Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

E-ISSN: 2320-7078
P-ISSN: 2349-6800
JEZS 2019; 7(2): 1078-1081

Received: 12-01-2019
Accepted: 15-02-2019

Sabrine Attia
LR14AGR02 of Bioaggressors and Integrated Pest Management in Agriculture. National Institute of Agronomy of Tunisia. 1082 Cité Mahrajène, University of Carthage. Tunisia

Sirine Khouja
LR14AGR02 of Bioaggressors and Integrated Pest Management in Agriculture. National Institute of Agronomy of Tunisia. 1082 Cité Mahrajène, University of Carthage. Tunisia

Imen Belaam Kort
LR14AGR02 of Bioaggressors and Integrated Pest Management in Agriculture. National Institute of Agronomy of Tunisia. 1082 Cité Mahrajène, University of Carthage. Tunisia

Essia Limam
Ministry of Agriculture, Water Resources and Fisheries, Tunisia

Mohammed Ammar
LR14AGR02 of Bioaggressors and Integrated Pest Management in Agriculture. National Institute of Agronomy of Tunisia. 1082 Cité Mahrajène, University of Carthage. Tunisia

Kaouthar Grissa Lebdi
LR14AGR02 of Bioaggressors and Integrated Pest Management in Agriculture. National Institute of Agronomy of Tunisia. 1082 Cité Mahrajène, University of Carthage. Tunisia

Correspondence
Essia Limam
Ministry of Agriculture, Water Resources and Fisheries, Tunisia

Pest thrips infesting citrus orchards in the South-East region of Tunisia

Sabrine Attia, Sirine Khouja, Imen Belaam Kort, Essia Limam, Mohammed Ammar and Kaouthar Grissa Lebdi

Abstract
Thrips are important pests that can cause significant yield losses in many agricultural crops, including citrus, vine, vegetables, and fruits. In this paper, populations of thrips were monitoring during 2012 and 2013 in a citrus orchards in the region of Takelsa using blue sticky traps and Wikly weeds and flower samples. Samplings from citrus in Takelsa revealed 6 thrips species. The most frequently captured species were *Thrips major*, *Frankliniella occidentalis T. tabaci*, *Leptothrips* sp, *Karnyothrips sp*, and *Haplothrips sp*. The most abundant species were *T. major* Uzel with 69.66% and *F. occidentalis* Pergande with 22.47%. Dynamic populations of *T. major* species was also studied showing that they started to appear with low number in spring when flowering began, whereas the largest catches were registered during the summer months at favorable climatic conditions period of falling petals and fruit formation.

Keywords: Thrips, citrus orchards, mass trapping, climatic conditions

1. Introduction
Citrus in Tunisia has a very important place in the agricultural sector and it plays a strategic role to which the governance attaches great importance. However, citrus is very susceptible to many pests such as mealybugs (*Planococcus citri*, *Icerya purchasi* and *Aonidiella aurantii*) aphids (*Aphis spiraecola*, *Toxoptera aurantii* etc,…), the citrus leafminer *Phyllocnistis citrella*, the fruit fly *Ceratitis capitata* which is considered to be one of the most important pests for citrus fruits [1]. Many thrips species may cause damage on citrus in Tunisia such as the western flower thrips *Frankliniella occidentatlis* Pergande [2] which is a polyphagous thrips species associated with many other cultivated plants including vegetable crops such as pepper, bean and tomato [3, 4] and ornamental cultures such as chrysanthemum and rose [5, 6]. As we know, few information are available about biology and ecology of thrips in citrus orchards, probably because thrips are considered as secondary pests of citrus since they did not cause severe visible damage on citrus [7]. In addition to *F. occidentalis*, many thrips species were reported on citrus and weeds and may be present in citrus orchards [2, 7]. Therefore, the aim of this work was to provide an inventory of thrips species in citrus orchards and to study the dynamic of the dominant thrips species in relation with the phenology of the host plant.

2. Materials and Methods
2.1 Experimental site
Studies were conducted during 2012 to 2013 on citrus orchards covering 1 ha area in the region of Takelsa (Governorate of Nabeul). This Orchard was established with 6 years old 'Maltaise' cultivar citrus trees by 4 × 6 m distance.

2.2 Environmental parameter monitoring
Takelsa has a Mediterranean climate with relatively mild winters and hot summers. The Climatic factors (temperature and relative humidity) were monitored weekly with a thermo hygrograph (figure 1).

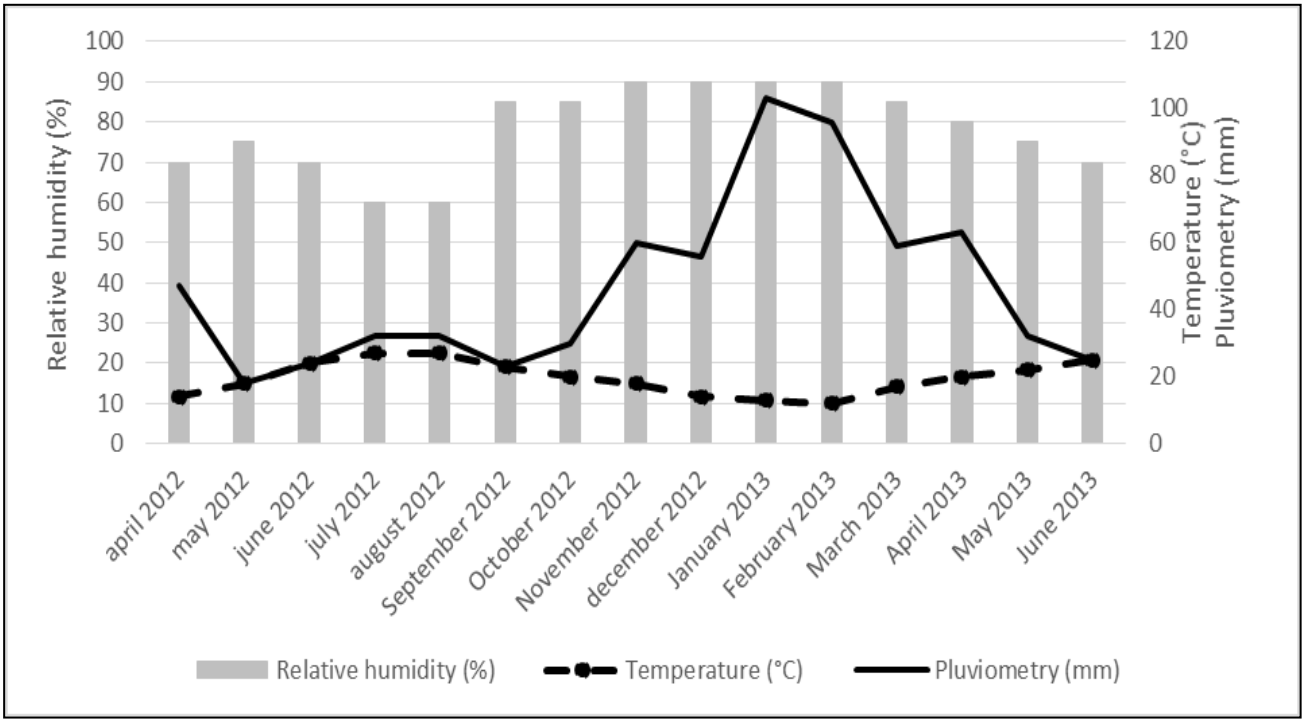

Fig 1: Temperature, Relative humidity and pluviometry in orchards in the region of Takelsa (Nabeul, Tunisia) during 2012 and 2013

2.3 Adult thrips trapping

Thrips population monitoring was carried out using blue and yellow sticky traps (Koppert, the Netherlands), renewed weekly, installed between central rows and suspended in the north at a height of 1.5 m above the trees.

One yellow sticky traps and one blue sticky traps were installed from 02/04/2012 till 18/06/2012 in the orchard, then, two blue sticky traps were installed from 11/09/2012 till 21/06/2013.

2.4 Flower and weeds sampling

Monitoring of thrips populations on the flowers and weeds was done randomly through a weekly sampling of 30 flowers and 50 weeds from the different plants in each plot. Sampling took place on 04 March 2013 till 22 June 2013.

Samples were immediately examined and counted in the laboratory under a binocular microscope to assess the density of thrips species. Collected thrips were immediately stored in vials with 10° alcohol and examined with a phase contrast microscope after slide preparations with Hoyer's mountant.

2.5 Thrips identification

Identification of thrips individual found on citrus in the region of Takelsa was made based on keys of Brodsgaard [8] and Palmer *et al*. [9].

The thrips species were classified according to Kucharczyck *et al*. (10) into the following groups: eudominants (>10%), dominants (5.1% to 10%), subdominants (2.1 to5%), recedents (1 to 2%) and subrecedents (lower than 1%).

3. Results and Discussion

3.1 Monitoring of climatic conditions in the experimental site

Climatic conditions monitoring in the citrus orchards in the region of Takelsa varied throughout the study period; the highest average temperature (figure 1) was of about 29°C was registered on 12th August 2012, while the lowest average temperature which was 17°C was observed on February 13th 2013.

Concerning RH (figure 1), mean values registered were highly elevated since the beginning of prospecting which was about 70% on 12th April 2012. Beyond this phase, the HR tended to increase progressively over the next months to reach 90% on 12th November 2012 until 13th February 2013, after which date RH tended to decrease with the lowest average recorded on 13th June 2013 with 70%.

On the other hand, the pluviometry are lower (34 mm) on April 2012 and arrives at a maximum in January 2013 with 160 mm. Then, the pluviometry are decreased (80 mm) on April 2013 and (0mm) on June 2013.

3.2 Occurrence of thrips species

Samplings from citrus in Takelsa revealed 6 thrips species. The most frequently captured species were *T. major*, *F. occidentalis T. tabaci*, *Leptothrips* sp, *Karnyothrips sp*, and *Haplothrips sp.*

3.3 Identification

Samplings from citrus in Takelsa by beating and flower sampling during all the period of study revealed 6 thrips species. The most frequently captured species were, *T. major*, *F. occidentalis T. tabaci*, *Leptothrips* sp, *Karnyothrips sp*, and *Haplothrips sp.*

Among these species, three belong to the suborder Terebrantia: *T. major* (Uzel, 1895), *T. tabaci* (Lindeman, 1889), and *F. occidentalis* (Pergande, 1895), and three belong to Tubulifera: *Haplothrips* sp.,, *Leptothrips* sp. and *Karnyothrips* sp.

During period of sampling, a total of 89 specimens were captured. According to the identification, the species were classified into phytophagous and predators. The first one was *T. major* followed by *F. occidentalis* and *T. tabacci*. The thrips species included three predators Leptothrips sp., *Karnyothrips sp.* and *Haplothrips sp.*

Table 1: Thrips species composition collected in the citrus orchard in the region of Takelsa during 2012 and 2013.

	Number of thrips	%	Dominance
Thrips major	62	69.66	+++++
Frankliniella occidentalis	20	22,47	+++++
Thrips tabaci	4	4,49	+++
Leptothrips sp.	1	1,12	++
Haplothrips sp.	1	1,12	++
Karnyothrips sp.	1	1,12	++
Total	89	100	-

Legend: (+++++): Eudominant, (++++): Dominant, (+++): sub-dominant, (++) Recedent

Our results showed that *T. major* and *F. occidentalis* were classified as eudominant thrips species. The most abundant was *T. major* with 69.66%, followed by *F. occidentalis* with 22.47%. *T. tabaci* was classified as dominant species with 4.49% of the total thrips number. Regarding thrips predators, results demonstrated that *Haplothrips sp., Karnyothrips sp.* and *Leptothrips sp.* were classified as a Recedent species with 1.12 % of the total thrips number (Table 1).

3.4 Population dynamics in citrus orchards (trapping)

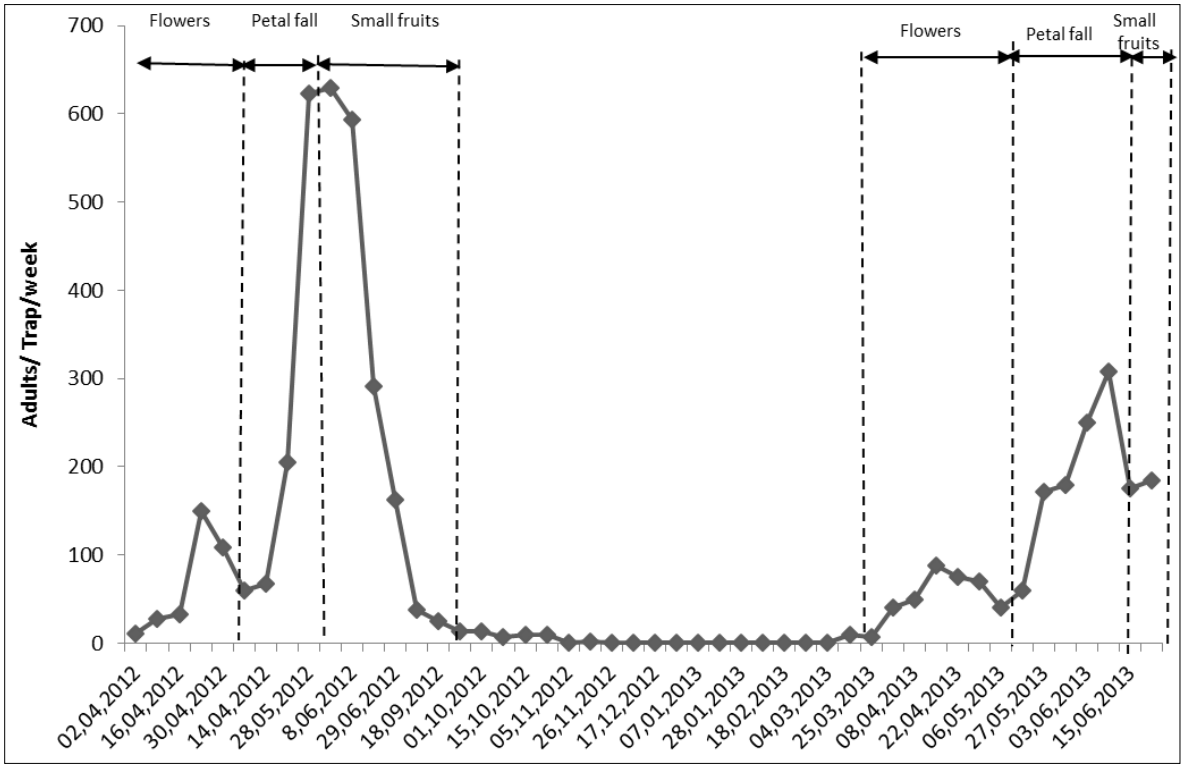

Fig 2: Evolution of *T. major* adults (male and female) on blue sticky traps in citrus orchards in the region of Takelsa during 2012 and 2013

Since *T. major* was the most abundant species in citrus orchards in Takelsa, the study of the dynamic of thrips focuses on this species. The adult population of *T. major* showed 2 generations: the first during the first decade of April and the second in the end of May-early June. The first generation, more discreet 150 and 88 individuals/ Trap/ week for 2012 and 2013 respectively occurred during period of flowering of Citrus. The second generation was the most significant with 623 and 308 individuals/Trap/ week for 2012 and 2013 respectively. This generation occured at the petal fall. Third generation could be observed in 2013. It occured at small fruits with about 185 individuals/Trap/ week (figure 2). Adults started to appear with low number in spring when flowering began, whereas the largest catches were registered during the summer months at favorable climatic conditions period of falling petals and fruit formation (Figure 1). Trap catches during the autumn-winter were low, and increased steadily in spring in parallel with the increasing of the temperature values (Figure 1). Population dynamics of thrips indicated the occurrence of 2 generations from April 2012 to May 2013 (Figure 1). In autumn-winter period, the proportion of all stages of thrips was almost constant. The population density was low due to a slow development period (Figure 1). The infestation level increase progressively in the spring and summer due to high temperatures unregistered which reached at 29°C. As example, on 1 June 2012, the number of thrips adults recorded was 630 per trap.

Two generations appeared during the same period, but the level of the thrips populations is the most important during the 2012 campaign. This can be explained by the light rainfall in April 2012 and their abundance during that same period 2013. Our results are in agreement with Belaam and Boulahia-Kheder [11]. They found that the most common species captured in citrus orchards was *T. major* with 90% of the total number of thrips compared with *F. occidentalis* represented with only 2.6%. According Elimem and Chermiti [2], *F. occidentalis* is a very common species in citrus orchards in Tunisia exceeding 32.97%. It is considered the most abundant species on citrus in Florida, Tunisia, Turkey and Spain respectively [7, 12, 13, 14] that causes pre-mature flower drop and

decrease yield of oranges [7, 15, 16, 17]. It is also a pest on other crops in Tunisia including pepper, tomato, onion melon, and rose [2]. Concerning the other thrips species founded in the region of Takelsa (table 1), most of them are were mentionned by many authors to be present in citrus orchards [2, 7, 14, 17]. Finally, the findings of this research were an important contribution for a best knowledge of species composition and seasonal dynamic populations of thrips in citrus orchards in in the South-East region of Tunisia. Nevertheless, it must be completed by a survey on citrus in other regions such as south of Tunisia. Moreover, this research has shown that *T. major* is the most common species captured in citrus orchards. More investigations and surveys are needed to understand the elucidate factors that allow an increase of *T. major* populations in this region.

References

1. Papadopoulous NT, Papachristos D, Ioannou C. Citrus Fruits and the Mediterranean fruit fly. International Citrus Congress. Eds: B. Sabater-Muñoz *et al*. Acta horticulturae. 1065, ISHS 2015. 2015, 1009-1018.
2. Mohamed E, Chermiti B. Thrips species composition and seasonal dynamic populations in an organic citrus orchard in the central eastern coat of Tunisia. Integrated control in citrus Fruit Crops. IOBC-WPRS Bulletin. 2013; 95:77-82.
3. González-Zamora JE, Garcia-Marí F. The efficiency of several sampling methods for *Frankliniella occidentalis* (Thysan. Thripidae) in strawberry flowers. Journal of Applied Entomology. 2003; 127(9, 10):516-521.
4. Papadaki M, Harizanova V, Bournazakis A. Influence of host plant on the population density of *Frankliniella occidentalis* pergande (Thysanoptera, Thripidae) on different vegetable cultures in greenhouses. Bulgarian Journal of Agricultural Science. 2008; 14(5):454-459.
5. Chau A, Heinz KM. Manipulating fertilization, a management tactic against *Frankliniella occidentalis* on potted *Chrysanthemum*. Entomologia Experimentalis et Applicata. 2006; 120(3):201-209.
6. Yudin L, Cho J, Mitchell W. Host range of western flower thrips, *Frankliniella occidentalis* (Thysanoptera, Thripidae), with special reference to *Leucaena glauca*. Environmental Entomology. 1986; 15(6):1292-1295.
7. Belaam I, Boulahia Kheder S. Inventory of Thrips Species in Citrus Orchards and Assessment of Scarring Fruits in two Citrus Producing Regions of Tunisia. Tunisian Journal of Plant Protection. 2012; 7(1):1-9.
8. Brodsgaard HF. Coloured sticky traps for *Frankliniella occidentalis* (Pergande) (Thysanoptera, Thripidae) in glasshouses. Journal of Applied Entomology. 1989; 107(1-5):136-140.
9. Palmer JM, Mound LA, Du Heaume GJ. CIE guides to insects of importance to man. 2. Thysanoptera. CAB Internatinal Institute of Entomology. 56 Queen's Gate, London, SW7 5JR, UK, 1989, 73.
10. Kucharczyk H, Bereś PK, Dąbrowski ZT. The species composition and seasonal dynamics of thrips (Thysanoptera) populations on maize (*Zea mays* L.) in southeastern Poland. Journal of Plant Protection Research. 2011; 51(3):210-216.
11. Belaam-Kort I, Boulahia-Kheder S. Thrips in citrus orchards, emerging pests in Tunisia. Faunistic Entomology. 2017; 70:77-87.
12. Childers CC, Nakahara S. Thysanoptera (thrips) within citrus orchards in Florida: Species distribution, relative and seasonal abundance within trees, and species on vines and ground cover plants. Journal of Insect Science. 2006; 6(1-19):3-7.
13. Teksam I, Tunç I. An analysis of Thysanoptera associated with citrus flowers in Antalya, Turkey. Composition, distribution, abundance and pest status of species. Applied Entomology and Zoology. 2009; 44:455-464.
14. Navarro CC, Pastor MP, Ferragut F, Marí FG. Thrips (Thysanoptera) Asociados a Parcelas de Citricos en la Comunidad Valenciana: abundancia, evolución estacional y Distribución Espacial. Boletin de Sanidad Vegetal. Plagas, 2008; 34:53-64.
15. Childers CC, Achor DS. Feeding and oviposition injury to flowers and developing floral buds of 'Navel' orange by *Frankliniella bispinosa* (Thysanoptera: Thripidae) in Florida. Annals of the Entomological Society of America. 1991; 84(3):272-282.
16. Childers CC, Achor DS. Thrips Feeding and Oviposition Injuries to Economic Plants, Subsequent Damage and Host Responses to Infestation. In: Parker BL, Skinner M, Lewis T. Thrips Biology and Management. Edn 1, Springer US, New York, 1995; 276:31-51.
17. Trabelsi I, Boulahia Kheder S. Sur la présence en Tunisie du thrips des agrumes *Pezothrips kellyanus* (Thysanoptera: Thripidae). Annales de l'INRAT. 2009; 82:181-186.