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# ECOMORPHIC ANALYSIS OF PLANT COMMUNITIES WITH *AMBROSIA ARTEMISIIFOLIA* L. IN THE URBAN ECOSYSTEM OF DNIPRO CITY

The relevance of the study is due to the growing problem of invasive plant species, in particular ragweed, which has become a dominant weed in many regions of Europe, including Ukraine. This species not only adapts to the conditions of urbanized areas, but also significantly changes the structure of the vegetation cover, which can lead to the loss of biodiversity of native plant species. In the city of Dnipro, where anthropogenic factors contribute to the spread of ragweed, it is important to know its impact on plant communities. Within the urban ecosystem of the city of Dnipro, 343 species of vascular plants belonging to 74 families were found on 685 surveyed plots. The phytocoenoses with *Ambrosia artemisiifolia* include 300 species from 71 families, while 274 species from 64 families were recorded in phytocoenoses without this species. The adventitious component of plant communities is 128 species (37.3%), of which a significant proportion (70%) are neophytes, mainly with a North American primary range, many of which have become naturalized. Among the most dangerous invasive species in phytocoenoses without ragweed are *Polygonum aviculare* (57.6%), *Hordeum murinum* (51.6%) and *Chenopodium album* (49.2%). The communities with the presence of ragweed are dominated by *Erigeron annuus* (62.5%), *Elytrigia repens* (53.7%) and *Chenopodium album* (49.6%). The presence of ragweed is associated with a decrease in the coverage of competitive species such as *Polygonum aviculare* and *Poa angustifolia*, which probably indicates its allopathic activity. The analysis showed that in phytocoenoses with *Ambrosia artemisiifolia*, the average number of species is 16.64 ± 0.59, which is higher than in communities without ragweed (11.16 ± 0.48). This increase is explained by the emergence of synanthropic species that adapt to the conditions created by the invasion. However, the increase in species diversity is a sign of ecological imbalance, which can lead to the dominance of ragweed and the transformation of natural communities. Plant communities with and without ragweed have a similar phytocoenotic and bioecomorphic structure, which indicates favorable ecological conditions for the spread of this species in the urban ecosystem of Dnipro. Competition between species can be an effective factor that restrains the further spread of ragweed. This emphasizes the prospects of using interspecific competition as a method of regulating the invasion of *A. artemisiifolia*.

*Key words: Ambrosia artemisiifolia*, ecomorphic analysis, plant communities, biodiversity, urban ecosystem, invasive species, ecological characteristics.

## Introduction

Cities are hotbeds of biological invasions, as many urbanized areas in different parts of the world share a common set of invasive species. Urban ecosystems not only act as key points of entry for alien species, but also become sources of their further

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spread to natural and agricultural landscapes [14]. Climate change is also contributing to the expansion of the ranges of invasive plants as they adapt to new conditions of temperature, precipitation and seasonal fluctuations. Rising temperatures and changes in precipitation in urban ecosystems create favorable conditions for the invasion of new species, which increases competition with native plants [31].

In the city of Dnipro, the urbanized ecosystem is formed under the influence of a temperate continental climate and a significant anthropogenic load, which affects the condition of vegetation and soil. The city's soils are polluted with heavy metals due to industrial emissions and exhaust gases, especially in areas with high traffic intensity, which creates environmental risks for soil and human health [2, 28]. Anthropogenic impacts change the acid-base balance of soils and cause them to become contaminated with construction and household waste. Such soils become favorable for the development of adventive species, in particular *Ambrosia artemisiifolia* L., which actively occupy free ecological niches [28]. Thus, urban areas stimulate the rapid evolution of species to new conditions [7].

Studies of urban green areas in Dnipro, in particular lawns, show that plants do indeed adapt to the stressful conditions of the urban environment. Representatives of the Fabaceae and Asteraceae families are highly active and often displace cereals, which indicates the response of plant diversity to anthropogenic impact [19]. At the same time, the plant communities that emerge in such conditions are under constant pressure from urbanization and invasive species.

Invasive species are plants that spread to new ecosystems due to human activity or natural processes. They adapt to new conditions, and some acquire invasive properties, displacing the native flora [11]. Alien species often have a high adaptive potential, the ability to reproduce rapidly, and competitive advantages. This makes it difficult to control their spread and leads to the displacement of native species due to competition for resources [8]. The wide range of plant viability in response to changes in environmental factors may be evidence of their local adaptation [32].

Globalization has caused the movement of organisms outside their natural range, which often has negative environmental and economic consequences. Cities, as centers of anthropogenic activity, often become the first points of entry for alien species [22]. In new environments, many alien species do not have natural enemies or other limiting factors, such as competition or lack of resources [23]. Furthermore, some invasive species, such as *Ailanthus altissima* (Mill.) Swingle and *Robinia pseudoacacia* L., produce allopathic substances that inhibit the growth of other plants [21].

Ragweed (*Ambrosia artemisiifolia*) is an annual invasive plant of the Asteraceae family, native to North America. It poses a serious threat to ecosystems and human health. From an ecological point of view, this species displaces native plants, reduces biodiversity, forms aggressive mono-dominant communities, and limits the natural recovery of native flora in urban areas [12, 20]. At the same time, ragweed pollen causes severe allergic reactions, which reduces the quality of life [4]. The high viability of the seeds of this species (up to 39 years) ensures its long-term impact on the ecosystem [6]. The seeds demonstrate great resistance to herbicides, remaining viable even after being treated with a double dose of some of them [10].

The main ways of spreading to new territories are by road and water. The successful transport of seeds by vehicles in Europe is well documented [30], and there are studies confirming that *A. artemisiifolia* seeds have been able to germinate even after several days of drifting at sea [16].

There is evidence that soil environmental factors such as arbuscular mycorrhiza can have a positive impact on the vital functions of ragweed plants. [9], but its invasive success may also be due to other factors. Increased relative humidity also plays a positive role by extending the flowering period and delaying the end of the pollen season [26]. As a result, it has become the dominant weed in most of the northern hemisphere over the past century [17], and is projected to expand further due to thermal changes in the climate [15].

Urbanized areas contribute to the spread of ragweed due to the high level of ecosystem disturbance, particularly on construction sites, roadsides and abandoned areas. In addition, anthropogenic factors such as transport and agriculture contribute to seed dispersal mechanisms [6, 13].

Invasive species, such as ragweed, not only adapt to urban environments, but also significantly change the structure of vegetation cover, creating new interconnections in ecosystems. This poses a threat to endangered species that are unable to compete effectively and can lead to the loss of unique elements of biodiversity [12].

Investigating the impact of ragweed on plant communities in urban areas is an important step in assessing the environmental risks associated with its invasion. In this study, we conducted an ecomorphic analysis of plant communities in the city of Dnipro, comparing communities with and without *A. artemisiifolia*. This approach allows not only to identify structural and species differences between these communities, but also to assess the impact of ragweed on key ecological characteristics, including biodiversity, resilience to environmental changes, and the ability of communities to recover from invasion.

The relevance of this issue in urban ecosystems, particularly in Dnipro, is due to the significant impact of anthropogenic factors that contribute to the spread of invasive species and reduce the ability of natural communities to regenerate themselves. Studying the ecological impacts of ragweed will help to better understand the extent of the problem and contribute to the development of effective management strategies to control invasive species. This will not only preserve the biodiversity of urban areas, but also improve the quality of ecosystems that provide important ecological functions.

The aim of the study is to conduct an ecomorphic analysis of plant communities with *A. artemisiifolia* in the urban ecosystem of Dnipro city, as well as to compare them with phytocoenoses without this species. Particular attention is paid to the study of structural, phytocoenotic and ecological characteristics of these communities.

The results of the study will be of great practical importance for the development of environmental protection measures and the preservation of the stability of urban ecosystems.

## Materials and methods of the study

The study was conducted during the growing seasons of 2022–2024 in different districts of Dnipro city in various habitats – in the urban and industrial areas, along roads and railways, in parks and gullies. The test plots for the study were 20–25 square meters in size. Fieldwork was carried out using traditional approaches in geobotanical research, which help to obtain detailed information about plant communities [27, 33]. We conducted a preliminary survey of the territory, study of the selected plots, systematic description of vegetation and research on 685 sample plots. The Euro+Med Plantbase database (https://europlusmed.org/) was used to determine the taxonomic characteristics of plants. The methodology included the identification of plant species at each sample plot, determination of their projected cover, analysis of the main ecological characteristics of plant communities, and comparison of the structural features of phytocoenoses with and without ragweed.

The structure of plant communities was studied using ecomorphic analysis. This method allows us to assess the morphological and ecological characteristics of plants and draw conclusions about their growth conditions. This approach analyses life forms, family affiliation, reproduction methods and adaptive features of plants to environmental conditions. In ecological analysis, it is important to divide the flora into groups of species that are similar in their requirements for certain environmental factors. Groups of plants that are distinguished in this way are called ecological groups or ecomorphs. The definition of biomorphs and ecomorphs of species was made by V. Tarasov [29].

The ecological analysis of phytocoenoses helps to clarify the relationships between plants and their environment, as well as the degree of adaptation of plants to key elements of the ecosystem. The basis of this analysis is the life form diagram, or ecomorph, developed by O. Belgard [5]. This approach is widely used for the certification of plants that form phytocoenoses and allows for a comprehensive assessment of their ecological status and functional role in plant communities.

We also analyzed the participation of invasive and adventive species in plant communities with *A. artemisiifolia* and in phytocoenoses without it. The status of species was determined using the GBIF source [1] and literature data [3, 18, 24, 25].

**Results and discussion**

The analysis of vegetation descriptions within the city of Dnipro showed that ragweed grew in 272 plots (40% of the total), while it was not recorded in 413 sample plots (60%). The studied species was found in the vegetation cover of habitats that differ in geomorphological and hydrological conditions, the degree of anthropogenic load, light regime, etc.

A total of 343 species of vascular plants from 74 families were recorded in the surveyed areas. In particular, 300 species from 71 families were found in communities with *A. artemisiifolia*, and 274 species from 64 families in phytocoenoses without this species. In terms of species richness of the leading families, these two groups of phytocoenoses are similar – they are dominated by representatives of the families Asteraceae (20 and 19 %, respectively), Poaceae (14 and 13 %, respectively), Fabaceae (7 % each) and Rosaceae (6 % each) (Fig. 1). Only in the areas without ragweed were there representatives of the families Apocynaceae, Araliaceae, Asparagaceae, Santalaceae. Species from the families Aristolochiaceae, Cupressaceae, Cuscutaceae, Geraniaceae, Grossulariaceae, Iridaceae, Juncaceae, Phytolaccaceae were found exclusively in areas with ragweed. Such a distribution is probably related to interspecific interactions, but it may be random and requires further study.

To study the adaptation strategies of plants to environmental conditions, a bioecological analysis was carried out. It is based on the identification of life forms and ecological groups in relation to moisture, light, trophicity and other factors, and allows us to assess the structure of plant communities. This is important for understanding the functioning of ecosystems, predicting changes in vegetation, and developing measures to preserve biodiversity. The analysis of the ratio of biomorphs and ecomorphs in communities without ragweed and with the presence of this species is shown in Figures 2–8.

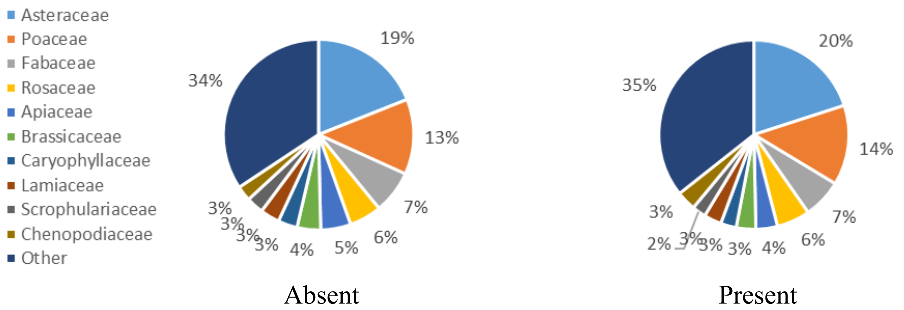



**Fig. 1.** Species richness of families

The analysis showed that in phytocoenoses with ragweed and in communities without this species, the ecomorphic structure is similar: perennials predominate among biomorphs (48 and 46%, respectively), with annuals (19 and 18%, respectively), trees (11 and 13%) and biennials (10% each) represented in smaller numbers (see Fig. 2).

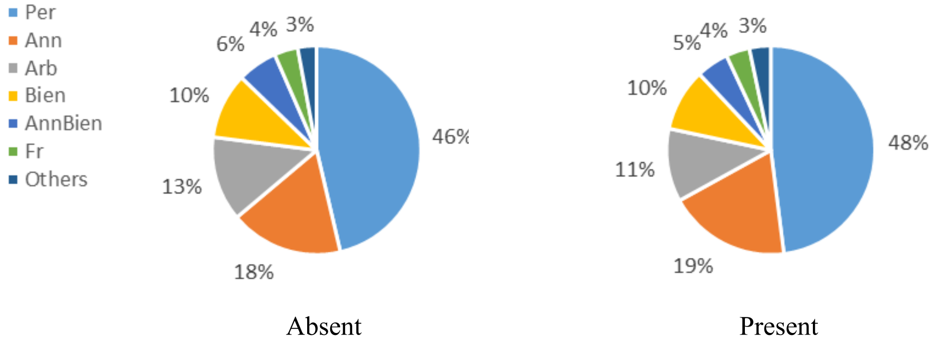



**Fig. 2.** Structure of biomorphs: Ann (Annuus) are annual; Bien (Biennis) are biennial; Per (Perennis) are perennial; Fr (Frutex) are bush; Arb (Arbor) are tree; L are liana

Most species in both analyzed lists are vegetatively immobile (see Fig. 3). Almost half of the studied species in phytocoenoses with ragweed and in communities without this species are hemicryptophytes (48 and 49%, respectively), which is typical for temperate flora. Therophytes (20 and 19%, respectively) and phanerophytes (12 and 14%) are less numerous. Other life forms are represented in small numbers (see Fig. 4).

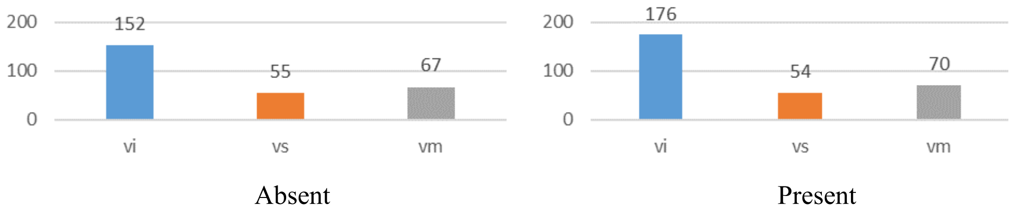
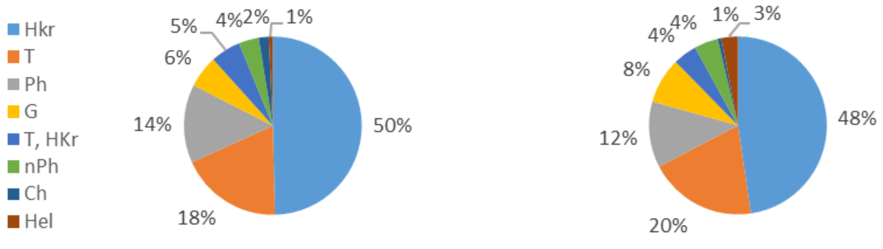



**Fig. 3.** Structure of life forms according to Ramensky: Vm are vegetatively mobile; Vs are vegetatively sedentary; Vi are vegetatively immobile.




Absent Present

**Fig. 4.** Structure of life forms according to Raunkier (climamorphs):
Ph is phanerophyte; nPh is nanophanerophyte; Ch is chameophyte;
HKr is hemicryptophyte; T is therophyte; G is geophyte, Hel is helophyte.

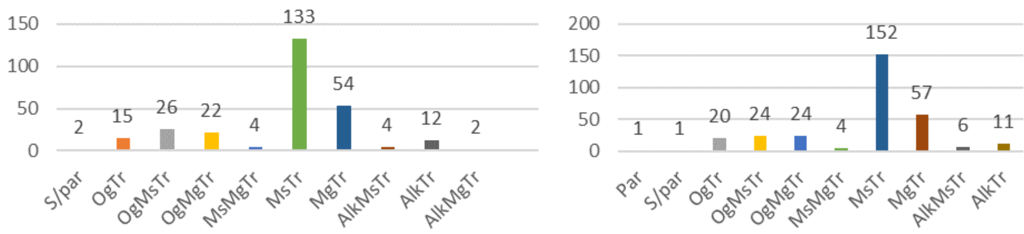



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**Fig. 5.** Structure of trophomorphs: Par are parasites; S/par are semiparasites;
OgTr are oligotrophs; OgMsTr are oligomesotrophs; OgMgTr are oligomegatrophs;
MsTr are mesotrophs; MsMgTr are mesomegatrophs; MgTr are megatrophs;
AlkMsTr are alkaline mesotrophs; AlkMgTr are alkaline megatrophs;
AlkTr are alkalotrophs.

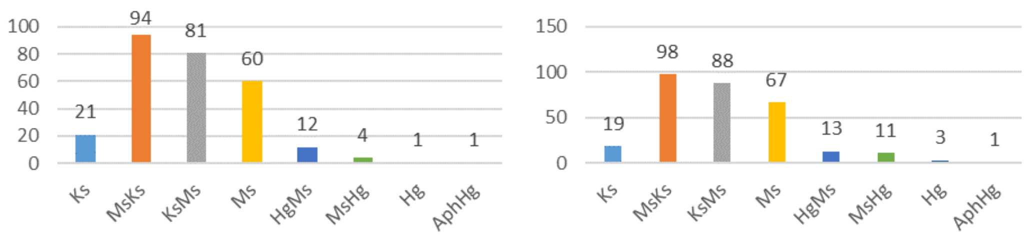


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**Fig. 6.** Structure of hygromorphs: Ks are xerophytes; MsKs are mesoxerophytes;
KsMs are xeromesophytes; Ms are mesophytes; HgMs are hygromesophytes;
MsHg are mesohygrophytes; Hg are hygrophytes; AphHg are aquahygrophytes.

As expected, in phytocoenoses with ragweed and in communities without this species, the most common coenomorphs are weeds (34 and 33%, respectively) (see Fig. 8). Silvants (21% each), pratants (14 and 13%, respectively), stepants (11 and 14%, respectively) and cultivars (10 and 8%, respectively) are somewhat less represented.

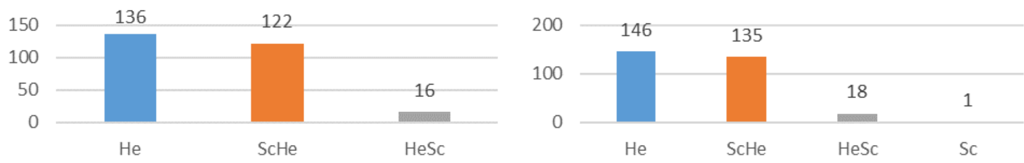


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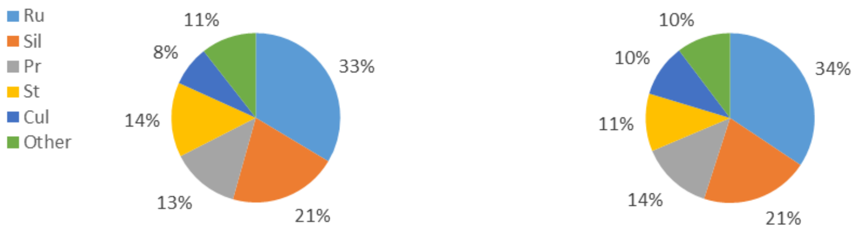
**Fig. 7.** Structure of heliomorphs: He are heliomorphs; ScHe are scioheliophytes; HeSc are heliosciophytes; Sc are sciophytes.




Absent Present

**Fig. 8.** Structure of coenomorphs: Cul are culturants; Pr are pratants; Ru are ruderals; Sil are silvants; St are stepants.

The vegetation cover of the studied test plots revealed 128 adventive plants (Table 1). The analysis showed that most of them are species originating from North America (26%). Their high proportion indicates the adaptive capabilities of representatives of this geographical area to the conditions of the urban environment. Species from other regions, such as the Mediterranean (15%), Asia (14%) and Europe (11%), are much less common, which may indicate a lower level of adaptation or limited migration to these ecosystems.

There are 85 naturalized species growing in the Dnipro urban ecosystem, of which 35 are archaeophytes (species that were naturalized before the 16th century) and 50 are neophytes (species that appeared after this period). This balance indicates an active process of naturalization in modern conditions. In addition, 43 spontaneous species were identified, including 39 neophytes, which confirms the dynamism and openness of urban ecosystems to new species.

The predominance of species of North American origin, as well as the dominance of neophytes among the spontaneous flora, demonstrates the high ecological plasticity of these plant groups. They actively use new ecological niches created by anthropogenic activity, which allows them to form competitive communities in urban environments. It is interesting that only in the communities with ragweed were the invasive species *Artemisia annua, Galinsoga parviflora, Helianthus tuberosus, Hippophae rhamnoides, Lactuca serriola, Xanthium albinum* found.

The analysis of invasive species participation showed that the most common species in communities without ragweed are: *Polygonum aviculare* – occurrence of 57.6% of the total number of areas with an average projective coverage of 5.64 ± 0.93%; *Hordeum murinum* L. – 51.6% (coverage – 11.05 ± 1.38%); *Chenopodium album* – 49.2% (4.64 ± 0.93%); *Taraxacum officinale* – 188, 45.5% (2.39 ± 0.43%); *Erigeron canadensis* – 38% (2.71 ± 0.36%); *Erigeron annuus* – 35.8% (3.13 ± 0.66); *Poa angustifolia* – 34.1% (12.62 ± 1.94%); *Lolium perenne* – 27.8% (23.33 ± 3.94%); *Setaria pumila* – 25.9% (3.64 ± 0.69%); *Elytrigia repens* – 25.9% (12.65 ± 2.58%).

*Table 1*

**Bio-geographical characteristics of the adventive species**

| Species | Biomorphs | Primary habitat | Inv. species | Naturalised | | Spontaneous | | Categories found in | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Archaeophytes | Neophytes | Archaeophytes | Neophytes | Absent | Present |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| *Acer negundo* L. | Arb | NA | + | | | | + | + | + |
| *Acer pseudoplatanus* L. | Arb | E | | | | | + | + | + |
| *Aegilops cylindrica* Host | Ann | EM | | | + | | | | + |
| *Aesculus hippocastanum* L. | Arb | E | | | + | | | + | + |
| *Ailanthus altissima* (Mill.) Swingle | Arb | As | + | | + | | | + | + |
| *Alcea rosea* L. | Per | ME | | | + | | | + | + |
| *Althaea officinalis* L. | Per | IT | | + | | | | + | |
| *Amaranthus retroflexus* L. | Ann | NA | + | | + | | | + | + |
| *Ambrosia artemisiifolia* L. | Ann | NA | + | | + | | | | + |
| *Anisantha sterilis* (L.) Nevski | Ann | MIT | | + | | | | + | + |
| *Anisantha tectorum* (L.) Nevski | Ann | MIT | + | + | | | | + | + |
| *Armeniaca vulgaris* Lam. | Arb | Anec | | | | | + | + | + |
| *Artemisia absinthium* L. | Per | IT | | + | | | | + | + |
| *Artemisia annua* L. | Ann | EAs | + | | | | + | | + |
| *Asclepias syriaca* L. | Per | NA | + | | + | | | + | + |
| *Atriplex micrantha* C.A. Mey. | Ann | As | | | | | + | + | + |
| *Atriplex sagittata* Borkh. | Ann | IT | | + | | | | + | + |
| *Atriplex tatarica* L. | Ann | MIT | | | + | | | + | + |
| *Avena fatua* L. | Ann | IT | | + | | | | | + |
| *Ballota nigra* L. | Per | MIT | + | + | | | | + | + |
| *Bromus arvensis* L. | Ann | M | | + | | | | + | + |
| *Bromus squarrosus* L. | AnnBien | MIT | | | + | | | + | + |
| *Bunias orientalis* L. | Bien | M | | | + | | | + | |
| *Campsis radicans* (L.) Bureau | L | NA | | | | | + | + | + |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *Capsella bursa-pastoris* (L.) Medik. | Ann | ? | + | + | | | | + | + |
| *Caragana arborescens* Lam. | Fr | As | | | + | | | | + |
| *Cardaria draba* (L.) Desv. | Per | Eas | | | + | | | + | + |
| *Carduus acanthoides* L. | AnnBien | M | | + | | | | + | + |
| *Carduus nutans* L. | Bien | M | | + | | | | + | + |
| *Catalpa bignonioides* Walter | Arb | NA | | | | | + | + | + |
| *Celtis occidentalis* L. | Arb | NA | | | | | + | + | + |

*Continuing of table 1*

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|
| *Cenchrus longispinus* (Kneuck.) Fernald | Ann | NA | + | | | | + | + | + |
| *Centaurea diffusa* Lam. | Bien | MIT | + | | + | | | + | + |
| *Cerasus vulgaris* Mill. | Arb | Anec | | | | + | | + | + |
| *Chenopodium strictum* Roth | Ann | E | | | + | | | + | + |
| *Chenopodium suecicum* Murr | Ann | As | | | + | | | | + |
| *Cichorium intybus* L. | Per | MIT | + | + | | | | + | + |
| *Consolida regalis* Gray | Ann | MIT | | + | | | | + | + |
| *Coreopsis grandiflora* Sweet | Ann | NA | | | | | + | | + |
| *Cotinus coggygria* Scop. | Fr | M | | | + | | | + | + |
| *Crepis foetida* L. | Ann | EAs | | | + | | | + | + |
| *Cyclachaena xanthiifolia* (Nutt.) Fresen. | Ann | NA | | | + | | | + | + |
| *Cynodon dactylon* (L.) Pers. | Per | EAfAs | | | + | | | + | + |
| *Cynoglossum officinale* L. | Ann | M | | + | | | | + | + |
| *Digitaria sanguinalis* (L.) Scop. | Ann | As | | + | | | | + | + |
| *Diplotaxis tenuifolia* (L.) DC. | Per | M | + | | + | | | + | + |
| *Echinochloa crus-galli* (L.) P. Beauv. | Ann | As | | + | | | | + | + |
| *Elaeagnus angustifolia* L. | FrArb | M | + | | + | | | + | + |
| *Elytrigia repens* (L.) Nevski | Per | E | + | | + | | | + | + |
| *Eragrostis minor* Host | Ann | E | | | + | | | + | + |
| *Erigeron annuus* (L.) Desf. | Ann | NA | + | | + | | | + | + |
| *Erigeron canadensis* L. | Ann | NA | + | | + | | | + | + |
| *Fallopia convolvulus* (L.) A.Löve | Ann | As | | + | | | | + | + |
| *Festuca arundinacea* Schreb. | Per | EAsAf | | | + | | | | + |
| *Fraxinus pennsylvanica* Marshall | Arb | NA | + | | | | + | + | + |
| *Gaillardia × hybrida* hort. | Ann | NA | | | | | + | + | + |
| *Gaillardia pulchella* Foug. | Ann | NA | | | | | + | + | + |
| *Galinsoga parviflora* Cav. | Ann | SA | + | | | | + | | + |
| *Gleditsia triacanthos* L. | Arb | NA | | | + | | | | + |
| *Grindelia squarrosa* (Pursh) Dunal | Per | NA | + | | | | + | + | + |
| *Hedera helix* L. | L | E | | | + | | | + | + |
| *Helianthus tuberosus* L. | Per | NA | + | | + | | | | + |
| *Heliopsis helianthoides* (L.) Sweet | Bien | NA | | | + | | | + | |
| *Hippophae rhamnoides* L. | ArbFr | EAs | + | | | | + | | + |
| *Hordeum leporinum* Link | Ann | M | | | + | | | + | + |
| *Hordeum murinum* L. | Ann | TMI | | | + | | | + | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *Impatiens parviflora* DC. | Ann | AS | + | | + | | | + | + |
| *Ipomoea purpurea* (L.) Roth | Ann | SA | | | | | + | + | + |
| *Iris* × *hybrida* hort. | Per | Eas | | | | | + | | + |
| *Juglans regia* L. | Arb | Mas | + | | + | | | + | + |
| *Juncus gerardi* Loisel. | Per | E | | | + | | | + | + |
| *Lactuca serriola* L. | AnnBien | MIT | + | + | | | | | + |
| *Lathyrus tuberosus* L. | Per | IT | | + | | | | + | + |
| *Lepidium ruderale* L. | AnnBien | IT | | + | | | | | + |

*Continuing of table 1*

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|
| *Ligustrum vulgare* L. | Fr | ME | | + | | | | + | + |
| *Lycium barbatum* Thunb. | Fr | As | | + | | | | + | + |
| *Malus domestica* Borkh. | Arb | Anec | | | | + | | + | + |
| *Malva neglecta* Wallr. | Per | IT | | + | | | | + | |
| *Malva pusilla* Sm. | Ann | ? | | + | | | | | + |
| *Medicago sativa* L. | Per | As | | | | | + | + | + |
| *Melissa officinalis* L. | Per | EI | | | | | + | + | + |
| *Morus alba* L. | Arb | As | | + | | | | + | + |
| *Oenothera biennis* L. | Bien | NA | + | | | | + | + | + |
| *Onobrychis viciifolia* Scop. | Per | MIT | | | + | | | | + |
| *Onopordum acanthium* L. | Bien | M | | + | | | | + | + |
| *Oxalis dillenii* Jacq. | Ann | NA | | | + | | | + | + |
| *Oxybaphus nyctagineus* (Michx.) Sweet | Per | NA | + | | | | + | + | + |
| *Papaver rhoeas* L. | Ann | MIT | | | | + | | + | + |
| *Parthenocissus quinquefolia* (L.) Planch. | Fr | NA | + | | + | | | + | + |
| *Pastinaca sativa* L. | Bien | E | | | + | | | + | + |
| *Persica vulgaris* Mill. | Arb | As | | | | + | | | + |
| *Phytolacca americana* L. | Bien | NA | | | | | + | + | + |
| *Picea pungens* Engelm. | Arb | NA | | | | | + | + | + |
| *Populus carolinensis* | Arb | NA/Hybrid | + | | | | + | + | |
| *Populus simonii* Carrière | Arb | As | | | | | + | | + |
| *Portulaca oleracea* aggr. | Ann | IT | | + | | | | + | + |
| *Prunus domestica* L. | Arb | Anec | | | | | + | + | + |
| *Psephellus dealbatus* (Willd.) K. Koch | Per | M | | | | | + | + | + |
| *Rapistrum perenne* (L.) All. | BienPer | M | | | | | + | + | + |
| *Reseda lutea* L. | Ann | M | | | + | | | + | + |
| *Rhus typhina* L. | Arb | NA | | | | | + | | + |
| *Ribes nigrum* L. | Fr | E | | + | | | | + | + |
| *Robinia pseudoacacia* L. | Arb | NA | + | | + | | | + | + |
| *Salix babylonica* L. | Arb | As | | | | | + | + | |
| *Saponaria officinalis* L. | Per | M | | | | | + | | + |
| *Sedum reflexum* L. | Per | E | | | | | + | + | + |
| *Setaria pumila* (Poir.) Roem. & Schult. | Arb | E | + | | + | | | + | + |
| *Setaria verticillata* L. | Ann | Af | | | + | | | + | + |
| *Setaria viridis* (L.) P. Beauv. | Ann | M | + | + | | | | + | + |
| *Sisymbrium loeselii* L. | AnnBien | MAs | | | + | | | + | + |
| *Solanum nigrum* L. | Ann | E | | + | | | | + | + |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *Solidago canadensis* L. | Per | NA | + | | + | | | + | + |
| *Sonchus oleraceus* L. | Ann | M | | + | | | | + | + |
| *Spiraea douglasii* Hook | Fr | NA | | | | | + | + | + |
| *Syringa vulgaris* L. | Fr | E | | | | | + | + | + |
| *Thlaspi arvense* L. | Ann | IT | | + | | | | + | + |
| *Thuja occidentalis* L. | Arb | NA | | | | | + | + | + |
| *Tilia platyphyllos* Scop. | Arb | E | | | | | + | + | + |
| *Tribulus terrestris* L. | Ann | M | | | + | | | + | + |

*Ending of table 1*

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|
| *Trifolium hybridum* L. | Bien | M | | | | | + | | + |
| *Triticum durum* Desf. | Ann | As | | + | | | | + | |
| *Ulmus pumila* L. | Arb | As | + | | + | | | + | + |
| *Urtica urens* L. | Ann | M | | | + | | | + | + |
| *Verbesina encelioides* (Cav.) A. Gray | Ann | NA | | | | | + | + | |
| *Vinca minor* L. | Per | NA | | + | | | | + | + |
| *Viola hissarica* Juz. | Per | AS | | | + | | | + | |
| *Vitis vinifera* L. | L | As | | | + | | | + | |
| *Xanthium albinum* (Widder) Scholz & Sukopp | Ann | IT | + | + | | | | | + |

Conventional designations. Biomorphs: Ann (Annuus) – annual; Bien (Biennis) – biennial; Per (Perennis) – perennial; Fr (Frutex) – bush; Arb (Arbor) – tree; L – liana.
Migratory element (primary range): As – Asian; E – European; M – Mediterranean; NA – North American; SA – South and Central American; IT – Iranoturan; ? – unidentified; Hybrid – forms hybrids with other species.

However, in phytocoenoses with the participation of ragweed, they are most common: *Erigeron annuus* – occurrence of 62.5% of the total (projected mean is 3 ± 0.82%); *Elytrigia repens* – 53.7% (13.54 ± 2.36%); *Chenopodium album* – 49.6% (4.73 ± 0.94%); *Polygonum aviculare* – 44.5% (2.63 ± 0.58%); *Poa angustifolia* – 41.2% (9.63 ± 1.82%); *Erigeron canadensis* – 39.7% (2.79 ± 0.89%); *Diplotaxis tenuifolia* – 36% (2.63 ± 0.53%); *Taraxacum officinale* – 32.7% (2.89 ± 1.44%); *Achillea millefolium* – 30.5% (2.78 ± 0.76%); *Hordeum murinum* – 27.2% (11.74 ± 2.34).

In the presence of ragweed in the community, the frequency of occurrence of species characterized by high ecological plasticity, such as *Chenopodium album*, *Erigeron annuus* and *Elytrigia repens*, increases. *Ambrosia artemisiifolia* takes an active part in the formation of the structure. This is accompanied by a decrease in the projective coverage of competitors such as *Polygonum aviculare* and *Poa angustifolia*, which may indicate its allopathic action.

The calculations showed that in phytocoenoses with ragweed, the average number of species was 16.6 ± 0.6, while in communities without ragweed it was only 11.2 ± 0.5 (P = 0.95).

It can be assumed that the presence of ragweed creates specific conditions that may favor the emergence and growth of other invasive species, leading to an increase in the total number of species in these communities. However, this may only be a temporary phenomenon until ragweed begins to dominate the area.

In areas where ragweed is absent, ecosystems remain more stable and less transformed. This contributes to their resistance to invasion by other species. Although a higher number of species in phytocoenoses with ragweed may at first glance indicate an increase in biodiversity, it actually indicates an ecological imbalance and transformation of natural communities due to invasive impact.

**Conclusions**

On 685 studied areas in the urban ecosystem of Dnipro city, 343 species of vascular plants from 74 families were recorded. Phytocoenoses with A. artemisiifilia include 300 species from 71 families, while 274 species from 64 families were recorded in phytocoenoses without this species.

The adventitious fraction of the studied plant communities comprises 128 species (37.3%), demonstrating a significant participation of neophytes (70%) and plants with a North American primary range, many of which have been naturalized. Among the most dangerous invasive species for biodiversity in phytocoenoses without ragweed, *Polygonum aviculare* (57.6%), *Hordeum murinum* (51.6%) and *Chenopodium album* (49.2%) are most common, while in communities with ragweed, *Erigeron annuus* (62.5%), *Elytrigia repens* (53.7%) and *Chenopodium album* (49.6%) are more constant. The presence of ragweed is accompanied by a decrease in the coverage of competitive species such as *Polygonum aviculare* and *Poa angustifolia*, which may indicate its allopathic effect.

The study showed that in communities with ragweed, the average number of species (16.6 ± 0.6) exceeds the same indicator in phytocoenoses without ragweed (11.2 ± 0.5). This increase is due to the emergence of synanthropic species that adapt to the conditions created by the invasion. However, such an increase in species richness indicates an ecological imbalance, which may eventually lead to the dominance of ragweed and the transformation of natural communities.

Plant communities with and without ragweed have a similar phytocoenotic and bioecomorphic structure. This indicates the potential for further spread of ragweed due to favorable environmental conditions in the urban ecosystem of Dnipro. Interspecific competitive relationships can be an effective deterrent to the spread of this invasive species. This indicates the prospects of using phytocoenotic competition as a method for regulating the spread of *A. artemisiifolia*.

Phytocoenoses with ragweed are dominated by invasive species and species with high ecological plasticity. Long-term monitoring is necessary to understand the dynamics of ragweed's impact on urban ecosystems and to develop effective control measures.

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