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Short communication

Oviposition preference of some insect pests of citrus in relation to leaf/ twig age of Nagpur mandarin

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Citrus is one of the important fruit crops in India with the production of 75.7 lakh tons from 8.43 lakh hectares with the productivity of 9.0 tons/ha at national level as compared to 25-30 tons/ha in advanced citrus producing countries (NHB, 1). The productivity and quality of citrus is severely affected by several factors; insect pests being one of them. Among them, blackfly, *Aleurocanthus woglumi* Ashby (Aleurodidae: Homoptera), psylla, *Diaphorina citri* Kuwayama (Psyllidae: Homoptera) and leaf-miner, *Phyllocnistis citrella* Stainton (Phyllocnistidae: Lepidoptera) are the major insect pests causing large scale damage to citrus crop throughout India.

Effective pest management with less environmental ill effects and production of high quality and globally competitive agro-products are the main objectives of modern agriculture. Time of pesticide application coinciding with susceptible developmental life stage of insect and most preferred stage of plant either for feeding or oviposition are the key factors for the effectiveness of any pest management approach. Information on oviposition preference by blackfly, psylla and leaf-miner with reference to citrus leaf or twig age is lacking. Therefore, the present study was aimed at generating information on ovipositional preference of key insect pests of citrus in relation to leaf or twig age of citrus cv. Nagpur mandarin (*Citrus reticulata* Blanco).

The study on leaf age preference by leaf-miner, blackfly and twig age preference by psylla on Nagpur mandarin were conducted under ambient temperature in screen house of Entomology at National Research Centre for Citrus, Nagpur during 2005-06. One year old Nagpur mandarin seedlings were pruned at regular intervals to induce new flush in order to get the required age of leaves as well as twigs. Leaves of different ages (5, 10,15,20,25 and 30 days) were provided for leaf-miner and blackfly adults and, twigs for psylla adults for oviposition. A total of 10, 2 and 5 pairs of adults of blackfly, psylla and leaf-miner, respectively, were released in each replication having a set of five seedlings. Each treatment was replicated four times. The experiment was conducted twice as Set-I and Set-II during 2005-06. Observations on egg laying by blackfly, psylla and leaf-miner (Fig.1, 2 and 3) and also on leaf growth *viz.*, length and width were taken. The data were transformed to $\sqrt{(c + 0.5)}$ values and subjected to analysis of variance (CRD). The oviposition intensity was correlated with leaf parameters.

Number of eggs laid in whorls by citrus blackfly was

Fig. 1. Blackfly eggs

Fig. 2. Psylla eggs

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Fig. 3. Leaf miner eggs

significantly higher on 15-days old leaves (342.1 eggs/leaf in Set-I; 335.2 eggs/leaf in Set-II) followed by 20-days old leaves (234.5 eggs/leaf in Set-I; 214.9 eggs/leaf in Set-II) than other leaf ages in both the years. Citrus blackfly did not lay eggs on 5-days old leaves. Oviposition by citrus psylla and leaf-miner was significantly greater on 5-days old twigs and leaves, respectively (psylla: 102.5-109.2 eggs / 5 twigs; leaf-miner: 19-21.5 eggs/10 leaves) but was at par with 10-days old leaves in case of leaf-miner (18.2-19.3 eggs / 10 leaves). Both citrus psylla and leaf miner did not lay eggs on 30-days old twigs and leaves, respectively. Oviposition preference by leaf miner for leaf age of 5-10 days and blackfly for 15-20 days coincided with leaf length of 0.97 -3.52 cm and 4.95 – 5.31 cm, respectively, and leaf width of 0.41 -2.06 cm and 3.06-3.26 cm, respectively (Table 1). The correlation of leaf length and width with oviposition by psylla and leaf-miner was negative whereas it was positive in case of blackfly. However, correlation between leaf parameters and oviposition by leaf-miner was significant in both Set-I and II (Table 2). The results indicated that blackfly and leaf miner preferred 15-20 and 5-10 days old leaves having leaf growth dimension of 4.95(L) x 3.06(W) cm - 5.31(L) x 3.26(W) cm and 0.97(L) x 0.41(W) cm – 3.52(L) x 2.06(W) cm, respectively, whereas psylla preferred 5 days old twig for egg laying. Probably visual / chemical cues present in the vicinity of the particular old / aged leaves might be favouring / inducing the maximum oviposition by these insect pests.

The early stages of *P. citrella* were pre-dominant

Table 2. Correlation of leaf parameters with oviposition of blackfly, psylla and leaf-miner

Insect pest	Leaf length		Leaf width	
	Set-I	Set-II	Set-I	Set-II
Blackfly	0.651	0.578	0.653	0.563
Psylla	-0.759	-0.801	-0.762	-0.811
Leaf-miner	-0.852*	-0.898*	-0.858*	-0.910*

* Significant of 5% level.

Table 1. Oviposition preference of citrus blackfly, psylla and leaf-miner to different ages of leaves / twigs of Nagpur mandarin.

Leaf / twig age	Citrus blackfly (No. of eggs/leaf)		Psylla (No.of eggs/5twigs)		Leaf-miner (No. of eggs/ 10 leaves)		Leaf parameter Length(cm)		Leaf parameter Width(cm)	
	Set -I	Set-II	Set-I	Set-II	Set-I	Set-II	Set-I	Set-II	Set-I	Set-II
5 day	0.0 (0.71)^{d}	0.0 (0.71)^{e}	102.5 (10.15)^{a}	109.2 (10.47)^{a}	19.0 (4.42)^{a}	21.5 (4.69)^{a}	0.98	0.96	0.40	0.41
10 day	36.5 (6.08)^{c}	28.4 (5.38)^{d}	87.5 (9.38)^{b}	91.5 (9.59)^{b}	18.2 (4.32)^{a}	19.3 (4.45)^{a}	3.56	3.48	2.08	2.04
15 day	342.1 (18.51)^{a}	335.2 (18.32)^{a}	85.0 (9.25)^{b}	84.7 (9.23)^{b}	9.4 (3.15)^{b}	8.9 (3.07)^{b}	4.98	4.92	3.07	3.05
20 day	234.5 (15.33)^{ab}	214.9 (14.68)^{ab}	18.3 (4.34)^{c}	16.3 (4.10)^{c}	5.1 (2.37)^{bc}	4.8 (2.30)^{bc}	5.29	5.32	3.25	3.27
25 day	146.8 (12.11)^{b}	128.1 (11.34)^{bc}	6.4 (2.63)^{d}	5.2 (2.39)^{d}	1.8 (1.52)^{cd}	1.4 (1.38)^{cd}	5.32	5.38	3.29	3.34
30 day	72.7 (8.56)^{c}	59.8 (7.76)^{cd}	0.0 (0.71)^{e}	0.0 (0.71)^{e}	0.0 (0.71)^{d}	0.0 (0.71)^{d}	5.36	5.40	3.33	3.48
CD (5%)	3.27	3.82	0.68	0.81	1.13	1.26				

Figures in parentheses are √(c+0.5) transformed values.

when shoot length of oranges was less than 9.5 cm, while the density of the other stages was relatively even when the shoot length was more than 9.5 cm. Females of *P. citrella* preferred the lower surface for oviposition (Shivankar and Shyam Singh, 3) when leaves were shorter than 10 mm (Garrido and Gascon, 2). Similarly, the present investigation showed that leaf miner preferred for oviposition when the Nagpur mandarin leaves with the length of 0.97-3.52 cm. The optimum spraying time was when shoots measured between 5.0 and 11.0 cm (Zeng *et al.,* 5). Spraying chemicals in the evening as 46% of eggs were laid between 18.00 and 21.00 hr (Garrido and Gascon, 2) and when leaf blades were 14 mm long (Yan and Yan, 4) greatly increased the effect of control of *P. citrella*. Application of insecticides with ovicidal action coinciding with Nagpur mandarin leaf age of 5-10 days 15-20 days for leaf miner and blackfly, respectively and twig age of 5 days for psylla may result in effective management of these key insect pests of citrus.

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