Colegio de Postgraduados

Presence of flower thrips *Frankliniella schultzei* in ornamental plants

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ABSTRACT
Objective: To report on the presence of *Frankliniella schultzei* in geranium (*Pelargonium hortorum*) and periwinkle (*Catharanthus roseus*) plants in greenhouses in the State of Morelos, Mexico.
Design/Methodology/Approach: We sampled geranium and periwinkle plants in greenhouses in the municipality of Jojutla, Morelos, Mexico. The collected specimens —of light to dark brown color— were processed, mounted on glass slides to be observed through a conventional light microscope, and identified with taxonomic keys.
Results: The specimens collected in the geranium and periwinkle plants presented morphological traits that conform to the species *Frankliniella schultzei*.
Study limitations/Implications: Monitoring the species is necessary because its presence has been identified in at least two regions of Mexico: West and Center.
Findings/Conclusions: *Frankliniella schultzei* had only been located in western Mexico. This report shows that the species is also found in the central region of the country.

Keywords: Morphology, Vector, Pest.

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INTRODUCTION

Frankliniella schultzei, also known as common flower thrips, is a thrips species with polyphagous habits. Specimens have been morphologically identified in light and dark tones, but their ability to transmit viruses and their geographical distribution are different (Kakkar *et al.*, 2010). Light-colored thrips live mainly north of the equator, while dark-colored ones are found south of the equator (Vierbergen and Mantel, 1991). There are records associating *F. schultzei* with 83 plant species distributed in 35 families; this species is considered a pest of several crops in different parts of the world. Its presence has been reported in vegetables (Feliciano *et al.*, 2008; Kakkar *et al.*, 2012), fruit trees (Carvalho *et al.*, 2020), and ornamentals (Carrizo *et al.*, 2008; Jiménez *et al.*, 2006). In Hawaii, for

example, certain crops are at high risk since *F. schultzei* is a quarantine pest (Yalemar *et al.*, 2001). Studies on the damage and losses caused by this species of thrips show that in melon crops, for instance, the yield dropped by 46% (Diamantino *et al.*, 2021), while in bell pepper crops, the losses amounted to 49% (Da S. Paes *et al.*, 2019).

This species is a notorious vector for the following viruses: Chrysanthemum stem necrosis virus (CNSV), Groundnut bud necrosis virus (GBNV), Groundnut ringspot virus (GRSV), Groundnut yellow spot virus (GYSV), Tomato chlorotic spot virus (TCSV) and Tomato spotted wilt virus (TSWV), as well as Impatiens necrotic spot virus (INSV), all of them belonging to the Tospovirus genus. The dark variant of *F. schultzei* is a competent vector for all these tospoviruses, unlike the light variant, which is not (Reitz *et al.*, 2011). Regarding economic losses due to these viruses, Sevik and Arli-Sokmen (2012) reported that TSWV caused a 42.1% decrease in tomato yield and a 95.5% drop in its commercial value, with estimated losses of around one million dollars in Turkey. In Georgia, USA, losses and economic costs caused by thrips and TSWV in tomato and pepper crops are estimated at over 60% (Reitz, S., and Funderburk, J., 2012).

Likewise, *F. schultzei* has been reported in ornamentals such as *Lathyrus latifolius*, *Tropeaelum majus* (Carrizo *et al.*, 2008), *Chrysanthemum coronarium*, *Mirabilis jalapa*, *Polianthes tuberosa* (Surís and González, 2008), *Hibiscus rosasinensis*, *Vigna caracalla*, *Ipomoea cairica* (Milne and Walter, 2000), *Dimorphotheca ecklonis*, *Lilium* spp., *Jasminum* spp., *Dianthus caryophyllus*, *Dahlia* spp., and *Tagetes erecta* (Jiménez *et al.*, 2006). In Mexico, the first report of *F. schultzei* dates from 2017, with specimens identified in western Mexico: Jalisco and Sinaloa (Johansen-Naime *et al.*, 2017). Until now, there was no other record of this species in the country.

MATERIALS AND METHODS

We conducted two samplings of geranium (*Pelargonium hortorum*) and periwinkle (*Catharanthus roseus*) plants from greenhouses in the municipality of Jojutla, Morelos, Mexico. The samplings took place in November 2020 and June 2021, when the plants were in bloom. To obtain the thrips, mainly from the flowers, we used the tapping technique. The thrips fell on a white sheet, and we collected them with an insect aspirator. We placed the thrips in 70% alcohol until processing them for mounting.

We completed progressive hydration of the thrips in alcohol concentrations of 90%, 80%, 70%, 60%, and 50% for 30 min each. Afterward, they spent two hours in 30% alcohol to be subsequently transferred to 5% NaOH for 20 minutes. With an entomological pin, we perforated their abdomen and massaged to eliminate all intestinal residue. Then they went through progressive dehydration, this time with different timings for each concentration: 50%, 50 min; 60%, 40 min; 70%, 30 min; 80%, 20 min; 90%, 10 min; 100%, 5 min. They were finally left in clove oil for 30 min (Palmer and Mound 1990). For the mounting process, a drop of Canada balsam was added on a slide for each specimen, and the preparations were allowed to dry at 40 °C for one week.

The morphological identification of the specimens was conducted at the Centro de Investigación en Estructuras Microscópicas of the Universidad de Costa Rica (CIEMic-UCR), using the species stored in the Thysanoptera Collection of said institution as

reference and employing the taxonomic keys of Mound and Marullo (1996), and Palmer *et al.* (1989).

RESULTS AND DISCUSSION

We obtained a total of 79 specimens, of which we selected 40 for mounting, and taxonomically identified 12, which coincided with the *F. schultzei* species description. All the thrips identified as *F. schultzei* were dark brown females. They had eight-segmented antennae (Figure 1), with metanotal campaniform sensilla absent. The pair of ocellar III setae appeared between the anterior margins of the posterior ocelli, and the comb on tergite VIII was absent (Figure 2).

Figure 1. Dorsal view of *Frankliniella schultzei* (female).

Figure 2. Setae: ioIII: interocular III, poIV: postocular IV, am: anteromarginal, I-III: antennal segments I-III; VII-IX: tergites VII-IX; single arrow: pedicel; double arrow: barely noticeable lateral comb teeth.

According to Vierbergen and Mantel (1991), the tropics and subtropics are the most suitable regions for *F. schultzei*. Therefore, Mexico is a country with an adequate climate for the development of this pest. Although these authors mention that the dark-colored specimens of the species can be found mainly south of the equator, Kakkar *et al.* (2012) have reported dark brown *F. schultzei* in southern Florida.

CONCLUSIONS

Our findings place the common flower thrips *F. schultzei* for the first time in central Mexico and for the second time in the country as a whole. *F. schultzei* is a potential pest for various crops in different states of the Mexican territory. The species would directly affect the crops due to the damage caused by both larvae and adults, as well as their ability to transmit tospoviruses. With this report, we raise alerts to intensify the monitoring of the species and the research on its population and seasonal dynamics.

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REFERENCES

Carrizo, P., Gastelú, C., Longoni, P., y Klasman, R. (2008). Especies de trips (Insecta: Thysanoptera: Thripidae) en las flores de ornamentales. *Idesia, 26*(1), 83–86.

Carvalho, S. C., Junior, P. A. S., Pereira, P. S., Sarmento, R. A., Farias, E. S., Lima, C. H. O., Santos, G. R., y Picanço, M. C. (2020). Spatial Distribution of *Frankliniella schultzei* (Thysanoptera: Thripidae) in Open-Field Yellow Melon, with Emphasis on the Role of Surrounding Vegetation as a Source of Initial Infestation. *Journal of Economic Entomology, 113*(6), 2997–3003. https://doi.org/10.1093/jee/toaa219

Da S. Paes, J., A. de Araújo, T., S. Ramos, R., João, J. R., C.R. de Araújo, V., y C. Picanço, M. (2019). Economic injury level for sequential sampling plan of *Frankliniella schultzei* in bell pepper crops. *Crop Protection, 123*(May), 30–35. https://doi.org/10.1016/j.cropro.2019.05.011

Diamantino, M. L., Soares Ramos, R., de Almeida Sarmento, R., Silvestre Pereira, P., y Coutinho Picanço, M. (2021). Decision-making system for the management of *Frankliniella schultzei* thrips in commercial melon fields. *Crop Protection, 139*(January 2020), 105346. https://doi.org/10.1016/j.cropro.2020.105346

Feliciano, M., Cabrera-Asencio, I., y Rivera-Vargas, L. I. (2008). *Frankliniella occidentalis*, *F. schultzei* and *F. fusca* (Thysanoptera: Thripidae) in Puerto Rico. *Journal of Agriculture of the University of Puerto Rico, 92*(1–2), 107–110. https://doi.org/10.46429/jaupr.v92i1-2.2625

Jiménez, S. F., Pérez, L., Toro, M., Granda, C., Mateo, A., Sariol, H., Rodríguez, E., Pérez, R., Jiménez, R., Pérez-Alejo, A., y Vázquez, R. (2006). Dispersión, distribución actual y nuevos reservorios de *Frankliniella schultzei* trybom (Thysanoptera: Thripidae) en Cuba. *Fitosanidad, 10*(4), 273–278.

Johansen-Naime, R. M., Mojica-Guzmán, Á., y Mejorada-Gómez, E. (2017). Primer registro de *Frankliniella shultzei* (Trybom) (Thysanoptera, Terebrantia: Thripidae) en México. *Entomología Agrícola*, 4, 306–309.

Kakkar, G., Seal, D. R., y Kumar Jha, V. (2010). Common blossom thrips, *Frankliniella schultzei* Trybom (Insecta: Thysanoptera: Thripidae). *Edis*, 2010(5), 1–5. https://doi.org/10.32473/edis-in860-2010

Kakkar, G., Seal, D. R., Stansly, P. A., Liburd, O. E., y Kumar, V. (2012). Abundance of *Frankliniella schultzei* (Thysanoptera: Thripidae) in flowers on major vegetable crops of South Florida. *Florida Entomologist, 95*(2), 468–475. https://doi.org/10.1653/024.095.0231

Mound L.A. y Marullo R. (1996). The Thrips of Central and South America: An Introduction. Memoirs on Entomology, *International* 6: 1–488

Milne, M., y Walter, G. H. (2000). Feeding and breeding across host plants within a locality by the widespread thrips *Frankliniella schultzei*, and the invasive potential of polyphagous herbivores. *Diversity and Distributions, 6*(5), 243–257. https://doi.org/10.1046/j.1472-4642.2000.00089.x

Palmer, J.M., Mound, L. y Heaume, G.J. (1989). Cie guides to insects of importance to man. Betts, C.R. ed. Wallinford, Oxon, U.K.: CAB International Institute of Entomology. British Museum of Natural History.

Palmer, J.M. y Mound, L. (1990). Thysanoptera. In: Armoured scale insects: their biology, natural enemies and control, W. Helle. Amsterdam, The Netherlands: Elsevier. Pp.241-242.

Reitz, S. y Funderburk, J. (2012). Management Strategies for Western Flower Thrips and the Role of Insecticides. En *Insecticides pests enginnering*. Londres; IntechOpen.

Reitz, S. R., Gao, Y. lin, y Lei, Z. ren. (2011). Thrips: Pests of Concern to China and the United States. *Agricultural Sciences in China, 10*(6), 867–892. https://doi.org/10.1016/S1671-2927(11)60073-4

Sevik, M. y Arli-Sokmen (2012). Estimation of the effect of Tomato spotted wilt virus (TSWV) infection on some yield components of tomato. *Phytoparasitica* (40): 87-93. https://doi.org/10.1007/s12600-011-0192-2

Surís, M., y González, C. (2008). Especies de trips asociadas a hospedantes de interés en las provincias habaneras. I. Plantas ornamentales. *Rev. Protección Veg., 23*(2), 80–84.

Vierbergen, G., y Mantel, W. P. (1991). Contribution to the knowledge of *Frankliniella schultzei* (Thysanoptera: Thripidae). *Entomologische Berichten, 51*(1), 7–12.

Yalemar, J. A., Hara, A. H., Saul, S. H., Jang, E. B., y Moy, J. H. (2001). Effects of gamma irradiation on the life stages of yellow flower thrips, *Frankliniella schultzei* (Trybom) (Thysanoptera: Thripidae). *Annals of Applied Biology, 138*(3), 263–268. https://doi.org/10.1111/j.1744-7348.2001.tb00111.x