Acta Agrícola y Pecuaria 12: e0121002. | e-ISSN: 2395-874X.
https://doi.org/10.30973/aap/2026.12.0121002 (2026, January 23rd)

REVIEW ARTICLE

Hemiptera species of agri-food importance in Jalisco, Mexico

Especies de Hemiptera de importancia agroalimentaria en Jalisco, México

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Reception date:
August 29th, 2025

Acceptation date:
December 10th, 2025

Published on line:
January 23rd, 2026

How to cite:
Becerra-Chiron, I. M., Rodríguez, W. D., & Torres-Moreno, R. (2026). Hemiptera species of agri-food importance in Jalisco, Mexico. *Acta Agrícola y Pecuaria*, *12*, e0121002. https://doi.org/10.30973/aap/2026.12.0121002

ABSTRACT

The state of Jalisco is one of Mexico's main agricultural regions, characterized by a wide diversity of crops. However, information on the diversity and crop associations of Hemiptera in this region remains fragmented. We analyzed Hemiptera emphasizing Heteroptera and Sternorrhyncha, associated with food crops in Jalisco, Mexico. The dataset was compiled through a systematic review of various bibliographic sources. A total of 62 species from 20 families were identified, with Aphididae being the most diverse. *Aphis gossypii* Glover and *A. spiraecola* Patch were the most polyphagous. Chi-square tests showed significant differences among crops and families, with fruits, legumes, and beverages/seeds hosting the highest richness. Findings highlight hemipterans' adaptability in key crops and knowledge gaps in Auchenorrhyncha, contributing to integrated pest management.

KEYWORDS

Pests, crops, agroecosystems, hemipterans.

RESUMEN

El estado de Jalisco es una de las principales regiones agrícolas de México, caracterizado por una amplia variedad de cultivos. Sin embargo, la información sobre la diversidad y las asociaciones de Hemiptera con los cultivos en esta región permanece fragmentada. Para atender esta problemática, se analizaron las especies de Hemiptera con énfasis en Heteroptera y Sternorrhyncha, asociadas a cultivos alimentarios en Jalisco, México. El conjunto de datos se compiló mediante una revisión sistemática de diversas fuentes bibliográficas. Se identificaron 62 especies de 20 familias, siendo Aphididae la más diversa. *Aphis gossypii* Glover y *A. spiraecola* Patch resultaron las más polífagas. Pruebas chi-cuadrada mostraron diferencias significativas entre cultivos y familias, destacando frutas, leguminosas y bebidas/semillas por su mayor riqueza. Los resultados evidencian la adaptabilidad de hemípteros en cultivos estratégicos y vacíos de información en Auchenorrhyncha, contribuyendo al manejo integrado de plagas.

PALABRAS CLAVE

Plagas agrícolas, cultivos, agroecosistemas, hemípteros.

Introduction

Hemipterans, commonly known as true bugs, are a globally distributed insect order that includes phytophagous, predatory, and phytopathogen-vector species, making them key components of ecological and agricultural systems (Panizzi et al., 2022). Approximately 90,000 species have been described, grouped into four suborders: Coleorrhyncha (one family), Heteroptera (75 families), and the former Homoptera, now divided into Auchenorrhyncha (28 families), and Sternorrhyncha (41 families) (Micieli et al., 2023). A defining trait of hemipterans is their stylet-like mouthparts, specialized for sucking, composed of two mandibles and two maxillae that form feeding canals. This structure enables them to extract sap from phloem and xylem tissues (Chapman et al., 2013), and in some species, to feed on vertebrate blood (Salazar-Schettino et al., 2010). These diverse feeding habits explain their constant presence in both natural and agricultural environments (Selfa & Anento, 1997).

Many hemipteran species are agricultural pests due to the direct damage caused by sap extraction, such as chlorosis, necrosis, gall formation, wilting, and other morphological and physiological effects (Xiao & Fadamiro, 2010). Their greatest impact, however, results from their efficiency as vectors of phytopathogens including *Candidatus* Liberibacter asiaticus, *Ca*. L. africanus, *Ca*. L. americanus, *Ca*. L. solanacearum, *Bactericera cockerelli*, *B. trigonica*, *Ca*. Phytoplasma prunorum, *Ca*. P. mali, and spiroplasmas, all transmitted by phloem-feeding hemipterans (Ammar et al., 2011; Orlovskis et al., 2015; Perilla-Henao & Casteel, 2016). They also transmit viruses from the families Luteoviridae, Geminiviridae, Nanoviridae, Rhabdoviridae, Potyviridae, and Caulimoviridae (Hogenhout et al., 2008; Ng & Perry, 2004).

In Mexico, hemipterans threaten several major crops. For instance, maize (*Zea mays* L.) and sugarcane (*Saccharum officinarum* L.) (Poales: Poaceae) are damaged by *Rhopalosiphum maidis* Fitch (Hemiptera: Aphididae), which causes leaf chlorosis and plant dwarfism (Ortega, 1987). Prickly pear (*Opuntia* spp.) (Caryophyllales: Cactaceae) suffers reduced photosynthetic capacity due to feeding by the red bug, *Hesperolabops nigriceps* Reuter (Hemiptera: Miridae) (Palomares-Pérez et al., 2010). In avocado (*Persea americana* Mill.), species of the genus Pseudacysta such as *P. perseae* (Heidemann) (Hemiptera: Tingidae) has been reported causing severe defoliation (Cambero-Ayón et al., 2019). In Jalisco, significant losses have been associated with *Bemisia tabaci* (Gennadius) (Hemiptera: Aleyrodidae) and an aphid complex responsible for virus transmission in melon (Urías-López et al., 2005). The potato psyllid *Bactericera cockerelli* Sulc. (Hemiptera: Triozidae) causes "purple top" disease in Jalisco (Rubio, 2006), and in sorghum fields near the Cienega de Chapala, the grain-feeding bug *Oebalus mexicana* Sailer (Hemiptera: Pentatomidae) affects cereal development (Martínez et al., 2005).

Jalisco is a key agricultural region in Mexico, producing economically and culturally crops such as agave, maize, berries, avocado, bean, tomato, coconut, and sugarcane (Secretaría de Agricultura y Desarrollo Rural, 2023). Its geographic position between the Nearctic and Neotropical biogeographical regions, along with predominantly semi-warm climatic conditions, favors the cultivation of thermoperiodic species and contributes to high biodiversity and endemism (Ríos-Muñoz, 2013; Ruiz-Corral et al., 2021).

Although many hemipterans are pests, others provide essential ecosystem services. Some act as pollinators in avocado, maize, chili, and tomato crops, while others function as biological control agents of aphids, thrips, and mites (Kriz et al., 2006). These beneficial species play valuable roles in integrated pest management programs (Sahayaraj, 2014).

Understanding the hemipteran species present in Jalisco's crops is essential for developing sustainable agricultural practices and maintain agroecosystem stability. Therefore, the objective of this review is to present a list of hemipteran species recorded in food-important crops in Jalisco, Mexico. This study focuses on species belonging to the suborders Heteroptera and Sternorrhyncha; Auchenorrhyncha will not be covered, as a dedicated project on that group is currently undeway. This work represents the first state-review of its kind.

Materials and methods

Search for and selection of studies

The list of Hemiptera species associated with agricultural crops in the state of Jalisco was compiled through a systematic review of multiple bibliographic sources.

Original scientific articles, review papers, conference abstracts and official lists published by institutions such as the Servicio Nacional de Sanidad, Inocuidad y Calidad Agroalimentaria (SENASICA, translated as National Service for Agri-Food Health, Safety and Quality), the Instituto Nacional de Investigaciones Forestales, Agrícolas y Pecuarias (National Institute for Forestry, Agriculture and Livestock Research), and the Secretaría de Agricultura, Ganadería, Desarrollo Rural, Pesca y Alimentación (Secretariat of Agriculture and Rural Development), as well as undergraduate and graduate theses, were reviewed. Electronic platforms used for data retrieval included Google Scholar, Consorcio Nacional de Recursos de Información Científica y Tecnológica, Elsevier, Web of Science, and Redalyc. To ensure data relevance, keywords related to the order Hemiptera (e.g., biology, ecology, agroecosystems, pests, damage, Jalisco, Mexico, among others) were employed in both English and Spanish. No specific period was defined for the literature search, as the objective was to include all relevant sources available in the scientific record, regardless of their publication date. Inclusion criteria comprised studies conducted in the state of Jalisco and those focused on agricultural crops. Exclusion criteria included records belonging to the taxonomic family Cicadellidae and reports related to forest pests. The information was independently analyzed by each author, after which a consensus was reached to integrate the data into the database based on taxonomic criteria and the geographical distribution of the studied species.

Data analyzed

The agri-food classification of crops included in the database was performed based on botanical characteristics, nutritional attributes, and predominant human consumption criteria. This classification followed the categories proposed by the Food and Agriculture Organization of the United Nations (Food and Agriculture Organization of the United Nations [FAO], 2015) and Wrigley et al. (2016), allowing for a functional analysis of the associations between Hemiptera species and their host plants. This approach facilitated the interpretation of the ecological and economic relevance of each crop type, as well as their susceptibility to Hemipteran infestations.

To assess relationships among categorical variables, Chi-square (χ^2) tests of independence and homogeneity were conducted to identify significant associations between the number of Hemiptera species per family, host crops, and crop types. Statistical analyses were performed in R Studio (Posit team, 2025).

Results

In the present study, a total of 62 species of Hemiptera associated with agricultural crops were identified, distributed across 20 taxonomic families. The family Aphididae exhibited the highest species richness (12 species), followed by Pentatomidae (10 species) and Coreidae (7 species) (Figure 1; Appendix 1). No statistically significant association was found between the number of Hemiptera species per family and the number of associated crops ($\chi^2 = 27.85$, p-value = 0.086).

The species *Aphis gossypii* Glover, and *A. spiraecola* Patch (Hemiptera: Aphididae) were the most polyphagous, being associated with 56 and 36 host plants, respectively (Figure 2). A statistically significant difference was detected among the evaluated species regarding the number of host crops ($\chi^2 = 71.50$, p-value < 0.0001).

The most affected crop was common bean (*Phaseolus vulgaris* L.) (Fabales: Fabaceae), with 26 Hemiptera species recorded, followed by oats (*Avena sativa* L.) (22 species), cacao (20), maize (16), and plum (15) (Figure 3). Statistically significant differences were observed in the number of Hemiptera species hosted among crops ($\chi^2 = 520.70$, p-value < 0.0001), indicating that species distribution is not uniform and that certain crops harbor a disproportionately higher diversity of Hemiptera. The most frequent reported damage included sap sucking from leaves, stems, and fruits, resulting in chlorosis, leaf deformation, wilting, and, in several cases, the transmission of phytopathogenic viruses that negatively impact crop yields.

Overall, Hemipteran species richness was high across crops, with 62 species recorded, and Aphididae being the most species-rich family (12 species).

The agri-food classification of crops in which Hemiptera have been recorded in Jalisco grouped the crops into 11 categories (Table 1).

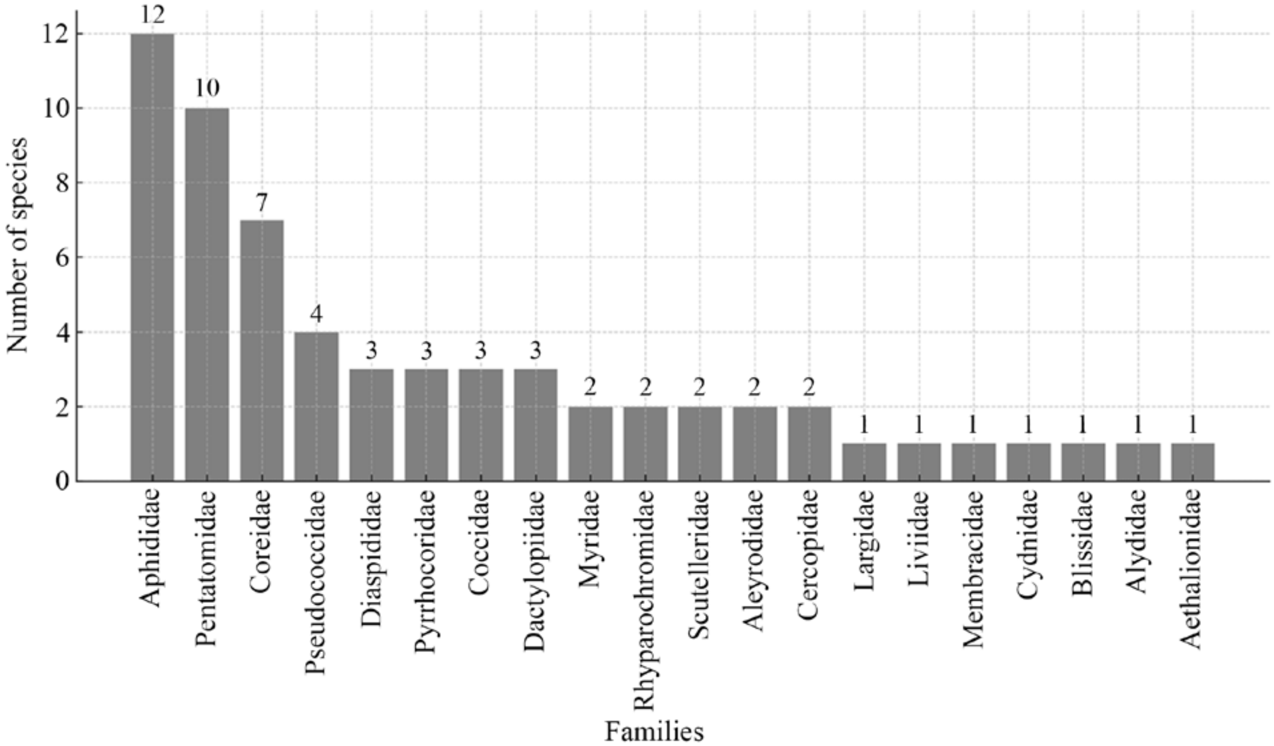

Figure 1. Number of Hemiptera species per family with the highest number of associated crops.

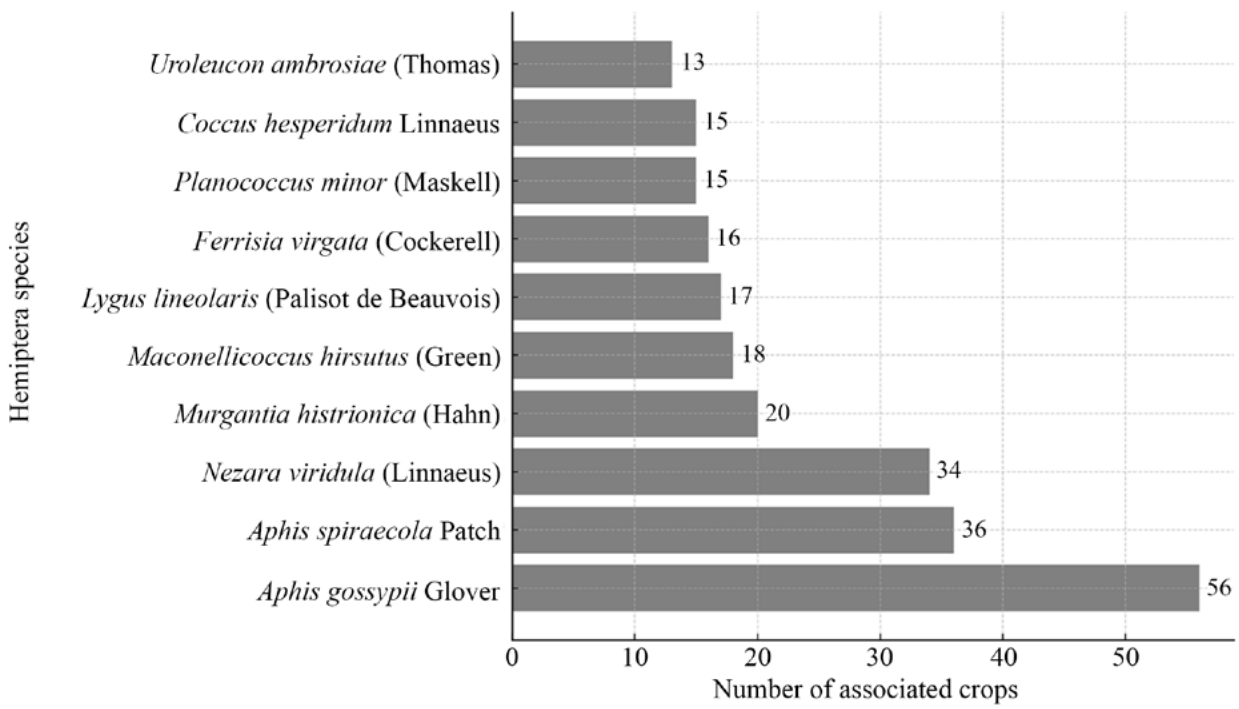

Figure 2. Hemiptera species with the highest number of associated crops.

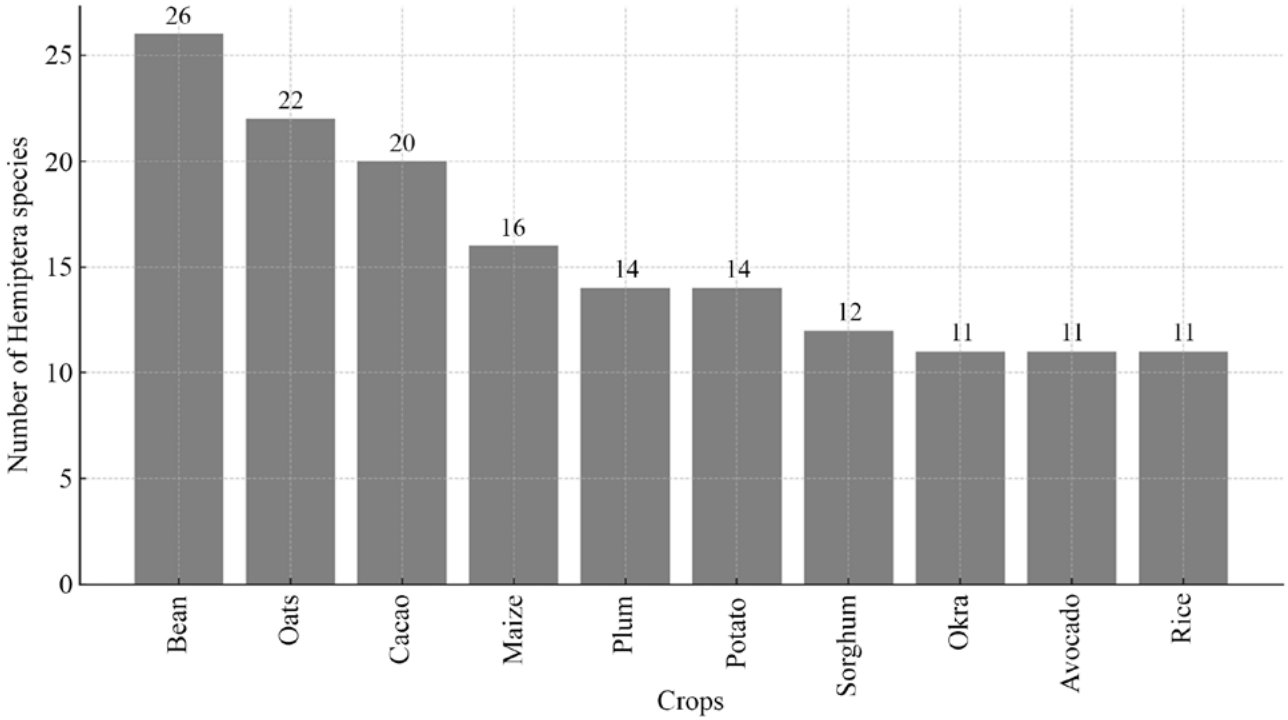

Figure 3. Crops with the highest number of Hemiptera species.

Table 1. Classification of crops in which Hemiptera have been recorded in the state of Jalisco, Mexico. The common English names of agro-food crops are linked to their corresponding scientific names according to the Fresh Fruits and Vegetables Import Manual (United States Department of Agriculture, 2012).

Crop type	Crops
Beverage/seed	Agaves, cacao, coffee, sugarcane, hibiscus, and chamomile.
Beverages/aromatic	Hibiscus.
Cereal	Rice, oats, barley, rye, maize, sorghum, and wheat.
Fruit	Avocado, almond, eggplant, squash, capulin, carambola, apricot, chayote, chilacayote, chili, cherimoya, wild cholulo, plum, citrus fruits, peach, strawberry, pomegranate, soursop, guava, fig, jackfruit, tomato, lime, lemon, lychee, mamey, mandarin, mango, apple, melon, quince tree, nance, loquat, papaya, cucumber, pear, pepper, banana, rambutan, watermelon, tamarind, Mexican hawthorn, grapefruit, prickly pear, grape, jackfruit, sapote, and blackberry.
Legume	Pea, bean, chickpea, and broad bean.
Legume/oilseed	Soybean.
Oilseed	Sesame, peanut, canola, rapeseed, safflower, sunflower, walnut, black walnut, pecan, pistachio, olive, and pine nut.
Pseudocereal	Amaranth.
Tuber	Beet, sweet potato, turnip, potato, and cassava.
Vegetable	Chard, chicory, garlic, celery, bamboo, broccoli, onion, cabbage, cauliflower, dandelion, spinach, asparagus, huauzontle, lettuce, prickly pear, nopales, okra, quelites, radish, and purslane.
Vegetable/sweetener	Agaves.

The fruit crop type included the highest number of different crops (52), reflecting a broad diversity of potential hosts for Hemiptera species. This result highlights the importance of fruit crops as food resources and habitats for these insects and indicates their vulnerability to infestation by multiple pest species. The vegetable crop type ranked second (20 crops), followed by oilseed crops (13). Pseudocereal, legume/oilseed, beverage/aromatic, and vegetable/sweetener categories included only one crop each. Significant differences were detected in the number of crops grouped within each crop type (χ^2 = 223.30, *p*-value < 0.0001), indicating a non-uniform among categories (Figure 4).

Crop classification revealed that fruits harbored the greatest richness of Hemiptera species (39 species), followed by beverage/seed crops (26), legumes (26), and cereals (22 species), suggesting higher susceptibility to Hemipteran pressure. Crop types with the highest equitability were beverage/seeds crops and legumes (q = 1, 24.14 and 23.30, respectively).

The number of hosts crops per Hemiptera family varied considerably, Aphididae presented the highest number of associated crops (83), followed by Pentatomidae (48), Pseudococcidae (35), and Miridae (18). Statistically significant differences were observed among families in the number of associated crops (χ^2 = 551.53, *p*-value < 0.0001) (Figure 5).

Finally, the crops with the highest frequency of Hemiptera records were common bean (26 species), oats (22 species), and cacao (20 species). Significant differences were confirmed in the number of Hemiptera species hosted among crops (χ^2 = 520.70, *p*-value < 0.0001), reinforcing that some crops are markedly more prone to harboring diverse Hemipteran assemblages than others.

Discussion

The present study provides an updated review of the occurrence of insects belonging to the suborders Heteroptera and Sternorrhyncha of the order Hemiptera associated with crops of agricultural importance for human consumption in the state of Jalisco, Mexico. A total of 62 hemipteran species distributed across 20 families were documented. Some species were associated with a wide range of crops, whereas others appeared to be adapted to predominant regional crops. These findings highlight the ecological significance of Hemiptera as a highly diverse and functionally important component of agroecosystems in Jalisco.

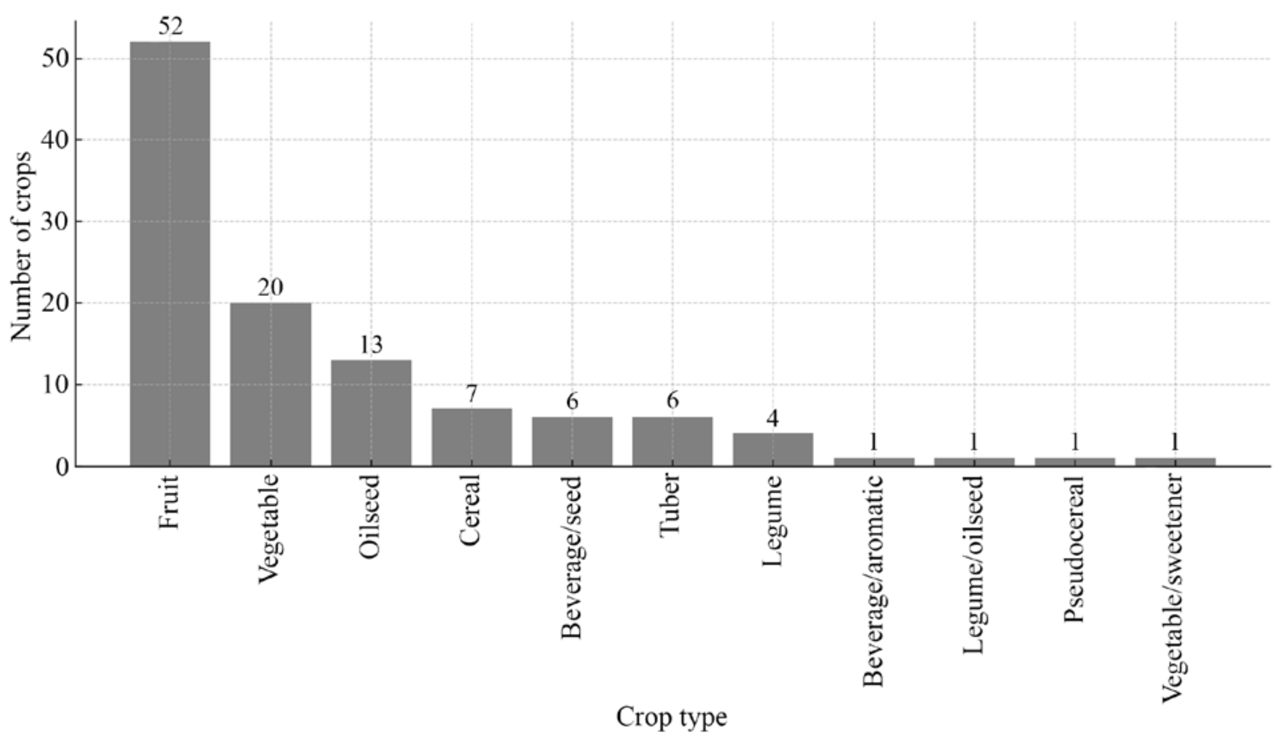

Figure 4. Number of crops per crop type. Crop classification according to FAO (2015), and Wrigley et al. (2016).

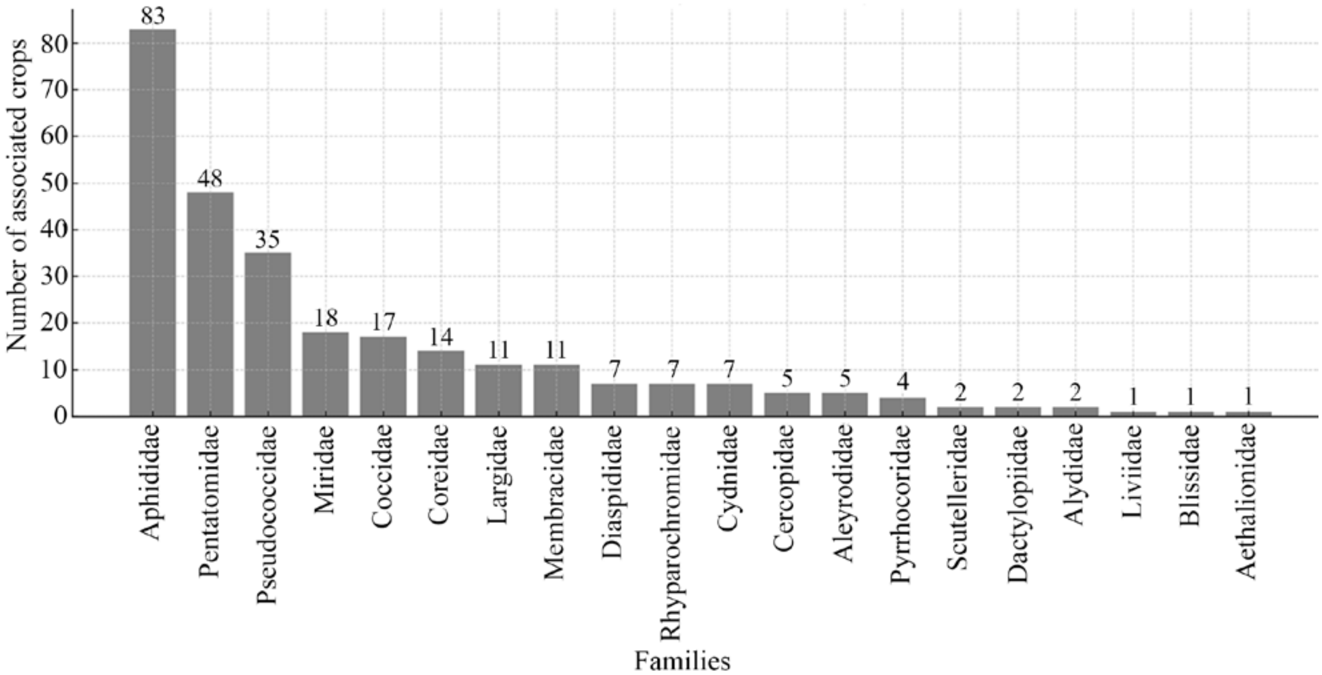

Figure 5. Number of crops per Hemiptera family.

The hemipteran families identified in this study largely correspond to pests of agricultural relevance with documented presence in several regions of Mexico. A notable example is the family Aphididae, represented by 12 species associated with crops in Jalisco. The importance of this family lies in specific biological characteristics, such as high reproductive capacity and the ability to cause significant damage through sap feeding and the transmission of plant pathogens, which negatively affect crop development and yield (Cisneros-Hernández, 2003). Similar patterns were noted by Singh & Singh (2021) in their book chapter on Aphids, and by Rosales-López et al. (2013) in studies conducted in Coahuila, Mexico. These findings are consistent with previous studies that identify Aphididae among the most impactful agricultural pest families.

Likewise, the families Pentatomidae and Coreidae—commonly known as stink bugs and leaf-footed bugs, respectively—were also frequently recorded. These phytophagous insects cause damage by feeding on plant sap and are widely distributed across several Mexican states, including Michoacan, Guerrero, and Veracruz. In agreement with González-Lucas et al. (2019), who studied chayote (*Sicyos edulis* Jacq.) crops, our review highlights these two families as particularly representative, with Pentatomidae comprising 85 species and Coreidae 27 species reported across multiple crops in Jalisco.

Another family of interest is Pseudococcidae. Species withing this family, such as those of the genus *Planococcus*, exhibit high adaptability and were reported in crops including maize, papaya, guava, oats, and cacao, as indicated by Hernández-Lara et al. (2020), which is consistent with our findings. An emblematic species is the pink hibiscus mealybug (*Maconellicoccus hirsutus* Green) (Hemiptera: Pseudococcidae), a pest established in various cultivars in Jalisco that has been extensively studied in terms of its biology, ecology, and control (García-Valente, 2008; Rodríguez-Ruiz et al., 2020). In this review, *M. hirsutus* was reported on 17 host plants, underscoring its broad host range, ecological plasticity, and generalist behavior. This wide distribution likely reflects the biogeographic position of Jalisco, which serves as a transition zone between the Neotropical and Nearctic regions, favoring high hemipteran richness and the establishment of diverse agricultural crops.

A total of 56 food crops were recorded as hosts of hemipteran species in Jalisco. Common beans emerged as the most frequently associated crop, followed by oats and cacao. Bean crops are widely affected by hemipterans throughout Mexico (González et al., 2011;

Gómez Sousa et al., 2009), particularly by families such as Pentatomidae [e.g., *Murgantia histrionica* (Hahn), *Nezara viridula* L., *Oebalus* spp.], Miridae [*Lygus lineolaris* (Palisot de Beauvois)]; Alydidae [*Burtinus notatipennis* (Stål)], Aphididae (*Aphis* spp.), and Coreidae. These taxa are present during various phenological stages of the crop. Our results are consistent with the works of Alvarado Ramírez et al. (2023), Baez-Santacruz et al. (2024), and Guarino et al. (2017), who documented recurrent hemipteran infestation in bean crops.

Oat was also associated with a high diversity of hemipterans, especially during the fall-winter season when moderate temperatures and humidity prevail. The most common families included Aphididae, Cercopidae, Cydnidae, Miridae, Pentatomidae, Pseudococcidae, and Rhyparochromidae. This pattern may be explained by crop morphophysiology, as young stems and leaves contain sap rich in sugars and amino acids. Weibull (1987) demonstrated that free amino acid concentrations in oats vary throughout the growth cycle, favoring aphid establishment. Field observations suggest that hemipteran populations peak during reproductive stages, when succulent tissues are most available.

Cacao also showed a high incidence of hemipterans, particularly from the families Pyrrhocoridae, Alydidae, and Aphididae (Cervantes-Mayagoitia & Huacuja-Zamudio, 2020; SENASICA, 2019a). This pattern may partly reflect the limited number of studies conducted on other widely cultivated crops in Jalisco. Most existing research on cacao-associated hemipterans originates from tropical states such as Tabasco and Chiapas (Calderón-Silva, 2021; Cortéz-Madrigal et al., 2008; Soto, 1995).

Crop susceptibility to hemipteran infestation may be influenced by sowing seasons and the agroecological distribution of crops across Jalisco. According to Pinedo-Escatel (2014), this agroecological diversity facilities the coexistence of multiple pest species that vary by region and agricultural management practices. The extensive cultivated area in the state exposes crops to a broad spectrum of hemipterans, including both generalist and specialist species. In this context, *Agave* deserves mention: although not directly consumed as food, it is economically and culturally significant in Jalisco. Despite this relevance, few studies have addressed the hemipteran fauna associated with this crop.

Comparison with previous studies, such as Ruiz Moreno (2015)—who mentioned new hosts for *Thasus gigas* Klug (Hemiptera: Coreidae) in Jalisco—, Rubio-Santana et al. (2020), and Brailovsky (1986), revealed strong agreement regarding the presence of hemipteran taxa in Jalisco. This review updates and expands existing knowledge by documenting species-host associations that had not been previously reported for food crops in the state.

From an agroecological perspective, hemipterans fulfill diverse functional roles within agricultural systems, including phytophagous insects, vectors of phytopathogens, and predators. This functional diversity indicates that Hemiptera should not be viewed solely from a pest-control perspective. Several species act as beneficial organisms, particularly predators that contribute to biological control and integrated pest management strategies.

Despite the representativeness of the results, several limitations should be acknowledged. Much of the available literature for Jalisco focuses primarily on taxonomic aspects, whereas fewer studies address the biology and ecology of hemipteran species. Additionally, although records of genera and species of this group exist for various regions of Mexico, many studies do not clearly specify the exact collection sites of the specimens. This lack of spatial precision constitutes an important limitation of the present review, as does the exclusion of the suborder Auchenorrhyncha, whose diversity and relevance in agricultural systems are also well recognized. Nevertheless, this study represents one of the few efforts aimed at documenting hemipteran species associated with food crops in the region. The findings highlight the need to pay special attention to these crops within phytosanitary management programs, and highlight the importance of regional-scale studies to strengthen existing national records. Moreover, the compiled data provide a baseline for future monitoring in agroecosystems of not only food relevance, enabling expanded analysis across different seasons, the incorporation of additional environmental variables, and the application of diverse sampling approaches. Our results also suggest the need to compile information on cultivated plants for human consumption that remain undocumented in the literature, thereby enriching local and regional knowledge. Overall, this review establishes a foundation for the development of region-specific pest management programs adapted to the ecological and agricultural conditions of Jalisco.

In this context, future research should prioritize integrate approaches that combine taxonomic, ecological, and applied management perspectives on Hemiptera species associated with food crops in Jalisco. Systematic field monitoring is recommended, including the suborder Auchenorrhyncha, as well as studies on insect-plant-pathogen interactions to better understand the role of hemipterans as vectors whitin the state's diverse agroecosystems. Additionally, assessments of population dynamics and responses to local climatic factors will be essential to anticipate potential changes in the distribution and abundance under climate change scenarios. Finally, integrated management programs should be strengthened by incorporating beneficial hemipteran species, recognizing their potential contribution to biological control within sustainable agroecological strategies.

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Appendix 1. Hemiptera associated with agricultural crops for food consumption in Jalisco, Mexico: results of a bibliographic review. Brailovsky (1978,1986), Cervantes-Mayagoitia & Huacuja-Zamudio (2017, 2020, 2021), Cruz Aragón et al. (2017), Dirección General de Sanidad Vegetal (2025), Hernández-García (1977), Martínez et al. (2005), Moreno et al. (2022), Pascal et al. (2018, Rodríguez-Ruiz et al. (2020), Rubio (2006), Ruiz Moreno (2015), Secretaría de Agricultura y Desarrollo Rural (2023), Salazar-Schettino et al. (2010), Sánchez-Flores et al. (2018), SENASICA (2019a, 2019b), Torres-Pacheco et al. (2013), Urías-López et al. (2005), Villa-Vázquez and Rodríguez (2011).

Family	Species (Taxon/Common name)	Crop (Common name)	Crop damage
Aethalionidae	*Aethalion quadratum* Fowler (Mosca verde del aguacate)	Avocado	Both nymphs and adults stages feed on the sap from leaves and branches.
Aleyrodidae	*Bemisia tabaci* (Gennadius) (Mosca blanca)	Cucumber, guava, melon, potato, tomato.	Virus vectors.
	Trialeurodes vaporariorum Westwood (Mosquita blanca)	Cucumber, melon, potato.	Both nymphal and adult stages feed on phloem sap. They excrete sugary secretions that promote the development of sooty mold fungi (Ascomycetes) belonging to the family Capnodiaceae. These fungi form a dark layer on the leaf surface, which interferes with photosynthesis. Additionally, adult insects may act as vectors of potato purple top and tomato leaf curl viruses.
Alydidae	*Burtinus notatipennis* Stål (Chinche)	Bean.	Both nymphal and adult stages feed on sap from pods, foliage, and stems.
Aphididae	*Aphis gossypii* Glover (Pulgón del melón, pulgón algodonero)	Amaranth, artichoke, avocado, banana, bean, beet, bell pepper, black sapote, cabbage, cacao, cactus pear, calabash, camote, capulin, carrot, cashew, cauliflower, chamomile, chard, chayote, chickpea, chili, citrus, coffee, cucumber, eggplant, fig tree, fig, garlic, grape, grapefruit, green bean, guava, huauzontle, jackfruit, jamaica, jicama, lettuce, lima bean, lemon, loquat, lychee, mandarin, mango, melon, nanche, nopal, okra, olive, onion, orange, papaya, peach, peanut, pear, pea, pepper, pineapple, pistachio, plantain, plum, pomegranate, potato, pumpkin, quince, radish, raspberry, sesame, sorghum, soybean, spinach, squash, strawberry, sugar beet, sugarcane, tamarind, tejocote, tomato, turnip, watermelon, wheat, yam.	Both nymphal and adult stages feed on sap from foliage and flowers and may induce the development of sooty mold. They are known to transmit more than 50 phytopathogenic viruses, including non-persistent viruses affecting bean, pea, celery, dahlia, lettuce, onion, potato, chili, soybean, strawberry, tobacco, sweet potato, and tulip, as well as persistent viruses such as cotton anthocyanosis, lily rosette, and lily mosaic. Additionally, they may act as vectors of citrus tristeza virus.

Family	Species (Taxon/Common name)	Crop (Common name)	Crop damage
Aphididae	*Aphis spiraecola* Patch Pulgón espiral de los cítricos)	Amaranth, apricot, avocado, bell pepper, blackberry, cabbage, chili, citrus, cucumber, eggplant, fig tree, grapefruit, guava, hibiscus, lettuce, lima, lime, loquat, mandarin, mango, melon, níspero, okra, orange, papaya, peach, pear, pepper, plum, potato, quince, sandía, squash, tomato, yam, zarzamora.	Damage is expressed as leaf curling and deformation, particularly in young shoots, resulting from sap feeding and the production of honeydew, which promotes the development of sooty mold. In addition, this species transmits viral diseases.
	Brachycaudus helichrysi (Kaltenbach) (Pulgón del crisantemo, pulgón verde del almendro)	Apricot, avocado, cacao, peach, plum, okra, and sunflower.	Both nymphal and adult stages feed on sap from foliage and flowers.
	Cinara curvipes (Patch)	Pine nut.	Both nymphal and adults stages feed on sap from branches.
	Melanaphis sacchari (Zehntner) (Pulgón amarillo, áfido del sorgo, áfido verde de la caña de azúcar, pulgón verde de la caña)	Barley, maize, oats, rice, sorghum, sugarcane, and wheat.	Damage occurs at all stages of crop development; however, the post-vegetative growth stage is the most affected. Sap extraction from leaves causes brown spots, which impair plant growth and reduce crop yield. Additionally, this insect acts as a vector of viruses such as Sugarcane mosaic virus (SCMV), Sugarcane yellow leaf virus (SCYLV), among other diseases.
	Lipaphis erysimi (Kaltenbach) (Pulgón verde opaco de la col)	Broccoli, cabbage, canola, cauliflower, cole seed, okra, radish, turnip, watermelon, wild turnip.	Both nymphal and adult stages feed on sap from foliage, stems, and roots. Their feeding activity promotes the development of sooty mold. They act as vectors of at least ten non-persistent phytopathogenic viruses, including cabbage ring spot and mosaic viruses affecting cauliflower, radish, and turnip.
	Rhopalosiphum padi (Linnaeus) (Pulgón negro del follaje)	Barley, bean, maize, oats, papaya, plum, *Prunus* spp., sorghum, tejocote, rye, rice, and wheat.	Both nymphal and adult stages feed on sap from foliage and stems.
	Schizaphis graminum (Rondani) (Pulgón de las gramíneas, pulgón del trigo, pulgón verde de los cereales, pulgón de la hoja de trigo)	Barley, maize, oats, rice, sorghum, wheat.	Salivary secretions of aphids induce yellow or red lesions at feeding sites, ultimately resulting in generalized chlorosis and leaf reddening.
	Sipha flava (Forbes) (Pulgón amarillo de la caña de azúcar)	Barley, cacao, maize, oats, okra, potato, sorghum, sugarcane, sunflower, tomato, wheat.	Both nymphal and adult stages feed on sap from foliage and developing seeds. They act as vectors of sugarcane mosaic virus.
	Sitobion (Macrosiphum) avenae (Fabricius) (Pulgón de la espiga del trigo)	Barley, cacao, capulín (black cherry), maize, oats, okra, plum, rye, sorghum, wheat.	Both nymphal and adult stages feed on sap from foliage and seeds.

Family	Species (Taxon/Common name)	Crop (Common name)	Crop damage
Aphididae	*Toxoptera aurantii* (Boyer de Fonscolombe) (Pulgón negro de los cítricos)	Avocado, bean, cacao, citrus (including lemon, lime, orange, grapefruit, and mandarin), coffee, fig.	Both nymphal and adult stages feed on sap from foliage and flowers. They may transmit citrus tristeza virus (CTV).
	Uroleucon ambrosiae (Thomas) (Pulgón rojizo de las compuestas)	Bean, cacao, chamomile, chili, chicory, dandelion, lettuce, okra, potato, safflower, soybean, sunflower, tomato.	Both nymphal and adult stages feed on sap from foliage and stems. They are vectors of sugarcane mosaic virus (SCMV) and maize dwarf mosaic viruses (MDMV).
Cercopidae	*Aeneolamia contigua* Walker (Mosca pinta, salivazo)	Oats, rice, sugarcane, maize, sorghum.	Nymphs feed on sap from roots and stems, whereas adults feed on sap from foliage.
	Prosapia simulans (Walker) (Mosca pinta de los pastos, salivazo de los pastos)	Maize, oats, sugarcane.	Both nymphal and adult stages feed on sap from foliage, stems, and roots.
Coccidae	*Coccus hesperidum* Linnaeus (Escama blanda café)	Avocado, black walnut, citrus, coffee, grapefruit, guava, lemon, mango, orange, papaya, plum, pomegranate, quince, white sapote.	Both nymphal and adult stages feed on sap from foliage, branches, and trunk, thereby promoting the development of sooty mold on leaves.
	Saissetia miranda (Cockerell y Parrott) (Escama negra mexicana)	Fig, guava, plum.	Both nymphal and adult stages feed on sap from foliage and stems.
	Saissetia oleae (Olivier) (Cochinilla negra o de la tizne)	Citrus, olive.	It feeds on plant sap, causing general weakening, leaf and fruit drop, and may promote the development of sooty mold due to the honeydew it secretes.
Coreidae	*Acanthocephala femorata* (Fabricius) (Chinche falsa)	Eggplant, pigeon pea, pine nut, potato, soursop.	Both nymphal and adult stages feed on sap from young shoots and fruits.
	Anasa andresii (Guérin-Méneville) (Chinche de la calabaza)	Bean, cacao, corn, cucumber, oats, pumpkin, squash gourd.	Both nymphal and adult stages feed on sap from foliage, stems, petioles, and fruits.
	Anasa maculipes Stål	Cucumber, nopal, pumpkin, sunflower.	Both nymphal and adult stages feed on sap from foliage, stems, and fruits.
	Mozena lunata (Burmeister)	Bean, pine nut.	Both nymphal and adult stages feed on sap from foliage and pods.
	Savius jurgiosus jurgiosus (Stål)	Bean, *Ziziphus pedunculata* (cholulo de monte, azufaifo, jujube).	Both nymphal and adult stages feed on sap from foliage and pods.
	Thasus gigas (Klug) (Chinche gigante del mezquite)	Bean.	Both nymphal and adult stages feed on sap from foliage, shoots, and pods.
	Villasitocoris inconspicuus (Herrich Schäffer)	Pumpkin.	Both nymphal and adult stages feed on sap from foliage, stems, and ground-level fruits.
Cydnidae	*Cyrtomenus crassus* (Walker) (Tortuguita de la raíz del arroz)	Bean, cabbage, maize, oats, peanut, rice.	Both nymphal and adult stages feed on sap from germinating seeds, roots, the subterranean portion of the stem, and the plant's pods.

Family	Species (Taxon/Common name)	Crop (Common name)	Crop damage
Dactylopiidae	*Dactylopius ceylonicus* Green (Cochinilla o grana silvestre del nopal)	Prickly pear pads.	Both nymphal and adult stages feed on sap from leaf pads.
	Dactylopius confusus (Cockerell) (Grana silvestre)	Prickly pear pads and fruits (*Opuntia* spp.).	Both nymphal and adult stages feed on sap from leaf pads.
	Dactylopius opuntiae (Cockerell) (Cochinilla)	Prickly pear pads and fruits (*Opuntia* spp.).	Both nymphal and adult stages feed on sap from leaf pads.
Diaspididae	*Aonidiella aurantii* (Maskell) (Escama roja de california)	Lime.	During sap feeding, it injects toxic substances into plant tissue. Trees infested by *A. aurantii* develop yellow spots on leaves, which may expand to cover the entire leaf surface. These effects result in chlorotic or dull-colored areas that reduce photosynthesis activity and may ultimately lead to leaf and branch desiccation. Such damage also facilitates the entry of fungi and other insects.
	Aonidiella citrina (Coquillet) (Escama amarilla)	Lime.	Sap feeding by scale insects causes discoloration, leaf yellowing, fruit drop, and overall plant weakening.
	Aulacaspis tubercularis Newstead (Escama blanca del mango)	Avocado, cacao, fig, guanabana, lemon, lime, mango.	Both nymphal and adult stages feed on sap from foliage, branches, inflorescences, and fruits.
Largidae	*Stenomacra marginella* (Herrich-Schaeffer) (Chinche negra)	Asparagus, avocado, banana, bean, cacao, coffee, fig, guava, mango, plum, starfruit, sweet potato.	Both nymphal and adult stages feed on sap from foliage, and stem.
Liviidae	*Diaphorina citri* Kuwayama	Citrus fruits.	Direct damage is caused by the feeding activity of nymphs and adults, which extract sap and may inject toxins that lead to leaf and shoot deformities and, in severe cases, to the death of new shoots. Indirect damage results from the transmission of the bacterium *Candidatus Liberibacter* spp., the causal agent of Huanglongbing disease.
Membracidae	*Membracis mexicana* (Gueérin Meneville) (Periquito de la guanábana)	Almond, bean, black sapote, cucumber, guanabana, litchi, mango, melon, nanche, papaya, plum.	Both nymphal and adult stages feed on sap from shoots, foliage, branches, and flowers.
Miridae	*Lygus lineolaris* (Palisot de Beauvois) (Chinche ligus)	Amaranth, bean, cabbage, cacao, eggplant, maize, oats, potato, plum, safflower, sesame, sorghum, soybean, strawberry, tomato, wheat.	Both nymphal and adult stages feed on sap from foliage, flowers, young fruits, and developing seeds.
	Caulotops agavis Reuter (Chinche del agave)	Agaves.	Both nymphal and adult stages feed on sap from agave leaves.

Family	Species (Taxon/Common name)	Crop (Common name)	Crop damage
Pentatomidae	*Brochymena quadripustulata* (Fabricius) (Garrapata del aguacate)	Apple, avocado, bean, grape, grapefruit, lime, pecan, plum.	Both nymphal and adult stages feed on sap from branches.
	Euschistus crenator (Fabricius) (Jumil)	Bean, cacao, eggplant, oats, okra, potato, rice, tomato.	Both nymphal and adult stages feed on sap from foliage and fruits.
	Murgantia histrionica (Hahn) (Chinche arlequin de la col)	Amaranth, asparagus, barley, bean, beet, broccoli, cabbage, cacao, cauliflower, cucumber, grape, maize, oats, okra, pumpkin, radish, safflower, tomato, turnip.	Both nymphal and adult stages feed on sap from foliage and stems.
	Nezara viridula (Linnaeus) (Chinche verde)	Amaranth, bean, cabbage, cacao, canola, cassava, chickpea, chile pepper, cucumber, eggplant, fig, garbanzo bean, maize, melon, oats, okra, pea, peanut, pecan, potato, pumpkin, purslane, radish, rapeseed, rice, safflower, sandía, sesame, sorghum, soybean, sunflower, tomato, turnip, walnut, watermelon, wheat, jackfruit.	Both nymphal and adult stages feed on sap from foliage, fruits, buds, pods, and developing seeds. They act as vectors of plant diseases.
	Oebalus insularis (Stål) (Chinche café del arroz)	Oats, rice, sorghum.	Both nymphal and adult stages feed on sap from developing seeds.
	Oebalus mexicana (Sailer) (Chinche café del sorgo)	Oatas, beans, sorghum.	Both nymphal and adult stages feed on sap from foliage and developing seeds.
	Oebalus pugnax (Fabricius) (Chinche de la espiga)	Bean, oats, rice, soybean.	Both nymphal and adult stages feed on sap from developing seeds.
	Piezodorus guildinii (Westwood)	Bean, chile pepper, oats, pine nut, potato, rice, soybean.	Both nymphal and adult stages feed on sap from stems, pods, fruits, and developing grains.
	Thyanta custator Fabricius	Pecan (*Carya illinoinensis*) and pistachio.	Both nymphal and adult stages feed on sap from foliage and stems.
	Thyanta perditor (Fabricius)	Bean, cacao, corn, oats, sorghum.	Both nymphal and adult stages feed on sap from foliage, stems, pods, and developing seeds.
Blissidae	*Toonglasa yushaniacola* Slater y Brailovsky	Bamboo.	
Pseudococcidae	*Ferrisia virgata* (Cockerell) (Piojo harinoso)	Avocado, bamboo, bean, cacao, coffee, custard apple, citrus fruits, guanabana, guava, lima, mamey, mango, plum, rambutan, sapote, soursop, sunflower, yam.	Both nymphal and adult stages feed on sap from foliage, stems, fruits, and shoots.
	Maconellicoccus hirsutus (Green) (Cochinilla rosada del hibisco)	Amaranth, avocado, bean, carambola, cherry coffee, fig, grapefruit, guanabana, guava, hibiscus, jackfruit, lemon, lime, mandarin, mango, nanche, orange, plum, soursop.	Feeding on stems, leaves, and flowers results in stunted growth, leaf deformation, stem thickening, and a racemose appearance of shoots; under severe infestation, defoliation may occur.

Family	Species (Taxon/Common name)	Crop (Common name)	Crop damage
Pseudococcidae	*Paracoccus marginatus* Williams y Granara de Willink (Piojo harinoso de la papaya)	Asparagus, cacao, hibiscus, *Manihot chlorosticta*, papaya, cassava.	Both nymphal and adult stages feed on sap from foliage, stems, and fruits.
	Planococcus minor (Maskell) (Piojo harinoso)	Banana, bean, cacao, carambola, citrus fruits, coffee, corn, grape, guava, lima, maize, mango, oats, papaya, potato, soybean.	Indirect or secondary damage results from the development of sooty mold on the honeydew excreted by *P. minor*. The sooty mold may cover the leaf blade surface, interfering with the normal photosynthetic activity. Both honeydew and the sooty mold cause aesthetic defects on plants and their fruits, thereby reducing their commercial value.
Pyrrhocoridae	*Dysdercus mimulus* Hussey (Chinche manchadora)	Cacao, maize, oats, and okra.	Both nymphal and adult stages feed on sap from buds, flowers, and developing seeds.
	Dysdercus mimus (Say) (Chinche manchadora)	Cacao.	Both nymphal and adult stages feed on sap from foliage, fruits, and developing seeds.
	Dysdercus obliquus (Herrich Schäffer) (Chinche manchadora)	Cacao.	Both nymphal and adult stages feed on sap from foliage, fruits, and seeds.
Rhyparochromidae	*Neopamera bilobata* (Say)	Plum, strawberry, potato.	Both nymphal and adult stages feed on sap from foliage and fruits.
	Paromius longulus (Dallas) (Chinche negra)	Oats, rice, maize, and sorghum.	Both nymphal and adult stages feed on grains.
Scutelleridae	*Pachycoris klugii* (Burmeister) (Chinche de la chaya de monte)	Pine nut.	It feeds on fruits and seeds, which may result in crop abortion or deformation.
	Tetyra bipunctata (Herrich-Schaeffer) (Conchuela de la semilla)	Pine nut.	It feeds on seeds.