

## Bionomics of *Drosicha mangiferae* (Green) on Citrus including New Record of its Three Natural Enemies

by

D. K. SAXENA<sup>1</sup> and R. R. RAWAT<sup>2</sup>

**Introduction:** *Drosicha (Monophlebus) mangiferae (stebbingi)* (Green,) (Homoptera: Margarodidae) is a serious pest in Northern India, chiefly on mango. During 1959-61, reports of heavy fruitfall in Citrus spp. at Gwalior and some other places in M. P. due to the infestation of this pest called for immediate investigations on its bionomics on citrus to fill the lacunae in our knowledge. The results of these investigations are reported here.

Rahman and Latif (1944) have reported their findings on its bionomics and control on mango at Lyallpur. Singh (1946) found that temperature and humidity of the soil were the most important factors affecting development and time of hatching of its eggs. Sen and Prasad (1965) reported its biology and control on mango in Bihar. Pruthi and Batra (1960) reported that it is a serious pest of mango in North-West India but it also attacks the citrus fairly well. The pest has been so far reported to be a serious pest of mango only. The only other record of economic damage caused by a Margarodid to citrus (orange) in India is by Bhowse (1965) in West Bengal.

**Materials and Methods:** The pest was reared on citrus at room temperature. Adults were separated from the mass culture and each pair was confined with citrus twigs in a glass jar measuring 9"—12" in height, half filled with loose moist soil. Freshly hatched nymphs were reared individually in petri-dishes. Its natural enemies and percentage parasitization were also studied by fortnightly collections of all the available stages from the orchards.

**Results and Discussion:** *Damage:* Tender stems, leaves and fruits are infested by nymphs and adults. Due to the draining of sap by the pest, the heavily infested plants show sickly appearance with stunted growth, drooping and shedding of leaves and flowers, poor fruit setting and premature fruit fall. Sooty moulds grow on the 'honey-dew' deposited by the pest and check the normal growth of the plants. Older fruits fail to develop properly.

*Life History.* (i) *The egg:* The eggs are usually laid during April to beginning of June at a depth of 2"—7" in loose soil inside white cottony ovisacs near or away from the base of the trees. In the absence of loose soil the eggs are also laid in the cracks of the soil and bark. The eggs are oval in shape and

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<sup>1</sup> Assistant Entomologist.

<sup>2</sup> Professor and Chairman of Entomology, Department of Entomology, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur.

shiny pink in colour, later turning to pale yellow. The eggs measure 0.85 to 1.25 mm in length and 0.65 to 0.80 mm breadth. The viability of eggs ranged from 47.2 to 88.5 per cent. Hatching occurred from September–October to February, mostly during November. Rahman and Latif (1944) recorded egg laying during May and June and hatching at Lyallpur during January whereas Sen and Prasad (1956) reported egg laying and hatching during May and May to middle of December, respectively, in Bihar. Pruthi and Batra (1960) reported that the eggs hatch in the later half of January and continue till March in North-West India. The egg period varied from 98 to 185 days as observed in 1,739 eggs. Rahman and Latif (1944) reported it to be longer (about eight months) at Lyallpur as against five months at Banaras. These differences are obviously due to differences in soil-temperature and humidity as studied by Singh (1946).

(ii) *The nymph*: The nymphs started ascending the trees from October–November. Bright sunny days favoured the ascending activities of the nymphs which congregate in clusters of 17 to 283 in the axils of the twigs and cracks of the bark. Four nymphal instars in females and three in males were recorded on citrus. The duration of nymphal instars in female varied from 26–38, 18–32, 18–29, and 9–20 days and in male from 26–38, 18–32 and 15–17 days. The total nymphal duration ranged from 71 to 119 days and 59 to 87 days. Rahman and Latif (1944) reported only three nymphal instars in both sexes on mango at Lyallpur with comparatively longer nymphal period of 77 to 135 days in female and 67 to 119 days in male. These differences seem to be due to temperature effect and better suitability of citrus as host than mango which was also confirmed by our field observations indicating more infestation on citrus than on mango. The sexes could be differentiated in 3rd nymphal instar, the female nymphs being oval, thickset and convex and the male nymphs elongated and compressed. Under starvation, the 4th instar nymphs survived for a longer period (2 to 3 weeks) as compared to third instar nymphs (5 to 12 days) and 1st and 2nd instar nymphs (only a few days). No such observations have been reported by previous workers.

(iii) *The male pupa*: Third instar male nymphs prepared white cottony cocoons for pupation. The prepupal and pupal periods varied from 2 to 5 and 6 to 13 days, respectively. Rahman and Latif (1944) reported these periods to be somewhat longer at Lyallpur on mango, being 3 to 7 and 9 to 15 days, respectively.

(iv) *Life cycle*: The total life cycle from egg to adult on citrus, varied from 169 to 304 days in females and 165 to 290 days in males. Previous workers have reported this period to be much longer on mango. This seems to be partly due to temperature and humidity effects and partly due to the better suitability of citrus as host plants than mango.

(v) *The adult*: The males have a pair of slaty membranous functional fore-wings; the females are apterous. The males have a very strong sex instinct. Soon after emergence, they fly in search of their mates. Mating takes place mostly during morning hours. Mating period ranged from 18 to 45 minutes. After mating the females become more active. They descend the trees and reach the soil for oviposition. A female was found to mate only once but a male was found to fertilize more than one female. The pre-oviposition, oviposition and post oviposition periods varied from 18—27, 17—26 and 0—8 days, respectively as observed in 20 females. A majority of females died soon after laying the full quota of eggs but a few survived upto 8 days after oviposition. Rahman and Latif (1944) recorded the preoviposition period on mango to be comparatively longer (15—36 days) but the oviposition period was the same as found in present studies on citrus. The males are attracted to light but the females are not. These observations are in confirmity with those of Rahman and Latif (1944). The females were found to survive for 20—39 days even under starvation.

(vi) *Fecundity*: The fecundity varied from 56 to 580 eggs in the field and 23 to 358 eggs in the laboratory. Previous records on mango mention lower fecundity ranging from 51 to 336 eggs in the field and 23 to 154 eggs in the laboratory in the Punjab (Rahman and Latif, 1944) and 250 to 300 eggs in Bihar (Sen and Prasad, 1956). Still previous records by Lefroy and Dutt as review by Rahman and Latif (1944) mention it to range from 300 to 400 eggs and 150 to 210 eggs, respectively. These differences obviously seem to be due to humidity and temperature effects of the soil and nutritional effects of host plants.

(vii) *Longevity*: The longevity of mated females and males was comparatively more ranging from 15 to 58 days and 4 to 13 days, respectively, than in non-mated females and males in which it varied from 32 to 63 days and 7 to 18 days, respectively. Rahman and Latif (1944) recorded comparatively lesser longevity on mango in the Punjab, varying from 22 to 47 days in female and a few days to a week in male. Pruthi and Batra (1960) reported that the males die after about a week of mating and the females live for about one month on mango in North-West India and die soon after oviposition. Thus higher fecundity as well as adult longevity confirm that citrus spp. are more suitable host plants for the pest than mango.

*Seasonal History*: The pest was active on citrus spp. and other host plants during most part of the year except from second week of June to July—August when only eggs were found in the soil. Only one generation was recorded in a year. The pest population was highly reduced during extreme winter and summer when the pest was not found on the usual host plants



but many adults and nymphs were found wandering away under the hedges, debris and weeds in and around the infested orchards, obviously for protection against unfavourable temperatures. The pest was found most active from October to March and afterwards the activity declined. Rahman and Latif (1944) mentioned the activity of the pest from January to first week of May at Lyallpur whereas Sen and Prasad (1956) reported the activity from middle of December to beginning of May and also mentioned that a sudden down pour in the month of January in Bihar attended with severe cold was found to cause a high percentage of mortality of nymphs and to retard their activities. In the present studies in M. P., the seasonal events in the life history of the pest were found to occur even earlier than those recorded by Sen and Prasad (1956) in Bihar, the activity starting with the hatching of eggs from September—October and ending with the descending of females for egg-laying in March—April.

*Natural Enemies and Percentage parasitization:* Eggs were found to be parasitized by a Chalcid parasite, and nymphs and adults by an ichneumonid as well as a dipterous endoparasite. Parasitized eggs became blackish or brownish in colour whereas the nymphs and adults developed a swelling and blackish colouration in the abdominal region. The percentage parasitization varied from 2.2 to 12.5 in eggs, 5.6 to 20.3 in nymphs, 3.7 to 12.8 in adult females and zero in adult males. A red mite *Bochartia* sp. was also recorded as an ectoparasite on nymphs and adults; the percentage parasitization by it varied from 16.4 to 28.7 in grown up nymphs, 15.6 to 35.5 in adult females and 2.7 to 10.4 in adult males. The number of mites per parasitized nymph and female and male adults varied from 1 to 9, 3 to 32 and 1 to 5 respectively. Some females were also found to be parasitized by an entomogenous fungus, *Aspergillus parasiticus* Speare, which has also been previously reported on *Ferrisiana virgata* Ckll. in M. P. by Bindra and Saxena (1961). Boyce and Fawcett (1947) reported that the parasitic *Aspergillus* caused Mycosis in mealy-bugs in California insectaries. Larvae and adults of *Coccinella septempunctata* L., *C. undecimpunctata* L., *Rodolia fumida* Muls., *Chilomenes sexmaculata* Fabr., *Aulis vestita* Muls., larvae of *Chrysopa scelestis* and birds were observed feeding as predators on the nymphs and adults of the pest.

*Aspergillus parasiticus* Speare, *Bochartia* sp. and *Rodolia fumida* Muls are the new records as natural enemies on this pest from India.

*Association with other Insects:* Black ants (*Camponotus compresses* F.) and red ants were found living in association with nymphs and adults, feeding on the 'honey dew' which also attracted some wasps, bees and flies. Similar observations have been recorded by Rahman and Latif (1944) and in a number

of homopterous insects by some workers like Khan and Rao (1956) and Chelliah and Basheer (1965).

**Summary:** During 1959—61, *Drosicha magniferae* (Green), appeared as a serious pest of citrus spp. in Madhya Pradesh, resulting in premature fruit fall. The infestation on citrus was more severe as compared to mango, guava and fig. Citrus was found to be more suitable host plant than mango. The total developmental period from egg to adult on citrus in female and male varied from 169 to 304 days and 165 to 290 days respectively. Females have a strong starvation capacity. Detailed bionomics have been reported. *Aspergillus parasiticus* Speare, *Bochartia* sp. and *Rodolia fumida* Muls were recorded for the first time as the natural enemies of this pest from India.

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