

# UC Riverside

## International Organization of Citrus Virologists Conference Proceedings (1957-2010)

### Title

Population Dynamics and Aspects of the Biology of Citrus Psylla,  
*Diaphorina citri* Kuw., in Maharashtra

### Permalink

<https://escholarship.org/uc/item/3bn6w2pp>

### Journal

International Organization of Citrus Virologists Conference Proceedings  
(1957-2010), 12(12)

### ISSN

2313-5123

### Authors

Chavan, V. M.  
Summanwar, A. S.  
Moreno, P.  
et al.

### Publication Date

1993

### DOI

10.5070/C53bn6w2pp

Peer reviewed

# Population Dynamics and Aspects of the Biology of Citrus Psylla, *Diaphorina citri* Kuw., in Maharashtra

V. M. Chavan and A. S. Summanwar

**ABSTRACT.** Citrus greening disease has destroyed many flourishing citrus gardens in the State of Maharashtra, India. The psyllid vector of greening disease, *Diaphorina citri* Kuw., is of common occurrence in almost all the citrus orchards of this region. In addition to citrus, the psylla also infest and breed on *Murraya koenigii* plants throughout the year. The population build-up of this vector is mainly related to the flushing rhythms of the plants. The maximum population on Mosambi sweet orange and citropsis (*Citropsis schweinfurthii*) is found in January and February, whereas the lowest population density occur from July to October following monsoon rains. The life span of the psylla depends on the plant species on which it breeds.

The presence of citrus greening in the Pune region of Maharashtra State, India, was first suspected in 1960 (4), its incidence being confirmed in 1966 (12,13). The disease has spread through the citrus gardens of the entire Maharashtra State. Surveys showed that greening is more prevalent on sweet orange plantations of the western part of the State than that of the central and northeastern parts where mandarins (Nagpur orange) are predominantly grown (1).

Citrus psylla, *Diaphorina citri* Kuw., the vector of the greening pathogen, is of common occurrence on citrus plants in this region (5,6). At Pune, apart from citrus, this vector has been found to breed on *Murraya koenigii*, *M. paniculata* (11,18) and *Citropsis schweinfurthii*, all members of the Rutaceae. A detailed study on the pathogen-vector relationship of greening disease has been carried out (7), but information on population dynamics and comparative biology of the vector on citrus and other hosts is lacking. The present paper deals with the studies on population dynamics and biology of citrus psylla carried out in Pune from 1989 to 1991.

## MATERIALS AND METHODS

Every first and sixteenth days of each month from 1989 to 1991, visual counts were taken on the number of adult psylla on two citropsis trees grown on the premises of the Research

Station. Similar counts were taken on Mosambi sweet orange plants in the Ganeshkhind citrus orchard of the Agricultural College, Pune situated nearly 7 km away from the Research Station. Twenty plants were marked for regular observations, and thirty twigs (18-25 cm) per plant were observed for psylla populations during 1990 and 1991. Corresponding meteorological data on maximum and minimum temperatures and average relative humidity were collected from the Meteorological Unit, College of Agriculture, Pune.

For biology studies, a colony of citrus psylla was maintained on host plants of Mosambi sweet orange, Kagzi lime, citropsis and *M. koenigii*. From these colonies adult female psylla were collected and eight to ten were released on each of the five 2-3-month-old plants of the respective host species. These plants were covered with a glass cylinder having muslin cloth tightened at one end. The psylla were removed from the plants the following day after observing egg laying. On egg-hatching, the freshly formed nymphs were transferred to new plants of the respective host species. Seven to twelve nymphs per individual plant were observed for the total nymphal period. The newly formed adult psylla were again transferred to fresh plants for observations on adult longevity. These life cycle studies were carried out during March-May, the favourable period for psylla.

## RESULTS AND DISCUSSION

**Population dynamics of *D. citri* Kuw. on citropsis.** The pooled observations for 1989-91 (Fig. 1) revealed that psylla became active from late January until April, and again in June and July, the highest population being recorded in the second fortnight of February. The onset of monsoon decreased the population until October when it began to increase again. But from November onwards populations declined, the lowest level being recorded during the second fortnight of December. The individual year's data, too, showed similar population peaks with slight variations i.e. February-March, March-April, June-July and in October with lowest population in December.

**Population dynamics of *D. citri* on Mosambi sweet orange.** The population fluctuations observed in the field on Mosambi were the same as on citropsis plants on the premises of Research Station. Thus, there were four population peaks observed in 1991 (Fig. 2) i.e. February to July and in October, with highest and lowest levels recorded in

second fortnight of February and December respectively. In 1990, the heavy prolonged rains suppressed the population from July onwards.

The above observations on population dynamics of *D. citri* on citropsis and Mosambi are not related to temperature fluctuations as the vector remained active over the wide range of maximum and minimum temperatures, i.e. 29 C- 39 C and 10 C- 24 C respectively. The average relative humidity ranged from 37 to 78% and did not apparently influence the population build-up. The lowest population levels in December, however, might be related to the low winter temperatures inducing the slower activity of the adults (2) together with non-availability of nutritious food supply (14). The psylla lay eggs exclusively on young flush points and nymphs develop on immature leaves (8). Hence, the major factor influencing the population build-up of *D. citri* under Pune conditions seems to be the availability of new leaf-growth for breeding of the vector. The flushing rhythms of citrus trees as observed in this area provided fresh

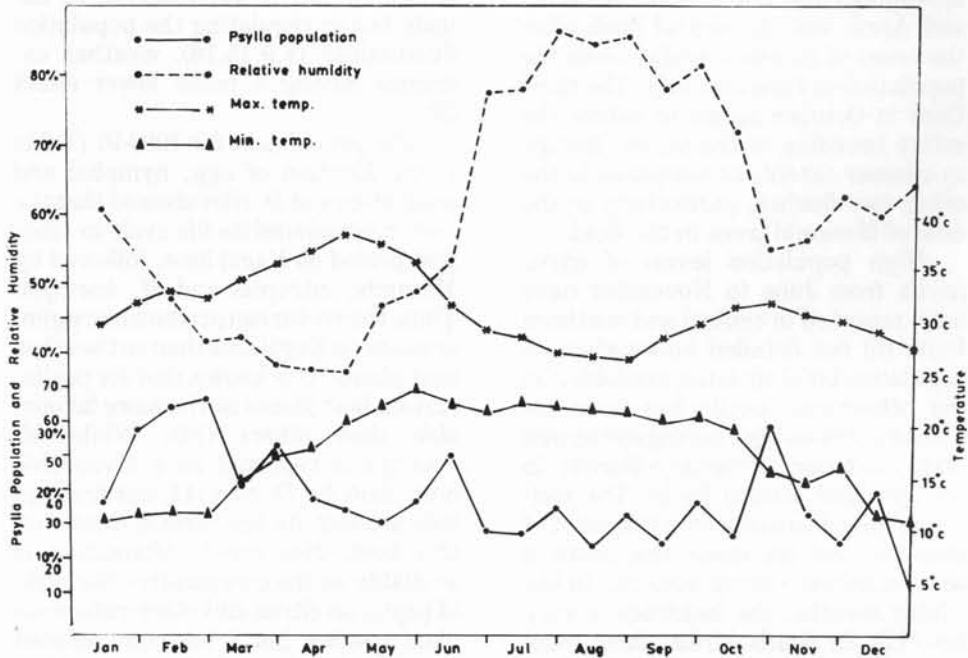


Fig. 1. Seasonal incidence of citrus psylla on citropsis 1989-91.

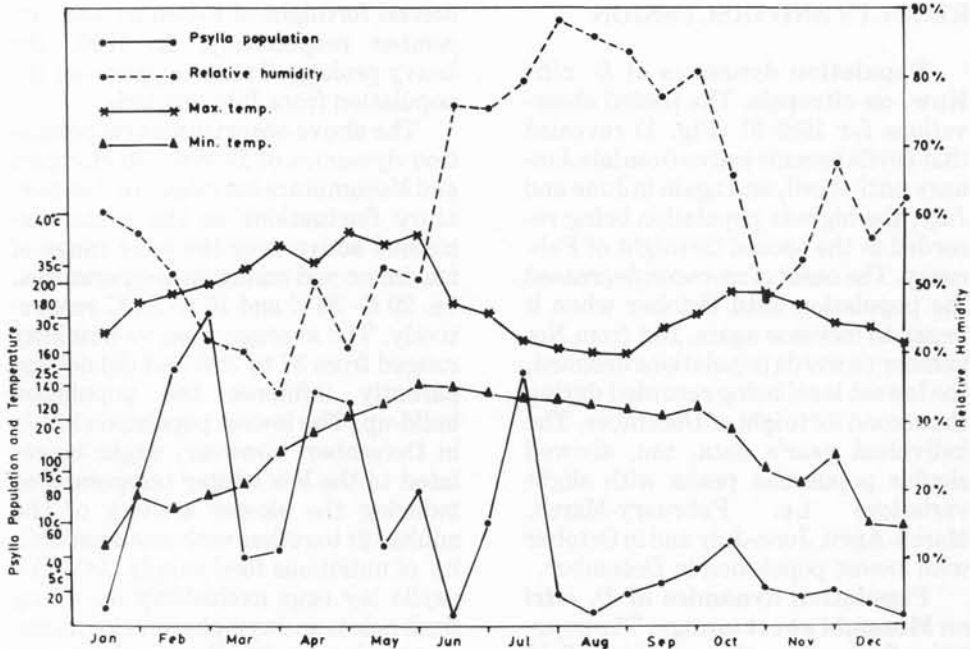


Fig. 2. Seasonal incidence of citrus psylla on Mosambi sweet orange January to December 1991.

growth of leaves in February and March making insect activity more pronounced during this period. The insects continue to breed, though in small numbers, throughout the hot months of March and April, and the second flush after the onset of monsoon again boosts the population in June and July. The third flush in October seems to induce the active breeding of the insect, though to a lesser extent, as compared to the other two flushes, particularly in the case of Mosambi trees in the field.

High population levels of citrus psylla from June to November have been reported in central and southern India (6) but detailed information on population build-up is not available. On the other hand, psylla has been reported a serious pest during spring and early summer (February-March) in western and central India. The incidence then decreases with the onset of monsoon, but the insect reappears in small numbers during autumn. In the winter months, the incidence is very low (17). In South Africa, three main factors regulating population of *Trioza erytreae*, the vector of South African

greening, were found, namely the flushing rhythms and quality of citrus, weather extremes and natural enemies (10). In the case of *D. citri*, flushing rhythm of citrus was found to be the main factor regulating the population fluctuations (8,9,15,16), weather extremes having a much lower effect (3).

The pooled data for 1989-91 (Table 1) on duration of egg, nymphal and adult stages of *D. citri* showed that the vector completed its life cycle in shortest period on Kagzi lime, followed by Mosambi, citropsis and *M. koenigii*. Thus, the vector can produce more generations on Kagzi lime than on the other host plants. It is known that for psylla, certain host plants can be more favourable than others (14). While *M. koenigii* is reported as a favourable host plant for *D. citri* (11) our findings indicate that its life cycle is slower on this host. Not much information is available on the comparative life cycle of psylla on citrus and other rutaceous plant species, but it has been pointed out that duration of life stages of *D. citri* depends on seasons, with the adult

TABLE 1  
BIOLOGY OF *DIAPHORINA CITRI* KUW. ON DIFFERENT PLANT HOSTS

| Host plants         | Life stages of <i>Diaphorina citri</i> (1989-91) <sup>a</sup> |                     |             |                 |
|---------------------|---|---------------------|-------------|-----------------|
|                     | Egg stage   | Total nymphal stage | Adult stage | Total life span |
| Kagzilime           | 2.0   | 11.06               | 13.83       | 27.86           |
| Mosambisweet orange | 3.16  | 11.76               | 15.13       | 30.20           |
| Citropsis           | 3.16  | 11.83               | 15.36       | 30.40           |
| <i>M. koenigii</i>  | 4.03  | 14.66               | 15.50       | 34.30           |

<sup>a</sup>Averages in days.

stage as long as 190 days in winter and only 20 days in summer (2).

Psylla are known to undergo dramatic fluctuations in numbers. Owing to their high fecundity and short life cycle they are able to multiply very fast to exploit their environment when limiting factors are relaxed (8). At Pune, flushing rhythms of the host plants seem to be the main factor governing the population build-up of *D. citri* though the low winter temperatures slow down its activity to a mini-

mum level. Influence of other factors such as natural enemies needs further investigation. Citrus being the main host plant, successful breeding of the vector on non-citrus hosts such as *M. koenigii* warrants a situation where such plants can act as dangerous reservoir of psylla.

#### ACKNOWLEDGEMENT

Thanks are due to the Director, I.A.R.I., New Delhi, for providing facilities for the work.

#### LITERATURE CITED

- Anonymous  
1989. Diseases. In: Research report on citrus. Session VI. Sixth Biennial Workshop of the All India Coordinated Research Project on Tropical Fruits, Agricultural College, A.P.A.U., Tirupati (13-16 September), I.I.H.R. Bangalore (India) p. 414-415, 421, 449, 462-463.
- Atwal, A. S.  
1962. Insect pests of citrus in the Punjab. I. Biology and control of citrus psylla, *Diaphorina citri* Kuwayama (Hemi.: Psyllidae). Punjab Hort. J. 11: 104-108.
- Bove, J., and J. Cassin  
1968. Problems of agriculture. Report on a survey in Reunion. IFAC-CNRA Versailles (Mimeographed)(Cited by Catling, H. D. 1972. Proc. 5th Conf. IOCV, IOCV, Riverside p. 56).
- Capoor, S. P.  
1966. Citrus viruses, their economic importance and modes of spread in India. Proc. Summer School in Plant Virol., Simla (India), (Abstr.) p. 80.
- Capoor, S. P., D. G. Rao and S. M. Viswanath  
1966. Transmission of the citrus greening disease by *Diaphorina citri* in India. Proc. Intern. Symp. on Plant Pathol., New Delhi. (Cited by Capoor S. P. et al. 1967. Indian J. Agric. Sci. 37: 572).
- Capoor, S. P., D. G. Rao, and S. M. Viswanath  
1967. *Diaphorina citri* Kuway. a vector of the greening disease of citrus in India. Indian J. Agric. Sci. 37: 572-576.
- Capoor, S. P., D. G. Rao, and S. M. Viswanath  
1974. Greening disease of citrus in Deccan Trap country and its relationship with the vector, *Diaphorina citri* Kuwayama, p. 43-49. In: Proc. 6th Conf. IOCV. Univ. Calif., Div. Agr. Sci., Richmond.
- Catling, H. D.  
1970. Distribution of the psyllid vectors of citrus greening disease, with notes on the biology and bionomics of *Diaphorina citri* Kuw. FAO Plant Prot. Bull. 18: 8-15.
- Catling, H. D.  
1972. Factors regulating populations of psyllid vectors of greening., p. 51-57. In: Proc. 5th Conf. IOCV., Univ. Calif., Div. Agr. Sci., Richmond.

10. Catling, H. D. and D. P. Annecke  
1968. Ecology of citrus psylla in the Letaba district of northern Transvaal. S. Afr. Citrus J. 410: 17.
11. Chakraborty, N. K., P. K. Pandey, S. N. Chatterjee, and A. B. Singh  
1976. Host preference in *Diaphorina citri* Kuwayama, vector of greening disease of citrus in India. Indian J. Entomol. 38: 196-197.
12. Fraser, L. R. and D. Singh  
1966. Greening virus: a new threat to citrus industry. Indian Hort. 10: 21-22.
13. Fraser, L. R., D. Singh, S. P. Capoor, and T. K. Nariani  
1966. Greening virus, the likely cause of citrus die-back in India. FAO Plant Prot. Bull. 14: 127-130.
14. Hodkinson, I. D.  
1974. The biology of the psilloidea (Homoptera): a review. Bull. Ent. Res. 64: 325-339.
15. Huang, C. H., C. F. Liaw, L. Chang, and T. Lan  
1990. Incidence and spread of citrus likubin in relation to the population fluctuation of *Diaphorina citri*. Plant Prot. Bull. (Taipei) 32: 167-176. (Cited in Review Plant Pathol. 1991. 70(10): 828. Abstr. no. 6534).
16. Husain, M. A., and L. D. Nath  
1927. The citrus psylla (*Diaphorina citri* Kuw.) Psyllidae : Homoptera. Mem. Dept. Agr. India. Ent. Ser. 10(2): 5-27.
17. Raychaudhari, S. P., T. K. Nariani, and V. C. Lele  
1969. Citrus die-back problem in India. Proc. 1st Int. Citrus Symp. 3: 1433-1437.
18. Singh, A. B., and M. R. Nimbalkar  
1977. *Murraya koenigii* L. and *M. paniculata* - preferable host of *Diaphorina citri* Kuway. Sci. Cult. 43: 97-98.