

Lecture 1 and 2

Major insect pests of citrus

Citrus leaf miner (*Phyllocnistis citrella*)

- x The characteristic symptom of leaf miner is presence of silvery serpentine mines usually on the under surface of the leaf. In general, each leaf has only a single mine, but in case of heavy infestation there may be several mines per leaf.
- x Mining of the leaves causes them to curl up, distorted and thereby reducing the photosynthetic area of the young foliage.
- x In case of severe infestation, mines can also be seen on the upper side of the leaves as well as on shoot portion of new twigs.

Pest identification

- x Eggs: Eggs are laid singly usually on the underside of leaves near the midrib and look like tiny water droplets.
- x Larva: The full grown larva measures 5.1 mm in length and is pale yellow or pale green with light-brown well developed mandibles. They settle down in galleries near the leaf margin for pupation.
- x Adult: Adult is a tiny silvery-white moth about 2 mm long with fringed wings. Fore wings have brown stripes and a prominent black spot near the apical margin while hind wings are pure white with a wing spread of 5-4mm.

Biology of the pest

The eggs hatch within 3-5 days. The young pale yellow larvae immediately start feeding between epidermal layers of the leaf. They pupate, when full grown, near the margin of the mined leaf. The total life cycle is about 2 - 3 weeks.

Management practices

- x Avoid pruning during active growth periods as it may induce further new flush and thereby allow the pest to have more number of generations. If

necessary, prune only the infested shoots during winter from the inner canopy.

x Remove the water shoots from the tree canopy as they are the preferred sites of attack.

x The spray timings are most important in managing leaf miner because before entering in leaf tissue it is highly susceptible to the toxic effect of pesticides. Foliar application of neem oil 5 ml or imidacloprid 17.8 SL @ 0.5 ml or phosolone 35 EC @ 1.5 ml or fenvalerate 20 EC @ 1.0 ml or spinosad 45 SC @ 0.34 ml or novaluron 10 EC @ 0.87 ml/l of water or make all season horticultural mineral oil @ 1.5% in flushing season by directing at the new flush checks the pest.

x Conserve the bio-agents (Coccinellids, Chrysopids predators and eulophid parasitoids) by avoiding application of insecticides during late winter to early spring.

Citrus psylla (*Diaphorina citri*)

x-The damage is caused by both nymphs and adults by sucking the cell sap from the leaves, tender shoots

and flowers causing curling of leaves, defoliation and drying of twigs.

x-Nymphs secrete whitish crystalline honey dew which attracts the growth of fungus, adversely affecting the citrus psylla on leaves

photosynthesis. Late instar nymphs and adults also transmit the citrus greening disease.

x-In case of severe attack the leaf buds, flower buds and leaves may wilt and die.

Pest identification

x-Eggs: The eggs are bright yellow and deposited on unopened leaf buds.

x- Nymph: Early instar nymphs are green or dull orange and late instar nymphs are bright yellowish orange.

x- Adult: It is 3-4 mm long, mottled brown in color, with transparent wings.

Biology of the pest

Eggs are laid on tips of growing shoots and between unfurling leaves. Females lay more than 800 eggs during their lives. Nymphs pass through five instars. Total life cycle requires 15 to 47 days depending upon the season. Adults may live for several months. There is no diapause, but population are low in peak Winter and Summer seasons . There are nine to ten generations a year; however, maximum of 16 have been reported.

Citrus blackfly (*Aleurocanthus woglumi*)

x Both adults and nymphs suck plant sap and results in the curling of leaves and also the premature fall of flower buds and the developing fruits thereby resulting in reducing the vitality of the tree.

x Moreover, honey dew secretion favours rapid development of black sooty mould that covers entire plant surface.

x The process of photosynthesis is hampered greatly resulting in stunted growth of plants.

low intensity of flowering and scarce fruiting.

Pest identification

Citrus blackfly on leaves

x Egg: Yellowish brown oval and lay in whorls of lower side of the leaves.

x Nymphs: The nymphs are scale like, shiny black and spiny with marginal fringes.

x Pseudo-pupa: Oval, black in colour and its dorsum is arched with long black spines, the margins have rounded black teeth.

x Adult: Adults are ashy coloured with brick red abdomen, smoky wings.

The adult females are about 1.2 mm long and the males are 0.8 mm in length.

Biology of the pest

The adults emerge in flushing seasons and the females lay yellowish brown oval shaped eggs which are arranged in a spiral manner on underside of leaves with 15-22 eggs in a cluster. The eggs hatch in 7-14 days and the nymphs on emergence start feeding on cell sap and settle on the lower side of the leaf. There are two distinct broods in a year. The first brood adults emerge in March-April and those of the second brood emerge in July-October.

Management practices

- x Close planting, water logging should be avoided.
- x Excessive irrigation and nitrogen fertilization should be avoided.
- x Avoid growing collateral hosts of the pest, guava, sapota and pomegranate.
- x Foliar application of imidacloprid 17.8 SL @ 0.5 ml or acephate 75 WP 1.25 @g or phosalone 35 EC @1.5 ml or dimethoate 30 EC@ 2 ml or novaluron 10 EC @ 0.79 ml/l of water on the lower sides of leaves covering the entire tree canopy at 50% egg hatching stage. Second spray should be given after 15 days with any of the above insecticides or neem oil @10 ml/l of water.

Citrus whitefly (*Dialeurodes citri*)

- x Both nymphs and adults suck the plant sap and secrete honeydew due to which sooty mould develops on the leaves.
- x Severe infestation results in black fungal layer manifestation, covering entire plant parts including fruits due to which photosynthesis is affected.

Pest identification

- x Egg: Oval, pale yellow and rest on small stalks and singly on the underside of soft young leaves.

Citrus whitefly on leaves

- x Nymph: The nymphs are oval in shape, scale like, blackish with marginal bristle like fringes and are stationary.
- x Pseudo-pupa: Oval, pale yellow, with an orange or yellow band in the middle of the body.
- x Adult: Adult is 1.5 mm long with white or greyish wings, pale yellow body and red constricted eyes.

Biology of the pest

- x The adult female lays about 150 eggs on the lower surface of leaves which hatches in about 10 days. The crawlers settle on the under surface of the leaves and suck the sap. Nymphal life averages 23 to 30 days. Pseudo pupal development requires 13 to 30 days. The adult lives an average of about 10 days, but has been known to live for as long as 27 days. The entire life cycle from egg to adult requires from 41 to 333 days.

Management practices

- x Same as given for blackfly.

Citrus aphid (*Toxoptera aurantii*, *Myzus persicae* Sulzer, *Aphis* spp)

- x Nymphs and adults suck sap from tender leaves and shoots during winter to early spring. Affected leaves turn yellow, curled, deformed and dry up. Growth of young shoots is adversely affected. Plant growth is stunted.
- x Sooty mould is produced on honeydew excreted by aphids.
- x Aphids also act as the active vectors of Citrus Tristeza Virus.

Pest identification

- x Nymph: The nymphs are dark reddish brown and approximately less than 0.1 mm in length.
- x Adult: Adults are soft-bodied, pear-shaped, tiny sucking insects, measuring less than 2 mm in length and are pale yellowish green to black in colour. They have a pair of cornicles arising from vth abdominal segment.

Biology of the pest

Citrus aphid

x Each aphid produces about 5 young nymphs/day for a period of 1-3 weeks parthenogenetically. Single life-cycle normally takes 6 to 8 days.

Management practices

x Foliar application of dimethoate 30 EC @ 2 ml or acephate 75 WP @1 g or imidacloprid 17.8 SL @ 0.4 ml /l on identified infested trees during winter season reduces the infestation levels. If needed, Second and third sprays should follow at 10 days intervals.

Fruit sucking moth (*Eudocima maternal*)

x-Adult moths are active during dusk and suck the juice from the ripening yellow colour fruits during Sept.-Nov.

x-The punctures produced during feeding by the adult moths leads to fruit rot due to invasion by secondary pathogens.

x-Only adult moths are destructive to citrus fruits. The moths are distinguished by having particularly well developed proboscis with dentate tips with which they are able to pierce the ripening fruits.

Pest identification

x Egg: Round, translucent, measuring about 1 mm in diameter.

x Larva: Full grown caterpillars are 50 - 60 mm long, stout, velvety-blue with yellow colour.

x Adult: The adults have pale orange brown body with forewings dark greyish and the hind wings orange red with two black curved patches.

Biology of the pest

x The female moth lays eggs on weeds like *Tinospora cardifolia*, *T. semilacina*, *Cocculus hirsutus*, *Convolvulus arvensis* etc. where the caterpillar develops after hatching. Egg period is 8 - 10 days. The caterpillar is a semilooper.

dark brown with yellow and red spots. Full grown caterpillars are 50 - 60 mm long, stout, velvety-blue with yellow patterns on dorsal and lateral sides. Larval period is 28 - 35 days. Pupation takes place in a transparent pale whitish silken cover enclosed in leaf fold. Pupal period is 14 - 18 days.

Management practices

- x Destroy fallen fruits by burrying in the ground.
- x Clean cultivation of the orchard is must to avoid the pest development.
- x Generation of smoke in the late evening hours in orchards repels the pest.
- x Systematic destruction of larval host plants during rainy season in the vicinity and surrounding the orchards in a mass campaign mode.
- x Bagging of fruits is effective but very laborious and expensive.
- x Poison baiting with malathion 50 EC @ 10 ml + 100 g jaggary +100 ml mandarin juice + 900 ml of water (two bottles containing poison bait per-25 30trees)
- x Foliar application of neem oil 1% or malathion 50 EC @ 2 ml at 10 -15 days interval during fruit maturity till harvest reduces the infestation levels.

Bark eating caterpillar (*Indarbela quadrinotata*)

Symptoms

- x Caterpillars feed on the bark and bore at stem joints Larva remains hidden inside the tunnel during day time and becomes active in the night.
- x Several caterpillars may attack the same tree at different locations which can cause serious injury to the bark and the death of small branches.
- x The holes left on the trunk may lead to infestation by other insects or plant pathogens. Affected branches break at the points of attack.
- x A severe infestation may arrest the growth of the tree and die within 2-3 years if untreated.

Pest identification

- x Eggs: Female lays eggs in group of 15 to 25 during May-June which remain attached to bark.
- x Larva: Caterpillars are 50-60 mm and have pale brown bodies with dark brown heads.
- x Adult: Adults are pale brown or grey in colour. They are 35 - 40 mm in size. The fore wings are pale rufous with numerous dark rufous bands. Their hind wings are fuscous.

Biology of the pest

- x The eggs hatch in 8-10 days. The larvae have the habit of making webs along the feeding galleries. The larvae take as many as 9-11 months to complete development. When full-grown, they make a hole into the wood and pupate inside. The pupal stage lasts 3-4 weeks. The moths emerge with the onset of monsoon and are short lived. Only one generation is completed in a year.

Management practices

- i. Clear the affected branches of the fross and faeces.
- ii. Inject 5-10 ml of dichlorvos 76 EC @ 4 ml/l into the tunnel and cover with cotton wad is quite effective due to its contact and fumigant action.

Citrus butterfly (*Papilio demoleus*)

Description: The Citrus butterfly is a common and widespread swallowtail butterfly. It gets its common name from its host plants, which are usually citrus species such as the cultivated lime. Unlike most swallowtail butterflies, it does not have a prominent tail.

The butterfly has also been referred to as the 'Butterfly of Death'. The caterpillar, known as the larva devours plants profusely, eating the leaves of the tender plants.

A fully-grown larva can consume a full-grown leaf in a matter of five minutes. This causes poor growth which results in lower production. As the larva grows, its appetite for leaf tissue increases. Larvae develop into pupae, which later develop into the adult butterfly. The butterfly is tailless and has a wingspan of 80–100 mm. The wings are black with a broad, irregular yellow band and a large number of irregular white spots. The upper hind wing has a red tornal spot with blue edging around it.

Management practices:

- Practice clean cultivation
- Encourage the presence of birds in the field, e.g. by erecting a T-stand in the field
- Hand pick the larvae and leaves that have had eggs laid on them, and bury in the soil or burn them