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Aphid species (Hemiptera: Aphididae) on medicinal-aromatic plants in Artvin (Türkiye)

Artvin (Türkiye)'de tıbbi-aromatik bitkiler üzerindeki afit türleri

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ABSTRACT

Medicinal and aromatic plants have recently gained popularity, contributing to the economic strength of countries or regions by increasing employment opportunities and representing the areas where they are grown, thus creating various tourism possibilities. However, exposure of these plants to insect groups consuming plant sap, such as aphids, in their natural or unnatural habitats can lead to product loss. There are 350 species of plants exhibiting medicinal-aromatic properties in Artvin province. In this study, medicinal-aromatic plant species distributed in the province were evaluated in terms of aphid population, and 80 aphid species were identified from 72 medicinal-aromatic plants. According to the data obtained from the fields, the highest number of aphid species were found on apple (*Malus sylvestris*), poplar (*Populus nigra*), plum (*Prunus* spp.) and oak (*Quercus petreae*) species respectively. Aphids were rarely found in medicinal-aromatic plants that give off a strong odor, such as thyme and mint, and it was observed that they did not form dense populations. It was determined that the identified aphid species generally formed dense populations on the leaf surface of fruit-bearing species while they fed on stems and leaves in annual species. To conclude, the study highlights the significant impact of aphid populations on the medicinal-aromatic plants in Artvin, underscoring the need for continuous monitoring and effective management strategies to protect the plants and the economic opportunities they represent.

INTRODUCTION

Plants used in the treatment of diseases are called "medicinal plants". Medicinal plants are derived from various plant parts, such as roots, leaves, flowers, or fruits, which contain biological components. They are commonly used to prevent diseases, maintain health, or treat illnesses. Aromatic plants, on the other hand, are plants primarily used to provide

pleasant scents and flavors. Aromatic plants, which include spices, essential oils, and similar products, are utilized in various fields such as food preparation, cosmetic products, perfumes, and aromatherapy. Today, the terms "medicinal and aromatic plants" are often used together, and scientific research on the bioactive components and potential health benefits of these plants continues. These studies help us better understand the role of plants in the healthcare field and provide information to support their safe usage. Medicinal and aromatic plants are extensively used in industries such as pharmaceuticals and food, as well as in chemistry, cosmetics, dye production, and many other sectors. Generally, these plants can be classified based on their families, active compounds, usage and consumption methods, utilized plant organs, and pharmacological effects. The classification based on active compounds is the most common one (Eminağaoğlu and Akyıldırım Beğen 2023).

Worldwide, there are many insect species that directly and indirectly damages plants and in turn indirectly lead to adverse effects on humans. One of the most significant species, which is of great importance in agriculture and causes damage to cereal and vegetable crops, leading to economic losses worth millions of dollars, is aphids (Agrawal and Marol 2022). There is no comprehensive study on the damage caused by aphids to medicinal and aromatic plants in our country or on the identification of aphids on these plants.

Investigating the presence of aphids on medicinal and aromatic plants has attracted the attention of many researchers (Bhagat 2012, Blackman and Eastop 1984, El-Kordy et al. 1999, Karkanis et al. 2011). In different regions of the world, studies focusing solely on medicinal and aromatic plants have identified aphid species that cause damage to these plants. El-Kordy et al. (1999) identified nine species belonging to six genera from 26 medicinal and aromatic plant species collected from different localities in Egypt. Karkanis et al. (2011) reported that *Dysaphis lappae* and *Aphis fabae* caused damage to *Silybum marianum*, a medicinal herb, in Iran and Greece. Bhagat (2012) identified 63 aphid species damaging 92 medicinal and aromatic plants in the Jammu and Kashmir region of India. However, in Pakistan, both faunistic and aphidological studies related to pests have primarily focused on food crops rather than medicinal plants. This is due to the lack of nationwide sustainable cultivation-protection practices and the unrealized export potential of medicinal plants (Akhtar et al. 2010, Ali and Aheer 2007, Amer et al. 2009).

In recent years, studies on aphid fauna in Türkiye have increased, and it has been determined that the number of pest aphid species is almost twice as high as it was ten years ago. The composition of the Türkiye aphid faunas was increased to 676 species with recent studies (Görür et al. 2024, Kök et al. 2024). There are also specific studies on the damage these species cause to plants. Görür (2004b) studied aphid species on fruit trees in the province of Niğde. Emir et al. (2025) identified 20 aphid species causing damage to fruits and vegetables in the province of Konya. Although aphids on medicinal and aromatic plants have not been studied extensively, control methods have been developed for certain species as mint and sage (Dev et al. 2024, Zarkani et al. 2017). Similar studies have been conducted on ornamental plants as well, and 30 aphid species have been identified on ornamental plants in the city center of Kayseri (Öztürk and Muşlu 2018).

Medicinal and aromatic plants have recently gained popularity, contributing to the economic strength of countries or regions, increasing employment opportunities, and becoming an element that represents their location while creating various tourism possibilities. In both natural and cultivated areas where these species grow, they are exposed to insect groups such as aphids, which sustain themselves by consuming plant sap, leading to yield losses. The taxonomic identification of these species will aid future agricultural studies.

MATERIALS AND METHODS

Study area

The province of Artvin is located in the northeastern part of Türkiye, within the Black Sea Region, and features a rich mountainous landscape. The highest point of the province is Kaçkar Mountain, with an elevation of 3931 meters. This mountain is situated at the junction of the Artvin, Rize, and Erzurum borders and is the highest peak of the Eastern Black Sea Mountains.

Figure 1. Map of Artvin province and some important medicinal and aromatic plants

The primary material of the study consists of aphids that cause damage to approximately 350 medicinal and aromatic plants found in the province of Artvin and its districts. The region is generally characterized by a rugged terrain and is located in a geographical area where three different climate types can be observed. Additionally, it is situated in the Caucasus region, which is one of the centers of plant biodiversity (Eminağaoğlu and Akyıldırım Beğen 2023).

Collection and preparation of samples

Within the boundaries of Artvin province and its districts, which constitute the project study area, aphid populations present on all cultivated and naturally growing medicinal and aromatic plants (MAPs) were sampled. The plant and aphid species were listed separately. During collection, special care was taken to prevent damage to the distinguishing characteristics of the aphids. Initially, the aphids were gently stimulated with a brush and then collected using a fine-tipped "0" size brush. They were then transferred into collection tubes containing 70% ethanol. During the sampling process, an effort was made to sample as many winged and wingless viviparous individuals as possible. Additionally, non-adult individuals were included in the sampling. Each sampled aphid population, plant and locality was considered a separate sample and assigned a unique identification number. Wherever possible, observations were made regarding the specific part of the plant the aphids were feeding on, whether they caused damage or discoloration, induced gall formation, colony density, aphid coloration on the plant, and whether ants or natural enemies were present. These characteristics were documented through photographs. The samples were prepared according to the principles specified by Martin (1983) without being kept in collection tubes for an extended period.

Morphological examination of plants

During the identification of plant samples, a stereomicroscope (Nikon SMZ1000) was used in conjunction with various sources, including Flora of Türkiye and the East Aegean Islands, Flora of Europe, and Flora of the USSR (Davis 1965-1985, Davis et al. 1988). Morphological studies were conducted on herbarium materials. The Nikon Stereomicroscope SMZ1000 was used for macroscopic examination of floral structures, leaf trichome characteristics, and the determination of leaf margin serration type and count. During the verification of identified samples, detailed information such as family, genus name and author, species name and author was recorded. For the verification of updated nomenclature and synonyms, sources such as The Red Data Book of Turkish Plants (Güner et al. 2012), the Catalog of Life, and the IPNI database (2024) were consulted (Bánki et al. 2022). Additionally, IUCN (2024) threat categories were checked (Ekim et al. 2000).

Identification of aphid samples

Permanent slides of the samples aphid population were conducted according principles offered by Martin (1983). An identification of the processed aphids specimens was performed based on the online identification keys (Blackman and Eastop 2025). The taxonomic status, host plants, worldwide distribution, synonyms, and general features of the defined species were derived and checked by comparing current studies (Blackman and Eastop 2025, Favret 2024, Görür et al. 2019a, 2024, Holman 2009, Kök and Özdemir 2021). Recognized features of the defined species were recorded and illustrated (Figure 2-4).

Figure 2. Aphids on plants; *Rhopalosiphum maidis* on *Zea mays* (a), *Aphis gossypii* on *Punica granatum* (b,d), *Aphis ruborum* on *Rubus* sp. (c,f), *Aphis fabae* on *Robinia acacia* (e)

RESULTS AND DISCUSSION

A total of 68 aphid species have been identified in studies conducted on all trees and shrubs in the provinces and districts of Artvin (Görür et al. 2019b). As a result of the evaluation of the conducted study in Artvin province, 80 aphid species belonging to Adelgidae and Aphididae

families have been recorded on 72 plant species among 350 native medicinal and aromatic plant species (Eminağaoğlu and Akyıldırım Beğen 2023). As there have been no studies carried out to determine aphid species on these important plant species in Türkiye and Artvin, both lists of the host plant and aphids species on them (Table 1) have been considered as promising findings. Most of the previous studies have focused on the determination of the faunistic aspects of the aphid species on fruits, vegetables, grains, forage crops, shrubby plants (Alaserhat 2021, Alaserhat et al. 2021, Alaserhat and Canbay 2017, Alaserhat and Güçlü 2020, Bayındır Erol et al. 2018, Güçlü et al. 2015, Kök and Özdemir 2021, Kök et al. 2016, Özdemir 2022). Artvin is the province with the highest plant species diversity in Türkiye and also hosts the largest number of medicinal and aromatic plants (Eminağaoğlu and Akyıldırım Beğen 2023). Therefore, a comprehensive investigation of these harmful aphid species will be conducted.

The analysis results show that the highest aphid species number was found on *Populus nigra* (7 species), *Malus sylvestris* (6 species), and *Quercus petrae* (5 species) (Table 1).

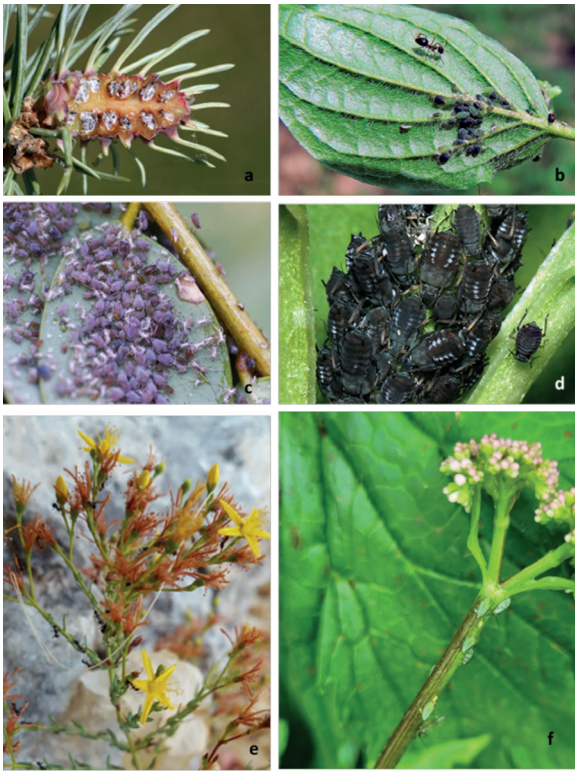

Figure 3. Aphids on plants; Adelges cooleyi on *Picea orientalis* (a), *Anoecia corni* on *Cornus sanguinea* (b), *Aphis fabae* on *Anthemis tinctoria* (d), *Aphis spiraecola* on *Hypericum* sp. (e), *Aphis gossypii* on *Valeriana alliariifolia* (f)

The genera with the highest number of species among the identified aphids are, in order, *Aphis* (21 species), *Brachycaudus* (4 species), *Chaitophorus* (4 species), *Cinara* (4 species), *Myzus* (3 species), and *Uroleucon* (3 species).

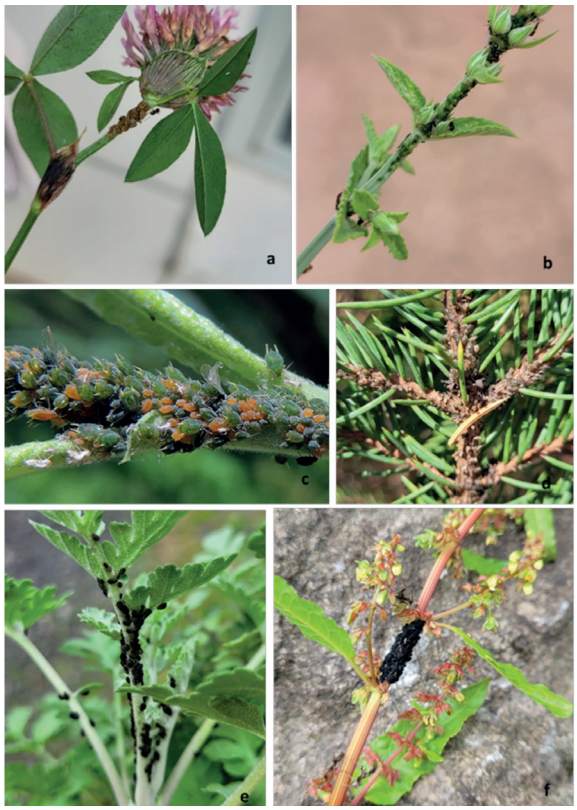

Figure 4. Aphids on plants; *Acyrthosiphon pisum* on *Trifolium pratanse* (a), *Aphis gossypii*, on *Nepeta nuda* (b), *Macrosiphum rosae* on *Rosa canina* (c), *Cinara cedri* on *Cedrus libani* (d), *Aphis fabae* on *Tanacetum parthenium* (e), *Aphis fabae* on *Rumex crispus* (f)

Türkiye is a country that stands out with its unique biogeographical characteristics and rich flora and fauna diversity. In addition to its faunistic richness, the plant diversity, which plays a decisive role in aphid diversity, is also quite high in Türkiye. Although there is no direct linear correlation, this high plant diversity creates special conditions in terms of aphid species diversity. Considering that our country has more than 12.000 plant species with an endemism rate of about 31%, it has been determined that aphid species native to Türkiye account for only about 2.2% of the total species (Akyıldırım et al. 2013, Güner et al. 2012). This indicates that studies on aphids are insufficient.

The first information about the aphid fauna of Türkiye dates back to the early 1900s. Although studies were predominantly conducted by foreign researchers until recent times, a significant amount of work has also been carried out by local researchers. Looking at the studies conducted until

Table 1. Aphid species determined on medicinal and aromatic plant species in Artvin province, Türkiye

Family	Medicinal and Aromatic Plant Species	Aphid Species	Locality	GPS Coordinates
Amaranthaceae	*Chenopodium album* L.	*Aphis fabae* Scopoli, 1763	Yusufeli	40°48'33.0"N 41°32'34.0"E
Apiaceae	*Daucus carota* L.	*Semiaphis dauci* (Fabricius, 1775)	Ardanuç	41°06'09.0"N 42°08'37.0"E
Asteraceae	*Arctium minus* (Hill) Bernh.	*Aphis solanella* Theobald, 1914	Center	41°13'33.0"N 41°51'34.0"E
	Arctium lappa L.	*Aphis fabae* Scopoli, 1763	Center	41°14'02.0"N 41°50'04.0"E
	Cota tinctoria (L.) J.Gay	*Aphis fabae* Scopoli, 1763	Murgul	41°18'04.0"N 41°37'33.0"E
		Aphis asclepiadis Fitch, 1851	Center	41°11'49.0"N 41°50'54.0"E
		Uroleucon siculum Barbagallo & Stroyan, 1982	Borçka	41°22'02.0"N 41°34'32.0"E
	Erigeron canadensis L.	*Aphis spiraecola* Patch, 1914	Arhavi	41°21'30.0"N 41°30'33.0"E
	Inula viscosa (L.) Aiton	*Uroleucon pulicariae* (Hille Ris Lambers, 1939)	Hopa	41°25'14.0"N 41°24'25.0"E
	Tanacetum parthenium (Willd.) Sch.Bip.	*Aphis craccivora* Koch, 1854	Yusufeli	40°59'06.0"N 41°21'46.0"E
		Aphis fabae Scopoli, 1763	Kemalpaşa	41°30'32.0"N 41°33'36.0"E
	Tragopogon porrifolius L.	*Aphis craccivora* Koch, 1854	Yusufeli	40°48'33.0"N 41°32'34.0"E
		Uroleucon sonchi (Linnaeus, 1767)	Şavşat	41°13'33.0"N 42°23'34.0"E
Balsaminaceae	Impatiens noli-tangere Michx.	Aphis impatientis Thomas, 1878	Arhavi	41°16'40.0"N 41°22'26.0"E
Betulaceae	*Alnus glutinosa* (L.) Gaertn.	*Neobetulaphis pusilla* Basu, 1964	Borçka	41°22'02.0"N 41°34'32.0"E
		Pterocallis albida Börner, 1940	Center	41°11'49.0"N 41°50'54.0"E
		Pterocallis alni (De Geer, 1773)	Borçka	41°22'14.0"N 41°34'07.0"E
	Betula pendula Roth *Corylus avellana* L.	*Symydobius oblongus* (von Heyden, 1837)	Şavşat	41°14'22.0"N 42°27'17.0"E
		Corylobium avellanae (Schrank, 1801)	Hopa	41°24'44.0"N 41°26'41.0"E
Boraginaceae	Echium vulgare L.	*Bracycaudus cardui* (Linnaeus, 1758)	Yusufeli	40°48'33.0"N 41°28'34.0"E
Caprifoliaceae	*Valeriana alliariifolia* Vahl	*Aphis fabae* Scopoli, 1763	Center	41°07'57.0"N 41°50'08.0"E
Cornaceae	*Cornus mas* L.	*Aphis spiraecola* Patch, 1914	Şavşat	41°16'47.0"N 42°24'26.0"E
	Cornus sanguinea L.	*Anoecia corni* (Fabricius, 1775)	Yusufeli	40°45'48.0"N 41°28'03.0"E
Cupressaceae	*Thuja orientalis* L.	*Cinara tujafilina* (Del Guercio, 1909)	Center	41°11'49.0"N 41°50'54.0"E
Ebenaceae	*Diospyros lotus* G.Don	*Aphis gossypii* Glover, 1877	Borçka	41°22'29.0"N 41°40'32.0"E
Elaeagnaceae	*Elaeagnus angustifolia* L.	*Capitophorus elaeagni* (Del Guercio, 1894)	Yusufeli	40°47'34.0"N 41°29'03.0"E
Ericaceae	*Arbutus unedo* L.	*Wahlgreniella nervata* (Gillette, 1908)	Center	41°11'46.0"N 41°50'56.0"E
	Rhododendron luteum Sweet	*Illinoia dzhibladzeae* Shaposhnikov, 1964	Hopa	41°27'08.0"N 41°29'32.0"E
		Macrosiphum euphorbiae (Thomas, 1878)	Yusufeli	41°03'33.0"N 41°26'43.0"E
Euphorbiaceae	*Euphorbia* sp.	*Aphis craccivora* Koch, 1854	Center	41°06'18.0"N 41°44'38.0"E
		Aphis hillerislambersi Nieto Nafría & Mier Durante, 1976	Center	41°11'46.0"N 41°50'56.0"E
		Aphis fabae Scopoli, 1763	Şavşat	41°13'33.0"N 42°23'34.0"E

Fagaceae	*Castanea sativa* Mill.	*Tuberculatus annulatus* (Hartig, 1841)	Borçka	41°22'24.0"N 41°37'48.0"E
	Fagus orientalis Lipsky	*Phyllaphis fagifoliae* Takahashi, 1919	Center	41°07'56.0"N 41°48'49.0"E
	Quercus petraea (Matt.) Liebl.	*Lachnus crassicornis* Hille Ris Lambers, 1948	Center	41°11'02.0"N 41°51'24.0"E
		Lachnus roboris (Linnaeus, 1758)	Şavşat	41°18'00.0"N 42°18'07.0"E
		Thelaxes suberi (Del Guercio, 1911)	Center	41°11'35.0"N 41°50'40.0"E
		Thelaxes californica (Davidson, 1919)	Şavşat	41°17'36.0"N 42°11'27.0"E
		Diphyllaphis mordvilkoi (Aizenberg, 1932)	Şavşat	41°17'24.0"N 42°24'53.0"E
Fabaceae	*Lathyrus vernus* (L.) Bernh.	*Aphis pseudocomosa* Stroyan, 1972	Center	41°12'02.0"N 41°53'06.0"E
	Vicia cracca L.	*Aphis craccae* Linnaeus, 1758	Center	41°09'49.0"N 41°47'06.0"E
	Vicia faba L.	*Aphis fabae* Scopoli, 1763	Center	41°10'25.0"N 41°49'25.0"E
Gentianaceae	*Gentiana asdepiadea* L.	*Aphis fabae* Scopoli, 1763	Borçka	41°29'02.0"N 41°41'31.0"E
Geraniaceae	*Geranium robertianum* L.	*Aphis spiraecola* Patch, 1914	Yusufeli	40°56'14.0"N 41°21'54.0"E
Hypericaceae	*Hypericum perforatum* L.	*Aphis gossypii* Glover, 1877	Şavşat	41°13'33.0"N 42°23'34.0"E
		Aphis spiraecola Patch, 1914	Yusufeli	40°59'10.0"N 41°21'43.0"E
Juglandaceae	*Juglans regia* L.	*Chromaphis juglandicola* (Kaltenbach, 1843)	Center	40°59'10.0"N 41°54'06.0"E
		Panaphis juglandis (Goeze, 1778)	Hopa	41°24'20.0"N 41°26'32.0"E
Lamiaceae	*Mentha* sp.	*Aphis craccivora* Koch, 1854	Borçka	41°22'53.0"N 41°35'32.0"E
	Prunella orientalis Bornm.	*Aphis brunallae* Schouteden, 1903	Borçka	41°21'53.0"N 41°30'32.0"E
	Salvia verticillata L.	*Aphis spiraecola* Patch, 1914	Yusufeli	40°59'35.0"N 41°21'49.0"E
		Aphis gossypii Glover, 1877	Şavşat	41°14'14.0"N 42°25'37.0"E
	Thymus sp.	*Aphis craccivora* Koch, 1854	Borçka	41°21'08.0"N 41°31'24.0"E
Moraceae	*Ficus carica* L.	*Aphis fabae* Scopoli, 1763	Center	41°10'52.0"N 41°49'38.0"E
		Aphis kachkoulii Remaudière, 1989	Arhavi	41°20'59.0"N 41°18'33.0"E
Onagraceae	*Epilobium angustifolium* L.	*Aphis gossypii* Glover, 1877	Center	41°11'44.0"N 41°51'24.0"E
Pinaceae	*Picea orientalis* (L.) Peterm.	*Adelges cooleyi* (Gillette, 1907)	Center	41°10'19.0"N 41°47'07.0"E
		Adelges pectinatae (Cholodkovsky, 1888)	Center	41°10'35.0"N 41°46'43.0"E
		Cinara pilicornis (Hartig, 1841)	Şavşat	41°13'26.0"N 42°27'22.0"E
	Pinus sylvestris	*Cinara pinivora* (Wilson, 1919)	Center	41°13'26.0"N 42°27'22.0"E
		Pseudessigella brachychaeta Hille Ris Lambers, 1966	Şavşat	41°13'50.0"N 42°26'33.0"E
		Cinara piniformosana (Takahashi, 1923)	Arhavi	41°19'53.0"N 41°16'08.0"E
Plantaginaceae	*Digitalis ferruginea* L.	*Aphis fabae* Scopoli, 1763	Şavşat	41°15'39.0"N 42°25'53.0"E
		Aphis craccivora Koch, 1854	Centre	41°09'49.0"N 41°47'06.0"E
	Veronica anagallis-aquatica L.	*Brachycaudus cardui* (Linnaeus, 1758)	Yusufeli	40°58'52.0"N 41°27'45.0"E
Poaceae	*Zea mays* L.	*Rhopalosiphum maidis* (Fitch, 1856)	Kemalpaşa	41°29'23.0"N 41°30'59.0"E
		Schizaphis graminum (Rondani, 1852)	Hopa	41°24'23.0"N 41°26'42.0"E

Polygonaceae	*Polygonum bistorta* L.	*Myzus certus* (Walker, 1849)	Yusufeli	41°06'02.0"N 41°25'19.0"E
	Rumex crispus L.	*Aphis fabae* Scopoli, 1763	Ardanuç	41°06'09.0"N 42°08'37.0"E
		Aphis gossypii Glover, 1877	Şavşat	41°16'20.0"N 42°25'04.0"E
		Aphis craccivora Koch, 1854	Yusufeli	40°59'52.0"N 41°27'45.0"E
Ranunculaceae	*Clematis vitalba* L.	*Aphis longituba* Hille Ris Lambers, 1966	Center	41°11'35.0"N 41°50'40.0"E
		Myzus persicae (Sulzer, 1776)	Hopa	41°23'22.0"N 41°26'41.0"E
Rhamnaceae	*Frangula alnus* Mill.	*Aphis frangulae* Kaltenbach, 1845	Kemalpaşa	41°30'36.0"N 41°33'59.0"E
		Aphis gossypii Glover, 1877	Yusufeli	41°02'37.0"N 41°26'07.0"E
	Paliurus spina-cristi Mill.	*Aphis nasturtii* Kaltenbach, 1843	Ardanuç	41°08'13.0"N 42°00'37.0"E
Rosaceae	*Cydonia oblonga* Mill.	*Aphis gossypii* Glover, 1877	Center	41°11'02.0"N 41°49'34.0"E
		Aphis pomi De Geer, 1773	Center	41°11'01.0"N 41°49'11.0"E
	Eriobotrya japonica (Thunb.) Lindl.	*Aphis craccivora* Koch, 1854	Center	41°11'03.0"N 41°49'17.0"E
		Aphis gossypii Glover, 1877	Hopa	41°23'43.0"N 41°26'27.0"E
		Aphis pomi De Geer, 1773	Center	41°10'59.0"N 41°49'07.0"E
	Malus sylvestris (L.) Mill.	*Aphis fabae* Scopoli, 1763	Şavşat	41°15'07.0"N 42°21'17.0"E
		Aphis pomi De Geer, 1773	Ardanuç	41°07'22.0"N 42°04'09.0"E
		Aphis spiraecola Patch, 1914	Şavşat	41°15'14.0"N 42°21'26.0"E
		Allocotaphis quaestionis (Börner, 1942)	Şavşat	41°14'24.0"N 42°21'59.0"E
		Dysaphis devecta (Walker, 1849)	Center	41°10'38.0"N 41°48'49.0"E
		Eriosoma lanigerum (Hausmann, 1802)	Murgul	41°15'02.0"N 41°34'28.0"E
	Prunus avium (L.) L.	*Myzus cerasi* (Fabricius, 1775)	Şavşat	41°14'03.0"N 42°23'02.0"E
	Prunus domestica L.	*Hyalopterus pruni* (Geoffroy, 1762)	Ardanuç	41°07'22.0"N 42°04'09.0"E
	Prunus laurocerasus L.	*Aphis gossypii* Glover, 1877	Center	41°10'38.0"N 41°48'49.0"E
		Rhopalosiphum rufiabdominale (Sasaki, 1899)	Hopa	41°23'43.0"N 41°26'27.0"E
	Prunus persica (L.) Batsch	*Brachycaudus schwartzi* (Börner, 1931)	Şavşat	41°15'04.0"N 42°21'58.0"E
		Pterochloroides persicae (Cholodkovsky, 1898)	Murgul	41°18'04.0"N 41°37'33.0"E
		Aphis spiraecola Patch, 1914	Ardanuç	41°07'22.0"N 42°04'09.0"E
		Brachycaudus persicae (Passerini, 1860)	Center	41°10'38.0"N 41°48'49.0"E
	Punica granatum L.	*Aphis gossypii* Glover, 1877	Center	41°11'04.0"N 41°49'49.0"E
	Pyrus communis L.	*Schizaphis pyri* Shaposhnikov, 1952	Yusufeli	40°59'33.0"N 41°21'50.0"E
	Rosa canina L.	*Macrosiphum rosae* (Linnaeus, 1758)	Ardanuç	41°06'10.0"N 42°06'24.0"E
	Rubus canescens DC.	*Aphis ruborum* (Börner, 1931)	Hopa	41°23'17.0"N 41°29'31.0"E
		Macrosiphum rosae (Linnaeus, 1758)	Şavşat	41°13'27.0"N 42°28'06.0"E
Rubiaceae	*Galium aparine* L.	*Aphis molluginis* (Börner, 1950)	Center	41°10'04.0"N 41°48'22.0"E
		Aphis fabae Scopoli, 1763	Şavşat	41°14'00.0"N 42°22'16.0"E

Rutaceae	*Citrus nobilis* Lour.	*Aphis fabae* Scopoli, 1763	Kemalpaşa	41°29'25.0"N 41°31'59.0"E
	Citrus sinensis (L.) Osbeck	*Aphis spiraecola* Patch, 1914	Kemalpaşa	41°29'23.0"N 41°30'59.0"E
Salicaceae	*Populus nigra* L.	*Chaitophorus kopuri* Hille Ris Lambers, 1966	Center	41°11'24.0"N 41°51'24.0"E
		Chaitophorus leucomelas Koch, 1854	Yusufeli	40°59'37.0"N 41°26'07.0"E
		Chaitophorus longisetosus Szelegiewicz, 1959	Hopa	41°22'32.0"N 41°27'27.0"E
		Chaitophorus populialbae (Boyer de Fonscolombe, 1841)	Şavşat	41°15'32.0"N 42°09'39.0"E
		Pemphigus immunis Buckton, 1896	Şavşat	41°15'25.0"N 42°09'12.0"E
		Pemphigus vesicarius Passerini, 1861	Ardanuç	41°07'56.0"N 42°02'50.0"E
		Thecabius lysimachiae Börner, 1916	Yusufeli	40°59'37.0"N 41°26'07.0"E
	Salix alba L.	*Aphis farinosa* Gmelin, 1790	Ardanuç	41°07'56.0"N 42°02'50.0"E
		Aphis gossypii Glover, 1877	Yusufeli	40°57'37.0"N 41°29'07.0"E
		Tuberolachnus salignus (Gmelin, 1790)	Kafkasör	41°09'43.0"N 41°47'55.0"E
Solanaceae	*Solanum nigrum* L.	*Aphis spiraecola* Patch, 1914	Yusufeli	40°58'09.0"N 41°22'40.0"E
Tamaricaceae	*Tamarix tetrandra* Pall. Ex M.Bieb.	*Brachyunguis tamaricis* (Lichtenstein, 1886)	Şavşat	41°16'13.0"N 42°11'59.0"E
Theaceae	*Ulmus glabra* Mill.	*Eriosoma grossularia* (Schüle, 1887)	Murgul	41°14'30.0"N 41°35'56.0"E
		Tetraneura ulmi (Linnaeus, 1758)	Hopa	41°26'23.0"N 41°29'59.0"E
Urticaceae	*Urtica dioica* L.	*Aphis urticata* Gmelin, 1790	Yusufeli	40°50'32.0"N 41°47'45.0"E
Viburnaceae	Viburnum orientale Pall.	*Aphis fabae* Scopoli, 1763	Center	41°08'41.0"N 41°45'56.0"E
	Sambucus nigra L.	*Aphis craccivora* Koch, 1854	Murgul	41°14'40.0"N 41°35'39.0"E
		Aphis fabae Scopoli, 1763	Ardanuç	41°00'19.0"N 42°10'50.0"E
		Aphis sambuci Linnaeus, 1758	Ardanuç	41°00'32.0"N 42°10'55.0"E

now, the aphid fauna of Türkiye, which was identified as 258 by Çanakçıoğlu (1975) through a review, has reached 560 before the current study, based on works by researchers such as Düzgüneş et al. (1982), Tuatay (1999), Toros et al. (2002), Görür (2002, 2004a, 2004b), Kaygın et al. (2008), Görür et al. (2009, 2014, 2019b). Furthermore, when looking at large-scale project-based studies on the aphid fauna of our country, it was observed that detailed studies have been conducted on the aphid fauna of the Eastern Mediterranean Region by Toros et al. (2002), the Eastern Black Sea Region (Artvin, Rize, Trabzon provinces) by Görür et al. (2009), the Inner Western Anatolia Region (Afyonkarahisar, Kütahya, Uşak provinces) by Görür et al. (2014), and the provinces of Malatya, Şanlıurfa, and Adıyaman by Görür et al. (2019b). The composition of the Türkiye aphid faunas was increased to 676 species with recent studies (Görür et al. 2024, Kök et al. 2024).

With the study conducted, 80 aphid species were identified from 72 medicinal and aromatic plant species in Artvin province, and the population densities of the aphids were largely revealed. Bhagat (2012) determined 63 aphid species on 92 medicinal aromatic plants, Amin et al. (2017) determined 20 aphid species on 35 medicinal-aromatic plants, Rohini et al. (2018) determined 12 aphid species on 22 medicinal-aromatic plants from Mudigere, Chikkamagaluru, Kadur and Tarikere talukas in India and Ali et al. (2023) found 14 aphid species on 37 medicinal plant species from 35 genera spread over 19 families. Given that there is no comprehensive study on aphid species on medicinal and aromatic plants in the broad geography of our country, the results of similar studies become even more meaningful. The significant share of agricultural products in Türkiye's economy, the fact that aphids cause an average crop loss of 35-40% (Ruberson 1999) without specific numerical

data for Türkiye, the large areas that remain unexplored, Türkiye's location in a region that may show the most effects of global warming, and the ability of aphids to utilize global warming in their favor and expand their distribution area all increase the importance of studies on aphid fauna.

In this study, the medicinal and aromatic plants of Artvin were investigated, and 80 aphid species were identified from 72 plant species belonging to 38 family (Table 1). It is known that 10% of these species have a very wide range of distribution and are capable of feeding on multiple plants (Blackman and Eastop 2025). While the damage levels on annual plants were found to be low, it was observed that aphids form dense populations on fruit trees like apple and plum, causing damage.

Determining the agricultural control methods that can be applied against the species identified in the study is expected to reduce the damage level of this insect species. Aphids, which feed on plant sap, not only cause damage to the areas they feed on but also can spread viruses, leading to plant diseases, wilting, and even extinction. The identification of these species will also be effective in pest control efforts. Additionally, identifying other harmful species and diseases will ensure that the medicinal and aromatic plants grown in the area are of higher quality and more productive. To preserve these plant species and sustainably contribute them to the economy, it is important to identify harmful insect groups and take preventive measures.

When the results of the study are evaluated as a whole, it is evident that a very comprehensive study has been conducted, the study area has been thoroughly surveyed, and extensive results have been obtained. The data obtained have made significant contributions to the aphid fauna on medicinal and aromatic plants in Artvin.

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Author's Contributions

HAB: Design of the study, data collection, diagnosis and identification, writing, critical review of content, literature review

ÖE: Data collection, diagnosis and identification, literature review

GG: Diagnosis and identification, writing, literature review

ÖŞ: Data collection, description, writing, literature review

EY: Data collection

Statement of Conflict of Interest

The authors have declared no conflict of interest.

ÖZET

Tıbbi Aromatik Bitkiler son zamanlarda popülaritesini arttırarak ülkelerin veya bölgelerin ekonomik gücünü, istihdam olanaklarını yükseltmiş ve bulunduğu alanı temsil edip çeşitli turizm olanakları yaratabilecek bir unsur haline gelmiştir. Bu türlerin yetiştikleri doğal veya doğal olmayan alanlarında afit gibi bitki öz suyunu tüketerek yaşamını devam ettiren böcek gruplarına maruz kalması ürün kaybına neden olmaktadır. Artvin ilinde Tıbbi-Aromatik özellik gösteren 350 bitki yer almaktadır. Bu çalışma ile ilde yayılış gösteren Tıbbi-Aromatik özellikli bitki türleri afit popülasyonu açısından değerlendirilmiş, 72 Tıbbi-Aromatik özellikli bitki üzerinden 80 adet afit türü tespit edilmiştir. Araziler kapsamında elde edilen verilerde en fazla afit türüne sırasıyla, elma (*Malus sylvestris*), kavak (*Populus nigra*), erik (*Prunus* spp.), meşe (*Quercus petreae*) türleri üzerinde rastlandığı belirlenmiştir. Kekik, nane gibi yoğun koku veren Tıbbi-Aromatik bitkilerde yaprak bitlerine nadiren rastlandığı ve yoğun popülasyon oluşturmadıkları gözlemlenmiştir. Tespit edilen yaprakbiti türlerinin meyveli türlerde genellikle yaprak üzerinde tek yıllık türlerde ise gövde ve yaprak üzerinde yoğun popülasyonlar oluşturdukları belirlenmiştir. Sonuç olarak, bu çalışma, Artvin'deki Tıbbi-Aromatik bitkiler üzerindeki afit popülasyonlarının önemli etkisini vurgulayarak hem bitkilerin hem de temsil ettikleri ekonomik fırsatların korunması için sürekli izleme ve etkili yönetim stratejilerinin gerekliliğini ortaya koymaktadır.

Anahtar kelimeler: afit, tıbbi ve aromatik, zararlı, Türkiye

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