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Comparative biological features of cotton whitefly, *Bemisia tabaci* (Hemiptera: Aleyrodidae) when reared on four host plants

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Abstract

Cotton whitefly *Bemisia tabaci* (Gennadius) (Hemiptera: Aleyrodidae) is a polyphagous devastating insect of numerous agronomic crops in Egypt. Comparison between the biological features of *B. tabaci* when reared on four vegetable plants, tomato, eggplant, cucumber and squash was established. Data showed a non-significant difference for the egg incubation period of *B. tabaci* on the investigated four vegetable plants. The developmental time of *B. tabaci* nymphal stage when fed on the different investigated diets was a significant longer period in tomato plant than other host plants (16.45 days). However, the smallest period of nymphal stage was observed on eggplant (10.36 days), followed by squash (11.96 days) and cucumber (12.04 days) plants. The accomplishment of *B. tabaci* life cycle (egg - adults per day) was a longest on tomato being 20.26 days, but it was a shortest on eggplant (12.57 days). In addition, a survival rate of *B. tabaci* when reared on different tested host plants was higher on squash and eggplant plants (84% and 80%, respectively) than on other examined host plants. Present data indicated that the net reproductive rate (R_o) was ranged from 27.081 on tomato to 52.560 on eggplant plants. The present data also reflected the highest finite rate of increase (λ) on eggplant (1.2128), followed by squash plant (1.1788) and the lowest on tomato plant (1.1222), and followed by cucumber plant (1.1546). The finite rate was ranged from 1.1222 – 1.2128, that means, *B. tabaci* was able to increase the population (λ>1) on all tested host plants. In the present study, the preference of whitefly influenced by the plant enzyme activities as well as Phenoloxidase and Peroxidase, as like, the *B. tabaci* infestation increased by increased the polyphenoloxidase and peroxidase activities in host plant. Moreover, the leaf phytochemical components influenced on the development of whitefly on the four tested vegetable plants. Finally, *B. tabaci* is obviously a greater host preference for eggplant and squash plants as compared to cucumber and tomato plants by documenting a short life and mortality. Hence, one should consider the susceptibility of vegetable plants when planning the IPM program for *B. tabaci* in Egypt.

Introduction

Cotton whitefly *Bemisia tabaci* (Gennadius) (Hemiptera: Aleyrodidae) is a polyphagous devastating insect of numerous agronomic crops in tropical and subtropical regions (Oliveira *et al.*, 2001 and Schuster *et al.*, 1996). *B. tabaci* infested about 506 plant species from 74 families in all plant growth stages, seedling, flowering and fruiting. After feeding on plant sap, both nymph and adult excreted honeydew on plant (Van Doorn *et al.*, 2015). Host plants effect on the development of *B. tabaci* (Sharaf *et al*., 1985 and Fekrat and Shishehbor, 2007). *B. tabaci* caused numerous damages by direct feeding (Wan and Yang, 2016) but also as vectors of plant viruses (Tocko-Marabena *et al.*, 2017), promoting fungi growth caused soot molds and reducing crop yield (Coudriet *et al*., 1985). *B. tabaci* caused serious damages due to secrete a large amount of honeydew on to leaves (Gangwar and Gangwar, 2018). Moreover, it's caused silver-leafing symptoms in squash (Vyskocilova *et al*., 2019). They compared the survival and fecundity of *B. tabaci* on 13 vegetable hosts viz. aubergine, squash and tomato plants.

The developmental time needed to *B. tabaci* for completing stages from egg to adult on cucumber and squash by Coudriet *et al.* (1985), cantaloupe by Nava-Camberos *et al.* (2001). In addition, the development and reproduction of *B. tabaci* under screen house conditions was determined by Tamilselvan *et al.* (2019) on resistant and susceptible cotton genotypes. Numerous studies on *B. tabaci* biology had been carried out under diverse conditions and recorded that the variation in biological features related to temperature, RH and host plant (Palaniswami *et al*. 2001). *B. tabaci* life cycle from egg to adult was carried out on cucurbita host species depend on temperature and humidity (Šimala and Masten, 2003). Bayhan *et al*. (2006) studied the whitefly rearing on squash, cucumber, cantaloupe and watermelon at 20, 25 and 30ºC to determine the development time and survival rate. On cucumber plant, Kakimoto *et al*. (2007) recorded that the developmental and reproductive of *Bemisia argentifolii* Bellows and Perring (Hemiptera: Aleyrodidae) increased under the laboratory at 25ºC. They found that the developmental period of *B. argentifolii* took about 22.4 days. Furthermore, Sohani *et al.* (2007) determined the life table of *B. tabaci*. The development period was 14.1 days at 30ºC, and immature mortality was 17.3% with 30ºC. The longevity of female was 16.8-34.1 days. Total fecundity was 150-263 eggs/female. Mean daily laid eggs ranged from 4.2-12.7 eggs/female. The generation extended from 19 to 43 days by increased temperature.

On tomato plants, Fekart and Shishehbor (2007) and Takahashi *et al.* (2008) determined that the developmental duration from the egg-to-adult period under laboratory conditions was ranged between 20 and 22 days. Moreover, the biology aspects of *B. tabaci* were evaluated on 18 tomato genotypes by Oriani *et al*. (2011) under laboratory greenhouse conditions. The history of life was determined by Khan and Wan (2015) at 25±2ºC, 60±5% RH. They indicated that the total egg - adult duration stage on tomato was 33.6 days. Total mortality percent from egg to adult was 34.4%. Females lived longer than males. Mean female and male stayed alive for about 19.1, 18.5 days. The total laid eggs were 78.3 eggs/ female and sex ratio were 52:48 (Female: Male).

Rarely issues were concerned on the cotton whitefly, *B. tabaci* biology in Egypt, so that, this work was undertaken to comparison between the biological features of *B. tabaci* when fed on four vegetable plants, tomato (*Lycopersicon exculentun* variety, supper strain-B), eggplant (*Solanum melongena* variety, black baladi), cucumber (*Cucumis sativus* variety, hayl) and squash (*Cucurbita pepo* variety, azid f1).

Materials and Methods

1. **Stock culture:**

Cotton whitefly *B. tabaci* infestations were collected through May 2018 from eggplant crop under green house at Fayoum governorate, Egypt. Eggplant nurseries cultivated in pots. After that, the collected *B. tabaci* infestations and adults were put on the cultivated pots in two wooden cages under normal conditions. The cage (80 cm length x 50cm width x 90 cm height) covered by Agrylic clothes (anti *B. tabaci* screening) (Figure, 1). The eggplant nurseries were irrigated and fertilized by balanced fertilizer contained 20N: 20P: 20K; additionally, the new nurseries were added to the stock cages when needed. After that, the cotton whitefly artificial infestation was placed on new tomato, eggplant, cucumber and squash nurseries in the wooden cage (35cm length x 25cm width x 45cm height) (Figure, 1).

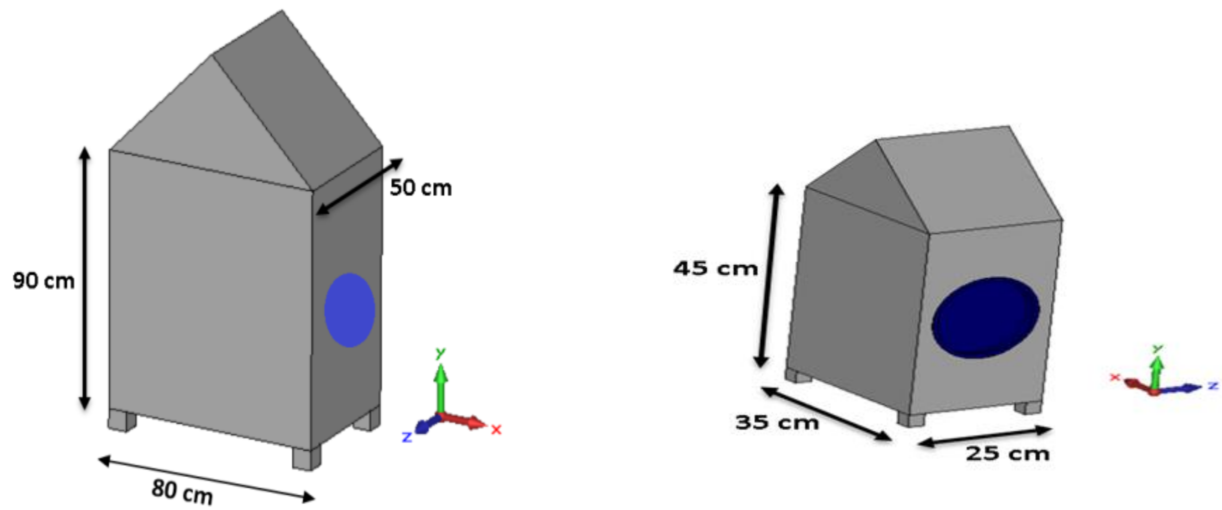

Figure (1): Wooden cages.

2. **Biology of *B. tabaci*:**

A total of 4 nurseries of each tested crop were placed on the stock cage to artificial infestation by *B. tabaci* adults for 24 hours. After that, these 4 nurseries for each crop (tomato, eggplant, cucumber and squash) were transferred to new cages (25cm width x 35cm length x 45 height); two nurseries from each plant were placed in the small wooden cage which covered by white Agrylic clothes. Stay about 50 deposited eggs was counted on 4 nurseries of each tested crop and the exceeded eggs were removed. The development of cotton whitefly, *B. tabaci* was observed and diagnosed by 20X lens from immature stages to adult emergence. The newly adults were transferred to a new nursery of each plant in wooden cage, after that, the laid eggs were counted. In addition, the adult longevity, life cycle, survival rate and sex ratio were determined. Also, net reproductive rate (R_o), intrinsic rate of increase (r_m) and finite rate of increase (λ) as suggested by Carey (1993), according to the method of Birch (1948) and Lin (1964) were calculated.

3. **Statistical analysis:**

Data were analyzed by using SAS program computer including F- test and simple correlation (SAS Institute, 2003) at 5% levels of probability.

Results and Discussion

The impact of four vegetable plants, tomato, eggplant, cucumber and squash plants was observed on the biological features of *B. tabaci* under natural conditions. *B. tabaci* life cycle pass through egg, 1st

nymphal instar, 2nd nymphal instar, 3rd nymphal instar, 4th nymphal instar and adult stages (Table, 1). Data showed a non-significant difference for the egg incubation period of *B. tabaci* on the investigated four vegetable plants. The egg incubation period was small on squash plant (2.15± 0.11 days) while on tomato plant was a long (3.80 ±0.14 days) under natural (Table, 1). The tomato plant was recorded a high value of the egg incubation period under natural conditions. The first nymphal instar is called crawling. A significant difference was observed between 1st nymphal instar fed on the four tested vegetable plants. The development time of 1st nymphal instar was small with cucumber and squash plants (1.74± 0.08 and 1.53± 0.10 days, respectively). However, it was a long when fed on tomato and eggplant plants (3.23± 0.10 and 2.56 ± 0.09 days, respectively). The development time of 1st nymphal instar seems to a longer when fed on tomato and eggplant plants under natural conditions (Pr.> |F| value= 2.94, LSD value= 1.486) (Table 1).

The nymphal instars from 2nd - 4th were sessile. The feeding impact on different host plants was observed to exhibit longer duration on tomato plant (4.86 ±0.19 days) than on other host plants. The lowest duration period of the 2nd nymphal instar was found in case of eggplant plant (2.62 ±0.12 days) with significant difference between both host plants. Also, data was indicated that the developmental time of nymphal instars from 2nd - 4th was longer on tomato plant and smaller on eggplant plant. A non-significant difference was found with 3rd and 4th nymphal instars when fed on the four tested plants. In general, the developmental time of *B. tabaci* nymphal stage when fed on the different investigated diets was a significant longer period in tomato plant than other host plants (16.45± 0.35 days) at 0.05 level of probability according F-test analysis (F value = 7.43, LSD= 3.132). However, nearly developmental period of nymphal stage was observed in case of eggplant (10.36± 0.03 days as smallest period), squash (11.96± 0.52 days) and cucumber (12.04± 0.43 days) plants without significant difference between them (Table, 1). Finally, the impact of host diet for eggplant was suitable diet for *B. tabaci* stage, followed by cucurbit hosts, but tomato plant was recorded a longest developmental period of *B. tabaci* stages under natural conditions.

On the other hand, the impact of different vegetable plants on longevity of was reported confining by females and males just immediately on emergence on different tested plants, tomato, eggplant, cucumber and squash (Table, 1). The mean longevity of *B. tabaci* male (immediately from 4th nymphal moult to adult death) was found to be longer when *B. tabaci* male feeding on squash plant (17.69 ± 1.48 days), followed by eggplant (14.50 ± 2.46 days). Contrariwise, in case of female, it was to be longer when *B. tabaci* female fed on eggplant (21.00 ± 1.36 days), followed by squash plant (19.38 ± 0.94 days). Doubtless, eggplant was a suitable diet for development of *B. tabaci*, on which, the female longevity was observed the longest duration under natural conditions (Table, 1). The longest mean generation survived for 21.26 ± 0.56 days on tomato and the shortest was *B. tabaci* that survived for 13.57 ± 0.2 days on eggplant (Table, 2). The mean generation was significantly different between eggplant and tomato, but it was insignificantly difference with both other tested host plants (F= 2.93, LSD= 6.363). The accomplishment of *B. tabaci* life cycle (egg-adults per day) was a longest on tomato being 20.26±0.62 days, but it was a shortest on eggplant (12.57±0.18 days) with significantly different between them (Table,2).

Table (1): Developmental period (Mean±SE) of *Bemisia tabaci* on different vegetable plants.

Stage	Incubation period (days)	Duration of nymphal instars (days)				Nymphal stage	Longevity (days)	
		1st nymph	2nd nymph	3rd nymph	4th nymph		Male	Female
Tomato	3.80± 0.14 a	3.23± 0.10 a	4.86± 0.19 a	4.43± 0.20 a	3.93± 0.20 a	16.45± 0.35 a	10.89± 2.01 b	13.78± 1.00 b
Eggplant	2.21± 0.10 a	2.56± 0.09 ab	2.62± 0.12 b	2.66± 0.08 a	2.53± 0.09 a	10.36± 0.03 b	14.50± 2.46 ab	21.00± 1.36 a
Cucumber	2.91± 0.12 a	1.74± 0.08 b	3.41± 0.12 ab	3.68± 0.14 a	3.19± 0.19 a	12.04± 0.43 b	13.20± 2.07 ab	14.50± 2.46 b
Squash	2.15± 0.11 a	1.53± 0.10 b	3.19± 0.11 ab	4.02± 0.17 a	3.21± 0.15 a	11.96± 0.52 b	17.69± 1.48 a	19.38± 0.94 ab
F value	1.29	2.94	2.04	1.48	0.66	7.43	3.77	3.63
LSD	2.211	1.486	2.177	2.035	2.306	3.132	4.769	6.11

Values signed by the same letter in the same column are statistically non-significant.

The obtained data in Table (1) were in line with Hendi *et al.* (1984) who recorded the developmental duration of *B. tabaci* being 19.5 days for on tomato at 30°C. Additionally, Sohani *et al.* (2007) observed that the development of *B. tabaci* stages was 14.1 days at 30°C on cucumber plant, and the generation times decreased with increasing temperature from 43 to 19 days. Moreover, on some cucurbita species, Bayhan *et al.* (2006) reported that the developmental duration of all nymphs was 19.3 days on cucumber, 20.1 days on squash, 20.8 days on cantaloupe and 23.8 days on watermelon plants at 25°C. In other crops, Butler *et al.* (1983) on cotton was 17 days on aubergine. In addition, Oriani *et al.* (2011) studied some biological aspects of *B. tabaci* on 18 tomato genotypes under laboratory greenhouse conditions. The development period of insects grown on these genotypes took ranged from 20.3 – 23.3 days. Moreover, Numerous issues was detected the development times of *B. tabaci* stages as like as Powell and Bellows (1992a) on potato (14.2 day), cucumber (16.74 days) at 30°C. Expectedly, the difference may be explained by disparities in the phytochemical components in the investigated host plants. In case of longevity, the females lived longer than males on host plant. Similarly, mean longevity was 19.1 of female and 18.5 days of male on tomato plant (Khan and Wan, 2015). In addition, the longevity of *B. tabaci* adult in this study was like those reported in other studies conducted at similar constant temperatures (Butler *et al.*, 1983 and Powell and Bellows, 1992 b). In which, most of these researchers reported that female insects lived longer than males, that it may be due to the plant ability to defend themselves against any herbivores.

Present data in Table (2) showed that the influence of four vegetable plants, tomato, eggplant, cucumber and squash on fecundity, generation and life cycle, sex ratio and survival rate was studied**.** All deposited eggs were daily recorded until adult death. Also, the numbers of male and female adults were reported and calculated the sex ratio on all investigated host plants. Fecundity of *B. tabaci* was crucial in determining the potential of *B. tabaci* populations on these hosts. Fecundity was affected by these tested host plants. *B. tabaci* female deposited the greatest and least egg numbers when fed on eggplant and cucumber plants with average of 109.50± 7.08 and 83.80± 6.10 eggs/ female, respectively (Pr. > F= 27.05 and LSD= 7.025). However, a mean daily egg was the greatest on tomato plant being 5.60± 0.99 eggs/ day/ female, and the least was 4.29± 0.65 eggs/ day/ female on squash plant without significant difference between them (Pr. < F= 0.47 and LSD= 2.806) (Table, 2).

Results showed that *B. tabaci* sex ratio (female %) was not affected by different tested host plant on which it was reared. Statistical analysis stated no significant differences in sex ratio between them (F= 0.95, LSD= 10.423). A survival rate of *B. tabaci* when reared on different tested host plants was higher on squash and eggplant plants (84% and 80%, respectively) than on other examined host plants (Table, 2).

Table (2): Biological aspects of *B. tabaci* fed on four vegetable plants under natural conditions.

Biological parameters	Host plants				Significant level	
	Tomato	Eggplant	Cucumber	Squash	F value	LSD
Total eggs	89.56± 8.30 [b]	109.50± 7.08 [a]	83.80± 6.10 [b]	90.15± 8.42 [b]	27.05	7.025
Daily rate of eggs	5.60± 0.99 [a]	4.76± 0.61 [a]	4.41± 0.95 [a]	4.29± 0.65 [a]	0.47	2.806
Mean generation time (days)	21.26± 0.56 [a]	13.57± 0.26 [b]	15.95± 0.43 [ab]	15.10± 0.47 [ab]	2.93	6.363
Life cycle (days)	20.26± 0.62 [a]	12.57± 0.18 [b]	14.95± 0.75 [ab]	14.10± 0.98 [b]	3.67	5.685
Sex ratio (Females %)	53.57 [a]	60.00 [a]	55.56 [a]	59.52 [a]	0.95	10.423
Survival rate %	56 %	80 %	72 %	84 %	——	
Net reproductive rate (R_0)	27.081	52.560	33.788	45.438	——	
Daily intrinsic rate of increase (r_m)	0.1153	0.1929	0.1438	0.1645	——	
Finite rate of increase (λ)	1.1222	1.2128	1.1546	1.1788	——	

Values signed by the same letter in the same row are statistically non-significant.

The obtained results were in line with Šimala and Masten (2003), they found the ability of *B. tabaci* female to deposit eggs up to 160 eggs on cucurbita plants. Moreover, a mean deposited eggs of *B. tabaci* ranged between 150 - 263 eggs /female and 4.2-12.7 eggs/day (Sohani *et al*., 2007). Other whitefly species, Nava-Camberos *et al.* (2001) stated that *B. argentifolii* laid about 14.6 - 36.0 eggs/ day. A low deposited eggs of female was 78.3 (Fekart and Shishehbor, 2007) and 60.1 eggs/ female (Khan and Wan,

2015) on tomato plants. Other laboratory experiments had detected a variety of fertility values of whitefly. On cotton and cucumber, Powell and Bellows (1992 b) observed that *B. tabaci* deposited about 73.7 and 208.6 eggs at 29°C, respectively. On tomato plants, Hendi *et al*. (1984) found a mean of 203.1 eggs at 30°C. They also found that the daily of laid eggs was 8, with a range of 5.5 - 10.8. On cotton, Horowitz (1983) recorded a mean of 95.5 eggs at 30°C. Regarding life cycle, the present data was comparable agree with Šimala and Masten (2003), who found that the life cycle requires 2-3 weeks. Fekart and Shishehbor (2007) and Takahashi *et al.* (2008) recorded that the period from egg-to-adult was 20.0-22.0 days on tomato crop. On the other hand, Khan and Wan (2015) recorded about 33.6 days of egg-adult period on tomato plant at 25 °C. Finally, it clarity emphasized that the egg- adult period of *B. tabaci* requires about 2-3 weeks on investigated host plants under natural condition at the experimental time.

During the study of survival rate, comparable present results were generally satisfactory with Nava-Camberos *et al.* (2001) were reported that the survival of *B. argentifolii* was 76.5% on cantaloupe. Present data showed that the survival rate of this pest was raged from 56 - 84 % on the four tested host plants, similarly, at different temperatures, the percentage survival of immature instars was 72.9 - 83.2% on cucumber, 72.9 - 84.9 % on cantaloupe, 52.1-76.1% on squash and 37.6 - 64.8 % on watermelon (Bayhan *et al*., 2006). Throughout the aforementioned issues, the survival rate was not exceeded than 85%, it may be depended on the feeding host plants or heat degree units require for development.

In the present study and previous issues, the sex ratio of whitefly, was independent of the feeding on different plant species (van Lenteren and Noldus, 1990). The current study recorded that sex ratio of *B. tabaci* female was 53.57 -60 %, as like as Khan and Wan (2015), who recorded that the sex ratio was 52:48 female: male on tomato plant.

By comparison in Table (2) between tomato, eggplant, cucumber and squash plants, all studied life table statistics were diversity on the examined host plants. The net reproductive rate (R_o) was ranged from 27.081 on tomato to 52.560 on eggplant plants. Moreover, the intrinsic rate of increase (r_m) was the highest on eggplant (0.1929), however, the lowest was recorded with tomato plant (0.1153). The present data also reflected the highest finite rate of increase (λ) on eggplant (1.2128), followed by squash plant (1.1788) and the lowest on tomato plant (1.1222), and followed by cucumber plant (1.1546). The finite rate of increase is the ability of *B. tabaci* to increase the population growth per unite time (female/ female/ day). The finite rate was ranged from 1.1222 – 1.2128, that means, *B. tabaci* was able to increase the population ($\lambda > 1$) on all tested host plants (Table 2). Similarly, Fekart and Shishehbor (2007) showed that the daily r_m was extended from 0.1438 to 0.1645 on aubergine, tomato and potato plants, and *B. tabaci* was capable of population increase ($\lambda > 1$) on different host plants. Yang and Chi (2006) conducted the life table of *B. argentifolii* on tomato at different temperatures, and they found that the intrinsic rate of increase (r_m) was 0.1469 at 25ºC. Comparably, the developmental time, r_m, R_o and fecundity of *B. argentifolii* raised on four vegetables as eggplant, cucumber, sweet pepper and tomato at 25ºC by Kakimoto *et al.* (2007). They recorded that the r_m and R_o was 0.168 & 185.1 on eggplant; 0.153 & 130.7 on cucumber; and 0.110 & 36.1 on tomato, respectively. In these two studies, the r_m and R_o of reared *B. tabaci* in the present work and *B. argentifolii* was lower on tomato when it's compared with than other tested vegetables.

Data tabulated in Table (3) showed that a high amount of the proteins was represented in eggplant and squash plants by

55.77±1.47 and 54.63± 0.70 mg/gdw. However, tomato plant had low amount of this leaf components. However, both cucumber and tomato plants had a highest level of total phenols being 4.22± 0.21 and 4.07± 0.34 mg/gdw, and the lowest one was found in leaf of tomato and squash plants (3.13± 0.19 and 3.20± 0.26 mg/gdw, respectively). In Table (3), a heavily Peroxidase and Phenoloxidase levels were represented in tomato leaves (10.63± 1.70 ΔO.D.430/min/gdw and 13.02± 0.96 ΔO.D.units/min/gdw than other tested plants. Contrarily, eggplant leaves contained a low amount of two examined plant enzymes (5.10 ±0.58 ΔO.D.430/min/gdw and 5.47 ±0.13ΔO.D.units/min/gdw, respectively).

Table (3): Certain phytochemical components and plant enzymes in four tested vegetable plants.

Leaf contents		Host plants				Significant level	
		Tomato	Eggplant	Cucumber	Squash	F value	LSD
Enzymes	**Peroxidase (ΔO.D.430/min/gdw)**	10.63± 1.70 ^{a}	5.10 ± 0.58 ^{b}	12.02 ± 1.00 ^{a}	6.30 ± 0.78 ^{b}	9.21	3.240
	Phenoloxidase (ΔO.D.units/min/gdw)	13.02 ± 0.96 ^{a}	5.47 ± 0.13 ^{c}	7.85 ± 0.16 ^{b}	6.72 ± 0.70 ^{bc}	30.11	1.782
Phytochemical contents	**Total proteins (mg/gdw)**	31.85 ± 0.53 ^{c}	55.77 ± 1.47 ^{a}	39.17 ± 0.86 ^{b}	54.63 ± 0.70 ^{a}	150.40	2.830
	Total phenols (mg/gdw)	4.07 ± 0.34 ^{a}	3.13 ± 0.19 ^{b}	4.22 ± 0.21 ^{a}	3.20 ± 0.26 ^{b}	4.93	0.753

Values signed by the same letter in the same row are statistically non-significant.

A significantly positive effect was found between the tested components except in case of total proteins were recorded negative effect on the life cycle, generation and nymphal stage of *B. tabaci*. By contrast, a significantly negative effect was stated between the tested components on the male and female longevity and fecundity of *B. tabaci* except in case of total proteins were recorded positive effect on these parameters (Table, 4).

Table (4): Effect of certain phytochemical components and plant enzymes on biological aspects of B. tabaci fed on four vegetable plants.

Leaf contents		Biological parameters					
		Life cycle	Generation	Nymphal stage	Longevity		Fecundity
					Male	Female	
Peroxidase (ΔO.D.430/min/gdw)	**r value**	0.64	0.64	0.58	– 0.67	– 0.96	– 0.79
	Prob.	0.04	0.05	0.14	0.03	0.01	0.05
	E.V.%	40.43	40.36	33.96	46.08	93.56	63.92
Phenoloxidase (ΔO.D.units/min/gdw)	**r value**	0.99	99.18	0.91	– 0.76	– 0.82	– 0.48
	Prob.	0.001	0.001	0.01	0.03	0.01	0.51
	E.V.%	99.77	99.84	92.88	58.32	64.72	23.72
Total proteins (mg/gdw)	**r value**	– 0.88	– 0.84	– 0.84	0.86	0.94	0.62
	Prob.	0.01	0.01	0.05	0.01	0.01	0.03
	E.V.%	78.34	72.87	70.14	74.40	92.48	39.62
Total phenols (mg/gdw)	**r value**	0.67	0.62	0.61	– 0.76	– 0.97	– 0.73
	Prob.	0.03	0.03	0.05	0.02	0.01	0.03
	E.V.%	45.18	41.50	37.77	57.67	94.61	53.39

r value= correlation coefficient **Prob. =** Probability **E.V.%**= Explained variance

Plants respond against pests by numerous biochemical substances to reduce their pest damage. The plant defense was wide-ranging, by direct and indirect actions (War *et al*., 2012) In the present study, the preference of whitefly influenced by the plant enzyme activities as well as Phenoloxidase and Peroxidase, as like, the *B. tabaci* infestation increased by increased the polyphenoloxidase and peroxidase activities in host plant (Shize *et al.*, 2008; Kai *et al.*, 2014 and Hongsheng *et al.*, 2017)

In the present study, the leaf phytochemical components influenced on the development of whitefly on the four tested vegetable plants as viewpoint of Hegab (2017) and Fucai *et al.* (2014) in cucumber plants, Saleh and Al-Shareef (2010) in cantaloupe plants and Khan *et al.* (1999) in ash gourd plants. Vegetable crops have a large variety of phytochemical compounds, as alkaloids, tannins, steroids, glycosides, phenolics, flavonoids among others (Rajasree *et al*. 2016), that it may be affected on whitefly preferences and some of these may be execute as repellent agents. Moreover, the role of phytochemicals may be act as an antifeedant approach on whitefly control (Koul, 2008 and Fucai *et al*., 2014).

In recent issues and this study, the antifeeding and/or phytochemical contents in host plants influenced on the whitefly density. These observations might lead to the diversity of whitefly-vegetable plant interactions which related to leaf phytochemical components. Some of these factors may be played as well as antifeeding and/or repellent in plant of the four investigated vegetable plants against the infestation of *B. tabaci* during this study.

Cotton whitefly, *B. tabaci* is obviously a greater host preference for eggplant and squash plants as compared to cucumber and tomato plants by documenting a short life and mortality with high net reproductive rate (R_o), the intrinsic rate of increase (r_m) and finite rate of increase (λ). Hence, one should consider the susceptibility of vegetable plants when planning the IPM program for the *B. tabaci* in Egypt.

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