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### Association studies of citrus psylla (*Diaphorina citri* Kuw.) nymphs and adults with weather parameters in Nagpur Mandarin

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#### Abstract

The present investigation entitled, "Association studies of citrus psylla (*Diaphorina citri* Kuw.) nymphs and adults with weather parameters 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 association citrus psylla (*Diaphorina citri* Kuw.) nymphs and adults with weather parameters during 2009-10. Simple linear association values for seasonal incidence of citrus psylla nymphs with weather parameters during 2009-10 revealed significantly positive association of maximum temperature ( $p = 0.01$ ) and minimum temperature ( $p = 0.05$ ) with citrus psylla nymph abundance. The morning relative humidity and evening relative humidity were negatively correlated in significant manner ( $p = 0.05$ ). Evaporation was related in positively significant manner ( $p = 0.05$ ). The association of seasonal incidence of citrus psylla adults with weather parameters revealed no association in significant manner. Weather data during 2009-10 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:** Citrus psylla (*Diaphorina citri* Kuw.) nymphs, adults with 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 colesperovirus* 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, 2002) [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 (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, "Association studies of citrus psylla (*Diaphorina citri* Kuw.) nymphs and adults with weather parameters 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 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 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

#### Association of citrus psylla nymphs and adults with weather parameters during

Simple linear association values for seasonal incidence of citrus psylla nymphs with weather parameters during 2010-11 (Table 6) revealed significantly positive association 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 association of seasonal incidence of citrus psylla adults with weather parameters revealed association of minimum temperature in significant manner ( $p = 0.01$ ) whereas, other parameters did not have significant association 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 association of psylla population exhibited significant positive association 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 association 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] association 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:** Association of citrus psylla (*Diaphorina citri*) abundance with weather parameters during 2009-10

Met Week	1											
T_Max°C	0.903	1										
T_Min°C	0.936	0.879	1									
RH_I %	-0.893	-0.952	-0.902	1								
RH_II%	-0.770	-0.837	-0.680	0.891	1							
Rain fall mm	0.394	0.146	0.408	-0.272	-0.177	1						
Rainy days	0.300	0.088	0.328	-0.255	-0.165	0.971	1					
BSH	0.882	0.903	0.866	-0.907	-0.801	0.321	0.247	1				
Evaporation	0.009	0.302	-0.044	-0.261	-0.387	-0.734	-0.694	0.223	1			
Nymphs	0.824	0.824**	0.707*	-0.714*	-0.671*	0.014	-0.121	0.732*	0.323	1		
Adults	0.690	0.424	0.523	-0.367	-0.351	0.313	0.180	0.364	-0.245	0.670	1	
Association	MW	T_Max	T_Min	RH_I	RH_II	RF	RD	Eva	BSH	Nymphs	Adults	

Simple linear association 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

<b>Met Week</b>												
<b>T Max<sup>0</sup>C</b>	0.903											
<b>T Min<sup>0</sup>C</b>	0.936	0.879										
<b>RH_I %</b>	-0.893	-0.952	-0.902									
<b>RH_II %</b>	-0.77	-0.837	-0.68	0.891								
<b>Rain fall mm</b>	0.394	0.146	0.408	-0.272	-0.177							
<b>Rainy days</b>	0.3	0.088	0.328	-0.255	-0.165	0.971						
<b>BSH</b>	0.882	0.903	0.866	-0.907	-0.801	0.321	0.247					
<b>Evaporation</b>	0.009	0.302	-0.044	-0.261	-0.387	-0.734	-0.694	0.123				
<b>Nymphs</b>	0.824	0.824**	0.707*	-0.714*	-0.671*	0.014	-0.121	0.732*	0.323			
<b>Adults</b>	0.69	0.424	0.323	-0.367	-0.351	0.313	0.18	0.364	-0.245	0.67		
<b>Correlation</b>	<b>MW</b>	<b>T_Max</b>	<b>T_Min</b>	<b>RH_I</b>	<b>RH_II</b>	<b>RF</b>	<b>RD</b>	<b>Eva</b>	<b>BSH</b>	<b>Nymphs</b>	<b>Adults</b>	

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

### Conclusions

Linear association values for seasonal incidence of citrus psylla nymphs with weather parameters revealed significantly positive association 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 association of seasonal incidence of citrus psylla adults with weather parameters revealed no association in significant manner except association of minimum temperature in significant manner during 2009-10. The association 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.

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