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Mass Rearing of Australian Lady Bird Beetle *Cryptolaemus montrouzieri* (Coleoptera: Coccinellidae) and their Importance as Bio-Agents

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Cryptolaemus montrouzieri a predator of quite a lot of economically vitalcoccid insect species is well-known classical biological management agents that are introduced in to manycountries. In India the coccinellid, *C. montrouzieri* has provided control against mealybugs and a few soft scales. Mealybugs usually attack on growing portions, main stems and branches as well. Growing portion of plants become bunched and affected plants stay underdeveloped constructing just some flowers and fewer bolls of a smaller size and followed by black sooty mold grows on parts that are principally visited by mealybugs. It is hugely troublesome to control mealy bugs because of the presence of waxy skin. Biological control is one in all the effective means of accomplishing insect control.

Target pest: Coffee green scale, *Coccus viridis* (Green); *Planococcu citri* (Risso), *P. lilacinus* (Cockerell), *Ferrisia virgata* (Cockerell), *Maconellicoccus hirsutus* (Green)

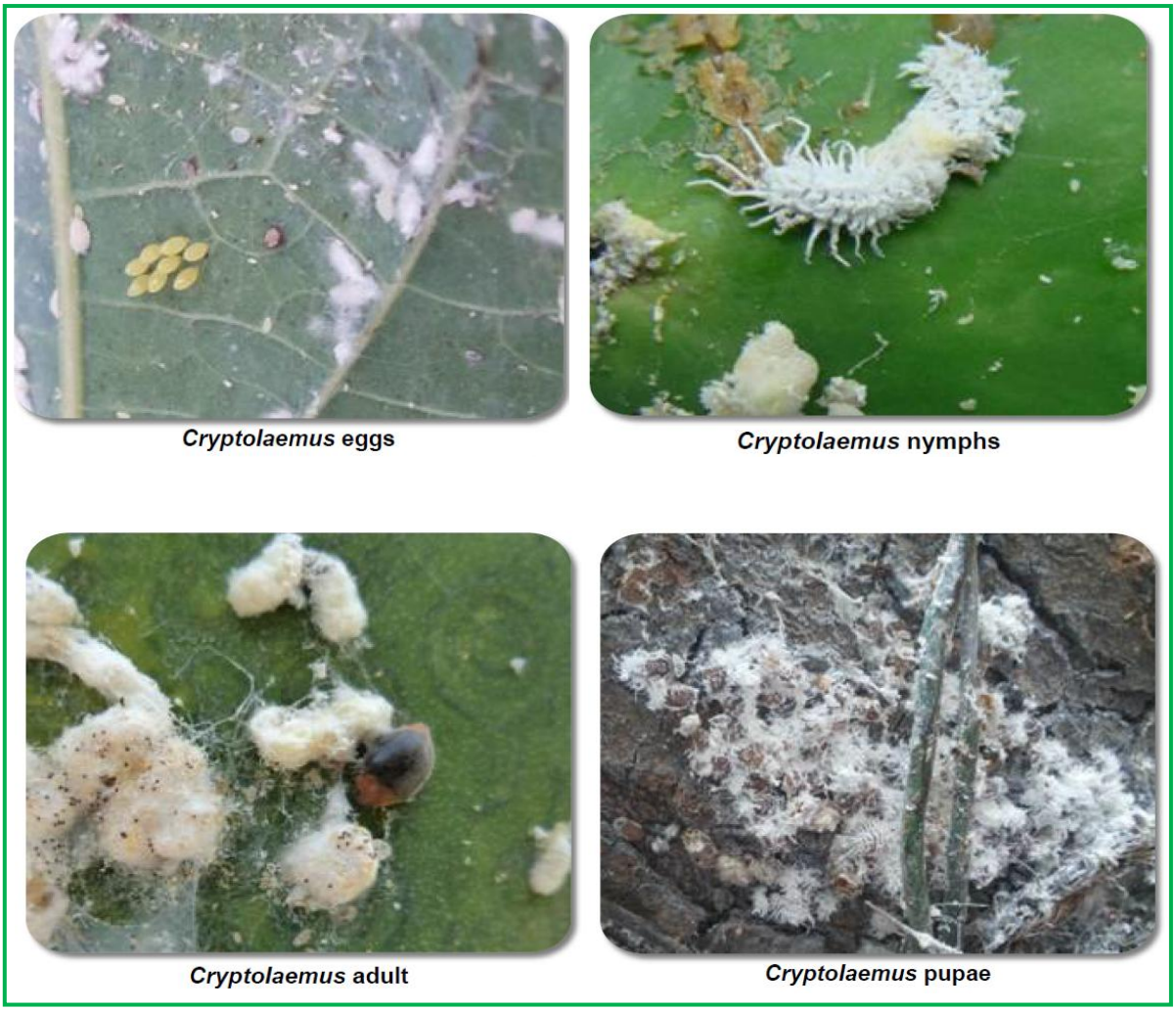
Host plants: Several horticultural and plantation crops, particularly citrus, grapevine, coffee

Mass culturing of Australian lady bird beetle (*Cryptolaemus montrouzieri*)

C. montrouzieri has been introduced from Australia for the management of *Coccus viridis* on coffee. However the predator has established on several species of mealybugs and green shield scale. Within the field its sensible use for the quenching of mealybugs viz., pink mealy bug, *Maconellicoccus hirsutus*, citrus mealy bug *Planococcus citri*, tailed mealy bug *Ferrisia virgata* and mealy scale *Pulvinaria maxima* has been demonstrated on citrus, coffee, grapes and several other fruit crops and ornamentals plants.

Use of *C. montrouzieri* is the revolution in applied classical biological control. The coccinellid predator is aborginal of Australia. In 1892, it had been introduced into California by Albert Koebele for the control of citrus mealy bugs. Following the success, the beetle was introduced into Republic of India in 1898 by New Port.

It has given effective management of mealy bugs in fruit crops like citrus, grapes, guava, etc. *C. montrouzieri* is one in every of the outstanding examples in the biological control history. Its importance is additionally evident by its growing commercialization in India.



Production procedures of predator

In the laboratory, the life cycle is completed in or so thirty (30) days. The premating and pre-oviposition periods are about 5 and 10 days severally. The oviposition is concerning 10 days. Eggs are laid from late evening to early morning. Eggs are pale yellowish white in color, the surface being swish and glossy. It's oval to cylindrical, each the ends beings smoothly rounded. Incubation period ranges from 5 to 6 days however extended in winter months. Viability of eggs is 90-100%. The newly hatched grubs are sluggish but become active after 3 to 4 hours of hatching. The little grub is pale achromatic with white lines across the body on intra segmental regions. After few hours to hatch these white lines become conspicuous and develop white wax strands near after a day. The grub has four larval instars, and therefore the larval stage occupies about 20 days. They take advantage of all stages of mealy bugs. Duration of first, second, third and fourth instar grubs are 3-4, 4, 4-5-7-8 days respectively.

An adult grub is entirely covered with white wax strands. For defensive drive the grub exudes a yellow fluid from the dorsal surface of the body when get disturbed,. The pre-pupal period is about 2 to 4 days when it suspends feeding activities. The pupal period varies from 7 to 9 days. Before it emerges the adult spends about one day in the pupal case. It is covered by a white powder like substance. The male could be notable from the female by the colouration of first pair of legs. In the case of male first pair of legs are brown and the latter two pairs being black, while all the three pairs are black in case of the female. Male to female ratio is 1: 1. Adults are also known to attack and feed the mealy bugs. Longevity of adults ranges from 50 to 60 days and the fecundity is about 200-220eggs.

Feeding behavior

Both adults and grubs are predating almost all stages of the mealy bug. However the grubs are voracious feeders. The coccinellid grub consumes a total of 900 to 1500 mealy bug eggs in its development. A single grub can eat as many as 30 nymphs or 30 adult mealy bugs. Fourth instar grub is the most After 15 days of infestation of pumpkins with bugs they are exposed to a set of 100 beetles for 24 hrs. After exposing, the pumpkin is kept back in a cage as described for under production of *M. hirsutus*. The beetle during the period of exposure feed on mealy bugs as well as deposits their eggs singly or in groups of 4-12. The grubs are visible in such cages within a week of exposure to beetles.

The young grubs feed on eggs and small mealy bugs but as they grow they become voracious and feed on all stages of mealy bugs. For facilitating the pupation of grubs dried guava leaves or pieces of papers are kept at the base of each of the cages. The first beetle from the cages starts emerging on 30th day of exposure to *C. montrouzieri* adults. The beetles are collected daily and kept in separate cages for about 10-15 days to facilitate completion of mating and pre-oviposition. The beetles are also fed on diet containing agar powder (1 g), sugar (20 g), honey (40 cc) and water (100 cc). The adult diet is prepared by boiling sugar in 70 cc of water, adding 1 g agar, diluting 40 cc honey in 30 cc of water and adding to the sugar and agar mixture when it comes to boiling point. The hot liquid diet is kept on small white plastic cards in the form of droplets which get solidified on cooling. Such cards containing adult diet can be fed not only to *C. montrouzieri* but also to many other species of coccinellids. From each cage about 175 beetles are obtained. The emergence of the beetles is completed within 10 days.

Beetles can also be reared on *Corcyra cephalonica* eggs but empty ovisacs of *Planococcus citri* are to be kept for inducing egg laying by the beetles. The beetles are also multiplied on semi synthetic diet which is still in the process of further refinement.

Precautions

All due precautions should be taken to avoid scarcity of food for the grubs to avoid cannibalism by grubs. All the pumpkins showing signs of rotting should be properly incinerated.

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