

activity of ants prior to the release of *Cryptolaemus*. General ant control measures like destruction of ant holes and ant nests, application of sticky bands around the tree trunk and chlorpyrifos 0.05% into the ant-hills are to be adopted to suppress the activity of the ants. After the patrolling (up and down) of ants on the trunk is stopped, the beetles are to be released.



#### Stage to be released

Adults and larvae can be released in the field for the suppression of pests. Adults upon release soon produce sufficient offspring to clear the mealybugs. However, the release of larvae is preferred to adults when the mealybug infestation is confined to few plants.

#### Time of release

Usually the releases are made between 8.00 AM and 10.00 AM and 3 PM and 5 PM.

#### Number to be released

Depending upon the severity of infestation, the beetles have to be released. A release rate of 5000 beetles/ha is recommended to suppress the pest population. Two to three releases are to be made annually depending upon the severity of pest infestation. The releases have to be made early in the season. The first generation develops from the released beetles. The second generation definitely brings down the pest population. As a pre-requisite for release, spraying of insecticides has to be discontinued two to three weeks prior to the release of the predator.

#### Target pests

- 1) **Green shield scales** : It has given very good control of green shield scales belonging to the genus *Choropulvinaria* on guava, mango, coffee and ornamental plants.
- 2) **Mealybugs** : It has given good control of mealybugs infesting citrus, grapes, mango, custard apple, pomegranate, pineapple, ber, passion fruit, avocado, coffee, brinjal, beans, ornamentals, tobacco, sugarcane etc.

## Integration with Chemicals

The pesticides often interfere with the activity of the predatory beetle. The pesticides are known to cause mortality of different stages of the beetle. Commonly used fungicides and acaricides namely copper oxychloride, mancozeb, sulphur, captafol, carbendazim, bordeaux mixture, dicofol, abamectin etc. are found to be very safe to *C. montrouzieri*. Dichlorvos, chlorpyrifos and buprofezin are found harmless to the ladybird beetle. These pesticides can be applied safely without affecting the activity of the beetle. Fish oil rosin soap and most of the botanical origin pesticides are also found to be very safe to the ladybird beetle.

## Do's

1. Apply the safer chemicals when the predator is used to control the mealybugs and scale insects. Avoid chemical harmful to ladybird beetle.
2. Release the ladybird beetle at the early stage of berry formation.
3. Release the ladybird beetles @ 5000 per hectare.
4. Release the ladybird beetle to cover the entire area under cultivation for getting adequate control.
5. Planning of releasing the beetle has to be done in advance.

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#### Extension Folder No. 19

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## Production and Use of Australian Ladybird Beetle *Cryptolaemus montrouzieri*



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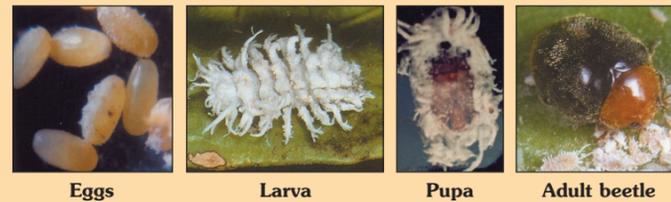
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The Australian ladybird beetle *Cryptolaemus montrouzieri* has often provided spectacular control of heavy infestations of sucking pests especially mealybugs and some soft scales in many countries. Following the success obtained in the control of the mealybugs in U.S.A. and other countries, the Australian ladybird beetle was introduced into India in 1898.

## Biology

Adult female beetle lays eggs either singly or in groups of 2-6 in the mealybug colonies. Freshly laid egg is pale yellowish white, smooth and cylindrical both ends being smoothly rounded. Incubation period varies from 4 to 6 days. Viability of eggs varies from 86-100%. Newly hatched larva becomes active after 3 to 4 h. The tiny larva is smooth and pale greyish, and white wax strands develop on the body after 24 h of hatching. There are four larval instars. The duration of first, second, third and fourth larval instars are 3.5, 2.5, 4.10 and 4.95 days respectively. The larval stage is completed in about 15 days. Pre-pupal period is about 2 days and the pupal period varies from 7 to 9 days. Emergence takes place normally between 8 A.M. and 11 A.M. The life cycle is usually completed in about 30 days under normal conditions.

### Life stages of Australian ladybird beetle



Adult is a black beetle measuring about 4 mm long with an orange head. In males, the first pair of legs is brown and the other two pairs are black, whereas in the female all the three pairs are black. Generally the male to female ratio is found to be equal. The pre-mating period varies from 4 to 7 days and the pre-oviposition and oviposition period range from 5 to 7 days and 45 to 68 days respectively. A single adult female lays about 200 eggs. The longevity of adult varies from 50 to 80 days.

## Predatory Potential

Both adults and larvae feed extensively on all stages of mealybugs and scale insects. A single larva is known to consume

2000-3000 mealybug eggs or green shield scales. It also feeds about 300 mealybug or scale insect nymphs. A single larva requires 30 female adult mealybugs to complete its development.

## Mass Production

To release the predator in large numbers in the field, mass culture of *Cryptolaemus* is a pre-requisite. *Cryptolaemus* is easily cultured on a large scale on the mealybugs particularly pink hibiscus mealybug and citrus mealybug. In the culture room, it is ideal to maintain 25 to 30°C.

### Mealybug production

**Pumpkins :** In the large scale production of mealybugs, ripe pumpkins have been utilised. The pumpkins are selected with ridges and grooves with a small stalk which makes handling very easy. They are cleaned with water to get rid of any dust on them. Ovisacs of the mealybug are placed over the pumpkin for about 48 hours. The infested pumpkins are kept on a plastic stand in wooden cages, with glass sliding front and cloth on other sides. In due course, crawlers emerged from ovisacs, settle on all sides of pumpkin and develop into fully mature mealybugs in 30 to 40 days.

### Culturing the mealybugs on pumpkins

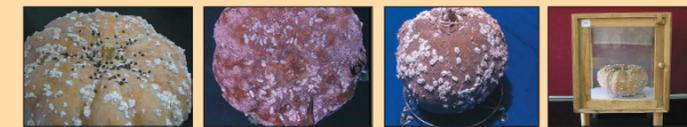


**Potato sprouts :** Planting trays are made of wood (45 x 45 x 10). Soil to be use is sandy silt. Approximately 3 months after harvest or when sprouts begin to appear, the tubers are ready for planting. Whole potatoes are used, and 25 to 36 tubers are placed about ½" apart on a ½" layer of soil in the tray and covered with slightly moist soil. These trays are kept in racks in the production room and watered. Temperature of 70 to 74°F appears to be optimum for facilitating sprout growth. The time from planting until infesting with the mealybugs is usually 20 days in summer and 30 days in winter. Stock from one mealybug tray is sufficient to infest 20-25 trays of sprouts.

## Beetle production

In about 20-25 days after the mealybug infestation on the pumpkins, *Cryptolaemus* adults are released into the cage through its sleeves. The adult beetles, besides feeding on the mealybugs, lay their eggs singly or in groups of 4-12 near the mealybug colonies. The larvae are visible in about a week's time. Initially, they feed on the eggs of mealybugs and smaller nymphs, and later they feed on all stages of the mealybug. Cannibalism is observed when the mealybug population is low. The fully grown larvae pupate on the pumpkin or anywhere inside the breeding cage. Adult beetles emerge in about 30 days time. The beetles are collected in glass vials using the aspirator. Each breeding cage yields 100 to 200 beetles. They are fed with honey solution (50%) and honey-agar in the laboratory. In about 10-15 days, when the adult beetles complete the mating and pre-oviposition, they are ready for field release.

### Culturing of ladybird beetle



Beetles released Developing larvae Pupation Rearing cage

The adult feeding with 50% honey solution is supplemented with the diet containing agar-agar and honey.

**Preparation of honey -agar medium :** The diet is prepared by boiling sugar 20g in 100ml of water, 1g agar agar powder and 40ml honey. The hot liquid is dropped on small white plastic cards in the form of droplets which solidifies on cooling. The diet can also be stored in refrigerator for 2-3 weeks.

## Storage

Pupae of *C. montrouzieri* could be stored for a period of 20 days after subjecting the five day old pupae at 10°C for 3 weeks without having any adverse effect on the fecundity.

## Use of Australian ladybird beetle

### Monitoring of ants

Ants are known to attack the predators of scales and mealybugs while attending the pests. Hence, it is necessary to check the