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**Life cycle and population dynamics of *Aleurolobus teucii*
(Homoptera Aleyrodidae) in Eastern Sicily (*)**

Abstract - In 1995-96, a study was carried out in Eastern Sicily on the biology and ethology of *Aleurolobus teucii* Mifsud & Palmeri, that lives on *Teucrium fruticans* L. (Labiatae). The whitefly has two yearly generations, with adults flying in May-June and July-August; it overwinters in the nymphal stages, especially 3rd and 4th instars, and its development only slightly slows down during the coldest months. Natural mortality at pre-imaginal stages was quite modest throughout the study. Parasitization by *Encarsia olivina* (Masi) (Hymenoptera Aphelinidae) was frequently observed, though usually at moderate levels. Direct control of the whitefly is not thought to be necessary at present, in spite of the increasing commercial interest in its host plant.

Riassunto - Ciclo biologico e dinamica di popolazione di *Aleurolobus teucii* in Sicilia orientale (Homoptera Aleyrodidae).

Uno studio sul comportamento bio-etologico di *Aleurolobus teucii* Mifsud & Palmeri, vivente sulla Labiata *Teucrium fruticans* L., è stato condotto in Sicilia orientale durante gli anni 1995-96. Nell'areale d'indagine, l'aleirode ha mostrato un comportamento tipicamente bivoltino, con sfarfallamenti delle due generazioni rispettivamente in maggio-giugno e luglio-agosto e con svernamento nei vari stadi neanidali (soprattutto 3^a e 4^a età); in particolare, in coincidenza con i mesi più freddi, si è verificato solo un parziale rallentamento nello sviluppo di tali neanidi svernanti, piuttosto che una vera e propria diapausa. La mortalità naturale complessiva degli stadi preimmaginali si è mantenuta su valori di modesta entità durante buona parte del periodo di osservazione. A carico dell'aleirode si è frequentemente evidenziata attività parassitaria ad opera dell'Imenottero Afelinide *Encarsia olivina* (Masi), mantenendosi tuttavia su livelli generali di efficacia alquanto contenuti. Al momento, non si ravvisa la necessità di un controllo diretto dell'aleirode, nonostante il crescente interesse commerciale attribuito alla sua pianta ospite quale essenza ornamentale.

Key words: *Aleurolobus teucii*, biology, *Encarsia olivina*, Italy.

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The whitefly *Aleurolobus teucarii* Mifsud & Palmeri has recently been described in Sicily and Malta (Mifsud & Palmeri, 1996). As far as is presently known, the insect is monophagous on *Teucrium fruticans* L. (Tubiflorae Labiatae), a Western Mediterranean plant which spontaneously grows on calcareous cliffs, from sea level up to about 600 m. Due to its roughness and thermophily, this plant finds good growing conditions in sunny and semi-arid coastal areas (Bossard & Cuisance, 1984) and in Italy it is widespread on the western side of the peninsula (from Liguria to Campania; in Sardinia, Sicily and various minor islands such as Elba, Pelagie and Pantelleria), and along its eastern coasts (mostly in Apulia, Gargano and the Tremiti islands) (Pignatti, 1982).

The commercial interest in *T. fruticans* is ever increasing in various parts of the Mediterranean basin, for its potential as an ornamental plant in coastal areas for adorning rocky flowerbeds and gardens. To this end, both its varieties (*album* and *azureum*, respectively with white and dark blue flowers), are increasingly cultivated in Italy, often being included in cultivation programmes of many nurseries specialised in producing ornamental plants for urban areas (Huxley, 1992; Romano & Scrimali, 1995).

The increasing economic importance of its host plant and the scarce knowledge presently available on the biology of *Aleurolobus teucarii*, were the basis for a study on the insect in Sicily, that aimed to improve understanding of its life cycle and population dynamics.

METHODOLOGY

The *A. teucarii* life cycle was studied on plants of *T. fruticans* growing in the Sicilian type locality of the whitefly (the province of Messina, in Santa Maria della Rocca, in Taormina). Commencing in July 1995, samples were taken about every ten days and through a complete year, up to July 1996. For each sample, ten leaves infested by the whitefly were collected from four different plants, to a total of forty leaves per sample. To ensure that each sample was representative, leaves were collected from different heights on the plants.

Microscope observations were made in the laboratory, to count all pre-imaginal stages (eggs, larvae and pupae) of *A. teucarii* present in each sample on both leaf surfaces. Moreover, all nymphs suspected of being parasitized, and still containing an endophagous larva, were also counted, as well as those already abandoned by a parasitoid and thus clearly detectable due to the presence of the typical, round, dorsal hole.

Once the material was observed and the counting described above completed, all leaves of each sample were isolated under controlled conditions ($25 \pm 1^\circ\text{C}$ and 70-80% R.H.), for a few weeks; parasitoids that emerged from such material were preserved in 70% alcohol until their identification.

RESULTS AND DISCUSSION

Information acquired on *A. teucii* biology and phenology in the present study are briefly discussed below. Complete data on the structure of the pre-imaginal population are reported in table 1, while graphic information on number of yearly generations, natural mortality and parasitization is illustrated in Figs 1-3.

Life cycle and number of yearly generations (Table 1; Fig. 1)

In late July 1995 (when the observations started) the pre-imaginal population of *A. teucii* was mainly represented by 4th instar nymphs and sub-pupae (about 64.54%) (Fig. 1), with a significantly lower occurrence of all younger stages (the pre-imaginal population being represented by 1st, 2nd and 3rd instar nymphs respectively at a rate of 13.62, 7.0 and 14.79%). All nymphs observed in this period may be assigned to the spring-summer generation, whose adults started to fly from the end of July and

Table 1 - *Aleurolobus teucii* Mifsud & Palmeri: structure of pre-imaginal population in Eastern Sicily.

Date	Viable eggs per leaf	Nymphs per leaf							
		First instar		Second instar		Third instar		Fourth instar/Subpupae	
		Alive	Dead	Alive	Dead	Alive	Dead	Alive	Dead
28. VII. 1995	0,00	0,88	0,00	0,45	0,05	0,95	0,00	4,15	0,00
08. VIII. 1995	0,00	0,03	0,08	0,05	0,08	0,28	0,15	1,05	0,00
18. VIII. 1995	0,48	0,25	0,05	0,10	0,00	0,18	0,00	1,83	0,03
28. VIII. 1995	0,10	0,08	0,03	0,00	0,03	0,13	0,00	0,50	0,00
08. IX. 1995	3,93	1,45	0,00	0,00	0,00	0,05	0,00	0,73	0,13
18. IX. 1995	0,93	1,48	0,00	0,28	0,03	0,00	0,00	0,35	0,03
28. IX. 1995	0,10	3,23	0,33	5,95	0,05	6,13	0,10	1,30	0,13
08. X. 1995	0,03	1,18	0,10	2,28	0,03	2,00	0,00	1,13	0,03
19. X. 1995	0,00	0,10	0,20	0,30	0,05	2,00	0,18	7,98	0,08
31. X. 1995	0,00	0,15	0,00	0,70	0,00	2,68	0,00	6,30	0,00
09. XI. 1995	0,00	1,13	0,03	0,85	0,05	1,85	0,05	7,43	0,00
21. XI. 1995	0,00	0,23	0,03	0,35	0,03	0,70	0,00	2,05	0,03
02. XII. 1995	0,00	0,08	0,00	0,43	0,00	0,93	0,00	5,08	0,13
12. XII. 1995	0,00	0,13	0,13	0,30	0,10	0,60	0,08	2,43	0,10
22. XII. 1995	0,00	0,03	0,13	0,15	0,20	0,68	0,13	4,00	0,13
03. I. 1996	0,08	0,40	0,40	0,85	0,05	2,33	0,00	8,03	0,08
17. I. 1996	0,00	0,25	0,28	0,43	0,18	1,23	0,05	6,53	0,23
29. I. 1996	0,00	0,00	0,00	0,00	1,15	1,38	0,53	1,73	0,20
16. II. 1996	0,00	0,00	0,53	0,00	0,55	1,15	0,10	5,23	0,38
02. III. 1996	0,00	0,00	0,28	0,03	0,13	0,33	0,10	3,75	0,28
12. III. 1996	0,00	0,00	0,15	0,13	0,20	0,33	0,13	8,73	0,10
28. III. 1996	0,00	0,05	0,05	0,18	0,05	1,03	0,00	6,63	0,95
10. IV. 1996	0,00	0,05	0,03	0,18	0,00	0,83	0,05	4,48	0,18
22. IV. 1996	0,00	0,10	0,00	0,20	0,08	0,53	0,10	5,43	0,13
03. V. 1996	0,00	0,00	0,13	0,00	0,03	0,13	0,00	5,20	0,25
14. V. 1996	11,23	0,00	0,03	0,03	0,00	0,00	0,03	1,50	0,05
24. V. 1996	5,98	0,70	0,00	0,00	0,00	0,00	0,00	0,00	0,00
06. VI. 1996	2,33	2,43	0,00	4,00	0,00	2,45	0,00	0,10	0,03
19. VI. 1996	0,25	2,33	0,00	2,13	0,00	7,58	0,00	1,35	0,00
03. VII. 1996	0,00	0,98	0,03	1,38	0,00	4,30	0,05	5,30	0,08
13. VII. 1996	0,00	0,60	0,00	0,50	0,00	1,00	0,05	2,58	0,00

up to the second ten days of August. Eggs laid by these adults from August to late September gave rise to the overwintering nymphs of the second generation. During September and October, the pre-imaginal population of *A. teucarii* was mainly composed by 1st and 2nd instar nymphs, but almost exclusively by 3rd and 4th instar ones starting from November and up to the following spring, when adult emergence marked the conclusion of the second generation. In winter 1995-96, 4th instar nymphs and sub-pupae prevailed during coldest months and together made up about 60-80% of the overwintering pre-imaginal population. Rather than a true winter diapause, the whitefly underwent only a slight slowing down in its nymphal development. In 1996, the first adults of the year laid their eggs from May and up to late June; thus, in late May the pre-imaginal population of the whitefly was almost totally composed by 1st instar nymphs. As in the previous year, this spring-summer generation was completed in August, when the new adults emerged and the first autumn egg depositions started to be noted again.

Total population density of *A. teucarii* was almost constant throughout the year, as it is underlined by the values of total pre-imaginal population of the whitefly.

Natural mortality at young stages (Table 1; Fig. 2)

The pre-imaginal population of *A. teucarii* showed quite a modest total mortality throughout the observation period, ranging from 5 to 10%, with an average of about 6.45%. Higher values (up to about 40%) were recorded in August and during the coldest months (January-March), mainly due to a probable susceptibility of 1st and 2nd instar nymphs of the whitefly to climatic stress.

Parasitization (Fig. 3)

In the investigated area, only one parasitoid species, *Encarsia olivina* (Masi), was detected on *A. teucarii*. The aphelinid wasp was present in the whitefly population throughout the year, with an average active parasitization of about 12.84%; highest values were noted in January (max. peak of about 36.70%), May (20.00%) and in late August - September (54.84%), when the whitefly population was mainly composed by older nymphs.

Finding *E. olivina* on *A. teucarii* confirms the marked preference of this aphelinid for whiteflies of the genus *Aleurolobus*, particularly those in the European fauna and already indicated as common hosts of the parasitoid (Viggiani, 1982, 1987).

CONCLUSIVE REMARKS

The observations carried out in Eastern Sicily clearly showed a bivoltine cycle of *A. teucarii*, which overwinters in the nymphal stages (mainly the mature ones). The adults emerge in May-June (overwintering generation) and July-August (spring-summer generation).

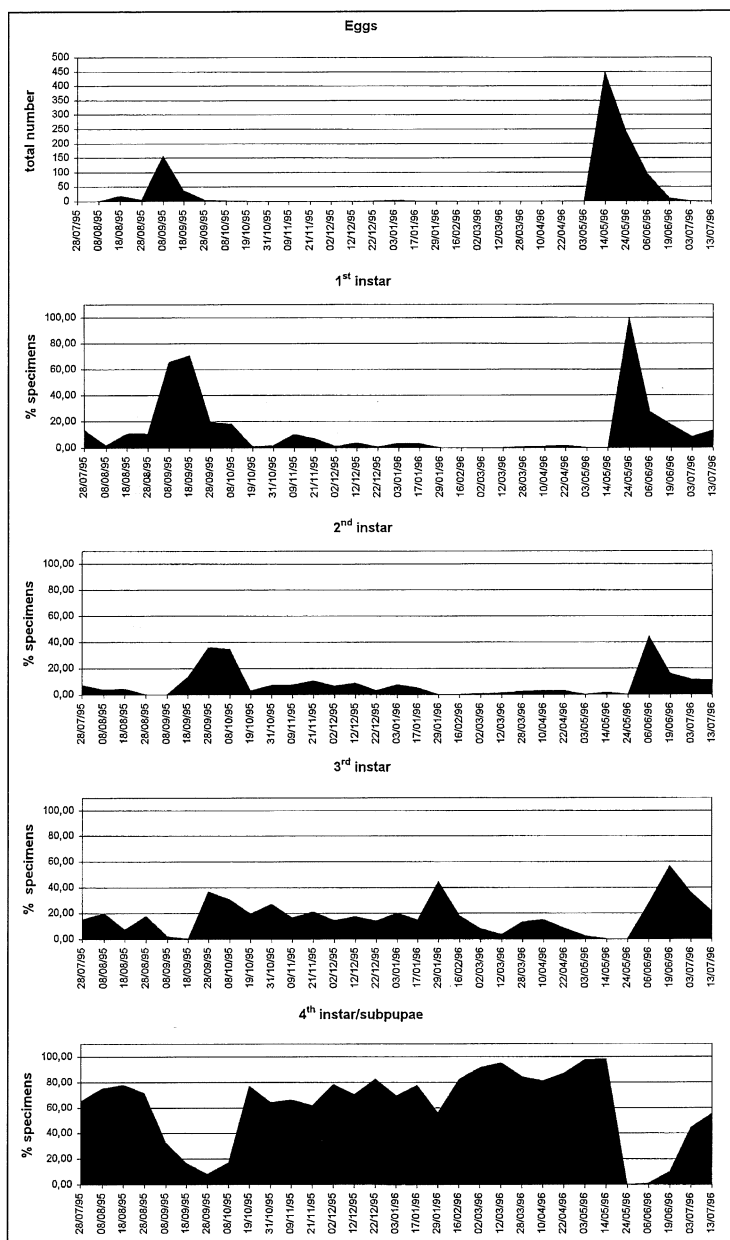
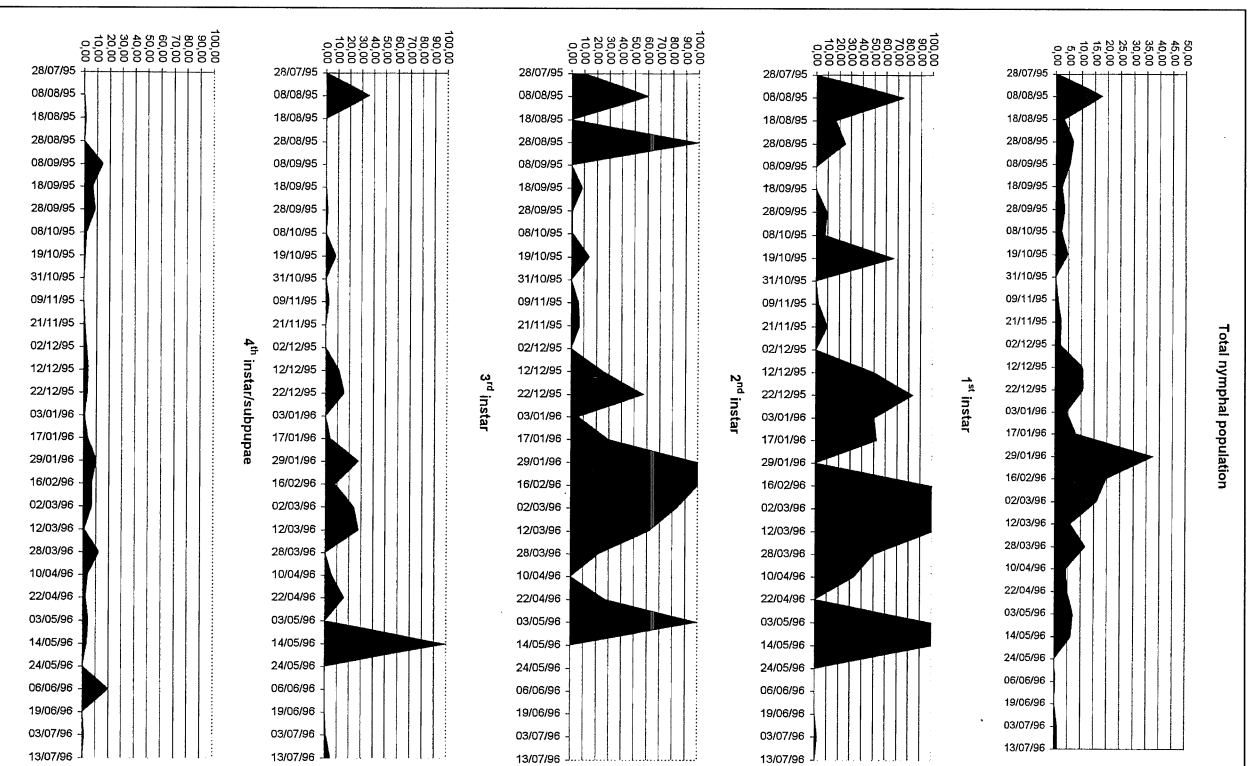


Fig. 1 - *Aleurolobus teucii* Mifsud & Palmeri: structure of pre-imaginal population in Eastern Sicily (eggs are reported as total number per 40 leaves; each nymphal stage is expressed as a percentage of larval population).



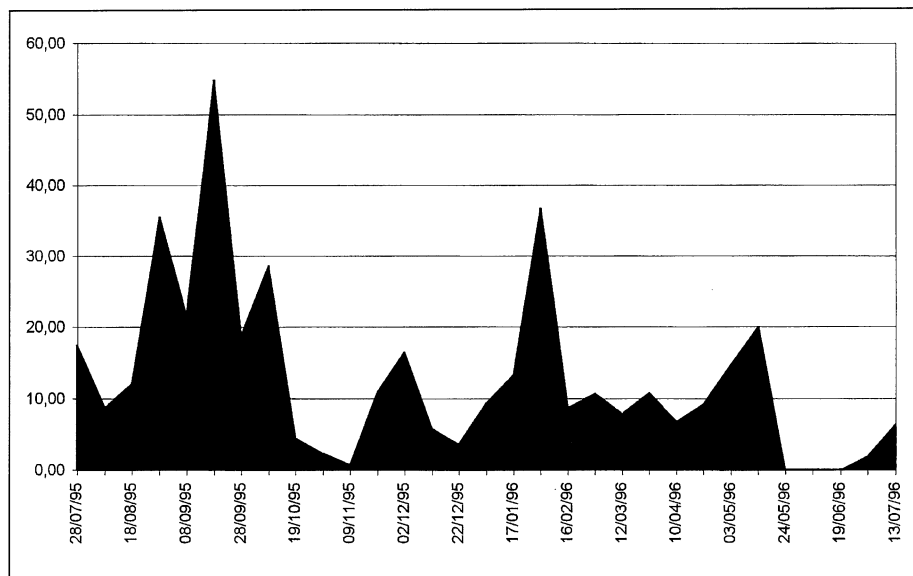


Fig. 3 - *Aleurolobus teucarii* Mifsud & Palmeri: parasitization rate by *Encarsia olivina* (Masi).

From a phytosanitary point of view, although a strict trophic relation exists between *A. teucarii* and its host plant, the whitefly does not seem to significantly harm *Teucrium fruticans*, apart from limited aesthetic damage. Nevertheless, although direct whitefly control does not seem to be required at present, the increasing economic potential of its host plant for ornamental purposes could lead to future changes in the phytosanitary status of *A. teucarii*.

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