



ISSN: 2321-4902
Volume 1 Issue 5

Online Available at www.chemijournal.com

International Journal of Chemical Studies

Studies on the seasonal incidence of citrus psylla (*Diaphorina citri* Kuw.) in Nagpur Mandarin

PN Dawane¹, UP Barkhade¹ and RM Wadaskar¹

1. Department of Entomology, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra, India
*[Email: dpradeep.ento@gmail.com,

The present investigation entitled, "Studies on the seasonal incidence of citrus psylla (*Diaphorina citri* Kuw.) in Nagpur Mandarin" was conducted during Ambia bahar of 2009-10. Eight-year-old Nagpur mandarin orchard selected for imposing treatments was, planted at spacing of 6.0 m X 6.0 m at Futala farm, College of Agriculture, Nagpur. Present investigation had components like studies on seasonal incidence of citrus psylla (*Diaphorina citri* Kuw.). The population of citrus psylla both nymph and adult were counted on the twigs of 5 cm fresh growth of the shoot. For population dynamics of citrus psylla (*Diaphorina citri* Kuw.) were recorded after every 7 days during Ambia bahar of 2009-10. Weather data during 2009-10 was obtained from Meteorological observatory in College of Agriculture, Nagpur, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola. The citrus psylla abundance was very low during January but with the increase in temperature in the end of February and March, the activity of adults increased. At the same time significant increase in nymphal population was observed during February and March. It was mostly associated with the flushing cycle indicating the preference of the pest for new flush. Citrus psylla prefers warm conditions with lower humidity regime which is evident from population rise in month of February and March.

Keyword: Incidence of citrus, psylla *Diaphorina citri* Kuw., Nagpur Mandarin

1. Introduction

Nagpur Mandarin is regarded as "Green gold" and Nagpur city is popularly known as the "Orange City". Kinnow mandarin has acclimatized very well in semi-arid irrigated zones of Punjab and its adjoining states and in Nagpur and Akola regions of Maharashtra. In Maharashtra, a comprehensive review, estimated a loss of about 30 per cent of citrus group due to damage caused by insect pests (Bindra, 1970) [5]. In Maharashtra out of 14 reported citrus insect pest species 8 are of major significance (Anonymous, 1994) [1]. Regular incidence of these pests is also seen prominently in vidarbha region (Anonymous, 1995) [2]. Among the insect pests, Citrus psylla *Diaphorina citri* is the most destructive and cause heavy losses to the citrus industry. Citrus psylla, *D. citri* is one of the most serious pests of citrus in North India (Punjab,

Haryana, Himachal Pradesh) and Maharashtra but trivial significance in South India (Randhawa and Srivastava, 1986) [16]. Nagpur mandarin in central India witnessed severe 'outbreak' of psylla during 1960-62. Since then, this pest attained an endemic status causing cognizable damage to citrus industry (Thakre *et al.*, 1985) [22]. Citrus psylla is the vector of viruses, citrus *Tristeza colescterovirus* and citrus leaf talter viruses, which causes the greening disease of citrus (Su *et al.*, 1991) [21]. The Asian citrus psylla, *Diaphorina citri* Kuwayama (Homoptera: Psyllidae), became recognized as an important pest particularly after the demonstration that it is the vector of citrus huanglongbing (HLB), or greening disease (Capoor *et al.*, 1967; Martinez and Wallace, 1967) [6, 14]. *D. citri* adults are grey coloured and they usually rest on the leaves with closed wings and hind ends raised upward. Adults reach sexual

maturity 2-6 days after emergence. A female life longer (13.77-80.22 days) than male (10.41-74.0 days) and lay eggs on an average 500-800 per female (Hoy and Nguyen, 1996, Bhagat and Nehru, 1999) ^[11, 3] and even as many as 900 eggs during its life time of 190 days in winter and 12-26 days in summer. The eggs are elongate and almond shaped with rounded basal portions provided with a slender stalk for thrusting the egg into plant tissue. The eggs are pale yellow immediately after oviposition but gradually change to orange colour at hatching. Incubation takes 3-6 and 10-20 days and nymphs (5 instars), takes 15 and 47 days during summer and winter, respectively. Overwintering adults may live over 6 months (Mangat, 1966) ^[13]. The pest completes 9-10 or even upto 16 overlapping generations in a year (Khan *et al.*, 1989). Apart from citrus, psylla also attacks Curry leaf plant (*Murraya koenigii* Unn.), Orange jasmine, *M. paniculata* (L.) and Jackfruit. The pest has the highest rate of fecundity, fastest development and lowest nymphal mortality and largest nymphs on *Muaaya koenigii* (Hussain and Nath, 1927) ^[12]. Both nymphs and adults of citrus psylla suck the cell sap with the help of their sharp piercing mouth parts and cause curling, defoliation of leaves, and flowers and die back of branches from tip to downward, as a result, premature dropping of fruits occur (Shah and Saleem, 2000) ^[17]. The fruits suffer both quantity and quality-wise, being undersized, poor juice quality and insipid in taste (Bindra, 1969) ^[4]. The nymphs excrete white crystalline waxy pellets on which black sooty mould may develop which reduces the photosynthetic area (Pruthi and Mani, 1945) ^[15] affecting the blossom, fruit set and also the market value of such fruits (Shivankar *et al.*, 2000) ^[19]. Loss due to citrus psylla infestation ranges from 83 to 95% (Randhawa, 1974) ^[23]. Citrus plantation in Assam and Punjab has suffered seriously due to greening disease. Citrus psylla is active during spring and after monsoon and less active during winter.

Materials and methods

The present investigation entitled, "Studies on the seasonal incidence of citrus psylla (*Diaphorina*

citri Kuw.) in Nagpur Mandarin" was conducted during Ambia bahar of 2009-10. Eight-year-old Nagpur mandarin orchard selected for imposing treatments was, planted at spacing of 6.0 m X 6.0 m at Futala farm, College of Agriculture, Nagpur. Present investigation had components like studies on seasonal incidence of citrus psylla (*Diaphorina citri* Kuw.). Component wise details of the material used and methods followed for the present investigation are given below. The observations on seasonal incidence of citrus psylla were recorded on four Nagpur mandarin trees. From each selected plant four branches were selected at random from top, middle and bottom portions from all four sides of the plant and were tagged. The population of citrus psylla both nymph and adult were counted on the twigs of 5 cm fresh growth of the shoot. For population dynamics of citrus psylla (*Diaphorina citri* Kuw.) were recorded after every 7 days during Ambia bahar of 2009-10. Weather data during 2009-10 was obtained from Meteorological observatory in College of Agriculture, Nagpur, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola.

Result and Discussion

Incidence of citrus psylla

The observations on seasonal incidence of citrus psylla were recorded on four Nagpur mandarin trees. From each selected plant four branches were selected at random and tagged. The population of citrus psylla both nymph and adult were counted on the twigs of 5 cm fresh growth of the shoot from top, middle and bottom portions from all the four sides of the plant. For population dynamics of citrus psylla, the data was recorded after every 7 days during *Ambia bahar* of 2009-10.

Seasonal incidence of citrus psylla (*Diaphorina citri*) nymphs

The citrus psylla nymphal population was recorded for eleven consecutive weeks from 15th January to 01st of April 2009 (Table 1). Consistently increasing trend of nymphal population was observed from 4th MW (9.6 psylla nymphs/twig) to 7th MW (14.1 psylla nymphs/twig) and then a drop in population for a

week (12.7 psylla nymphs/twig) was recorded. The psylla nymph population was again on rise in 9th and 10th MW (with 14.1 and 14.7 psylla nymphs/twig, respectively) which followed a dip in nymphal abundance in 11th and 12th MW (with 14.2 and 13.0 psylla nymphs/twig, respectively). Thirteenth and 14th MW again had increasing trend of psylla nymph population with 17.7 and 17.3 psylla nymphs/twig, respectively.

Seasonal incidence of citrus psylla (*Diaphorina citri*) adults

In case of citrus psylla adults' abundance recorded over same period (Table 1), 6.6 psylla adults/twig were observed in 4th MW with an increase in population to 7.6 psylla adults/twig in 5th MW. Sixth MW again had lower psylla adult abundance (6.8 psylla adults/twig) followed by increase in psylla adults to 7.9 and 9.0 psylla adults/twig in 7th and 8th MW. Lower population of psylla was observed in 9th and 10th MW (7.1 and 6.1 psylla adults/twig, respectively) followed by increasing population trend from 11th to 14th MW with 7.9 to 10.2 psylla adults/twig.

In 2009-10 8th Met week had highest psylla count of 9.0 adults per twig whereas, the psylla adults counts were higher in the month of February and March. Nymphal counts were higher as compared to psylla adults population with consistent rise in population from 10th Met week and peak (19.0 nymphs per twig) in the 14th Met week.

The data set generated from present study was supported by the findings of previous workers. Shivankar *et al.*, (2005) [20] studied the predisposing factors of citrus psylla (*D. citri*) during 2002-03 on both healthy and citrus psylla-infested Nagpur mandarin orchards in Nagpur. Psylla incidence usually increased with increasing temperature (warmer days) during Ambia season (February-March). Das *et al.*, (2002) [7] conducted an extensive survey during

1996-98 in the citrus (*Citrus reticulata* and *C. sinensis*) growing areas of Vidarbha and Marathwada regions of Maharashtra, India. Vector population was lower during October-January (2-9 nymphs and 1-4 adults/5 cm twig) and larger during February-April (6-20 nymphs and 14-25 adults/5 cm twig), which coincided with appearance of new flushes. Findings of Correlations between fluctuations in citrus psylla populations of nymphs and the flushing cycles was reported by Fernandez and Miranda, (2005) [8, 9, 10] who suggested the crop phenology could represent a key factor for the survival of *D. citri* when there is a synchronic relation between the bud growth and the life cycle.

The pest intensity data of present study is in corroboration with reports of Sharma, (2008) [18] who studied population dynamics and revealed that adult population of *Diaphorina citri* Kuwayama was very low during December and January but with the increase in temperature in the end of February, the activity of adults increased. At the same time a low population of nymphs was also recorded and thereafter, the population of both adults and nymphs increased but significant increase in nymphal population was observed during March (41-47 nymphs).

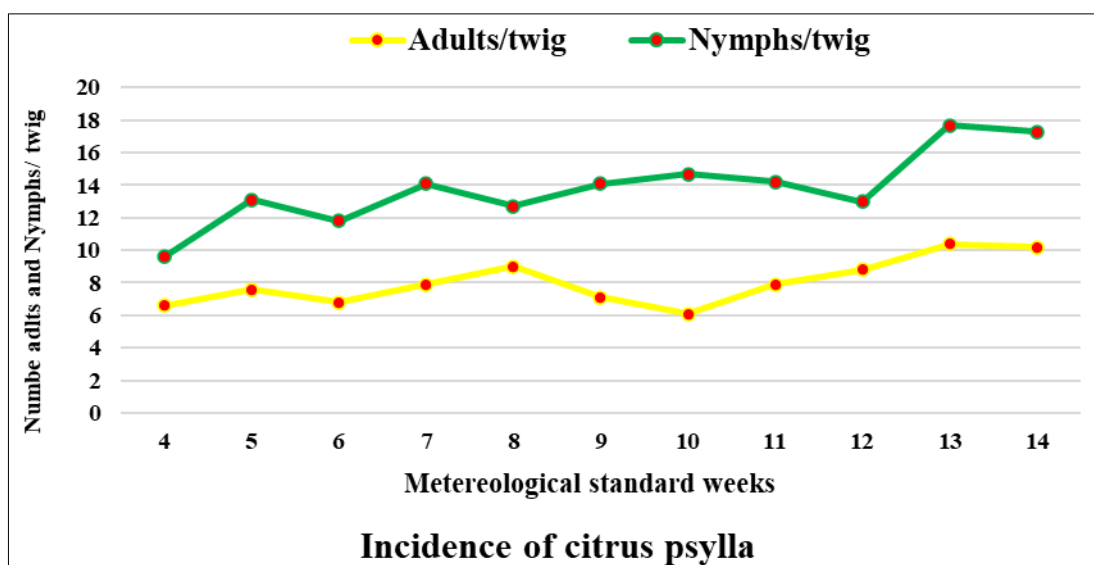
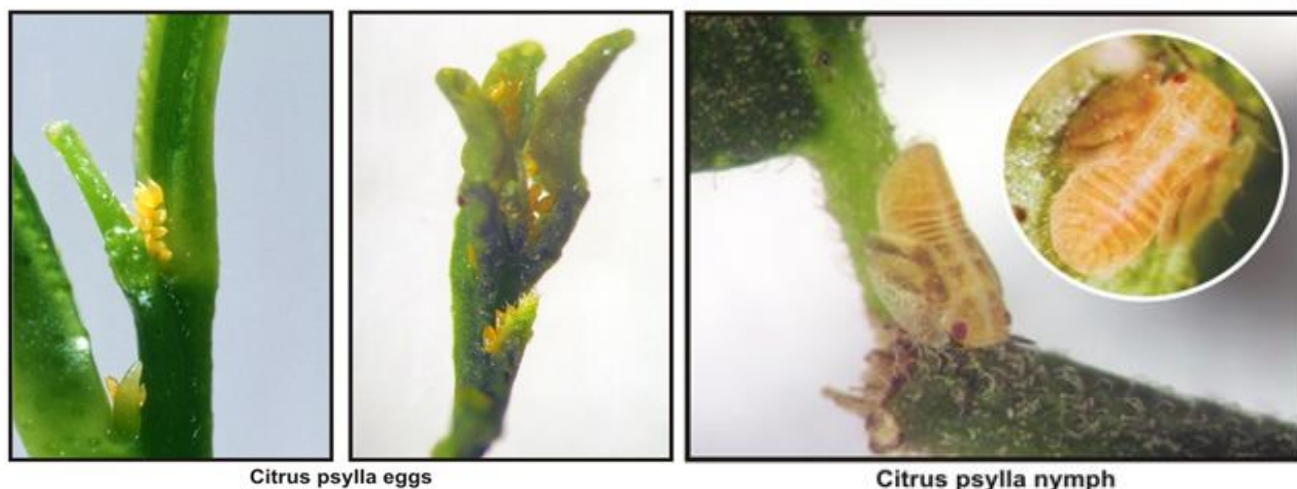
Conclusions

Citrus psylla abundance was quite low in January, but when the temperature increased in late February and early March, adult activity increased. In parallel, a large rise in the nymphal population was noted in February and March. It was mostly connected to the flushing cycle, suggesting the pest's desire for a fresh flush. Citrus psylla enjoys moderate temperatures and a low humidity level, as seen by the increase in population during the months of February and March.

Table 1: Incidence of citrus psylla (*Diaphorina citri*)

MW	Period	Adults/twig	Nymphs/twig	T-Max	T-Min	RH I	RH II	RF	RD	Eva	BSH
4	15 to 21 Jan 2009	3.8	7.6	27.2	9.2	58.0	32.0	0.0	0	2.6	8.7
5	22 to 28 Jan 2009	5.4	6.8	28.9	9.2	52.0	22.0	0.0	0	3.4	9.2
6	29 Jan to 04 Feb 2009	5.7	8.4	29.8	13.1	60.0	34.0	0.0	0	3.4	8.3
7	05 to 11 Feb 2009	7.3	7.4	29.8	14.0	69.0	32.0	0.0	0	2.6	5.4
8	12 to 18 Feb 2009	9.0	6.8	31.6	17.9	68.0	34.0	7.4	1	3.9	6.5
9	19 to 25 Feb 2009	8.3	8.5	32.0	16.0	43.0	25.0	0.0	0	4.5	8.3
10	26 Feb to 04 Mar 2009	6.9	10.2	35.7	16.6	39.0	16.0	0.0	0	5.4	9.6
11	5 to 11 Mar 2009	7.9	11.8	36.3	19.8	45.0	22.0	18.6	1	7.1	9.3
12	12 to 18 Mar 2009	7.4	13.0	36.0	18.5	53.0	28.0	28.0	1	4.8	7.3
13	19 to 25 Mar 2009	6.6	15.1	39.8	20.5	36.0	16.0	0.0	0	6.1	9.1
14	26 Mar to 01 Apr 2009	8.5	19.0	40.2	23.4	39.0	18.0	0.0	0	6.9	8.1

T-Max: Maximum temperature, T-Min: Minimum temperature, RH-I: Relative humidity-I, RH-II: Relative humidity-II, RF: Rainfall, RD: , Eva: Evaporation, BSH:

**Fig 1:** Graphical representation of incidence of citrus psylla (*Diaphorina citri*)

Citrus psylla eggs

Citrus psylla nymph



Citrus psylla adult

Plate 1: Eggs nymphs and adults of citrus psylla

Acknowledgement

Authors are thankful to the Head, Department of Entomology and Director of Research, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola for providing necessary facilities.

References

1. Anonymous. Annual Report of Citrus Entomology, All India fruit improvement project (*Citrus*), Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola. MS, India; c1994.
2. Anonymous. Annual Report of Citrus Entomology, All India fruit improvement project (*Citrus*), Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola. MS, India; c1995.
3. Bhagat KS, Nehru RK. Biology and some biotic enemies of citrus psylla, *Diaphorina citri* Kuwayama. Abstracts. International Symposium on Citriculture, Held at NRC for Citrus, Nagpur, 1999, 130.
4. Bindra OS. Controlling citrus pests. *Indian Horticulture*. 1969;13(2):28-31.
5. Bindra OS. Insects. In *Citrus decline in India*. Joint publication of PAU/OSU/USAID, Ludhiana, Punjab; c1970.
6. Capoor SP, Rao DG, Viswanath SM. *Diaphorina citri* Kuway., a vector of greening disease of citrus in India. *Indian J. Agric. Sci.* 1967;37(572-576):1382.
7. Das AK, Shivankar VJ, Singh S. Presence of citrus (*Citrus* species) greening disease (*Candidatus Liberobacter asiaticum*) and its psyllid vector (*Diaphorina citri*) in Maharashtra. *Indian Journal of Agricultural Sciences*. 2002;72(3):188-191.
8. Fernandez M, Miranda I. *Diaphorina citri* Kuwayama (Hemiptera: Psyllidae) behaviour. Part I. Morphological characteristics, incidence and associated natural enemies. *Revista de Proteccion Vegetal*. 2005a;20(1):27-31.
9. Fernandez M, Miranda I. Behaviour of *Diaphorina citri* Kuwayama (Hemiptera: Psyllidae). Part II Preferential behaviour in relation to crop phenology. *Revista de Proteccion Vegetal*. 2005b;20(2):122-124.
10. Fernandez M, Miranda I. *Diaphorina citri* Kuwayama (Hemiptera: Psyllidae) behavior. Part III: Relation between life cycle and leaf vegetative bud. *Revista de Proteccion Vegetal*. 2005c;20(3):161-164.
11. Hoy A, Nguyen RU. Classical biological control of potential new pests of Florida citrus. *Citrus Industry*, 1996, 18-19.

12. Husain MA, Nath D. The citrus psylla (*Diaphorina citri* Kuw.) Psyllidae: Homoptera. Memoirs of the Department of Agriculture in India, Agricultural Research Institute, Pusa. Entomol. Series. 1927;10(2):27.
13. Mangat BS. Biology and control of citrus psylla, *Diaphorina citri* Kuwayama. Plant Protection Bulletin, New Delhi. 1966;18(3):18-20.
14. Martinez AL, Wallace JM. Citrus leaf mottleyellows disease in the Philippines and transmission of the causal virus by a psyllid, *Diaphorina citri*. Plant Dis. Repr. 1967;51:692-695.
15. Pruthi HS, Mani MS. Our knowledge of the insects and mite pests of citrus in India and their control. Important consc. Agricultural Research Science Monoger. 1945;16:42.
16. Randhawa GS, Srivastava KC. Insects pests of citriculture in India. Hindustan Publishing Group, 1986, 316-334.
17. Shah HA, Saleem MA. Applied Entomology. 2nd Ed. Izharsons Printers, Lahore, 2002, 151-152.
18. Sharma DR. Population dynamics in relation to abiotic factors and management of citrus psylla in Punjab. Indian J. Hort. 2008;65(4):417-422.
19. Shivankar VJ, Rao CN, Singh S. Studies on Citrus psylla, *Diaphorina citri* Kuwayama A review. Agriculture Reviews. 2000;21(3):199-204.
20. Shivankar VJ, Rao CN, Singh S. Predisposing factors of citrus psylla, *Diaphorina citri* Kuwayama incidence. Journal of Applied Zoological Researches. 2005;16(1):26-27.
21. Su HJ, Chen CN, Kirtani K, Chu YI. Implementation of IPM of citrus virus and greening (Likubin) diseases. Proceed. Intl. Workshop TARI, Taichung, Taiwan, 1991, 3-11.
22. Thakre KR, Radke SG, Borle MN, Ghughuskar HT. Two decades of research on citrus pest management in Maharashtra. Brochure published by Director of Research, PKV, Akola; c1985.
23. Randhawa MS. Green Revolution. John Wiley and Sons; 1974.