

III. Integrated Pest Management strategies

The following Good Agricultural Practices should be adopted for the management of various pests of custard apple:

- Collect and destroy the mealy bug infested leaves, twigs and fruits.
- Flooding of orchard with water in the month of October kill the eggs.
- Ploughing of orchard in November.
- Avoid plant stresses - healthy plants are much less susceptible to attack
- Release *Cryptolaemus montrouzieri* beetles @ 10/tree or @ 30 larvae/plant twice at 15 days interval.
- The Coccinellid *Menochilus (Chilomenes)* sex maculatus (F) is a predator of the nymphs and adults, and the Hymenopterous parasite *Anaysis alcocki* (Ashm.) *Anagyrus dactylopii* and *Aenasius advena* are three parasitoids on mealy bugs.
- Release of coccinellid *Scymnus coccivora* @ 10 beetles /tree or @ 30 larvae/plant is a good predator of both nymphs and adults.
- Collect fallen infested fruits and destroy them.
- Provide summer ploughing to expose the pupae.
- Immersion of fruits in hot water (45 to 47°C) for 60 minutes to kill eggs and maggots
- Use 10 traps per acre of methyl eugenol.
- Field release of natural enemies *Opius compensates* and *Spalangia philippines*.
- Apply well rotten sheep manure @ 4 t/ acre in two splits or poultry manure in 2 splits
- Control ants and dust which can give the scale a competitive advantage.
- Field release of ladybird beetle.
- Spray dormant oil in late winter before spring.
- Spray horticultural oil, if needed, year round.
- Adopt bagging of fruits.
- Use of braconid parasitoids (*Apanteles* spp.) to parasitize larvae

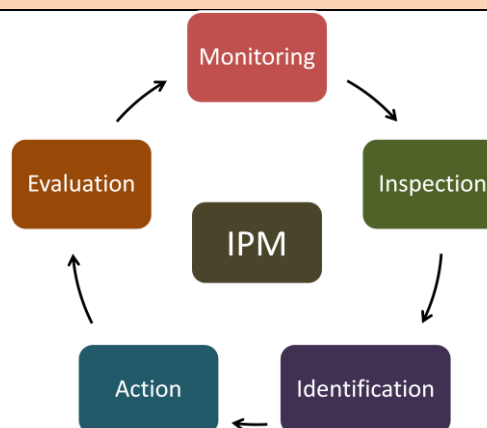


Biodiversity in natural enemies: Parasitoids



Biodiversity in natural enemies: Predators

Important activities for pest free custard apple production for export



For more details please contact:

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**Integrated Pest Management
(IPM) in Custard Apple
(*Annona reticulata*) for export
purpose**



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Custard apple (*Annona reticulata*) is a sweet fruit, which is widely grown across the world. Custard apple has many health and nutritional benefits. There are many insect pests which infest the crop. Major pests like. Fruit spotting bug, Mealy bug, spiraling whitefly, fruit fly and Yellow peach moth.

I. Identification of important pests

1) Fruit fly (*Bactrocera zonata*):

Under optimum conditions, a female can lay more than 3,000 eggs during its lifetime, but under field conditions from 1,200 to 1,500 eggs per female is considered to be the usual production. Development from egg to adult under summer conditions requires about 16 days. The mature larva emerges from the fruit, drops to the ground, and forms a tan to dark brown puparium. Pupation occurs in the soil. About nine days are required for attainment of sexual maturity after the adult fly emerges. Adults are brown or dark brown with hyaline wings and yellow legs.

Maggots bore into the semi ripened fruits and feed on the pulp. Affected fruits become shrivelled, deformed, rot and drop.



2) Fruit borer (*Heterographis bengalella*):

Eggs are laid singly on immature fruit. Upon hatching, the caterpillar bore into the fruits where they pupate. Fully developed gray to black coloured caterpillars are about 20 mm long. Adults are light brown with transparent wing.

Caterpillar makes irregular tunnels and damages the mesocarp by feeding the internal content of the fruits.

The presence of excreta of the caterpillars near the entry holes on the affected fruits the growth of affected fruits is arrested and later fall down.



3) Mealy bug (*Maconellicoccus hirsutus*):

Female and male adults live for 23 to 28 days, respectively. Pre-oviposition, oviposition and post-oviposition periods is 6-7, 8-9 and 1-2 days, respectively. The total life span of female and male is 46 -49 and 23 -29 days. The reproduction took place both sexually as well as parthenogenetically and female laid an average of 155 eggs during its life period. Nymph Yellow to pale white in colour. It has three to four nymphal instars and the total nymphal period is 21 to 29 days. Females are apterous, long and slender covered with white waxy secretions. The life-span of the adult female is 12-31 days.

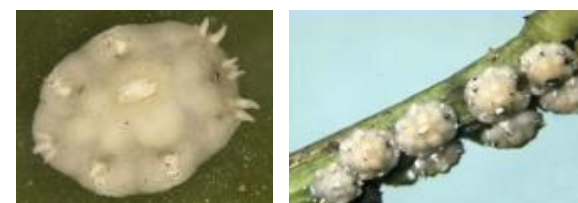
The tiny small bugs usually suck sap from twigs, leaves and flowers. Infested fruits will have uneven shapes, poor quality, and are susceptible to secondary infections by pathogens.



4) Scales insects (*Ceroplastes floridensis*):

First instar nymphs, called crawlers hatch from eggs over a period of 2 to 3 weeks and in colour. The crawlers undergo three moults and develop into adults. The wax-covering secreted around their body gives them a star-like appearance. Soft scales have 3 or 4 instars in the female and 5 in the male. The adults are elliptical, reddish brown with short anal process. The adult female is reddish which is coated with a thick layer of pinkish-white wax. Adults are mostly found on twigs and branches. The size of the female is about 2 to 4 mm in length and 1 to 3.5 mm in width. Males are not known in this species. Females have 2 to 3 immature stages without any pupa-like instars while males have 4 immature stages with the two pupa-like instars.

The direct damage is caused by insertion of stylets during feeding by the nymphs, which causes premature leaf drop and drying of twigs. Sooty mould develops on honeydew excreted by these scale insects and incase of severe infestations shoots or branches die and host's death may also occur.



II. Pest Surveillance

Weekly monitoring should be done through pest scouting with the help of monitoring devices like pheromone and colored sticky traps. For field scouting 300 fruits from 100 plants per acre should be observed. Minimum 15 spots at reasonable distance with each other following a cross diagonal pattern moving zig zag manner for counting all type of insects. Pest monitoring for fruit flies using traps should be done regularly from fruiting stage onwards. If 95% plants are found free from insect pests then the field will be considered fit for export.