ORGANIC MANGO CROP PROTECTION

PART-I INSECT PESTS

ICCOA, BANGALORE
Mango hoppers
Control of Hoppers.

- They suck sap of tender parts and destroy the inflorescence and cause fruit drop.
- Secrete sweet sticky substance - cause of sooty mould growth.
- Always maintain open canopy, field hygiene and prune after rainy season.
- Spray *Verticillium lacanii* or *Metarhizium* @ 5-10gm/lit of water.
- Spray Nimbicidin 2ml/lit water dilution or Azadirachtin 3000 ppm@2m/lit at initial stage of hopper population.
Mango mealy bugs
Control of Mealy bug

• The nymphs climb the trees and settle on inflorescence causing flower drop - affecting fruit set.
• Due to excretion of sticky substance, sooty mould develops.
• **October**: Flood the orchard with water to kill the eggs.
• **November**: Plough the orchard. Rake the soil around tree trunk to expose the eggs to natural enemies and sun. remove weeds.
• **December**: Plaster tree trunk with mud and cover it with alkathene (400 gauge), 25 cm wide sheets -30 cm above ground level. Release 10 predator beetles/tree of *Cryptolaemus montrouzieri*
• **January**: Apply Beauveria bassiana product (5g/litre dilution) or 5% Neem seed kernel extract* in last week of January around tree trunk.
• *(soak 5 kg crushed neem seed in 10 lit water for 3 days-strain-dilute the extract@ 1 lit extract +9 lit water ratio. Spray)*
Polyethylene bands around mango trees to prevent mealy bugs and other pests from soil.

Arrange bands of polyethylene around trees by December.

Monitor this band regularly. If it is disturbed, rearrange it.
coccinellid- predator on mealy bug

Release 10-15 grubs of coccinellid predator, C. montrozieri per tree to control Mealy bugs.
Lady bird beetles: predator on sucking pest
Aphids, jassids, mites, mealy bugs and scales.
Mango midge

Fig. 8. Twig damaged by midge
Fig. 7. Panicle damaged by midge
Mango Midge control

• Cause: Inflorescence / leaf/ twig midge (*Erosomyia indica*), *Dasineura amraramanjarae*, *Procystiphovra mangiferae* and *Procontarinia matteriana*

• Damage by *E. indica* causes bending and drying of the inflorescences. Second attacks starts at fruit setting - young maggots bore into these tender fruits which turn yellow and finally drop.

• Collection and disposal of infested panicles leaves and twigs.

• Deep ploughing of orchard in October- November to expose pupae and exposing larvae to sun’s heat will kill them.

• Monitoring of larval population on white paper in April/ May and apply Neem oil @3ml/lit of water dilution or NSKE 5%.
Mango fruit fly

Fig. 9. Adult fruit fly  Fig. 10. Traped flies  Fig. 11. Maggots in pulp  Fig. 12. Infested fruit
Fruit fly infested mangoes.
Mango fruit fly control

- **Cause:** *(Bactrocera dorsalis, B. correctus and B. zonatus)*
- Punctures outer wall of fruits and insert eggs in small clusters inside mature fruits. On hatching, the maggots feed on fruit pulp.
- Infested fruits rot due to further secondary infection
- Collect and dispose off infested and fallen fruits.
- November-December: Plough orchard to expose pupae to sun’s heat.
- April to August: Place methyl eugenol pheromone traps @4 traps/ ac. at 3-5 feet above ground level.
- Hot water treatment of fruit at 48 degree C for 60 min.
- Three weeks before harvesting, spray Azadiractin (3000 ppm) @3 ml/l.
- Managing fruit flies also reduces anthracnose disease and prevents late fruit fall.
Mango Fruit-fly control: Eugenol Pheromone traps

Fruit Fly Trap
Mango webber

Fig 15. Infection of Aspergillus flavus

Fig 16. Adult fly, pupae and caterpillar of webber (Orthaga Sp.)
Leaf webber control

• **Cause: Orthaga euadrusalis**

• Caterpillars start feeding on leaf surface. Later they make web of tender shoots and leaves together and feed within.

• Prune overcrowded and overlapping branches.

• Remove infested webs and burn them.

• Plough orchard for mealy bug control to check its population. Spray Bt @400gm/acre

• Spray two to three rounds of NSKE 5% or Neem oil 3ml/lit water commencing from last week of July.
Mango Gall psylla

Fig 17. Infestation of shoot gall psylla

Fig 18. Nymphs of Apsylla cistellata
Mango gall psylla control measures

• Cause: Apsylla cistellata
• August -September: Nymphs suck cell sap from buds.
• Sep-Oct- Buds develop into hard conical green galls
• Flowering and fruit setting-affected.
• Galls should be collected and destroyed.
• Spray neem oil @ 3ml/lit water dilution at fortnightly interval starting from August.
Mango tree and leaf borers

Fig 19. Infestation of borer on tree trunk

Fig. 20. Infestation of shoot borer on young leaves
Mango tree and leaf borer (Stem Borer) control

• **Cause:** *Batocera rufomaculata*

• The damage is caused by grubs either to roots or stems. The grubs after hatching from eggs first feed on bark and make irregular cavities. It makes tunnels which may either be in boring upward, resulting in drying of branches.

• Remove grubs from the tunnel with iron spoke and fill it with kerosene soaked cotton swab and seal with wet soil.

• Cut and destroy affected branches with grubs and pupae. Swab coal tar and Kerosene @ 1:2 after scraping the loose bark to prevent egg laying by adult weevils.

• Spray green muscardine fungi, *Metarhizium anisopliae* or *Beauveria bassianna* on the trunks and branches @ 1 kg diluted in 100 lit. water ratio. If spray solution required is more than 100 litres, then increase the quantity of biocontrol agents in the same ratio.
Mango scales
Mango scales control

- **Cause:** *Chloropulvinaria polygonata, Aspidiotus destructor*

- They suck the sap of leaves and other tender parts reducing vigor of plants. They excrete honeydew which helps in the development of sooty mould.

- Prune heavily infested plant parts to open the tree canopy

- Spray Neem oil @ 3ml/lit water or Neem Seed Kernel Extract at 21 days interval.

- Removal of attendant ants will help natural enemies to control the insect.
Mango nut weevil
Mango stone weevil control

• Cause: *Sternochetus mangiferae*

• Eggs are laid on the tender fruits. The grubs bore through the pulp, feed on seed coat and later damage the cotyledons. Pupation is inside the seed. The pulp is discoloured - fruit becomes useless.

• Collect and destroy infested and fallen fruits at weekly interval till harvest fruit.

• Plough orchard after harvest to expose hibernating adults, reduce, infestation levels.

• Destroy all left over seeds in the orchard and also in the processing industries.

• The natural enemies recorded on S. gravis are: a) mite -Rhizoglyphus sp, b) ants (Camponatus sp., Monomorium sp. and oecophylla smaragdina)

• Fungus- Aspergillus sp, Beauveria bassiana have been found to be pathogenic on mango weevil. These can be sprayed at 1 kg /100 lit water.
Mango Thrips

Fig 23. Thrips infested leaves
Mango thrips control

- **Cause:** *Oliothrips indicus, Rhipiphorothris cruentatus, Scirtothrips dorsalis*)
- Thrips suck cell sap of leaves inflorescence, and young fruits. Affected leaves show silvery sheen.
- Spray Neem oil at 3ml/lit of water dilution rate. Also spray NSKE 5% solution as mentioned earlier.
Mango fruit borer

Fig. 24 Fruit borer on mango
Mango fruit borer control

- **Cause:** *Deanolis albizonalis*

- January to May: Adults lay eggs on fruits. Larvae bore into fruits. Caterpillars bore into the fruit at the beak region and feed inside reaching Kernels. Entrance hole is plugged with excreta. Affected fruits rot and fall prematurely.

- Collect affected, fallen fruits and dead wood- destroy them.

- Spray Metarhizium at 1 kg in 100 litres of water dilution. Depending on the total solution required, the bioinsecticide can be increased.
Mango leaf miner

Fig. 25. Leaf miner infestation
Mango Leaf Miner control

• Cause: *Acrocercops syngramma*
• grayish white blisters appear on leaves
• Clip off and destroy the affected shoots.
• Spray metarhizium @ 1 kg/100 lit of water from the emergence of new flush.
Red Tree Ants
RED TREE ANTS CONTROL.

• Cause: Oecophylla smaragdina
• The ants web and stitch together a few leaves, and build their nests. Prey upon small insects. Indirect damage is caused by protecting insects like aphids and scales, which excrete honey dew for them.
• Remove nests and destroy by web cutting device.
• Spray neem oil 3ml/lit of water dilution after disturbing the nest.
Termite

Fig 27. Termiorium along with mango tree
Termite control

• Cause: *Odontotermes sp.*
• Termites feed on root and move upward making the tunnels. They feed on the bark of the trunks.
• Remove the mud galleries on trunk.
• Spray the trunk with the bio pesticide - *Metarhizium anisopliae*. After two months, drench the soil at the base of the tree with Metarhizium soil drench preparation*.

*Soil drench: Take 2 Kg of Metarhizium anisopliae plus 500 gm of jaggery and mix in 400 lit of water. Drench this solution at the base of the trees.