Egypt. J. Plant Prot. Res. Inst. (2019), 2 (2): 222 - 234

Egyptian Journal of Plant Protection Research Institute

www.ejppri.eg.net

Impact of ecological aspects on pests infesting tomato varieties and their control measure

Horia, A. Abd-Elwahab ; Mahgoub, M.H. and Hosnea, A. Afifi

Plant Protection Research Institute, Agricultural Research Centre, Dokki, Giza, Egypt.

ARTICLE INFO

Article History

Received:9 / 4 / 2019

Accepted:27 /6 /2019

Keywords

Population fluctuation, *Bemisia tabaci* , *Aphis gossypii* , *Tetranychus urticae*, tomato , control and Egypt.

Abstract:

Tomato, *Lycopersicon esculentum* (Solanacea) is one of the most important vegetable crop in Egypt. Two Field experiments were conducted during two winter successive seasons of 2013/2014 and 2014 /2015 at Gizera Bele, Banha, Qalyubiya Governorate . The study included population fluctuation, the population growth rate of the whitefly**,** *Bemisia tabaci* (Gennadius) (Hemiptera: Aleyrodidae); the aphid**,** *Aphis gossypii* Glover (Hemiptera: Aphididae) ; the spider mite, *Tetranychus urticae* (Koch) (Acari: Tetranychidae) and evaluation the susceptibility degree of three varieties of tomato (omnia, arika and safira) for infestation by previously mentioned pests. The study, also included the control of these pests by sesame oil; biofly (*Beauveria bassiana*) , abamactin and malathion. The obtained results revealed that the highest mean population fluctuation (for 15 weeks) of *B. tabaci* (22.1, 61.2, 88.6) and (10, 17.7, 28.9) nymph and adult stages/ 5 leaves, followed by mean population of *T.urticae* (14.9, 5.3, 26.3) and (10.7, 9.0, 14.9) individuals/ 5 leaves of the three tomato varieties omnia, arika and safira during the two seasons, respectively, while population of *A. gossypii* was lowest mean population. Also the results revealed clearly susceptibility degree of safira variety was susceptible to infest with the above mentioned pests of tomato plants during the two seasons, with mean 58.73 , 10.6 and 20.6 (individual) / 5 leaves , respectively . Present data indicated that *B. tabaci* recorded the highest growth rate (23.64 and 4.57), taking time difference 14 days at safira variety in the first and second season, respectively. Our data exhibited, sesame oil and abamactin gave the significant highest reduction against *B. tabaci, A. gossypii* and *T. urticae* on tomato plants, as the average of their reductions after 14 days of spraying were (80.9% , 78.1% , 69.8%) and (77.6, 86.3, 71.4%), respectively .

Introduction

Tomato, *Lycopersicon esculentum* (Solanacea), is economically one of the most important and widely grown vegetables in the world vegetables (Polston and Anderson, 1999 and Peralta and Spooner, 2007), ranking second in importance next to potato (FAO STAT, 2005). Tomato is a good source of all nutrients especially vitamin C, B and K. Tomato plants are subject to infestation by the piercing sucking pests, such as the whitefly**,** *Bemisia tabaci* (Gennadius) (Hemiptera: Aleyrodidae); the aphid**,** *Aphis gossypii* Glover (Hemiptera: Aphididae) and the spider mite, *Tetranychus urticae* (Koch) (Acari: Tetranychidae) (Ahmed, 2000). *B. tabaci* is one of the most important pests of tomato, it sucks the plant sap (Schuster *et al*., 1996) reducing the quality and quantity of the sap (Mound, 1965). This insect exists as an economic pest in most places of the world (Martin, 1987; Byrne and Houk, 1990 and Gerling, 1990). This pest also transmits various viral diseases (Bedford *et al.,* 1994 and Jones, 2003).

Aphids feed through phloem tissue. Those are important pests on agricultural crops (Blackman and Eastop, 2000). Aphids cause many losses on numerous crops and about of 13% agricultural outputs were recorded to be lost by insect pests (Van Emden and Harrington, 2007 and Faria *et al*., 2007). Economic agricultural losses resulted from aphid feeding, which returned to deficiency of essential plant nutrients through the plant development. Rapid reproduction of aphids is due to parthenogenetic reproductions which produce high population densities. While, winged aphids infest new host plants (Powell *et al*., 2006). In addition, aphids feeding, also, allow transition of more than 275 viruses; aphids cause also insufficiency of photosynthesis by producing honeydew on the leaf surface (Miles, 1989 and Sylvester, 1989).

The tetranychid mite species feed on the plant sap injuring the epidermis resulting in blotching, stippling or bronzing causing serious damage (Park and Lee, 2002). The mites consumed nearly all the chlorophyll causing decrease in leaves vitality and lead to a reduction or damage the crop. *T. urticae* causes much indirect damage by transmitting viral and fungal pathogens (Park and Lee, 2007).

The cultivation of pest-resistant plants is one way to counter pests. Resistant genotype can affect the morphology, biology and physiology of pests and can play a part in reducing the population of pests (Toscano *et al.,* 2002; Fancelli *et al*., 2003; Cunha *et al*., 2005; Bogorni and Vendramim 2005 and Baldin *et al*., 2007).

Pesticides produced from natural products have been recently attracting the attention of many scientists to avoid the problems caused by synthetic compounds they are deeply interested in their chemical constituents and biological properties (Abou-Yousef *et al.,* 2010).The significance of botanical pesticides/plant extracts is highly recognized in the field of agriculture as botanical pesticides are cheap, safe , hazardless, non-residual and highly effective.

The objectives of this research were to:

1. Study the population fluctuation and the population growth rate of *B. tabaci* , *A. gossypii* and *T. urticae* on three varieties of tomato.
2. Evaluate susceptibility degree of three varieties of tomato to infest by *B.tabaci* , *A. gossypii* and *T. urticae* .
3. Evaluate the efficacy of sesame oil, biofly (*Beauveria bassiana*) and abamactin (Cormat 1.8% E.C) in comparison to malathion 57% E.C (Coromandel)) against some pests on susceptible tomato variety in open field.

Materials and methods

Two field experiments were conducted at Gizera Bele, Banha, Qalyubiya Governorate . The first one conducted to study the population fluctuation, susceptibility degree and the population growth rate to *B.tabaci* , *A. gossypii* and *T. urticae* infestation on three tomato varieties. At second experiment the susceptible variety were used in evaluation the efficiency of some tested materials, against the three previous pests.

The first experiment was conducted for two successive winter seasons throughout 2013/ 2014 and 2014/2015 seasons. An area of about 525 m^2 was cultivated with the three tomato varieties (omnia, arika and safira) in 26 th and 30th of October during 2013/2014 and 2014/2015 seasons; respectively. The whole area was divided in 9 replicates, (each replicate of 58 m^2). Each variety was represented by 3 replicates. All the experimental area received the recommended and standard cultivation practices. The total area was kept free from any pesticides application. Weekly randomized samples continue for 15 weeks, sampling of 5 leaves were randomly taken from each replicate then each sample was kept in a tightly closed paper bag and transferred to the laboratory in the same day for inspection under stereomicroscope to count the numbers of *B.tabaci* (nymphs), *A. gossypii* (nymphs and adults) and *T. urticae* (Individuals) and direct count of the whitefly adults numbers was done in the field on random samples of 5 leaves.

For parameters, maximum population size and growth rate for *B.tabaci* , *A. gossypii* and *T. urticae* were recorded for three varieties tomato and the time taken to reach the maximum count (N_t) were used for comparing between varieties tomato. Population growth rate (GR) was calculated by using Odum's equation (Odum, 1971) as follow;

$GR= (N_t – N_\circ)/ \Delta t$

Where N_t = the number of each pest recorded at the maximum count of the population on a plant.

$N_\circ$= the initial number of each pest released on each plant.

Δt= the difference in time between N_t and $N_\circ$.

The classification the susceptibility degree of each variety to infestation with the previously mentioned pests was dependent on the general mean number ($\bar{X}$) of each pest and the standard deviation (SD) as reported by Chiang and Talekar (1980) The varieties that:-

Highly susceptible (HS) : had an average numbers of pest more than $\bar{X}$ +2SD

Susceptible (S): had an average numbers of pest between $\bar{X}$ and $\bar{X}$ +2S

Low resistant (LR): had an average numbers of pest between $\bar{X}$ and $\bar{X}$ -1SD

Moderately resistant (MR): had an average numbers of pest between $\bar{X}$ -1SD and $\bar{X}$-2SD

Highly resistant (HR): had an average numbers of pest less than $\bar{X}$ -2SD.

The second experiment was conducted during the second season 2014/2015 to evaluate the efficiency of four treatments, sesame oil (*Sesamum indicum* L.) (Pedaliaceae) was purchased from El-Captain Company (CAP PHARM) for extracting oils, Natural plantsand COSMECICS. Egypt; malathion 57% E.C (Coromandel); biofly (*Beauveria bassiana*) and Cormat 1.8% E.C (Abamactin), with rate of 500 ml, 500 ml, 425 ml and 40 ml /100 L water ,respectively. Sesame oil was formulated by addition of Pril detergent at 1% in water. Water was used as controls (or untreated plants) safira variety which infested by the highest numbers of these pests used in this experiment.

An area of about 1125 m^2 was cultivated with the tomato variety (safira) in 30 th and 25th of October during 2013/2014 and 2014/2015 seasons; respectively. The whole area was divided into 15 replicates (75 m^2 for

each replicates). Each treatment was represented by three replicates and control. All the normal of agricultural practices for tomato variety (safira) cultivation were followed except pesticidal treatment. The chosen treatments were sprayed in 1st of December during 2014/2015 by using a 20 L. knapsack sprayer with one nozzle.
The efficiency of treatments was determined by inspecting 5 randomly leaves from each replicate then each sample was kept in a tightly closed paper bag and transferred to the laboratory in the same day for inspection under stereomicroscope to count the numbers of *B.tabaci* (nymphs), *A. gossypii* (nymphs and adults) and *T. urticae* (individuals). In respect to *B. tabaci* adult, the direct count done in the early morning on random samples of 5 leaves.

Inspection of plants was carried out before spraying and after 3, 7 and 14 days from application to evaluate the efficiency of sesame oil; biofly (*Beauveria bassiana*) and abamactin, while malathion after 1, 7 and 14 days on the reduction rates of the pest populations.
The reduction percentage of population (% mortality) was calculated according the equation of Henderson and Tilton (1955).

Statistical tests were performed using SAS program computer and calculated LSD (Least significant difference) to find differences between mean numbers of three pests on the three tomato varieties studied (SAS Institute, 2003).

Results and discussion

1.Population fluctuation of *Bemisia tabaci, Aphis gossypii* and *Tetranychus urticae* on three tomato varieties during two successive seasons at Qalyubiya Governorate .

1.1.First season 2013/ 2014:

1.1.1.*Bemisia tabaci*:

Data in Table (1) and Figure (1) indicated that the population fluctuation of *B. tabaci* in omnia variety had three peaks in dates 26 November and 24 December 2013 and 21 January 2014 with 87.0, 29.0 and 6.0 (nymph and adult stages) / 5 leaves. On the other hand arika and safira varieties recorded single peak at the date of 26 November 2013 as 353.0 and 3 December 2013 with 298.0 (nymph and adult stages) / 5 leaves, respectively.

1.1.2.*Aphis gossypii* :

Data in Table (1) and Figure (1) was showed that the population fluctuation of *A.gossypii* in omnia variety recorded three peaks at the dates 26 November, 17 December 2013 and 28 January 2014 with 6.0, 16.0 and 5.0 (nymph and adult stages) / 5 leaves, respectively. In the first season, arika variety recorded single peak at the date of 17 December 2013. While safira variety had two *A. gossypii* peaks at the dates of 26 November 2013 and 21 January 2014 with 10.0 and 29.0 (nymph and adult stages) / 5 leaves, respectively.

1.1.3.*Tetranychus urticae*:

Data of omnia variety in Table (1) and Figure (1) illustrated that *T.urticae* population recorded two peaks at dates 26 November and 31 December 2013 with 67.0 and 25.0 individuals/ 5 leaves.
Data of arika variety showed that single peak of *T. urticae* at date of 31/12/2013 with 55.0 individuals. Mean while safira variety showed gradually increasing in *T. urticae* tell recorded single peak at the end of season at date 11 February 2014 with 70.0 individuals/ 5 leaves.

Table (1): Counts and population growth rate of some pests on three tomato varieties during of 2013 / 2014 season.

Dat of inspection	Plant age	Number of pests /5 Leaves								
		Omnia			Arika			Safira		
		B. tabaci	*A. gossypii*	*T. urticae*	*B. tabaci*	*A. gossypii*	*T.urticae*	*B.tabaci*	*A. gossypii*	*T. urticae*
		Nymph+ Adult stages	Nymph+ Adult stages	Indiv-iduals	Nymph+ Adult stages	Nymph+ Adult stages	Indiv-Iduals	Nymph+ Adult stages	Nymph+ Adult stages	Indiv-iduals
12/11/2013	17	15	2	7	22	2	3	25	2	0
19/11/2013	24	36	2	8	56	1	10	40	5	1
26/11/2013	31	87	6	67	353	5	15	137	10	3
3/12/2013	38	54	5	48	205	8	23	298	5	12
10/12/2013	45	38	8	10	107	8	29	248	9	15
17/12/2013	52	28	16	10	70	15	32	153	10	17
24/12/2013	59	29	10	15	46	10	35	130	5	22
31/12/2013	66	17	9	25	24	9	55	94	9	25
7/1/2014	73	15	7	15	12	6	22	89	10	32
14/1/2014	80	5	7	10	10	5	10	66	18	36
21/1/2014	87	6	4	5	5	3	9	42	29	40
28/1/2014	94	1	5	2	4	2	5	4	26	42
4/2/2014	101	0	3	1	1	2	3	2	12	58
11/2/2014	108	0	1	1	0	2	0	1	9	70
18/2/2014	115	0	0	0	0	2	0	0	5	22
Mean ± SE		22.07±6.31	5.67±1.1	14.93±4.86	61±24.38	5.33±1.03	16.73±4.07	88.6±23.58	10.93±2.0	26.33±5.26

1.2.Second season 2014/ 2015:

1.2.1.*Bemisia tabaci*:

Data of omnia variety in Table (2) and Figure (1) illustrated that *B. tabaci* population recorded single peak at date of 1 December 2014 with 50.0 (nymph and adult stages) / 5 leaves. It is notice that the weekly inspections from date 12 January 2015 tell the end of season at 23 February 2015 recording Zero. Arika variety recorded single peak of *B. tabaci* population at the date 8 December 2014 with 62.0 (nymph and adult stages) / 5 leaves. Meanwhile, safira variety had two peaks of *B. tabaci* population at dates of 1 December 2014 and 12 January 2015 with 88.0 and 22.0 (nymph and adult stages) / 5 leaves, respectively.

1.2.2.*Aphis gossypii*:

Data in Table (2) and Figure (1) showed that, omnia variety had four peaks in the second season. The peak dates of omnia variety were 1 December 2014 and 5, 26 January and 16 February 2015 with 29.0, 12.0, 9.0 and 8.0 (nymph and adult stages) / 5 leaves, respectively. Also, arika variety recorded three peaks were in 1, 15 December 2014 and in 12 January 2015 with 27.0, 20.0 and 12.0 (nymph and adult stages) / 5 leaves, respectively. The three peaks of safira variety were in 1, 22 December 2014 and in 5 January 2015 with 20.0, 25.0 and 29.0 (nymph and adult stages) / 5 leaves, respectively.

1.2.3.*Tetranychus urticae*:

Table (2) and Figure (1) illustrated that *T. urticae* population of omnia and safira varieties had two peaks at dates of 8 and 29 December 2014. The two peaks of omnia variety recorded 20.0 and 33.0 individual / 5 leaves, while safira showed 22.0 and 49.0 individual / 5 leaves, respectively. On the other hand Arika variety had single peak at date of 8 December 2014 with 30.0 individual / 5 leaves. In general, the three weeks from 1 December tell 22 December 2014 had the distinct peaks of three tomato varieties for *B. tabaci* and *A. gossypii*. On the other hand *T. urticae* peaks recorded in 8 and 29 December 2014.

Table (2): Counts and population growth rate of some pests on three tomato varieties during of 2014 / 2015 season.

Dat of inspection	Plant age	Omnia			Arika			Safira		
		B. tabaci	*A. gossypii*	*T. urticae*	*B. tabaci*	*A. gossypii*	*T. urticae*	*B. tabaci*	*A. gossypii*	*T. urticae*
		Nymph+ Adult stages	Nymph+ Adult stages	Indiv-iduals	Nymph+ Adult stages	Nymph+ Adult stages	Indiv-iduals	Nymph+ Adult stages	Nymph+ Adult stages	Indiv-iduals
17/11/2014	18	6	13	2	10	10	6	24	8	7
24/11/2014	25	18	17	6	25	19	14	49	13	14
1/12/2014	32	50	29	14	61	27	15	88	20	20
8/12/2014	39	35	20	20	62	15	30	62	19	22
15/12/2014	46	23	15	10	31	20	19	38	18	12
22/12/2014	53	10	12	12	28	18	13	37	25	17
29/12/2014	60	5	10	33	16	9	10	33	20	49
5/1/2015	67	3	12	22	10	7	10	20	29	34
12/1/2015	74	0	7	15	6	12	8	22	15	12
19/1/2015	81	0	6	8	5	8	4	20	8	9
26/1/2015	88	0	9	6	3	4	3	17	1	7
2/2/2015	95	0	2	5	4	3	2	10	0	5
9/2/2015	102	0	4	4	2	1	1	8	0	3
16/2/2015	109	0	8	2	2	0	0	4	0	8
23/2/2015	116	0	4	2	1	0	0	1	0	4
Mean ± SE		10.0±3.8	11.2±1.82	10.73±2.29	17.73±5.24	10.2±2.12	9.0±2.15	28.87±6.07	11.73±2.59	14.87±3.23

2.Evaluation of relative susceptibility degree of three tomato varieties to *Bemisia tabaci, Aphis gossypii* and *Tetranychus urticae* infestation during the two seasons under consideration (2013/ 2014-2014/2015 :

2.1.*Bemisia tabaci* :

Table (3) and Figure (1) showed that omnia variety was showed moderate resistance 22.07 (nymph and adult stages) / 5 leaves in the first season meanwhile recorded a low resistance 10.0 nymphs and adults / 5 leaves in the second season, respectively. The mean susceptibility degree of the two seasons recorded moderate resistance with 16.03 (nymph and adult stages) / 5 leaves. In respect to, arika variety had susceptible in the first season and low resistance in the second season with 61.0 and 17.73 (nymph and adult stages) / 5 leaves, respectively. The mean susceptibility degree of the two tested seasons showed low resistance with 39.37 (nymphs and adults) / 5 leaves. Susceptibility degree of safira variety was susceptible in the two seasons with mean 58.73 (nymph and adult stages) / 5 leaves.

2.2.*Aphis gossypii*:

Susceptibility degree of both omnia and arika varieties was recorded low resistance in both tested seasons, with mean 7.43 and 6.80 nymph and adult stages. While safira variety was susceptible in the two seasons with mean 10.63 nymph and adult stages [Table (3) and Figure (1)].

2.3.*Tetranychus urticae* :

In respect to *T. urticae* both omnia and arika varieties had a low resistance in both seasons, with mean 12.83 and 12.87 individual/ 5 leaves, respectively. Meanwhile safira variety recoded susceptible in the two tested season, with mean 20.60 individual/ 5 leaves[Table (3) and Figure (1)].

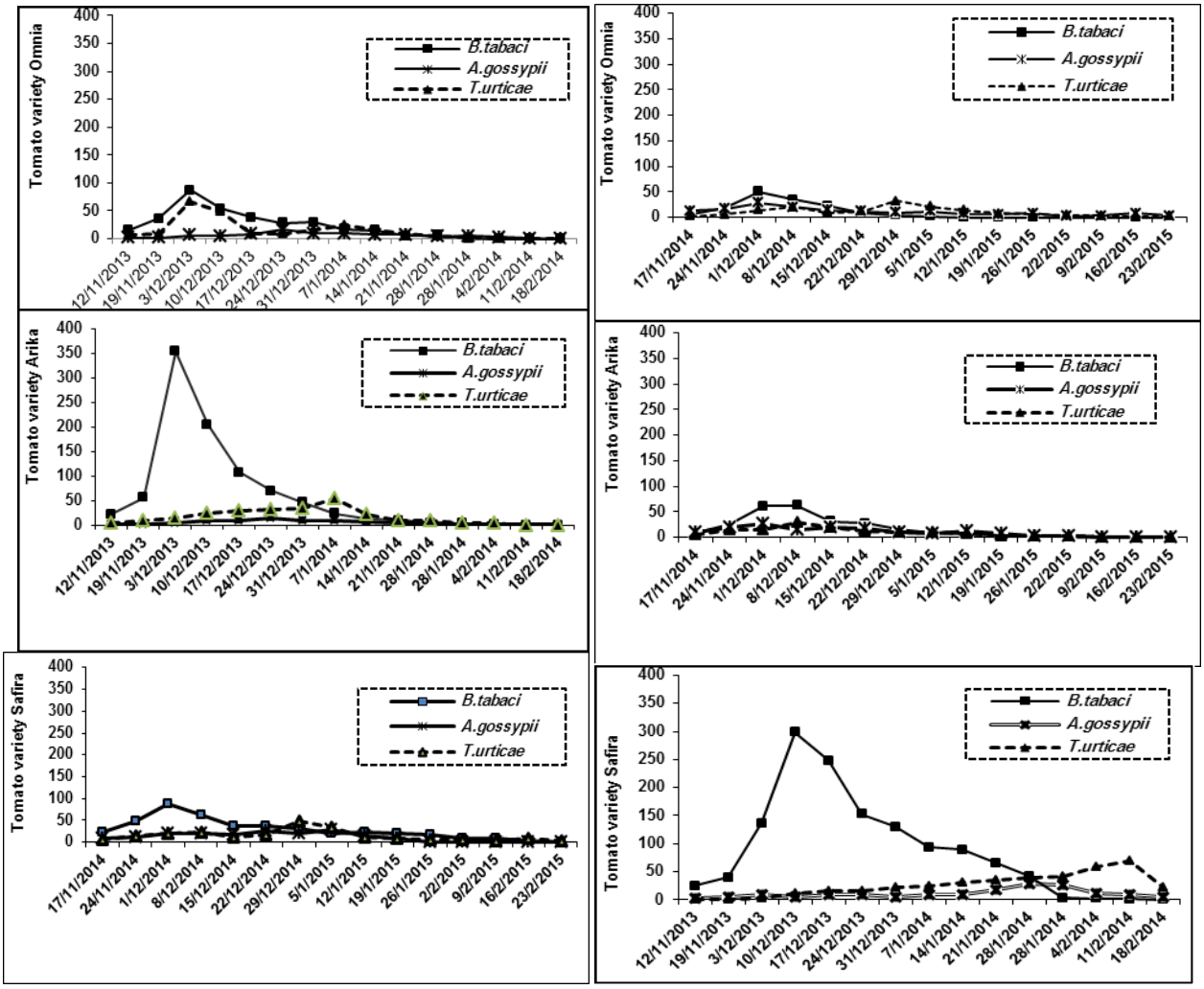

Figure (1): Counts and population growth rate of some pests on three tomato varieties during two seasons.

Table (3): Susceptibility degrees of three tomato varieties for *Bemisia tabaci*, *Aphis gossypii* and *Tetranychus urticae* during winter plantation of 2013/2014 and 2014/2015 seasons at Qalyubiya Governorate .

Pests varieties	*B. tabaci*						*A. gossypii*						*T. urticae*					
	1st season	S. degree	2nd season	S. degree	Mean	S. degree	1st season	S. degree	2nd season	S. degree	Mean	S. degree	1st season	S. degree	2nd season	S. degree	Mean	S. degree
Omnia	22.07	MR	10.00	LR	16.03	MR	5.67	LR	9.20	LR	7.43	LR	14.93	LR	10.73	LR	12.83	LR
Arika	61.00	S	17.73	LR	39.37	LR	5.33	LR	8.27	LR	6.80	LR	16.73	LR	9.00	LR	12.87	LR
Safira	88.60	S	28.87	S	58.73	S	10.93	S	10.33	S	10.63	S	26.33	S	14.87	S	20.60	S
Mean ± SD	57.22± 33.43		18.87± 9.48		38.04 ± 21.38		7.31± 3.14		9.27± 1.03		8.29± 2.05		19.33± 6.13		11.53±3. 04		15.43± 4.47	

Susceptible (S) = between $\bar{X}$ and $\bar{X}$ +2SD Low resistant (LR) = between $\bar{X}$ and $\bar{X}$ -1SD Moderately resistant (MR) = between $\bar{X}$ - 1SD and $\bar{X}$-2SD

3.Population growth:

Data in Table (4) is an attempt to study the population growth rate in length of recording the initial pests numbers (N_o) , maximum count of the pests populations (N_t) and the time difference them (Δt) of some serious pests that attacking some tomato varieties. Firstly, in respect to *B. tabaci*, data in Table (4) was showed that, arika

variety recorded the highest growth rate (23.64), taking time difference 14 days between initial *B. tabaci* number 22 and maximum count 353 in the first season. Data of the second season was showed the arika variety recorded the lowest growth rate 2.48 taking 21 day between the initial pest number N_o (10 nymph and adult stages) / 5 leaves) and maximum count N_t (62 nymph and adult stages) / 5 leaves). Secondly, in respect to *A. gossypii*, the three variety (omnia, arika and safira) had the lowest growth rate in the first season were 0.40, 0.37 and 0.39, respectively. Meanwhile, the safira variety recorded the lowest growth rate (0.43), where omnia and arika varieties had 1.14 and 1.21 in the second season. Thirdly, Data of *T. urticae* was showed fluctuated growth rate in the two tested seasons.

Table (4): Population growth rate of of some pests on three tomato varieties during 2013 / 2014 and 2014/2015 seasons.

Pests	Variety	First season				Second season			
		Population growth rate parameters			GR	Population growth rate parameters			GR
		N_o	N_t	Δt		N_o	N_t	Δt	
B. tabaci	Omnia	15	87	14	5.14	6	50	14	3.14
A. gossypii		2	16	35	0.40	13	29	14	1.14
T.urticae		7	67	14	4.29	2	33	42	0.74
B.tabaci	Arika	22	353	14	23.64	10	62	21	2.48
A.gossypii		2	15	35	0.37	10	27	14	1.21
T.urticae		3	55	49	1.06	6	30	21	1.14
B.tabaci	Safira	25	298	21	13.00	24	88	14	4.57
A.gossypii		2	29	70	0.39	8	29	49	0.43
T.urticae		1	70	84	0.82	7	49	42	1.00

GR= the population growth rate, N_t = the pest numbers at the maximum count of the population on a plant
N_o = the initial pest numbers on a plant, Δt = the time difference between N_o and N_t

4.Efficiency of different compounds for reducing the population density of *Bemisia tabaci, Aphis gossypii* and *Tetranychus urticae* during 2014/2015 season:

4.1.Initiale effect:

4.1.1.*Bemisia tabaci*:

In respect to initial effect (Table, 5) of the tested materials against *B. tabaci* nymph and adult, the abamactin categorized in first rank, followed by sesame oil and malathion in the second rank, while biofly occupied the third category, with % reduction were 85.7, 78.5, 78.5 and 61.9, respectively.

4.1.2.*Aphis gossypii* :

Dunkan analysis ranked the tested materials into three groups against *A. gossypii* . malathion, (sesame oil and abamactin) and biofly, where the initial reduction % recorded 100, (92.2, 90.5) and 73.3, respectively.

4.1.3.*Tetranychus urticae*:

Statistical analysis categorized the tested materials into four groups. The descending arrangements were sesame oil > abamactin > biofly > malathion, where the initial redction % showed 85.2, 79.0, 73.3 and 54.6, respectively.

4.2.Residual toxicity:

4.2.1.*Bemisia tabaci*:

It is worth to mention that sesame oil ranked in the first category after 7 and 14 days after application. The mean of residual toxicity (Table,5) of sesame oil recorded 82.1.

4.2.2. *Aphis gossypii* :

Abamactin occupied the highest reduction % after 7 and 14 days after application against *A. gossypii* , where recorded 100 and 68.3, respectively. In

respect to the mean of residual toxicity of abamactin was 84.2

4.2.3. *Tetranychus urticae*:

Sesame oil came in the first category after 7 days with reduction % was 79.8, while abamactin occupied the first category after 14 day with reduction % was 58.8. The mean of residual toxicity of abamactin was 67.7

4.3.General mean of reduction % (Table,5):

4.3.1. *Bemisia tabaci*:

The highest reduction % recorded by sesame oil and followed by abamactin with 80.9 and 77.6, respectively.

4.3.2. *Aphis gossypii* :

Abamactin and malathion showed the highest mean reduction % (86.3 and 79.9) with non significant differences.

4.3.3. *Tetranychus urticae*:

The best mean reduction % recorded by abamactin and sesame oil with 71.4 and 69.8, respectively with non significant differences.

In general the three tested tomato varieties, showed maximum population fluctuation of *B. tabaci* at the first fifth weeks from transplantation in the two growing tomato season. In the same field Metwally (1976) studied the seasonal fluctuation of *B. tabaci*, he found that the population peak took place by mid September on tomato.

In recent years, studies conducted in the field of production and use of crop varieties resistance to insects, has helped to significantly increase food production in major agricultural area. In most pests management programs the subject of plant resistance to insects (Smith *et al*., 1994 and Yasaikinici and Hincal, 1996), and the subject of the host preference of pests (Jounior *et al*., 2003) are important. If pest resistant varieties are used with chemical control methods, the costs of chemical control and problems related to insecticides which remain in the environment will be reduced. In particular, using substances of natural origin (as sesame oil in this study) in the chemical method will be very useful, because there are numerous known harmful effects of these substances on human health and animals. Consequently, the application of resistant plant varieties plays an important role in reducing environment pollution. Susceptibility degree studies of our varieties of three tomato varieties indicated that, the safira variety was susceptible for the three tested pests in both seasons. While arika variety had low resistance along the two study seasons. On the other hand omnia recoded low resistance for *A.gossypii* and *T. urticae* , while showed moderate resistance against *B. tabaci*.

Arika variety had fluctuated growth rate in the two test seasons in respect to *B. tabaci*. Safira variety recorded the lowest growth rate of *A. gossypii* during the two seasons. Lamiri *et al*. (2001) demonstrated that the insecticidal activity of an essential oil could be attributed either to the major compound present in the oil or to the synergistic and / or antagonistic effects of all the compounds of oil.

The chemical analysis of sesame oil (untabulated data) showed the components balance of sesame oil, were the Fatty acid 16.73 ug/ triolein/ ml, Triglycerides vales (212.3 mg%), total phenols values 372.3ug/ ml and Tannis values (130.3 ug tannic acid/ ml) exhibited a promise toxic effect against *B. tabaci* nymphs and adults and considerable results against *A. gossypii* and *T. urticae*. In the same field Homam and El Ghanam (2017) investigated the ovicidal effect of six plant oils, they concluded that Marjoram oil revealed the highest mortality % 89.1 against *Phthorimaea operculella* (Zeller) eggs and the predation efficiency of *Chrysoperla carnea* was 96.4 % with marjoram oil that treated *P. operculella* eggs and the predator lived for 15.3 days out of 16 days. Also, the results showed that, the abamactin recoded reduction %

Table (5): Effect of various treatments against *Bemisia tabaci, Aphis gossypii* and *Tetranychus urticae* infesting tomato variety (safira) during winter plantation at Qalyubiya Governorate .

Treatments		Mean number /5 Leaves and percent reduction at indicated periods (days)																	
		No. of	*B. tabaci*					No. of	*A. gossypii*					No. of	*T. urticae*				
	Rat/ 100L Water	Insect Pre-Spray	3	7	14	Residual Toxicity	Mean	insects Pre-Spray	3	7	14	Residual Toxicity	Mean	insects Pre-Spray	3	7	14	Residual toxicity	Mean
Sesame oil	500 ml	65	14	5	7	6	8.7	17	1	3	6	4.5	3.3	9	2	2	3	3	2.3
(*Sesamum indicum*)			78.5 b	89.1 a	75.1 a	82.1 a	80.9 a		92.2 b	81.4 b	60.8 b	71.1 b	78.1ab		85.2 a	79.8 a	44.4 c	62.1 ab	69.8 a
Bio fly	425 gm	92	35	16	13	14.5	21.3	10	2	3	4	3.5	3.0	10	4	4	3	3.5	3.7
(*Beauveria bassiana*)			61.9 c	75.3 b	67.3 bc	71.3 b	68.2 c		73.3 c	68.4 d	55.6 c	62.0 b	65.8 b		73.3 c	63.6 c	50.0 b	56.8 ab	62.3 ab
Cormat 1.8% E.C	40 ml	84	12	15	10	12.5	12.3	14	1	0	4	2.0	1.7	89	28	23	22	22.5	24.3
(Abamactin)			85.7 a	74.7 b	72.4 ab	73.6 b	77.6 ab		90.5 b	100 a	68.3 a	84.2 a	86.3 a		79.0 b	76.5 b	58.8 a	67.7 a	71.4 a
Control		88	88	62	38	50	62.7	20	15	19	18	18.5	17.3	20	30	22	12	17	21.3
Treatments	Rat/100L Water	No. of insects Pre-Spray	1	7	14	Residual Toxicity	Mean	No. of insects Pre-Spray	1	7	14	Residual Toxicity	Mean	No. of insects Pre-Spray	1	7	14	Residual toxicity	Mean
Malathion 57% E.C	500 ml	79	17	14	12	13	14.3	18	0	4	6	5	3.3	15	10	7	5	6	7.3
(Coromandel)			78.5 b	74.9 b	64.8 c	69.9 b	72.7bc		100 a	76.6 c	63.0 b	69.8 b	79.9 a		54.6 d	57.6 c	44.4 c	51.0 b	52.2 b
Control		88	88	62	38	50	62.7	20	23	19	18	18.5	20.0	20	15	22	12	17	16.3
LSD			3.261	4.738	6.679	6.771	6.464		5.069	2.977	3.882	12.62	12.82		5.242	3.919	1.883	14.12	12.22

were 77.6, 86.3 and 71.4 for *B. tabaci, A. gossypii* and *T. urticae*, respectively. Some author as, Soliman and Tarasco (2009) in Egypt stated that abamectin (Vertemic 1.8% EC) reduced significantly whitefly and aphid populations on cucumber and tomato plants, in field experiments. Siti Hajar *et al.* (2016) found that effect of malathion at 50µg/ml concentration on reproduction and feeding activity of aphids. The total number of new born nymphs produced and the relative development stage of nymphs were significantly reduced compared to untreated leaves.

This is primary study for sesame oil against some piercing sucking pests need more efforts and to apply in suitable method and tactics in the field to study its effect on predators and parasite to be become an item in integrated pest management.

References

Abou-Yousef, H.M.; Farghaly, F.S. and Torkey, H.M. (2010): Insecticidal activity of some plant extracts against some sap- sucking insects under laboratory conditions. World Journal of Agricultural Sciences, 6(4): 434-439.

Ahmed, M.M.M. (2000): Studies on the control of insect pests in vegeTables (okra, tomato and onion) in Sudan with special reference to neem preparations. University of Giessen, Germany, 13-31.

Baldin, E.L.L.; Vendramim, J.D. and Lourencao, A.L. (2007): Interaction between resistant tomato genotypes and plant extracts on *Bemisia tabaci* (Genn.) biotype B. Sci. Agric., 64 (5): 476–481.

Bedford, I.D.; Briddon, R.W.; Brown, J.K.; Rosell, R.C. and Markham, P.G. (1994): GeMinivirus transmission and biological characterization of *Bemisia tabaci* (Gennadius) biotypes from different geographic regions. Ann. Appl. Biol., 125 (2): 311–325.

Blackman, R.L. and Eastop, V.F. (2000): Aphids on the world's crops: An identification and information guide, second edition; John Wiley and Sons, England. 466 pp.

Bogorni, P.C. and Vendramim, J.D. (2005): Efeitosubletal de extratosaquosos de *Trichilia* spp. sobre 0 desenvolvimento de *spodoptera frugiperda* (J.E. Smith) (Lepidoptera: Noctuidae) emmilho. Neotrop. Entomol., 34 (2): 311–317.

Byrne, D.N. and Houk, M.A. (1990): Morphometric identification of wing polymorphism in *Bemisia tabaci* (Genn.) (Homoptera: Aleyrodidae). Ann. Entomol. Soc. Am., 83 (3): 487–493.

Chiang, H.S. and Talekar, N.S. (1980): Identification of sources of resistance to the bean fly and two other agromyzid flies in soybean and mungbean. J. Econ. Entomol., 73: 197-199.

Cunha, U.S.; Vendramim, J.D.; Rocha, W.C. and Vietra, P.C. (2005): Potencial de *Trichida pallid* Swartz (Meliaceae) comofonte de substacias com atividadeinsecticidasobre a traca do tomaterio, *Tuta absoluta* (Meyrick) (Lepidoptera: Gelechiidae). Neotrop. Entomol., 34 (4): 667–673.

Fancelli, M. ; Vendramim, J.D.; **Lourencao, A.L. and Dias, C.T.S. (2003):** Atratividade e preferência para oviposição de *Bemisia tabaci* (Gennadius) (Hemiptera: Aleyrodidae) biótipo B em genótipos de tomateiro. Neotropical Entomology, 32: 319-328.

FAO STAT (2005): Food outlook, September 2005,www.fao.org/giews

Faria, C.A.; Wackers, F.L.; Pritchard, J.; Barrett, D.A. and Turlings, T.C. (2007): High susceptibility of Bt maize to aphids enhances the performance of parasitoids of lepidopteran pests. Plus One, 2: 600pp.

Gerling, D. (1990): Whiteflies: Their Bionomics, Pest Status and Management. Wimborne, UK, Intercept, 348 pp.

Henderson, C.F. and Tilton, E.W. (1955): Tests with acaricides against the brown wheat mite. J. Econ. Entomol., 48: 157-161.

Homam, B. H. and El Ghanam, M. S. (2017): Ovicidal efficiency of some botanical oils against hatchability of potato tuber moth, *Phthorimaea operculella* eggs and their side effect on *Chrysoperla carnea* under laboratory conditions. Egypt. J. Agric. Res., 95 (2): 625-637.

Jones, D.R. (2003): Plant viruses transmitted by whiteflies. Eur. J. Plant Pathol., 109: 195-219.

Jounior, B.A.; Toscano, L.C. and Santos, T. (2003): Non-preference to *Bemisia tabaci* biotype B oviposition in cotton cultivar. p. 17–20. In: Proc. third international *Bemisia* workshop. Barcellona, 261 pp.

Lamiri, A.; Lhaloui, S.; Benjilali, B. and Berrada, M. (2001): Insecticidal effects of essential oils against hessian fly, *Mayetiola destructor* (Say). Field Crop Res., 71: 9-15.

Martin, J.H. (1987): An identification guide to common whitefly pest species of the world (Homoptera, Aleyrodidae). Trop. Pest. Manage., 33 (4): 298–322.

Metwally, A.A.H. (1976): Studies on certain pests attacking solanaceous crops, Ph. D. Thesis, Fac. of Agric. Al-Zhar Univ.

Miles, P.W. (1989): Specific Responses and Damage Caused by Aphidoidea. In Aphids. Their biology, Natural Enemies and Control. The Netherlands, C: 23–47.

Mound, L.A. (1965): An introduction to the Aleyrodidae of western Africa (Homoptera). Bull. Br. Mus. Nat. Hist., 17 (1): 115–160.

Odum, E.P. (1971): Fundamentals of ecology. Third edition. W.B. Saunders company: Philadelphia, 574 pp.

Park, Y. L. and Lee, J. H. (2002): Leaf cell and tissue damage of cucumber caused by two spotted spider mite (Acari: Tetranychidae). J. Econo.Entomo. 95(5): 952-957.

Park, Y. L. and Lee, J. H. (2007): Seasonal dynamics of economic injury levels for *Tetranychus urticae* Koch (Acari, Tetranychidae) on *Cucumis sativus* L. J. Appl. Entomo., 131(8): 588-592.

Peralta, I. E. and Spooner, D. M. (2007): History, origin and early cultivation of tomato (Solanaceae). *In*: Razdan M.K. and Mattoo A.K. [ed.] Genetic Improvement of Solanceous Crops, Vol. 2. Enfield, USA: Science Publishers. 1-27pp.

Polston, J.E. and Anderson, P.K. (1999): Surgimiento y distribución de geMinivirus transmitidos por mosca blanca en tomate en el Hemisferio Occidental. Manejo Integrado de Plagas, 53: 24-42.

Powell, G.; Tosh, C.R. and Hardie, J. (2006): Host plant selection by aphids: Behavioral, evolutionary, and applied perspectives. Annu. Rev. Entomol., 6(51): 309–330.

SAS Institute (2003): SAS version 9.1. SAS Institute Inc, Cary, NC, USA.

Schuster, D.J.; Stansly, P.A. and Polston, J.E. (1996): Expressions

of plant damage of *Bemisia*. p. 153–165. In: "Bemisia 1995: Taxonomy, Biology, Damage, Control and Management" (D. Gerling, R.T. Mayer, eds.). Intercept Ltd., Andover, Hants, UK, 684 pp.

Siti Hajar, M. S.; Azila, A. A.; Harisun, Y.A. and Khalidah, P. (2016): Toxicological effect of lauric acid based insecticide on the reproduction system, growth development and feeding activity of aphids, *Aphis gossypii* Glover. International Journal of Biotechnology for Wellness Industries, 5(3): 76-81.

Smith, C.M.; Khan, Z.R. and Pathak, M.D. (1994): Techniques for evaluating insect resistance in crop plants. p. 17–114. In: "Evaluation of Plants for Insect Resistance" (C.M Smith, Z.R. Khan, M.D, Pathak, eds.). CRC Press, Boca Raton, Florida, 320 pp.

Soliman, M.M.M. and Tarasco, E. (2009): Toxic effects of four biopesticides (Mycotal, Vertalec, Vertemic and Neem Azal-T/S) on *Bemisia tabaci* (Gennadius) and *Aphis gossypii* (Glover) on cucumber and tomato plants in greenhouses in Egypt. Entomologica, Bari, 41: 195-217.

Sylvester, E.S. (1989): Viruses transmitted by aphids. In Aphids. Their Biology, Natural Enemies and Control. The Netherlands, C: 65–88.

Toscano, L.C.; Boica, A.L. and Maruyama, W.I. (2002): Nonpreference of whitefly for oviposition in tomato genotypes. Sci. Agric., 59 (4): 677–681.

Van Emden, H. and Harrington, R. (2007): Aphids as Crop Pests; CABI Publishing: London, UK, 717 pp.

Yasaikinici, N. and Hincal, P. (1996): The population growth of pests and their beneficials in cucumber plastic tunnels in the Izmir region on Turkey. http: www. geocities. com/ nyasarakinci/ nil/cucum.htm. Accessed on: November 3–5.