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Biotsenotic Relations Of Aphids (Homoptera, Aphidoidea) With Acclimatized Trees And Shrubs

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Abstract

The acclimatization of plants causes the aphid fauna of the same area to change, i.e. the formation of a specific aphidofauna. Along with the acclimatized plants, adventitious species that are not specific to the fauna of this region are emerging and becoming dangerous pests, while some local species are specializing in the survival of aphids on newly introduced plants.

According to the results of the study, 6 families of the dendroflora of Tashkent, 96 species of 46 genera of dendrophilic aphid live in 63 species of 23 families, 46 genera of acclimatized trees and shrubs.

The biggest number of aphid species, namely 33, live in the representatives of Rosaceae, Salicaceae, Fabaceae. This means that fauna consists of 34.4% of this aphid species. The role of Rosaceae and Salicaceae in this region is of particular importance, as only 19 species of aphids live in Rosaceae, while 9 species of these insects are pests in Salicaceae.

In general, the expansion of insect nutritional spectrum coverage plays an important role in the stability of the quantitative density of insect populations.

Keywords: acclimatized, trees and shrubs, aphids, dendrophil, fauna, nutritional spectrum, life cycle, biology, Tashkent, Uzbekistan.

Introduction

The main part of the ornamental and fruit plants grown in many parks, alleys, around the city highways of Uzbekistan are acclimatized trees and shrubs imported from different countries. In recent years, with the special attention paid to landscaping in our country, the diversity of ornamental plants in cities and settlements is enriched at the expense of acclimatized trees and shrubs.

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The acclimatization of plants not only enriches the flora and biodiversity of the region, but also leads to changes in the fauna of insects, including aphids, that is, the formation of a unique aphidofauna. Along with the acclimatized plants, species that are not specific to the fauna of this region are emerging and becoming dangerous pests, while some local species specialize in the transfer of aphid to newly introduced plants [20]. These insects, which have a complex life cycle and continuous reproduction, cause serious damage to ornamental, fruit trees and shrubs throughout the season [15]. In order to prevent this situation, the study of the adaptive properties of aphids according to plant species is of great scientific and practical importance. Indeed, such data are important in the timely implementation of scientifically based effective control measures against aphids [3, 17].

There is a lot of research work on the study of aphids in Uzbekistan, but among them it is worth noting the research conducted by M.Kh. Akhmedov in 1972-1995. In his research on the fauna, biology, vertical distribution, and zoogeographic properties of the West Tianshandendrophilic aphids, he focused on the biology, distribution, and damage of some species of aphids living in acclimatized trees and shrubs [2]. In his subsequent research, the scientist provided a detailed analysis of the taxonomy, ecology and faunogenesis of aphid species in the arid mountain regions of Central Asia [3, 4, 5].

Studies on the nutritional spectrum of insects are found in some scientific sources. They mainly contain information on the adaptation characteristics, morphoecology and control of forage species of forage crops. Also, most of the work on the nutritional spectrum is devoted to the study of other groups of insects, and in Tashkent there are no studies on the nutritional spectrum of the aphid of acclimatized trees and shrubs [4, 13, 18, 19,].

As a continuation of the above work, we aimed to study the species composition of tree and shrub aphids, their nutritional spectrum. Preliminary research results have been published [15].

Materials and methodology

The scientific data presented in this article are based on the materials collected from Tashkent and adjacent areas for 2009-2020, the results of research and observations. Most of the materials were collected from March to the end of November, and some were also collected during the winter months.

During our research, ornamental, fruit trees and shrubs growing in all parks, gardens, sanatoriums and streets of Tashkent were observed, and samples of aphid were collected.

Samples of aphids were identified at the species level with the participation of aphidologists (M.Kh. Akhmedov, I.Zokirov, A.Khusanov). The identification of plants was carried out using special identifiers with the help of plant introduction and acclimatizing laboratory staff of the Botanical Garden of the Academy of Sciences of the Republic of Uzbekistan [7, 8, 9]. Aphid samples were collected and processed according to

the methods proposed by AK Mordvilko, GH Shaposhnikov [9, 14]. A trinocular microscope was used to prepare permanent preparations and analyze the size of the aphids. In the identification of acclimatized as well as native ornamental and fruit trees, reference has been made to the manuals and identifiers of several botanical scientists [1, 6, 10, 11].

Results

According to the results of the study, 6 families of the dendroflora of Tashkent, 96 species of 46 genera of dendrophilic aphid live in 63 species of 23 families, 46 genera of acclimatized trees and shrubs.

The biggest number of aphid species, namely 33, live in the representatives of Rosaceae, Salicaceae, Fabaceae. This means that fauna consists of 34.4% of this aphid species. The role of Rosaceae and Salicaceae in this region is of particular importance, as only 19 species of aphids live in Rosaceae, while 9 species of these insects are pests in Salicaceae.

Aphids belonging to 17 species are found in plants belonging to the families of Elaegnaceae, Capripholiaceae, Rhamnaceae, Cupressaceae, Pinaceae, Juglandaceae and Saxifragaceae and account for 17.7% of the fauna.

Only one representative of each acclimatized trees and shrubs of Berberidaceae, Tamaricaceae, Citrullaceae, Asegaseae, Fagaceae, Celasraceae, Malvaceae, Sambucaceae, Viburnaceae, Punicaceae, Punicaceae families is infected with aphids.

According to it, aphids live in different genera of Salix, Rosa, Lonicera, Ribes, Spiraea, Viburnum, Crataegus and Rubus. For example, in 9 species of Salix, 21 species of aphid are recorded, while Rosa serves as a food plant for aphid of 6 genera. In 5 species of Viburnum, only Aphis fabae aphid was found. In contrast, 5 species of aphids live in peaches one by one throughout the season. A similar situation can be observed in poplar aphid. In particular, 4 species of these insects were observed in 10 species of poplars. 6 species of aphid feed on almonds and plums, while Pinaceae has 7 species of aphid.

Representatives of the remaining 47 genera of trees and shrubs recorded 1 to 4 species of aphids (Table 1).

Also, when the identified species were analyzed by genera, 58 of them were monotypic, making up 1 species belonging to 1 genus. There are 22 bitypic genera with two species, 6 tritypic genera, 5 tetratyapic genera, 3 pentatypical genera and 2 polytypic genera. The largest genera were Aphis L., and 14 species of this genus were identified in acclimatized trees and shrubs. Even when analyzing the nutritional spectrum of dendrophilic aphid, it was found that this figure was highest in the genus Aphis L., i.e., species belonging to this genus occur in representatives of 14 families of plants.

A complete list of all trees and shrubs with aphids was compiled and the species composition of these insects living in them was studied in detail. Based on the data obtained, the classification, position of plants, family, genus and species, the rate of occurrence of aphids are fully expressed in Table 1.

During the study, 52 species of aphid were recorded for the first time in new forage plants. In general, 52 species (54.2%) of the identified species in the Tashkent aphidofauna lived simultaneously on local and acclimatized food plants, while 61 species lived only on acclimatized trees and shrubs.

Table 1 List of trees and shrubs infested with aphid

Families, genera and species of plants	Types of aphid	Frequency of occurance
PINACEAE		
Genus. Pinus		
1(1) Pinuspallasiana	Eulachnusalticola Börner, 1940 Eulachnustauricus Bozhko, 1961	++ +
Genus. Picea		
2(1) Piceakoraiensis	Cinarapiceae (Panzer, 1801)	+
3(2) Picea schrenkiana	Cinarapiceae (Panzer, 1801)	+
CUPRESSACEAE		
Genus. Biota		
4(1) Biota orientalis	Cinara tujafilina (del Guercio, 1909)	+++
Genus. Juniperus		
5(1) Juniperusseravshanica 6(2) Juniperusturkestanica 7(3) Juniperuscommunis	Cinaratujafilina (del Guercio, 1909) Cinaratujafilina (del Guercio, 1909) Cinara tujafilina (del Guercio, 1909)	++ ++ ++
Genus. Thuja		
8(1) Thujaoccidentalis	Cinara tujafilina (del Guercio, 1909)	+++
SALICACEAE		
Genus. Populus		
9(1)Populus pyramidalis	Thecabiusaffinis (Kaltenbach, 1843) Pemphigus bursarius (Linnaeus, 1758) Pemphigus immunis Buckton, 1896. Pemphigus populi Courchet, 1879 Pemphigus populinigrae (Schrank, 1801)	++ ++ ++ +++ ++

	Pemphigus protospirae Lichtenstein, 1885	+
	Pemphigus vesicarius Passerini, 1861	++
	Chaitophorusleucomelas Koch, 1854	++
10(2)Populusnigra	Thecabiusaffinis (Kaltenbach, 1843)	++
	Pemphigus bursarius (Linnaeus, 1758)	++
	Pemphigus populi Courchet, 1879	+++
	Pemphigus populinigrae (Schrank, 1801)	+++
	Pemphigus protospirae Lichtenstein, 1885	++
	Pemphigus vesicarius Passerini, 1861	+
	Chaitophorusleucomelas Koch, 1854	+
	Chaitophoruspopulialbae (Boyer de Fonscolombe, 1841)	+++
	Pterocomma populeum (Kaltenbach, 1843)	+++
11(3) Populusdensa	Pemphigus napaeus Buckton, 1896	+
	Pemphigus protospirae Lichtenstein, 1885	+
	Pemphigus vesicarius Passerini, 1861	+
	Pterocommapopuleum (Kaltenbach, 1843)	++
12(4)Populus alba	Chaitophoruspopuleti (Panzer, 1804)	++
	Chaitophoruspopulialbae (Boyer de Fonscolombe, 1841)	+++
Genus. Salix		
13(1) Salix alba	Tuberolachnussalignus (Gmelin, 1790)	+++
	Chaitophoruscapreae (Mosley, 1841)	++
	Chaitophorussalicti (Schrank, 1801)	++
	Pterocommapilosum Buckton, 1879	+++
	Pterecommapopuleum (Kalt.)	+++
	Aphis farinosa Gmelin, 1790	+++
	Cavariella aegopodii (Scopoli, 1763)	+
	Cavariellaarchangelicae (Scopoli, 1763)	+
	Cavariellapastinacae (Linnaeus, 1758)	+
	Cavariellatheobaldi (Gillette & Bragg, 1918)	++
14(2) Salix babilonica	Tuberolachnussalignus (Gmelin, 1790)	++
	Chaitophoruscapreae (Mosley, 1841)	+
	Chaitophorussalicti (Schrank, 1801)	+

	Pterocommapilosum Buckton, 1879	++
	Pterocommapopuleum (Kaltenbach, 1843)	+++
	Aphis farinosa Gmelin, 1790	++
	Cavariella aegopodii (Scopoli, 1763)	+
	Cavariellaarchangelicae (Scopoli, 1763)	++
	Cavariellapastinacae (Linnaeus, 1758)	+
	Cavariellatheobaldi (Gillette & Bragg, 1918)	++
15(3) Salix adenophylla	Tuberolachnussalignus (Gmelin, 1790)	
16(4) Salix purpurae	Tuberolachnussalignus (Gmelin, 1790)	+
	Chaitophoruscapreae (Mosley, 1841)	+
	Pterocommapilosum Buckton, 1879	++
	Pterocommapopuleum (Kaltenbach, 1843)	++
	Aphis farinosa Gmelin, 1790	++
	Cavariellaarchangelicae (Scopoli, 1763)	+
	Cavariellapastinacae (Linnaeus, 1758)	+
	Cavariellatheobaldi (Gillette & Bragg, 1918)	+
17(5) Salix cinerea	Tuberolachnussalignus (Gmelin, 1790)	++
	Chaitophoruscapreae (Mosley, 1841)	+
	Cavariellaarchangelicae (Scopoli, 1763)	+
	Cavariellapastinacae (Linnaeus, 1758)	+
	Cavariellatheobaldi (Gillette & Bragg, 1918)	+
JUGLANDACEAE		
Genus. Juglandis		
18(1) Juglans regia	Callaphisjuglandis (Goeze, 1778)	+++
	Chromaphisjuglandicola (Kaltenbach, 1843)	++
19(2) Juglans nigra	Chromaphis juglandicola (Kaltenbach, 1843)	++
FAGACEAE		
Genus. Quercus		
20(1) Quercus alba	Tuberculatusannulatus(Hartig, 1841)	++
ULMACEAE		
Genus. Ulmus		
21(1) Ulmusdensa	Eriosoma lanuginosum (Hartig, 1839).	++
	Eriosoma phaenax Nevsky, 1929	+
	Eriosoma ulmi (Linnaeus, 1758)	+

	Kaltenbachiella pallida (Haliday, 1838) Thetraneuracoerulescens(Passerini, 1856) Thetraneuraulmi(Linnaeus, 1758) Tinocallissaltans (Nevsky, 1929)	+ + ++ ++
BERBERIDACEAE		
Genus. Berberis		
22(1) Berberisnummularia	LiosomaphisturanicusNarzikulov, 1964 Berberidaphislydiae Narzikulov, 1957	++ +
SAXIFRAGACEAE		
Genus. Ribes		
23(1) Ribeshispidulum	Aphis grossulariae Kaltenbach, 1843. CryptomyzuselaeagniBörner, 1950 Hyperomyzus lactucae (Linnaeus, 1758)	++ + +
ROSACEAE		
Genus. Spiraea		
24(1) Spiraeahypericifolia	Aphis pomi de Geer, 1773 Aphis spiraephaga Muller, 1961 Aphis spiraefila Patch, 1914 BrachycaudusspiraeaeBörner, 1932	+++ ++ ++ ++
Genus. Amygdalus		
25(1) Amygdalus spinosissima	Pterochloroidespersicae (Cholodkovsky, 1899). Brachycaudushelichrysi (Kaltenbach, 1843). Brachycaudusamygdalinus (Schouteden, 1905)	+ + +
Genus. Prunus		
26(1) Prunus sogdiana	Pterochloroidespersicae (Cholodkovsky, 1899). Rhopalosiphumnymphaeae (Linnaeus, 1761). Hyalopteruspruni (Geoffroy, 1762). Brachycaudus (Acaudus) cardui (Linnaeus, 1761, 1858) Brachycaudus prunicola (Kaltenbach, 1843)	++ ++ +++ ++ ++
27(1) Prunus domestica	Pterochloroidespersicae (Cholodkovsky, 1899). Rhopalosiphumnymphaeae (Linnaeus, 1761). Hyalopteruspruni (Geoffroy, 1762).	+ +++ +

	Brachycaudus (Acaudus) cardui (Linnaeus, 1761, 1858) Brachycaudus prunicola (Kaltenbach, 1843) Phorodon humuli (Schrank, 1801).	+ + ++
Genus. Cotoniaster		
28(1) Cotoniasterhissarica	Dysaphismicrosiphon (Nevs.)	++
Genus. Pyrus		
29(1) Pyrus communis	Schizaphispyri Shaposhnikov, 1952 Aphis pomi de Geer, 1773 Anuraphissubterranea (F.Walker, 1852). Dysaphispyri (Boyer de Fonscolombe, 1841). DentatusreamuriRusanova, 1942	+++ +++ ++ + +
Genus. Malus		
30(1) Malus domestica	Eriosomalanigerum (Hausmann, 1802) Aphis pomi de Geer, 1775 Dysaphisplantaginea (Passerini, 1860). Dysaphisaffinis (Mordvilko, 1928).	++ +++ ++ +
Genus. Sorbus		
31(1) Sorbus persica	Aphis pomi de Geer, 1775	++
Genus. Crataegus		
32(1) Crataegusaltaica	Rhopalosiphum insertum (Walker, 1849).	++
33(2) Crataegushissarica	Aphis pomi de Geer, 1775 Dysaphiscrataegi (Kaltenbach, 1843)	+++ ++
34(3) Crataegussongorica	Aphis pomi de Geer, 1775	++
Genus. Rubus		
35(1) Rubusoccidentalis	Aphis ruborum (Börner, 1932) Acyrthosiphonrubi Narzikulov, 1957	++ +++
Genus. Rosa		
36(1) Rosa beggeriana	Maculolachnussubmacula (Walker, 1848) Myzaphisrosarum (Kaltenbach, 1843) Metopolophiumdirhodum (Walk.) Amphorophoracatharinae (Nevs.) Macrosiphumrosae (Linnaeus, 1758)	+++ +++ ++ ++ +++
37(2) Rosa fedtschenkoana	Maculolachnussubmacula (Walker, 1848)	+++

	Myzaphisrosarum (Kaltenbach, 1843) Chaetosiphonchaetosiphon (Nevs.) Macrosiphumrosae (Linnaeus, 1758)	+++ ++ +++
Genus. Cydonia		
38(1) Cydonia vulgaris	Aphis pomi de Geer, 1775	++
39(2) Cydonia oblonga	Aphis pomi de Geer, 1775	++
	Ovatusinsitus (F.Walker, 1849)	+
Genus.Armeniaca		
40(1) Armeniaca vulgaris	Pterochloroidespersicae (Cholodkovsky, 1899). Rhopalosiphumnymphaeae (Linnaeus, 1761). Hyalopteruspruni (Geoffroy, 1762).	+ ++ +++
Genus.Persica		
41(1) Persica vulgaris	Pterochloroidespersicae (Cholodkovsky, 1899). Hyalopteruspruni (Geoffroy, 1762). Brachycaudushelichrysi (Kaltenbach, 1843). Brachycaudus prunicola (Kaltenbach, 1843) Myzuspersicae (Sulzer, 1776).	+++ +++ +++ ++ +++
Genus.Padus		
42(1) Padusmahleb	Rhopalosiphum padi (Linnaeus, 1758)	+
FABACEAE –		
Genus.Robinia		
43(1) Robiniapseudacacia	Aphis craccivora Koch, 1854.	+++
Genus.Gleditschina		
44(1) Gleditschinacaspica	Aphis gossypii Glover, 1877	+
Genus. Albizzia		
45(1) Albizzia julibrissin	Aphis gossypii Glover, 1877 Aphis craccivora Koch, 1854.	+ +
Genus.Amorpha		
46(1) Amorphacanescens	Aphis craccivora Koch, 1854.	++
Genus. Caragana		
47(1) Caragana acanthophylla	Aphis craccivora Koch, 1854.	++
CELASTRACEAE		
Genus.Evonymus		

48(1) Evonymusamericana	Aphis fabae subsp. evonymi Fabricius, 1775	+
ACERACEAE		
Genus. Acer		
49(1) Acer regelii	Periphyllusmamontovae Narzikulov, 1957 PeriphyllusnevskyiiMamontova, 1955	+ +
RHAMNACEAE		
Genus.Rhamnus		
50(1) Rhamnuscathartica	Macchiatiella rhamni subsp. tarani (Nevs) Aphis frangulae Kaltenbach, 1845 Aphis nasturtii Kaltenbach, 1843	 + ++ +
Genus. Frangula		
51(1) Frangula alnus	Aphis gossypii Glover, 1877	++
MALVACEAE		
Genus. Hibiscus		
52(1) Hibiscus siryacus	Aphis gossypii Glover, 1877	++
TAMARICACEAE		
Genus.Tamarix		
53(1) Tamarixramosissima	Brachyunguistamaricis (Lichtenstein, 1885) Brachyunguistamaricophilus (Nevsky, 1928)	++ ++
ELAEAGNACEAE		
Genus.Hyppophae		
54(1)Hyppophaerhamonides	Capitophorushippophaes (Walker, 1852)	+
Genus.Eleagnus		
55(1)Eleagnusangistifolia	Capitophorusarchangelskii Nevsky, 1928 Capitophoruselaeagni (del Guercio, 1894) Capitophorushippophaes (Walker, 1852) Capitophoruspakansus Hottes&Frison, 1931.	++ + + +
BIGNONIACEAE		
Genus. Tecoma (Campsis)		
56(1) Campsis radicans	Aphis gossypii Glover, 1877	+
CAPRIFOLIACEAE		
Genus. Lonicera		

157(1) Lonicera tatarica	Prociphilusumarovi Narzikulov, 1964 Prociphilusxylostei (De Geer, 1773) Hyadaphistataricae (Aizenberg, 1935) Semiaphislonicerina Shaposhnikov, 1952	++ ++ +++ ++
58(2) Lonicera simulatrix	Hyadaphispasserinii (del Guercio, 1911) Semiaphislonicerina Shaposhnikov, 1952 Rhopalomyzus lonicerae (Siebold, 1839)	+++ ++ ++
SAMBUCACEAE		
Genus. Sumbacus		
59(1) Sumbacus canadensis	Aphis sambuci Linnaeus, 1758.	+
VIBURNACEAE		
Genus. Viburnum		
60(1) Viburnum acerifolium	Aphis fabae Scopoli, 1763.	+ +
PUNICACEAE		
Genus. Punica		
61(1) Punicagranatum	Aphis punicae Passerini, 1863.	+ +
VITACEAE		
Genus. Vitis		
62(1) Vitis vinifera	Aphis gossypii Glover, 1877	+
CITRULLACEAE		
Genus. Citrullus		
63(1) Citrullus limonum	Aphis gossypii Glover, 1877 Myzuspersicae (Sulzer, 1776).	+ + +

CONCLUSION

In Uzbekistan, the acclimatization of plants has led to a change in the fauna of the aphids, that is, the formation of a unique aphidofauna. Along with the acclimatized plants, adventitious species that are not unique to the fauna of this region have emerged, while some native species have specialized in the transition of aphids to newly introduced plants.

According to the results of the study, 6 families of the dendroflora of Tashkent, 96 species of 46 genera of dendrophilic aphids live in 63 species of 23 families, 46 genera of acclimatized trees and shrubs.

Studies have shown that in Pinaceae, the feeding rate of 3 species of aphid, including Eulachnusalticola aphid, is somewhat higher. The fact that only Cinaratujafilina is common in 5 species of Cupressaceae indicates that stable colonies of this species constitute the perfect nutritional spectrum.

There are 21 species of aphids on the trunks, branches and leaves of 9 species of Salicaceae, and Pemphigus populinigrae, Pemphigus protospirae, Pterocommapopuleum, Pterocommapilosum, Chaitophoruspopulialbae, Tuberolachnussalignus and Aphis farinosa have wide nutritional spectrum.

There are only 2 species of Juglandaceae, and the plants that make up their nutritional spectrum are Juglans regia and Juglans nigra.

Tuberculatusannulatus is the only species that causes damage in Fagaceae.

Most generations of aphids specialize in feeding on the representatives of Rosaceae, with 33 species of aphids in 19 species of Rosaceae. There are also aphids that make up 2 or more plants in their nutritional spectrum.

In general, the expansion of insect nutritional spectrum coverage plays an important role in the stability of the quantitative density of insect populations.

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