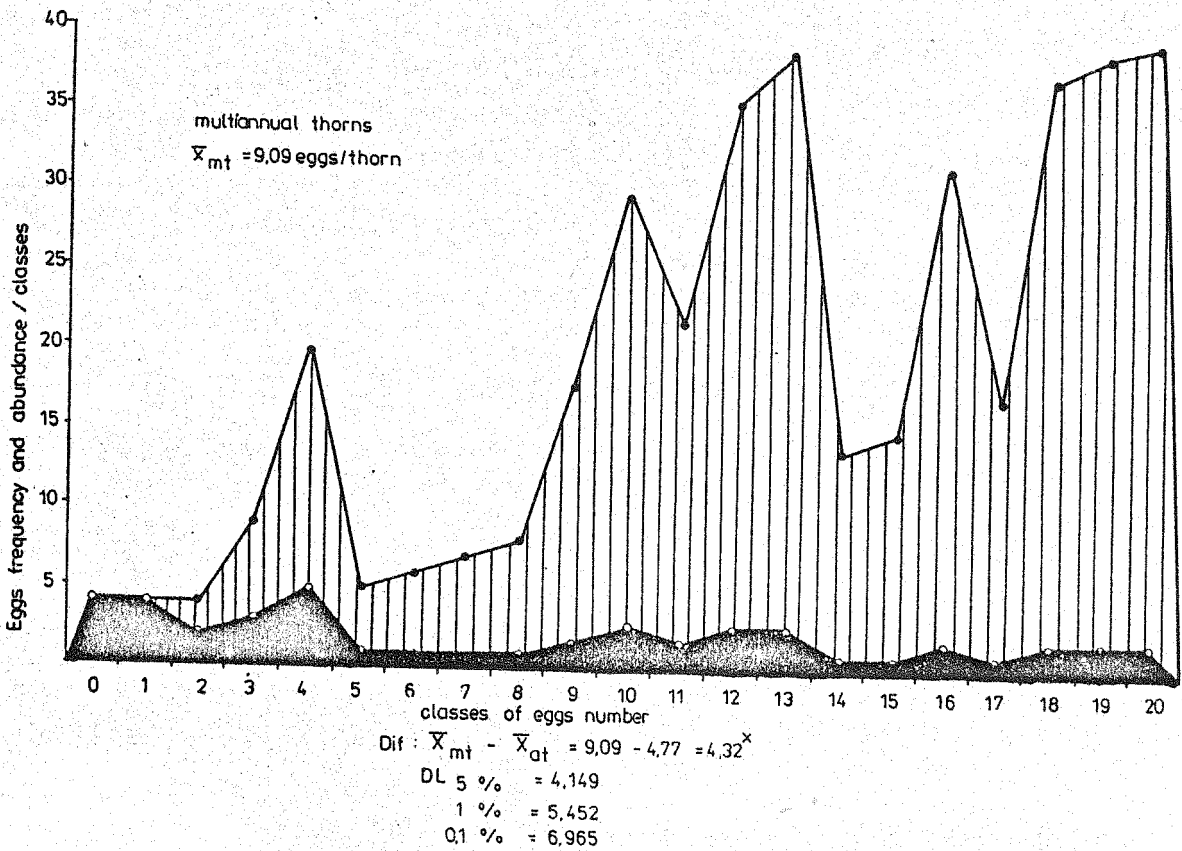
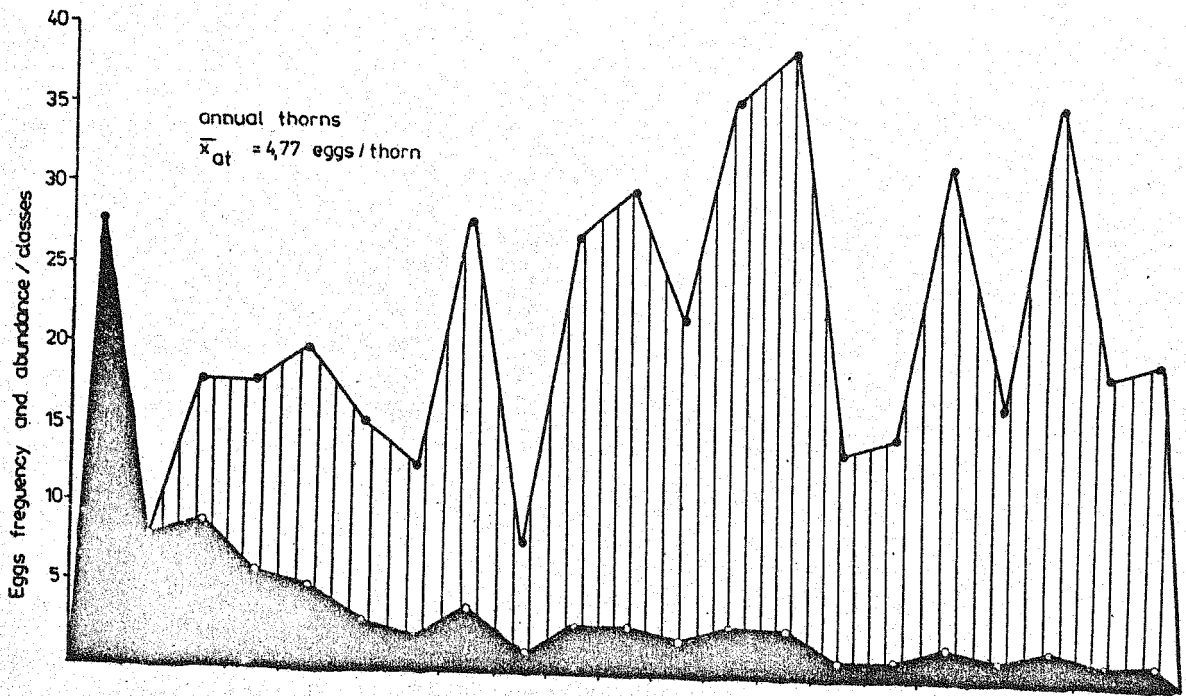


Fig. 5. Frequency and numerical abundance of *Cacopsylla pyri* eggs laid on pear thorns.

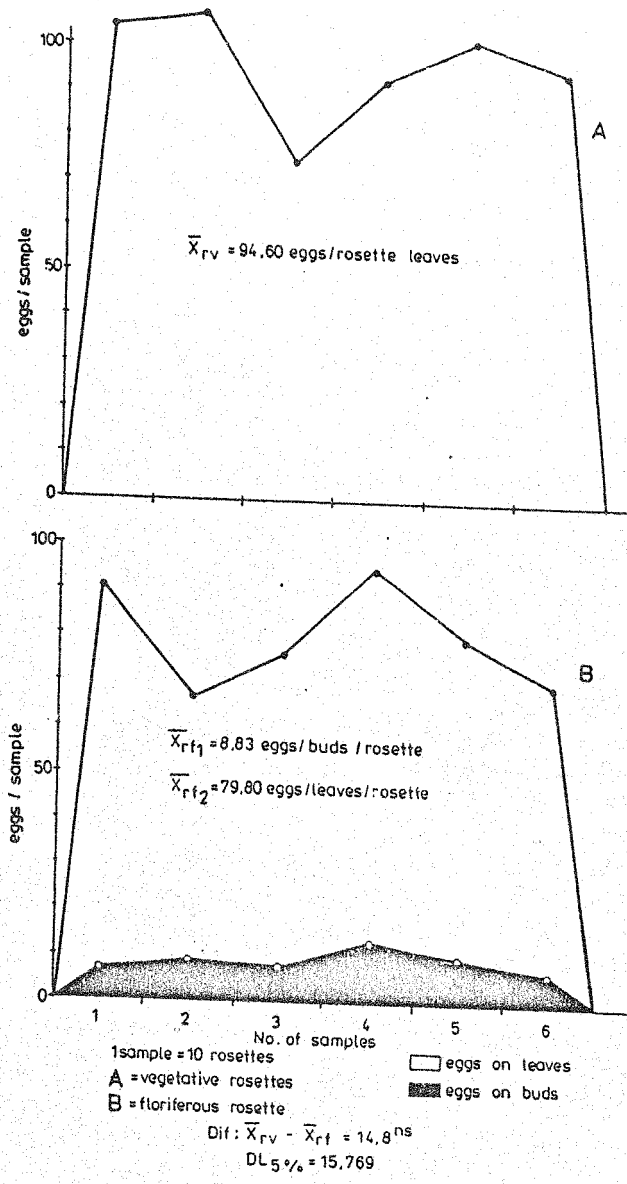


Fig. 6. *Cacopsylla pyri* egg-laying on floriferous and vegetative rosettes of pear.

11 eggs, had relative abundances superior to those recorded for lateral buds. The highest values in subterminal buds have been noted in oviposition with 1-2 eggs. In a few cases eggs abundance exceeded 11 eggs, both in terminal and subterminal position buds (Fig. 2).

The phenomenon explained by BUTT and STUART (1986), STUART and col. (1989) for *C. pyricola*, is also valid for *C. pyri*, this being ascribed to more rapid development of terminal buds, which could delay opening of those lateral, thus influencing preference of overwintering females for oviposition.

Comparison of egg amount recorded on vegetative and floriferous buds in the tip of short fruiting branches of pear (Fig.3) allowed to state that the overwintering *C. pyri* females prefer the second bud category (floriferous). These branches

are called "spurs", when have at their tip a vegetative bud, and "thorns" if the tip bud is floriferous. Preference for oviposition on these two types of buds, materialized in the number of eggs distributed by frequencies classes, is marked by highly significant differences. In the vegetative buds frequency is higher in classes with 1-2 eggs compared to floriferous buds, while the rest of classes with 3-20 eggs are superior at the floriferous buds. Values of eggs abundances by classes are obviously higher in the floriferous buds, over the vegetative ones.

The overwintering *C. pyri* females also manifested preference during oviposition for the age of pear branches, annual or multiannual. Data obtained by us presented in Graphs 4 and 5 allowed to note that the most searched areas for oviposition are the rough ones at the basis of

younger shoots (Fig. 4), as well as the rough wood of multiannual branches (Fig. 5). Psylla eggs present a short pedicel at their upper pole, which firmly hold on substrate. As the green tissue is not yet developed in this period and the ligneous young is smooth and hard to be pierced, the rough bark with numerous grooves is more accessible and eggs could be easily laid.

On pear spurs on multiannual wood the number of eggs is incomparably higher than that recorded on annual spurs (Fig. 4).

Eggs distribution on branch is possibly in agreement with the favourable conditions created for oviposition (bud size on annual wood, occurrence of several lenticels below the bud on multiannual wood, as well as the rough bark of multiannual spurs, or the basis of the annual ones).

Multiannual thorns are also preferred by *C. pyri* females, on which 9.09 eggs on average have been recorded, i. e. 1.9 times more than the average in annual thorns (Fig. 5). Trends of frequency values are generally similar in both thorn-types, except for class zero, being 5 fold higher in annual thorns, over those multiannual.

Distribution of abundance values of eggs also showed roughly similarities, though in classes with 5-8 eggs these values were superior in annual thorns, and values in classes with 19-20 eggs were higher in multiannual ones.

Another character studied in *C. pyri* referred to oviposition on floriferous and vegetative rosettes, more advanced in development (Fig. 6).

Most eggs were recorded on leaves in vegetative rosettes, 94.6 eggs/rosette on average. In floriferous rosettes winter form psylla also preferred leaves than buds, the differences of average numbers of eggs being 9:1 in favour of leaves. In the whole floriferous rosette, the number of eggs was 88.63, slightly reduced than in vegetative rosette, difference between the two types being insignificant.

Conclusions

- Oviposition of the overwintering form of *C. pyri* has been examined on vegetative and floriferous organs of pear trees, at the beginning of pear vegetation period (vegetative and floriferous buds, annual long shoots only with vegetative buds, short fruiting branches annual and multiannual, vegetative and floriferous rosettes).

- The hypothesis was proved that winter

form of this species prefer the terminal buds of branches for oviposition (average 11 eggs/bud, maximum 31 eggs/bud). The total number of eggs decreased from terminal to subterminal buds in position 1-10 (Figs. 1 and 2).

- There were highly significant differences between the number of eggs laid on floriferous buds over the vegetative ones, the ratio being 2.7 : 1 (Fig. 3).

- On multiannual fruiting branches size of egg -laying was higher than in the annual ones, statistical differences of their means being significant (Figs. 4 and 5). Rough bark at the basis of annual formations is chosen for oviposition by the overwintering *C. pyri* females, before the smooth parts of these (Figs. 1 and 4).

- Among the pear branches analysed, the highest egg abundance was recorded on vegetative and floriferous rosettes. On the vegetative rosettes, an average of 94.6 eggs was recorded on leaves while on the floriferous ones (leaves + buds) 88.63 eggs, differences between these being statistically insignificant (Fig. 6).

- Scientific information acquired in this study on oviposition of the overwintering form of *C. pyri* are helping in the control of the first generation of pear psylla, which is exclusively performed by prefloral spraying on females during the egg-laying.

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