

New records of Ichneumonidae (Hymenoptera: Ichneumonoidea) collected in avocado orchards in Nayarit, Mexico

Nuevos registros de Ichneumonidae (Hymenoptera: Ichneumonoidea) recolectados en huertos de aguacate en Nayarit, México

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ABSTRACT

Ichneumonidae is a family that contains important species for biological pest control. In Nayarit, the studies about the diversity and distribution of Ichneumonidae are poorly known in crops of economic importance, such as the avocado. The aim of this study was to know the Ichneumonidae species distributed in orchards of different avocado cultivars in the state. Collections were made during January and April 2021 in two Nayarit municipalities. The entomological net collection method was used. One genus and four species are registered in this study.

KEY WORDS: Ichneumonidae, biological control, diversity, distribution, avocado.

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RESUMEN

Ichneumonidae es una familia que contiene especies importantes para el control biológico de plagas. En Nayarit, los estudios sobre la diversidad y distribución de Ichneumonidae en cultivos de importancia económica es limitado, tal es el caso del aguacate. El objetivo del estudio fue conocer las especies de Ichneumonidos distribuidas en huertos de distintos cultivares de aguacate en la entidad. Se realizaron recolectas durante enero y abril del 2021 en dos municipios de Nayarit. Se empleó el método de recolecta con red entomológica de golpeo. Se registran un género y cuatro especies al conocimiento de esta familia.

PALABRAS CLAVE: Ichneumonidae, control biológico, diversidad, distribución, aguacate.

Introduction

Ichneumonidae is one of the most abundant families in the Hymenoptera order, recently Yu *et al.* (2016) reported 25,285 species, 1,601 genera and 44 subfamilies worldwide and Gauld *et al.* (2002) estimate near 100,000 species.

In Mexico, 1,333 species, 380 genera and 29 subfamilies are reported (Ruíz-Coronado *et al.*, 2018). Ruíz-Cancino *et al.* (2014) estimate around 4,544 species. In Nayarit, just 28 species, 50 genera and 14 subfamilies are reported (González *et al.*, 2003; Ruíz-Cancino *et al.*, 2013; López, 2016; Ruíz-Cancino *et al.*, 2016; Coronado-Blanco *et al.*, 2017; Mancilla-Brindis *et al.*, 2021).

Some parasitoid wasps represent great importance in the pollination and regulation of populations of different pest insects in crops such as avocado; In addition, these wasps are considered bioindicators in their habitats (Sharkey, 2007; Okello *et al.*, 2021). In Mexico, avocado is grown in 29 states, Nayarit is positioned in fourth place with 74,998 t, a planted area of 8,028 hectares and an economic benefit of over 1,556 million Mexican pesos (SIAP, 2022).

One of the problems faced by the entity's producers is caused by different pest insects that affect the production (Morales & Gamboa, 2010; De Dios *et al.*, 2015). In this sense, only the knowledge of insects of economic importance and their management is emphasized, without giving importance to the beneficial fauna, therefore, this study aimed to learn more about the presence of these insects in the areas of avocado production.

Material and Methods

Parasitoid surveys were carried out during January and April 2021 in commercial avocado orchards of the Hass and “Booth 8” cultivars with different agronomic management conditions. The plots are located in 1) the Palapita ejido, Xalisco municipality (732 masl, Booth 8 cultivar; 21°25'43.6" N 105°03'07.1" W) and 2) the city and municipality of Tepic, Nayarit (931 masl; Hass cultivar; 21°30'37.9"N 104°52'20.2"W).

Traditional hitting net (50 cm wooden handle, 42 cm diameter hoop and 78 cm long bag) was used as the capture method. In the selected orchards, the trees damaged by the attack of ambrosia beetles were established as a reference point and the adjacent shrub and herbaceous vegetation was hit in a zigzag pattern with an approximate effort of 100 blows per sampled tree.

Townes & Townes (1966) and Ruíz-Cancino *et al.* (2014) keys were used to the taxonomic determination at the subfamily level; for genera and species, Kasparyan (2006) and Kasparyan & Ruíz (2005; 2008) keys were used. The voucher material was kept in the CEMIC 03 laboratory of the Autonomous University of Nayarit.

Results and Discussion

Six species, belonging to five subfamilies and six genera of ichneumonids, were determined (Table 1). Five species were captured in the Palapita ejido, municipality of Xalisco and only one in Tepic.

Table 1. Ichneumonidae genera and/or species collected in avocado crops.

	cv.		No. especimens	Biology and Reference
<u>Family</u>	Booth 8	Hass		
<u>Subfamily</u>				
Genus and/or species				
<u>Ichneumonidae</u>				
<u>Banchinae</u>				
<i>Venturia nigriscapus</i> (Viereck, 1921)* (Figure 1A)		X	1	Endoparasitoid larvae <i>Hypena scabra</i> (Lepidoptera: Noctuidae). (Pavuk & Williams, 2003).

Continuation

Table 1. Ichneumonidae genera and/or species collected in avocado crops.

	cv.		No. specimens	Biology and Reference
<u>Family</u> Subfamily Genus and/or species	Booth 8	Hass		
Cremastrinae				
<i>Eiphosoma vitticolle</i> Cresson, 1865)*	X		1	Parasitoid larva-pupa Lepidoptera: Pyralidae, Noctuidae. (Torres <i>et al.</i> , 2018).
Cryptinae				
<i>Lyneon moratus</i> (Cresson, 1874)* (Figure 1B).	X		1	Attack small cocoons of various insect groups and spider egg- sacs. (Sobczak <i>et al.</i> , 2019).
<i>Polycyrtus macer</i> (Cresson, 1874)* (Figure 1C).	X		1	Idiobiont endoparasitoid of prepupae Lepidoptera. (Kasparyan & Ruiz, 2008).
Ichneumoninae				
<i>Lobaegis</i> sp. (Townes, 1946)* (Figure 1D).	X		1	Parasitoids of Lepidoptera. (Heinrich, 1960).
Pimplinae				
<i>Neotheronia nigrolineata</i> (Brulle, 1846)* (Figure 1E).	X		1	Primary parasitoids of pupae or prepupae of various Lepidoptera. (Khalaim & Ruiz, 2021).
<i>N. tacubaya</i> (Cresson, 1874)*	X		1	
Total	6	1	7	

Records for Nayarit: • = (Ruíz-Cancino *et al.*, 2013); * = new records for Nayarit.

With the data obtained, to date seven species of Ichneumonidae are recorded in avocado cultivation in Nayarit, of which this study includes five new records for the state (Figure 1), so now 32 species, 51 genera and 14 subfamilies are known. of ichneumonids for Nayarit.

Taxonomic studies of Ichneumonidae species in Nayarit focus mainly on Corn cultivation (Estrada *et al.*, 2013; Gutiérrez-Ramírez *et al.*, 2015; Coronado-Blanco *et al.*, 2017). López (2016) carried out work on ichneumonid diversity in non-agricultural sites in 18 municipalities where he

reported two species, 15 genera and four subfamilies. This work represented an advances in the knowledge of this family.

Subsequently, isolated records were made on some genera and/or species in Nayarit. Ruíz-Cancino *et al.* (2016) report *Cryptophion espinozai* (Gauld & Janzen, 1994) obtained from a cocon collected on papaya leaf. Recently, Mancilla-Brindis *et al.* (2021) mention one species on the genus *Xiphosomella* associated with the avocado seed borer, *Cryptaspasma perseana* (Gilligan & Brown 2011), in Nayarit.

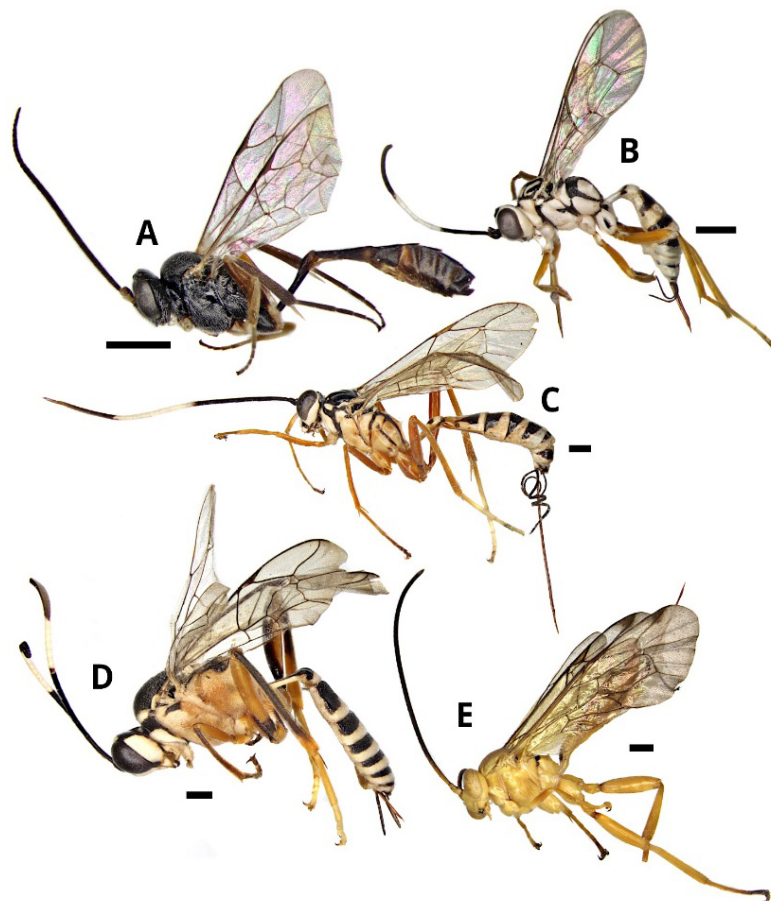


Figure 1. Ichneumonidae species collected in avocado crops (Scale 1 mm).

(A) *Venturia nigriscapus*. (B) *Lyneon moratus*. (C) *Polycyrtus macer*. (D) *Lobaegis* sp. (E) *Neotheronia nigrolineata*.

Conclusions

The avocado crop generates an important economic profit in Nayarit, placing it among the main agricultural activities. The total value of agricultural production of perennial crops in Nayarit is 9,569 million pesos, where avocado is in fourth position with a contribution of 1,556 million pesos (16.2 %), only surpassed by sugar cane, agave and mango (SIAP, 2022). Studies on insect diversity basically focus on pests and leave aside beneficial organisms such as parasitoids. In this sense, the present work provides new records of genera and/or species of Ichneumonidae distributed in avocado crop in Nayarit that could help in the regulation of insect pests.

Authors' contribution

Conceptualization of work, JMER, RBA.; methodology development, JMER, RBA, AIK, CBJM, RCE, VCJM.; Software management, Experimental validation, analysis of results, data management, writing, review and editing, JMER, RBA, AIK, CBJM, RCE, VCJM.; fund acquisition and project manager, RBA.

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Conflict of interest

The authors declare that they have no conflict of interest.

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