

Research Article

Insect Pests and Qualitative Composition of Walnut (*Juglans Regia L*) Fruits in Azerbaijan

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Abstract

Two dangerous invasive pests of walnut (*Juglans regia L.*), the brown marmorated stink bug (*Halyomorpha halys*) and the citrus flatid planthopper (*Metcalfa pruinosa*) are recorded for the first time in Azerbaijan. The main pests of walnut (*Juglans regia L.*) in recent years in Azerbaijan are *Cydia pomonella* (*Sarothrips musculana* Ersch.) from the family Cymidae (Lepidoptera), *Panaphis juglandis* (Goeze, 1778) and *Chromaphis juglandicola* (Kaltenbachphte, 1843), *Halyomorpha halys* (Stål) (Hemiptera, Pentatomidae), *Eriophyes tristriatus* Nal. (Eriophyidae), *Metcalfa pruinosa* Say, 1830. (Hemiptera, Flatidae). Two dangerous invasive walnuts - a marble bug (*Halyomorpha halys*) and a white circus (*Metcalfa pruinosa*) were discovered in Azerbaijan for the first time. In the studied nut samples, metal ions Li, Al, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, As, Cd, Ag, Cd, Ba, Tl were determined in the amount of -0.869, 153.770, -0.354, 0.225, 23.528, 168.871, -0.786, 0.267, 8.286, 5.865, -0.384, -9.183, 0.442, 8.528, 1.147, 1.399 ppb. It should be noted that the content of Fe/56 ions is maximum and corresponds to 168.871 ppb, and that of V/51 ions is minimally reaching -0.354 ppb. Analyzing the results of the obtained experimental studies, it should be noted that the infection of walnuts with insect pests affects both the qualitative and elementary composition, as well as the taste properties of walnut fruits.

Keywords: Walnut; Insects-Pests; Entomofauna; Heavy metals; Mass spectrometry

Introduction

Walnut (*Juglans regia L.*; *Juglandaceae*) is currently present in alleys, gardens, parks and other green spaces of many cities and towns of Azerbaijan. Our country has become one of the largest manufacturers and exporters of walnuts in the world. Walnut is widespread everywhere not only in personal plots. At present, gardens are being planted annually on an industrial scale in order to provide nuts to the country's population. Walnut is a medicinal plant containing a large number of biologically active substances. All the organs of a walnut tree: leaves, roots, bark and, accordingly, the fruits themselves are high in vitamins, minerals and have healing properties. Unripe fruits are rich in ascorbic acid (up to 10%) [1].

Fruit kernels contain fatty oil (up to 60% - 76%), protein substances (up to 21% carbohydrates (up to 7%, provitamin A [2], vitamins K and B, amino acids (asparagine, cystine, glutamine, serine, histidine, valine, phenylalanine). Young nuts contain vitamins C, B1, B2, PP, carotene and quinones, but the composition of ripe walnuts is much richer. They contain vitamins C, B1, B2, PP, carotene, tannins, quinones and fatty oils (linoleic, oleic, palmitic acids), fiber, salts of iron and cobalt.

In Azerbaijan, walnut leaves, branches and fruits damage and infect walnut pests. A stable habitat formed by perennial plantings of walnut trees creates the prerequisites for the constant propagation of a complex of species tropically associated with walnuts. Until recently, the question of the harmfulness of the whole complex of walnut phytophages remained poorly studied. Pests insects cause damage to the growth and development of walnuts.

Materials and Methods

The research was carried out in 2017-2020 on the Persian walnut planted on individual trees in areas subject to varying degrees of anthropogenic impact (in private gardens and along the main motorway) in 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) regions, Nabran (41° 45' 44" N 48° 41' 52" E) on individual trees and parks in Baku and Absheron. Field surveys were conducted twice a month along the route, and every week in the stationary areas. 15-20 trees have been examined in the fields of nearly 50 nut trees and 25-30 trees in the fields of more than 100 trees. Mainly the leaves of nut tree have been visually examined as it has been mentioned above. Samples taken from 10 areas of 20 hectares were used to identify the damage of the pests to walnut trees.

The rate and the intensity of the damage

The studies were carried out in 2017-2019 on walnuts in the courtyards and gardens 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 and in the village of Nabran in the Khachmaz district (41° 45' 44" N 48° 41' 52" C). The collection of information about pests was obtained as a result of systematic examination of walnut trees using generally accepted methods: routine examination, visual counting, shaking, mowing with a net, the use of trapping belts, as well as laboratory analysis of samples of various biological units from plants - flowers, leaves and fruits [1,2].

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Metal ions were determined by the method of mass spectrometry on an inductively coupled plasma mass spectrometer - Agilent 7500 ICP-MS (EPA Method 6020 V "INDUCTIVELY COUPLED PLASMA - MASS SPECTROMETRY"). Pre-tested experimental samples were processed in a DG-EN-10 furnace at a temperature of 1800°C for 10 minutes, then at a temperature of 2000°C for 20 minutes. The obtained sample samples in an amount of 0.2 g - 0.25 g were treated with 10 ml of HNO₃ (65%) suprapur, 1 ml of 1% HCl, 1 ml of 30% H₂O₂.

Using mass spectrometry on an inductively coupled plasma mass spectrometer - Agilent 7500 ICP-MS, the qualitative composition of walnut fruits was determined. The following metal ions were detected in the fruit of a nut infected with pests: Li, Al, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, As, Cd, Ag, Cd, Ba, Tl (Table 1). To determine metal ions by inductively coupled plasma mass spectrometry, we processed samples of nuts with shells in the amount of m = 0.2480g.

Results and its Discussion

One of the most common pests of walnuts is the Codling moth *Cydia pomonella* (Sarrothripsmusculana Ersch.) which belongs to the family *Cymbidae*. It is widely distributed in Azerbaijan and has a great negative economic value. Caterpillars of the moths feed first on the walnut shell, after the cotyledons.

Two species of aphids *Panaphis juglandis*, (Goeze, 1778) and *Chromaphis juglandicola* (Kaltenbach, 1843) damaging the leaves of the Persian walnut were recorded. Two aphid species *Panaphis juglandis* (Goeze, 1778) and *Chromaphis juglandicola* (Kaltenbach, 1843) were recorded on walnut leaves (*Juglans regia* L.) in the Ismayilli, Gabala and Zagatala regions of Azerbaijan in May, June and July 2017 [3]. Both species are monophagous and feed only on Greek nut, which can cause serious damage to both leaves and fruits.

One of the recently registered arthropod species - walnut phytophages is a representative of the *Pentatomidae* family, the marble bug - *Halyomorpha halys* Stål (*Hemiptera*) - appeared in Azerbaijan in 2017 [4]. Marble bug is a wide polyphage and feeds on flowers, stems, leaves and fruits of plants. The adults wintered. In Azerbaijan, bedbugs leave their wintering places in late April, and additionally feed for 1-2 weeks.

The main pest of walnut in Azerbaijan in all cultivation zones is a gall, or warty, mite, *Eriophyes tristriatus* Nal, (*Eriophyidae*). A walnut felt mite can harm the leaves of the plant, forming galls on the upper side of the leaves. On the underside of the sheet in places of deepening there is a felt cover of long beige hairs.

In Azerbaijan, on the young walnut trees, the first invasive species *Metcalfa pruinosa* Say, 1830. (*Hemiptera, Flatidae*) - A white circadian was discovered for the first time. *Metcalfa pruinosa* Say appeared relatively recently, in 2018. Insect nutrition on young walnut leaves leads to significant changes in plants, manifested in a decrease in the degree of attractiveness of damaged plants.

Metal ions Li, Al, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, As, Cd, Ag, Cd, Ba, Tl were determined in the amount of -0.869 ppb, 153.770 ppb, -0.354 ppb, 0.225 ppb, 23.528 ppb, 168.871 ppb, -0.786 ppb, 0.267 ppb, 8.286 ppb, 5.865 ppb, -0.384 ppb, -9.183 ppb, 0.442 ppb, 8.528 ppb, 1.147 ppb, 1.399 ppb) in the studied samples of nuts. It should be

Table 1: Data on the determination of metal ions by inductively coupled plasma mass spectrometry in the studied walnut fruit.

Samples	Metal Ions in ppb															
	Li/7	Al/27	V/51	Cr/53	Mn/55	Fe/56	Co/59	Ni/60	Cu/63	Zn/66	As/75	Ag/107	Cd/111	Ba/137	Tl/205	Pb/208
In Shell Nuts	-0.869	153.77	-0.354	0.225	23.528	168.871	-0.786	-0.267	8.286	5.865	-0.384	-9.183	0.442	8.528	1.147	1.399

noted that the content of Fe/56 ions is maximum and corresponds to 168.871 ppb, and the content of V/51 ions is minimal, reaching a value of -0.354 ppb (Table 1).

Analyzing the results of the obtained experimental studies, it can be stated that infection of the fruit of nuts with insect pests affects both the qualitative and elementary composition and the taste properties of their fruits (Figure 1).

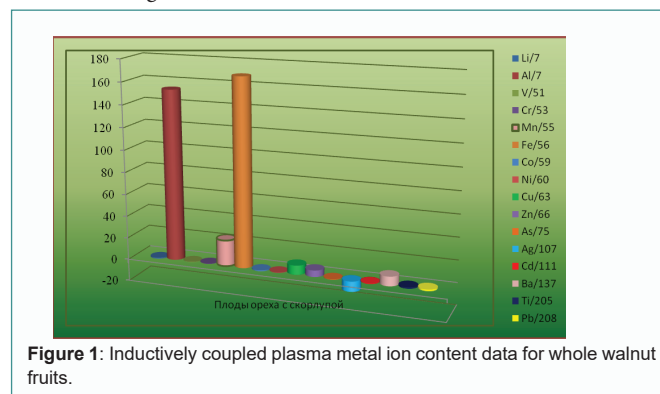


Figure 1: Inductively coupled plasma metal ion content data for whole walnut fruits.

Thus, as a result of our experimental studies, we have identified the elemental composition of walnut fruits. The harmfulness of harmful entomofauna on the qualitative and quantitative composition of walnut fruits has been established.

Findings

1. The main pests of walnut in recent years in Azerbaijan are *Cydia pomonella* (Sarrothripsmusculana Ersch) from the family *Cymbidae* (*Lepidoptera*), *Panaphis juglandis* (Goeze, 1778) and *Chromaphis juglandicola* (Kaltenbach, 1843) (*Hemiptera, Aphaly, Hal Stål* (*Hemiptera, Pentatomidae*), *Eriophyes tristriatus* Nal, (*Eriophyidae*), *Metcalfa pruinosa* Say, 1830. (*Hemiptera, Flatidae*).
2. Two dangerous invasive walnuts (*Juglansregia* L.) - marble bug (*Halyomorpha halys*) and white cicadas (*Metcalfa pruinosa*) were discovered in Azerbaijan for the first time.
3. Metal ions Li, Al, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, As, Cd, Ag, Cd, Ba, Tl were determined in the amount of -0.869, 153.770, -0.354, 0.225, 23.528, 168.871, -0.786, 0.267, 8.286, 5.865, -0.384, -9.183, 0.442, 8.528, 1.147, 1.399 ppb) in the fruits of the nut.
4. The maximum content of Fe / 56 ions was found, which corresponds to 168.871 ppb, and the minimum content of V / 51 ions reaching a value of -0.354 ppb.

References

1. Oleinik KN. Monitoring optimization of small arthropod garden agrocenoses. KN. Oleynik. Agro XXI. 1998;10:16-17.
2. Grichanov IY, Ovsyannikova EI. Pheromones for phytosanitary monitoring of harmful *Lepidoptera*. St. Petersburg: Vseros. Institute of Plant Protection. 2005;244.
3. Nuriyeva I, Nadirova G. Some Bioecological Peculiarities of *Panaphis juglandis* (Goeze, 1778) and *Chromaphis juglandicola* (Kaltenbach, 1843) (*Hemiptera, Aphididae*) the pests of Persian walnut (*Juglans regia* L.) in Azerbaijan. Journal of Entomology and Zoology Studies. 2018;6(2):800-3.
4. Borisova MI, Urajay M. Medicinal properties of agricultural plants. 1974;244-336.