edge up to midrib. Larger caterpillar can feed on mature leaves.

Control:

- Hand picking of larvae.
- *Trichogramma spp.* are effective egg parasitoids.
- Spray of 3% neem extract is also affective.
- Spray trees with endosulfan 35 EC / methamidophos 60 SL (200ml/100 L of water)

4.7.3 CITRUS LEAF-MINER

T.N: *Phyllocnistis citrella*

(Gracillariidae; Lepidoptera)

Identification: Eggs are minute and transparent. Larva is legless, pale yellow in colour. Adult is a tiny moth and silvery white in colour. Fore and hind wings have fringe of hairs.

Life cycle: The female lays eggs singly on leaves. Larva lives for 2-4 weeks. Mature larva settle down in galleries near the leaf margins. Later on, larva spins a cocoon and pupates. Pupal duration is 1-2 weeks. Adult life is 2-3 weeks.

Damage: This pest is active throughout the year. Larvae mine into young / tender leaves and form zigzag galleries between upper and lower leaf layers. Infestation of this insect results in infection of citrus canker.

Control:

- Collection and burning of mined leaves.
- Spray of 2 % neem extract is also affective.
- Bifenthrin 10 EC 40ml/100 L of water
- Imidacloprid 200 SL 40ml/100 L of water

4.7.4 MANGO HOPPERS

T.N: *Amritodus atkinsoni*

(Cicadellidae; Homoptera)

Identification: Adult are grayish. There are three dark brown spots on the head, a median band and two black spots on the pronotum.

Life cycle: The pest is active during the hot months of May-June and the cold months of October-January. The adults emerge in February from underneath the bark of trees and other places of shelter. When the inflorescence appears, they start laying eggs in them in the second or third week of February and continue to do so for some weeks. Female deposits 200 eggs singly, that hatch and the newly emerged nymphs are first seen at the end of February or in early March. The life cycle is completed in 2 weeks. The adults are mostly seen congregated on the lower portions of the branches and trunks. There is a second cycle of brood-rearing, starting with the monsoon. Eggs and nymphs of this generation are found during July-August in the sub-mountain districts of the Punjab, adults of this generation emerge in September and they hibernate during the winter.

Damage: The nymphs are particularly harmful, as they are voracious feeders. They cause the inflorescence to wither and turn brown by sucking cell sap. Even if the flowers are fertilized, the subsequent development and fruit-setting may cease. The nymphs also secrete drops of a sweet thick fluid on which a black fungus develops, adversely affecting photosynthesis.

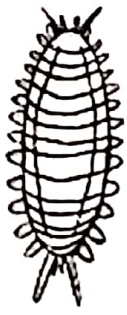
Control:

- Dense plantings should be avoided.
- Waterlogged conditions should be avoided.
- Natural enemy of mango hopper is *Epipyrops* spp. should be encouraged.
- Spray trees with deltamethrin EC 40ml/100 L of water or imidacloprid SL 50ml/100 L of water.

4.7.5 MANGO MEALY BUG

T.N: *Drosicha mangiferae*

(Margarodidae; Homoptera)



Identification: Eggs are pinkish. The wingless females are oval and flattened, with their body covered with white mealy powder. They males have one pair of black wings and other is crimson red.

Life cycle: The pest is active from December to May and spends rest of the year in the egg stage. The eggs are generally deposited in April-May in the soil up to 15 cm, within silken purses and the dead body of the female often found sticking to them. They hatch in the end of December or in January. Thus the nymphs appear before the fresh growth of flowers of mango trees. Eventually, they congregate on the panicles where they feed on the cell sap and pass through three stages. The duration of the first stage runs from the middle of December-early February; the second from February-middle of March and that of the third from March-April. The females mature after 5 weeks and lay eggs for 6 weeks during April-May.

Damage: Only the nymphs and wingless females are destructive and they suck plant juice, causing the tender shoots and flowers to dry up. The young fruits also become juiceless and drop off. The pest is responsible for causing considerable loss to the mango growers and when there is a serious attack, the trees retain no fruit at all.

Control:

- Destroy the eggs laid under the infested trees. For this purpose, all dry leaves and twigs should be burnt in May-June.
- The soil should be scraped to a depth of 15 cm to expose the eggs.
- Nymphs should he prevented from crawling the trees by applying 8 cm wide sticky bands with greasy material or slippery bands or plastic sheets around the trunks at about one meter above the ground level during the second week of December.
- Removal and destruction of weed hosts.
- Coccinellid beetles are important predators of this pest.
- The nymphs congregating below the bands may be killed by spraying them with acetamiprid SP 100 ml/100 L of water or imidacloprid SL 50 ml/100 L of water.

(Aqueel et al., 2015)

4.7.6 FRUIT FLY

T.N: *Bactocera dorsalis*

(Tephritidae; Diptera)

Identification: A female lays 50 eggs on an average. The maggots are legless and yellowish in colour. Fruit flies can be easily distinguished from ordinary flies by their triangular shaped abdomen and spotted wings.

Life cycle: Shining whitish cigar shaped eggs are thrust into the skin of the ripening fruit, these hatches into footless maggots. Maggots feed on the fruit pulp by burrowing into it. When full fed, they generally go to the soil, convert themselves into seed like pupae under the soil and emerge as flies after a week or ten days. Life cycle is completed in 5-13 weeks. There are many generations in a year.

Damage: Only maggots are destructive. They maggots of these flies bore into the ripening fruits and very often cause appreciable injury, the fruits begin to rot and drop. All sort of fruits and cucurbits, especially melons and bitter gourds suffer from these flies.

Control:

- Damage fruits should be rapidly destroyed and the flies trapped by poisoned syrups to prevent egg laying.
- Ploughing of soil and heavy irrigation are also helpful.
- Pheromone traps of methyl eugenol are effective for their control.
- Braconid wasps are effective in controlling these flies.
- Spray trichlorphon WP 170 gm/100 L of water or dichlorvos EC 100 ml/100 L of water.