

# Some Bioecological Peculiarities and Predatories of *Myzocallis coryli* (Goeze, 1778) and *Corylobium avellanae* (Schrank, 1801) (Hemiptera, Aphididae) in Azerbaijan

Nuriyeva Irada Aqaverdi\*, Nadirova Gulbaniz Inqilab

Institute of Zoology, National Academy of Sciences of Azerbaijan, Baku, Azerbaijan

## Email address:

iradafatima@mail.ru (N. I. Aqaverdi)

\*Corresponding author

## To cite this article:

Nuriyeva Irada Aqaverdi, Nadirova Gulbaniz Inqilab. Some Bioecological Peculiarities and Predatories of *Myzocallis coryli* (Goeze, 1778) and *Corylobium avellanae* (Schrank, 1801) (Hemiptera, Aphididae) in Azerbaijan. *American Journal of Entomology*.

Vol. 3, No. 1, 2019, pp. 1-5. doi: 10.11648/j.aje.20190301.11

**Received:** November 16, 2018; **Accepted:** December 11, 2018; **Published:** January 24, 2019

**Abstract:** The aim of research was establishing of aphids damaging the hazel trees in Azerbaijan, their entomophaghs, studying of their bioecological abilities. The paper was prepared on the basis of results of researches carried out in Ismayilli, Gabala and Zagatala districts in 2017-2018. Research was carried out on single hazelnut bushes growing in parks and orchards of Baku and Absheron, and in hazelnut orchards and forests of Ismayilli, Gabala and Zagatala districts in 2017-2018. Field works were carried out twice in a month along the route and each week in the stationaries. In the areas containing 50 hazel bushes 15-20 bushes were surveyed, and 25-30 bushes were surveyed in orchards with more than 100 bushes. Samples for revealing the hazel pests were taken in 10 points in the 20 hectare area. Damage percent, intensity of damage, accurate number of aphids were calculated on 20 bushes. The number of aphids per bush calculated by five-point scale: 0 point means no aphids on the hazelnut, 1 point when there single individuals on leaves, 2 points mean that there are 1-2 colonies and 5-10 aphids per colony, 3 points mean that 50% of leaf blade was occupied and there are more than 20 aphids per collony, 4 point mean that 75% of leaf blade was occupied and there are more than 50 aphids per collony and 5 points mean that aphid colony occupied the whole area of the leaf blade. The populations of the aphids are managed by predators: *Adalia bipunctata* (Linnaeus, 1758), *Adalia decempunctata* (Linnaeus, 1758), *Coccinella septempunctata* (Linnaeus, 1758), *Oeponia conglobata* L., *Harmonia axyridis* (Pallas, 1773), *Calvia decemguttata* (Linnaeus, 1767), *Propylea quatuordecimpunctata* (Linnaeus, 1758) from Coccinellidae, *Chrysoperla carnea* (Stephens, 1836) from Neuroptera, *Phyus coryli* (Linnaeus, 1758) from Hemiptera, *Clanoptilus sp.* from Melyridae and *Forficula auricularia* (Linnaeus, 1758) from Forficulidae. Chemicals are usually not required. The hazelnut pest *Myzocallis coryli* was recorded in all studied areas: along Shaki-Zagatala motorway edge, in the Mughanli and Kebeloba villages of Zagatala district and in the Baku-Absheron area. *Corylobium avellanae* was found along Shaki-Zagatala motorway edge and Mughanli village of Zagatala district. Entomophags *Adalia bipunctata*, *Adalia decempunctata*, *Coccinella septempunctata*, *Harmonia axyridis*, *Chrysoperla carnea*, *Forficula auricularia* also were recorded everywhere in studied areas, however *Oeponia conglobata*, *Calvia decemguttata* - along Shaki-Zagatala motorway edge, *Propylea quatuordecimpunctata* – along Shaki-Zagatala motorway edge, Mughanli village of Zagatala district and *Phyus coryli*, *Clanoptilus sp.* in the all studied area except Baku-Absheron peninsular.

**Keywords:** Pest, Aphid, *Corylus maxima*, *Myzocallis coryli*, *Corylobium avellanae*, Aphididae, Entomophag

## 1. Introduction

Azerbaijan, earning \$105 million from the export of hazelnuts last year, increased the area of the nut gardens up to 55 thousand hectare at present. The state is rendering all

possible assistance in the development of hazelnut production in the republic. The area of hazelnut garden is planned to increase up to 80 hectares.

Increasing the hazelnut production in our country, getting a full harvest and high marketing quality for the product is the

main aim. The aim can not be achieved without scientifically justified protection of seedlings and hazelnut gardens from pests, revealing of local entomofauna of the hazelnut gardens, studying of developmental peculiarities of the dominant species, forecasting of their outbreak, timely control of pests. Almost all fruit trees and bushes, including hazelnut, suffer from pests and diseases. At the moment 100 species of hazelnut pests have been identified.

In Turkey, 130 natural enemy species of hazelnut pests have been found. Most growers use chemicals to control pests. This causes a decrease in the effectiveness of natural enemies, an increase in environmental contamination and other well-known problems [1].

*Myzocallis coryli* – filbert (hazelnut) aphid causes substantial damage to hazelnut in hazelnut growing areas in the Northern America, Italy, Spain and Turkey. To evaluate the resistance of hazelnut to this insect, Turkish scientists reared aphids on five major cultivars under laboratory conditions and two resistant cultivars for *M. coryli* were revealed [2]. Seven species and one subspecies of predators coccinellids on filbert aphid were registered in Chile: *Adalia angulifera* Mulsant, *A. bipunctata* (L.), *A. deficiens* Mulsant, *Eriopis connexa chilensis* Hofmann, *Hippodamia convergens* Guerín-Meneville, *H. variegata* (Goeze), *Scymnus bicolor* (Germain) and *S. loewii* Mulsant [3].

The total production of hazelnuts in Oregon state accounts for roughly 99 percent of U.S. and 5 percent of world production and current key insect pests in this area include *Myzocallis coryli* and *Corylobium avellanae*, too [4]. In Chile a predatory ability of *Adalia angulifera* (Coleoptera: Coccinellidae) in relation to aphid *M. coryli* was studied in laboratory condition [5].

The factors affecting the occurrence of hazelnut pests in the Poland hazelnut growing areas were environmental conditions, cultural practices and efficacy of chemical treatments. In the protected plantation, aphid species (*Myzocallis coryli* and *Corylobium avellanae*), scale insects (mostly *Parthenolecanium corni*) and mite species (mostly *Phytoptus avellanae*) occurred in the greatest number [6].

## 2. Material and Methods

### 2.1. Methods and Studied Areas

Research was carried out on single hazelnut bushes growing in parks and orchards of Baku and Absheron, and in hazelnut orchards and forests of Ismayilli (40° 52' 71" N, 48° 04' 17" E), Gabala (40° 54' 21" N, 47° 57' 28" E) and Zagatala (41° 28' 30" N, 46° 29' 5" E) districts in 2017-2018. Field works were carried out twice in a month along the route and each week in the stationaries. In the areas containing 50 hazel bushes 15-20 bushes were surveyed, and 25-30 bushes were surveyed in orchards with more than 100 bushes [7]. Hazel leaves were observed visually. Samples for revealing the hazel pests were taken in 10 points in the 20 hectare area. Leaves were taken from all sites of the hazel bush.

### 2.2. Damage Percent, Intensity of Damage

Damage percent, intensity of damage, accurate number

of aphids were calculated on 20 bushes. The number of aphids per bush calculated by five-point scale: 0 point means no aphids on the hazelnut, 1 point when there single individuals on leaves, 2 points mean that there are 1-2 colonies and 5-10 aphids per colony, 3 points mean that 50% of leaf blade was occupied and there are more than 20 aphids per collony, 4 point mean that 75% of leaf blade was occupied and there are more than 50 aphids per collony and 5 points mean that aphid colony occupied the whole area of the leaf blade.

For calculation of the economic damage thresholds the number of aphids was determined in Autumn, Spring and Summer. In Autumn the aphid stock on a branch 1 - 2 meters long or on a tree trunk were taken into account. In Spring and Summer 100 leaves per hazel tree were observed and adults and larvae were calculated. Economic damage threshold for aphids was 15 colonies per 100 leaves.

Leaves occupied by aphids were collected, placed in entomological packets and jars, labelled and brought to laboratory for further observations. Material is included into collection and determined [8, 9]. Photos of aphids were taken with the help of stereomicroscope and scan electron microscope (SEM) (YEOL "JCM-6000").

## 3. Results and Discussion

During researchs carried out in May, June and July of 2017 in the hazel orchards of Ismayilli, Gabala and Zagatala districts of Azerbaijan we recorded two species of aphids *Myzocallis coryli* (Goeze, 1778.) and *Corylobium avellanae* (Schrank, 1801). Both species are monophags and feed on leaves and fruits of hazel bush. These species were not studied in detail in Azerbaijan [10].

Leaves and trunk of the hazel tree is covered with dense hairs which protect leaves from phytophags. The amount of hairs on leaves and trunk effects on number of aphids, particularly *M. coryli* [11] revealed that the hazel cultivar with longer hairs on leaves and trunk are less suffered from aphids.

From aphids damaging to hazel leaves and young branches in Azerbaijan the yellow apid *M. coryli* (Figure 1) and the green aphid *C. avellanae* were met frequently during research. *M. coryl* usually inhabits the lower parts of the leaves.



Figure 1. *Myzocallis coryli*.

It is widespread, non-migratory species. There are winged and wingless individuals. The color of parthenogenetic individuals varies from light yellow to whitish. Near the end of the antennae there are cross black rings. The length of the body is 1.3-2.2 mm. The color of individuals reproducing sexually is orange (Figure 2).



Figure 2. *Myzocallis coryli* (SEM).

The females of *M. coryli* lay its eggs on trunk and main stems of hazel tree. The eggs spend the winter in the cracks on the bark of the infected 2-3 years old stems or in scales of buds.

Eggs are oval, at first they are yellow, later they are brilliantly black. Nymphs hatched from eggs in March are fed on buds at first then they pass to the underside of just opened leaves. After four molting, they become adults. Adult female of yellow aphids can give during the summer a lot of parthenogenetic generations. In Gabala and Zagatala districts depending on the meteorological conditions, in 3-4 weeks we could meet young insects that form small colonies or sit alone on the leaves of hazelnuts. The aphid is characterized by heterogony – the alternation of sexual and parthenogenetic generations. *M. coryli* develops during the summer increasing the population. The aphid can give up to 10 parthenogenetic generations during the season. The pest fed on leaves suck and fresh fruits. Adults and young specimens live together in the same colony. The density of population of *M. coryli* is higher in May and June when environmental factors are favourable. Later because of high temperature and activity of predators the number of aphids is decreased. The sexually reproducing specimens appear in October and early November. In the autumn, winged females and males are appeared. After mating the normal oviposition function is restored, which ensures a successful wintering of the population of the aphid in the form of eggs. In spring, wingless females, which reproduce parthenogenetically, again develop from these eggs.

During investigation the number of *M. coryli* was on the threshold of economic damage in 2 hazel orchards of Muganly village of Zagatala district. Manure fertilization in these gardens promoted the development of young leaves, which created a favorable condition for the development of aphids.

"Powdery mildew", which is formed on leaves as a result of the functioning of *M. coryli*, is a good substrate for the mycelium of pathogen fungi, which increases the damage

from aphids. As a result, the yield of hazelnut is markedly reduced. Excessive use of nitrogenous fertilizers in hazelnut gardens also contributes to the development of new leaves, which leads to an increase in the number of aphids.

There was registered the following predators of aphids: *Adalia bipunctata* (Linnaeus, 1758), *Adalia decempunctata* (Linnaeus, 1758), *Coccinella septempunctata* (Linnaeus, 1758) *Oeponia conglobata* L., *Harmonia axyridis* (Pallas, 1773), *Calvia decemguttata* (Linnaeus, 1767), *Propylea quatuordecimpunctata* (Linnaeus, 1758) (Coccinellidae).

Aphids have a lot of predators and parasites. And filbert (hazelnut) aphid also becomes infected with some parasites and diseases. The small parasites from Aphelinidae family infect the aphids. Infected aphids are transformed into brown, convex, paper-like mummies. Parasites play significant role in management of number of aphids.

*Corylobium avellanae* - hazelnut aphid is usually yellowish-green and sometimes matter pink. Eyes are dark. Antennae are light in color getting darker towards the ends. Body length is 1.7-2.8 mm, width is 0.39 mm.

It usually inhabits fruiting shoots. Black eggs are laid on buds, particularly on female inflorescence, where they spend winter. It gives a lot of generations during the season. *C. avellanae* does not migrate and spends the whole life cycle on hazel tree. The sexual stage in the life cycle of the aphid is not replaced by other stages. Sexual individuals are appeared in Autumn. After mating they lay eggs on hazel tree. This aphid feeds on young shoots, it rarely can be met on leaves. If it goes to the leaves, it feeds on the intermediate vessels. Because on these vessels the hairs are short. Even small instar nymphs of the aphid can be recorded among short hairs. The aphid is widely distributed in Europe and in the Caucasus it is registered recently. Ants do not occur in colonies of *C. avellanae*.

This aphid also produces "Powdery mildew" on leaves. The development of young shoots slows down as a result of damage caused by *C. avellanae*. Damaged leaves fall, the quality of the product decreases, the plant freezes. When aphids feed on the sap of the plant they carry viruses and bacteria from diseased plants to healthy ones. *C. avellanae* is not common species. Single individuals of the species were registered on hazel trees in May and June. It was distributed in the Sheki-Zagatala region. The damage caused by this species during research did not exceed the economic threshold of harmfulness.

#### Predators of aphids

The small and average sized populations of the aphids are managed by predators and parasites before they damage the harvest. Chemicals are usually not required.

*Adalia bipunctata* (Linnaeus, 1758) (Coccinellidae) the two-spot ladybird is an active predator. Both larvae and adults of the ladybird destroy the aphids. Each adult can eat about 1400-1500 individuals of aphids per day. The two-spot ladybird eats various species of aphids.

*Adalia decempunctata* (Linnaeus, 1758) (Coccinellidae) the ten-spotted ladybird feeds on aphids on trees and shrubs. It was recorded on the hazel trees, too.



*Coccinella septempunctata* (Linnaeus, 1758) (Coccinellidae) the seven-spotted ladybird lays about 600 eggs on the bottom of the leaf blade. Larvae eat both eggs and little instar larvae of aphids. Each individual of the seven-spotted ladybird can eat 60-100 adult or about 300 larvae of the aphids.

*Oeponia conglobata* L. (Coccinellidae) like many coccinellids feeds on larvae and adults of aphids.

*Harmonia axyridis* (Pallas, 1773) (Coccinellidae) simply Asian ladybird has many variations. Originated from Eastern Asia it was introduced in USA and Canada as an effective agent of biological control [12, 13]. We recorded different variations of the species in the hazel orchards of Zagatala district.

*Calvia decempunctata* (Linnaeus, 1767) (Coccinellidae) feeds on aphids.

*Propylea quatuordecimpunctata* (Linnaeus, 1758) (Coccinellidae) the 14-spotted ladybird is an entomophag of aphids. The female of this species can lay about 400 eggs. The mortality of larvae is high.

*Chrysoperla carnea* (Stephens, 1836) (Neuroptera, Chrysopidae) the common green lacewing. The larvae of this lacewing can eat about 200-300 aphids during its development. The adults feed on nectar or honeydew. The honey dew extracted by aphids attracts them to hazel trees and females lay their eggs on leaves carrying aphid colonies.

*Phytus coryli* (Linnaeus, 1758) (Hemiptera: Miridae) was registered on hazel trees (Gabala, Vandam 06.06.2017-ci il) in large quantities. It is phytophag, as well as zoophag. It was recorded in Azerbaijan by us for the first time.

*Clanoptilus sp.* (Coleoptera, Melyridae). The larvae of this beetle are active predators and feed on aphids. The larvae are active predators and feed on aphids (Figure 3).

*Forficula auricularia* (Linnaeus, 1758) (Forficulidae) - the common earwig is an omnivorous insect. It harms agricultural and horticultural crops. On the other hand, it destroys other garden pests, for example, aphids.

The mantis (Mantoptera) larvae were met on hazel trees. They were feeding on aphids. Predatories and parasites of aphids and also agents of their diseases suffer from

insecticides. That is why pesticides should be used as less as possible.



Figure 3. *Clanoptilus sp.* Zagatala, Mughanly village. Hazelnut garden 20.06.2017.

## 4. Conclusion

The hazelnut pest *Myzocallis coryli* was recorded in all studied areas: along Shaki-Zagatala motorway edge, in the Mughanli and Kebeloba villages of Zagatala district and in the Baku-Absheron area. *Corylobium avellanae* was found along Shaki-Zagatala motorway edge and Mughanli village of Zagatala district. Entomophags *Adalia bipunctata*, *Adalia decempunctata*, *Coccinella septempunctata*, *Harmonia axyridis*, *Chrysoperla carnea*, *Forficula auricularia* also were recorded everywhere in studied areas, however *Oeponia conglobata*, *Calvia decempunctata* - along Shaki-Zagatala motorway edge, *Propylea quatuordecimpunctata* - along Shaki-Zagatala motorway edge, Mughanli village of Zagatala district and *Phytus coryli*, *Clanoptilus sp.* in the all studied area except Baku-Absheron peninsular (Table 1).

Table 1. The aphids and wild entomophages met on the hazel tree (*Corylus maxima* Mill.).

The Importance of the species	Names of Species	Locations			
		I	II	III	IV
Pest	<i>Myzocallis coryli</i> (Goeze, 1778.)	+	+	+	+
	<i>Corylobium avellanae</i> (Schrank, 1801)	+	+	-	-
	<i>Adalia bipunctata</i> (Linnaeus, 1758) (Coccinellidae)	+	+	+	+
	<i>Adalia decempunctata</i> (Linnaeus, 1758) (Coccinellidae)	+	+	+	+
	<i>Coccinella septempunctata</i> (Linnaeus, 1758) (Coccinellidae)	+	+	+	+
	<i>Oeponia conglobata</i> L. (Coccinellidae)	+	-	-	-
	<i>Harmonia axyridis</i> (Pallas, 1773) (Coccinellidae)	+	+	+	+
Entomophags	<i>Calvia decempunctata</i> (Linnaeus, 1767) (Coccinellidae)	+	-	-	-
	<i>Propylea quatuordecimpunctata</i> (Linnaeus, 1758) (Coccinellidae)	+	+	-	-
	<i>Chrysoperla carnea</i> (Stephens, 1836) (Neuroptera, Chrysopidae)	+	+	+	+
	<i>Phytus coryli</i> (Linnaeus, 1758) (Hemiptera: Miridae)	+	+	+	-
	<i>Clanoptilus sp.</i> (Coleoptera, Melyridae).	+	+	+	-
	<i>Forficula auricularia</i> (Linnaeus, 1758) (Forficulidae)	+	+	+	+

Notes: I – Shaki-Zagatala motorway edge, II – Zagatala, Mughanli villages, III – Zagatala, Kebeloba village, IV – Baku-Absheron.  
- none, + a few specimen.

---

## References

- [1] Tuncer C., Akca I., Saruhan I. (2001) Integrated pest management in Turkish hazelnut orchards. *Acta Horticulturae* 556: 419-429.
- [2] Guncan A., Gumus E. (2017) Influence of Different Hazelnut Cultivars on Some Demographic Characteristics of the Filbert Aphid (Hemiptera: Aphididae). *Journal of Economic Entomology* 110 (4): 1856–1862.
- [3] Aguilera P., A. and Escobar S., S. (2014). New Two Registers of Aphidophagous Coccinellids (Coleoptera: Coccinellidae) on Filbert Aphid, *Myzocallis coryli* (Goeze) (Hemiptera: Aphididae) in Chile. *Acta Hort. (ISHS)* 1052: 305-308.
- [4] Walton. V M., Chambers U., Olsen J. L. (2009) The Current Status of the Newly Invasive Hazelnut Aphid in Oregon Hazelnut Orchards. *Acta Horticulturae*. 845: 479-485.
- [5] Aguilera, A., Neculman R., Rebolledo R. (2014) Predatory capacity of *Adalia angulifera* (Coleoptera: Coccinellidae) larvae on *Myzocallis coryli* (Hemiptera: Aphididae) in Chile. *Ciencia e investigacion agraria*. 41. (1): 81-88.
- [6] Gantner, M. (2001) Occurrence of hazelnut pests in southeastern Poland. *Acta Horticulturae* 556: 469-477.
- [7] Lazarov, A. & P. Grigorov, (1961) *Karantina na Rasteni Jata*. Zemidat, Sofia.: 258.
- [8] *Opređitel nasekomikh evropeiskoi chasti SSSR*. (1964) T. I. Nizshie, drevnokrilie s nepolnim prevrasheniem. / editor. G. Ya. Bey-Bienko. — M. -L.: «Nauka»,.: 526. — 936. — (Key for fauna of the USSR, Publ. Zoological institute of the AS of the USSR. is. 84.
- [9] Key for fauna of the USSR. (1965) v. II. Coleoptera and Strepsiptera. / editor. G. Ya. Bey-Bienko. — M. -L.: «Nauka»,. —: 319—326. — 668. — (Key for fauna of the USSR, Publ. Zoological institute of the AS of the USSR. is. 89.
- [10] Vezirov N. C. (1995) *Aphids of Azerbaijan*. Homoptera, Aphidinea. Baku. Elm: 520.
- [11] Weryszko-Chmielewskai, E. et al. (2006). The comparative analysis of anatomical traits of four largefruited hazelnut cultivars showing different susceptibility to filbert aphid (*Myzocallis coryli* Goetze) feeding. (in Polish). *Acta Agrobotanica* 59 (2): 69-83.
- [12] Koch R. L., Venette R. C., (2006) Hutchison W. D. Invasions by *Harmonia axyridis* (Pallas) (Coleoptera: Coccinellidae) in the Western Hemisphere: Implications for South America. // *Neotropical Entomology*, 35 (4),: 421-434.
- [13] Beltra, A.; Wackers, F. L.; Nedved, O.; Pekas, A. (2018) Predation rate and performance of three ladybirds against the green peach aphid *Myzus persicae* in sweet pepper. *Entomologia Experimentalis Et Applicata*, 166 (6),: 491-499.