



INSECT PESTS OF KHASI MANDARIN IN EAST AND WEST KHASI HILLS DISTRICT OF MEGHALAYA

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ABSTRACT

Roving survey of insect pests on Khasi mandarin carried out during August 2018 to February 2019 in the East and West Khasi hills districts of Meghalaya revealed the spectrum of insect pests. The survey covered five villages in each district, that is major citrus growing one. The results revealed eight insect species as the more dominant, and incidence observed individually for these showed that the citrus leaf miner (*Phyllocnistis citrella*) was found in abundantly in all the villages. The vector pests of citrus aphid (*Toxoptera citricida*) was found more in citrus tristeza viral disease prone areas and citrus blackfly (*Aleurocanthus woglumi*) also occurred.

Key words: Meghalaya, East and West Khasi hills, Khasi mandarin, Meghalaya, vectors, pests, tristeza, *Phyllocnistis citrella*, *Aleurocanthus woglumi*, dominants

Citrus is native to the north eastern India and adjacent valley which is collectively called as Indo-Burma region. GI tagged Khasi mandarin is one of the major and seasonal fruits of Meghalaya, and East and West Khasi hills districts are major producers. Decline of Khasi mandarin is governed by several factors which result in less productivity in Meghalaya (4.95 t/ha) compared to India's average (11.08 t/ha) (Anonymous, 2017). Among different factors, is the visible damage caused by insects, and hence details of their incidence needs to be recorded. Since, the crop becomes susceptible to pests due to its variable climate as well as unattended and uncared plantations these details are of utmost importance. In the north eastern region around 42 insect species are found assuming as major and minor pest status in the mandarin causing citrus decline (Hore and Barua, 2004). Among them the citrus leaf miner (*Phyllocnistis citrella* Stainton) and lemon butterfly (*Papilo demoleus* L.) are common. Citrus trunk borer (*Anoplophora versteegi* Ritzema) can make the whole tree to fall down. Sucking pests such as aphids (*Toxoptera citricida* Kirkaldy) have vector importance; blackfly (*Aleurocanthus woglumi* Ashby), mealybug (*Planococcus citri* Risso) and psylla (*Diaphorina citri* Kuwayama) cause severe citrus decline (Sreedevi, 2010). Hence this study to evaluate the emerging pest complex of Khasi mandarin in the state of Meghalaya particularly in East and West Khasi hills districts.

MATERIALS AND METHODS

Roving survey was carried out in different Khasi mandarin growing villages in East and West Khasi hills districts (EKH & WKH) to assess the infestation level of insect pests. In each district, five villages were selected i.e, Mawryngkneng, Sohryngkham, Mawlynnong, Pynursla, Nohwet (EKH) and Mawphanniew, Kynrud, Sohpi, Mairang, Nongshillong (WKH) Among all villages five orchards each having 25 randomly selected trees had been chosen and the observations of insect damage were recorded. The method of survey mainly employed for various insects are, citrus leaf miner by number of mining leaves in total number of leaves (% infestation), larval population per tree were recorded for lemon butterfly, for citrus trunk borer boreholes were counted, citrus psylla were recorded by number of nymphs in 5 cm length of twig, the vector pest citrus aphid were recorded by counting the number of insects per square centimeter, citrus black fly has been recorded number of insects present in randomly selected 15 leaves/ tree and citrus mealybug were recorded by number of nymphs in 5 cm length of twig per tree (Rao et al., 2012).

RESULTS AND DISCUSSION

Citrus leaf miner *Phyllocnistis citrella* was found in all the villages surveyed, with maximum (56%) infestation being at Kynrud (WKH) and minimum by

(38.7%) in Mawlynnong (EKH), and it is a predominant pest (Fig. 1, 3). The incidence level was > the ETL of 25% infected leaves, affecting at least 10 leaves/ tree. Singh (1984) observed this on younger and tender leaves, which became distorted and get curled, with irregular twisted galleries or zigzag glistening tunnels on both sides of the leaves. It frequently affects the stems leading to loss of vigour (Pena et al., 2000). For the lemon butterfly *Papilio demoleus* larval counts ranged from 1.1 to 1.5/ tree (Fig. 2, 4); it was noticed on tender and older leaves, with its ETL of 3-5 larvae/ tree not exceeded, making it as a minor pest. Mahesh and Pizvi (2003) reported total defoliation due to *P. demoleus*, while Raju and Naidu (2000) observed *Citrus aurantium* (lemon tree) as its preferred host for its egg laying. Citrus trunk borer *Anoplophora versteegi* incidence was observed as 0.6 to 1.0 boreholes/ tree (Fig. 2, 4); and among the villages surveyed three villages namely, Sohryngkham (EKH), Sohpi (WKH) and Mairang (WKH) were found to show incidence above the ETL (1 borehole/ tree); and West Khasi hills are affected more than East Khasi hills. Citrus trunk borer infestation is quite important due to its severe form of damage on trunk. Singh and Singh (2012) observed its grub boring into the trunk at ground level horizontally up to the pith and then tunnelling vertically and then again return to

horizontal to exit. Infected trunks exude gum and wood powder accumulation on ground, with tree succumbing at short period.

Citrus psylla Diaphorina citri affected the tree in all six villages with maximum incidence of 0.9/ 5cm twig (Fig. 2, 4) being at Sohryngkham (EKH). In West Khasi hills the khasi mandarin plants were found free from this except one village Kynrud. Nymphs were less in the villages surveyed. Citrus aphid *Toxoptera citricida* population was found to occur in seven villages, and at Mawryngkneng (EKH) it was significantly more (13.9/ cm² twig) followed by Nohwet (EKH) (Fig. 2,5), and its ETL is 5-8/ cm² twig). Thus, it predominantly occurred in East Khasi hills. Symptoms of citrus tristeza viral disease were observed herein. In addition to viral transmission, its infestation is attributed for stunted and reduction of fruit setting (Ghosh et al., 2015). Citrus blackfly *Aleurocanthus woglumi* was found @ 18.4/ leaf in Pynursla (EKH), and it was also observed at Mawphanniew (WKH), Nongshillong (WKH) and Mairang (WKH) (Fig. 2, 5) above ETL (5-10 nymphs per leaf). This pest infects by sucking sap from underside of the leaf resulting in yellowing, stunting and reduction in yield. Chatterjee et al. (2000) observed yield loss of fruits up to 50-70% due to this pest. Citrus

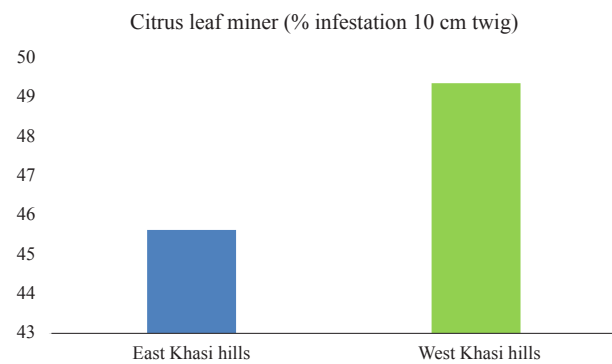


Fig. 1. Citrus leaf miner infestation

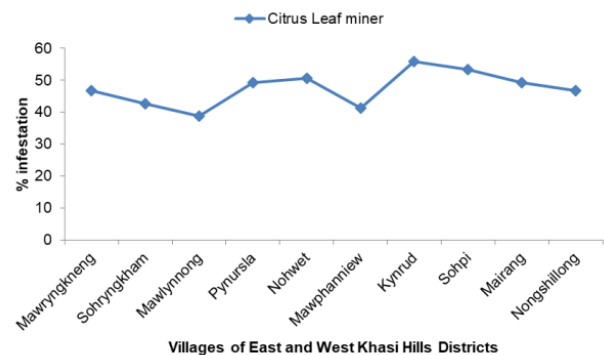


Fig. 2. Lemon butterfly, trunk borer, psylla, blackfly, mealybug

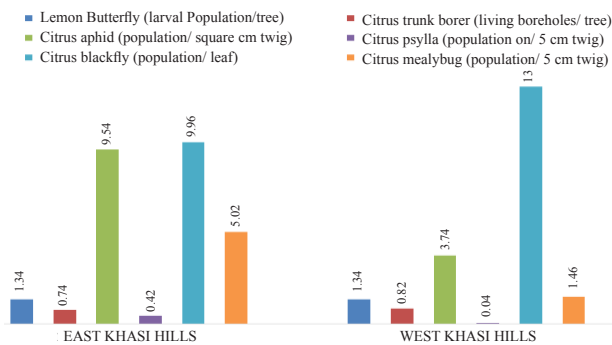


Fig. 3. Leaf miner (10 cm twig) infestation

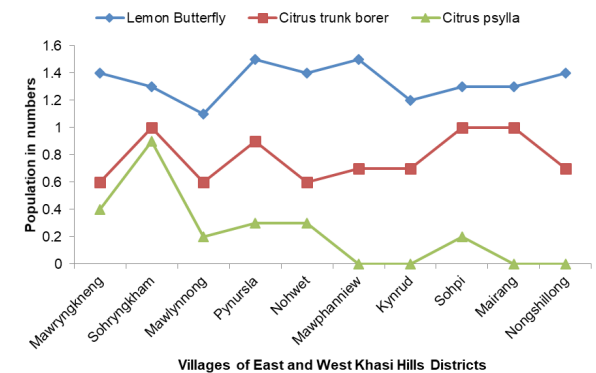


Fig. 4. Lemon butterfly, trunk borer, citrus psylla infestation

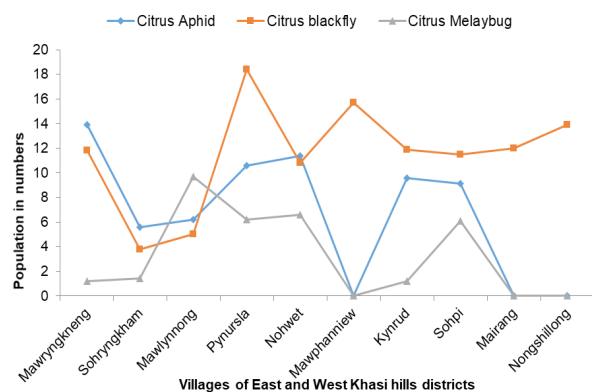


Fig. 5. Citrus aphid, blackfly, and mealybug

mealybug *Planococcus citri* occurred in seven villages, with a maximum of 9.7/ 5 cm twig in Mawlynnong (EKH) which was followed by 6.6 numbers/5 cm twig in Nohwet (EKH) and 6.2 numbers/5cm twig in Pynursla (EKH). In West Khasi hills only two villages namely, Sohpi and Kynrud were found affected and remaining villages found free from pest (Fig. 2 & Fig. 5). Citrus mealybug reduces the yield by their colonisation occurrence. It was very destructive at fruiting stage. Similar form of damage symptom was identified in the observation made in the five villages and found with density exceeding ETL (3-5 nymphs per 5 cm twig). Rao et al., (2012) reported its sporadic nature, prefers humid conditions planted on heavier soils or with large and/or closely planted trees.

Finally, the roving survey indicated that lacking intercultural operations such as pruning of old, withered and dried twigs leads to low yield of mandarin. These affected plantations should be rejuvenated by undertaking integrated pest and nematode management programme from the data on economic threshold level (ETL) collection from time to time, stage to stage, field to field on prevailing climatological and the other biotic and abiotic factors. Although, the government should take initiative to extension programmes in different

blocks to educate the khasi mandarin growers and farmers to maximize its production as it will make the Khasi mandarin much valuable GI product of Meghalaya.

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