

Parasitoids of aphids (Hemiptera:Aphididae) in Irapuato, Guanajuato, Mexico

Abstract

Knowing the parasitoids that attack aphids is important as tools for integrated management. The present work was carried out in Irapuato, Guanajuato, Mexico. *Hordeum vulgare*, *Brassica oleracea* var. *italica*, *Ficus benjamina* and *Amaranthus* spp. *Diaretiella rapae* (Hymenoptera: Aphididae) parasitized *Brevicoryne brassicae* in 60.8% and *Myzus persicae* in 73%; *Schizaphis graminum* was parasitized by *Aphidius* spp in 48% and *Lysiphlebus* spp with 26.6%, *Aphis* spp in amaranth was parasitized by *Aphidius* spp in 73.3%. It is suggested to establish strategies to conserve this parasitoid due to its ability to parasitize aphids.

Keywords: aphids, parasitoids, barley, broccoli

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Introduction

Aphids reproduce in large numbers; on average a female produces between 50 and 100 offspring per cycle and these new individuals only take a few weeks to mature and reproduce; they are important vectors of viruses.¹

Hymenopterans of the Aphidiidae family are specific parasitoids of aphids and play an important role in biological control, which is why they have great potential in integrated aphid management programs.²

The adult female of these parasitoids inserts one or more eggs per aphid, but only one survives. Between 5 to 7 days after being parasitized, the aphid acquires a globose and leathery appearance, the complete cycle of the parasitoid has an average duration of 10-15 days. Once it has reached the adult stage, the wasp makes a hole in the abdomen through which it emerges.³

Knowing the parasitoid species of pest insects and their incidence will help in the establishment of integrated management programs; therefore, the objective of the work was to identify the aphid parasitoid species and the percentage of each of the species in the parasitized individuals.

Materials and methods

The field work was carried out in March 2019 in Irapuato, Guanajuato, Mexico. Random leaf samples were taken from the following species: barley (*Hordeum vulgare*), broccoli (*Brassica oleracea* var. *italica*), ficus (*Ficus benjamina*) and amaranth (*Amaranthus* spp). Leaf samples were kept in the brood chamber (27°C; 30% RH; 12:12 photoperiod) in the Entomology laboratory of the Department of Agronomy of the University of Guanajuato, in Irapuato, Mexico, to await the emergence of the parasitoids.

The identification of aphids was based on the keys of Blackman and Eastop¹ and of the parasitoids in Kavallieratos et al.⁴

Results and discussion

The identified parasitoid species emerged from aphids were: *Aphidius* spp, *Diaretiella rapae* MacIntosh, and *Lysiphlebus* spp (Figure 1).

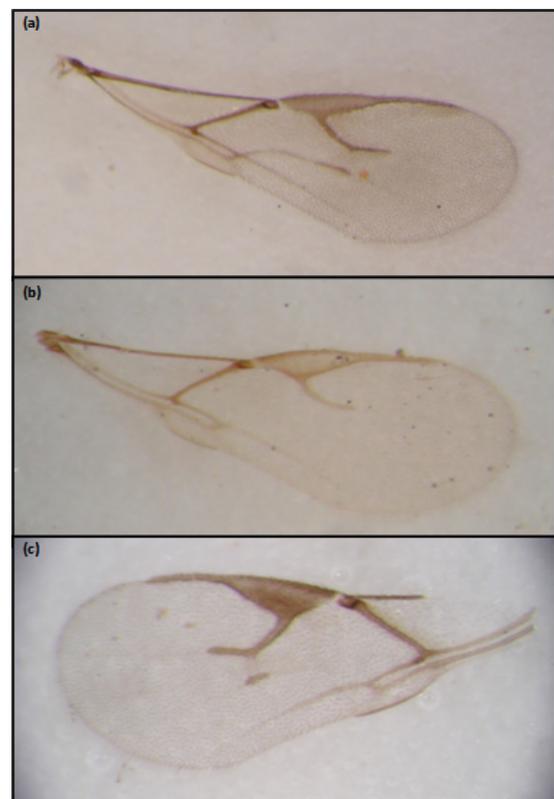


Figure 1 Aphid parasites identified. a) *Aphidius* spp; b) *Diaretiella rapae* M'Intosh; c) *Lysiphlebus* spp.

The aphids *Brevicoryne brassicae* (L.) and *Myzus persicae* (Sulzer) were preferentially parasitized by *D. rapae* in 60.8 and 73% respectively in broccoli; in this regard Salas-Araiza et al.⁵ indicated that the parasitism of *D. rapae* in *B. brassicae* reached up to 35.7% in January, but they did not report the presence of parasitism in *M. persicae*; *D. rapae* is a specialist parasitoid of *B. brassicae* and presents a high degree of specificity for the host and its habitat, it uses the smell of the plant to locate the host, but *Aphidius nigripes* Ashmead is a polyphagous parasitoid that does not present a response, the smell of the plant.⁶

The green grass aphid *Schizaphis graminum* (Rondani) was parasitized by *Aphidius* spp up to 48%, Salas-Araiza et al.⁷ pointed out the potential of *Aphidius* spp as a parasitoid of aphids; observed that the yellow sugarcane aphid *Melanaphis sacchari* (Zehntner) was parasitized by *Aphidius* spp in 31% and *Praon* in 29%. This result demonstrates the benefits of conserving and protecting wasps of the genus *Aphidius* due to their versatility in parasitizing different species of aphids and their ability to parasitize.

In 2011, Salas-Araiza et al.² indicated that there was no parasitism in *Greenidea ficicola* Takahashi and that the main biological control agent was predators; in this investigation although the parasitoids were not obtained if parasitized aphids were observed in 20%. The populations of *G. ficicola* do not affect the tree but it does produce a large quantity of honeydew, due to its evergreen characteristic, this tree species serves as a refuge for various species of predators and parasitoids. This aphid is of Asian origin, thermophilic and anholocyclic that is dispersing to different regions of the world, thanks to climate change Bella et al.⁸ and world trade,⁹ which possibly explains the low presence of associated parasitoids.

Lysiphlebus is a genus of importance in the biological control of *S. graminum*, in wheat it can maintain populations below the economic threshold of damage and in sorghum it parasitizes *M. sacchari*,¹⁰ in this work it parasitized in 26.6%, but *Aphidius* spp prevailed with 73.3% over *Aphis* spp in amaranth. The aphid *Aphis* is a polyphagous genus of Aphididae, the observed population was very abundant and produced a large quantity of honeydew, seriously affecting the plant.

Conclusion

The most abundant parasitoids were *Aphidius* spp with 73% in the aphid *Aphis* spp and *Diaretiella rapae* in *Myzus persicae* with the same percentage.

In barley *Schizaphis graminum* was parasitized by *Aphidius* spp in 48%.

It is suggested to conserve and increase the populations of *Aphidius* spp due to its abundance and capacity for parasitism shown in this research, through conservation shelters free of insecticide application and possibly its massive reproduction.

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None.

Conflicts of interest

The authors have no conflict of interest for this research.

References

1. Blackman RL, VF Eastop. Aphids on the World's crops. an identification guide. *John Wiley & Sons*. 1989;466.
2. Salas-Araiza MD, RW Jones, A Peña-Velasco, et al. Population dynamics of two species of Greenidea (Hemiptera: Aphididae) and their natural enemies on Psidium guajava (Myrtaceae) and Ficusbenjamina (Moraceae) in Central Mexico. *Florida Entomologist*. 2011;94 (1):97–105.
3. Zamani AA, AA Talebi, Y Fathipour, et al. Temperature-dependent functional response of two aphid parasitoids, *Aphidius colemani* and *Aphidiusmatricarie* (Hymenoptera: Aphidiidae), on the cotton aphid. *Journal Pest Science*. 2006;79:183–188.
4. Kavallieratos NG, Z Tomanovic, A Petrovic, et al. Athanassiou. Review and key for the identification of parasitoids (Hymenoptera: Braconidae: Aphidiinae) of aphids infesting herbaceous and shrubby ornamental plants in southeastern Europa. *Annals Entomological Society America*. 2013;106(3):294–309.
5. Salas-Araiza MD, MA González-Márquez, OA Martínez-Jaime. Relationship of the number of individuals of *Brevicorynebrassicae* with the temperature and with its parasitoid *Diaretiellarapae* in broccoli in El Bajío, Mexico. *Revista Mexicana de Ciencias Agrícolas*. 2016;7(2):463–469.
6. Rehman A, W Powell. Host selection behavior of aphid parasitoids (Aphidiidae: Hymenoptera). *Journal of Planta Breeding and Crop Science*. 2010;2(10):299–311.
7. Salas-Araiza MD, DR López-Gutiérrez, OA Martínez-Jaime, et al. Parasitoids of Sugarcane Aphid, *Melanaphis sacchari*, at Irapuato, Guanajuato, Mexico. *Southwestern Entomologist*. 2017;42(4):1091–1093.
8. Bella SD, Mifsud D, Pérez H, et al. *Greenidea ficicola*: in it and example of rapid colonization due to climatic changes?. *REDIA*. 2009;42:137–139.
9. La Rossa FR, AL Vasicek, A Paglioni. First record of *Greenideaficicola* Takahashi (Hemiptera: Aphididae) in Argentina. *Rev FCA UNCUIYO*. 2011;43(1):247–252.
10. Rodríguez-Vélez B, A Suaste-Dzul, A Gallou, et al. 2019. Aphids (Hemiptera: Aphididae) and their parasitoids (Hymenoptera) in sorghum crops in the states of Colima and Tamaulipas, Mexico. *Acta Zoologica Mexicana (new series)*. 2019;35:1–9.