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INCIDENCE OF SOME PIERCING SUCKING PESTS AND THEIR NATURAL ENEMIES ON WATERMELON IN ASSIUT GOVERNORATE

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ABSTRACT

Field experiments were carried out at El-Ghorieb village, Sahel Selem district, Assiut Governorate during two growing successive seasons, 2013 and 2014 to study some ecological aspects of some piercing sucking pests and associated natural enemies inhabiting water melon, *Citrullus vulgaris* (Schard).

Results indicated that the major piercing sucking pests [the two-spotted spider mite, *Tetranychus urticae* Koch; the whitefly, *Bemisia tabaci* (Genn.); the cotton aphid, *Aphis gossypii* Glover and the leafhopper, *Empoasca decipiens* (Paoli)] and their associated natural enemies [*Coccinella undecimpunctata, Chrysopa carnea, Orius* sp. and *Scolothrips longicornis*]

Data showed that the relation between the natural enemies with their preys was positively and significantly during both seasons.

The results also showed that the highest dominance and abundance were recorded with the piercing sucking pests; *T. urticae* and *B. tabaci* followed by *E. decipiens* and *A. gossypii* as for the natural enemies; *S. longicornis* followed by *Orius* sp., *C. undecimpunctata* and *Ch. Carnea*. Finally, the previous natural enemies could have a promising role when planning Integrated Pest Management (I.P.M.) strategies with other safe methods to protect the surrounding environment from pollution.

Key words: Population fluctuation – Correlation – Dominance & abundance – Pests – Predators.

INTRODUCTION

Cucurbitaceous plants are very important vegetable crops in Egypt, it is a common practice to cultivate these vegetables in successive plantations all year round.

Watermelon, *C. vulgaris* (Schard) is subject to pest infestations of which the two-spotted spider mite, *T. urticae*, is the most important phytophagous mite known to cause serious damage to plants, reducing quantity and quality of yield, besides to the whitefly, *B. tabaci*, the cotton aphid, *A. gossypii* and the leafhopper, *E. decipiens.* The important piercing sucking pests threaten also the yield of the watermelon crop (Bachatly, 1992; Adam, 1998; Ahmed, 2003; Hagrass *et al*., 2008 and El-Lakwah *et al*., 2011).

On the other hand, natural enemies as well as, *C. undecimpunctata, C. carnea, Orius* sp. and *S. longicornis* play an important role in pest management and feeding mainly on the piercing sucking pests (Ali *et al*., 1991; El-Maghraby *et al*., 1994 and Meligi, 2009).

Therefore, the objectives of the present work are to study the population fluctuation of the piercing sucking pests and their natural enemies during the two seasons 2013 and 2014, the relationship between the piercing sucking pests and their natural enemies, and the dominance and abundance of the previous pests and their natural enemies.

MATERIALS AND METHODS

A field experiment was conducted at El-Ghorieb village, Sahel Selem district, Assiut Governorate.

An area about ¼ feddan was sown with watermelon seeds, *C. vulgaris* on 15th April 2013 and 20th April 2014 in a complete randomized block design with three replicates. Normal agricultural practices were followed except for keeping the whole area free from any pesticides treatments. Sampling started after three weeks from planting and continued to the harvesting time. Weekly (10 leaves/replicate) were collected and kept in paper bags for further laboratory inspection by the aid of stereoscopic microscope searching for the presence of the two-spotted spider mite, *T. urticae* (eggs & moving stages); the whitefly, *B. tabaci* (immature stages); the cotton aphid, *A. gossypii* (nymphs and adults) and the leafhopper, *E. decipiens* (nymphs and adults). Meanwhile, numbers of the natural enemies stages; *C. undecimpunctata, Ch. Carnea, Orius* sp. and *S. longicornis* associated with the previously mentioned pests were also directed and recorded.

All obtained data were subjected to the statistical analysis using F-test according to Snedecor and Cochran (1971), and simple correlation tests according to Gomez and Gomez (1984); also, dominance (D) and abundance (A) degree were determined according to Facylate (1971).

$$D = \frac{t}{T} \times 100$$

where,

t = Total number of each species during the collecting period.

T= Total number of all species collected during the collecting period.

$$A = \frac{n}{N} \times 100$$

where,

n = Total number of samples in each species appeared.

N= Total number of samples taken allover the season.

RESULTS AND DISCUSSION

I- Population fluctuation of main piercing sucking pests and their natural enemies:

The average numbers of the main piercing sucking pests and their natural enemies inhabiting watermelon plants are presented in Tables (1 and 2).

a) The main piercing sucking pests:

Data presented in Tables (1 and 2) indicated the population fluctuations of *T. urticae* (eggs & moving stages), *B. tabaci* (immature), *A. gossypii* (nymph & adult) and *E. decipiens* (nymph & adult) infesting watermelon plants. The average of number (No/30 leaves) of the two-spotted spider mite, *T. urticae* (eggs & moving stages) ranked the highest abundant during the second week of July in the two seasons (602.33 & 204.67) and (602.33 & 212.67) respectively (Abou El-Saad, 2008 and Magouz *et al*., 2011), followed by *B. tabaci* during the two seasons in the third week of July

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(117.33 and 140.67) respectively (El-Dash, 2001 and Abou El-Saad, 2008), *A. gossypii* in the first season in the second week of June 68.33 and 77.33 in the third week of June during the second season 2014 (Klingler, 1997 and Kamel *et al*., 2002), and *E. decipiens* during third week of June recorded 38.67 in the first season 2013 and 56.67 during fourth week of June in the second season 2014. The present data on the population fluctuation of the four piercing pests agree with the results obtained by many authors e.g. Metwally *et al*. (1995) and El-Khawas (2005).

b) The natural enemies:

Data in Tables (1 and 2) show the population fluctuations of *C. undecimpunctata, Ch. Carnea, Orius* sp. and *S. longicornis* incidence on watermelon plants. *S. longicornis* ranked as the highest average numbers in the second week of July (16.33 and 17.67) during the two seasons 2013 & 2014 respectively, followed by *Orius* sp. in the second week of July (10.33 and 11.67) during the two seasons respectively, *C. undecimpunctata* recorded (2.67 and 3.67) in the third week of July during the two seasons respectively, and *Ch. Carnea* in the first week of June (3.0) during the first season 2013 and recorded (4.0) in the second week of June during the second season 2014. These finding results are in agreement with that obtained by Aly & Gharib (1989); Abou El-Saad (1998) and Ghallab *et al*. (2011).

II- The relationship between the piercing sucking pests and their natural enemies:

Data in Table (3) show the correlation coefficient values (r) between the population density of each natural enemies from one hand, and the population density of each of the piercing sucking pests or their total from the other hand.

The correlation coefficient values were positive, high significant and significant between *S. longicornis, Orius* sp. and *C. undecimpunctata* from one hand and the piercing sucking pests from other hand during the two seasons 2013 and 2014. For *E. decipiens,* correlation was positive insignificant with *S. longicornis, Ch. Carnea* and *C. undecimpunctata* (r= 0.251, 0.172 and 0.067) respectively during the first season, (r= 0.231, 0.094 and 0.029) respectively during the second season 2014. The correlation coefficient was negative insignificant between *T. urticae* (eggs & moving stages), and *Ch. Carnea* (r= -0.019 & -0.050) respectively during the first season, (r= -0.007 & -0.004) respectively in the second season 2014.

Similar findings were obtained by Ali & Abdel-Rahman (2000); Hamouda *et al*. (2001) and Hamouda (2007).

III- Dominance and abundance degrees of the piercing sucking pests and their natural enemies:

The dominance and abundance degrees in Table (4) indicated that, *T. urticae* (eggs and moving stages) and *B. tabaci* recorded the highest dominant and abundant (58.03 & 100.0; 16.87 & 100.0 and 15.97 & 100) respectively during the first season 2013, (54.91 & 100.0; 16.62 & 100.0 and 17.04 & 100.0) respectively in the second season 2014 followed by *A. gossypii* and *E. decipiens* (6.07 & 83.33 and 3.06 & 91.67) respectively during the first season, (7.44 & 91.67 and 3.99 & 91.67) respectively, during the second season 2014.

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According to dominance and abundance, natural enemies may be put in the following descending order in the first season (2013) as *S. longicornis* (50.90 and 91.67), *Orius* sp. (32.66 and 91.67), *C. undecimpunctata* (9.01 and 75.00) and *Ch. carnea* (7.43 & 58.33). For the second season, 2014, the figures were in respective (48.0 and 91.67), (33.27 and 91.67), (10.13 and 75.00) and (8.60 and 58.33). These finding in congruity with those documented by Ali *et al*. (2011); Salem *et al*. (2012) and Abdel-Galil & Amro (2014).

The previous results showed that, the two-spotted spider mite and the other piercing sucking pests are very serious on watermelon crop, but on the other light hand, found of some predators help in planning Integrated Pest Management (I.P.M.) strategies.

Table (4): Dominance and abundance (D & A) of the piercing sucking pests and their natural enemies collected from watermelon plantation during 2013 and 2014 seasons, Assiut Governorate.

Species	2013			2014		
	Total number	Dominance %	Abundance %	Total number	Dominance %	Abundance %
Piercing sucking pests						
T. urticae eggs	7673	58.03	100	8254	54.91	100
T. urticae moving stages	2231	16.87	100	2498	16.62	100
B. tabaci	2111	15.97	100	2562	17.04	100
A. gossypii	802	6.07	83.33	1119	7.44	91.67
E. decipiens	405	3.06	91.67	598	3.99	91.67
Total	13222	96.75		1503		
Natural enemies						
C. undecimpunctata	40	9.01	75	53	10.13	75
Ch. carnea	33	7.43	58.33	45	8.60	58.33
Orius sp.	145	32.66	91.67	174	33.27	91.67
S. longicornis	226	50.90	91.67	251	48.00	91.67
Total	444	3.25		523		

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تواجد بعض الآفات الثاقبة الملصة وأعدائها الحيوية علي نباتات البطيخ في محافظة أسيوط

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أجريت هذه الدراسة بقرية الغريب – مركز ساحل سليم – محافظة أسيوط خلال موسمي 2013 و 2014 وذلك بهدف دراسة:

1 – تذبذب مجاميع بعض الآفات الثاقبة الملصة وأعدائها الحيوية:

أظهرت النتائج أن أعلي تعداد للعنكبوت الأحمر كان في الأسبوع الثاني من يوليو خلال موسمي الدراسة، يليه في التعداد الذبابة البيضاء سجلت أعلي تعداد لها خلال الأسبوع الثالث من شهر يوليو خلال موسمي الدراسة ثم منّ القطن والبطيخ سجل أعلي تعداد له خلال الموسم الأول في الأسبوع الثاني من شهر يونيو والأسبوع الثالث من نفس الشهر في الموسم الثاني، ثم الجاسيد سجل خلال الأسبوع الثالث والرابع من شهر يونيو خلال موسمي الدراسة علي الترتيب أعلي تعداد له.

كما أوضحت النتائج أن أعلي تعداد للتربس المفترس يليه بقة الأوريس كان خلال الأسبوع الثاني من شهر يوليو خلال موسمي الدراسة، يليهما أبو العيد أظهر أعلي تعداد له خلال الأسبوع الثالث من شهر يوليو في موسمي الدراسة، ثم يأتي أسد المنّ بأعلي تعداد له في الأسبوع الأول والثاني من شهر يونيو خلال موسمي الدراسة علي الترتيب.

2 – العلاقة بين الآفات الثاقبة الملصة وأعدائها الحيوية:

أشارت النتائج إلي أن العلاقة بين التربس المفترس وبقة الأوريس وأبو العيد من جهة والآفات من جهة أخري كانت مؤكدة وموجبة خلال موسمي الدراسة.

3 – درجات السيادة والوفرة العددية للآفات الثاقبة الملصة وأعدائها الحيوية:

أظهرت النتائج أن العنكبوت الأحمر والذبابة البيضاء أهم الآفات من حيث درجة السيادة والوفرة العددية يليهما منّ القطن والبطيخ ثم الجاسيد.

كما أوضحت النتائج أن التربس المفترس وبقة الأوريس أعلي سيادة ووفرة عددية يليهما أبو العيد ثم أسد المنّ.

أخيراً، ومن خلال النتائج السابقة يتضح أن نباتات البطيخ تصاب بآفات عديدة مثل العنكبوت الأحمر وغيرها من الآفات ، هذا من جانب، أما من الجانب الآخر المضئ هو وجود أعداء حيوية مثل التربس المفترس وبقة الأوريس التي تدخل في إطار منظومة تطبيق إستراتيجية لمكافحة مثل تلك الآفات مع باقي الطرق الأخري الآمنة للحفاظ علي البيئة المحيطة من التلوث.

Table (1): Average numbers* of the piercing sucking pests and their natural enemies collected from watermelon plantations during 2013 season, Assiut Governorate.

Date		Piercing sucking pests						Natural enemies				
		Two-spotted spider mite		Whitefly	Aphid	Leaf-hopper	Total	*Coccinella undecim-punctata*	*Chrysopa carnea*	*Orius sp.*	*Scolothrips longicronis*	Total
		Eggs	Moving stages	Immature	Nymph & adult	Nymph & adult						
May	6	1.00	0.67	2.00	0	0	3.67 H	0	0	0	0	0 G
	13	3.00	1.33	5.00	0	0.33	9.66 H	0	0	0.67	2.00	2.67 FG
	20	39.00	8.00	18.00	8.00	2.00	75.00 G	0.67	1.67	2.33	3.67	8.34 D
	27	137.33	34.33	39.67	19.33	4.67	235.33 E	1.67	1.33	3.33	4.67	11.00 DE
June	3	83.33	27.67	61.00	44.67	16.33	233.00 E	2.33	3.00	2.00	3.00	10.33 DE
	10	209.67	70.33	58.33	68.33	35.33	441.99 D	2.33	1.67	5.00	8.33	17.33 B
	17	298.33	98.67	103.67	21.00	38.67	560.34 C	0.33	0.67	6.67	10.33	18.00 B
	24	298.67	93.00	102.33	10.00	32.00	536.00 C	0.33	0	6.00	7.00	13.33 CD
July	1	415.00	120.00	72.67	7.67	4.00	619.34 B	1.00	0	5.67	9.00	15.67 BC
	8	602.33	204.67	94.33	38.33	1.00	940.66 A	2.00	1.00	10.33	16.33	29.66 A
	15	390.67	66.67	117.33	48.00	0.33	623.00 B	2.67	1.67	4.67	8.00	17.01 BC
	22	79.33	18.33	29.33	2.00	0.33	129.32 F	0	0	1.67	3.00	4.67 F
Total		2557.66 A	743.64 B	703.68 C	267.36 D	135.00 E	4407.34	13.22 C	11.04 C	48.36 B	75.36 A	148.08
F-value		1274.00**					1010.00**	151.10**				42.96**

*** Based on 30 leaves.**

**** Significant at 0.01 probability level.**

Table (2): Average numbers* of the piercing sucking pests and their natural enemies collected from watermelon plantations during 2014 season, Assiut Governorate.

Date		Piercing sucking pests						Natural enemies				
		Two-spotted spider mite		Whitefly	Aphid	Leaf-hopper	Total	*Coccinella undecim-punctata*	*Chrysopa carnea*	*Orius sp.*	*Scolothrips longicronis*	Total
		Eggs	Moving stages	Immature	Nymph & adult	Nymph & adult						
May	11	3.00	1.33	3.33	0	0	07.66 H	0	0	0	0	0 G
	18	4.67	2.00	6.67	1.67	1.00	16.01 H	0	0	1.00	2.33	3.33 F
	25	62.00	12.67	23.33	11.00	3.00	112.00 G	1.00	2.33	2.33	4.00	9.66 E
June	1	159.00	47.00	48.67	30.00	8.33	293.00 E	2.33	2.00	4.33	5.67	14.33 E
	8	103.67	32.67	73.33	55.33	25.67	290.67 E	3.00	4.00	2.67	3.33	13.00 D
	15	233.67	74.00	68.33	77.33	47.00	500.33 D	2.67	2.00	6.00	9.00	19.67 B
	22	330.33	100.00	122.33	33.00	56.67	642.33 C	0.67	1.00	8.00	10.67	20.34 B
	29	328.33	99.00	121.00	21.00	47.67	617.00 C	0.67	0	7.00	8.00	15.67 CD
July	6	450.33	134.00	88.33	16.67	6.67	696.00 B	1.33	0	7.00	9.67	18.00 BC
	13	602.33	212.67	113.33	56.67	2.00	987.00 A	2.33	1.67	11.67	17.67	33.34 A
	20	391.67	88.00	140.67	64.67	0.66	685.67 B	3.67	2.00	5.67	9.00	20.34 B
	27	82.33	29.33	45.33	5.67	0.66	163.32 F	0	0	2.33	4.33	6.66 E
Total		2751.36 A	832.68 B	854.64 B	372.96 C	199.32 D	5010.96	17.64 C	15.00 C	57.96 B	83.64 A	174.24
F-value		2531.00**					625.0**	221.40**				68.98**

*** Based on 30 leaves.**

**** Significant at 0.01 probability level.**

Table (3): Correlation coefficient (r) between some piercing sucking pests and their natural enemies collected from watermelon plantations during 2013 and 2014 seasons, Assiut Governorate.

Natural enemies	Simple correlation coefficient (r)											
	2013 season						2014 season					
	Two-spotted spider mite		White-fly	Aphid	Leaf-hopper	Total pests	Two-spotted spider mite		White-fly	Aphid	Leaf-hopper	Total pests
	Eggs	Moving stages					Eggs	Moving stages				
Coccinella undecimpunctata	0.371*	0.290*	0.370*	0.711**	0.067	0.406**	0.406**	0.334*	0.473**	0.823**	0.029	0.457**
Chrysopa carnea	-0.019	-0.050	0.153	0.596**	0.172	0.053	-0.067	-0.004	0.147	0.614**	0.094	0.084
Orius sp.	0.894**	0.923**	0.759**	0.769**	0.406**	0.339*	0.917**	0.923**	0.776**	0.516**	0.336*	0.927**
Scolothrips longicornis	0.914**	0.938**	0.759**	0.460**	0.251	0.931**	0.920**	0.935**	0.759**	0.559**	0.231	0.925**
Total	0.890**	0.898**	0.782**	0.595**	0.299	0.923**	0.902**	0.899**	0.795**	0.716**	0.270	0.928**

*** Significant at 0.05 probability level.**

**** Significant at 0.01 probability level.**