



P-ISSN2349-8528
E-ISSN 2321-4902
IJCS 2016; 4(2): 119-121
© 2016 JEZS
Received: 18-01-2016
Accepted: 22-02-2016

PN Dawane
SMS (Plant Protection), KVK,
Dr. Panjabrao Deshmukh Krishi
Vidyapeeth, Akola,
Maharashtra, India

UP Barkhade
Ex- Head, Department of
Entomology, Dr. Panjabrao
Deshmukh Krishi Vidyapeeth,
Akola, Maharashtra, India

PR Panchbhai
Assistant Professor, Department
of Entomology, Dr. Panjabrao
Deshmukh Krishi Vidyapeeth,
Akola, Maharashtra, India

Assessment of linear relationship between citrus psylla (*Diaphorina citri* Kuw.) with weather parameters in Nagpur Mandarin

PN Dawane, UP Barkhade and PR Panchbhai

Abstract

The present investigation entitled, "Assessment of linear relationship between citrus psylla (*Diaphorina citri* Kuw.) with weather parameters in Nagpur Mandarin" was conducted during Ambia bahar of 2010-11. 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 correlation citrus psylla (*Diaphorina citri* Kuw.) nymphs and adults with weather parameters during 2010-11. Simple linear correlation values for seasonal incidence of citrus psylla nymphs with weather parameters during 2010-11 (Table-1) revealed significantly positive correlation of maximum temperature ($p = 0.01$) and minimum temperature ($p = 0.01$) whereas, morning and evening relative humidity were negatively correlated in significant manner ($p = 0.05$). Evaporation was related in positively significant manner ($p = 0.01$). The correlation of seasonal incidence of citrus psylla adults with weather parameters revealed correlation of minimum temperature in significant manner ($p = 0.01$) whereas, other parameters did not have significant correlation trend. Weather data during 2010-11 was obtained from Meteorological observatory in College of Agriculture, Nagpur, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola. 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.

Keywords: Linear relationship, citrus psylla (*Diaphorina citri* Kuw.), weather parameters

Introduction

The Nagpur Mandarin is known as the "Green gold" and Nagpur city is commonly referred to as the "Orange City". The Kinnow mandarin has thrived in semi-arid irrigated zones of Punjab and neighboring states, as well as in Nagpur and Akola regions of Maharashtra. In Maharashtra, a comprehensive review estimated a loss of about 30% of the citrus group due to damage caused by insect pests (Bindra, 1970) [6], with 8 out of the 14 reported citrus insect pest species being of major significance (Anonymous, 1994) [1]. These pests are regularly found in the Vidarbha region (Anonymous, 1995) [2]. The most destructive insect pest to the citrus industry is the Citrus psylla *Diaphorina citri*, which causes significant losses in North India (Punjab, Haryana, Himachal Pradesh) and Maharashtra but has little significance in South India (Randhawa and Srivastava, 1986) [15]. The Nagpur mandarin in central India suffered a severe outbreak of psylla during 1960-62, and since then, this pest has become endemic and caused substantial damage to the citrus industry (Thakre *et al.*, 1985) [23]. Citrus psylla is the vector of viruses, citrus *Tristeza closterovirus* and citrus leaf talter viruses, which cause the greening disease of citrus (Capoor *et al.*, 1967; Martinez and Wallace, 1967 and Su *et al.*, 1991) [7, 12, 22]. *D. citri* adults are grey in color and usually rest on leaves with closed wings and hind ends raised upward. The pest completes 9-10 or even up to 16 overlapping generations in a year (Khan *et al.*, 1989) [24]. Apart from citrus, psylla also attacks Curry leaf plant, Orange jasmine, and Jackfruit. Both nymphs and adults of citrus psylla suck the cell sap with their sharp piercing mouthparts and cause curling, defoliation of leaves, and flowers, as well as dieback of branches from tip to downward, leading to premature dropping of fruits (Shah and Saleem, 2000) [16]. Infested fruits are undersized, have poor juice quality, and insipid taste (Bindra, 1969) [5]. The nymphs excrete white crystalline waxy pellets on which black sooty mold may develop, reducing the photosynthetic area (Pruthi and Mani, 1945) [13] and affecting the blossom, fruit set, and market value of such fruits

Correspondence
PN Dawane
SMS (Plant Protection), KVK,
Dr. Panjabrao Deshmukh Krishi
Vidyapeeth, Akola,
Maharashtra, India

(Shivankar *et al.*, 2000) [20]. Losses due to citrus psylla infestation range from 83 to 95%. Citrus plantations in Assam and Punjab have suffered significantly due to greening disease (Randhawa, 1974) [14]. Citrus psylla is most active during spring and after monsoon and less active during winter.

Materials and Methods

The present investigation entitled, "Assessment of linear relationship between citrus psylla (*Diaphorina citri* Kuw.) with weather parameters in Nagpur Mandarin" was conducted during Ambia bahar of 2010-11. 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 association of citrus psylla (*Diaphorina citri* Kuw.) with weather parameter of Nagpur. 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 2010-11. Weather data during 2010-11 was obtained from Meteorological observatory in College of Agriculture, Nagpur, Dr. Panjabrao Deshmukh Krishi Vidyaapeeth, Akola.

Result and Discussion

Correlation between citrus psylla (*Diaphorina citri* Kuw.) and weather parameters during

Simple linear correlation values for seasonal incidence of citrus psylla nymphs with weather parameters during 2010-11 (Table-1) revealed significantly positive correlation of maximum temperature ($p = 0.01$) and minimum temperature ($p = 0.01$) whereas, morning and evening relative humidity were negatively correlated in significant manner ($p = 0.05$). Evaporation was related in positively significant manner ($p = 0.01$). The correlation of seasonal incidence of citrus psylla adults with weather parameters revealed correlation of minimum temperature in significant manner ($p = 0.01$) whereas, other parameters did not have significant correlation trend.

Chavan, (2004) [8] Reported that rushing rhythms of citrus plants were major factors influencing the population buildup of both adult and nymph phyllid in January-February. The maximum temperature and relative humidity significantly influenced the population growth of phyllids whereas, Kalita and Baruah, (2001) [10] reported that the correlation of psylla population exhibited significant positive correlation with the minimum temperature and Sharma, (2008) [19] association of weather parameters population of *Diaphorina citri* revealed that minimum, maximum and mean temperatures, relative humidity and vapour pressure had a positive relation with both nymphal and adult population whereas, wind velocity had very low impact on adults. Which supports the correlation trend of present study.

Shivankar *et al.*, (2005) [21] studied the predisposing factors of citrus psylla (*D. citri*) during 2002-03 on both healthy and citrus psylla-infested Nagpur mandarin orchards in Nagpur, Maharashtra, India. Psylla incidence usually increased with increasing temperature (warmer days) during Ambia season (February-March) and was correlated significantly positive with maximum temperature (27.0-35.8 degrees C) in both orchards, but correlated significantly negative with relative humidity (60.8-91.7%) in the neglected orchard. Sahu and Mandal, (1997) [17] Moderate climatic conditions coupled with the flushing of citrus trees favoured the development and activity of nymphs, while extremes of both high and low temperatures, low relative humidity and high rainfall were detrimental which is in line with present findings. Khan *et al.*, (1984) [11] the number of eggs and nymphs did increase with an increase in temperature and decrease with an increase in rainfall and relative humidity.

Das *et al.*, (2002) [9] on the basis of extensive survey in the citrus growing areas of Vidarbha and Marathwada regions of Maharashtra reported higher psylla abundance during February-April (6-20 nymphs and 14-25 adults/5 cm twig), which coincided with appearance of new flushes. Berg, (2000) [4] inferred that during years when the seasonal rainfall is significantly higher than the long term average, an increase in new growth in fruit trees and an earlier and larger fruit set can be expected. Also expected is an increase in the numbers of the citrus psylla (*Diaphorina citri*). Ashari and Eveleens (1974) [3] correlation between fluctuations in populations of nymphs and the flushing cycles; these, in turn, were correlated with rainfall following dry spells. Adults were present throughout dry periods though nymphs were not.

Table 1: Simple linear correlation of citrus psylla (*Diaphorina citri*) abundance with weather parameters during 2009-10

Met Week	1										
T Max °C	0.979	1									
T Min °C	0.952	0.922	1								
RH_I %	-0.664	-0.737	-0.504	1							
RH_II%	-0.642	-0.736	-0.479	0.920	1						
Rain fall mm	0.358	0.267	0.332	0.058	0.111	1					
Rainy days	0.258	0.180	0.360	0.234	0.240	0.877	1				
BSH	0.105	0.246	-0.034	-0.742	-0.650	-0.124	-0.230	1			
Evaporation	0.881	0.918	0.856	-0.786	-0.752	0.301	0.263	0.445	1		
Nymphs	0.891	0.913**	0.817**	-0.686*	-0.638*	0.191	0.023	0.222	0.818**	1	
Adults	0.644	0.539	0.773**	-0.128	-0.159	0.309	0.479	-0.368	0.529	0.344	1
Correlation	MW	T Max	T Min	RH_I	RH_II	RF	RD	Eva	BSH	Nymphs	Adults

Simple linear correlation for $n=11$ at 5% - 0.602 and at 1% - 0.735

Met Week – Meteorological Week, T Max – Maximum Temperature (°C), T Min – Minimum Temperature (°C), RH I – Morning, Relative Humidity (%), RH_II – Evening Relative Humidity (%), RF – Rainfall (mm), RD – Rainy Days, Eva – Evaporation, BSH – Bright Sunshine Hours, Nymphs – Citrus Psylla nymphs/5 cm twig, Adults – Citrus Psylla adults/5 cm twig

Conclusions

Simple linear correlation values for seasonal incidence of citrus psylla nymphs with weather parameters revealed significantly positive correlation of maximum temperature and minimum temperature with citrus psylla nymph abundance. The morning relative humidity and evening relative humidity were negatively correlated in significant manner. Evaporation was related in positively significant manner ($p = 0.05$) during both the seasons. The correlation of seasonal incidence of citrus psylla adults with weather parameters revealed no correlation in significant manner except correlation of minimum temperature in significant manner during 2010-11. The correlation hints the preference of citrus psylla to warm conditions with lower humidity regime which is even evident from population rise in month of February and March.

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. Ashari, Eveleens KG. The Citrus Psyllid (*Diaphorina citri*): population ecology and distribution. Agricultural Cooperation Indonesia the Netherlands. Research reports 1968-1974. Section II. Technical contributions; c1974. p. 370-373. 1 fig.
4. Berg M van den. Influence of high rainfall on pests. Neltropika Bulletin. 2000;309:15-17.
5. Bindra OS. Controlling citrus pests. Indian Horticulture. 1969;13(2):28-31.
6. Bindra OS. Insects. In Citrus decline in India. Joint publication of PAU/OSU/USAID, Ludhiana, Punjab; c1970.
7. 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.
8. Chavan VM. Investigations on citrus psylla, *Diaphorina citri* Ku., a vector of citrus greening disease in Maharashtra. Journal of Maharashtra Agricultural Universities. 2004;29(3):290-293.
9. Das AK, Shivankar VJ, Singh S. Presence of citrus (Citrus species) greening disease (*Candidatus Liberibacter asiaticum*) and its psyllid vector (*Diaphorina citri*) in Maharashtra. Indian Journal of Agricultural Sciences. 2002;72(3):188-191.
10. Kalita H, Baruah BP. Population buildup of certain citrus pests in relation to weather factors. Journal of Applied Zoological Researches. 2001;12(1):51-52.
11. Khan KM, Radke SG, Borle MN. Seasonal activity of citrus psylla, *Diaphorina citri* Kuwayama, in the Vidarbha region of Maharashtra. Bulletin of Entomology. 1984;5(2):143-146.
12. Martinez AL, Wallace JM. Citrus leaf mottle yellows disease in the Philippines and transmission of the causal virus by a psyllid, *Diaphorina citri*. Plant Dis. Repr. 1967;51:692-695.
13. 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.
14. Randhawa GS. Horticulture importance of pest control. Pesticides Annual; c1974. p. 85-87.
15. Randhawa GS, Srivastava KC. Insects pests of citriculture in India. Hindustan Publishing Group; c1986. p. 316-334.
16. Shah HA, Saleem MA. Applied Entomology. 2nd Ed. Izharsons Printers, Lahore; c2002. p. 151-2.
17. Sahu SR, Mandal SK. Population fluctuation of citrus psylla, *Diaphorina citri* kuwayama (Psyllidae: Hemiptera). Journal of Interacademia. 1997;1(4):329-332.
18. 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.
19. Sharma DR. Population dynamics in relation to abiotic factors and management of citrus psylla in Punjab. Indian J Hort. 2008;65(4):417-422.
20. Shivankar VJ, Rao CN, Singh S. Studies on Citrus psylla, *Diaphorina citri* Kuwayama A review. Agriculture Reviews. 2000;21(3):199-204.
21. 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.
22. Su HJ, Chen CN, Kirtani K, Chu YI. Implementation of IPM of citrus virus and greening (Likubin) diseases. Proceed. Intl. Workshop TARI, Taichung, Taiwan; c1991. p. 3-11.
23. 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.
24. Khan MR. Prediction of sulphur distribution in products during low temperature coal pyrolysis and gasification. Fuel. 1989 Nov 1;68(11):1439-1449.