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Preferential Distribution Of Whitefly, *Bemisi Tabaci* Genn. On Cucurbit And Non-Cucurbit Crops

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Abstract: In present study 14 different crops viz., melon, water melon, bitter gourd, sesame cucumber, ridge gourd, pumpkin, Indian squash, cotton, cluster bean, brinjal, okra chillies and cowpeas were grown on the randomized complete block design with 4 replicates in the last week of February. The cotton was grown in last week of March. The result showed that the population of both stages of whitefly (adult and nymph) was significantly more on cucurbit crops than on the non-cucurbit crops except brinjal. The highest population (10.86 whitefleis per leaf) was recorded on cucumber followed by melon (9.92), brinjal (8.25), cluster bean (5.39), Indian squash (5.33), cotton (4.92), ridge gourd (4.26), sesame (3.14), pumpkin (3.09), water melon (3.03), okra (2.83), bitter gourd (1.98), chilies (1.97) and cowpea (1.96). The increase in the population on cucumber and melon could be due to higher level of pH in their leaves. The analysis of variance on all 14 tested plants showed that the population abundance of *B. tabaci* was significantly higher on cucumber, melon, brinjal, Indian squash and cluster bean which was confirmed by Duncan's Multiple Range (DMR) test. Regression analysis showed that the population of *B. tabaci* positively correlated with the pH level in the leaves of different host plants.

Keywords: *B. tabac*, Cucurbit crops, Host preference, Non-cucrubit crops and pH level.

1. INTRODUCTION

Bemisia tabaci is a highly polyphagus pest and has been recorded on very wide range of cultivated and wild plants (Basu, 1995). Greathead (1986) reported 506 plant species from 74 families were infested by the whitefly. Whereas David and Winstone (1988) compiled a list of 450 plant species belonging to 77 families. The most preferred plant species belong to families, Solanaceae, Leguminosae, Cucurbitaceae, Malvaceae and Euphorbiaceae (Othman *et al.*, 2002). In Pakistan, it was recorded on 160 plant species belonging to 113 genera of 42 families including crops, ornamentals, fruit and forest trees, and weeds (Attique *et at*., 2003; Lanjar and Sahito, 2005). Vegetable, oil seed crops and ornamental plants found heavily infested (Sharma and Batra, 1995, Oliveira *et al.*, 2001and Ghosh *et al.*, 2004), legume crops are the most preferred in intercropping (Natarajan *et al*., 1991). In choice and non-choice hosts *B. tabaci* laid lower proportion of eggs on cabbage (Blua *et al.* (1995). The fly preferred differently to different host plants in various seasons as cucumber in all seasons, marrows in summer and egg plant [aubergines] in winter (Singh *et al*., 2003), melon in spring (Lanjar *et at*. 2009 and Lanjar *et al*., 2012), and in early summer cucumbers, tomatoes, pepper and okras (El-Sayed *et al*., 1991). The present study was under taken to ascertain the behaviour the fly to wards the crops cultivated at the same place almost at the same time with a little variation in case of cotton crop.

2. MATERIALS AND METHODS

To observe preferential abundance of *B. tabaci* on multiple cropping on the population development of whitefly, a field was selected at Rahooki, about four kilometer west of Sindh Agriculture University Tandojam. This test farm belongs to a progressive landlord. The landlord, wants to cultivate vegetables and other short lived crops without using toxic chemicals especially insecticides**.** In this study, 14 different crops namely melon, water melon, bitter gourd, sesame, cucumber, ridge gourd, pumpkin, indian squash, cotton, cluster bean, brinjal, okra, chillies and cowpeas were grown in 2nd week of March and cotton was grown in last week of March. Each crop was replicated four times. The all 56 plots were arranged in a completely randomized block design. The block under study was 50x260 feet. All crops were seed sown on both sides of ridges except brinjal and chillies crops had three to four weeks old nursery to be transplanted. The distance between row to row was maintained five feet and two feet from plant to plant especially for cucurbits. The crops were given usual cultural practices such as thinning, proper irrigation, fertilization, etc. Previously the land was kept fallow during autumn. The crops listed above were sown after six months on the same piece of fallow land.

Observations were taken at 6 to 8 days intervals soon after germination and transplanting (chillies and brinjal). For each observation 30 leaves from each crop were randomly selected (10 leaves from each row). It was to see host preference of whitefly adults. This procedure was continued up to cucurbit harvesting. The data on temperature were recorded from MC, ARI, Tandojam. The mean maximum and

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minimum temperatures were 35.41±0.17°C and 29.41±1.13°C.

In each sample the whitefly adults were directly (visually) counted. This method was based on the fact that adults on leaves provide more accurate and practical method to estimate field population on cucurbit crop. Leaves were gently turned over and the number of whitefly adults was recorded. Scouting was made early in the morning hours (8-10 a.m.).The observations were made when the temperatures were cool and pest was easy to handle.

Similarly, nymphal (crawler) population was observed on the same leaves, which were selected for recording adult population; however, a metalic ring measuring 2.5 cm^2 diameter was tossed at the centre of the leaf, i.e. between proximal and distal ends of the leaf. The nymphs easily visible through the magnifying (10^x) glass with in the area of metal ring were counted and their population recorded. Adults plus nymphs were considered as total *B. tabaci* population per leaf. For recording the pH- value of the leaves of each crop, the leaves were brought in the laboratory, Dept. of Entomology. The collected leaves were ground separately of each crop in electric grinder. The ground leaves were squeezed in a muslin cloth to have sap of the leaves. pH- values were then taken by using pH meter. The jug of the electric grinder was rinsed after receiving the paste of the leaves of each crop.

3. RESULTS AND DISCUSSION

Contrary to the hypothesis that in multiple cropping system might have encouraged preferential behavior and the decrease in the population abundance of *B. tabaci* on cucurbit creepers. The result shows that both stages were significantly more on cucurbit creepers than on the non-cucurbit crops, except on brinjal and the cluster bean. The total population was less on some cucurbit crops i.e. ridge gourd, pumpkin, watermelon and bitter gourd. This preferential difference could be attributed to colour texture morphology of the leaves and host chemistry.

Fig. 1 showed the highest population (10.86 whitefly per leaf) was recorded on cucumber followed by melon (9.92), brinjal (8.25), cluster bean (5.39), indian squash (5.33), cotton (4.92), ridge gourd (4.26), sesame (3.14), pumpkin (3.09), water melon (3.03), okra (2.83), bitter gourd (1.98), chillies (1.97) and cowpea (1.96). The increase in the whitefly population on cucumber and melon could be due to level of pH in the leaves (Table 2) and better protection from wind because of denser canopy of these plants. In the present work the higher the pH the more abundant was the pest population (Fig 2).

The ANOVA was used to test differences in abundance of whitefly population on all 14 test plants. The analyses on population abundance showed that the population were significantly higher (Df = 13, F =19.72, P>0.01) on cucumber, melon, brinjal, Indian squash and cluster bean **(Fig. 1and Table 1)**, and confirmed by Duncan's Multiple Range (DMR) test on mean population of adults and nymphs and their total population. Regession analysis showed that the population of *B. tabaci* positively correlated with the pH of different host plants **(Fig. 2 Table 2).**

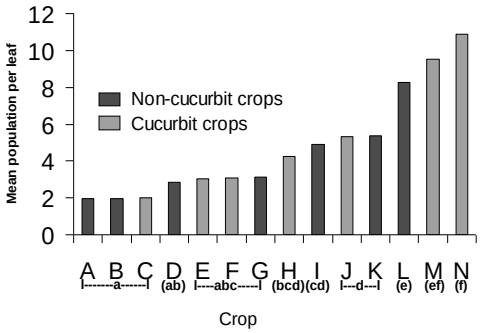


Fig. 1. Mean population of *B. tabaci* (nymphs+adults) on cucurbit and non-cucurbit crop

Table. 1. Duncan's multiple range test for comparison of means

Crop	Respective Letter in Histogram	Dancan's Homogeneous group
Cowpea	A	A
Chillies	B	A
Bitter gourd	C	A
Okra	D	Ab
W. melon	E	Abc
Pumpkin	F	Abc
Sesame	G	Abc
Ridge gourd	H	Bcd
Cotton	I	Cd
Indian squash	J	D
Cluster bean	K	D
Brinjal	L	E
Melon	M	Ef
Cucumber	N	F

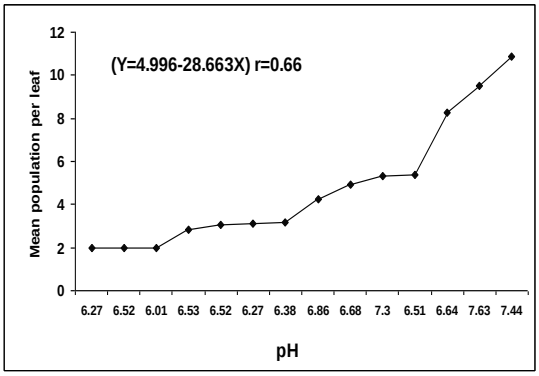


Fig. 2. The effect of pH on population abundance of *B. tabaci* on cucurbit and non-cucurbit crop

Table 2. pH values of various cucurbit and non-cucurbit crops.

Date	Crop	Crop-age (days)	Temperature x=s.e.	pHx=s.e
19-4	Cucumber	60	32.06±0.07	7.44±0.08
14-4	Melon	65	30.40±0.04	7.63±0.01
17-4	Ridge gourd	70	31.14±0.14	6.86±0.01
18-4	Indian squash	60	32.18±0.02	7.30±0.04
18-4	Water melon	60	32.20±0.00	6.52±0.08
16-4	pumpkin	70	31.19±0.01	6.27±0.03
16-4	Bitter gourd	70	30.12±0.02	6.01±0.01
20-4	Cowpeas	63	30.19±0.01	6.27±0.09
26-4	Cluster Bean	70	32.11±0.04	6.51±0.09
28-4	Brinjal	90	30.59±0.02	6.64±0.12
30-4	Okra	60	29.88±0.19	6.53±0.14
18-4	Cotton	95	30.42±0.13	6.68±0.09
18-4	Chillies	85	30.88±0.15	6.52±0.81

The result shows the total population of both stages was significantly more on cucurbit creepers than non-cucurbit, except on brinjal and cluster bean. Less population on ridge and bitter-gourd, pumpkin, watermelon and biter gourd was also recorded. Sharma and Batra (1995) noted heaviest infestation on egg-plant [*Solanum melongena*], and cotton followed in decreasing order by potato, marrow, cabbage and tomato. The result of present studies also revealed that whitefly population was significantly lower on watermelons. This preferential difference could be attributed to colour, texture, leaf morphology and host chemistry (Baloch *et al.,* 1982; Sippell *et al.,*1984; Van Lenteren and Noldus 1990). Maximum population of whitefly was recorded on cucumber and melon. Moreno *et al.* (1993) evaluated a wide range of cucurbit species and genera, melon varieties and the cucumber were severely affected by *B. tabaci.*

It is in partial agreement with these workers. In our work the higher the pH the more abundant was the pest population. This could be due to higher nitrogen contents and pH of their leaves (Jackson *et al.*1973). Ven Boxtel *et al. (*1978) noted that *B. tabaci* probes with its stylets almost any surface on which they alight. If they happen to land on favorable pH-level crop, they stay on it for feeding and egg lying. If the pH is an unfavorable (of less pH value) host the fly migrates to neighboring host (Van Sas *et al*., 1978). The results on the present study indicate that fly infest all test crops. Mound and Halsey (1978) observed that whitefly is a notorious pest of many crops including cucurbits and non-cucurbit, but it does not infest equally all host plant species (Horowitz, 1986).The whitefly adults, nymphs occurred on all 14 test plants. The analyses of population abundance of both stages (adult plus nymphs) were significantly higher on cucumber, melon, brinjal, Indian squash and cluster bean. (El-Sayed *et al.*, 1991). Sukhoruchenko *et al.* (1995) and Barbosa *et al.* (2001) reported that melon, aubergine, cabbage, *Broussonetia* and *Hibiscus* are preferred crops. Aslam and Gebara (1995) also mention cucumbers as the preferred crop.

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