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HARMFUL AND BENEFICIAL FAUNA ASSOCIATED WITH MEDICINAL AND AROMATIC PLANTS

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Abstract

Our country has a wide variety of wild medicinal and aromatic plants and very good conditions for their cultivation. Due to the diversity of active principles they contain, they represent an impressive source of plant material for medicinal, food and other uses, being a significant natural resource and an important part of our cultural and scientific heritage. Most medicinal and aromatic plants are entomophilous, their reproduction depending on pollinating insects. This paper presents the harmful and beneficial species associated with medicinal and aromatic plants, present in the didactic collection of USAMV Bucharest, in the period 2023-2024. Species belonging to the classes Arachnida, Insecta, Gastropoda, Amphibia and Reptilia were identified. Species such as Rhopalapion longirostre Olivier, Nezara viridula L., Chrysolina coerulans Scriba, Agapanthia cynarae Germar, Pegomya terebrans Rondani and Aphis spp. showed a significant attack on host plants. Beneficial fauna was also identified and evaluated.

Key words*: medicinal plants, aromatic plants, host plants, harmful fauna, beneficial fauna.*

INTRODUCTION

Due to their chemical composition, medicinal and aromatic plants have a wide use for pharmaceutical and food purposes (Luchian et al., 2017). Organic farming systems recommend them as companion plants in various horticultural crops, as a source of pollinators and beneficial fauna (Roman et al., 2009). It is recommended that plants with male-sterile, dioecious or partially self-fertile flowers, with entomophilous pollination, be associated with medicinal and aromatic plants, in various crop systems, to increase the percentage of fruit setting (Burns & Stanley, 2022). Medicinal and aromatic plants also easily find a place in private ornamental gardens, patios, gardens on the roofs, balconies, in front of kitchen windows, or on sloped areas (Arslan & Yanmaz, 2010), being often marketed by specialized units, alongside ornamental plants. There is growing interest in potted aromatic plants for culinary and decorative purposes (Krisantini et al., 2022).
Some species are the basis for obtaining pesticides of plant origin, with a role in preventing the establishment, development and control of harmful organisms (Niroumand et al., 2016). Data on the harmful fauna associated with medicinal and aromatic plants are briefly presented in the specialized literature in Romania (Păun et al., 1986). However, these plants, in addition to the abundant beneficial fauna, are also populated by harmful species, which can depreciate their quality (Mazunder & Anouke, 2023; Rău et al., 2024). Knowledge and control of harmful fauna is essential for obtaining plants rich in active principles with a therapeutic role (Mitituc et al., 2000).

MATERIALS AND METHODS

The observations were carried out in the collection of medicinal and aromatic plants of USAMV of Bucharest, Romania, during 2023-2024. It includes over 40 species of perennial and annual plants (Figure 1).
The vast majority of the species are native plants, with high potential for large-scale cultivation, adapted to the climatic conditions of our country.

Figure 1. Planting scheme in the collection of medicinal and aromatic plants of USAMV of Bucharest

Our observations aimed at qualitative assessment of harmful and beneficial fauna. Species were detected by weekly visual inspection; with the help of yellow adhesive traps for flaying species, pheromone traps and by installing Barber traps.

The atraSEG pheromone trap was used to detect the *Agrotis segetum* Denis & Schiff species. Barber traps were installed at ground level, remaining open 24 hours/month, so as not to destroy the beneficial fauna.

Harmful and beneficial entomofauna was collected and determined in the laboratory, based on specific morphological characters at the genus and species level.

The results are expressed in the form of lists of harmful and beneficial species detected on medicinal and aromatic plant species.

RESULTS AND DISCUSSIONS

Following observations made in the collection of medicinal and aromatic plants of USAMV of Bucharest, during the period 2023-2024, 25 harmful species belonging to the classes Arachnida, Insecta and Gastropoda were detected. Regarding the structure of the detected species, the highest share was recorded by the class Insecta (88%), followed by the class Gastropoda (8%) and Arachnida (4%). Within the class Insecta, the species of the order Hemiptera recorded 36.36% of the total insect species, followed by the order Lepidoptera with 27.27%, and Coleoptera with 22.72%. The orders Orthoptera, Thysanoptera and Diptera each represented a share of 4.54% of the total species detected (Figure 2).

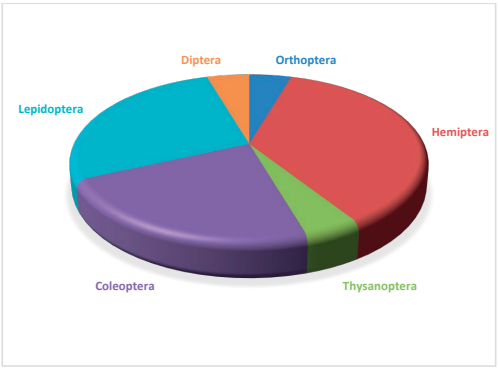

Figure 2. The structure of insect pests

I. All the pest species detected are present in Europe and in our country (Table 1). Most of them are known as polyphagous pests (*Tetranychus urticae* Koch., *Gryllotalpa gryllotalpa* L., *Psammotettix alienus* Dahlb., *Corizus hyoscyami* L., *Thrips tabaci* L., *Oxythyrea funesta* Poda., *Agrotis segetum* Denis & Schiff., *Iphiclides podalirius* L., *Helix pomatia* L., *Deroceras agreste* L.). Rău et al. (2024) present 8 polyphagous species, of which 3 (*Tetranychus urticae* Koch on plants of *Echinacea purpurea* Moench, *Thrips tabaci* L. on plants of *Rosa* spp. and *Nezara viridula* L. on plants of *Althaea rosea* L.) are also found in our observations. Other species are narrowly polyphagous (*Phyllotreta atra* Fabricius on plants of *Mellisa officinalis* L.) or are oligophagous species (*Graphosoma lineatum* L., on plants of *Feniculum vulgare* Mill., *Pegomya terebrans* Rondani on plants of *Cynara scolymus* L.).

Aphididae species were found on mint, sage and in high density on artichoke plants, stationed on the growth tips and inflorescences (Figure 3, a-d). Aphid colonies were accompanied by Coccinellidae and *Formica* spp.

Two species, *Nezara viridula* L. and *Halyomorpha halys* L., are found on the list of invasive species and with a pronounced polyphagism (CABI Compendium Invasive Species). *Nezara viridula* L. known in Romania since 2012 (Grozea et al., 2012; 2015) was present on sage and mallow *Althaea rosea* L. plants (Figure 3 h; 3 i), being reported in the literature on 6 species of Malvaceae (CABI Compendium; Gutue et al., 2024). *Halyomorpha halys* L. present in Romania since 2015 (Macavei et al., 2015) was detected on buckthorn plants *Hippophae rhamnoides* L., the host plant for reproduction and food (Zakharchenko et al., 2020; CABI Compendium).

The weevil *Rhopalapion longirostre* Olivier, an oligophagous species (Plant parasites of Europe) recorded high densities on *Althaea rosea* L. plants. This weevil has been present in our country since 1875 and was reported in Oltenia on *Alcea rosea* L. plants, synonymous with *Althaea rosea* L. (Bârcă et al., 2011).

Agapanthia cynarae Germar is a xerothermal beetle species, present in South-Eastern Europe, polyphagous on herbaceous plants. In our country, it was reported in the Danube Gorge, in 1976 by Oreva and Slătinic (Serafim, 2010). Adults were present on artichoke plants at the beginning of June (Figure 3 l). The larvae developed at the base of the stem where they produced galleries (Figure 3 m), being detected in the fall when the crop was cleared, by sectioning the stems.

Lepidoptera species were present in the collection of medicinal and aromatic plants, as adults, feeding on flower nectar.

Chrysolina coerulans Scriba reported in Romania in 2010 (CABI compendium Invasive Species) and 2017-2019 (Ilie & Abrudan, 2019), produces gnawing on the growth tips of mint plants (Figure 3 p).

Pegomya terebrans Rondani larvae produced mines in the leaf blade of artichoke plants. At first, the mines are produced individually by each larva, then they merge and the presence of 2-3 larvae is observed. The upper epidermis becomes transparent and black excrement can be observed (Figure 3 x). It is an oligophagous species, reported in our country by Drăghia in 1968 (Plant parasites of Europe). Gastropods produced gnawing on the basal leaves of *Salvia sclarea* L., during periods of high humidity (Figure 3 y).

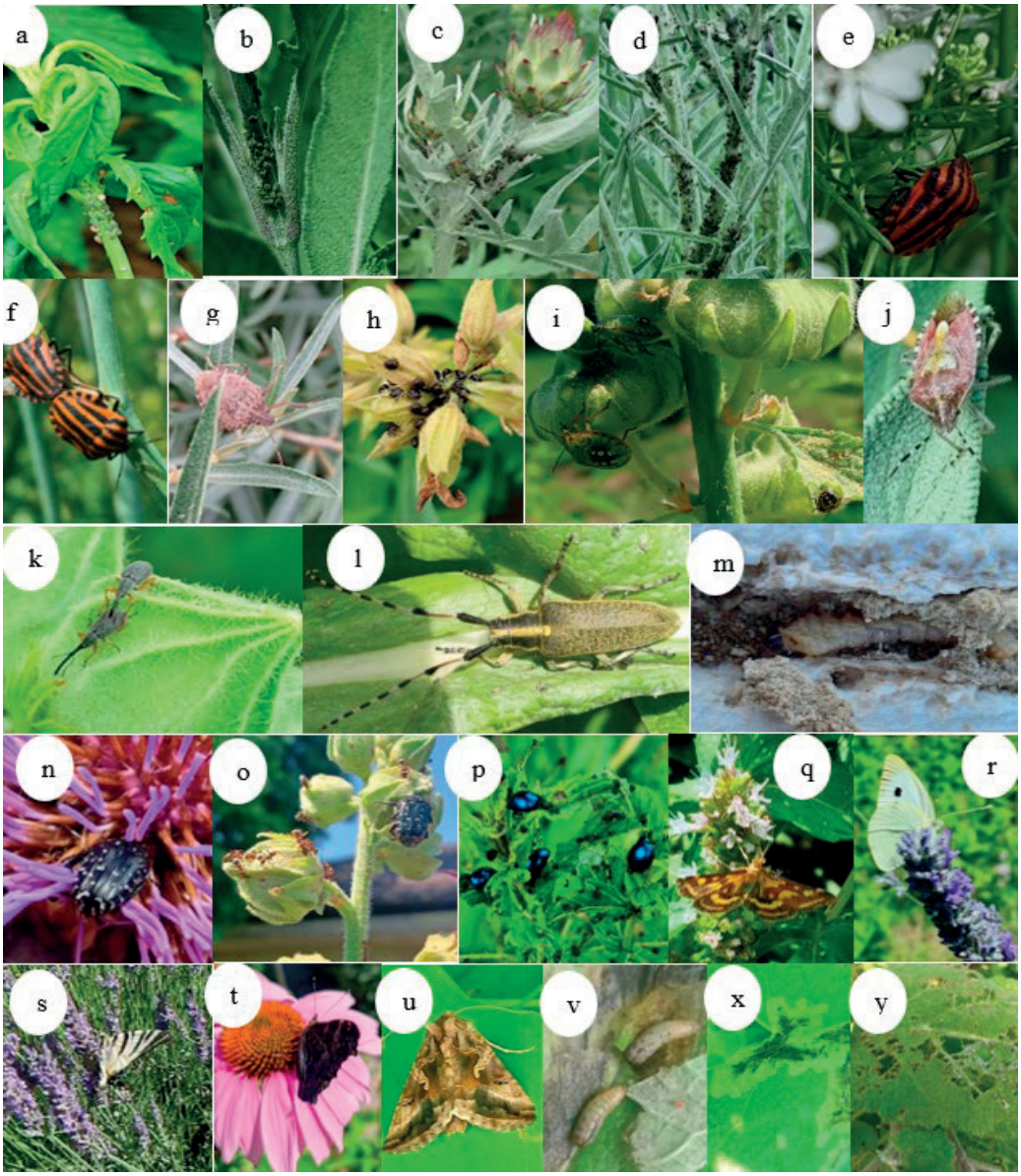

Figure 3. Harmful fauna associated with medicinal and aromatic plants: a, b, c, d - Aphididae on mint, sage and artichoke; e, f - *Graphosoma lineatum*; g - *Halyomorpha halys*; h, i - larvae of different stage of *Nezara viridula*; j - *Dolycoris baccarum*; k - *Rhopalapion longirostre;* l - *Agapanthia cynarae*; m - larva of *Agapanthia cynarae* in the stem of an artichoke plant; n, o - *Oxythyrea funesta* on flowers of different plants; p - *Chrysolina coerulans*; q - *Pyrausta purpuralis*; r - *Pieris brassicae*; s - *Iphiclides podalirius*; t - *Aglais io*; u - *Autographa gamma*; v - larvae of *Pegomya terebrans*; x - *Pegomya terebrans* mines; y - attack produced by Gastropoda

Table 1. Harmful fauna associated with medicinal and aromatic plants

Class	Order	Family	Species	Feeding regime of the pest/host plant
Arachnida	Acari	Tetranychidae	*Tetranychus urticae* Koch	polyphagous species
Insecta	Orthoptera	Gryllotalpidae	*Gryllotalpa gryllotalpa* L.	polyphagous species
	Hemiptera	Cicadellidae	*Psammotettix* alienus Dahlb.	polyphagous species
			Typhlociba rosae L.	*Rosa* spp. L.
		Aphididae	*Aphis* spp. L.	mint, sage, artichoke
		Scutelleridae	*Graphosoma lineatum* L.	umbelliferous
		Pentatomidae	*Nezara viridula* L.	polyphagous species
			Halyomorpha halys L.	polyphagous species
			Dolycoris baccarum L.	polyphagous species
		Rhopalidae	*Corizus hyoscyami* L.	polyphagous species
	Thysanoptera	Thripidae	*Thrips tabaci* L.	polyphagous species
	Coleoptera	Apionidae	*Rhopalapion longirostre* Olivier	oligophagous species
		Cetoniidae	*Oxythyrea funesta* Poda.	polyphagous species
		Chrysomelidae	*Chrysolina coerulans* Scriba	mint
			Phyllotreta atra Fabricius	narrowly polyphagous
		Cerambycidae	*Agapanthia cynarae* Germar	polyphagous in herbaceous plants/ artichoke
	Lepidoptera	Noctuidae	*Agrotis segetum* Denis & Schiff.	polyphagous species
			Autographa gamma L.	polyphagous species
		Crambidae	*Pyrausta purpuralis* L.	mint, sage, thyme, oregano
		Pieridae	*Pieris brassicae* L.	oligophagous species
		Papilionidae	*Iphiclides podalirius* L.	polyphagous species
		Nymphalidae	*Aglais io* L.	hop, nettle
	Diptera	Anthomyiidae	*Pegomya terebrans* Rondani	oligophagous species
Gastropoda	Stylommatophora	Helicidae	*Helix pomatia* L.	polyphagous species
		Agriolimacidae	*Deroceras agreste* L.	polyphagous species

II. Beneficial fauna was present on medicinal and aromatic plants from spring to early autumn. A variety of genera and species were observed and identified (Table 2).

The diversity of plants in the collection of medicinal and aromatic plants, as well as their different flowering periods, attracted a multitude of beneficial insect species throughout the observation period. In addition to the richness in nectar and pollen, even honeydew constitutes an important source of material for the attraction and development of beneficial pollinating fauna (Iordache et al., 2008). Pollinating species were frequently observed on plants such as *Lavandula angustifolia* Mill., *Lavandula x intermedia* L., *Echinacea purpurea* Moench. (L.), *Origanum majorana* L., *Salvia officinalis* L., *Cynara scolymus* L. and *Althaea rosea* L.

The detected insect species belong to the orders Hymenoptera, Diptera and Coleoptera. The vast majority are pollinating insects (Figure 4), but predatory zoophagous species were also present (Table 2).

Ladybird species (Figure 5) and Syrphidae larvae managed to keep aphid populations under control, with plants growing very well.

Table 2. Beneficial fauna associated with medicinal and aromatic plants

Class	Order	Family	Species	Feeding regime
Insecta	Hymenoptera	Apidae	*Apis mellifera* L.	Important pollinator of plants
			Bombus spp. Latreille	Important agricultural pollinators
		Scoliidae	*Scolia hirta* Schrenck	Feed on nectar and pollen Parazitoid species
		Formicidae	*Formica* spp. L.	Feed on honeydew
	Diptera	Bombyliidae	*Bombylius major* L.	Nectar robber Feed pollen Pollinator
		Syrphidae	*Syrphus* spp. Fabricius	Adults feed only on pollen, nectar, or honeydew Larvae are predatory, feeding on aphids
	Coleoptera	Coccinellidae	*Coccinella septempunctata* L.	Aphidophagous species, but also feeds on other arthropods, fungal spores, pollen
			Harmonia axyridis Pallas	Aphidophagous species, but also feeds on other arthropods, fungal spores, pollen, aphidophagous insects and fruits
			Adalia bipunctata L.	Aphidophagous species,but also feed other small insects, insects eggs and mites
		Scarabeidae	*Cetonia aurata* L.	Adults feed on pollen, nectar and flowers Larvae are saprophagous
		Dermestidae	*Anthrenus verbasci* L.	Adults feed on pollen and nectar Larvae feed on keratin and chitin of natural fibers
		Chrysomelidae	*Clytra laeviuscula* Ratezburg	Adults feed on pollen, nectar and leaves Larvae are found in ant nests
		Carabidae	*Carabus* spp. L.	Predatory species
			Pterostichus cupreus L.	Predatory species
			Pterostichus niger Sch.	Predatory species
Amphibia	Anura	Bufonidae	*Bufo bufo* L.	Feed on invertebrates
Reptilia	Squamata	Lacertidae	*Lacerta agilis* Laurenti	Feed on insects, spiders, earthworms and snails

Figure 4. Beneficial, pollinator species: a - *Bombylius major* L.; b - *Apis mellifera* L.

Figure 5. Beneficial, predatory zoophagous species (*Coccinellidae*)

CONCLUSIONS

In the collection of medicinal and aromatic plants of USAMV of Bucharest, 25 harmful species were detected: *Tetranychus urticae* Koch, *Gryllotalpa gryllotalpa* L., *Psammotettix* alienus Dahlb., *Typhlociba rosae* L., *Aphis* spp. L., *Graphosoma lineatum* L., *Nezara viridula* L., *Halyomorpha halys* L., *Dolycoris baccarum* L., *Corizus hyoscyami* L., *Thrips tabaci* L., *Rhopalapion longirostre* Olivier, *Oxythyrea funesta* Poda., *Chrysolina coerulans* Scriba, *Phyllotreta atra* Fabricius, *Agapanthia cynarae* Germar, *Agrotis segetum* Denis & Schiff., *Autographa gamma* L., *Pyrausta purpuralis* L., *Pieris brassicae* L., *Iphiclides podalirius* L., *Aglais io* L., *Pegomya terebrans* Rondani, *Helix pomatia* L. and *Deroceras agreste* L. The vast majority are polyphagous species, but oligophagous species have also been identified. Species such as *Rhopalapion longirostre* Olivier, *Agapanthia cynarae* Germar, *Chrysolina coerulans* Scriba, invasive stink bugs (*Nezara viridula* L., *Halyomorpha halys* L.) and aphids are pests that require monitoring and control management.

Beneficial fauna (pollinators and zoophagous) was represented by 17 species: *Apis mellifera* L, *Bombus* spp. Latreille, *Scolia hirta* Schrenck, *Formica* spp. L., *Bombylius major* L., *Syrphus* spp. Fabricius, *Coccinella septempunctata* L., *Harmonia axyridis* Pallas, *Adalia bipunctata* L., *Cetonia aurata* L., *Anthrenus verbasci* L., *Clytra laeviuscula* Ratezburg, *Carabus* spp. L., *Pterostichus cupreus* L., *Pterostichus niger* Sch., *Bufo bufo* L. and *Lacerta agilis* Laurenti.

The variety of beneficial species recommends medicinal and aromatic plants as species that favor their conservation.

Our observations contribute to obtaining more information about the harmful and beneficial fauna associated with medicinal and aromatic plants. They can form the basis for further

research in the field and can be useful for those involved in the cultivation and use of medicinal and aromatic plants in landscape design.

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