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Seasonal Abundance of Predator chrysopids and citrus psylla, *Diaphorina Citri* Kuwayama and predator in relation to citrus psylla on kagzi lime

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Abstract

The experiments were conducted on kagzi lime about the seasonal abundance of predators chrysopids and citrus psylla, *D. citri* on Kagzi lime was carried out at Horticulture Instructional Farm, College of Horticulture, S. D. Agricultural University, Sardarkrushinagar, Banaskantha (Gujarat). Mean data on the seasonal abundance of citrus psylla showed three peak times in a year, firstly in the month of March, second time in the month of June and third time in month of October. In the months mean, seasonal abundance of citrus psylla varied from 0.2 to 13.64 psylla/twig on kagzi lime. Seasonal abundance of predator showed chrysopid was fluctuated at low level during different months and was ranged between 0.08 and 0.78/twig and higher during second week of October which coincided with peak population of most of citrus psylla on kagzi lime during the year January to December, 2012. The correlation study showed that predator chrysopids exhibited significant positive influence on seasonal abundance of citrus psylla.

Keywords: Seasonal abundance, kagzi lime, *Diaphorina citri*, chrysopids, predator and Citrus.

1. Introduction

Citrus belonging to family Rutaceae, is one of the most important fruit of the world grown in more than hundred countries. Out of many citrus species grown in different parts of India, Orange (*Citrus sinensis* Linnaeus); mandarin (*Citrus reticulata* Balanco) and acid lime (*Citrus aurantifolia* Swingle) are the most common. About 160 pests are reported on citrus trees in India which include 49 species of Coccidae, 39 of Lepidoptera, 12 of Aleurodidae and 12 of Coleoptera (Pruthi and Mani, 1945). Among the citrus insect pests listed above, psylla, *D. citri* has been recorded most destructive and the losses ranged from 83-95 per cent (Randhava, 1974). Both nymphs and adults of the pest suck the cell sap with the help of their sharp piercing mouth parts and cause curling and defoliation of leaves and flowers and die back of branches from tip to downward. The nymphs excrete white crystalline waxy pellets on which black sooty mould may develop which hinders photosynthetic activity of the tree and thereby the growth of the tree is retarded. In addition to direct feeding damage to plants, *D. citri* is also an efficient vector of the bacterium, *Candidatus Liberibacter Asiaticus* (earlier reported as virus and other members of the genus) which cause "Greening" or "Huanglongbing" disease of citrus (Pluke *et al.*, 2008).

2. Materials and methods

A field experiment was carried out on seasonal abundance of predator chrysopids and citrus psylla on kagzi lime during the year January- December, 2012 at Horticulture Instructional Farm, College of Horticulture, S. D. Agricultural University, Sardarkrushinagar, Banaskantha (Gujarat).

Ten trees were selected and kept unsprayed in orchard throughout the season for determination of seasonal abundance of predator population. Five newly emerged or fresh tender twigs (ten inch long from tip to downward having 6 to 8 leaves) were selected randomly on each tree. The total number of predator were counted by observing the entire selected twig critically at weekly interval. Such observations on seasonal abundance of predator were initiated from 1st standard week (first week of January) and was continued upto 52nd standard week (last week of December) of 2012. Also, the mean number of citrus psylla observation were counted and recorded. Citrus psylla correlations were computed with chrysopids.

3. Results and discussion

Results have been presented in Table and Figure on the abundance of psylla and predator of psylla on kagzi lime. During the course of investigation, arthropod predator chrysopids were recorded.

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Chrysopids

Chrysopids started its activity little late and were recorded from first week of March (9th SW) (0.1 chrysopids/twig). With the increase in psylla population, the chrysopids population increased gradually and noted as maximum as 0.48 chrysopids/ twig during the last week of March (13th SW). Thereafter, the population declined suddenly and disappeared from third week of April (16th SW). However, the chrysopids were observed again a kagzi lime from fourth week of May (21st SW) to last week of June (26th SW) with a range of 0.14 to 0.32/twig. Though, the activity of chrysopids was not observed in the month of July. But in August, the predator again commenced its activity and 0.08 chrysopids/twig were recorded.

The population of chrysopids followed increasing trend and reached at its maximum *i.e.* 0.78 chrysopids/twig during second week of October (41st SW). Further, decline in chrysopids population was observed and from second week of November (45th SW), and it was not noted at all till last week of December.

Thus, results clearly indicated that the population of chrysopids varied considerably among different months and was found ranged between 0.08 and 0.78 chrysopids/twig. when higher peak level of citrus psylla then seasonal abundance of chrysopids were reach three peak level in the month of March, June and October.

Psylla

It is evident from the results presented in Table and illustrated graphically in Figure on mean periodic incidence of citrus psylla that the pest was recorded on the kagzi lime from second week of January (2nd SW). Initially, the population was low (0.2 psylla/twig), which started building up and increased rapidly. During the month of March, the population was noted to be higher *i.e.* 7.82 to 12.18 psylla/twig. Afterwards, there was steady decline in the pest population (0.6 psylla/twig) till second week of May (19th SW).

The sudden increase in pest population was noted in the month of June and it reached at its peak level *i.e.* 13.64 psylla/twig during second week of June (24th SW). Again the population followed decreasing trend and reached as low as 0.2 psylla/twig during third week of July (29th SW) coincided

with monsoon shower. Further, low level of pest population was noted in August-September months having more number of rainy days. During this time the population averaged from 0.6 to 3.16 psylla/twig. With the new flush of kagzi lime trees, the psylla population raised back and reached at the level of 11.82/twig. After that, the mean number of citrus psylla per twig started declining and remained on the tree up to second week of December with 1.40 psylla/twig. At the end of observation period *i.e.* last week of December, the psylla disappeared from kagzi lime trees.

Thus, results clearly indicated that the the population of psylla varied considerably among different months and was found ranged between 0.2 and 13.64 psylla/twig. There were three peak level of seasonal abundance of *D. citri viz.*, March, June and October.

Seasonal abundance of citrus psylla is affected by abiotic as well as biotic factors. The biotic factors include predators, parasites, pathogen, host plants and competitors. An attempt was made to understand the role of predators on population fluctuation of citrus psylla on kagzi lime. The correlations was worked out in Table between psylla and predator chrysopid on kagzi lime. The population of citrus psylla had significant positive correlation with predator, chrysopids ($r = 0.51^{**}$). This indicated that abundance of citrus psylla was influenced by chrysopids on kagzi lime.

Thus, results clearly indicated that the the population of predator chrysopid was higher during second week of October which coincided with peak population of most of citrus psylla on kagzi lime. Predators exhibited significant positive influence on seasonal abundance of citrus psylla.

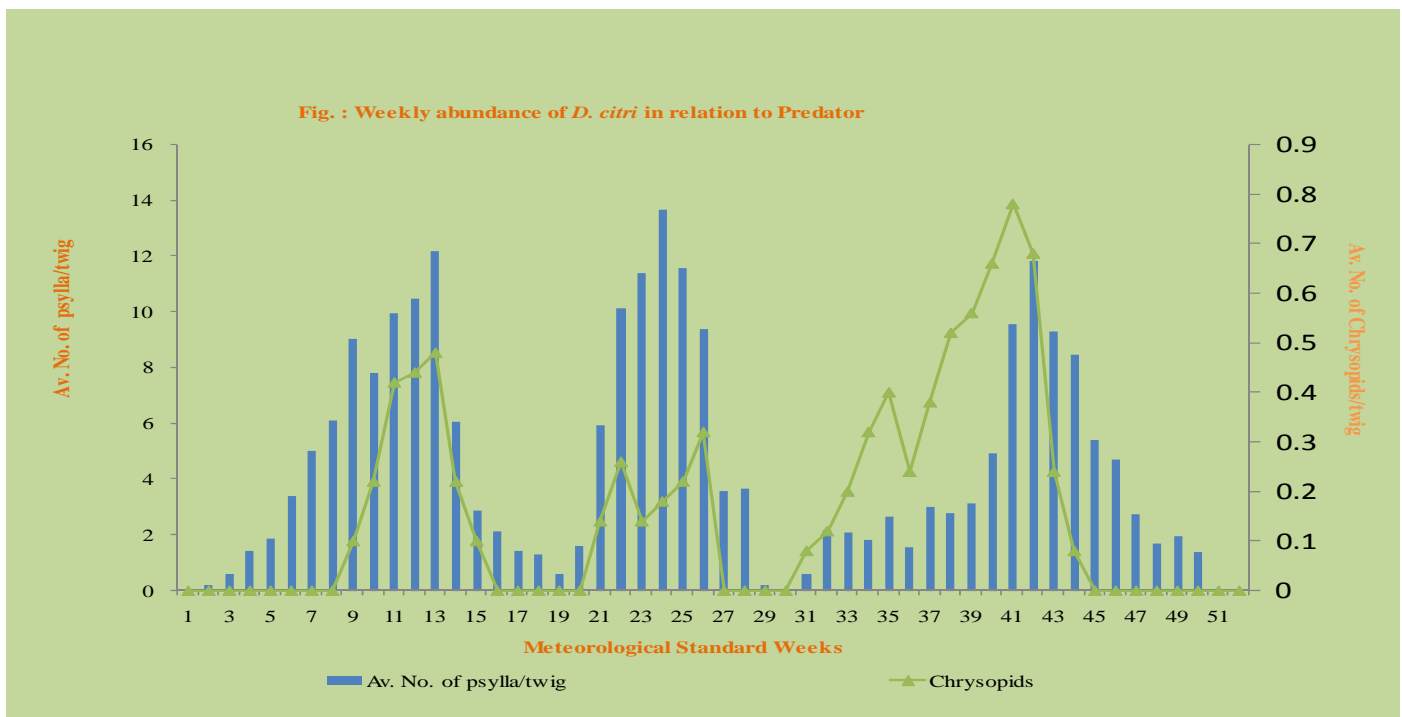
D. citri is commonly attacked by the following generalist predators: ladybeetles (Coleoptera: Coccinellidae); syrphid flies (Diptera: Syrphidae); lacewings (Neuroptera: Chrysopidae, Hemerobiidae) and spiders (Araneae) (Michaud 2001, Michaud 2002 and Michaud 2004). There is relatively little known regarding the extent to which these predators reduce infestations of *D. citri*, but some are regarded as important biological control agents. Michaud (2004) reported that two lacewings, *Ceraeochrysa* sp. and *Chrysoperla rufilabris* Burmeister, contributed to psyllid mortality in Florida.

Table: Weekly observations on the abundance of citrus psylla and natural enemies of citrus psylla on kagzi lime

Standard Week	Week of observation	Mean number of psylla/twig	Mean number of predator/twig
			Chrysopids
1	I- Jan., 2012	0.0	0.0
2	II- Jan., 2012	0.2	0.0
3	III- Jan., 2012	0.6	0.0
4	IV- Jan., 2012	1.44	0.0
5	I- Feb., 2012	1.88	0.0
6	II- Feb., 2012	3.4	0.0
7	III- Feb., 2012	5.0	0.0
8	IV- Feb., 2012	6.12	0.0
9	I- Mar., 2012	9.04	0.1
10	II- Mar., 2012	7.82	0.22
11	III- Mar., 2012	9.92	0.42
12	IV- Mar., 2012	10.46	0.44
13	V- Mar., 2012	12.18	0.48
14	I- April., 2012	6.04	0.22
15	II- April., 2012	2.86	0.1
16	III- April., 2012	2.14	0.0
17	IV- April., 2012	1.46	0.0
18	I- May., 2012	1.32	0.0
19	II- May., 2012	0.6	0.0
20	III- May., 2012	1.6	0.0

21	IV- May., 2012	5.92	0.14
22	V- May., 2012	10.12	0.26
23	I- June., 2012	11.4	0.14
24	II- June., 2012	13.64	0.18
25	III- June., 2012	11.56	0.22
26	IV- June., 2012	9.38	0.32
27	I- July., 2012	3.58	0.0
28	II- July., 2012	3.68	0.0
29	III- July., 2012	0.2	0.0
30	IV- July., 2012	1.06	0.0
31	I- Aug., 2012	0.6	0.08
32	II- Aug., 2012	2.16	0.12
33	III- Aug., 2012	2.08	0.2
34	IV- Aug., 2012	1.82	0.32
35	V- Aug., 2012	2.66	0.4
36	I- Sep., 2012	1.56	0.24
37	II- Sep., 2012	3.0	0.38
38	III- Sep., 2012	2.78	0.52
39	IV- Sep., 2012	3.16	0.56
40	I- Oct., 2012	4.92	0.66
41	II- Oct., 2012	9.56	0.78
42	III- Oct., 2012	11.82	0.68
43	IV- Oct., 2012	9.3	0.24
44	I- Nov., 2012	8.44	0.08
45	II- Nov., 2012	5.42	0.0
46	III- Nov., 2012	4.72	0.0
47	IV- Nov., 2012	2.76	0.0
48	V- Nov., 2012	1.72	0.0
49	I- Dec., 2012	1.98	0.0
50	II- Dec., 2012	1.4	0.0
51	III- Dec., 2012	0.0	0.0
52	IV- Dec., 2012	0.0	0.0
Correlation			Chrysopids
Citrus psylla			0.51**

** Highly significant at 1% level. (Table r= 0.27)



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