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New recorded of thrips species and seasonal fluctuation of some thrips on cucumber in the field during the Autumn season in Iraq

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Abstract

Studies were carried out in the field was cultivated by cucumber crop *(Cucumis sativus)* in central of Iraq during autumn season 2016. Three native, five new thrips species were identified in a cucumber field calculated from 1213 thrips specimans individuals. Melon thrips, *Thrips pamli* was the dominant species recorded 76%, the highest number of it was noticed in the first week of October recorded 42.1 individual species. Second highest number of thrips was shown by onion thrips *Thrips tabaci* recorded 23% of all pest thrips species, highest number of it was recorded at second week of October 2016 with an average of 9.1 individuals per leaf, whereas tomato thrips *Frankliniella schultzie* recorded 0.4%, *Haplothrips* sp., *Eremiothrips* sp. *recorded* 0.21% each, *Anaphothrips sudanensis* recorded the lowest percent (0.1%). *Scolothrips sexmaculatus* recorded 99.6%, followed by *Scolothrips pallidus* (0.4%) of all predators thrips which feeding on other thrips and preference feeding on two spotted mites *Tertranychus urticae* and white fly *Bemisia tabaci,* the average individual per leaf of *S. sexmaculatus* was 24.9 individuals per leaf.

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Introduction

In Iraq, cucumber plants *Cucumis sativus* were planted in four seasons two of them in the field and others planted in the greenhouse. Short time and economically yields encouraged the farmers to cultivate the cucumber widely, Iraq's production of the cucumber crop in 2012 reached 258799 thousand tons with a total area of 45845 thousand dunums (Iraqi Ministry of Agriculture, 2012). Within these planted seasons the cucumber plant was infested by many pests, thrips are an important pest and only two important species of Thrips were recorded on cucumber *Thrips tabaci* and *Thrips palmi* (Al-Jorany *et al.,* 2014; Hamodi and Abdul-Rassoul, 2012; Al-Haidari, 1983).

Due to sapping of juices from leaves and flowers caused by thrips, discoloration, scarring and browning appear on the leaves and flowers (Tillekaratne *et al.*, 2011). More than 90% losses in the yield of cucumber can be done by thrips *T. palmi* (Cooper, 1991). Although more than 26 species of thrips have been recorded in Iraq (Hamodi, 2001; Hamodi and Abdul-Rassoul, 2010, 2014) few studies on thrips and very few on thrips of cucumber had been done, whereas Al Jorany *et al.,* 2014 studied the population density of *T. palmi* on cucumber in Iraq. However, the information are not enough to face the climate changes and insects behavior changing during the latest years, more Knowledge we need for identifying the thrips species and their behaviors.

The main objective of this study was to identify thrips species on the cucumber and their population density to enrich the missing information about thrips species infesting cucumber in the field during the autumn season in central Iraq.

Material and methods

Study area

Studies were carried out in the field, in the central of Iraq, Baghdad, Abu-Gareeb. The field was cultivated by seeds of cucumber plant (*Cucumis sativus*) variety alpha beta in 5th August 2016 in 3 lines with total area about 1000 m^2 until the end of the autumn season at 2nd January 2017.

The growing plants were fertilized with NPK (20*20*20), weeds were removed every time needed by hand and insecticides were not used throughout studies all the season.

Identification of thrips species

Ten leaves were calculated randomly each week from 7:15- 8:15 am during Autumn season, were put in plastic bags quietly to avoid the insects escaping, transferred to the laboratory in the Plant Protection Department, Agricultural research office in Abu-Gareeb. Samples were provided with all information needed, were kept in the refrigerator about a half an hour to quiet thrips samples, Olympus microscope (40X) was used for testing.

All stages of thrips species were calculated and preserved in test tubes (10ml) containing Kahil solution (15 parts of ethanol 96%, 30 parts of distilled water, 2 parts of glacial acetic acid and 6 parts of formaldehyde) (Hamodi, 2001) to prepare the slides and identify thrips species later. All specimens were provided with all information needed. All slides were identified depending on taxonomic keys (Hamodi, 2001; Mound and Masumoto, 2009; Reed *et al.,* 2006; Mound and Azidah, 2009; El-Wahab, 2012; Hamodi, 2012; Mound *et al.,* 2016; Mound and Masumoto, 2005; Mound, 2010; Skarlinsky and Funderburk, 2016; Ramezani *et al.* 2009; Mirab-balou *et al.*, 2013; Hamodi and Abdul-Rassoul, 2004, 2008, 2009; Speyer and Parr, 1941) and cooporative with thrips taxonomist Dr. Awatif Hamodi Abdul-fatah (Plant Protection Department, College of Agriculture, University of Baghdad).

Preparation of thrips slides

1. Specimens were poured to trend petri-dish to make calculated of thrips easier.
2. The individual thrips body was transferred and dipped into castor oil for 5-10 minutes by fine camel brush, then transferred to a glass slide.
3. Surplus castor oil around thrips body was absorbed by fine tissue or fine filter paper.
4. Wings, legs and antennae were separated by needle and then drop of Canada balsam was put on the body of thrips.

5. Cover slide was put gradually, then pressed on the edges of the cover slide for air emptying.
6. All information was added to the slide.
7. Slides were left 2-3 days under laboratory temperature for drying.

Population density and Seasonal fluctuation of thrips species

Ten leaves were calculated weekly from early morning (7:15-8:15 am) were kept in plastic bags provided with all information, which transferred to Laboratory of Plant Protection Department, Agricultural Research Office in Abu- Gareeb. Numbers of all species of thrips were counted and recorded.

Results and discussion

Identification of thrips species

Eight species of thrips were identified from samples calculated from cucumber plants during the autumn season, 2016 in the field. Results showed that the *Thrips palmi* was the dominant species recorded 76% of all pest thrips species infested cucumber leaves plant, followed by *Thrips tabaci* (23%), while the tomato thrips *Frankliniella schultzie* recorded (0.4%), *Haplothrips* sp. (0.21%), *Ermiothrips* sp. (0.21%), and *Anaphothrips sudanenss* (0.1%) (Table 1). These results agree with results of Al –jorany *et al.* (2014) and Hamodi & Abdul-Rassol (2012) that the *T. palmi* was an important pest can infest the cucumber crop, while the *T. tabaci* was mentioned by al-Haidari, 1983 on cucumber and he studied its population density. Although Iraqi studies not sure from the economic damage of these species on cucumber, the economic importance was confirmed by Sathe and Mitthari, 2015.

Table 1. Identifying thrips species on the cucumber crop during autumn season 2016 in field in the center of Iraq.

No.	Scientific name	Percentage of presence
1	*Thrips palmi*	76%
2	*Thrips tabaci*	23%
3	*Frankliniella schultzie*	0.4%
4	*Eremiothrips* sp.	0.21%
5	*Haplothrips* sp.	0.21%
6	*Anaphothrips sudanensis*	0.1%
Number of identifying thrips		963

Haplothrips sp. and *Anophothrips sudanensis* and *Eremiothrips* are new record on cucumber in Iraq however; *Haplothrips* sp. and *A. sudanensis* were mentioned as pests on other hosts (Hamodi and Abdul-Rassol, 2009).

Frankliniella schultzie was a pest on cucumber in Iraq without mentioning their economic effect of it (Hamodi, 2001), whereas Kakkar *et al.*, 2012 recorded this species as an important in the USA on cucumber.

Tillekaratne *et al.* (2010, 2011) confirmed the occurrence of thrips species *A. sudanensis* on grass and sugar cane, but did not mention it on cucumber in Sri Lanka, Kiliç and Ylaş (2004) reported the presence of thrips species *Haplothrips* sp. on cucumber crop. Bhatti *et al.* (2003) mentioned the occurrence of genus *Eremiothrips* in Iran and Iraq. Ramezani *et al.* (2009) recorded thrips species *Eremiothrips similis* in Iraq and Iran on cotton and watermelon therefore; it's the first record of this genus on cucumber in Iraq.

Scolothrips sexmaculats recorded 99.6% of all predators thrips and approved itself on the leaves of the cucumber crop by feeding on white fly *Bemisia tabaci*, two spotted mites *Tetranychus urticae* and less preference on thrips, these results agree with Al-dahwi (2002,2008) (Table 2).

Table 2. Identifying predatory thrips species on the cucumber crop during autumn season 2016 in field in the center of Iraq.

No.	Scientific name	Percentage of presence
1	*Scolothrips sexmaculatus*	99.6%
2	*Scolothrips pallidus*	0.4%
Number of identifying thrips		250

Very low percentage (0.4%) of predator *Scolothrips pallidus* was recorded in leaves of the cucumber crop may be fed on the same hosts of *S. sexmaculats*. These species are new observed and new recorded on leaves of cucumber plants.

Population density and Seasonal fluctuation of thrips species

Table 3 & Fig. 1 represented the Population density and seasonal fluctuation of thrips species on the cucumber crop during autumn season 2016 as follows:

Population Density and Seasonal fluctuation of Onion Thrips Thrips tabaci

Thrips tabaci through the growing season started from the fourth week of September 2016 with an average of 0.3 individuals per leaf, individuals of this pest increased gradually and reached the first peak at second week of November with an average of 9.1 individual per leaf, *Thrips tabaci* was seen until the third week of December with low population density till the end of the season. Predators, *S. sexmaculatus,* green lacewing, *Orius* sp., syrphid flies and coccinellidae (lady bug) had been increased synchronizing with aboundance of white flies *B. tabaci* and two spotted mites *T. urticae* in the field, so the population density of *T. tabaci* had been decreased (Baniameri *et al.* 2006; Rajabpour *et al.,* 2011).

In addition, the age of plant effected on population density of *T. tabaci* and old progress, weak-yellowish leaves of plant not preferred for thrips feeding (Al–Jorany *et al.,* 2016), decreasing of temperature with an average (9.2C^{o}) during November month and increasing of relative humidity with an average 85.9% had been participating on absent the individuals of *Thrips tabaci* at the end of December, this results agree with results of Waiganjo *et al.*, 2008.

Population density and Seasonal fluctuation of Melon Thrips Thrips palmi

First starting of *T. palmi* was at second week of September 2016 with low average of population density (0.4) individual per leaf, then the numbers of thrips increased gradually to reaching the first peak at the first week of November with an average of 42.1 individual per leaf. Population density of *T. palmi* decreased gradually until end of November 2016, synchronizing with the high population density of the predator thrips *S. sexmaculatus* with an average of 3.3 individual per leaf, this pest proven itself feeding on cucumber field in previous studies of Al-Jorany *et al.* 2014 on Spring season in Iraq.

Which indicate that the predator thrips *S. sexmaculatus* may prefer *T. palmi* than *T. tabaci* due to its (*T. tabaci*) presence through all the season compared to *T. palmi*, although the presence of other predators such as green lacewing, ladybugs, syrphid flies and *Orius* sp. May helped decrease the population density of *T. palmi* in the field (Baniameri *et al.,* 2006; Rajabpour *et al.,* 2011).

Population density and Seasonal fluctuation of Predatory Thrips Scolothrips sexmaculatus

Table 3 and Fig.1 showed that the predator thrips *S. sexmaculatus* found through the autumn season in the field on cucumber plants, first appearance was in the second week of September 2016 with an average of 0.3 individual per leaf, the numbers of thrips increased gradually and reached the first peak with an average of 3.3 individuals per leaf at the end of November 2016. The second peak was in the second week of December 2016 with an average of 4.6 individuals per leaf, synchronizing with a lot of number of white flies *Bemisia tabaci* and two spotted mites *Tetranychus urticae,* they were seemed preference food for *S. sexmaculatus* on the cucumber crop in the field, these result agree with previous study of Al- dahwi, 2002 which reported that the efficiency and the ability of this predator was high towards these two pests. In addition of the effective of temperature for increasing the functional responses against *T. urticae* especially when the temperature above than 35C^{o} (Pakyari *et al.,* 2009). Zamani *et al.,* 2006 participated this predator as good predator in early autumn and late spring season on mite in green plastic houses in Iran, Al- dahwi, 2002 as well participated it as a biological control agent on white flies in the cotton fields.

Table 3. Population density of Average Number of Thrips Species per Leaf on Cucumber Crop during Autumn Season 2016 in Field.

Date	*T. tabaci*	*T. palmi*	*S. sexmaculatus*
2016/8/25	0	0	0
2016/9/1	0	0	0
2016/9/8	0	0.5	0
2016/9/15	0	0.3	0.3
2016/9/22	0.3	0.6	0.3
2016/9/29	4.8	8.7	0.2
2016/10/5	4.6	42.1	0.3
2016/10/9	9.1	17	0.3
2016/10/16	0	2.2	1.1
2016/10/23	1.4	1.4	2.9
2016/10/30	0	0	3.3
2016/11/6	0.3	0	1.6
2016/11/13	0.4	0	0.7
2017/11/22	0	0	0.4
2016/11/27	0.3	0	1.3
2016/12/4	0.8	0	3
2016/12/12	0	0	4.6
2016/12/18	0.4	0	4.6
2016/12/25	0	0	0
2017/1/2	0	0	0
Total average	22.4	72.8	24.9

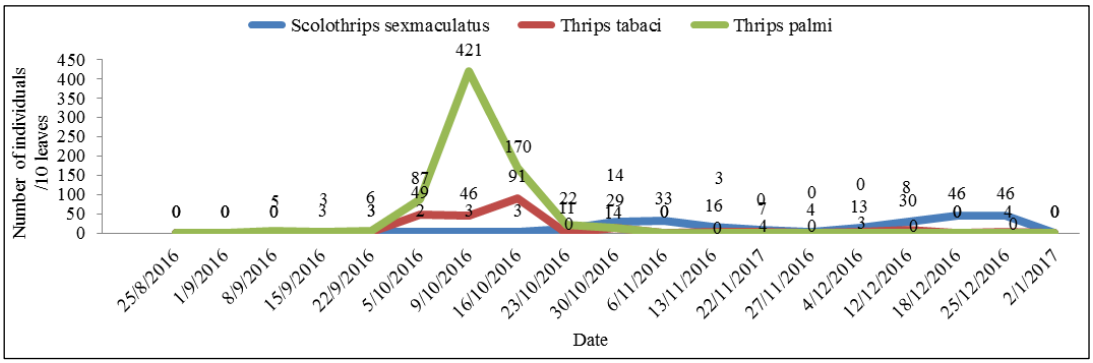

Fig. 1. Seasonal fluctuation of Thrips Species (*Thrips tabaci*, *Thrips palmi*, *Scolothrips sexmaculatus*) during Autumn Season 2016 Abo- gareeb.

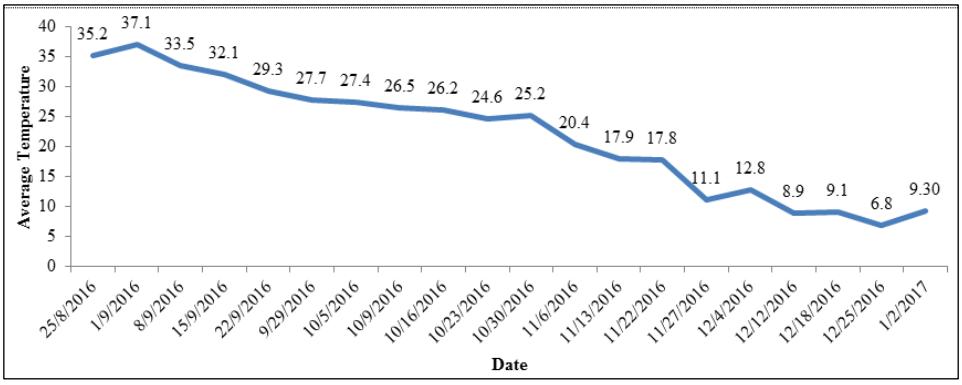

Fig. 2. Average Temperature/Week during Autumn Season 2016 in field, Abo-gareeb (Abo-gareeb research station).

Conclusion

Eight species of thrips (*Thrips palmi, Thrips tabaci, Frankliniella schultzie, Eremiothrips* sp., *Haplothrips* sp., *Anaphothrips sudanensis*) noticed on cucumber in the field during autumn season 2016. *Eremiothrips* sp., *Haplothrips* sp., *Anaphothrips sudanensis*, *Scolothrips sexmaculatus*, *Scolothrips pallidus* were identified as a new species on cucumber in the field during autumn season 2016. *Scolothrips sexmaculatus* and *Scolothrips pallidus* can and fed on two spotted mite *Tetranychus urticae* and white fly *Bemisia tabaci* can use in biological control programs against these pests. *Scolothrips sexmaculatus* and *Scolothrips pallidus* records less preference of thrips species preferred feeding on mites and white fly.

It seemed the thrips fluctuated during the autumn season in the field with three generations. More studies were needed for understanding the species of thrips, their behaviors an economically important.

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