



## Insect Pests of Khasi Mandarin in Meghalaya

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In North-Eastern region around 42 insect species are found assuming as major and minor pest status in the mandarin for aggravation as citrus decline. Among them the Citrus Leaf miner, Citrus psylla, citrus trunk borer, citrus butterfly, Mealy bugs and Aphids were recorded as major pests of Khasi mandarin oranges in NEH region of India. These pests significantly contribute towards the Citrus decline in the region. Peak period of activities was observed from July to January for leaf miner, March to October for Psylla, July to October for Mealy bugs and April for Aphids with infestation on tree basis being 83.375, 8.125, 24.375 and 10.25 per cent respectively for these pests.

**Key words:** Khasi Mandarin, citrus leaf miner, citrus psylla, mealy bugs, aphids, citrus decline

### Introduction

Khasi mandarin (*Citrus reticulata*) is one of the most important citrus varieties grown in the North-Eastern region of India, particularly in Meghalaya. Khasi mandarin is grown mainly in the North-eastern region of India covering an area of about 1,12,500 ha and 10,882 ha in Meghalaya. Productivity is approximately 4.8 t/ha. It is valued for its excellent flavor, bright orange color, and high market demand. In Meghalaya, Khasi mandarin oranges (*Citrus reticulata*) are grown extensively at foot hills (100 Mts) as well as at high altitudes (1500 Mts). Citrus decline has been observed in this belt from severe to mild form and insect pests are reported to play a major role in decline in North Eastern Hills region (Sachan and Gangwar, 1978 & 1979). A comprehensive account of more than 42 species of insect pests attacking citrus in entire NEH region with recognition of 12 species as being more injurious to citrus trees is given. In view of this, the present studies were undertaken at Shillong to bridge the gap in our knowledge on the seasonal behaviour of some of the major pests of Khasi Mandarin oranges at high altitudes in Meghalaya.

### Citrus leaf miner (*Phyllocnistis citrella*)

Citrus leaf miner infestation level was recorded between 30.7% and 53.2%. The highest level of infestation by 53.2% was observed in 4th August 2018 when the mean temperature of maximum and minimum, percentage of relative humidity morning and evening and rainfall required as 27.9 °C, 21.0°C, 88.1%, 78.7% and 8.8mm respectively and then gradually decreased to the least infestation level by 30.7% in 8th December 2018 when it had 23.1 °C, 8.9 °C, 83.1%, 49.1% and 0mm data respectively. Consequently, the next highest level by 50.5% in 19th January '19 onwards (20.6 °C, 6.1 °C, 83.8%, 45.3% and 1.5mm) and then it got declined. These results were compared with ETL in all intervals against percentage infestation of citrus leaf miner was found to be more. As well, it was more in rainy days between the month of August to September and Cold weather period between January to February by 47.5% and 44.8% respectively. (Krishna *et al*, 2018)

**Nature of Damage:** The larva mine in to the leaf blade making silvery zigzag lines which results in curling and drying of tender leaves. On older leaves, brownish patches are formed.

The mining may also lead to the secondary infection by fungi and bacteria Eg: Citrus canker caused by bacteria. New flushes of the seedlings suffer the most. Larvae mine into the leaves making silvery zigzag lines which results in curling and drying of tender leaves. Heavily attacked plants can be spotted from a distance and young nurseries are severely affected.

### Lemon butterfly (*Papilio demoleus*)

*P. demoleus* larval infestation got reached at a peak status by 6.9/tree in 18th August 2018 onwards (28.8°C, 20.3 °C, 88.1%, 68.5% and 24.3mm) and then gradually reduced and reached to the lowest level by 0.5/tree in 5th January 2019 (20.4 °C, 6.2 °C, 86.1%, 52.4% and 0.2mm) then again it increased. The occurrence of lemon butterfly larvae exceeds at most of the intervals above ETL except four months from November to February. For rainy season it was found at high level by 5.5/tree and there was only least difference under post-rainy and cold weather seasons. It was found as highest level in August and January but remain prevalent throughout the year at low population and favoured to increase as when rainfall occurs.

**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 feeds on all the leaves and defoliating the entire plants.

### Citrus trunk borer (*Anoplophora versteegi*)

*A. versteegi* population of citrus trunk borer assumed to be around 0.27/tree by the observed mean of living boreholes per tree from the month of August to December and then increased to 0.33/tree (20.4 °C, 6.2 °C, 86.1%, 52.4% and 0.2mm) onwards. Shukla and Gangwar had reported earlier larval infestation occurring throughout the year and adults appeared in late March to mid-April in the state of Meghalaya. Hence, the borer considered an important deadliest pest wherever ETL: 1 living boreholes/tree is exceeding which is succumbed to death within 2 years after its entry into the trunk region. During study period, trunk borer infestation was recorded in 4 trees out of 15 trees surveyed.

**Nature of damage:** The grub of the trunk borer bores the tree trunk near ground level horizontally up to the pith and then tunnels vertically and again horizontally for exit. The attacked tree gradually dries up with leaves turning yellow and drop off prematurely due to the results in the interruption in the translocation of cell sap. Affected twigs break at the point of attack and severely affected plants lose its vigour and look sickly.

### Citrus aphid (*Toxoptera citricidus*)

*T. citricida* was found above of ETL in many fortnight intervals except in winter months i.e. November, December, January and February. The population was observed to be more in rainy season by 15.0 and lesser in post-rainy season by 5.4 and cold weather season by 3.8. Aphid occurrence found at that peak level in August and October and then got decreased in winter months. The reason being as it was supported by the study made by Komazaki (1982) coincides with peak periods of flush availability during these seasons. A large proportion of available terminals may be infested during these periods and a significant a greater number of large colonies could be able to develop and the mean daily temperatures above 25 °C have adverse effects on aphid reproduction and survival.

**Nature of damage:** It feeds on tender foliage and flowers. Nymphs and adults suck the sap of the leaves which leads to wilting and flower dropping. Infested leaves become shaped and crinkled. Growth of the plants is hindered. It transmits Citrus Tristeza Virus disease.

### Citrus psylla (*Diaphorina citri*)

The population level of *D. citri* was observed above ETL in all the intervals except in the month between December to February. Its populations were observed to be more in rainy season by 6.7/5cm twig and less in post-rainy by 3.2/5cm twig and cold weather by 0.4/5cm twig. Population obtains peak level at September and then reduced during cold temperature. The peak periods of the pest coincided with the emergence of new flushes, during months of August-September and March.

**Nature of damage:** Both nymphs and adults crowded on the terminal shoots and buds and suck the sap and also inject toxic saliva as a result in poor growth and death of shoots. Excrete honey dew as a result sooty mould. Affected plant parts dry and die away the fruit may become under sized, poor in juice contents and taste less. It is a vector of citrus greening virus disease.

### Citrus blackfly (*Aleurocanthus woglumi*)

The blackfly was founded at higher level of ETL in almost all fortnight intervals. Blackfly population was found quite high in rainy season by 19.2/leaf and less in other two season i.e. post rainy by 7.1/leaf and cold weather by 4.1/leaf. Sucking pest *A. woglumi* was found to occur more in August and October months and lesser in November. Chatterjee and co-workers (2000) obtained similar result that the citrus black fly population significantly got increased with the increase in relative humidity and rainfall during July to September. Also, several studies attained the same result as peak population during July-October months (Koli SZ et al. 1981)

**Nature of damage:** Nymphs and adults suck plant sap, causing curling of leaves and premature fall of flower buds and developing fruits.

### Citrus mealybug (*Planococcus citri*)

*P. citri* population was recorded above the ETL in all fortnight intervals except one interval. This population were higher in rainy season lesser in post rainy as well as cold weather season. The mealybug population recorded high in October and low in January and then started to increase from February inwards.

**Nature of damage:** Both nymphs and adults suck the sap from the cells of tender branches and fruits. Turn pale colour. Affected plant parts - wilt and dry up. Large amounts of honey dew excrete - sooty mould fungus. Fungus covers the foliage and fruits. In severe infestation the flowers do not form fruits.



### Conclusion

Several insect pests that are affecting citrus plantation causing economic loss are citrus leaf miner, lemon butterfly and citrus trunk borer. Their populations could be controlled by following package of practices such as use of high yielding varieties, proper plantation management (including clean cultivation by pruning trees time to time and removal of weeds), providing fertilizers supplement, efficient drainage and irrigation system, and integrated pest and disease management. Although, the government should take initiative to extension programmes in different blocks to educate the khasi mandarin growers and farmers to maximize its production and remains a much valuable GI product in Meghalaya.

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