

Field evaluation of coffee mealy bug parasitoid, *Leptomastix dactylopii* (How.) in Wayanad district of Kerala, India

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Abstract: Field releases of the exotic parasitoid, *Leptomastix dactylopii* were carried out on seven zones in Wayanad district of Kerala against coffee mealy bug *Planococcus citri* during the pest season of year 2006. The mean percentages parasitism by *L. dactylopii* in seven zones of Wayanad district of Kerala after 30, 60 and 90 days of release were 51.18 ± 5.38 , 63.61 ± 6.18 and 76.51 ± 5.56 respectively. The results indicate that *L. dactylopii* readily attacks, colonises, establishes and reduces the mealybug, *P. citri* population to substantial level under Wayanad condition. Hence it can be used in Wayanad for coffee mealy bug control.

Key words: mealy bug; *Leptomastix dactylopii*; field evaluation, wayanad

INTRODUCTION

Planococcus citri (Risso) (Homoptera: Pseudococcidae) is one of the major economically important pseudococcids infesting coffee in Wayanad district of Kerala. A large number of native natural enemies attack *P. citri* in coffee and their contribution in its suppression is valuable (Reddy *et al.*, 1990). But, although they have substantial impact, late in the pest season, the natural enemies generally do not maintain the populations of the pest below the economic threshold level. Biological control of *Planococcus spp.* using *Cryptolaemus montrouzieri* (Muls.) (Coleoptera: Coccinellidae) was attempted since 1976 and the control achieved was partial to complete (Chacko *et al.*, 1983). Further observations on *C. montrouzieri* revealed that it could build up its population at high pest density only by which time the mealy bug would have caused severe damage to crop (Anonymous, 1987).

In order to tackle *P. citri* more effectively through biological means, an encyrtid parasitoid, *Leptomastix dactylopii* (How.) (Hymenoptera: Encyrtidae) was first introduced to India through Indian Institute of Horticultural Research in 1983 from Trinidad, West Indies (Anonymous, 1983). *L. dactylopii* was earlier introduced to some other countries and the results varied from recoveries during the seasons of release to permanent establishment (Clausen, 1978). The study reported here was carried out to evaluate the performance of *L. dactylopii* in the coffee tracts of Wayanad district of Kerala, India.

MATERIALS AND METHOD

The field evaluations were carried out during the year 2006 (February to March) to assess the performance of the exotic parasitoid, *L. dactylopii* against coffee mealy bugs, *P. citri* in the coffee tracts of Wayanad district of Kerala. There are seven liaison zones in Wayanad viz. 1) Chundale 2) Kalpetta 3) Meenangadi 4) Sulthanbathery 5) Pulpally 6) Mananthavady and 7) Panamaram. These zones comprise groups of coffee growing villages with an average elevation of 900 meters. Kalpetta zone covers Kalpetta, Venganapally, Muttill and Kottathara villages. The villages Purakkadi and Poothadi constitute Meenangadi liaison zone. Chundale zone comprises Thariode, Achooranam, Kunnathidavaka, Mooppainad and Kottappadi villages. Panamaram zone covers Anchukunnu, Kuppethodi, Porunnannur and Kaniambetta villages. The villages Pulpally, Padichira and Irulam form Pulpally zone. Sulthanbathery zone covers Sulthanbathery, Kidanganad, Nenmeni, Noolpuzha and Ambalavayal. Mananthavady liaison zone covers Thirunelli, Thavinhal, Nellurnad, Edavaka, Venom, Peria, Vellamunda, Kuppadithara, Thondarnad and Padinjarathara villages. A total of 21 estates were selected for this study. Three estates were selected from each liaison zone. The details of the estates are furnished below.

i. Chundale zone

1. Cottanad Estate, Meppadi.
2. Aysha Plantation, Vythiri.
3. Padivayal Estate, Padivayal.

ii. Kalpetta zone

1. Warriat Estate, Muttill.

2. Edaguni Estate, Edaguni.
3. Plakandy Estate, Puthoorvayal.

iii. Meenangadi zone

1. Eden Vally, Vakery.
2. Georgia Estate, Krishnagiri.
3. Libra Garden, Appatt.

iv. Sulthanbathery zone

1. Beenachi Estate, Beenachi.
2. Vedankotta Estate, Cheeral.
3. Geetha Estate, Kaloor.

v. Pulpally zone

1. Dhanalakshmi Estate, Kurchipetta.
2. K. Krishnanunni Estate, Irulam.
3. Sreedharan Estate, Manalvayal.

vi. Mananthavady zone

1. Bisonfield Estate, Kartikulam.
2. Bhargiri Estate, Tholpetty.
3. Technical Evaluation Centre, Coffee Board, Kuzhinilam.

vii. Panamaram

1. Prasanthi Estate, Pachilakkad.
2. Ramdham Estate, Krishnamoola.
3. Muralivihar Estate, Kayakunnu.

The variety of coffee grown in these estates was S.274 (*Coffea canephora* var. *robusta*) and the plants were 25 to 60 years old. The spacing maintained between the plants was 10' X 10' with medium shade pattern. The parasitoid, *L. dactylopii* was reared in the glass house on mealybug infested pumpkins as described by Chacko (1982) for *Cryptolaemus montrouzieri* (Muls.). About 25,000 adult parasitoids were released in a hectare plot of each estate during February 2006. There were 1087 plants in each experimental plot. The mealybug infestation levels were medium to high in the experimental plots. A mealybug count of 1-5 on a node was considered as low, 6-20 as medium, 21 to 40 as high and mealybugs over 40 as severe (Gokuldas Kumar *et al.*, 1989). During the period of the study the average relative humidity was 75.4% and maximum and minimum temperatures were 30.6 °C and 18.9 °C respectively.

For sampling and observations the methods developed by Atwal and Singh (1990) and Reddy *et al.* (1988) were followed. For sampling, one hectare plot was divided into quadrants consisting of 16 plants. Five plants from the quadrant, one at centre and four from each corner of the quadrant were selected for sampling. 20 such quadrants were chosen for assessing the percentage parasitism of mealybugs by *L. dactylopii*. Follow up observations were made after 30, 60 and 90 days interval. From each plant one mealybug infested node with leaves was collected for observation. A total of 100 samples were collected from each plot for each observation. The collected nodes were taken to laboratory and the count of mealybug was made under microscope and classified as healthy and parasitised and calculated the percentage parasitism of the mealybug using the formula (Reddy *et al.*, 1988).

$$\frac{\text{Number of parasitised mealybugs}}{\text{Total number of mealybugs}} \times 100$$

RESULTS AND DISCUSSION

The data on the evaluation of the mealybug parasitoid *L. dactylopii* in Wayanad district of Kerala is provided in Table I. The highest rate of parasitism was recorded in Mananthavady zone (80.45 ± 8.06) followed by Chundale zone (80.24 ± 3.90), Kalpetta zone (80.00 ± 4.05), Pulpally zone (77.14 ± 4.49), S. Bathery zone (77.03 ± 5.17), Panamaram zone (71.54 ± 8.10) and Meenangadi zone (69.14 ± 4.49) after 90 days of release. There was no significant difference in parasitism between zones. The mean percentage parasitism by *L. dactylopii* in the seven zones of Wayanad after 30, 60 and

90 days of release was 51.18 ± 5.38 , 63.61 ± 6.18 and 76.51 ± 5.56 respectively. The results of the study clearly indicate that the parasitoid, *L. dactylopii* readily attacks, colonises, establishes and reduces the mealybug, *P. citri* to a substantial level.

In this direction the studies of various authors on various crops in India and other countries are noteworthy. Ortu and Prota (1983) reported 96 percent parasitism of *L. dactylopii* in citrus orchards in Sardinia. Barbagallo *et al.* (1982) claimed that the release of *L. dactylopii* on orange groves of Sicily for the management of *P. citri* gave very good results. *L. dactylopii* which was introduced into France in 1972, played an important role in the control of *P. citri* on citrus (Panis, 1983). Longo and Benefatto (1982) reported that *L. dactylopii* is able to control the citrus mealybugs in Italy. *L. dactylopii* was introduced into Cyprus from Italy in 1977, it has established and reported 15 percent parasitism of *P. citri* in citrus orchards (Krambias and Konzonis, 1980). Panis (1981) claimed that *L. dactylopii* has high searching ability and parasitizing scattered populations of mealybug nymphs. Meyerdirk *et al.* (1978) reported that *L. dactylopii* was the most abundant parasite in grape fruits and lime trees in Texas and parasitizing 21 percent of *P. citri*. Luppino (1979) claimed that the citrus trees with parasite, *L. dactylopii* did not become re-infested by *P. citri*, where as infestation by *P. citri* re-appeared where pesticides had been used. Mineo and Viggiani (1975) claimed that the incidence of infestation, percentage of infested fruits and percentage of commercially damaged fruits were not significantly different in citrus plots treated with parasites only and plots treated with both parasites and insecticides in Sicily. In Belgium, the *P. citri* infestation in green houses was successfully controlled by *L. dactylopii* and use of pesticides was substantially reduced (Ronse, 1990). Pest infestation averaging 38 percent of citrus orchards were drastically reduced to 5 percent by *L. dactylopii* in Queensland (Smith *et al.*, 1988). *L. dactylopii* was an active natural enemy in the management of mealybug, *P. citri* in date palm gardens of Libiya (Bitwa and Binsad, 1988). *L. dactylopii* were released to control mealybug, *P. citri* in Israel and pest free house plants were thus produced at low cost, or equal to that of conventional pest control (Rubin, 1985). *L. dactylopii* was introduced into Queensland from California in 1980 to control citrus mealybug, *P. citri*, in citrus and custard apple and 50 to 80 percent parasitism was reported within three months (Smith, 1991). In Morocco, the *P. citri* was effectively controlled in the citrus orchards by the release of *L. dactylopii* (Abdel Khalek *et al.*, 1998). In Ghana, the *L. dactylopii* was established in the cocoa gardens infested with *P. citri*, where it was introduced in 1949 (Ackonor, 2002). The citrus mealybug, *P. citri*, the main pest of citrus was controlled by *L. dactylopii* in Turkey (Ozkan *et al.*, 2001). Reciti *et al.* (2001) observed 50 to 70 percent parasitism of *L. dactylopii* in citrus gardens of Italy. Hannekam *et al.* (1987) reported that the *L. dactylopii* was the most successful parasitoid of commercial green houses of Netherlands. The use of *L. dactylopii* for the control of *P. citri* in Sardinia led to drastic reduction in the use of synthetic insecticides against *P. citri* (Fronteddu *et al.*, 1996). Viggiani (1975) reported that the multiplication and parasitism of *L. dactylopii* were very good in citrus gardens of Italy.

Inoculative release of *L. dactylopii* was made in orange and lime orchards in 1984 in Karnataka, for the control of *P. citri* by Krishnamoorthy and Singh (1987). Prior to the release, infestation by the pest ranged from 38 to 68 percent, but establishment of the parasitoid resulted in complete control within 3 to 4 months. Mani and Krishnamoorthy (2000) claimed that *L. dactylopii* reduced the population of *P. citri* from 128.80 adults to 8.10 adults within 2 months on pomegranates in India. Nagarkatti *et al.* (1992) reported that *L. dactylopii* caused cent percent parasitism of *P. citri* on mandarins in Karnataka within 2 months. For the suppression of *P. citri* on citrus and grape, inoculative release of *L. dactylopii* has proved very effective (Singh, 1993). Krishnamoorthy and Singh (1987) reported that the mealybug problems on citrus and pomegranate can be tackled in India with the use of *L. dactylopii*. *L. dactylopii* proves to be very effective in suppressing the mealybug, *P. citri* on acid lime, guava and pomogranate (Mani and Krishnamoorthy, 2001). Mani (1993) reported that the release of *L. dactylopii* was very effective against mealybugs in ber orchards. Mani and Krishnamoorthy (1997) claimed that *L. dactylopii* is able to suppress the problem of *P. citri* on supputa gardens in India. Mani (1994) reported that the release of *L. dactylopii* gives effective and permanent control of *P. citri* in guava orchards. The *L. dactylopii* was released in Tamil Nadu on sweet orange, acid lime and lemon, within 4 months, complete control was achieved (Krishnamoorthy, 1990). *L. dactylopii* caused 85 percent parasitism of coffee mealybugs in Sathya estate, Mudigere, Karnataka (Anonymous, 1986). 27 percent parasitism of coffee mealybug was recorded in Honsala estate, Kalasa, Karnataka (Anonymous, 1986). *L. dactylopii* caused 40 to 80 percent parasitism of coffee mealybugs in Ammanagiri estate and Badnekhane estate in Chikmagalur, Karnataka (Anonymous, 1987). From the foregoing discussion, it is concluded that the parasitoid, *L. dactylopii* is an effective bio agent of coffee mealybugs and it can be used in Wayanad district of Kerala for mealybug control.

Table 1. Evaluation of *L. dactylopii* in Wayanad district of Kerala

S.No.	Zones	Percent Parasitism		
		30 DAT Mean \pm SD	60 DAT Mean \pm SD	90 DAT Mean \pm SD
1.	Chundale	53.31 \pm 3.60	66.04 \pm 3.83	80.24 \pm 3.90
2.	Kalpetta	55.24 \pm 4.20	65.87 \pm 6.80	80.00 \pm 4.05
3.	Meenangadi	48.18 \pm 4.70	58.68 \pm 3.87	69.14 \pm 5.14
4.	S.Bathery	53.70 \pm 4.85	65.67 \pm 6.87	77.03 \pm 5.17
5.	Pulpally	47.45 \pm 6.28	62.42 \pm 6.21	77.14 \pm 4.49
6.	Mananthavady	52.73 \pm 5.96	65.49 \pm 7.69	80.45 \pm 8.06
7.	Panamaram	47.68 \pm 8.04	61.11 \pm 8.01	71.54 \pm 8.10
	Range	47.45 \pm 6.28 to 55.24 \pm 4.20	58.68 \pm 3.87 to 66.04 \pm 3.83	69.14 \pm 5.14 to 80.45 \pm 8.06
	Mean \pm SD	51.18 \pm 5.38	3.61 \pm 6.18	76.51 \pm 5.56

DAT – Days after treatment

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