

## A STUDY OF BIONOMY OF THE PRIVET SAWFLY (*Macrophya punctumalbum* (L.)) (Hymenoptera, Tenthredinidae) – A PEST OF PARK PLANTS

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**Abstract:** The study of the bionomy of privet sawfly (*Macrophya punctumalbum* (L.)), a pest of park plants in the city of Poznań, was conducted during three vegetation seasons in the years 1981–1983, at the insectarium of the Department of Entomology at Agricultural University in Poznań. The aim of the study was to define the longevity and fecundity of imagines, larvae development of the species and the level of parasitizing the eggs of the privet sawfly by parasitoids of the *Chalcidoidea* superfamily. The sawfly occurred in the last ten days of May. The females lived from 4 to 36 days, most often quite short (73.3%), from 7 to 14 days. After reaching the stage of sexual maturity, which lasted mostly 8–9 days, they started laying eggs. The fecundity of females fluctuated between 1 and 122 eggs. The mean female fecundity was 52 eggs. It was found that the larvae of sawfly went through 5 instar stages. The parasitoids of the *Chalcidoidea* superfamily decreased the abundance of the sawfly at the egg stage from 0.47% to 8.65%. Those were *Anaphes cultripennis* Debauche (*Mymaridae*) and *Trichogramma* sp. (*Trichogrammatidae*).

**Key words:** *Hymenoptera*, *Tenthredinidae*, *Macrophya punctumalbum*, lifecycle, parasitoids, *Anaphes cultripennis*, *Trichogramma* sp., park plants

### INTRODUCTION

For a few years in the parks and alleys of Poznań privet sawfly (*Macrophya punctumalbum* (L.)) has occurred in various numbers on common privet (*Ligustrum vulgare* L.). The patches it causes significantly lower esthetic values of city greenery. This is a species that occurs on trees and bushes of the olive family (*Oleaceae*). It is frequently observed in young cultivations of lilacs (*Syringa* spp.) and common privet [Łabanowski et al 2000]. The data on its bionomy are incomplete. Some information on the species

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from southern Europe was supplied by Schwenke [1982]. In Poland no study has been conducted on the bionomy of this species so far; that is why research was started in order to determine the imaginal longevity, fecundity and instar of this species and the degree of parasitizing the eggs of the sawfly by parasitoids of the *Chalcidoidea* superfamily in the environmental conditions of the city of Poznań.

## MATERIAL AND METHODS

The study was carried out during three vegetation seasons in the years 1981–1983, at the insectarium of the Department of Entomology at Agricultural University in Poznań. In the years 1981–1982 the study aimed at defining the degree of parasitizing the eggs of the privet sawfly by parasitoids of the *Chalcidoidea* superfamily. To achieve this, some leaves of common privet from hedges in city parks were collected – those where the sawfly laid eggs. Then they were placed in test-tubes and reared in the insectarium. In 1982 a study defining the imaginal longevity and fecundity began. The biological material was obtained from a cultivation carried out in the previous year in the insectarium and the experiment was conducted on 30 females. They were bred in single isolators at the insectarium, fed with agar feed (1 g agar + 50 g sugar + 20 g honey + 100 ml distilled water) and water. The feed was changed every 4 days. The females were supplied with fresh privet leaves every day. In 1983 the research was conducted to define the length and number of instar stages. In order to do this the leaves of the privet growing along streets where the sawfly laid its eggs were selected, placed on cellulose lining on Petrie dishes and bred in the insectarium. After hatching the larvae were placed in separate plates and bred individually, fed every day with fresh privet leaves. Every 3 or 4 days the width of head capsule and the larva's weight were measured.

Weather conditions, including air temperatures in 1982 and 1983 were close to the multi-year average (1881–1960). The mean monthly temperatures did not greatly differ from the data of the multi-year period, except that in 1983 January was clearly warmer than in the multi-year period. In both years of research a clear drop in the precipitation sum was noted in comparison with the multi-year period, only in January and December 1982 and in January and April 1983 more precipitation was noted than the average in the period. The years 1982 and 1983 were then warm and dry, with an increase in 1982. The meteorological data describing weather conditions are presented in figures 1 and 2.

## RESULTS

Privet sawfly is a monocycle species, multiplying by parthenogenesis, namely tely-totic one. Males only occasionally occur in populations of privet sawfly. Out of 1500 specimens caught in 1981 in a city park only one was a male.

The beginning of spring occurrence of imagines comes in the third week of May. In 1982 the first sawflies occurred on 21 May, while in 1983 – 23 May. The flights lasted 2–3 weeks. The hatched imagines started a short-time complementary feeding on privet leaves, which consisted in females' peeling the upper leaf cuticle along with paren-

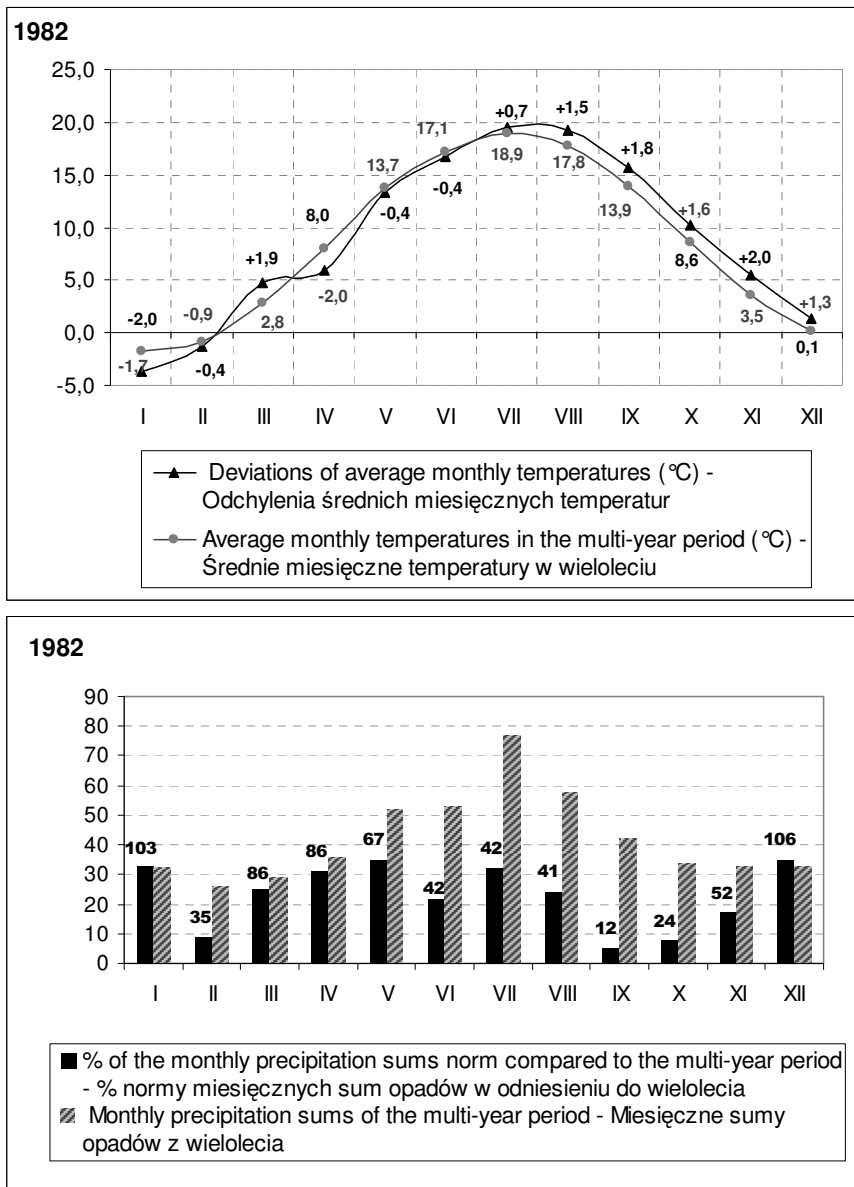


Fig. 1. Deviations of average monthly air temperatures and a percentage of monthly sums of precipitation norm compared to the multi-year period (1881–1960) for Poznań in 1982

Rys. 1. Odchylenia średnich miesięcznych temperatur powietrza od średniej wieloletniej i procent normy sum opadów w odniesieniu do wielolecia (1881–1960) dla m. Poznania w 1982 roku

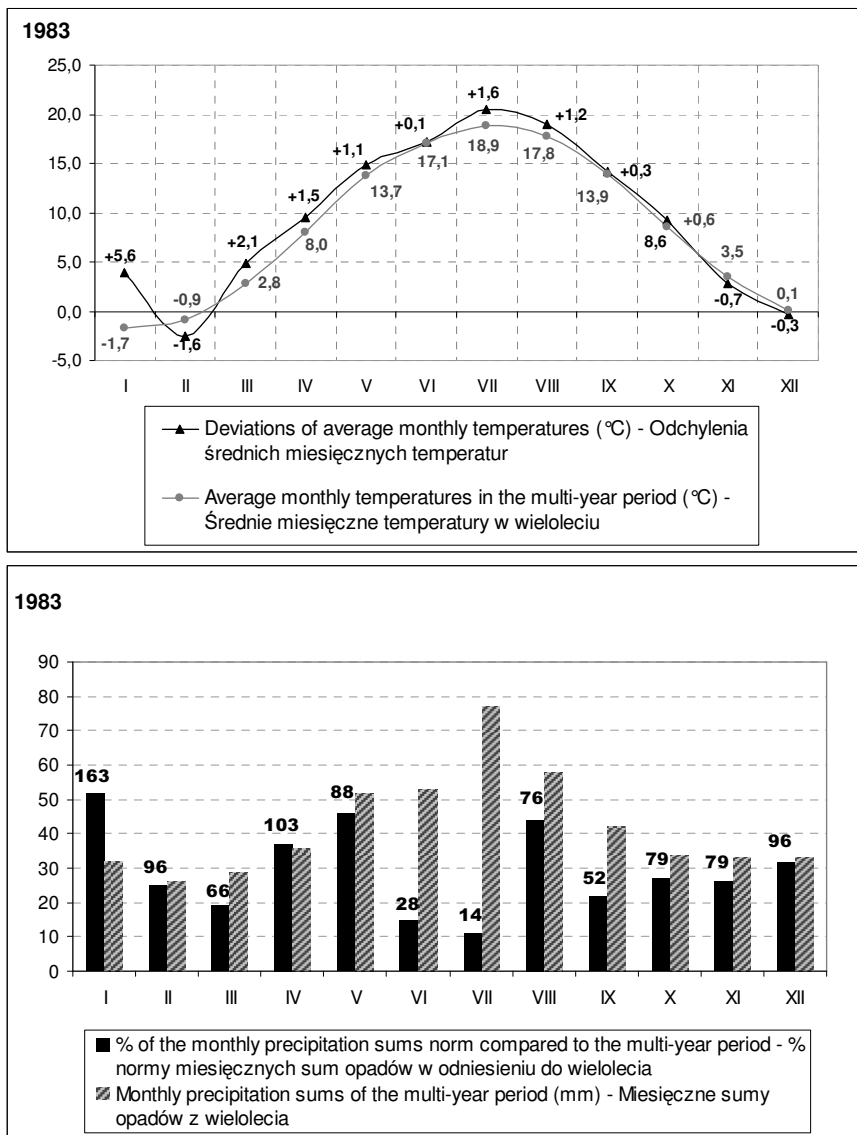


Fig. 2. Deviations of average monthly air temperatures and a percentage of monthly sums of precipitation norm compared to the multi-year period (1881–1960) for Poznań in 1983

Rys. 2. Odchylenia średnich miesięcznych temperatur powietrza od średniej wieloletniej i procent normy sum opadów w odniesieniu do wielolecia (1881–1960) dla m. Poznania w 1983 roku

chyma. After obtaining sexual maturity, which takes 8–9 days, females started laying eggs. The oviposition started at the end of May and lasted till the end of June. In 1982 females started laying eggs on 28 May and in 1983 – 1 June. The oviposition ended on 29 June in 1982 and 30 June in 1983.

The longevity of females and their fecundity were defined on the basis of a study carried out in 1982 on 30 females. The results are presented in table 1. The breeding of females started on 26 May. The last female died on 30 June. The longevity of females ranged between 4 and 36 days. Most females (73.3%) lived a short life, from 7 to 14 days, with the mean longevity of 11 days. Between 2 and 5 days after hatching the females started laying eggs to 'pockets' cut out by themselves, most often located under the lower leaf cuticle. The period of laying eggs lasted from 1 to 26 days. Over half the females (56.7%) laid eggs from 6 to 8 days. The fecundity of females fluctuated between from 1 and 122 eggs. The mean fecundity of females was 52 eggs. The average number of eggs per day per female was 4.

Table 1. Longevity and fecundity of females

Tabela 1. Długość życia i płodność samic

No of female Nr samicy	Longevity in days Długość życia w dniach	Number of oviposition eggs Liczba złożonych jaj
1	7	45
2	8	47
3	15	39
4	9	86
5	8	30
6	8	20
7	13	70
8	36	122
9	13	52
10	12	52
11	8	50
12	7	26
13	11	47
14	16	76
15	9	44
16	17	122
17	6	1
18	13	89
19	9	64
20	14	62
21	13	90
22	4	8
23	15	73
24	6	14
25	7	5
26	11	49
27	12	45
28	12	55
29	12	50
30	10	29
Average – Średnia	11	52
Minimum	4	1
Maximum	36	122
Standard deviation Odchylenie standardowe	5.69	30.32

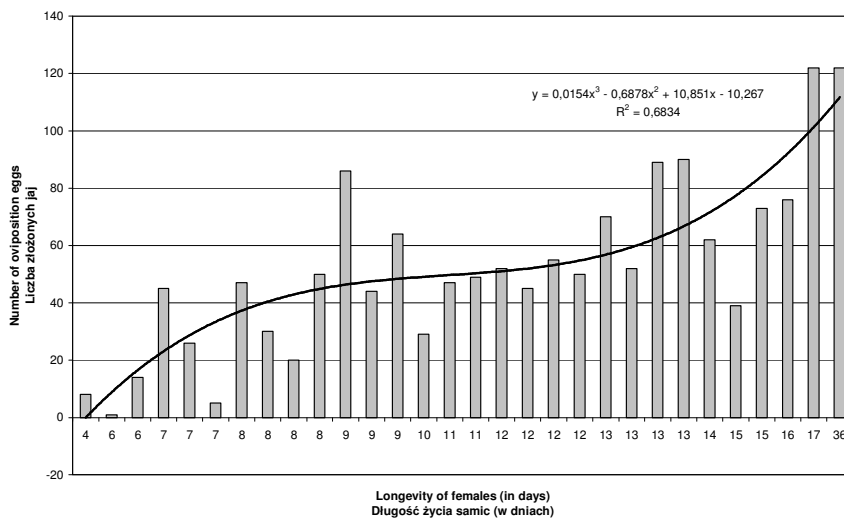


Fig. 3. Graphic picture of relations between the longevity and fecundity of females  
Rys. 3. Graficzna ilustracja zależności pomiędzy długością życia samic i płodnością

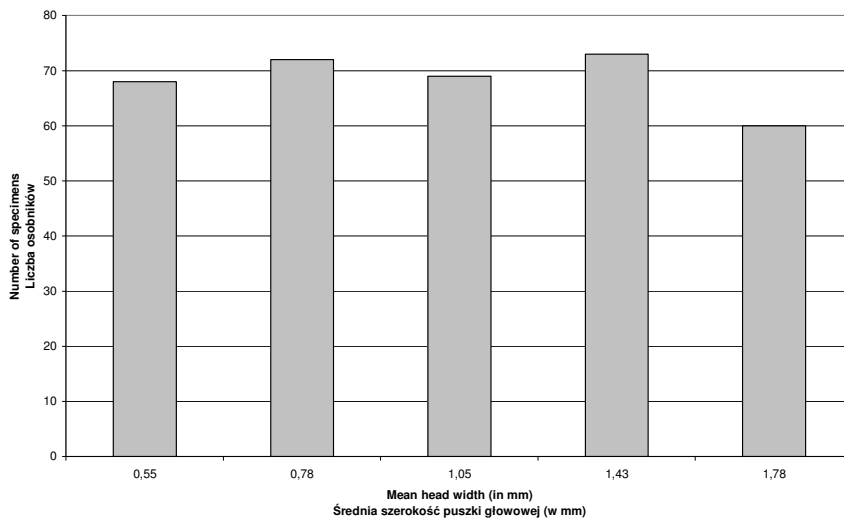


Fig. 4. Mean head widths in five instar larvae  
Rys. 4. Średnie szerokości puszek głowowych u pięciu stadiów larwalnych

A relationship between the longevity of females and the number of eggs laid was established. The relationships are presented in figure 3: they are in the form of a third-degree multinomial. It is a curve in the form of  $y = 0.02 x^3 - 0.69 x^2 + 10.85 x - 10.27$ , where  $x$  is the females' longevity expressed in days. The determination coefficient  $R^2$  achieved the value of 0.68.

$R$  – the coefficient of the correlation between the females' longevity and the number of eggs laid was also calculated. It was  $r = 0.75$ . The value of the correlation coefficient shaped in such a way shows that the analysed features were correlated on a medium level.

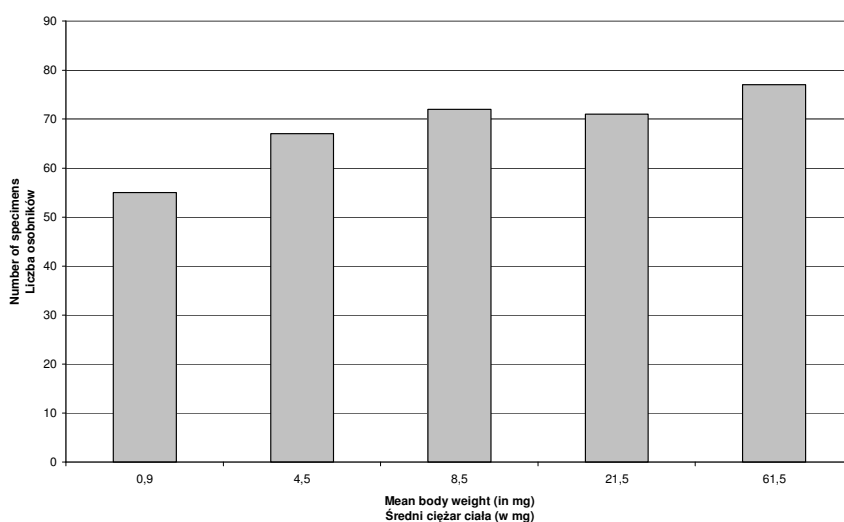


Fig. 5. Mean body weight in five instar larvae

Rys. 5. Średni ciężar ciała u pięciu stadiów larwalnych

The instar of privet sawfly was determined on the basis of measurements of the width of head capsule in 30 larvae bred in the insectarium in 1983, from 1 July to 30 August. The results of the measurements are presented in figure 4 as the mean values of head capsules width. It was found that the larvae went through 5 stages. The mean width of head capsules was between 0.55 mm for  $L_1$  and 1.78 mm for  $L_5$ . The width of head capsules at particular stages increased by the following values:  $L_1 \rightarrow L_2$  by 0.23 mm,  $L_2 \rightarrow L_3$  by 0.27 mm,  $L_3 \rightarrow L_4$  by 0.38 mm and  $L_4 \rightarrow L_5$  by 0.35 mm. The developing larvae increased their weight by intensive feeding. The mean body weight of next 5 instar stages is presented in figure 5. It was found that passing through all instar stages the larvae increased their body weight from 0.9 mg to 61.5 mg on average. During subsequent instar stages they increased their body weight on average by 3.6 mg, 4.0 mg, 13.0 mg and 40 mg. The body and the head capsule of young larvae up to stage

L<sub>3</sub> was yellowish and green or completely green. Older larvae changed into dark green, with yellowish-brown head. The larvae which stopped feeding before going to pupate in soil, changed their colour of cover into sapphire.

At the beginning, when feeding intensively, the larvae scratched the parenchyma and one of cuticles, then they bit holes in leaves. First the larvae finished infesting plants at the beginning of August, and last of them in the third week of that month. The larvae started descending into soil in order to pupate at the end of August and finished in mid-September. The privet sawfly is a species that winters as pupae in soil down to 10 cm depth.

In the years 1981–1982 the total of 1141 eggs of the privet sawfly were collected. The parasitoids of the superfamily *Chalcidoidea* limited the number of the species at the stage of eggs by 0.47% to 8.65%. The lowest and the highest parasitizing were noted in 1982. Two species of parasitoids were bred, namely *Anaphes cultripennis* Debauche of the family *Mymaridae* (det. B. Miczulski) and *Trichogramma* sp., a representative of the family *Trichogrammatidae*. The population numbers of *A. cultripennis* to *Trichogramma* sp. were at 4 to 1 ratio. In 1981 parasitoids hatched from the eggs of the sawfly occurred from 29 June to 6 July, while in 1982 from 21 to 25 June.

## DISCUSSION AND CONCLUSIONS

The research conducted in 1981–1983 to get to know the bionomy of *Macrophya punctumalbum* (L.) proved that the species massively feeds on the common privet (*Ligustrum vulgare* L.) in city greenery of Poznań. The larvae of the species chewed almost completely the plant's leaf blades. The information on the harmfulness of the sawfly in city greenery in south-eastern Europe and north-eastern America was presented by Schwenke [1982]. According to references besides privet the species harms mainly the ash *Fraxinus excelsior* L. and the hawthorn (*Crataegus* sp.) [Schwenke 1982, Hoop 1983, Price et al 2005]. The current research has not confirmed ash tree as a host plant for the species. The larvae of all stages did not infest ash leaves and died.

As a result of the studies it was determined that the period of occurrence of imagines forms started in the third week of May and finished in the third week of June. Those data correspond with the information by Schwenke [1982], according to whom in southern Europe the flight of hymenoptera lasts from mid-May till the end of June.

The study proved that the larvae went through 5 instar stages. This is confirmed by studies by Veržuckij [1981], according to whom the development of species of *Macrophya* genus may take 4 or 5 instar stages.

As a result of studies it was established that the period of larvae infestation was in July and August. It was slightly longer than in southern Europe, as according to Schwenke [1982] already in July some larvae descend to the soil to pupate. The research established that first larvae descended to the soil at the end of August and the last in mid-September. In southern Europe the larvae descend to the soil and create cocoons earlier, in July and the process lasts till the end of September [Schwenke 1982].



The study established some aspects of bionomy of the privet sawfly, a pest of city greenery in Poznań, which may periodically occur in great number and effectively lower the esthetic values of plants.

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## BADANIA BIONOMII BROSZNICY JESIONÓWKI (*Macrophya punctumalbum (L.)*) (*Hymenoptera*, *Tenthredinidae*) – SZKODNIKA ROŚLIN PARKOWYCH

**Streszczenie:** Badania nad bionomią brosznicy jesionówki (*Macrophya punctumalbum (L.)*), szkodnika roślin parkowych miasta Poznania, prowadzono przez trzy sezony wegetacyjne, w latach 1981–1983, w insektarium Katedry Entomologii Akademii Rolniczej w Poznaniu. Celem badań było określenie długości życia imaginalnego, płodności i rozwoju larwalnego tego gatunku oraz stopnia spasożytności jaj brosznicy przez parazytoidy z nadrodziny *Chalcidoidea*. Błonkówki pojawiały się w III dekadzie maja. Samice żyły od 4 do 36 dni, przy czym najczęściej krótko (73,3%), od 7 do 14 dni. Po uzyskaniu dojrzałości płciowej, trwającej przeważnie 8–9 dni, przystępowały do składania jaj. Płodność samic wahała się w granicach od 1 do 122 jaj. Średnia płodność samic wyniosła 52 jaja. Ustalono, że larwy brosznicy przechodziły przez 5 stadiów rozwojowych. Parazytoidy z nadrodziny *Chalcidoidea* obniżyły liczebność brosznicy w stadium jaja w granicach od 0,47% do 8,65%. Były nimi *Anaphes cultripennis* Debauche (*Mymaridae*) i *Trichogramma* sp. (*Trichogrammatidae*).

**Słowa kluczowe:** *Hymenoptera*, *Tenthredinidae*, *Macrophya punctumalbum*, cykl życiowy, parazytoid, *Anaphes cultripennis*, *Trichogramma* sp., roślinność parkowa

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