

# Evaluation of permanent establishment of *Leptomastix dactylopii* How. against *Planococcus citri* (Risso) in Citrus orchards in India.

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EVALUATION OF PERMANENT ESTABLISHMENT OF *LEPTOMASTIX DACTYLOPII* HOW. AGAINST *PLANOCOCCUS CITRI* (RISSO) IN CITRUS ORCHARDS IN INDIA.

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**ABSTRACT** - A study conducted from October 1985 to December 1986 in one of the Citrus orchards where releases were suspended since August 1984 revealed that an exotic parasitoid, *Leptomastix dactylopii* Howard introduced into India against *Planococcus citri* (Risso) was found permanently established. An overall mean of 2.33 adults of *L. dactylopii* was recovered round the year from each mealybug infested fruit. Status of *P. citri* and effect of pesticides used in the orchard on the activity of the parasitoid are also discussed.

ETUDE DE L'INSTALLATION DE *LEPTOMASTIX DACTYLOPII* HOW. CONTRE *PLANOCOCCUS CITRI* (RISSO) DANS DES VERGERS D'AGRUMES EN INDE.

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**RESUME** - Une étude menée d'octobre 1985 à décembre 1986 dans des vergers d'agrumes où les lâchers ont été arrêtés depuis août 1984 a montré qu'un parasite, *Leptomastix dactylopii* HOWARD, introduit pour lutter contre *Planococcus citri* (RISSO) s'était établi d'une façon permanente. Une moyenne de 2,33 adultes de *L. dactylopii* a été collectée toute l'année sur chaque fruit attaqué par la cochenille. On traite aussi de la situation de *P. citri* et de l'effet des pesticides employés dans le verger sur l'activité du parasite.

## INTRODUCTION

Citrus is one of the major fruit crops in India. The mealybug, *Planococcus citri* (Risso), (Homopt., Pseudococcidae) recently attained a major pest status in some Citrus orchards mainly due to the fact that many registered insecticides failed to control the pest. Zinna (1963), Luppino (1979) and Krishnamoorthy and Singh (1987) have successfully controlled the mealybug *P. citri* by releases of an exotic parasitoid, *Leptomastix dactylopii* Howard (Hym., Encyrtidae) (origin Brazil and West Indies). In the present study an investigation was made to assess the extent of establishment of the parasitoid *L. dactylopii* in one of the release orchards and results are presented in this paper.

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## MATERIALS AND METHODS

One of the Citrus orchards where inoculative releases of *L. dactylopii* were effected by earlier workers and suspended since August 1984 was chosen to evaluate the establishment from October 1985. The sweet orange (*Citrus sinensis* Osbeck) plants in the orchard were producing two crops in a year under Bangalore conditions viz., summer crop (flowering in October and harvesting in May) and monsoon crop (flowering in February and harvesting in October/November). Thus fruits of different ages were found almost round the year in the orchard. Mealybug infestation therefore on 100 randomly selected fruits in the orchard was observed for computing per cent infestation. Mere presence of one or many mealybugs on the fruits was considered as affected fruit. The establishment of the parasitoid was assessed based on the emergence of *L. dactylopii* from mealybug infested fruits. Mummies found at the time of sampling from each mealybug infested fruit were recorded along with mummies subsequently formed from the same fruit held in the laboratory at  $27 \pm 2^\circ\text{C}$  and 60-75% RH. In the end the data were pooled to as number of adults recovered per infested fruit.

Observations though at different dates were made in every month, the data of each month were finally pooled and presented for month-wise. Similarly but occasional sampling of mealybug infested fruits from an adjacent sweet orange orchard was also made just to record the dispersal and establishment of *L. dactylopii*. Number of pesticidal sprays used in these two orchards were recorded to find out the extent of pesticide interference on the establishment of *L. dactylopii* between the orchards. Weather data pertaining to the study period indicated that the monthly mean minimum and maximum temperatures were ranging from 15.6 to 22.2°C and 26.6 to 35.1°C respectively. The monthly mean of minimum and maximum relative humidity were ranging from 27 to 64% and 67 to 86% respectively. The total rainfall received per month during the study period ranged from 0.0 to 245.2 mm.

### RESULTS

The mean number of parasitoid, *L. dactylopii* recovered per mealybug infested fruit during fifteen months ranged from 0.40 to 8.20 (Table 1), suggesting that the parasitoid had established in the orchard since releases were suspended in August 1984. The number of parasitoid recovered per infested fruit though low the over all performance of the parasitoid was revealed by the low per cent fruit infestation in the orchard (Table 1). The reduction in the number of parasitoid recovered per infested fruit (except Jan-May'86) was mainly due to either complete control of mealybug in the orchard or insecticide interference. High activity of *L. dactylopii* in November'85 resulted in disappearance of both pest and parasitoid in December'85. However reappeared subsequently in large numbers, use of one spray in each of fenvalerate and quinalphos in the month of February and early March'86 for the control of leaf minor and green scale, resulted in the reduction in the parasitoid recovery and increase in the mealybug infestation. Subsequent withdrawal of pesticides created a favourable environment of the increased activity of parasitoid

which resulted in complete control of mealybug once again in the month of June 86 and disappearance of parasitoid.

Seven rounds of monocrotophos and four rounds of fenvalerate sprayed since late July to December 86 (Table 2), for the control of red scale, leaf minor and lemon butterfly, reduced the activity of *L. dactylopii* drastically and gradually aggravated the problem of mealybug in the orchard. Despite such insecticidal pressure in the orchard, the parasitoid was able to survive on the mealybug population.

Sampling made twice in the adjacent sweet orange orchard which was about 0.5 km away to assess the dispersal and establishment of *L. dactylopii* revealed that the parasitoid had migrated to the orchard where no releases were ever effected and got established. However the number of parasitoid recovered per infested fruit was very low and the mealybug infestation while itself was very low. Pesticides used in the orchard are presented in table 2. First sampling was made seven days after the spray of ethion and cypermethrin while the second observation was taken before the spray of cypermethrin. The parasitoid population which got reduced due to the application of cypermethrin, slowly multiplied during August and September and reached to 1.01 adults per infested fruit before spraying cypermethrin. However this spray would have subsequently reduced the parasitoid population once again. Use of fewer rounds of synthetic pyrethroid as a whole would spare the parasitoid for very good control of the mealybug.

### DISCUSSION AND CONCLUSION

The exotic parasitoid, *L. dactylopii* after introduction into India found got permanently established in the released orchard. Dispersal of the parasitoid also indicated that the parasitoid would survive throughout the year in one or other Citrus orchards and offer good control of mealybug

TABLE 1 - Status of *P. citri* and establishment of *L. dactylopii*.

Month	Orchard A*		Orchard B**	
	% fruit damage	$\bar{x}$ parasitoid recovered/ infested fruit	% fruit damage	$\bar{x}$ parasitoid recovered/ infested fruit
Oct. 85	2.00	1.47	-	-
Nov.	5.00	8.20	-	-
Dec.	0.00	0.00	-	-
Jan. 86	3.00	4.29	-	-
Feb.	2.00	4.40	-	-
March	6.00	2.79	-	-
April	5.00	5.40	-	-
May	3.00	4.57	-	-
June	0.00	0.00	-	-
July	1.00	0.83	3.00	0.23
Aug.	0.80	0.40	-	-
Sept.	2.00	0.00	-	-
Oct.	3.00	0.67	4.00	1.01
Nov.	6.00	0.00	-	-
Dec.	18.00	2.00	-	-

\* - where parasitoid was previously released

\*\* - parasitoid never released.

TABLE 2 - Details of pesticidal sprays given in sweet orange orchards.

Orchard A *		Conc. used (%)	Orchard B **		Conc. used (%)
Spraying date	Pesticide used		Spraying date	Pesticid used	
6.2.86	tridemorphe	0.05	21.1.86	quinalphos	0.05
17.2.86	fenvalerate	0.01	12.2.86	fenvalerate	0.01
28.2.86	quinalphos	0.05	15.3.86	tridemorphe	0.05
10.3.86	quinalphos	0.05	16.6.86	dicofol+ sulphur	0.05 + 0.32
23.4.86	ethion	0.10	28.7.86	ethion+ cypermethrin	0.10 + 0.005
15.7.86	monocrotophos+ fenvalerate	0.08 + 0.01	20.10.86	cypermethrin	0.005
28.7.86	monocrotophos	0.08	22.11.86	quinalphos+ ethion + sulphur	0.05 + 0.10 + 0.32
21.8.86	monocrotophos + fenvalerate	0.08 + 0.01	29.12.86	sulphur	0.32
8.9.86	monocrotophos	0.08			
19.10.86	monocrotophos+ fenvalerate	0.08 + 0.01			
25.11.86	monocrotophos	0.08			
30.12.86	monocrotophos+ fenvalerate	0.08 + 0.01			

\* - parasitoid previously released

\*\* - parasitoid never released

*P. citri*. Such establishment of *L. dactylopii* was also previously documented by Krambias and Kontzonis (1980) and Barbagallo *et al.* (1981) in other countries. Whereas Carrero (1979) reported that *L. dactylopii* did not establish in province of Valencia (Spain) after introduction from Italy.

First and foremost factor which appears to have influenced the permanent establishment of the parasitoid in India was the mild weather, because according to Zinna (1963) and Longo and Benfatto (1982), the parasitoid could not survive the extreme winter in the Island of Procida and in Sicily or mainland Italy. The ideal weather thus prevailing especially in Bangalore, South India undoubtedly created a favourable environment for a permanent establishment of *L. dactylopii* as reported by Krishnamoorthy and Singh (1987). Therefore it is not required for rearing and periodical releases unlike as observed by Zinna (1963) and Longo and Benfatto (1982) for areas with severe winter conditions.

The parasitoid was so effective that it completely controlled the mealybug populations in two occasions and

disappeared from the orchard as reported earlier by Luppino (1979) and Krishnamoorthy and Singh (1987). In addition to the weather, the permanent establishment of the parasitoid was also aided by the presence of low population of *P. citri* in the Citrus orchard and so also from *P. citri* infested plants in the region such as pomegranate, guava, etc. which are 3-5 km away. (Krishnamoorthy and Mani, 1989). Interference of insecticides appeared to have created a favourable environment in the orchard for continued presence of *P. citri*. As observed in the present study, unpublished data of the author also supported that the synthetic pyrethroids are highly toxic to *L. dactylopii*. Thus whenever many rounds of insecticides especially synthetic pyrethroids are sprayed, care may be taken to reintroduce the parasitoid in the orchard after a safe period for better control of *P. citri*.

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#### REFERENCES

- BARBAGALLO (S.), LONGO (S.) and PATTI (I.). 1981. Primi risultati di lotta biologica - integrata in Sicilia orientale contro il cotonello e il dialeurode degli agrumi. *Fruits*, 36 (2), 115-121.
- CARRERO (J.M.). 1979. Entomophages of Citrus coccids in the province of Valencia. *Proc. International Symposium of IOBC/WPRC on Integrated control in agriculture and forestry, Vienna, 8-12 Oct.*, 648 p.
- KRAMBIAS (A.) and KONTZONIS (A.). 1980. Establishment of *Leptomastix dactylopii* How. in Cyprus. *Fruits*, 35 (12), 783-785.
- KRISHNAMOORTHY (A.) and MANI (M.). 1989. Recovery of *Leptomastix dactylopii* How. from *Planococcus citri* (Risso) infested plants. *J. Biol. Control*, 3,(2) : (In Press).

**KRISHNAMOORTHY (A.) and SINGH (S.P.). 1987.**

Biological control of Citrus mealybug, *Planococcus citri* with an introduced parasite, *Leptomastix dactylopii* in India.  
*Entomophaga*, 32 (2), 142-148.

**LONGO (S.) and BENFATTO (D.). 1982.**

Utilization of *Leptomastix dactylopii* How. for biological control of the Citrus mealybug in eastern Sicily.  
*Informatore Agrario*, 38, 19671-19676.

**LUPPINO (P.). 1979.**

Biological control for the protection of Citrus groves :  
*Planococcus citri* is controlled using *Leptomastix dactylopii*.  
*Informatore Agrario*, 35, 4183-4186.

**ZINNA (G.). 1963.**

Experiments on the biological control of the Citrus mealybug *Pseudodoccus citri* (Risso) on the Island of Procida by means of two foreign parasites, *Pauridia peregrina* Timb. and *Leptomastix dactylopii* Howard.  
*Boll. Lab. Ent. agr. Portici*, 18 p.

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**ESTUDIO DE LA INSTALACION DE *LEPTOMASTIX DACTYLOPII* HOW. CONTRA *PLANOCOCCUS CITRI* (RISSO) EN HUERTAS DE AGRIOS EN LA INDIA.**

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**RESUMEN** - Un estudio llevado a cabo de octubre 1985 a diciembre 1986 en huertos de cítricos en dónde las sueltas se detuvieron desde agosto de 1984 ha mostrado que un parásito, *Leptomastix dactylopii* HOWARD, introducido para luchar contra *Planococcus citri* (RISSO) se había establecido de una manera permanente. Una media de 233 adultos de *L. dactylopii* se ha recogido todo el año en cada fruto atacado por la cochinilla. Se trata también de la situación de *P. citri* y del efecto de los pesticidas empleados en el huerto sobre la actividad del parásito.

