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Integrated Pest and Disease Management of Citrus Nursery in North East India

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SUMMARY

Production of quality planting material in citrus is considered as one of the major challenges to the nursery growers. Integrated Pest and Disease Management is a holistic and sustainable approach to pests and diseases control in agriculture and beyond. It employs multiple strategies to account for environment, economic and human health implications. This article highlights citrus nursery pests and diseases prevention strategies to ensure healthy and high quality seedlings. The management of major pests and diseases prevalent in the region, such as citrus butterfly, whitefly, leafminer, scab, canker, greasy spot and others, are discussed. The aspects cover in this paper emphasizes on the cultural, physical, biological and chemical controls integrated management. The information provided will be useful to frame an effective model of Integrated Pest and Disease Management. It has proven to be successful in promoting harmonious and sustainable agriculture.

INTRODUCTION

The global agriculture sector is strongly reliant on the citrus industry, which serves as a significant source of income and nutrition. The North Eastern region of India is a major area of Khasi Mandarin production. The success of citrus orchards depend on the availability of quality seedlings from the healthy nurseries. Since, recent era citrus nursery's pests pose a potential threat to the successful propagation of citrus trees. Citrus nurseries are generally recorded with major incidence of citrus butterfly, *Papilo* spp., whitefly (*Bemisia tabaci*) and leaf miner (*Phyllocnistis citrella*), Scab, Canker and Greasy spot *etc* causing significant crop losses. Although synthetic chemical pesticides have been used to control these pests, their extensive use has raised concerns about environmental pollution, pest resistance and resurgence. Moreover, majority of farmers are following natural/organic farming systems are interested towards non chemical approaches. In response to these challenges, there is growing interest in the utilization of Integrated Pest and Disease Management that offer environmentally friendly and sustainable alternative options to chemical pesticides.

Integrated Pest Management under Nursery condition:

1. Citrus leaf miner-*Phyllocnistis citrella* (Phyllocnistidae: Lepidoptera)

Nature of Damage:

- Citrus leaf miner larvae feed by creating shallow tunnels, referred to as mines, in young leaves.
- The larva mine in to the leaf blade making silvery zigzag lines which results in curling and drying of tender leaves.

Management:

- Release the nonstinging wasps like Cirrospilus, Pnigalio species.
- Use pheromone trap @ 5/acre. Pruning of affected parts during winter and burning.
- Foliar spray with Imidacloprid 17.8% SL @ 50 ml and use spray volume depending on size of tree & protection equipment used, Foliar spray Permethrin 25% EC @160-240 ml in 400 l of water/acre, Foliar spray with phorate 10% CG @ 6000 g/acre.

2. Citrus butter fly: *Papilio demoleus* (Papilionidae: Lepidoptera)

Nature of Damage:

- The pest is more common in nurseries and young plantations
- The early instar larvae prefer to feed on tender leaves where they feed on the lamina leaving the mid rib.
- The matured larvae feed on all the leaves and defoliating the entire plants.

Management:

- Collection and destruction of various stages of the pest in nurseries and new orchards
- Field release of parasitoids *Trichogramma evanescens* and *Telenomus sp* on eggs, *Brachymeria sp* on larvae and *Pterolus sp*. on pupae.

- Spray *Bacillus thuringiensis* @ 5 g/lit. or Nematode DD-136 strain or NSKE 3% also gives high mortality of caterpillar.
- In severe infestation - Spray Quinalphos 25 EC @ 2ml/ lit. or Carbaryl 50 WP @ 2 g/lit of water per ha during April and October or DDVP (Nuvan) @ 1 ml /lit

3. Mealy bug-*Planococcus citri* Risso (Pseudococcidae: Homoptera)

Nature of Damage:

- The leaves and tender shoots get deformed and twisted into knots and loops.The leaves become curled up.
- Clusters of white formations of bug are found at the joints of twigs. It extracts plant sap and reduces tree vigour. It also excretes honeydew which invites sooty mould.

Management:

- Prune the branches of canopy
- Use of nymphal and adult parasitoid *Leptomastric dactylopii* and the predators coccinellid *Cryptolaemous montrouzieri* and chrysopid *Mallada boninensis*.
- Chemical control of the pest includes spraying of Dimethoate 150 ml + Kerosene oil 250 ml in 100 liters of water or Malathion 20 ml in 10 liters of water.

4. Citrus whitefly: *Dialeurodes citri* (Aleyrodidae: Hemiptera)

Nature of Damage:

Both the nymphs and adults suck the sap from the tender leaves and produce heavy amounts of honeydew which attracts the sooty mould fungus that forms a black layer over the canopy.

Management:

- Hedging, Topping can be practised
- The Hymenopteran parasitoids, *Encarsia opulenta*, *E. bennetti*, *Eretmocerus gunturiensis* and the predators, coccincllid *Serangium parcesetosm* and chrysopid *Mallada boninensis* can be used in field (*Brumus suturalis* F., *Scymnus*) feed on CBF white-fly eggs and nymphs. *Lasius* sp., a black ant, feeds on eggs and crawlers actively; *Amystus* sp., a red spider mite, and an unidentified spider feed upon adult white flies.
- Pesticide are to be applied at 50% egg hatching stage when lst and 2nd larval instars predominate

Citrus leaf miner incidence

Citrus butterfly caterpillar damage

Citrus whitefly incidence

Citrus mealy bug incidence

Integrated Disease Management in Citrus Nursery

1. Citrus scab: *Elsinoe fawcettii*

Diagnostic symptoms:

- Irregular protuberant corky outgrowths up to 3 mm across
- Deeply cracked on the invaded side of leaf, depression forms on the opposite side.

Management:

- Disease free plants should be selected for new plantation to avoid introduction of citrus scab of leaves Inoculum.
- High humidity, continuous wetting period and temperature between 20 – 28°C are favourable fordisease development.
- Overhead sprinklers should not be used.
- Chemical control of the disease requires many repeated sprays to keep disease under control.
- Old Infected leaves and twigs should be removed from the orchard to minimize the Inoculum load and reinfection.
- The disease coincides with the emergence of new Tlush, prophylactic sprays of captafol, benomyl, methyl thiophenate and Carbendazim at this time provide satisfactory control of the disease.
- Copper Fungicides if applied as protectants after bloom give good control.

Citrus Greasy Spot

Citrus Canker

2. Greasy spot: *Mycosphaerella* spp.

Diagnostic symptoms:

- The initial symptoms of the disease appear as yellow mottle on the upper side of leaf which produces yellow brown to black lesions on the lower side of leaf.
- Usually the infected leaves drop before development of typical symptoms.
- Develop necrosis on upper surface of leaves.

Management:

- The fallen and decomposed leaves are the main source of inoculum. Sanitation and removal of infected leaves from orchard will help in reduction of inoculum.
- When new flush emergence coincides with highly humid and hot conditions, spray of copper fungicides or benomyl controls the disease significantly.
- Copper fungicides are the best

3. Canker- *Xanthomonas campestris pv.* citri (Hasse) Dye

Symptoms:

- On leaves is the yellow halo that surrounds lesion. Young lessons are raised or pustular, particularly on the lower leaf surface.
- The pustules later became corky and crateriform, with a raised margin and a sunken centre.

Management:

- Using canker free nursery stock.
- Pruning all the infected twigs before monsoon and burning.

- Application of NSKE 5% to manage the vector (Leaf miner) reduce the canker in nursery
- Integrated application of pruning of infected twigs suitable Copper oxychloride (0.1%), Streptocycline (100 ppm) and Neem cake.

Important Tips for production of disease-free planting materials of citrus:

- Nursery site should be away from the citrus orchards. Nursery should be raised in containers using plastic trays or polythene bags.
- Before using the potting mixture in the primary or secondary nursery, should be sterilized by covering UV stabilized transparent polythene sheets during summer months or through application of Basamid as soil fumigant or steam sterilization.
- It is advisable to use fresh seeds extracted from healthy fruits and sow in trayUnder shade conditions for better germination.
- Nursery floor should be covered with stones/stone dust to avoid contamination from soil.
- Only nucellar seedlings should be selected for further growth. Seedlings with bent and twisted tap root system should be discarded and too long taproot should be cut to ensure the straight penetration of root in soil.
- Seedlings should be transplanted during rainy season /cloudy days for greater survival. Seedlings should be treated with Ridomil @ 2.75g and Bavistin @ l g/litre water at the time of transplanting in secondary nursery.
- Bud wood should be selected from disease free and certified elite mother plants of known pedigree. Budwood should be selected from fairly well mature non bearing shoots of current year growth from selected plants.
- Samples are taken from identified elite mother plants for serological indexing or Biological indexing against major pathogens like Tristeza virus, mosaic, ring spot, Exocortis, viroid and greening bacterium before selection for bud wood.
- High budding not less than 20-25cm of height shoud be done by using sterilized knife.
- Regular recommended plant protection measures are followed to control insect pests *e.g.*, Monocrotophos @ l ml/l water against leaf miner, confidor @ 0.5ml/lit against leaf eating caterpillar/thrips, Dichlorvos@ 1.5ml/lit against leaf miner, Quinalphos @l ml/lit against aphids and Dicofol @ 2 m/lit or Wettable sulphur @3g/lit water against mites.

CONCLUSION

Citrus nursery management not only involves the care of seedlings/grafted material through proper irrigation and environment control during its young growth but also need an integrated pest and disease management. The extensive pest and disease management strategies provided emphasise the multidimensional and holistic approach required for effective control, as well as the necessity to ensure nursery health and productivity. Furthermore, a comprehensive guideline for effective production of disease-free planting materials has been provided. Amidst the challenges, employing integrated, sustainable and scientifically validated approaches is the key to a healthy citrus nursery. Thus, the farmers ensure not only economic growth but also the nutritional and environmental significance of citrus farming in regions like North Eastern India.

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