

Establishment of *Leptomastix dactylopii* (HOW.) in Cyprus.

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ACCLIMATATION DE *LEPTOMASTIX DACTYLOPII* HOW.
A CHYPRE

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RESUME - Le parasite de la Cochenille farineuse *Planococcus citri* (R.), *Leptomastix dactylopii* HOW., a été introduit à Chypre et deux ans d'échantillonnage montrent qu'il s'est bien établi. Le niveau atteint par le parasitisme est de 15 p. 100. La parcelle de *Citrus* en lutte biologique montrait quatre fois moins de Cochenilles sur fruit à la récolte, que la parcelle qui recevait trois traitements chimiques.

INTRODUCTION

The Citrus mealybug *Planococcus citri* (R.) has become a very severe problem recently and localized outbreaks are often associated with the destruction, or lack of natural enemies. The damage in many cases persists for a number of years despite the extensive use of chemicals. The coverage of the body of the mealybug by a waxy material as well as the protection given to the pest by the fruit's sepals makes the chemicals inaccessible to their body. Furthermore the sooty mould that follows, as a result of the mealybug presence, increases the level of the damage, because fruits covered with the sooty mould are unsuitable for the market.

The introduction of biological control agents to combat the problem in the past was unsuccessful by the liberation of *Cryptolaemus montrouzieri* (MULS.). The objective of the present work was to introduce a new species of parasite against the citrus mealybug and assist its establishment. Subsequently the efficiency was evaluated in comparison with standard chemical treatments.

MATERIALS AND METHODS

The parasites of *Leptomastix dactylopii* (HOW.) were introduced from Palermo of Italy in 1977. They have been reared locally at Phasouri farm as indicated by FISHER (1965). The liberation of parasites in the citrus orchard was initiated in May 1978 at Phasouri farm Limassol. The plot where the liberations were made was known to have a severe mealybug infestation and did not receive chemical treatments before and after the liberations. The numbers and period of *Leptomastix dactylopii* liberations are indicated below :

month	numbers liberated
May 1978	3,050
June 1978	3,770
July 1978	7,100
August 1978	5,940
September 1978	5,370
October 1978	1,000
total	26,230

In the following year, 1979, the liberation of parasites ceased so that to be able to assess the overwintering ability under the climatological conditions of Cyprus. Four months

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after the first liberations of parasites a sample of 25 fruits infested by the mealybug was collected and the number of mealybugs present on the fruits was counted and subsequently the parasites emerged in the cages where the infested fruits were kept, were also recorded. There have been two samples in 1978 and another two in 1979.

To be able to have comparable results with those received in the *Leptomastix dactylopii* plot, two additional plots nearby the first one, in the same farm, received different treatments. One of them received the regular chemical treatments (a) parathion 50 % E at 0,13 % in June, (b) Methomyl 90 % at 0,04 % in September and Methidathion 40 % E at 0,1 % in November. The other one was used as control without any treatment. When the fruits of the three treatments were harvested, a random sample of 100 fruits was taken, when transferred to the packing house. The fruits were carefully examined and when a mealybug infested fruit was found, the number of mealybugs present were counted under the binocular and separated into parasitized, non parasitized and old parasitization (Table 2).

RESULTS

Table 1, shows that the parasite *Leptomastix dactylopii* managed to parasitize its host insect few months after its liberation in the citrus orchard. The degree of parasitism given by *Leptomastix* sp. in the first sampling of 1978 was 9 % while by *Anagyrus* sp. was 14 %. In the following year the observed degree of parasitism by *Leptomastix* sp. increased to 15 % while by *Anagyrus* sp. decreased to 10 %.

Table 2, shows the results taken at harvest period in three different treatments. The plot that received three chemical treatments showed four times more infested fruits than the *Leptomastix* treated plot and two times more than the untreated plot.

The level of parasitization was 16 % in the *Leptomastix* sp. treated plot, 6 % in the chemically treated plot and 9 % in the untreated plot.

TABLE 1 - Degree of parasitism given by *Leptomastix* sp. and *Anagyrus* sp. in 1978 and 1979.

Sampling date	Nº of mealybugs counted *	Nº of reared <i>Leptomastix</i> sp.	Nº of reared <i>Anagyrus</i> sp.	Old parasitization	Dead mealybug
a) 13.9.78 1978	92	8 (9 %)	13 (14 %)	25 (27 %)	2 (2 %)
b) 11.10.78	58	4 (7 %)	6 (10 %)	25 (30 %)	3 (5 %)
20.8.79 1979	78	11 (15 %)	7 (10 %)	7 (10 %)	10 (14 %)
20.9.79	55	6 (11 %)	2 (4 %)	19 (35 %)	20 (36 %)

* from 25 fruits

TABLE 2 - Comparison of the efficiency of three treatments on mealybug.

treatment	Nº of infested by mealybug fruits	Nº of mealybugs counted	Parasitized mealybugs	Old parasitization	Dead mealybugs
(1) (a) Parathion 20.6.78	20	208	12 (6 %)	27 (13 %)	129 (62 %)
(b) methomyl 22.9.78					
(c) methidathion 9.11.78					
(2) <i>Leptomastix dactylopii</i>	5	193	30 (16 %)	53 (27 %)	80 (41 %)
(3) control	10	163	15 (9 %)	27 (16 %)	78 (48 %)

DISCUSSION

The appearance of *Leptomastix dactylopii* in all the four samples of fruits taken not only soon after the liberations but also one year after their cessation and particularly the increased parasitism in the second year is very encouraging. Furthermore the observed higher degree of parasitization of the newly introduced parasite compared with that of the already existing, the *Anagyrus* sp., may increase even further in the future.

In table 2 it is shown quite clearly how detrimental chemicals can be if not used at the right time, to prevent the establishment of mealybug on the fruit. The untreated plot had two times less infested fruits than the treated with chemicals plot. MINEO and VIGGIANI in 1976 presented a comparison of combination of biological control and chemical control together with biological control alone and received

no difference between the two treatments. Quite recently it was showed by BERLINGER and GOLBERG (1978) that the fruit sepals protect the mealybugs not only from the chemical treatments but parasitization as well. It is therefore concluded that in any future work on an integrated control programme for mealybug on citrus, further interest should be paid on the biology of the pest so that to achieve the right period to treat with chemicals. By achieving this target the effect of chemicals on the parasite will also be minimised because they mostly appear and activate in the middle of summer. It is expected in this way that the number of mealybugs, that manage to establish on the fruits will be greatly reduced, and their control will be supplemented by the parasite of *Leptomastix dactylopii*, which in the meantime will be given the chance to be expanded in all the remaining areas where citrus are grown.

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