



EGYPTIAN ACADEMIC JOURNAL OF
BIOLOGICAL SCIENCES
ENTOMOLOGY

A



ISSN
1687-8809

WWW.EAJBS.EG.NET

Vol. 14 No. 4 (2021)



Population Dynamics of Tomato Erineum Mite, *Aceria lycopersici* (Wolffenstein) On Leaves and Buds of Tomato at Qalubia Governorate.

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ARTICLE INFO

Article History

Received:27/10/2021

Accepted:9/12/2021

Keywords:

Population;

Tomato;

eriophyid mites;

Aceria; Halawa

ABSTRACT

Population dynamics of *Aceria lycopersici* (Wolffenstein) has been studied on leaves and buds of tomato through three plantations *i.e.* winter plantation (from October to January); summer plantation (from March to June) and fall plantation (from August to November) during two successive years. The obtained results showed that the population of tomato erineum mite, *A. lycopersici* has one peak in each plantation, *e.g.* in winter plantation, the annual peak was recorded in December (48 individuals) and November (59 individuals) at average temperature 13.2 and 17.6 C° and relative humidity 56.9 and 39.6 R.H. in the first and second years respectively, while the highest number of *A. lycopersici* in buds of tomato recorded in January with total number 25 & 23 individuals at average temperature 11.7 and 13.4 C° and relative humidity 34.2 and 32.4 R.H. in the first and second years respectively.

INTRODUCTION

Tomato (*Solanum lycopersicum* L.) has the highest area under cultivation among vegetables at the global level. Egypt is one of the major tomato-producing and exporting countries (Almas *et al.*, 2021). Eriophyoids are obligatory plant feeders with unusual morphological, biological and behavioral specialization compared to other Acari (Skoracka *et al.*, 2010). Eriophyoid mites are tiny arthropods which considered dangerous pests of many economic plants including vegetable crops, fruit orchards, ornamental plants and herbaceous plants (Lindquist *et al.*, 1996). Noticeable plant damage may be caused directly by mite feeding or indirectly by the transmission of plant pathogens; therefore, many species are pests of great economic importance on citrus, apple, grape, hazelnut, coconut, tomato, corn and wheat. On the other hand, a number of eriophyoid species are considered invasive and pose a quarantine threat to several countries (Hong & Zhang 1996; Lindquist & Oldfield 1996; Lindquist *et al.* 1996; Amrine *et al.*, 2003; Lawson-Balagbo *et al.* 2007 and Denizhan *et al.*, 2015) In the family Eriophyidae (superfamily Eriophyoidea) there are two major pest species of tomato, the tomato russet mite (TRM) *Aculops lycopersici* (Masse) and the tomato erineum mite *Aceria lycopersici* (Wolffenstein). *Ace. lycopersici* is closely related to the TRM and will be mentioned only when it differs substantially from *Acu. Lycopersici* (Waqas Wakil *et al.*, 2018). Several papers on tomato

russet mite *Acu. Lycopersici* were published while the tomato erineum mite *Ace. lycopersici* has been poorly studied. So, the presented work aims to study the population dynamics of tomato erineum mite *Ace. lycopersici* through three plantations of tomato in Qalubia governorate.

MATERIALS AND METHODS

The population dynamics of *Aceria lycopersici* (Wolffenstein) has been studied on leaves and buds of tomato through three plantations (winter plantation (from October to January) – summer plantation (from March to June) – fall plantation (from August to November) during two successive years. The three tomato plantations were cultivated (half a feddan which is divided into four replicates) in the same locality at Toukh district (Qalubia province). Bi-weekly samples were taken randomly (25 leaves and five buds) while the results of inspection were monthly recorded. The samples were put in paper bags and directly transferred to the laboratory the same day. The upper and lower surface and buds were inspected. The monthly average temperature (C°) and relative humidity (R.H. %) in El-Sharqia and Qalubia provinces were obtained from the metrological department of the central laboratory of condition at Dokki, Giza, Egypt. Spearman's rank correlation coefficient was done among the weather factors and *A. lycopersici*.

RESULTS AND DISCUSSION

Population dynamics of *Aceria lycopersici* has been studied on tomato leaves and buds through three plantations during two successive years, the obtained results in tables (1&2) and figures (1&2) are detailed as follow:

1-Winter Plantation:

On leaves:

The population dynamics of *A. lycopersici* on leaves has one peak in December, (46 individuals) at average temperature (12.6°C) and relative humidity (77.1%). The population began with moderate numbers in October, then gradually increased in number in November and December and decreased in January, the monthly total numbers of mite were 30, 41, 46 and 27 individuals at average temperature 23.1, 17.8, 12.6, and 10.7°C and relative humidity 75.9, 77.9, 77.1 and 79 % in October, November, December, January, in the first year, respectively. The population fluctuated in the same trend in the second year whereas it was recorded one peak in December (59 individuals) at average temperature (13.3°C) and relative humidity (60.85%) in the second year. The population was started with moderate numbers in October then gradually increased in number in November and December and decreased in number in January, the total numbers of mite were 32, 38 59 and 50 individuals at average temperature 23.8, 17.1, 13.3, and 12.1°C and relative humidity 71.92, 75.35, 60.85 and 47.4% in October, November, December, January, respectively.

In Buds:

The highest numbers *A. lycopersici* were recorded in November, (21 individuals) at average temperature (17.8°C) and average humidity (77.9 %). The population dynamics fluctuated from a moderate number in October, then increased in November, and deceased in December while turning to increase again in January. The monthly total numbers of mites were 15, 21, 16 and 20 individuals at average temperature 23.1, 17.8, 12.6, and 10.7°C and relative humidity 75.9, 77.9, 77.1 and 79% in October, November, December, January in the first year, respectively. On the other hand, the population was recorded its peak in January (28 individuals) at average temperature (12.1°C) and relative humidity

(47.4%), in the second year. The monthly total numbers of mites from October to January were: 13, 17, 22 and 28 individuals at average temperature 23.8, 17.1, 13.3, and 12.1°C and relative humidity 71.92, 75.35, 60.85 and 47.4% in October, November, December, January, respectively.

1-Summer Plantation:

On leaves:

The population of *A. lycopersici* began with a few numbers (18 individuals) in March at average temperature (16.2°C) and relative humidity (74.5%). The population gradually increased in numbers as far as reached to the peak in June plantation end. The monthly total numbers of mites were 18, 34, 43 and 49 individuals at average temperature 16.2, 21.4, 24.1, and 25.3°C and relative humidity 74.5, 64.1, 58.1 and 64.5% in March, April, May and June, in the first year respectively. On temporary, in the second year, the population of *A. lycopersici* began with moderate numbers (40 individuals) in March, and gradually increased in numbers until reached its peak in June. The monthly total number of mites were 40, 51, 54 and 62 individuals at average temperature 13.1, 15.9, 20.8, and 24.7°C and relative humidity 81, 74.4, 57.3 and 60.1% in March, April, May and June, respectively.

In Buds:

The population of *A. lycopersici* in buds during summer plantation was started with little numbers in March, (17 individuals) then gradually increased in number until reached to the peak in June. The monthly total numbers of mites were 17, 23, 28 and 37 individuals at average temperature 16.2, 21.4, 24.1, and 25.3°C and relative humidity 74.5, 64.1, 58.1 and 64.5% in March, April, May and June in the first year, respectively. In the second year, the same trend occurred when the monthly total numbers were 16, 25, 37 and 40 individuals at average temperature 13.1, 15.9, 20.8, and 24.7°C and relative humidity 81, 74.4, 57.3 and 60.1% in March, April, May and June, respectively.

1-Fall Plantation:

On leaves:

The fall plantation included four months from August to November, the population of tomato erineum mite, *A. lycopersici* on leaves has one peak in November (75 individuals) at average temperature (17.1°C) and relative humidity (75.35%). The population has appeared with a moderated number in August and gradually increased in number until reached its peak in November. The monthly total numbers of mites were 39, 56, 63 and 75 individuals at average temperature 27.2, 25.9, 23.8, and 17.1°C and relative humidity 73.3, 69.9, 71.92 and 75.35% in August, September, October, November in the first year, respectively. The highest number of mites in the second year was recorded also in November (71 individuals) at average temperature (24.2°C) and relative humidity (45.2%). The monthly total numbers of mites were 49, 65, 68 and 71 individuals at average temperature 26.2, 27.9, 28.6, and 24.2°C and relative humidity 69.2, 72.3, 60.3 and 45.2% in August, September, October, November, respectively.

In Buds:

The population of *A. lycopersici* in buds through fall plantation has one peak in October, (38 individuals) at average temperature (23.8°C) and relative humidity (71.92%). The population was appeared with a moderate number in August (20 individuals) then gradually increased in number until reached to peak in October, finally decreasing in November. The monthly total numbers of mites were 20, 25, 38 and 22 individuals at average temperature 27.2, 25.9, 23.8, and 17.1°C and relative humidity 73.3, 69.9, 71.92 and 75.35% in Augusts, September, October, November in the first year, respective. In the second year, the population recorded its peak also October (36 individuals) at average temperature (28.6°C) and relative humidity (60.3%). The monthly total numbers of mites

were 26, 28, 36 and 24 individuals at average temperature 26.2, 27.9, 28.6, and 24.2°C and relative humidity 69.2, 72.3, 60.3 and 45.2 % in August, September, October, November, respectively.

Table 1: Population dynamics of *Aceria lycopersici* (Wolfenstein) on three plantations of tomato in Qalubia governorate during period 2016- 2017.

Date of sampling	No. of mites			Means of	
	Leaves	Buds	Total	Temperature	R.H%
Winter plantation					
Oct.2016	30	15	45	23.1	75.9
Nov.	41	21	62	17.8	77.9
Dec.	46	16	62	12.6	77.1
Jan.2017	27	20	47	10.7	79
Summer plantation					
Mar.	18	17	35	16.2	74.5
Apr.	34	23	57	21.4	64.1
May.	43	28	71	24.1	58.1
Jun.	49	37	86	25.3	64.5
Fall plantation					
Aug.	39	20	59	27.2	73.3
Seb.	56	25	81	25.9	69.9
Oct.	63	38	101	23.8	71.92
Nov.	75	22	97	17.1	75.35
Total	521	282	803		
Regression correlation analysis					
" r " Temp. °C	0.246*	0.501**	0.369*		
" r " R.H %	-0.107	-0.563**	-0.286*		

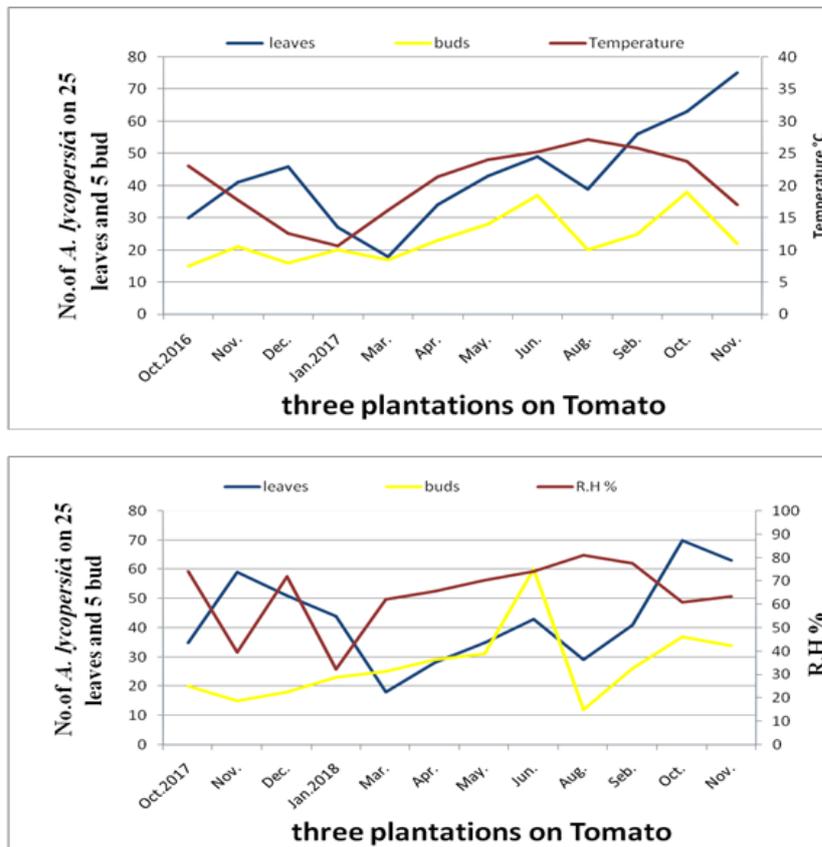


Fig.1: Population dynamics of *Aceria lycopersici* (Wolfenstein) on three plantations of tomato in Qalubia governorate during period 2016- 2017

Table 2: seasonal Population dynamics of *Aceria lycopersici* (Wolffenstein) on three plantations of tomato in Qalubia governorate during period 2017- 2018.

Date of sampling	No. of mites			Means of	
	Leaves	Buds	Total	Temperature	R.H%
Winter plantation					
Oct.2017	32	13	45	23.8	71.92
Nov.	38	17	55	17.1	75.35
Dec.	59	22	81	13.3	60.85
Jan.2018	50	28	78	12.1	47.4
Summer plantation					
Mar.	40	16	56	13.1	81
Apr.	51	25	76	15.9	74.4
May.	54	37	91	20.8	57.3
Jun.	62	40	102	24.7	60.1
Fall plantation					
Aug.	49	26	75	26.2	69.2
Seb.	65	28	93	27.9	72.3
Oct.	68	36	104	28.62	60.3
Nov.	71	24	95	24.2	45.2
Total	633	312	945		
Regression correlation analysis					
" r " Temp. Ċ	0.439*	0.403*	0.461*		
" r " R.H %	-0.593**	-0.491*	-0.6000**		

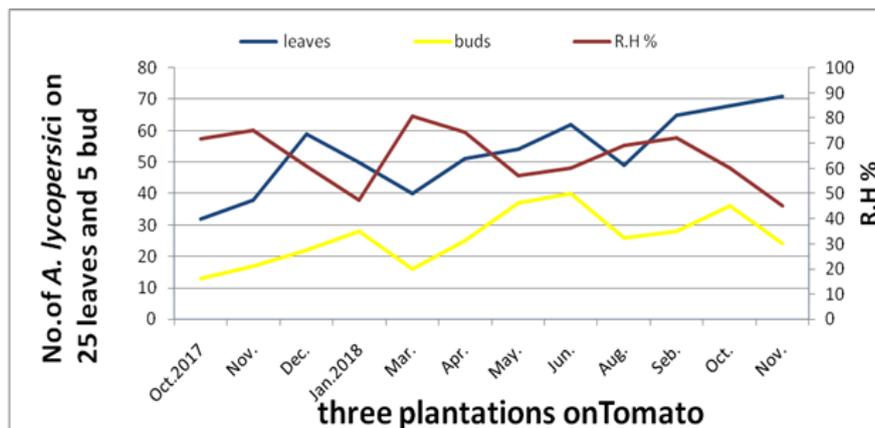
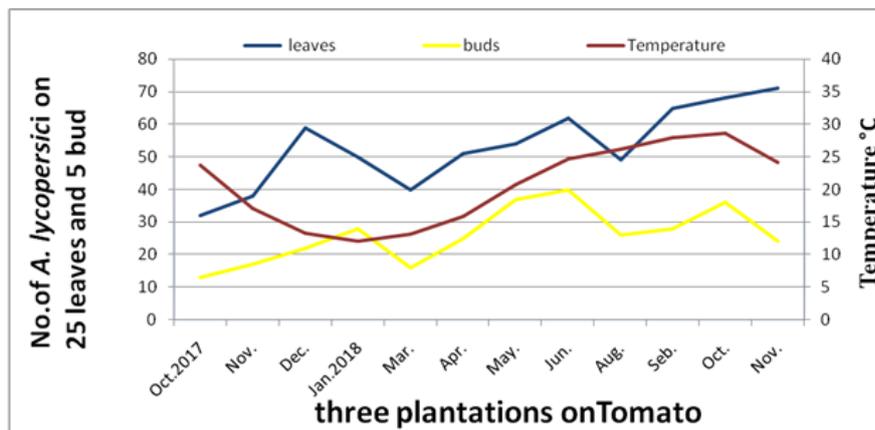


Fig.2: Population dynamics of *Aceria lycopersici* (Wolffenstein) on three plantations of tomato in Qalubia governorate during period 2017- 2018.

REFERENCES

- Almas Lal; M. Usman; M. Hazman; M. ElSayed; A. Shams El-Din⁵; S. Burian and M.McFarland(2021):Biosaline Agriculture: Tomato Production in Egypt and Its Export Potential. <https://bu.edu.eg/staff/alishamseldin-publications/45124>.
- Amrine, J. W. ; Stasny, T. A. H. and Flechtmann, C. H. W.(2003): Revised keys to world genera of Eriophyoidea (Acari: Prostigmata). *Indira Publishing House, 244pp*.
- Denizhan, E.; Monfreda, D.; De lillo, E. and Çobanoğlu, S. (2015): Eriophyoid mite fauna (Acari: Trombidiformes: Eriophyoidea) of Turkey: new species, new distribution reports and an updated catalogue. *Zootaxa, (3991) 1: 29*.
- Hong XiaoYue and Zhang ZhiQiang (1996): The eriophyoid mites of China: an illustrated catalog and identification keys (Acari: Prostigmata: Eriophyoidea). *Associated Publishers, 318pp*.
- Lawson-Balagbo, L.M.; Gondim, M.G.C; deMoraes, G.J.; Hanna, R. and Schausberger, P. (2007): Refuge use by the coconut mite *Aceria guerreronis*: Fine scale distribution and association with other mites under the perianth. *Biological control, 43(1) 102-110*.
- Lindquist, E.E. and Oldfield, G.N (1996): Chapter 1.5 Evolution and phylogeny 1.5.1 Evolution of Eriophyoid mites in relation to their host plants. *World Crop Pests, (6) 277:300pp*.
- Lindquist, E.E.; Sabelis, M.W. and Bruin, J. (1996): Eriophoid mites: their biology, natural enemies and control. *Elsevier science.B.V. (6): 785pp*.
- Skoracka, A., and Dabert, M. (2010): The cereal rust mite *Abacarus hystrix* (Acari: Eriophyoidea) is a complex of species: evidence from mitochondrial and nuclear DNA sequences. *Bulleten of Entomology Research, 100, 263–272*.
- Waqas Wakil ; Gerald E. Brust And Thomas M. Perring (2018): *Sustainable Management of Arthropod Pests of Tomato*. Academic Press 2018, 253-267pp.

ARABIC SUMMARY

حركة تعداد اكاروس اوراق الطماطم (*Aceria lycopersici* (Wolffenstein) على اوراق وبراعم الطماطم في محافظة القليوبية

- مصطفى ابراهيم عبدالقوى¹ – محمد كريم يس² – علاء محمد حلاوه¹
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 2- قسم علم الحيوان والحشرات – كلية العلوم – جامعة الازهر

تم دراسة حركة تعداد اكاروس اوراق الطماطم (*Aceria lycopersici* (Wolffenstein) على اوراق وبراعم الطماطم خلال سنتين متتاليتين في ثلاث عروات زراعية وهي العروة الشتوى (من اكتوبر الى يناير)؛ العروة الصيفى (من مارس الى يونية) العروة الخريفى (من اغسطس الى نوفمبر). النتائج المتحصل عليها اشارت الى ان اكاروس اوراق الطماطم كان له قمة موسمية لكل عروة من العروات المذكورة. فقد تم تسجيل اعلى تعداد لهذا الاكاروس فى العروة الشتوية فى شهر ديسمبر (48 فرد) و نوفمبر (59 فرد) عند متوسط حرارة 13.2 و 17.6 م و رطوبة نسبية 56.9 و 39.6 % على الاوراق خلال الموسم الاول والثانى على التوالي بينما تم تسجيل اعلى تعداد فى البراعم فى يناير (25 و 23 فرد) عند درجات حرارة (11.7 و 13.4 م) و رطوبة نسبية (34.2 و 32.4 %) خلال الموسمين الاول والثانى على التوالي .