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Research Article

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Preliminary studies on predatory potential of Australian ladybird beetle, *Cryptolaemus montrouzieri* Mulsant against Mealybug, *Planococcus lilacinus* Cockerell

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ABSTRACT

Mealybug *Planococcus lilacinus* Cockerell (Hemiptera: Pseudococcidae) damages Cocoa, Guava, Citrus, Cotton and other plant families. Besides causing direct loss to the plants they also reduce the market value of infested fruits. The extent of the damage may go up to 70 percent in a severe infestation. An Australian ladybird beetle, *Cryptolaemus montrouzieri* Mulsant (Coleoptera: Coccinellidae) introduced from Australia is a potential bio-control agent and is being utilized on many crops in Southern India. Mealybugs or scale insects constitute the natural food of certain ladybird beetles. The adult beetles as well as their larvae (grubs) seek the pests and feed voraciously on all stages. They often wipe out the entire pest colonies. The ladybird beetles are being used for suppression of mealy bugs in citrus, coffee, grapes, guava, ornamental and a variety of other crops. The feeding potential of different development stages of *C. montrouzieri*, a biological control agent against mealybugs, was investigated on *P. lilacinus*. Fourth instar grubs and adults of *C. montrouzieri* were the most voracious feeders of mealybug. The number of mealybug consumed by 1st, 2nd, 3rd and 4th instar larvae and adult beetles of *C. montrouzieri* was 20, 33.30, 37.50, 40 and 66.60 percent respectively. The results indicate that *C. montrouzieri* has the potential to be exploited as a bio-control agent. Inoculative releases of 4th instar larvae and adults may provide instant control of *P. lilacinus*. Field experiments should be conducted to determine the efficiency of the ladybird beetle on this mealybug.

KEYWORDS: Mealy bugs, *Planococcus lilacinus*, Bio-control agent, Ladybird beetle, *Cryptolaemus montrouzieri*, Cocoa

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INTRODUCTION

Mealy bugs, a sap sucking pest is often causing serious damage in many crops including grapes, papaya, citrus, hibiscus, cocoa, cotton, etc., (Nagrare et al., 2009). They have now developed as a major pest from the status of minor pest. Infestation of the growing points of the plants, especially with the pink mealy bug results in malformation of leaves and shoots tips. Honeydew excreted by mealy bug nymphs and adults support the growth of sooty mould on leaves, shoots and bunches. The importance of the species has warranted its control using chemicals and biological control agents in several parts of India, mainly on coffee, cocoa, custard apples, mandarins, etc., The use of chemical pesticides results in the accumulation of chemical residues in the soil, food stuffs, animals and even humans. Excess use of these chemicals also results in the development of resistance as well as resurgence in the target pests. Hence the use of biological control measures can help to reduce the hazards to a considerable extent (Anon, 2010).

In order to overcome the above said problems there is a need for alternate pest control methods. Even though there are several other chemical methods, biological methods are sustainable and the study was made. In India, the coccinellid beetle, *Cryptolaemus montrouzieri* Mulsant (Coleoptera: Coccinellidae) has provided spectacular control of heavy infestations of sucking pests, especially mealy bugs (Mani, 1990; Mani & Krishnamoorthy, 2008) and some soft scales (Kumar & Prakasam, 1984; Mani & Krishnamoorthy 1990; Mani & Krishnamoorthy 1997).

The predator was also reported to feed on citrus mealy bug, *Planococcus citri* (Singh, 1978) and pink mealy bug,

Maconellicoccus hirsutus (Green) (Reddy & Narayanan 1986; Mani & Thontadarya, 1987; Mani & Thontadarya, 1988). *C. montrouzieri* was found to be the almost efficient predator among coccinellids, *Hyperaspis maindroni*, *Scymnus coccivora* and *Nephus regularis* for *Phenacoccus solenopsis* in New Delhi, India (Babasahe et al., 2010). Moore (1988) also stated that despite the frequent use of predators, only the coccinellid *C. montrouzieri* can be considered successful. Keeping in mind the efficacy of *C. montrouzieri* on mealy bug species, the present study was conducted with the objective to estimate the predatory potential of *C. montrouzieri* on different stages of *Planococcus lilacinus* Cockerell.

MATERIALS AND METHODS

Prey Source

Mealy bugs (*P. lilacinus*) were collected along with pieces of infested plant material in a polythene bags (15 x 20 cm) from the cocoa plantation intercropped in coconut, South farm, Vanavarayar Institute of Agriculture, Manakkadavu, Pollachi. To avoid damage or injury no disturbances was made to the live specimens of target insect *P. lilacinus* and were not picked off the host plant parts. The collected samples were kept in the laboratory for mass culturing.

Predator Source

Adults and crawlers of *C. montrouzieri* Mulsant were obtained from stock colony maintained in the department of Entomology, The Center for plant protection studies (CPPS) of Tamil Nadu Agricultural University (TNAU), Coimbatore.

Experimental Procedure

The experiment was aimed to identify the variations in the feeding potential of various stages of *C. montrouzieri* against all the stages of *P.lilacinus* by confining first, second, third and fourth instar predatory grubs as well as adult beetles singly in glass vials (7.0×1.5 cm). In order to study the predation efficacy of first instar grubs, five number of mealy bugs were provided for three days per vial daily. Second and third instar grubs were provided with six and eight number of mealy bugs for four and five days respectively. Fourth instar grubs and adult beetles were provided with ten and 15 number of mealy bugs per vial daily for eight and ten days respectively. The observations on prey consumption were recorded daily until the instar change for all grub stages and until death in the case of adult beetles. The remaining individuals of prey (nymphs or adults) were counted and removed daily before providing the fresh prey and consumption was calculated. The experiment was repeated twice (March to May) under laboratory conditions (27±2°C and 70±5% RH) and the mean of both experiments was taken to determine the feeding potential (Figure 1) of *C. montrouzieri* Mulsant on *P. lilacinus* Cockerell and biological parameters of *C. montrouzieri* Mulsant on *P. lilacinus* Cockerell.

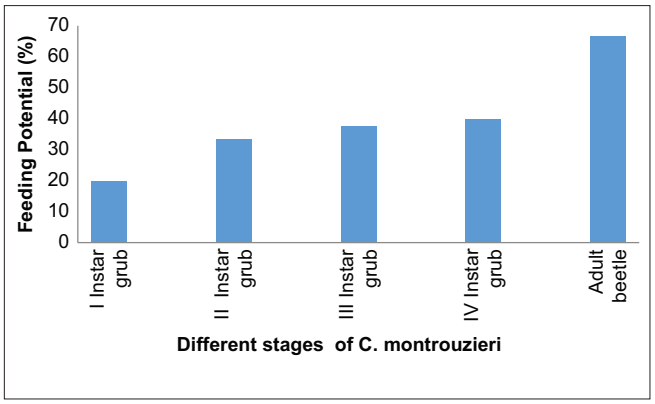

Figure 1: Feeding potential of *C. montrouzieri* against *P. lilacinus*

RESULTS AND DISCUSSION

The feeding efficiency of *C. montrouzieri* increased significantly with advancement in each development stage. The mean consumption of first instar grub of *C. montrouzieri* on *P. lilacinus* was the lowest (20 per cent). The second instar grub *C. montrouzieri* consumed significantly more of *P. lilacinus* (33.30 per cent) as compared with the first instar grub, but significantly less than the other development stages of *C. montrouzieri*. A similar feeding trend was observed with the third and fourth instar grub stages as well as adult beetles of *C. montrouzieri*, where each development stage consumed significantly more mealy bugs than the previous stage. Significant variations in the predatory potential of *C. montrouzieri* were observed. These variations depend upon the size of food (*P. lilacinus*) offered to different stages of *C. montrouzieri* as well as the size and longevity of different stages of *C. montrouzieri*. The adult *C. montrouzieri* beetles were voracious feeders and consumed maximum numbers of all stages of mealy bug during their life span.

The fourth instar larvae and adults of predator were voracious feeders of all stages of *P. lilacinus* and can play important role in classical biological control of this pest. Waxy filaments on the prey prompted the coccinellid for foraging and oviposition (Merlin et al., 1996a; Dixon 2000; Dixon & Hemptinne, 2010).

It is concluded that *C. montrouzieri* successfully completed their development stages on cocoa mealy bug, *P. lilacinus* and proved as an ideal bio-control agent in laboratory. However, in semi-field conditions survival of the exotic predator was severely affected by temperature. There is need to acclimatize the population of *C. montrouzieri* for cold tolerance as has been done previously. This is a voracious feeder and very an effective predator of mealy bugs. Further studies are needed on its relationships under field conditions.

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