



**An Extensive Biological Control Project
of *Parabemisia myricae* in Sicily**

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An Extensive Biological Control Project of *Parabemisia myricae* in Sicily

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Abstract. At the first appearance of *Parabemisia myricae* (Kuwana) in Eastern Sicily (October '90) a biological control project was realized on a 25,000 ha citrus cultivated area. The project (carried out by a cooperation between ARA - Catania and Institutes of agricultural Entomology of the University of Catania and Plant Protection of the University of Reggio Calabria), was based on introduction and diffusion of two parasitic wasps: *Encarsia meritoria* Gahan, founded in Calabria, and *Eretmocerus* sp., imported from Israel. A monitoring network allowed to check the whitefly distribution and to plane the releases program. Altogether, 100,000 pupae of *E. meritoria* and 30,000 pupae of *Eretmocerus* were released. The program was sponsored by the 'Consorzio di Bonifica della Piana di Catania'.

Parabemisia myricae (Kuwana) was first found in Italy in summer 1990, widely diffused in citrus-groves of Eastern Sicily (Rapisarda et al., 1990), in high population density. For this reason, and since the Japanese bayberry whitefly was considered as an injurious pest in other citrus areas as Israel (Sternlicht, 1979), Cyprus, Turkey (CAB International Institute of Entomology, 1986) and California (Rose et al., 1981), an extensive biological control program was sponsored by the 'Consorzio di Bonifica della Piana di Catania' (an agricultural public organization, of 103,000 ha total surface, 40,000 ha of which are citrus-groves). This program has been carried out thanks to a cooperation among the Institutes of agricultural Entomology of the University of Catania and Plant Protection of the University of Reggio Calabria, for scientific aspects, and ARA, for technical organization. The biological control program was realized by introducing, rearing and spreading *Encarsia meritoria* Gahan, detected on *P. myricae* in Calabrian citrus-groves (Longo et al., 1990b), and *Eretmocerus* sp., introduced from Israel and then reared in nurseries; the original samples of the latter parasite were kindly supplied by Prof. E. Swirski, the Volcani Center, Bet Dagan, Israel.

This paper reports the obtained results.

Materials and Methods

The project was divided in two joined steps.

First step (November - December 1990). In this phase were realized: a preliminary survey of whitefly distribution in the Consorzio di Bonifica area. Not less than 30 citrus trees for each sampling point were checked, to ascertain the whitefly presence and its density; a releases program, in order to obtain a net of release points homogeneously covering the area; several collections in Calabrian orchards of citrus leaves, bearing whitefly nymphs with *E. meritoria* preimaginal stages and, at the same time, a citrus plants nursery, in a greenhouse close to Catania, for rearing and reproducing the entomophagous collected; microscopic observation and selection of the collected material, in order to avoid incidental introductions of other pests; distribution of *E. meritoria* in one of the two plots of the rearing greenhouse;

arrangement of the release units (500 pupae of parasites obtained from the field for each unit); diffusion of the parasites in 83 citrus-groves heavily infested (a release unit for each citrus grove); check of field parasitization.

Second Step (January - November 1991). In this phase were realized: rearing in greenhouse of the Israeli strain of *Eretmocerus* sp. in the other plot; arrangement and diffusion of the release units (at least 150 *Eretmocerus* sp. and 500 *E. meritoria* specimens for each unit). A total of 217 release points were realized; check of field parasitization. In each investigated citrus orchard, inside and outside (500 - 2,000 m far from the release point), one sample of 50 leaves was collected, with preimmaginal stages of *P. myricae*. Each sample was observed, in laboratory, recording living, dead and parasitized stages of Japanese bayberry whitefly. The parasitized specimens were distinguished in relation to the presence of *Eretmocerus* or *Encarsia*.

A synoptic table is reported (Fig. 1).

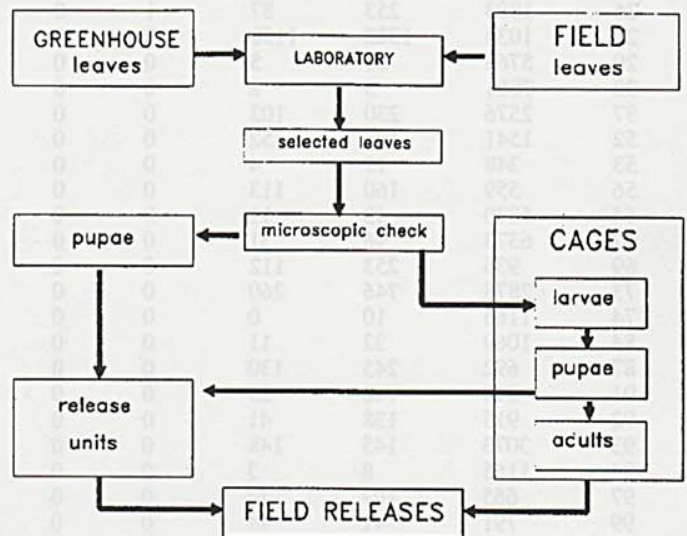


Figure 1. Synoptic scheme of entomophagous utilization.

Results and Discussion

Results of checked field parasitization are reported in Tables and 2.

The preimaginal stages parasitized by *Eretmocerus* and *Encarsia*, were distinguished by means of the absence or presence of black pupal remains respectively. Occasional parasitization by *Cales noacki* Howard, already reported for the investigated areas (Longo et al., 1990a), was enclosed in the former case.

The parasitization values by *E. meritoria*, outside and inside the release point, were negligible and the parasite was found occasionally.

Inside the release points, the total number of *P. myricae* nymphs, with *Eretmocerus* preimaginal stages, set about 9.4% of total alive nymphs of the whitefly (probably this value could be much higher than the recorded one, because the pupa is the only preimaginal stage which is easily distinguishable in *Eretmocerus*). The percentage of *Eretmocerus* parasitization holes was more than 8%.

Outside the release points the total number of *P. myricae*

Table 1. Number of parasitized specimens of *P. myricae* by *Eretmocerus* sp. and *E. meritoria* recorded inside the areas subjects of biological control program in November 1991. R.P.= release point; *P. myr.* alive: number of *P. myricae* living specimens; P.P. *Eret.*: *P. myricae* nymphs with presence of preimaginal stages of *Eretmocerus*; P.P. *Enc.*: *P. myricae* nymphs with presence of preimaginal stages of *Encarsia*; P.H. *Eret.*: *P. myricae* nymphs with presence of emergence hole of *Eretmocerus*; P.H. *Enc.*: *P. myricae* nymphs with emergence hole of *Encarsia*.

R.P. n°	<i>P.myr.</i> alive	P.P. <i>Eret.</i>	P.H. <i>Eret.</i>	P.P. <i>Enc.</i>	P.H. <i>Enc.</i>
1	3514	285	280	0	0
2	1868	210	12	0	0
4	4139	480	242	0	0
10	94	134	176	0	7
15	2910	211	56	0	1
16	2149	212	1359	0	0
18	838	619	1264	1	0
20	2954	306	254	0	2
26	1883	253	87	1	0
28	1034	1322	1158	0	0
29	5768	61	5	0	0
32	7851	5	2	0	0
37	2576	230	102	0	0
52	1541	184	52	0	0
53	348	15	4	0	0
56	559	160	113	0	0
64	5370	43	11	0	0
67	6373	96	31	0	0
69	936	253	112	0	0
73	2878	746	260	0	0
74	1165	10	0	0	0
84	1069	32	11	0	0
87	692	245	130	0	0
91	814	146	29	0	0
92	915	138	41	0	0
93	3073	145	148	0	0
94	1165	8	3	0	0
97	665	107	12	0	0
99	791	41	44	0	0
114	204	46	25	0	0
125	934	40	14	0	0
127	1346	32	15	0	0
156	2601	181	89	0	0

Table 2. Number of parasitized specimens of *P. myricae* by *Eretmocerus* sp. and *E. meritoria* recorded close the areas subjects of biological control program in November 1991. C.P.= checked point; *P. myr.*: number of *P. myricae* living specimens; P.P. *Eret.*: *P. myricae* instar larvae with presence of preimaginal stages of *Eretmocerus*; P.P. *Enc.*: *P. myricae* instar larvae with presence of preimaginal stages of *Encarsia*; P.H. *Eret.*: *P. myricae* instar larvae with presence of hole due to *Eretmocerus*; P.H. *Enc.*: *P. myricae* instar larvae with presence of hole due to *Encarsia*.

C.P. n°	<i>P.myr.</i> alive	P.P. <i>Eret.</i>	P.H. <i>Eret.</i>	P.P. <i>Enc.</i>	P.H. <i>Enc.</i>
1	4776	365	31	0	0
2	2106	58	16	0	0
3	17	67	74	0	0
4	173	48	29	0	0
5	2807	66	36	0	0
6	260	33	12	0	0
7	1728	20	4	0	0
8	329	45	21	0	0
9	2492	352	99	0	0
10	2409	209	73	0	0
11	999	18	1	0	0
12	1586	53	6	0	0
13	1506	40	78	0	0
14	2122	187	80	0	0
15	1570	27	19	0	0
16	2012	444	95	0	0
17	3079	117	27	0	0

nymphs, with *Eretmocerus* preimaginal stages, set about 6.7% of total alive nymphs of the whitefly, while the percentage of *Eretmocerus* parasitization holes was more than 2.3 %.

The reported data show that *Eretmocerus* sp. was well acclimatized, in the release and surrounding points, reaching an average of parasitization up to 15.8 % inside the release points and up to 8.8% out of them, just few weeks after the first releases. On the contrary, *E. meritoria* did not resulted an effective biological control agent, because was not acclimatized up to November 1991.

With reference to the previous observations, the program gave appreciable results, allowing the diffusion of *Eretmocerus* sp. that results presently the most effective parasitoid of *P. myricae*.

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