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SPECIES OF THRIPS (THYSANOPTERA) IN AVOCADO ORCHARDS IN NAYARIT, MÉXICO

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ABSTRACT

This study was conducted in 3 different counties (Tepic, Xalisco and San Blas) of the avocado growing area of Nayarit. For identification of species, thrips collections were conducted during 2008 using knockdown and net sweeping techniques. A total of 72 species were captured, 10 of which were phytophagous of which the most prevalent was *Heliothrips haemorrhoidalis* (Bouché) (13.42%); 16 were predaceous of which the most prevalent was *Franklinothrips vespiformis* (D. L. Crawford) (8.26%) and 46 species (26.83%) were considered occasional visitors. Species registered for the first time in Mexico were as follows: *Heterothrips xolismae* Hood 1936; *H. pubescens* Hood 1934; *Frankliniella ramirezi* Mound & Marullo 1996; *F. sandovalensis* Retana 1998 and *Macrophthalmothrips heinzei* Mound 1972.

Key Words: Thysanoptera, phythophagous, predaceous, visitors, new records

RESUMEN

El estudio se llevó a cabo en tres diferentes municipios (Tepic, Xalisco and San Blas) de la región productora de aguacate de Nayarit. Para la identificación de especies de thrips, se hicieron recolectas durante 2008 utilizando al derribo y redeo como técnicas de muestreo. Se capturaron un total de 72 especies, de las cuales 10 fueron fitófagas, siendo la más abundante *Heliothrips haemorrhoidalis* (Bouché) (13.42%); 16 fueron depredadoras siendo *Franklinothrips vespiformis* (D. L. Crawford) (8.26%) la más abundante y 46 especies (26.83%) fueron consideradas visitadoras incidentales. Se dan a conocer los primeros registros para México de las siguientes especies: *Heterothrips xolismae* Hood 1936; *H. pubescens* Hood 1934; *Frankliniella ramirezi* Mound & Marullo 1996; *F. sandovalensis* Retana 1998 and *Macrophthalmothrips heinzei* Mound 1972.

Translation provided by authors.

México is the main producer of avocado worldwide, with an annual production of 1,124, 565 tons harvested from 114,471 ha (FAOSTAT 2008) in 26 states. Nayarit is the second largest producer within a production area of 2,703 ha (SIAP 2009). The counties of Nayarit with the largest avocado acreage planted are Tepic, Xalisco and San Blas. The crop presents a large diversity of thrips species (Cambero et al. 2010), which are considered important pests because they cause lesions on leaves, flowers and fruits (González et al. 2000). Studies performed on avocado in Nayarit by Cambero et al. (2010) showed the presence of 40 species associated with the avocado crop just in Xalisco. This study was performed with the following objectives: a) to determine thrips species associated with avocado in the counties of Tepic, Xalisco and San Blas, Nayarit, and b) to learn their importance as avocado pests, and their predaceous habits.

MATERIALS AND METHODS

Captured thrips were monitored weekly by sampling from Jan to Dec 2008 in 5 commercial avocado orchards located in Tepic, Xalisco and San Blas, Nayarit. In Tepic, collections were conducted in 2 orchards planted to the 'Hass' cultivar, the first at the Ejido Camichin de Jauja named 'Tintilagua' (21°29 × 18.5"N, 104°46 × 18.4"W, 1,117 masl), and the second at 'El Fortin' at Ejido Venustiano Carranza (21°31

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TABLE 1. PHYTOPHAGOUS THRIPS SPECIES COLLECTED IN AVOCADO GROVES IN XALISCO, TEPIC AND SAN BLAS, COUNTIES OF NAYARIT.

Species	Number of specimens					Total	%
	Cha	Car	For	Tin	Ced		
Frankliniella invasor Sakimura 1972T	—	2	2	7	8	19	2.45
Heliothrips haemorrhoidalis (Bouché 1833)T	9	26	28	—	41	104	13.42
Neohydatothrips signifer (Priesner 1932)T	7	2	—	1	1	11	1.42
Neohydatothrips gracilipes (Hood 1924)T	4	30	15	12	3	64	8.26
Scirtothrips bisbravoae Johansen 1983T	—	1	7	—	—	8	1.03
Selenothrips rubrocinctus (Giard 1901)T	—	—	—	—	6	6	0.77
Pseudophilothrips perseae (Watson 1923)P	—	—	—	—	2	2	0.26
Pseudophilothrips sp. 1P	—	—	1	—	14	15	1.93
Pseudophilothrips sp. 2P	—	2	3	—	18	23	2.97
Pseudophilothrips sp. 3P	—	14	5	—	2	21	2.71
Total 10	20	77	61	20	95	273	35.22%

Avocado groves where specimens were sampled: Cha - Chapula, Car - Carbonera, For - Fortín, Tin - Tintilagua, and Ced-Cedro. [T]Thripidae, [P]Phlaeothripidae.

× 00.5”N, 104°58 × 57.8”W, 1,099 masl). In Xalisco 2 orchards of the cultivar Hass were sampled, i.e., ‘La Chapula’ at Ejido Xalisco (21°25 × 09.4”N, 104°54 × 53.9”W 1,035, masl), and ‘La Carbonera’ at Ejido El Cuarenteño (21°27 × 34.1”N, 105°00 × 19.1”W 1,787, masl). In San Blas samples were taken in the orchard ‘El Cedro’ at Ejido Mecatan (21°32 × 47.4”N, 105°08 × 23.1”W, 384 masl), which was planted to the ‘Choquette’ and ‘Hall’ cultivars.

Knockdown sampling and sweep netting were used (Cambero et al. 2010) to collect thrips from trees as well as from weeds within the orchards. The insects collected were placed in 5 cc transparent plastic vials containing 70% ethyl alcohol, and taken to the Entomology Laboratory of the Universidad Autónoma Agraria Antonio Narro, where thrips were mounted and identified according to Johansen & Mojica (1997).

TABLE 2. PREDACEOUS SPECIES OF THRIPS COLLECTED IN AVOCADO GROVES IN XALISCO, TEPIC AND SAN BLAS, COUNTIES OF NAYARIT.

Species	Number of specimens					Total	%
	Cha	Car	For	Tin	Ced		
Aeolothrips mexicanus Priesner 1924[A]	5	3	4	2	—	14	1.80
Erythrothrips durango Watson 1924 [A]	9	12	9	9	4	43	5.55
Franklinothrips lineatus Hood 1949 [A]	—	6	4	1	—	11	1.42
Franklinothrips orizabensis Johansen, 1974[A]	6	20	20	10	—	56	7.22
Franklinothrips vespiformis (D. L. Crawford 1909)[A]	8	6	12	17	21	64	8.26
Franklinothrips caballeroi Johansen 1980[A]	—	—	—	1	—	1	0.13
Franklinothrips **sp. nov.**[A]	1	—	1	2	2	6	0.77
Scolothrips sexmaculatus (Pergande 1894)[T]	4	1	1	4	—	10	1.30
Leptothrips astutus Johansen 1978[P]	—	—	1	—	—	1	0.13
Leptothrips longicapitis Johansen 1987[P]	—	5	2	1	—	8	1.03
Leptothrips obesus Johansen 1987[P]	1	1	—	—	—	2	0.26
Leptothrips primigenus Johansen 1987[P]	15	25	11	9	3	63	8.13
Leptothrips **sp. nov.** 2[P]	1	1	1	—	—	3	0.39
Leptothrips **sp. nov.** 3[P]	—	—	—	1	1	2	0.26
Leptothrips **sp. nov.** 4[P]	2	1	—	—	—	3	0.39
Trybomia brevitubus (Moulton 1929)[P]	—	—	—	2	5	7	0.90
Total 16	52	81	66	59	36	294	37.93

Avocado groves where specimens were sampled: Cha - Chapula, Car - Carbonera, For - Fortín, Tin - Tintilagua, and Ced-Cedro. [A]Aeolothripidae, [T]Thripidae, [P]Phlaeothripidae.

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TABLE 3. OCCASIONAL VISITOR SPECIES OF THRIPS COLLECTED IN AVOCADO GROVES IN XALISCO, TEPIC AND SAN BLAS, COUNTIES OF NAYARIT.

Species	Number of specimens					Total	%
	Cha	Car	For	Tin	Ced		
Heterothrips xolismae Hood 1936[H*]	—	10	—	—	—	10	1.30
Heterothrips pubescens Hood 1934[H*]	—	1	1	—	—	2	0.26
Chirothrips spiniceps (Hood 1915)[T]	—	—	—	—	1	1	0.13
Bregmatothrips **sp. nov.**[T]	1	—	—	—	—	1	0.13
Caliothrips punctipennis (Hood 1912)T	1	3	—	1	3	8	1.03
Caliothrips **sp. nov.** [T]	—	—	2	—	—	2	0.26
Ceratothripoides silvestris Hood 1935[T]	—	—	1	2	—	3	0.38
Chaetisothrips reticulatus (D. L.Crawford 1910)[T]	—	—	1	—	—	1	0.13
Echinothrips mexicanus Moulton 1911[T]	1	—	—	3	1	5	0.65
Exophtalmothrips chiapaensis Johansen 1980[T]	—	—	—	—	1	1	0.13
Frankliniella aurea Moulton 1948[T]	—	—	—	1	—	1	0.13
Frankliniella cephalica (D. L. Crawford 1910)[T]	4	—	1	—	3	8	1.03
Frankliniella fulvipes Bagnall 1919[T]	1	2	3	5	2	13	1.68
Frankliniella gardeniae Moulton 1948[T]	1	5	5	12	3	26	3.35
Frankliniella insularis (Franklin 1908)[T]	—	—	2	1	1	4	0.52
Frankliniella minuta (Moulton 1907)[T]	—	1	—	1	2	4	0.52
Frankliniella microchaeta Retana, Cambero, Sánchez & Rodríguez 2010[T]	—	2	1	—	—	3	0.38
Frankliniella ramirezi Mound & Marullo 1996T*	—	—	1	—	—	1	0.13
Frankliniella rostrata Priesner 1932[T]	1	—	—	1	1	3	0.38
Frankliniella **sp. nov.** 1[T]	3	—	—	—	—	3	0.38
Frankliniella **sp. nov.** 2[T]	—	2	2	2	1	7	0.90
Frankliniella **sp. nov.** 3[T]	1	—	—	—	—	1	0.13
Frankliniella **sp. nov.** 4[T]	1	2	—	1	1	5	0.65
Frankliniella **sp. nov.** 5[T]	1	—	—	1	1	3	0.38
Frankliniella **sp. nov.** 6[T]	—	—	—	—	1	1	0.13
Frankliniella **sp. nov.** 7[T]	—	3	1	6	2	12	1.54
Frankliniella nr. *musaeperda* **sp. nov.**[T]	—	1	—	—	—	1	0.13
F*rankliniella sandovalensis* Retana 1998[T]*	1	—	1	—	1	3	0.38
Humbolthrips incomparabilis Johansen 1983[T]	—	1	—	—	—	1	0.13
Humbolthrips piperaffinis Johansen 1986[T]	1	—	—	—	—	1	0.13
Leucothrips nigripennis Reuter 1904[T]	—	7	—	—	1	8	1.03
Microcephalothrips abdominalis (D. L. Crawford 1910)[T]	—	—	2	—	4	6	0.77

Avocado groves where specimens were sampled: Cha - Chapula, Car - Carbonera, For - Fortín, Tin - Tintilagua, and Ced-Cedro.
[T]Thripidae, [P]Phlaeothripidae.
*New record for México.

TABLE 3. (CONTINUED) OCCASIONAL VISITOR SPECIES OF THRIPS COLLECTED IN AVOCADO GROVES IN XALISCO, TEPIC AND SAN BLAS, COUNTIES OF NAYARIT.

Species	Number of specimens					Total	%
	Cha	Car	For	Tin	Ced		
Microcephalothrips **sp. nov.**[T]	—	—	—	—	1	1	0.13
Neohydatothrips **sp. nov.** 1[T]	2	13	—	1	—	16	2.06
Neohydatothrips **sp. nov.** 2 nr.[T]	1	—	2	—	1	4	0.52
Scirtothrips **sp. nov.**[T]	—	3	13	1	3	20	2.58
Gen. nov. 1[T]	—	—	—	1	—	1	0.13
Allothrips megacephalus mexicanus Stannard 1955[P]	—	1	—	—	—	1	0.13
Elaphrothrips affinis (Bagnall 1908)[P]	—	—	1	—	—	1	0.13
Elaphrothrips angusticeps (D. L. Crawford 1910)[P]	1	—	—	—	3	4	0.52
*Elaphrothrips laevicollis (*Bagnall 1910)[P]	—	—	—	—	3	3	0.38
Haplothrips gowdeyi (Franklin 1908)[P]	—	—	1	1	—	2	0.26
Macrophthalmothrips helenae Hood 1934[P]	—	1	—	—	2	3	0.38
Macrophthalmothrips heinzei Mound 1972[P]*	—	1	—	—	—	1	0.13
Terthrothrips **sp. nov.**[P]	—	1	—	—	—	1	0.13
Gen. nov. 3[P]	—	1	—	—	—	1	0.13
TOTAL 46	22	61	41	41	43	208	26.83

Avocado groves where specimens were sampled: Cha - Chapula, Car - Carbonera, For - Fortín, Tin - Tintilagua, and Ced-Cedro.
[T]Thripidae, [P]Phlaeothripidae.
*New record for México.

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Results and Discussion

A grand total of 9,428 thrips of different stages were collected during this research. A total of 775 thrips adults in good condition were identified, which represented 8.22% of the grand total of captured specimens. The 775 thrips adults belong to 72 species. Ten species (273 specimens) were phytophagous (Table 1), 16 predaceous (Table 2) and 46 occasional visitors (Table 3).

The phytophagous species are those that feed on avocado trees and are commonly established on them. Johansen et al. (2007) reported 33 species in Mexico that can cause injury to avocado trees. In this research 10 species were found with such injurious habits (Table 1). *Heliothrips haemorrhoidalis* (Bouché) was the most abundant phytophagous species (13.42% of the total). Mound & Marullo (1996) observed that males of this species are very rare, and very few specimens are available in insect collections. In this work 24 *H. haemorrhoidalis* adult males were found. *Scirtothrips perseae* Nakahara is the most important pest of avocados of Mexico (Johansen et al. 2007). However, in this research it was not detected.

Sixteen predaceous species were detected (Table 2). Johansen et al. (2007) recognized 10 predaceous thrips species related to avocado agroecosystems. In this study the most representative were *Franklinothrips vespiformis* (D. L. Crawford) (8.26%), followed by *Leptothrips primigenus* Johansen (8.13%) and *Franklinothrips orizabensis* Johansen (7.22%). The rest of the species ranged from 0.13% to 5.5% of the total of 775 collected (Table 2). Several members of *Franklinothrips* are considered as successful biological control agents against thrips plant pests (Loomans & Vierbergen 1999). Hoddle et al. (2008) reported that *Scolothrips sexmaculatus* (Pergande) is found particularly in fruit trees and considered to be a significant mite predator comparable to various *Leptothrips* species.

Forty six visitor species were identified (Table 3). They are considered to be visitors because of their only occasional presence on avocado trees. Johansen et al. (2007) listed 40 visitor species that are phytophagous and that live on weeds within and around the orchards, or are transported by the wind as aerial biological material and dispersed into orchards. The mycophagous species within vegetable debris are also occasional visitors, and they include species in the *Allothrips, Elaphrothrips, Macrophthalmothrips* and *Terthrothrips genera*.

Frankliniella was the genus with the largest number of species (18), followed by *Elaphrothrips* (3). Within the genera *Heterothrips, Caliothrips, Humbolthrips, Microcephalothrips, Neohydatothrips* and *Macrophthalmothrips* 2 species of each. It is important to point out the presence of 19 new species (**sp. nov.**) and 2 genera new to science (**Gen. nov.**); all are now in the process of description.

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