



Population Dynamics of *Eutetranychus orientalis* (Klein) and Predacious Mites Associated with Three Citrus Varieties (Navel orange, Grapefruit, and Lemon) at El-Sharqia Governorate

Mohamed A. Halawa¹; Abd-Elsattar M. Metwally², Awad A. Abdallah². and Aziza, M. Abo-Zaid³

1- Shora company for chemicals.

2- Agric. Zoology and Nematology Dept., Faculty of Agriculture, AL- Azhar Univ., Egypt

3- Plant Protection Research Inst., National Research Centre, Dokki, Egypt.

Email: Mhalawa22@yahoo.com

ARTICLE INFO

Article History

Received:22/5/2020

Accepted:24/7/2020

Keywords:

Eutetranychus;

Citrus ;

Phytophagous ;

Predacious

;Halawa;

Population.

ABSTRACT

This work was conducted to investigate the population dynamics of citrus brown mite, *E. orientalis* (Klein) on Navel orange, Grapefruit, and Lemon varieties at El-Sharqia Governorate during two successive years, from March 2017 to February, 2019. The obtained results showed that the population dynamics of citrus brown mite, *E. orientalis* has been varied based on host plant verity. Meanwhile, it has one annual peak in August on Navel orange with total numbers (931 & 884 individual) and on Lemon (305 & 324 individual) at average temperature (31.58 & 31. 9 C°) and relative humidity (56 & 59 %) in the first and second years, respectively. While the highest population number of the citrus brown mite species on Grapefruit was recorded (844 & 833 individual) in September at average temperature (29.77 & 30.37 C°) and relative humidity (57 & 60.4 %) respectively. On the other hand, the population of predacious mites, *Euseius scutalis* (Athias-Henriot) and *Amblyseius (Typhlodromips) swirskii* Athias was recorded on the three citrus verities: Navel orange, Grapefruit, and Lemon, one annual peak in November during the first year when the highest number of predators were (246, 248 and 111 individual, respectively) at average temperature 23.77 C° and relative humidity 63 %. While in the second year the number of predators was (276, 341, and 210 individuals, respectively) at average temperature 24.40C° and relative humidity 63.5%.

INTRODUCTION

Citrus is the foremost fruit crops all over the world in terms of planting area and production. Egypt is the sixth-largest producer of citrus crops, and also, considered the largest exporter of orange in the world (FAO,2016). The phytophagous mites are the most important obstacles to citrus production in Egypt (Halawa,1998; Halawa *et.al.*, 2013; Halawa & Fawzy, 2014; Abdelgayed, *et. Al.*, 2017 and Abo-batta, 2018). The great diversity of these tiny plant feeders is related to their intimate host relationships (Oldfield, 1996), while, their impact as specialized phytophagous mites is well known and strongly accented in each of their involvements as direct plant pests, plant-pathogen vectors, and food sources for predators (Walter *et.al.*, 1995; and Zhang 2003). Recently, Thirty-nine mite species in 19

families have been reported from citrus trees in Assiut Governorate of these, nine species belong to phytophagous mite families (Taronemidae, Tenuipalpidae, and Tetranychidae). Twenty-three belong to predacious mites belong to different families, while the remaining species pertaining to different feeding habits (Abdelgayed, *et. Al.*, 2017). The citrus brown mite, *Eutetranychus orientalis* (Klein) is an important pest of citrus, especially in drier areas. It is the most persistent citrus pest in Upper and Lower Egypt. The mites colonize confirmed on the upper side of leaves where they feed, and their damage develops as yellow-grey stippled spots which cause leaf wilting and drop. Heavy infestations can cause fruit drop and the death of upper branches, and next-years' blossoming may be severely affected (Klein, 1936; Zaher, *et. al.*, 1970; Jeppson, *et. al.*, 1975; Zaher *et.al.*, 1984; Momen and El-Borolossy, 1999 Kaspi, *et.al.*, 2017 and Kamran, *et. Al.*, 2018) Therefore, the present work was conducted to study the population dynamics of *E. orientalis* and predator mites on three citrus varieties population on three citrus varieties (Navel orange; Grapefruit and Lemon) at El-Sharqia Governorate.

MATERIALS AND METHODS

The population dynamics of *E. orientalis* (Klein) attacking Navel orange; Grapefruit and Lemon varieties were studied during two successive years, from March, 2017 to February, 2019. The population of the predatory mites as a biotic factor and temperature & relative humidity as biotic factors were recorded during the same period. The farm infested by a citrus brown mite, *E. orientalis* was chosen at Faqous district (El-Sharqia province), this farm was cultivated with three orange varieties trees (fifteen years old) (Navel orange, Grapefruit, and Lemon) and kept free from any chemical applications. Each variety was represented by 60 trees, which divided into four replicates (20 trees each). Monthly samples were taken randomly from each variety. The samples were put in paper bags and directly transferred to the laboratory the same day. The sample was composed of 25 leaves and five fruits. The upper and lower surface and fruits were inspected. The moving stages of *E. orientalis* and its predatory mites were counted. The monthly average temperature (C°) and relative humidity (R.H. %) in El-Sharqia province was obtained from metrological department of central laboratory of condition at Dokki, Giza, Egypt. Spearman's rank correlation coefficient was done among the weather factors and *E. orientalis* as well as its predatory mites.

RESULTS

Population dynamics of citrus brown mite, *E. orientalis* and some predacious mites on three citrus varieties were studied at Faqous district in El-Sharqia Governorate during two successive years from March 2017 to February, 2019.

A- Population Dynamics of *E. orientalis*. Data in tables (1 and 2) showed that the population of *E. orientalis* have been affected by citrus variety and weather factors (temperature degrees & relative humidity) as follow:

a- On Navel Orange:

The population of citrus brown mite, *E. orientalis* was significantly positively correlated with average temperature and nonsignificant negatively correlated with relative humidity; therefore, it has one annual peak on each leaf and fruits during the studying period. Whereas, the individual numbers were 276 and 655 individuals at average temperature 31.58 C° and average relative humidity 56% in August, respectively in the first year. While in the second year, the highest numbers of individuals have been recorded on leaves and fruit in August and September, 288 and 610 individuals at average temperature 31.9 C° and 30.37 C°

and average relative humidity 59 and 60.4%, respectively. The population of citrus brown mite, *E. orientalis* was started with few numbers on navel orange in March and progressively increased until it reached the highest numbers on leaves and fruits in the first year. While in the second year, the population began was appeared in March on leaves and in April on fruits and gradually increased until reached to the highest numbers in August on leaves and in September on fruits and then, the population gradually decreased from September to December and disappeared in January and recorded again with few numbers in February in the first year, while in the second year, the population gradually decreased from August to February on leaves while on fruits was disappeared from September to February. The monthly total numbers of individuals on leaves were 9, 27, 63, 91, 181, 276, 215, 89, 33, 6, 0, 2 individuals while, the monthly total numbers on fruits were 4, 16, 98, 298, 412, 655, 590, 210, 83, 17, 0, 0 individuals at average temperature 20.52, 22.77, 26.65, 28.23, 29.10, 31.58, 29.77, 25.32, 23.37, 20.58, 17.65, 19.43 C° and relative humidity 51, 49.5, 48, 51.2, 55, 56, 57.2, 60, 63, 64.1, 66.5, 67 % in March, April, May, June, July, August, September, October, November, December, January, February from the first year, respectively. Moreover, the monthly total number of citrus brown mite *E. orientalis* in the second year were 16, 31, 58, 87, 125, 288, 251, 197, 56, 13, 3, 3 individuals on leaves while the monthly total numbers on fruit were 0, 21, 104, 221, 399, 596, 610, 345, 155, 45, 9, 0 individuals at average temperature 24.66, 27.61, 29.7, 31.48, 31.9, 30.37, 28.6, 24.4, 19.89, 17.77, 18.99 C° and average relative humidity 51.4, 49, 49.7, 58.5, 59, 60.4, 61, 63.5, 65, 67, 69 % in March, April, May, June, July, August, September, October, November, December, January, February, respectively.

b- On Grapefruit:

Data in tables (1&2) indicated that the population of *E. orientalis* on grapefruit was beginning with moderate numbers in March and gradually increased until reached to the annual peak in September and return to gradually decreased from October to February on leaves and fruits in the first year while in the second year the population has been recorded with the same trend in the first year in exception it's absence on leaves in January and February. The population has been affected by temperature where it was significantly positively correlated with average temperature and nonsignificant negatively correlated. The monthly total numbers of individuals on leaves were 13, 19, 75, 102, 207, 235, 288, 147, 28, 12, 5, 8 individual while on fruits the individuals numbers were 22, 31, 186, 311, 397, 484, 545, 322, 221, 67, 21, 32 individuals at average temperature 20.52, 22.77, 26.65, 28.23, 29.10, 31.58, 29.77, 25.32, 23.37, 20.58, 17.65, 19.43 C° and relative humidity 51, 49.5, 48, 51.2, 55, 56, 57.2, 60, 63, 64.1, 66.5, 67 % in March, April, May, June, July, August, September, October, November, December, January, February in the first year, respectively. in the second year, the monthly total number of individuals on leaves were 17, 26, 88, 113, 229, 277, 308, 218, 186, 87, 0, 0 individuals while on fruit were 19, 35, 213, 289, 379, 487, 540, 490, 305, 123, 18, 8 individuals at average temperature 24.66, 27.61, 29.7, 31.48, 31.9, 30.37, 28.6, 24.4, 19.89, 17.77, 18.99 C° and average relative humidity 51.4, 49, 49.7, 58.5, 59, 60.4, 61, 63.5, 65, 67, 69 % in March, April, May, June, July, August, September, October, November, December, January, February, respectively.

c- On Lemon:

The population of citrus brown mite, *E. orientalis* on lemon trees was significantly positively correlated with average temperature and nonsignificant negatively correlated, while it was started with few numbers in April and gradually increased until reached the highest numbers in September on leaves and October on fruits and gradually decreased from October to December and disappeared in January and February on leaves while on fruits the individuals number gradually increased from November to January and return to increased again in November. The monthly total number of individuals on leaves were 0, 10, 46, 69, 77, 91, 101, 64, 51, 9, 0, 0 individuals and 0, 3, 25, 76, 83, 122, 131, 134, 97, 34,

11, 3 individuals on fruits at average temperature 20.52, 22.77, 26.65, 28.23, 29.10, 31.58, 29.77, 25.32, 23.37, 20.58, 17.65, 19.43 C° and relative humidity 51, 49.5, 48, 51.2, 55, 56, 57.2, 60, 63, 64.1, 66.5, 67 % in March, April, May, June, July, August, September, October, November, December, January, February in the first year, respectively. In the second year, the population was started with few numbers in March on leaves and in April on fruits and progressively increased until the annual peak in August on leaves and in September on fruits, meanwhile, the population gradually decreased from September on leaves and from October on fruits to December and disappeared in January and February on each leaf and fruits. The monthly total numbers of individuals on leaves were 3, 15, 51, 82, 96, 106, 86, 71, 49, 22, 0, 0 individuals while on fruits of lemon the individual numbers were 0, 7, 31, 69, 77, 141, 143, 127, 84, 19, 0, 0 individuals at average temperature 24.66, 27.61, 29.7, 31.48, 31.9, 30.37, 28.6, 24.4, 19.89, 17.77, 18.99 C° and average relative humidity 51.4, 49, 49.7, 58.5, 59, 60.4, 61, 63.5, 65, 67, 69 % in March, April, May, June, July, August, September, October, November, December, January, February, respectively.

Table 1: Population dynamics of citrus brown mite, *E. orientalis* on leaves and fruits of three citrus varieties (Navel orange, Grapefruit, and Lemon) at El-Sharqia Governorate during the period (March 2017 to February 2018).

Date of sampling	Number of mites/25 leaves and 5 fruits									Mean	
	Navel orange			Grapefruit			Lemon			Temp. C°	R.H. %
	Leaves	Fruits	Total	Leaves	Fruits	Total	Leaves	Fruits	Total		
March, 2017	9	4	13	13	22	35	0	0	0	20.52	51
April	27	16	43	19	31	50	10	3	13	22.77	49.5
May	63	98	161	75	186	261	46	25	13	26.65	48
June	91	298	389	102	311	413	69	76	145	28.23	51.2
July	181	412	593	207	397	604	77	83	160	29.10	55
August	276	655	931	235	484	719	91	122	305	31.58	56
September	215	590	805	288	545	833	101	131	232	29.77	57.2
October	89	210	299	147	322	469	64	134	198	25.32	60
November	33	83	116	28	221	249	51	97	430	23.37	63
December	6	17	23	12	67	79	9	34	43	20.58	64.1
Jan.,2018	0	0	0	5	21	26	0	11	11	17.65	66.5
Feb.	2	0	2	8	32	40	0	3	54	19.43	67
Total	992	2383	3375	1139	2639	3778	518	719	1237		
"r" Temp. C°	0.91**	0.90**	0.90**	0.88**	0.92**	0.91**	0.94**	0.75*	0.53		
R.H. %	-0.27	-0.21	-0.22	-0.22	-0.20	-0.20	-0.26	0.03	0.18		

Table 2: Population dynamics of citrus brown mite, *E. orientalis* on leaves and fruits of three citrus varieties (Navel orange, Grapefruit and Lemon) at El-Sharqia Governorate during period (March, 2018 to February, 2019).

Date of sampling	Number of mites/25 leaves and 5 fruits									Mean	
	Navel orange			Grapefruit			Lemon			Temp. C°	R.H. %
	Leaves	Fruits	Total	Leaves	Fruits	Total	Leaves	Fruits	Total		
March, 2018	16	0	16	17	19	36	3	0	3	23.22	51.2
April	31	21	52	26	35	61	15	7	22	24.66	51.4
May	58	104	162	88	213	301	51	31	25	27.61	49
June	87	221	308	113	289	402	82	69	151	29.7	49.7
July	125	399	524	229	379	608	96	77	173	31.48	58.5
August	288	596	884	277	487	764	106	141	324	31.9	59
September	251	610	861	308	540	848	86	143	229	30.37	60.4
October	197	345	542	218	490	708	71	127	198	28.6	61
November	56	155	211	186	305	491	49	84	427	24.4	63.5
December	13	45	58	87	123	210	22	19	41	19.89	65
Jan. 2019	3	9	12	0	18	18	0	0	0	17.77	67
Feb.	3	0	3	0	8	8	0	0	41	18.99	69
Total	1128	2505	3630	1549	2906	4455	581	698	1279		
"r" Temp. C°	0.80*	0.83*	0.82*	0.80*	0.84**	0.83**	0.93*	0.79*	0.54		
R.H. %	-0.04	-0.01	-0.02	0.03	-0.03	-0.01	-0.45	0.02	0.17		

A- Population Dynamics of Predacious Mites, *Euseius scutalis* (Athias-Henriot) and *Amblyseius (Typhlodromips) swirskii* Athias – Henriot on Three Citrus Varieties (Navel orange, Grapefruit, and Lemon)

The population dynamics of predacious mites were directly affected by the weather factors (temperature degrees and relative humidity) and indirect by host plants.

a- On Navel Orange:

Data in Tables (3 and 4) indicated that the population of predacious mites, *E. scutalis*, and *A. swirskii* were positively correlated with weather factors (Average temperature with relative humidity). The predacious mites were started with moderate numbers in the case of *E. scutalis* and with few numbers in the case of *A. swirskii* in March and gradually increased until they reached the annual peak in December and November for *E. scutalis* and *A. swirskii*, respectively. Therefore, the population was decreased in January and absent in February in the case of *E. scutalis* while the population of *A. swirskii* was disappeared in January and return to appeared again in February. The Monthly total numbers of *E. scutalis* were 7, 12, 14, 20, 51, 63, 88, 109, 134, 156, 4, 0 individual while the Monthly total numbers of *A. swirskii* were 3, 5, 17, 23, 29, 35, 42, 94, 112, 83, 0,1 individual at average temperature 20.52, 22.77, 26.65, 28.23, 29.10, 31.58, 29.77, 25.32, 23.37, 20.58, 17.65, 19.43 C° and relative humidity 51, 49.5, 48, 51.2, 55, 56, 57.2, 60, 63, 64.1, 66.5, 67 % in March, April, May, June, July, August, September, October, November, December, January, February in the first year, respectively. Moreover, in the second year, the population of predacious mites appeared with high numbers in case *E. scutalis* and with moderate numbers in case of *A. swirskii* in March and gradually increased until reached to the highest numbers in November and gradually decreased from December to February in exception absence of individuals in February in case of *A. swirskii*. The Monthly total numbers of *E. scutalis* were 11, 17, 21, 29, 63, 76, 101, 124, 147, 129, 19, 6 individuals while these numbers in *A. swirskii* were 6, 9, 19, 32, 47, 51, 63, 108, 132, 78, 13, 0 individuals at average temperature 24.66, 27.61, 29.7, 31.48, 31.9, 30.37, 28.6, 24.4, 19.89, 17.77, 18.99 C° and average relative humidity 51.4, 49,

49.7, 58.5, 59, 60.4, 61, 63.5, 65, 67, 69 % in March, April, May, June, July, August, September, October, November, December, January and February, respectively.

b- On Grapefruit:

Data in tables (3 and 4) showed that the population dynamics of predacious mites *E. scutalis* and *A. swirskii* was positively correlated with weather factors (Average temperature & relative humidity) while it began with few numbers in first species and with high numbers in second species in March and then the population gradually increased from April to reached the annual peak in November and gradually decreased in December and January then disappeared in February in case of the first predator while in the second predatory (*A. swirskii*) the population gradually increased from April until reached to the highest numbers in December and disappeared in January and February. The Monthly total numbers of *E. scutalis* were 4, 7, 11, 19, 23, 46, 58, 105, 125, 92, 3, 0 individual while numbers of *A. swirskii* were 13, 21, 29, 34, 48, 54, 61, 99, 123, 145, 0, 0 individual at average temperature 20.52, 22.77, 26.65, 28.23, 29.10, 31.58, 29.77, 25.32, 23.37, 20.58, 17.65, 19.43 C° and relative humidity 51, 49.5, 48, 51.2, 55, 56, 57.2, 60, 63, 64.1, 66.5, 67 % in March, April, May, June, July, August, September, October, November, December, January and February in the first year, respectively. In the second year, the population has been recorded one annual peak in November after gradually increasing started from March in the two predacious mites, In contrast, the population gradually decreased from December to February in case of *E. scutalis* while disappeared in January in case of *A. swirskii*. The Monthly total numbers of *E. scutalis* were 8, 11, 15, 26, 54, 82, 133, 149, 162, 104, 26, 9 individual while these numbers in *A. swirskii* were 9, 27, 38, 49, 63, 79, 96, 143, 179, 128, 34, 0 individual at average temperature 24.66, 27.61, 29.7, 31.48, 31.9, 30.37, 28.6, 24.4, 19.89, 17.77, 18.99 C° and average relative humidity 51.4, 49, 49.7, 58.5, 59, 60.4, 61, 63.5, 65, 67, 69 % in March, April, May, June, July, August, September, October, November, December, January and February, respectively.

c- On Lemon:

Data in tables (3 and 4) illustrated that the trend of predacious mites, *E. scutalis*, and *A. swirskii* population was differed on lemon trees where the predatory species *E. scutalis* appeared with very few numbers in March and absent in April then return to appear again in May and gradually increased until reached to the highest numbers in November and decreased in December and disappeared again in January then appeared again with few numbers in February. While the population of *A. swirskii* was appeared with moderate numbers in March and gradually increased until reached to the annual peak in November and then gradually decreased from December to February. The monthly total numbers in *E. scutalis* were 1, 0, 6, 11, 18, 23, 34, 41, 53, 22, 0, 1 individual while these numbers in *A. swirskii* were 5, 11, 21, 29, 36, 51, 72, 87, 111, 56, 9, 9, 4 individual at average temperature 20.52, 22.77, 26.65, 28.23, 29.10, 31.58, 29.77, 25.32, 23.37, 20.58, 17.65, 19.43 C° and relative humidity 51, 49.5, 48, 51.2, 55, 56, 57.2, 60, 63, 64.1, 66.5, 67 % in March, April, May, June, July, August, September, October, November, December, January and February in the first year, respectively. In the second year, population of *E. scutalis* appeared in May while *A. swirskii* appeared in March and gradually increased until reached to the highest numbers in November in each predatory species and return to decreased in December and disappeared in January and February in each species. The monthly total numbers in *E. scutalis* were 0, 0, 12, 19, 27, 36, 51, 69, 85, 19, 0, 0 individuals while these numbers in *A. swirskii* were 3, 9, 27, 41, 57, 69, 84, 98, 125, 68, 0, 0 individuals at average temperature 24.66, 27.61, 29.7, 31.48, 31.9, 30.37, 28.6, 24.4, 19.89, 17.77, 18.99 C° and average relative humidity 51.4, 49, 49.7, 58.5, 59, 60.4, 61, 63.5, 65, 67, 69 % in March, April, May, June, July, August, September, October, November, December, January, February, respectively.

Table 3: Population dynamics of predacious mites associated with leaves and fruits of three citrus varieties (Navel orange; Grapefruit and Lemon) at El-Sharqia Governorate during the period (March, 2017 to February, 2018).

Date of sampling	Number of predacious mites associated with <i>E. orientalis</i> on									Mean	
	Navel orange			Grapefruit			Lemon			Tem.C°	R.H %
	<i>E. scutalis</i>	<i>A. swirskii</i>	Total	<i>E. scutalis</i>	<i>A. swirskii</i>	Total	<i>E. scutalis</i>	<i>A. swirskii</i>	Total		
March, 2017	7	3	10	4	13	17	1	5	6	20.52	51
April	12	5	17	7	21	28	0	11	11	22.77	49.5
May	14	17	31	11	29	40	6	21	27	26.65	48
June	20	23	43	19	34	53	11	29	40	28.83	51.2
July	51	29	80	23	48	71	18	36	54	29.10	55
August	63	35	98	46	54	100	23	51	74	31.58	56
September	88	42	130	58	61	119	34	72	106	29.77	57.2
October	109	94	203	105	99	204	41	87	128	25.32	60
November	134	112	246	125	123	248	53	111	164	23.77	63
December	156	83	239	92	145	237	22	56	78	20.58	64.1
Jan.,2018	4	0	4	3	0	3	0	9	9	17.65	66.5
Feb.	0	1	1	0	0	0	1	4	5	19.43	67
Total	658	444	1102	493	627	1120	210	492	702		
"r" Temp. C°	0.16	0.15		0.15	0.15		0.39	0.36			
R.H. %	0.37	0.33		0.36	0.28		0.26	0.26			

Table 4: Population dynamics of predacious mites associated with leaves and fruits of three citrus varieties (Navel orange; Grapefruit and Lemon) at El-Sharqia Governorate during period (March, 2018 to February, 2019).

Date of sampling	Number of predacious mites associated with <i>E. orientalis</i> on									Mean	
	Navel orange			Grapefruit			Lemon			Tem.C°	R.H%
	<i>E. scutalis</i>	<i>A. swirskii</i>	Total	<i>E. scutalis</i>	<i>A. swirskii</i>	Total	<i>E. scutalis</i>	<i>A. swirskii</i>	Total		
March, 2018	11	6	17	8	9	17	0	3	3	23.22	51.2
April	17	9	26	11	27	38	0	9	9	24.66	51.4
May	21	19	40	15	38	53	12	27	39	27.61	49
June	29	32	61	26	49	75	19	41	60	29.7	49.7
July	63	47	110	54	63	117	27	57	84	31.48	58.5
August	76	51	127	82	79	161	36	69	105	31.9	59
September	101	63	164	133	96	229	51	84	135	30.37	60.4
October	124	108	232	149	143	292	69	98	167	28.6	61
November	147	132	279	162	179	341	85	125	210	24.40	63.5
December	129	78	207	104	128	232	19	68	87	19.89	65
Jan.,2019	19	13	32	26	34	60	0	0	0	17.77	67
Feb.	6	0	6	9	0	9	0	0	0	18.99	69
Total	743	558	1301	779	845	1624	318	581	899		
"r" Temp. C°	0.22	0.25		0.27	0.22		0.43	0.46			
R.H. %	0.38	0.30		0.39	0.31		0.22	0.21			

DISCUSSION

In some previous studies, special attention was paid to the importance of citrus brown mite, *E. orientalis* as a major pest on more than sixteen host plants in many parts of the world (Dhoria & Butani, 1984; Smith-Meyer, 1987 & Abdelgayed, *et. Al.*, 2017). In the present study, the mentioned species have been affected by the biotic factor (Host plant) and biotic factors (Temperature degrees & relative humidity). Where, the population on Grapefruit was the most abundant (3378 and 4455 individual in the first and second years, respectively) than Navel orange (3375 and 3630 individual in the first and second years, respectively), while the population of *E. orientalis* was the fewest on lemon trees (1237 and 1279 individual in the first and second years, respectively). The data in our study mentioned above agreed with Garcia-Man, *et.al.*, 1985 & 1994 in southern Spain, they mentioned that the population of *E. orientalis* on Navel orange was higher than on Lemon trees. In the same

trend, Rasmy, (1977) reported that the different host plants can influence the biology of *E. orientalis*, its fecundity being higher on sour orange than on mandarin leaves. Furthermore, the population of mentioned species was affected by biotic factors (Temperature degrees & relative humidity) where the statistical analysis showed a significant positive correlation between the population dynamics of *E. orientalis* and average temperature but not significant correlation with relative humidity. Therefore, the results in our study recorded the highest numbers of *E. orientalis* on Navel orange, Grapefruit, and Lemon in August; September and November when the average temperature was 31.58; 29.77 & 23.37 C° and relative humidity 56; 57.2 & 63% in the first year, respectively. In the second year the highest numbers of mites on (Navel orange, Grapefruit and Lemon) were recorded in September and November at average temperature 30.37 and 24.4 C°. While relative humidity was 60.4 and 63.5% respectively. These results agreed with Yarahmady & Rajabpour (2013) in Southwest Iran, they reported that the population peak of the mentioned mite species was recorded during the period from 10 August to 28 November. On the other hand, the dominant predacious mites recorded in this study were *E. scutalis* and *A. swirskii* which affected by temperature degrees & relative humidity where the statistical analysis showed a positive correlation between the population dynamics of predators and average of temperature & relative humidity. The highest numbers of predacious mites were observed in November and December during two successive years. While they were affected indirectly by host plants where the abundance was higher on Grapefruit (1120 and 1624 individuals) than Navel orange (1102 and 1301 individuals) and Lemon (702 899 individuals), meanwhile these results consequently agreed with Claudio *et. al.* (2011). They reported that the predatory mites of the family phytoseiidae were recorded with high numbers in Autumn (from September to December) and affected by host plant where the abundance was higher on orange trees than the on clementine and lemon.

REFERENCES

- Abdelgayed, A.S.; Negm, M.W.; Eraky, S.A.; Helal, T.Y. and Mussa, S.F.M. (2017). Phytophagous and predatory mites inhabiting citrus trees in Assiut Governorate, Upper Egypt. *Assiut Journal of Agricultural Science* 48 (1) 173-181.
- Abobatta, W.F. (2018). Improving navel orange (*Citrus sinensis* L.) productivity of Delta region. *Egypt Advances Agricultural Environmental Science* 1 (1) 36-38.
- Claudio, I.; Jose-Miguel, L.; Eva, W.; Josep, A.J. and Juan, R.B. (2011). Population dynamics of the citrus oriental mite, *E. orientalis* (Klien) and its mite predatory complex in southern Spain. *Integrated Control Citrus Fruit Crops IOBC/ WPRS Bulletin* (62). 83:92.
- Dhooria, M.S. and Butani, D.K. (1984). Citrus mite *E. orientalis* (Klien) and its control. *Pesticides*, 18 35:38.
- FAO (2016). Citrus fruit fresh and processes statistical bulletin. *Food and Agriculture Organization of the united nation*.
- GarciaMan, F.; Laborda, R.; Cost-Comdles, J. Ferragut, F. and Marzal, C. (1985). Acaros fitofagos despredadores en nuetros citricos. *Cuadernos de Fitopatologia*, 2(2) 54-63.
- GarciaMan, F.; Cost-Comdles, J. and Ferragut, F.C. (1994). M anejo de acaros en citricos. *Phytoma Espana*, 58: 63:72.
- Halawa, A.M. (1998). Studies on some mites associated with some fruit trees. *Msc Thesis, Faculty of Agriculture, Benha Universty.*, 206 pp.
- Halawa, A.M. & Fawzy, M M.H. (2014). A new species of *Brevipalpus donnadieu* (Acari: Tenuipalpidae) and key to the Egyptian species. *Zootaxa* 3755 (1): 087–095.

- Halawa, A.M.; Abdallah A. A. and Ebrahim, A.A. (2013): Types of *Brevipalpus californicus* (Banks) (Acari: Tenuipalpidae) in Egypt. *Acrines* 7(2): 13-16.
- Jeppson, L.R., Keifer, H.H. and Baker, E.W. (1975): Mites injurious to economic plants. Univ. Calif. Press, Berkeley, 614 pp.
- Kaspi, R.; Drishpoun, Y.; Gross, S. and Rotman, N. (Eds) (2017). Citrus Pests and Their Natural Enemies in Israel. Ministry of Agriculture and Rural Development, Extension Service. (In Hebrew).
- Kamran, M.; Khan, E.M. and Alatawim F.J. (2018). The spider mites of the genus *Eutetranychus* Banks (Acari, Trombidiformes, Tetranychidae) from Saudi Arabia: two new species, a re-description, and a key to the world species. *ZooKeys* 799: 47-98.
- Klein, H.Z. (1936). Contribution of the knowledge of the red spiders in Palestine, I. The oriental red spider, *Anychus orientalis* Zacher. II. The common red spider, *Epitetranychus althea* v. Hainstein. *Bulltin Israel Agricultural Research Station Rehovot*, 21: 3-36, 37-63.
- Momen, F. and El-Borolossy, M. (1999). Suitability of the citrus brown mite, *Eutetranychus orientalis* as prey for nine species of phytoseiid mites (Acari: Tetranychidae, Phytoseiidae). *Acarologia*, 40: 19-23.
- Oldfield, G.N. (1996). Chapter 1.4.3. Diversity and host plant specificity In: Lindquist E. E.; Sabiles, M.W. & Bruin, J. (eds). World group pests. Vol. 6. Eriophyid mites their biology – control and natural enemies and control. *El-Sevier Science B. V. Amsterdam, Netherland* 199-216.
- Rasmy, A.H. (1977). Biology of the citrus brown mite, *E. orientalis* as affected by citrus species. *Acarologia* 19(2) 222:224.
- Smith-Meyer, M.K.P. (1987). African Tetranychidae (Acari-Prostigmata) with reference to the world fauna. *Entomlogy memoir Department of Agriculture and Water Supply. Republic of South Africa. No. 69 PP. 77:78- 80:82.*
- Wallter, D.E.; Halliday, R.B. and Smith, D. (1995). The oriental red mites *Eutetranychus orientalis* (Klein) in Australia. *Journal of the Australian of Entomological society*.34, 307-208.
- Yarahmady, F. and Rajabpour, A. (2013). Seasonal dynamics and spatial distribution of *Eutetranychus orientalis* (Klein) on Albizia lebbeck (Fabaceae) in parks in Ahwaz, Southwest Iran. *International Journal of Tropical Insect Science*.33,114:119.
- Zaher, M.A.; Wafa, A.K.; Maher Ali, M. and Rasmy, A.H. (1970). Survey of mites associated with citrus trees in Egypt and Gaza Strip. *Bulletin de la Societe Entomologique d’Egypte* 56: 73-79.
- Zaher, M.A.; Soliman, Z.R.; Hanna, M.A.; Abo-Awad, B.A. and EL-Nany, M.A.M. (1984). Phytophagous mites in Egypt (Nile Valley and Delta). *PI. 480 Programme. USA. Project No. EG. ARS-30., 228 pp.*
- Zhang Z.Q. (2003). Mites of Greenhouses: Identification, Biology and Control. *Centre of Agriculture and Biosciences International Publishing, Wallingford, United Kingdom, xii + 244 pp.*

ARABIC SUMMARY

ديناميكية تعداد اكاروس الموالح البنى (*Eutetranychus orientalis* (Klein) والمفترسات الاكاروسية المرتبطة بثلاثة اصناف من الموالح (البرتقال ابو سره والجريب فروت والليمون) فى محافظة الشرقية

محمد احمد حلاوه¹ - عبد الستار محمد متولى² - عوض على عبدالله² - عزيزة محمود ابوزيد³

1- شركة شورى للكيمياويات

2- قسم الحيوان الزراعى - كلية الزراعة - جامعة الازهر - القاهرة

3- معهد بحوث وقاية النباتات - مركز البحوث الزراعية

تم دراسة ديناميكية تعداد أكاروس الموالح البنى *E. orientalis* على اصناف الموالح، البرتقال ابوسره والليمون والجريب فروت فى محافظة الشرقية خلال عامين متتاليين من مارس ٢٠١٧ إلى فبراير ٢٠١٩م. اظهرت الدراسات التى اجريت على ديناميكية التعداد، ان حركة تعداد أكاروس الموالح البنى *E. orientalis* تأثرت بشكل كبير باصناف الموالح، حيث سجل فى شهر اغسطس اعلى تعداد له على البرتقال ابوسره والليمون بـ ٩٣١ & ٨٨٤ و ٣٠٥ & ٣٢٤ فرد عند درجات حرارة ٣١,٥٨ °C & 31.9 °C ورطوبة نسبية % 59 & 56 خلال سنتين متتاليتين على التوالي، بينما كان اعلى تعداد على الجريب فروت فى شهر سبتمبر ٤٤٤ & ٤٣٣ عندما كانت درجات الحرارة ٢٩,٧٧ °C & ٣٠,٣٧ °C و الرطوبة النسبية ٥٧ % & ٦٠,٤ %، على التوالي. على الجانب الاخر اظهرت المفترسات الأكاروسية اعلى تعداد لها خلال الموسم الاول فى شهر نوفمبر حيث كان اعلى تعداد للمفترسات *E. scutalis* و *A. swirskii* ٢٤٦ , ٢٤٨ , ١١١ و ٢٧٦ , ٣٤١ , ٢١٠ فرد على البرتقال ابوسره والجريب فروت والليمون على التوالي، عندما كانت درجة الحرارة ٢٣,٧٧ °C ورطوبة نسبية ٦٣,٦٪، بينما فى الموسم الثانى كانت اعداد المفترسات ٢٧٦ , ٣٤١ , ٢١٠ فرد عند درجة حرارة ٢٢,٤٠ °C ورطوبة نسبية ٦٣,٥ %.