

## First record of *Hemiberlesia cyanophylli* (Hemiptera: Coccoidea) on *Opuntia ficus-indica* in Mexico

Carlos Lázaro-Castellanos<sup>1</sup> y Juan Manuel Vanegas-Rico<sup>2\*</sup>

<sup>1</sup>Posgrado en Fitosanidad-Entomología y Acarología, Colegio de Postgraduados, Campus Montecillo. km 36.5 Carretera México-Texcoco. C.P. 56230. Montecillo, Texcoco, Estado de México, México.

<sup>2</sup>Universidad Nacional Autónoma de México. Facultad de Estudios Superiores Iztacala, Laboratorio de Control de Plagas. Av. de los Barrios, No. 1, Los Reyes Iztacala, C.P. 54090 Tlalnepantla de Baz, Estado de México, México.

\*Correspondence author: [entomologo.mexicano@gmail.com](mailto:entomologo.mexicano@gmail.com)

### ABSTRACT

*Opuntia ficus-indica* is a cactus distributed in more than 30 countries in the world, it is affected by the presence of hemipteran, of which the superfamily Coccoidea stand out, sessile insect, with a hard cover (armored scales) or without it (soft scales). There are other species of coccoids known as armored scales in the country, which are little studied, since they are usually secondary pests in crops. Therefore, the objective of this work is to present the first record of a species of armored scale on *O. ficus-indica* in Mexico. For this, cladodes of *O. ficus-indica* were collected and placed in tricot-nylon bags for review in the laboratory, a photographic record was made, sampling adult scales and fixed in 70% ethanol. The specimens were processed with the Hamon and Kosztarab technique and were determined; obtaining an identification of *Hemiberlesia cyanophylli* (Signoret) that can occupy up to 86% of the cladode surface.

**Keywords:** *Opuntia ficus-indica* cladodes, *Hemiberlesia cyanophylli*.

### INTRODUCTION

The cactus *Opuntia ficus-indica* is distributed in over 30 countries of the world (CAB International, 2020) due to its potential in diverse industries, besides incidental dispersion by humans and other animals. In Mexico, an area of origin and domestication (Griffith, 2004), the main use its young cladodes as vegetable named nopalitos (12,523 ton/year) and its fruits (43,765 ton/year) (SIAP, 2019); although, it is an ornate plant in houses and green areas.

Hemiptera are one of the primary groups of insects associated with *Opuntia* spp (Mann, 1969). Of which stand out the superfamily Coccoidea, sessile insects, with a hard cover (armored scales) or lacking it (soft scales), which suck the sap and weaken these plants. The presence and damage of the family Dactylopiidae, soft scales covered by a whitish wax known as “prickly pear cochineal”, is most noticeable on *Opuntia*. Some *Dactylopius* species are primary pests

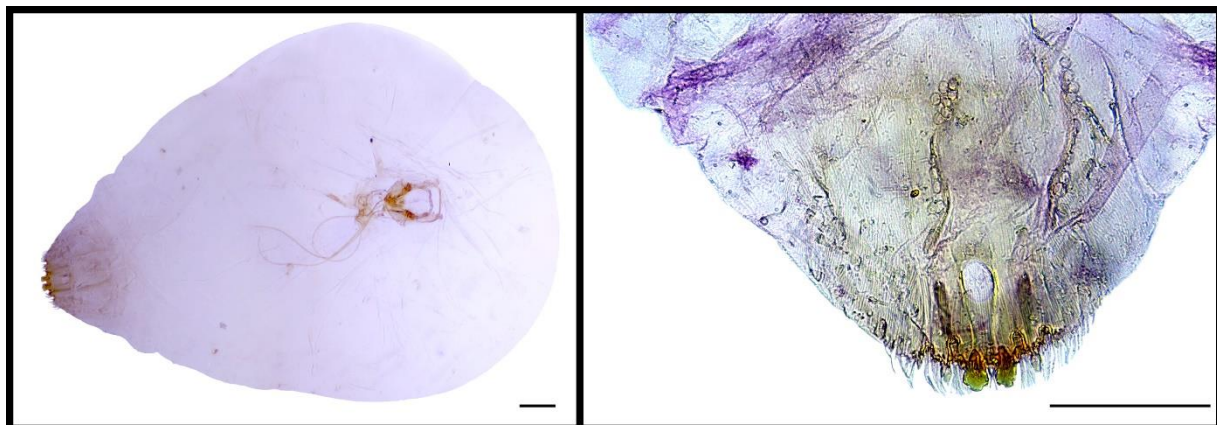
in Mexico and other regions of the world, where biological control strategies are sought (Vanegas-Rico *et al.*, 2010). There are other species of coccoids known as armored scales in the country, which are little studied, since many are usually secondary pests on *Opuntia* crops in Valley of Mexico, the principal zones of nopalitos. Considering that scale insects introductions to new sites is a serious threat to growers (Miller *et al.*, 2005). In addition, outside the agricultural field, the species of armed scales affecting *Opuntia* spp. are unknown. The aim of this paper is to present the first record of a species of armed scale on *O. ficus-indica* in Mexico.

## MATERIALS AND METHODS

In the municipality of Irapuato, Guanajuato, cladodes of *O. ficus-indica* were collected in a gardener of the flower field colony, in February 2018. The cladodes were placed in tricot-nylon fabric bags for review in a personal laboratory, where they were kept at room temperature. A photographic record was made, sampling adult scales and fixed in 70% ethanol. The specimens were processed in 2019 with the technique of Hamon and Kosztarab (1979), for their determination the keys of Ferris (1955) and Evans *et al.* (2009) were used by the first author. It would be deposited some Voucher specimens in the authors' personal collections and in the Coccoidea collection of the Faculty of Higher Studies Iztacala (UNAM).

## RESULTS AND DISCUSSION

The identified scale corresponded to *Hemiberlesia cyanophylli* (Signoret) (Fig.1), which occupy up to 86% of the surface of the cladode. The damage recorded is the weakening of the plant by the insect feeding; besides the opportunistic development of pathogens, apparently of *Erwinia* complex, which occurs in other states of the country (data not published). These damages are similar to reports on the impact of the *Diaspis echinocacti* (Bouché) on *Opuntia* spp. and other Cactaceae (Claps and de Haro, 2001; Zimmermann and Granata, 2002).



**Figure 1.** *Hemiberlesia cyanophylli* (Signoret). A) Full body scale 0.1 mm, B) Detail of the pigidia 0.1mm.

*H. cyanophylli* develops on 180 species of plants (73 families and 141 genera), among these 17 species correspond to cacti (García-Morales *et al.*, 2016). Of the affected plants there are several of economic interest such as avocado, coffee, cocoa, mango, tea, and citrus (García-Morales *et al.*, 2016), on which it can cause damage as chlorotic spots on the leaves and defoliation (Miller and Davidson, 2005). The presence of this phytophagous on *Opuntia* spp. dates from 1932 to 2011 and corresponds to records in the Canary Islands (*O. humifusa*), the Middle East (*Opuntia* sp.), Madagascar (*Opuntia* sp.), England (*O. quitensis*), and the island of Crete in Greece (*O. ficus-indica*) (Balachowsky 1932; Mamet 1954; Gómez-Menor, 1962; Malumphy y Redstone, 2011; Pellizzari *et al.*, 2011).

In Mexico, the presence of two armored species on *Opuntia* is known, *D. echinocacti* (Bouché), that has a wide worldwide distribution on *Opuntia* and other Cactaceae, and *Opuntiaspis philococcus* (Cockerell) that has little distribution in Mexico, in addition to being mentioned in Germany, France and Japan (García-Morales *et al.*, 2016). Is mentioned in a technical brochure about *H. cyanophylli* on *Opuntia* crops of Milpa Alta, Mexico City (Delgadillo *et al.*, 2018), which does not describe assembly or determination techniques, besides presenting taxonomic errors in other nopal pests. This suggests that they based it on technical literature (lists of nopal pests not updated and with taxonomic errors) to determine the association of the species with the host. The scale collected by the second author in Milpa Alta (data not published) corresponds to *D. echinocacti*, species associated, among other plants, to *O. ficus-indica* in the Valley of Mexico and with a few incidences in the crops of the region (Vanegas-Rico *et al.*, 2018). In Mexico *H. cyanophylli* is mainly associated with avocado (Lázaro-Castellanos *et al.*, 2012), the unusual presence of nopal until now could become a problem for the *Opuntia* crops of neighboring municipalities. The absence of parasitoids suggests an initial adaptation process to this plant.

## CONCLUSIONS

The present work is considered representing the first record of *H. cyanophylli* on *O. ficus-indica* in Mexico, and the third species of armored scale associated with this Cactaceae in the country.

## REFERENCES

- Balachowsky, A.S. 1932 Étude biologique des coccides du bassin occidental de la Méditerranée. Encyclopédie Entomologique, XV P. Lechevalier & Fils Paris 214 pp + LXVII.
- CAB International. 2020. *Opuntia ficus-indica* (prickly pear). Crop Protection Compendium. Wallingford, UK: CAB International. <https://www.cabi.org/isc/datasheet/37714#toDistributionMaps>
- Claps, L. E., & de Haro, M. E. 2001. Coccoidea (Insecta: Hemiptera) associated with Cactaceae in Argentina. Journal of the Professional Association for Cactus Development, 4, 77-83.
- Delgadillo, V. I., González, M. A., & Rivera, R. 2008. Manejo fitosanitario del nopal verdura en Milpa Alta, Distrito Federal. Comité Estatal de Sanidad Vegetal del Distrito Federal (CESAVEDF). 63 p.

- Evans, G. A., Watson, G. W., & Miller, D. R. 2009. A new species of armored scale (Hemiptera: Coccoidea: Diaspididae) found on avocado fruit from Mexico and a key to the species of armored scales found on avocado worldwide. *Zootaxa*, 1991(1): 57-68.
- Ferris, G. F. 1955. Atlas of the scale insects of North America. Series IV. The Diaspididae. Second Printing. Stanford University Press, Stanford, California.
- García-Morales M., Denno, B. D., Miller, D. R., Miller, G. L., Ben-Dov, Y., & Hardy, N. B. 2016. ScaleNet: A literature-based model of scale insect biology and systematics. Database. doi: 10.1093/database/bav118. <http://scalenet.info/catalogue/Hemiberlesia%20cyanophylli/>.
- Gómez-Menor Guerrero, J.M. 1962. Diaspidos de Gran Canaria y Tenerife (Islas Canarias) (Hom. Coccoidea). *Anales de Estudios Atlánticos*, 8: 147-214.
- Griffith M.P. 2004. The origins of an important cactus crop, *Opuntia ficus-indica* (Cactaceae): new molecular evidence. *American Journal of Botany*, 91(11): 1915–1921.
- Hamon, A. B. & M. L. Kosztarab. 1979. Morphology and systematic of the first instar of the genus *Cerococcus* (Homoptera: Coccoidea: Cerococcidae). *Virginia State University Research Division Bulletin*, 146: 1-122.
- Komosińska, H. (1961). Niektóre gatunki czerwców szklarniowych (Homoptera, Coccoidea) w Polsce= Nekotorye vidy oranžerejnyh červecov (Homoptera, Coccoidea) v Pol'se. *Fragmenta Faunistica*, 9(15): 221-232. <https://rcin.org.pl/miiz/dlibra/publication/53478/edition/39370>
- Lázaro-Castellanos, C., González-Hernández, H., Lomeli-Flores, J. R., Myartseva, S. N., Ortega-Arenas, L. D. & Ochoa-Ascencio, S. (2012). Enemigos naturales de escamas armadas (Hemiptera: Diaspididae) en aguacate Hass en Michoacán, México/Natural enemies of armored scale (Hemiptera: Diaspididae) on avocado Hass in Michoacan, Mexico. *Revista Colombiana de Entomología*, 38(1):6-13.
- Malumphy, C., & Redstone, S. 2011. First incursion of smooth pine scale *Leucaspis pini* (Hartig) (Hem., Diaspididae) in Britain, with a review of the status of *Leucaspis* in Britain. *Entomologist's Monthly Magazine*, 147(1763-65): 69-75.
- Mamet, R. J. 1954 Notes on the Coccoidea of Madagascar, III. *Mémoires de l'Institut Scientifique de Madagascar* (Ser. E) 4(1953): 1-86.
- Mann, J. 1969. Cactus-feeding insects and mites. *United States Natural Museum Bulletin*, 256:1-158.
- Miller, D.R. & Davidson, J.A. 2005. Armored scale insect pests of trees and shrubs (Hemiptera: Diaspididae). Cornell University Press, Ithaca and London. 442 p.
- Miller, D. R., Miller, G. L., Hodges, G. S., & Davidson, J. A. 2005. Introduced scale insects (Hemiptera: Coccoidea) of the United States and their impact on US agriculture. *Proceedings of the entomological Society of Washington* 107(1): 123-158.
- Pellizzari, G., Porcelli, F., Seljak, G., & Kozár, F. 2011 Some additions to the Scale insect fauna (Hemiptera: Coccoidea) of Crete with a check list of the species known from the island. *Journal of Entomological and Acarological Research Ser.II* 43(3): 291-300.
- SIAP. 2019. Anuario Estadístico de la Producción Agrícola 2019. <https://nube.siap.gob.mx/cierreagricola/>

- Vanegas-Rico J.M., Lomeli-Flores J.R., Rodríguez-Leyva E., Mora-Aguilera G., & Valdez J.M. 2010. Enemigos naturales de *Dactylopius opuntiae* (Cockerell) en *Opuntia ficus-indica* (L.) Miller en el centro de México. Acta Zoológica Mexicana (nueva serie) 26: 415-433.
- Vanegas-Rico, J. M., Lomeli-Flores, J. R., Rodríguez-Leyva, E., Valdez-Carrasco, J. M., & Luna-Cruz, A. 2018. Primer registro de *Laetilia coccidivora* (Lepidoptera: Pyralidae) como depredador de *Diaspis echinocacti* (Hemiptera: Diaspididae) en Tlalnepantla, Morelos. Dugesiana, 25(2): 125-127.
- Zimmermann, H. G., & Granata, G. 2002. Insect pests and diseases. In: Nobel, P. S. (Ed.) Cacti: biology and uses, 235-254.