Теоретичні та прикладні питання

Old cemeteries as refuge of the steppe flora in Southern Ukraine

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Changes in natural landscapes and economic activities lead to the loss of a large proportion of the steppes. Recent studies (2008–2017) have demonstrated the high importance of old cemeteries, that contribute to the preservation of steppe red-listed steppe species. The area of the old cemeteries of the Lower Dnieper varies from 0.43 ha to 6.79 ha. The list of vascular plants from 10 cemeteries of the Lower Dnieper region includes 388 species belonging to 226 genera, 62 families, 3 classes and 2 divisions. The total number of species within cemetery varied from 104 to 217 (on average 153 species). In old cemeteries of the studied region, rare steppe species have survived, although steppe vegetation is preserved where there are fragments of virgin and unploughed steppes around the cemeteries, near old villages or cities. 22 protected vascular plant species were found in the studied old cemeteries (5.65 % of the total species pool). Five of these are included in the Red Data Book of Ukraine: *Astragalus henningii*, *Stipa capillata*, *Stipa lessingiana*, *Stipa ucrainica*, *Tulipa biebersteiniana*. 17 species of vascular plants are included in the Red List of the Kherson region: *Amygdalus nana*, *Bellevalia sarmatica*, *Centaurea trichocephalla*, *Convallaria majalis*, *Dianthus andrzejowskianus*, *Elytrigia pseudocaesia*, *Ephedra distachya*, *Fraxinus excelsior*, *Iris halophila*, *Limonium platyphyllum*, *Linaria macroura*, *Muscari neglectum*, *Peucedanum ruthenicum*, *Prangos odontalgica*, *Quercus robur*, *Veronica capsellicarpa*, *Vinca herbacea*.

Key words: Lower Dnieper, steppe, cultural heritage sites, vascular plants, flora, sozophytes, in situ

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Зміни природних ландшафтів та господарська діяльність призводить до втрати великої частки степів. Недавні дослідження (протягом 2008–2017) продемонстрували високе значення існування старих цвинтарів, які сприяють збереженню степових созофітів. Площа старих цвинтарів Нижнього Дніпра коливається від 0.43 га до 6,79 га. У список флори судинних рослин входять 388 видів з 10 цвинтарів. Загальне багатство видів варіювало від 104 до 217 (у середньому по видів 154 види). Флора старих цвинтарів включає до 226 родів, 62 родини, 3 класи та 2 відділи. Зазвичай на цвинтарях Нижнього Дніпра зустрічаються рідкісні види, які протягом тривалого часу зберігаються на старих цвинтарях та сприяють збереженню виду in situ разом зі степовим покривом, проте рослинний покрив зберігається не на всіх цвинтарях, а лише на тих, які були закладені на цілинній та нерозораній ділянці степу, поблизу старих сел чи міст. На старих цвинтарях знайдено 22 видів судинних рослин 5,65 %, які підлягають охороні з них 5 видів рослин включені до Червоної книги України: *Astragalus henningii*, *Stipa capillata*, *Stipa lessingiana*, *Stipa ucrainica*, *Tulipa biebersteiniana*, та 17 видів судинних рослин, які включено до Червоного Списку Херсонської області: *Amygdalus nana*, *Bellevalia sarmatica*, *Centaurea trichocephalla*, *Convallaria majalis*, *Dianthus andrzejowskianus*, *Elytrigia pseudocaesia*, *Ephedra distachya*, *Fraxinus excelsior*, *Iris halophila*, *Limonium platyphyllum*, *Linaria macroura*, *Muscari neglectum*, *Peucedanum ruthenicum*, *Prangos odontalgica*, *Quercus robur*, *Veronica capsellicarpa*, *Vinca herbacea*.

Ключові слова: Нижнє Дніпро, степ, об'єкти культурної спадщини,судинні рослини, флора, созофіти, in situ

МОЙСИЕНКО И.И., СКОБЕЛЬ Н.О., СУДНИК-ВОЙЦИКОВСЬКАЯ Б., ДЕМБИЧ И., ЗАХВАТОВИЧ М., ЗАХАРОВА М.Я., ДЗЕРКАЛЬ В.Н. (2021). **Старые кладбища как рефугиум степной флоры Юга Украины.** *Черноморск. бот. ж.*, **17** (3): 194–217. doi: 10.32999/ksu1990-553X/2021-17-3-1

Изменения ландшафтов и хозяйственная деятельность приводит к потере большой части степей. Недавние исследования (в течение 2008–2017) продемонстрировали высокое значение существования старых кладбищ, которые способствуют сохранению степных созофитив. Площадь старых кладбищ Нижнего Днепра колеблется от 0.43 га до 6,79 га. В список флоры сосудистых растений входят 388 видов из 10 кладбищ. Общее богатство видов варьировало от 104 до 217 (в среднем по 154 вида). Флора старых кладбищ включает 226 родов, 62 семейства, 3 класса и 2 отдела. Обычно на кладбищах Нижнего Днепра встречаются редкие виды, которые в течение длительного времени сохраняются на старых кладбищах и способствуют сохранению вида in situ вместе со степным покровом, однако растительный покров хранится не на всех кладбищах, а только на тех, которые были заложены в целинных и не распаханных участках степи, вблизи старых сел или городов, На старых кладбищах найдено 22 вида сосудистых растений 5,65 %, Из которых 5 видов растений включены в Красную книгу Украины: *Astragalus henningii*, *Stipa capillata*, *Stipa lessingiana*, *Stipa ucrainica*, *Tulipa biebersteiniana*, и 17 видов сосудистых растений, включенных в Красную книгу Херсонской области: *Amygdalus nana*, *Bellevalia sarmatica*, *Centaurea trichocephalla*, *Convallaria majalis*, *Dianthus andrzejowskianus*, *Elytrigia pseudocaesia*, *Ephedra distachya*, *Fraxinus excelsior*, *Iris halophila*, *Limonium platyphyllum*, *Linaria macroura*, *Muscari neglectum*, *Peucedanum ruthenicum*, *Prangos odontalgica*, *Quercus robur*, *Veronica capsellicarpa*, *Vinca herbacea*.

Ключевые слова: Нижний Днепр, степь, объекты культурного наследия, сосудистые растения, флора, созофиты, in situ

In recent centuries, anthropogenic activity has led to significant losses of natural habitats in the world [LÖKI et al., 2019; VICKERY et al., 2009]. Especially significant changes occurred in steppe zone in the south of Ukraine, where the area of steppe vegetation decreased forty-fold (steppe in the XXth centuries covered circa 40 % of the total territory of the country, while today steppe remnants survived only on 1 % of this territory) [BURKOVSKYI et al., 2013]. Recent studies demonstrated the high biodiversity of cultural heritage sites of anthropogenic origin such [LÖKI et al., 2015, 2019a, b] as burial mounds or kurgans [DEÁK et

al., 2016, 2018, 2020, 2021; DEMBICZ et al., 2020; SUDNIK-WÓJCIKOWSKA, MOYSIYENKO, 2006; SUDNIK-WÓJCIKOWSKA et al., 2011; VALKÓ et al., 2018], sacred groves and forests [BHAGWAT, RUTTE, 2006; BRANDT et al., 2013], old settlements [CELKA, 2011; DAYNEKO, 2019; MOYSIYENKO et al., 2015, 2018, 2019, 2020; MOYSIYENKO, DAYNEKO, 2019].

Another cultural heritage site that plays a significant role in biodiversity conservation are the old cemeteries [BARRETT, BARRETT, 2001]. Nonetheless, sacred hills, caves and islands and water bodies connected with religious beliefs like sacred rivers, lagoons and springs are also common on several continents [VERSCHUUREN et al., 2010; AYSEL et al., 2009]. Information on the role of cemeteries in biodiversity conservation is summarized in Löki's article, which lists the groups of biodiversity and the most relevant publications connected to them [LÖKI et al., 2015, 2019a, b]: «Cemeteries are important centers for the preservation of lichens [HAWKSWORTH, MCMANUS, 1989], mosses [FUDALI, 2001], rare mushrooms [BROWN et al., 2006], rare plants [HOLDEN, MCDONALD-MADDEN, 2017; MOLNÁR et al, 2017; SIGIEL-DOPIERALA, JAGODZINSKI, 2011], trees that are much older than the trees in the surrounding areas [GAO et al., 2013; PRESTON, 1972], invertebrates [ÖRSTAN, 2004; ÖRSTAN, KÖSEMEN, 2009; TAN, 2012; TAN et al., 2013], birds [ČANÁDY, 2017; KOCIAN et al., 2003; LUNIAK, 1981; LUSSENHOP, 1977; PEARSON, 1915; VALLEJO et al., 2009; VILLASECOR, ESCOBAR, 2019] and bats [TREWHELLA et al., 2005]».

Numerous countries have recognized the natural and cultural value of cemeteries. Significant differences in the role of cemeteries can vary depending on the location and land use, biogeographical features and cultural traditions of the country [LÖKI et al., 2015, 2019a, b]. World practice shows that cemeteries cover large areas [BHAGWAT, 2009; LÖKI et al., 2015, 2019a, b] and usually do not have active anthropogenic activity and are key elements for the preservation of natural habitats vegetation [BARRETT, BARRETT, 2001], therefore, the flora of cemeteries is the subject of research in many countries around the world. Most case studies (except reviews) are concentrated in Asia or Europe [LÖKI et al., 2015, 2019a, b]. Some botanical studies of cemeteries were conducted in Albania, Australia, Bangladesh, Czech Republic, Germany, Great Britain, Greece, India, Israel, Japan Latvia, Morocco, New Zealand, Pakistan, Romania, Russia, Slovakia, Slovenia, Tunisia, Turkey, USA [LÖKI et al., 2015, 2019a, b].

In Europe, the flora of cemeteries is the best studied in Poland. Polish researchers most often study old cemeteries in forests or areas of anthropogenic environments [GALERA et al., 1993; LISOWSKA et al., 1994, NOWIŃSKA et al., 2010, 2019, 2020; SUDNIK-WÓJCIKOWSKA, GALERA, 2005, TANAŚ, 2008; TRZASKOWSKA et al., 2013].

Studies of the flora of cemeteries in Ukraine are not very common. There are a few special publications devoted to the spontaneous flora of cemeteries located in cities: Odessa [GERASYMIUK, 2014; VASYLIEVA-NEMERTSALOVA 1996], Kropyvnytskyi [ARKUSHYNA, 2003 a, b, 2007] and Kherson [MOYSIYENKO, 1997]. The decorative flora of Kyiv cemeteries [KUSHNYR, 2006, 2004; SUKHANOVA, 2010] and distribution of adventitious tree and shrub plants from cemeteries in Donetsk [EREMENKO, 2013] was also studied. Cemeteries are an integral part of cities, thus should be taken into account in studies focusing on urban flora. Their flora is usually included in general publications of city floristic studies [BESARABCHUK, VOLHIN, 2017; BURDA, HUMECH, 1988; HAMULIA, ZVIAHYNTSEVA, 2010; HUBAR, 2006; MALTSEVA, 2019; MELNYK, 2001; MOYSIYENKO, 1997, 1999; VASYLIEVA-NEMERTSALOVA, 1996; ZAVIALOVA, 2010].

Rural cemeteries are generally unexplored. The role of cemeteries in the preservation of steppe diversity has also not been studied in Ukraine.

In altered landscapes, historic burial sites, such as cemeteries, have the potential to conserve biodiversity [LÖKI et al., 2019a, b]. Thus, in the steppe zone of Eurasia and in the contact zones of the forest-steppe zone, mounds, cemeteries and settlements are often the last safe havens of steppe vegetation in Eastern Europe [CREMENE et al., 2005; MOYSIYENKO et

al., 2014; MOYSIYENKO, SUDNIK-WÓJCIKOWSKA, 2006, 2009; SUDNIK-WÓJCIKOWSKA, MOYSIYENKO, 2006, 2010, 2011]. Steppe vegetation in old cemeteries is a remnant of virgin steppe landscapes, as most cemeteries were founded in 17–18th centuries, when the expansion of natural habitats was continuous [MOYSIYENKO et al., 2017].

The purpose of our study was: 1) to establish the level of floristic richness of ancient cemeteries on the example of 10 cemeteries of the Lower Dnieper; 2) to find out the peculiarities of the structure of the flora of ancient cemeteries; 3) show the role of ancient cemeteries in the preservation of steppe flora.

Study area

The characteristic features of the natural conditions of the Lower Dnieper region are determined by its geographical location within the true steppe zone of the Eastern European plain.

The climate of the Lower Dnieper as a steppe zone is continental and is characterized by a temperate-continental climate with mild snowless winters and hot dry summers. The main features of this climate are formed under the influence of general and local climate-forming factors. The surface of the territory is almost flat. There are no rivers. The average duration of the frost-free period is 170–180 days. The total annual precipitation is below 350 mm; total summer rainfall is greater than total winter rainfall; maximum rainfall occurs in June and July. Mean July temperature is +23^{0}C, mean temperature for January – not greater than –3^{0}C; extreme temperatures: +39^{0}C in summer, –31^{0}C in winter The region is characterized by low rainfall (350–420 mm per year) and intense solar radiation [MARYNYCH, SHYSHCHENKO, 2005; MOYSIYENKO et al., 2006; MOYSIYENKO, DAYNEKO, 2019].

The floodplain of the Lower Dnieper is densely cut by numerous straits and branches. Islands and lakes of various sizes and configurations are common. In the coastal strip of the Lower Dnieper terrace-delta plain, coastal land, flooded by sea waters, spit and islands, estuaries and lagoon lakes are situated. There are more than 140 lakes in the Lower Dnieper, some of which are called estuaries: White Lake, Bezmen, Deaf Estuary, Pigeon Estuary, Mud, Zburyiv Estuary, Kardashian Estuary, Burkut, Kokhansk, Oleshkiv Lakes and others. [MARYNYCH, SHYSHCHENKO, 2005; MOYSIYENKO, DAYNEKO, 2019].

Regarding the geobotanical zoning, the Lower Dnipro region is located in three districts of the Black Sea and Azov steppe sub-province of the Pontic steppe province of the Steppe zone: Bug-Ingul district of grasses, grass meadows and vegetation of limestone outcrops, Lower Dnipro district of sand steppes, sands and reed beds, Dnipro-Azov district of grasses, wormwood-grass steppes and depression (pid – in Ukrainian) meadows [GEOBOTANICAL ZONING …, 1977; MOYSIYENKO, DAYNEKO, 2019].

Floristic research was carried out in 10 old cemeteries (Fig. 1, Fig. 2). According to the administrative and territorial division, the examined cemeteries are located in the Beryslav, Henichesk, Skadovsk and Kherson districts (former Belozerka, Beryslav, Velykooleksandrivka, Hola Prystan, Nyzhni Sirogozy districts) of Kherson region.

The area of the cemeteries varies from 0.43 ha to 6.79 ha (Table 1).

Material and methods

The study of the flora of 10 old cemeteries was conducted during 2008–2017 using route-field method and literature data [SCHMIDT, 1980; SCHMIDT, 1984; TOLMACHEV, 1974; SHELYAG-SOSONKO, DIDUKH, 1975].

We determined the date of the establishment of each cemetery indirectly - on the basis of the date of foundation of the nearby villages. We searched for the date of establishing the village in the literature [ISTORIIA…, 1972] and cartographic materials [MAP OF THE CRIMEA…, 1855; MAPS OF SCHUBERT, 1965; MAP OF THE KHERSON DISTRICT…, 1910].

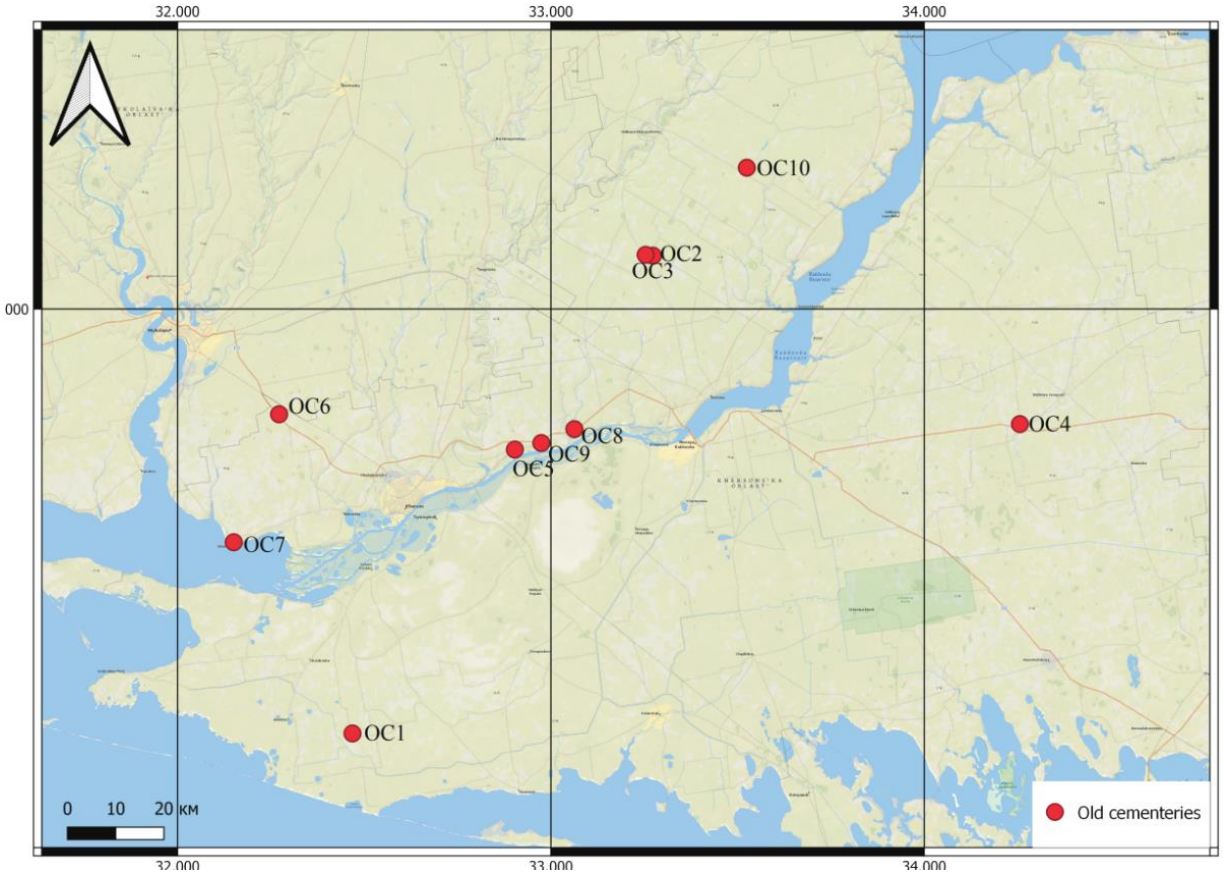

Fig. 1. Map of the location of old cemeteries (OC). Explanation: OC1 – Dolmativka, OC2 – Ekonomiia Ivanivka, 3 – Kurgan near khutir Balakshova, 4 – Nyzhni Torhai, 5 – Poniativka, 6 – Posad-Pokrovske, 7 – Stanislav, 8 – Tiahynka, 9 – Tokarivka, 10 – Tryfonivka.

After the research, the cemetery in Nyzhni Torhai was enlarged to 2.1638 ha (cadastral number 6523883000: 02: 001: 0122), therefore we present floristic data related to the examined area of 1.1 ha.

The study of each site was conducted at least 3 times during the growing season: spring, summer and autumn. The data were compiled in Table A (Appendix 1) which contained the following additional information about each taxon: its occurrence and abundance by [MOYSIYENKO et al., 2006] (estimated according to a 3-point scale: 1 – sporadic, 2 – infrequent, 3 – common) functional group (hs – habitat specialist, g – generalist), species life form, species life span, status in the historical-geographical classification [KORNAŚ, 1981], the number of old cemeteries the species occurs, and origin in the case of alien species. Alien species were identified on the based on the publication of [PROTOPOPOVA, 1991]. Floristic analyses was conducted in which species richness.

The following scale was used classification by [MOYSIYENKO et al., 2006] to assess the frequency category of the species: I – rare (occurring in 1–2 cemeteries), II – relatively rare (3–4), III – not rare (5–6), IV – relatively frequent (7–8), V – common (9–10).

To check what is the level of synanthropization of the flora of old settlements, we used geographical-historical classification by [KORNAŚ, 1981] includes groups of adventive species isolated by the time of drift (archaeophytes and kenophytes), degree of naturalization (epecophytes, ephemerophytes, etc.), and groups of aboriginal species isolated on the basis of resistance to anthropogenic impact (evapophytes, hemiapophytes, etc.), and assigned all species to the following groups: indigenious species (non-synanthropic species, hemi-apophytes, eu-apophytes, ekiophytes) and aliens or anthropophytes (archaeophytes, kenophytes and ergasiophygophytes).

Fig. 2. The general view of some old cemeteries of the Lower Dnipro region: A – Abondanded cemeteries (Ekonomiia Ivanivka); B – Invasion of *Syringa vulgaris* (Tokarivka); C – Used and abandended part of cemeteries (Stanislav), D – Kurgan on cementeries (Tryfonivka), E – Cemetery among field (Kurgan Khutir Balakshova), F – Cemeteries among village (Stanislav) (A-D by Ivan Moysiyenko; E, F – satellite image of the system Google Earth).

To assess plant adaptation to certain ecological conditions we used classification of life forms which includes certain groups as: hemicryptophytes, therophytes, geophytes, phanerophytes, chamaephytes, hemicryptophytes-chamaephytes [RAUNKIAER, 1934]. Names of plant species are given in Latin according to [MOSYAKIN, FEDORONCHUK, 1999], except for species that are absent in the flora of Ukraine (the authors are listed according to the sources in which they are mentioned). We have used Google Earth Pro [GOOGLE EARTH PRO, 2021] and QGIS 3.16 Hannover [QGIS 3.16 HANNOVER 2021] to prepare mapping and spatial analysis of the Lower Dnipro region.

Table 1

General information about old cemeteries

№	Name of the cemetery	Location in the Kherson region	Year of establishment	Area, ha	Coordinates
1	Dolmativka	Kherson Region, Skadovsk District (ex Velykooleskandrivka), v. Dolmativka	1850-1855	3,17	46.220247 32.468254
2	Ekonomiia Ivanivka	Kherson Region, Beryslav District (ex Velykooleskandrivka)	1855-1865	0,43	47.097128 33.273068
3	Kurgan near khutir Balakshova	Kherson Region, Beryslav District (ex Velykooleskandrivka)	1855-1865	0,7	47.098750 33.253558
4	Nyzhni Torhai	Kherson Region, Henichesk District (ex Nyzhnsirohozy), v. Nyzhni Torhai cadastral number 6523883000: 02: 001: 0122	1840	1,1 (2.1638)	46.789683 34.256028
5	Poniativka	Kherson Region, Kherson District, (ex Bilozerka), v. Poniativka	1780	1,1	46.743071 32.903220
6	Posad-Pokrovske	Kherson Region, Kherson District, (ex Bilozerka), v. Posad-Pokrovske	1789	3,6	46.807617 32.271652
7	Stanislav	Kherson Region, Kherson District (ex Bilozerka), v. Stanislav	1697	6,79	46.572933 32.150254
8	Tiahynka	Kherson Region, Beryslavsky District, v. Tiahynka	1778	5,86	46.780492 33.062809
9	Tokarivka	Kherson Region, Kherson District (ex Bilozerka), v. Tokarivka	1780	2,81	46.754950 32.974147
10	Tryfonivka	Kherson Region, Beryslav District (ex Velykooleskandrivka), v. Tryfonivka	1863	3,2	47.257042 33.524622

Results

1. Biodiversity of old cemeteries

The list of vascular flora includes 388 species of spontaneously growing plants found in the 10 examined cemeteries. Total species richness ranged from 104 to 216 species (average 153 species per 1 cemetery) (Fig. 3). The species belong to 226 genera, 62 families, 3 classes and 2 divisions.

The vast majority of species belong to the *Magnoliophyta* division (99.75 %). Division *Pinophyta* (0.25 %) is represented by one family – *Ephedraceae* and one species – *Ephedra distachya.* The following families were represented by the greatest number of taxa (Fig. 4): *Asteraceae* (76), *Poaceae* (32), *Fabaceae* (27), *Brassicaceae* (24), *Lamiaceae* (20), *Caryophyllaceae* (16), *Rosaceae* (16), *Scrophulariaceae* (15), *Chenopodiaceae* (15) and *Boraginaceae* (11).

Genera leading by the number of species were: *Veronica* (9), *Artemisia* (8), *Astragalus* (7), *Euphorbia* (7), *Allium* (6), *Chenopodium* (6), *Galium* (6), *Centaurea* (5), *Limonium* (5), *Medicago* (5).

About half of the flora of cemeteries – 179 species (46 %) are plants that occur sporadically (in 1-2 cemeteries – I frequency class). Most of them are planted on graves or appear there temporarily (Fig. 5).

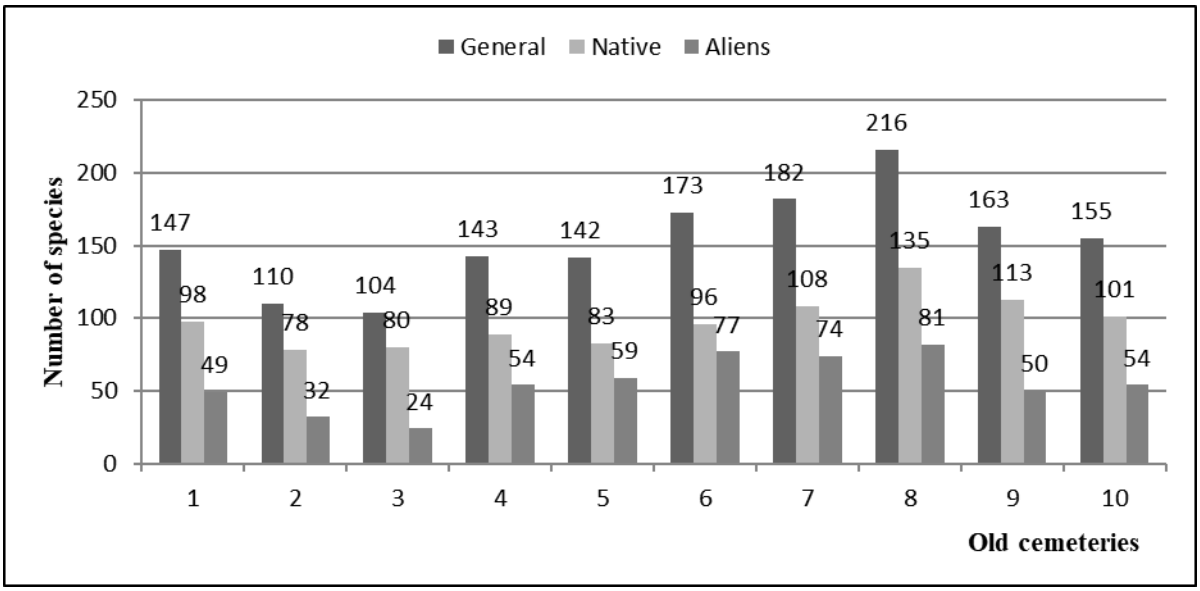

Fig. 3. The General number of species and the number of native and alien species in the flora of each of 10 cemeteries (the number of species is indicated at the top of the bar). Explanation: 1 – Dolmativka, 2 – Ekonomiia Ivanivka, 3 – Kurgan near khutir Balakshova, 4 – Nyzhni Torhai, 5 – Poniativka, 6 – Posad-Pokrovske, 7 – Stanislav, 8 – Tiahynka, 9 – Tokarivka, 10 – Tryfonivka.

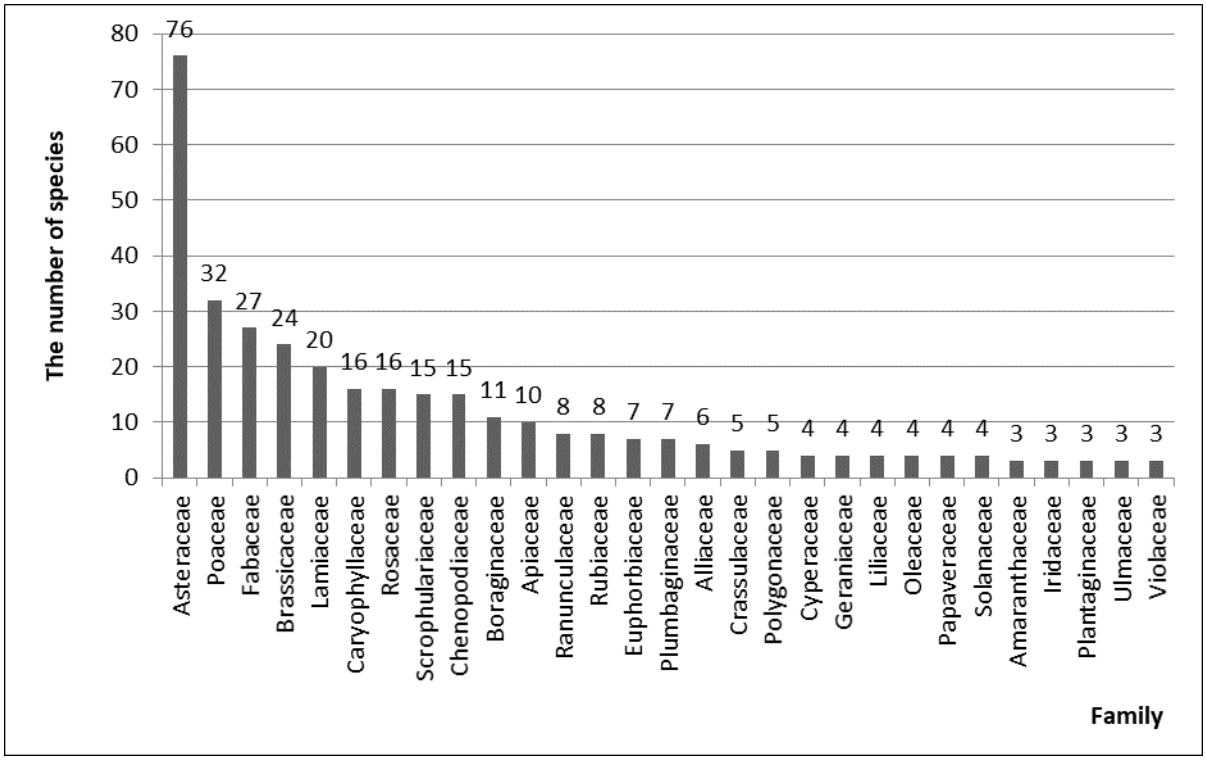

Fig. 4. The most numerous families in the total flora of the 10 cemeteries studied.

The group of common species recorded on 9–10 of old cemeteries (frequency class V) are 49 species, or 12.6 % of flora: *Anisantha tectorum* (10), *Agropyron pectinatum* (9), *Amaranthus retroflexus* (9), *Arenaria uralensis* (10), *Artemisia austriaca* (10), *Bromus squarrosus* (10), *Buglossoides arvensis* (10), *Capsella bursa-pastoris* (10), *Chenopodium album (10), Chondrilla juncea* (9), *Consolida paniculata* (10), *Convolvulus arvensis* (10), *Coronilla varia* (10), *Descurainia sophia* (9), *Elytrigia repens* (10), *Falcaria vulgaris* (10), *Festuca valesiaca* (10), *Galium aparine* (10), *Hemerocallis fulva* (9), *Holosteum umbellatum*

(10), *Koeleria cristata* (9), *Lactuca serriola* (10), *Lamium amplexicaule* (10), *Medicago falcata* (10), *Onopordum acanthium* (9), *Poa angustifolia* (10), *Poa bulbosa* (10), *Polygonum aviculare* (10), *Potentilla argentea* (10), *Pterotheca sancta* (10), *Ranunculus oxyspermus* (9), *Rosa canina* (9), *Salvia nemorosa* (10), *Senecio vernalis* (10), *Seseli tortuosum* (10), *Setaria viridis* (9), *Sisymbrium loeselii* (9), *Stipa capillata* (9), *Syringa vulgaris* (10), *Taraxacum erythrospermum* (10), *Tragopogon major* (10), *Trifolium arvense* (10), *Valerianella carinata* (10), *Verbascum phoeniceum* (10), *Veronica arvensis* (10), *Veronica triphyllos* (10), *Veronica verna* (9), *Vicia villosa* (10), *Viola kitaibeliana* (10).

In the next 4 groups, there is a linear increase in the number of species with decreasing frequency of occurrence. Thus, the most numerous class in terms of the frequency class I, includes half of the species of flora of old cemeteries.

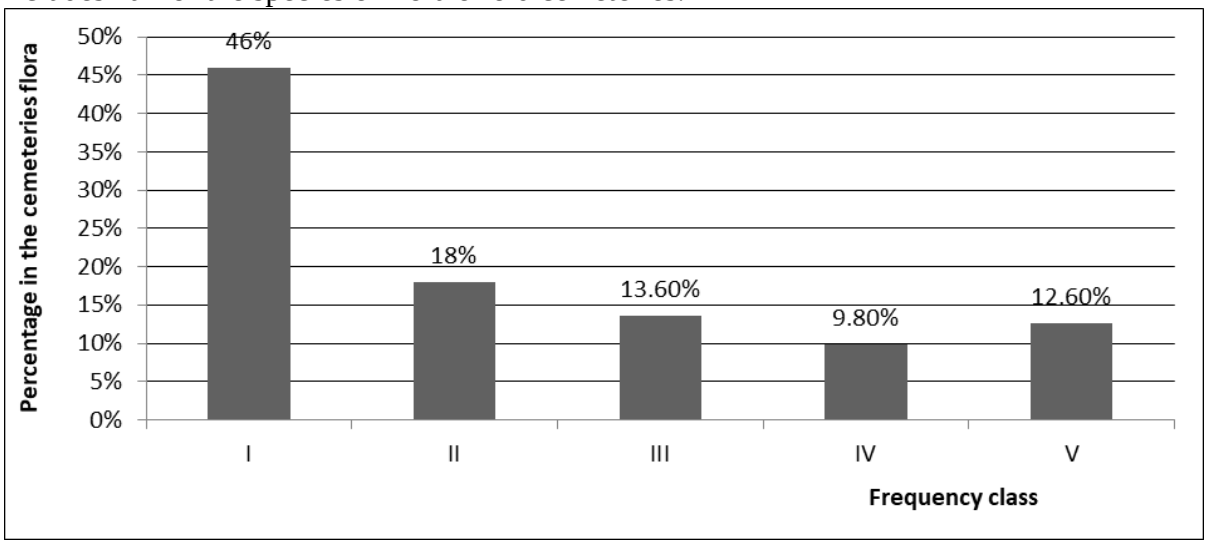

Fig. 5. Subdivision of the total flora of old cemeteries by frequency class (the total number of species in each category is indicated at the top of the bar). Frequency classes: I – rare (1–2 cemeteries), II – relatively rare (3–4 cemeteries), III – not rare (5–6 cemeteries), IV – relatively frequent (7–8 cemeteries), V – common (9–10 cemeteries).

2. Spectrum of life forms

The spectrum of life forms of ancient cemeteries corresponds basically to that of the flora of the Pontic grass steppe zone [SUDNIK-WÓJCIKOWSKA, MOYSIYENKO, 2006].

The dominant group of species in old cemeteries are therophytes (38.8 %) (Fig. 6). The most frequent species therophytes in old cemeteries are: *Anisantha tectorum, Arenaria uralensis, Bromus squarrosus, Buglossoides arvensis, Capsella bursa-pastoris, Chenopodium album, Consolida paniculata, Galium aparine, Holosteum umbellatum, Lactuca serriola, Lamium amplexicaule, Polygonum aviculare, Pterotheca sancta, Senecio vernalis, Trifolium arvense, Valerianella carinata, Veronica arvensis, Veronica triphyllos, Vicia villosa, Viola kitaibeliana.*

The second group by number of species are hemicryptophytes (33.4 %). Significant representation of hemicryptophytes indicates the preservation of the flora of old cemeteries, as they are the dominant group in natural steppe groups. The most frequent hemicryptophytes species in old cemeteries were: *Coronilla varia, Falcaria vulgaris, Festuca valesiaca, Medicago falcata, Poa bulbosa, Potentilla argentea, Salvia nemorosa, Seseli tortuosum, Taraxacum erythrospermum, Tragopogon major, Verbascum phoeniceum.*

Geophytes and geophytes-hemicryptophytes occupy 3 positions in the life form spectrum and include 56 species or 14.4 %. The most common species of this group are: *Ranunculus oxyspermus, Convolvulus arvensis, Elytrigia repens* and *Poa angustifolia.*

Phanerophytes accounted for 9.3 % of the flora of investigated cemeteries. The most common species of phanerophytes (nanophanerophytes) were shrubs: *Rosa canina* and *Syringa vulgaris.* Phanerophytes are not typical for the steppe zone. Their relatively high representation in cemeteries is due to the fact that they are often grown and run wild here.

The smallest number of species in the flora of old cemeteries were represented by chamephytes (including hemicryptophytes-chamephytes), of which there were 16 species or 4.1 %. Among them, only *Artemisia austriaca* belongs to the V frequency class.

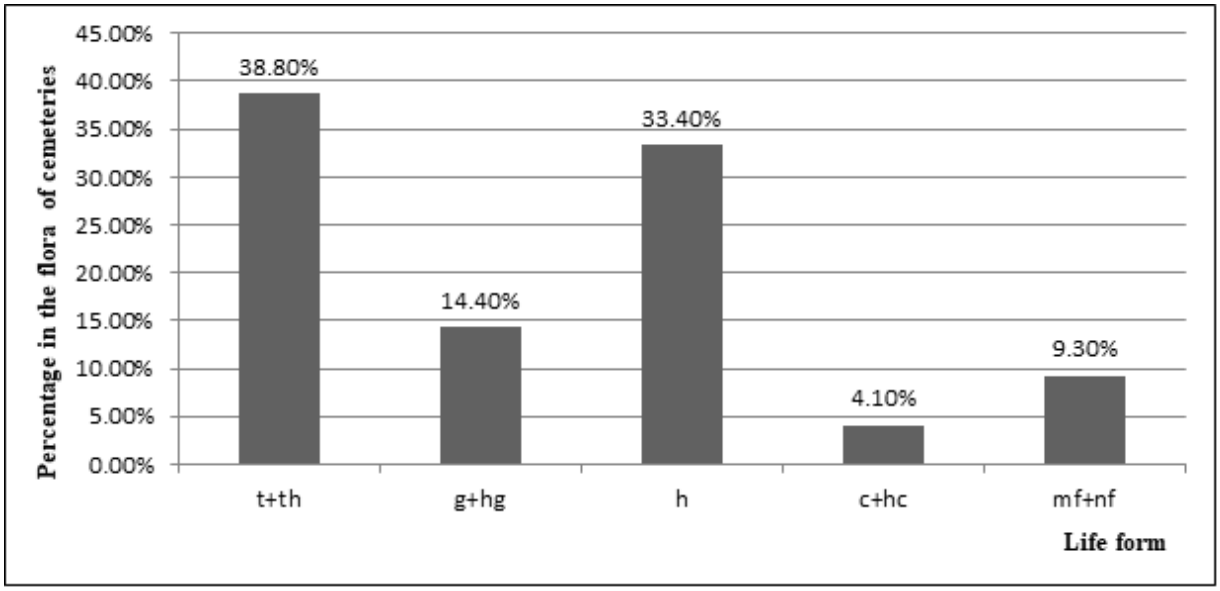

Fig. 6. Spectrum of life forms in the flora of old cemeteries.

3. Spectrum of species groups in the historical-geographical classification of plants

Most species of flora of old cemeteries were natives (254 species – 65 % of the flora). As it is shown by Fig. 8, more than half of the native species are non-synanthropic plants – 135 species, or 35 % of the total number of species that are the plants not entering the habitats altered by man, i.e. non-synanthropic, represented on the old cemeteries mostly by steppe plants (Fig. 7). Non-synanthropes steppe species occurring with the highest frequency are: *Koeleria cristata, Stipa capillata, Festuca valesiaca.* Non-synanthropic species, that are "cemetery specific" is *Sedum acre.*

Depending on the level of transformation of the habitats into which they enter, apophytes can be subdivided into two groups: eu-apophytes and hemi-apophytes. The most frequent apophytes are as follows: *Chenopodium album, Consolida paniculata, Convolvulus arvensis, Elytrigia repens, Galium aparine, Polygonum aviculare, Senecio vernalis, Tragopogon major, Trifolium arvense.*

Significant number of local plants indicates a high level of preservation of vegetation in old cemeteries. The contribution of native species in old cemeteries varied from 55.5 % (Posad-Pokrovske) to 76.9 % (Kurgan near khutir Balakshova), depending on the area of the cemetery that is subjected to intensive treatment.

Some native species are cultivated in cemeteries and sometimes they run wild from cultivation (ekiophytes). The most common of them are: *Convallaria majalis, Euphorbia cyparissias, Ficaria calthifolia, Fraxinus excelsior, Ligustrum vulgare, Muscari neglectum, Quercus robur, Sedum sexangulare, Sempervivum ruthenicum, Ulmus laevis, Ulmus minor.*

Alien species occur in all old cemeteries (a total of 134 species, 35 % of flora), and their share ranges from 23.1 % (Kurgan near khutir Balakshova) to 44.5 % (Posad-Pokrovske). Significant number of species indicate the threat of possible spread of these alien species in the future.

Among anthropophytes, archeophytes predominate over kenophytes. There are 48 species of kenophytes, or 12.6 % of the flora of old cemeteries. The most common of kenophytes belonging to the V class of frequency are1 species: *Amaranthus retroflexus.* The majority of kenophytes belong to the frequency class I (20 species) and occur rarely in individual cemeteries.

There are 54 species of archeophytes (14 % of the total flora). The total number of archaeophytes in cemeteries was greater than the sum of kenophytes. The most common archeophytes belonging to the frequency class V, were 13 species: *Anisantha tectorum, Bromus squarrosus, Buglossoides arvensis, Capsella bursa-pastoris, Descurainia sophia, Lactuca serriola, Lamium amplexicaule, Onopordum acanthium, Setaria viridis, Sisymbrium loeselii, Veronica arvensis, Veronica triphyllos, Vicia villosa.*

Among anthropophytes, there is a significant percentage of ergasiophygophytes, plants that are grown on graves and appear temporarily in cemeteries. The most common "fugitives from culture" are: *Alcea rosea, Calendula officinalis, Centaurea dealbata, Gaillardia pulchella, Hemerocallis fulva, Sedum reflexum, Syringa vulgaris,Iris × hybrida, Verbesina encelioides.*

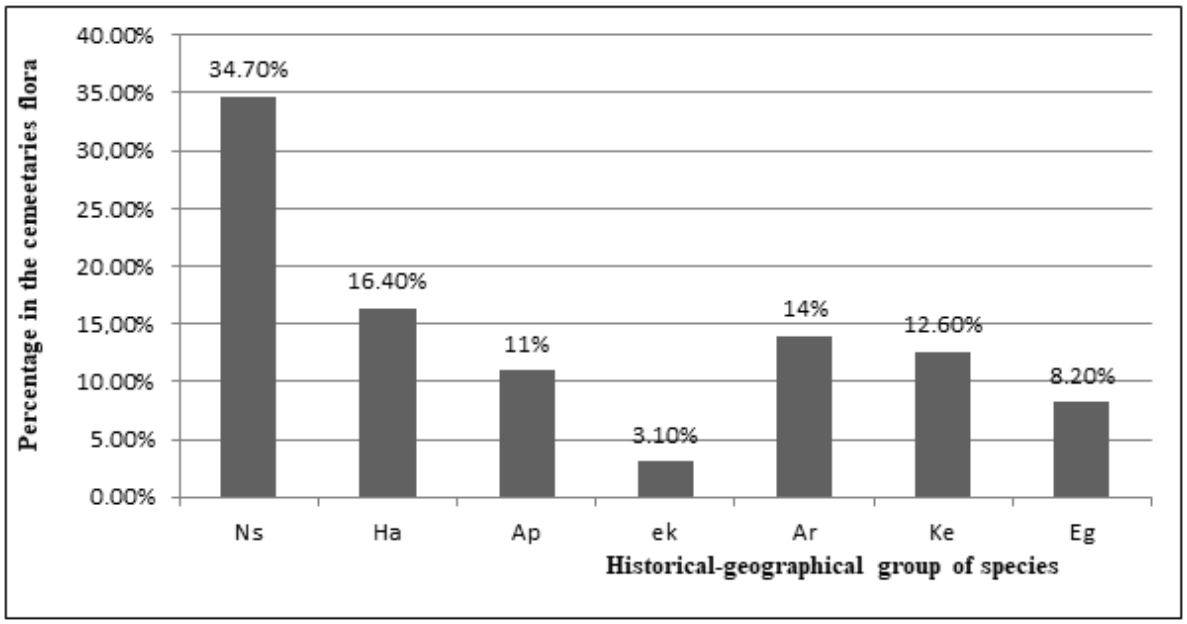

Fig. 7. Historical-geographical classification of the total flora of old cemeteries.

Discussion

Despite the relatively small size of the old cemeteries, they are characterized by a fairly high level of floristic richness of vascular plants. The flora of old cemeteries represent 7.6 % of the flora of Ukraine, which includes 5 100 species [MOSYAKIN, FEDORONCHUK, 1999] and 19.2 % of the flora of the Northern Black Sea coast, which includes 2 025 species [MOYSIYENKO, 2013].

The size of cemeteries affects the quantitative characteristics of local flora (number of species). Cemetery size, spatial isolation and current use can affect the floristicdiversity of cemeteries. On the other hand, the qualitative features of flora probably depend more on other factors (human activity and location) than on cemetery size. The location of a cemetery affects the species specificity of the flora. This statement applies in particular to abandoned cemeteries, which are characterized by lower species similarity and a higher proportion of native plants in comparison to cemeteries that are still in use [NOWIŃSKA et al., 2020].

Steppe vegetation is not preserved in all cemeteries, but only in those that were laid on the virgin and unploughed part of the steppe, near old villages or towns. If the cemetery is

already laid on the plowed area (newly created) or transferred to another area, it does not proper for the existence of steppe plants" or something similar. A clear indicator of the conservation value of old cemeteries is the share of sozophytes in the flora [MOYSIYENKO et al., 2017]. In the old cemeteries in the Lower Dnieper region, there are rare steppe species that have survived (*in situ*) for a long time. It is possible because the burial places in Ukraine are held in esteem, and any maintenance activities activities are traditionally limited to the care of graves. On the other hand, spontaneous vegetation in the vicinity of graves and wastelands is not destroyed [MOYSIYENKO et al., 2017]. Currently used cemeteries are richer in species and more diverse than abandoned ones, because human activities (burial and systematic economic practices introduction of ornamental species) usually contribute to the short-term emergence of random species [NOWIŃSKA et al., 2020]. The relatively high proportion of kenophytes is related to their spontaneous spread in favorable (corresponding) habitats.

A number of unfavorable anthropogenic factors in old cemeteries lead to a decrease in the share of biodiversity. Fires, grazing, littering, and cultural traditions of burial and care of graves in cemeteries lead to the loss of steppe cover due to the appearance of deliberately introduced ornamental plants and other adventitious species in cemeteries, which are usually planted by locals around graves, however the presence of a tombstone or other tombstones affects the escape of lichens and bryoflora [FUDALI, 2001]. The location of the cemetery near the settlements affects the species specificity of the flora [NOWIŃSKA et al., 2020].

The presence of typical steppe species, such as *Festuca valesiaca*, *Koeleria cristata*, *Stipa capillata* and a large proportion of natural non-synanthropic species, compared to invasive ones, indicates a relatively good state of preservation of steppe vegetation in old cemeteries in the natural state in situ.

In the natural steppe flora, therophytes are usually less numerous than the hemicryptophytes. The high number of therophytes in the flora of the old cemeteries of the Lower Dnieper region is due to less favorable conditions in the south of Ukraine (temperate-continental climate) and anthropogenic influences. Also, the loss of steppe cover may be due to the appearance in cemeteries of purposefully introduced ornamental plants, which are usually planted by the local population, on graves, as well as the spontaneous spread of anthropophytes. The contribution of native species in old cemeteries varied from 55.5 % (Posad-Pokrovske) to 76.9 % (Kurgan near khutir Balakshova), which indicates that the flora of cemeteries is largely transformed by man. These numbers are really high suggesting that old cemeteries are very important habitats for steppe plants.

The specificity of the flora of cemeteries is a significant percentage of plants that found themselves in this territory as a result of escaping from cultivation (ergasiophygophytes and ekiophytes). This is due to the peculiarities of the care of cemeteries in the South of Ukraine, which consists in the intensive planting of cemeteries with ornamental plants, which are represented by both non-native and local plants. From the point of view of preservation of a natural vegetation cover widespread cultivation of plants in cemeteries has two consequences. Wild non-native plants have a negative effect by competing with local plants. In particular, large areas of cemeteries are occupied by thickets *Syringa vulgaris, Ailanthus altissima, Lycium barbatum*. Native woody plants (trees, such as *Fraxinus excelsior, Quercus robur*, and shrubs, as *Ligustrum vulgare*), which are not characteristic of steppe vegetation, but also are cultivated in cemeteries and escape from cultivation, may have a negative impact on steppe vegetation on cemeteries and in vicinity.

Fig. 8. Rare species of some old cemeteries of the Lower Dnipro – A *Stipa capillata*; B – *Stipa lessingiana*; C – *Stipa ucrainica*; D – *Limonium platyphyllum*; E – *Muscari neglectum*; F– *Vinca herbacea*; G – *Ephedra distachya*; H – *Dianthus andrzejowskianus* (A, B, C included in the Red Data Book of Ukraine; D, E, F, G, H – Included in the Red List of the Kherson region, all photos by Moysiyenko I.I.).

On the other hand, local plants spontaneously growing in old cemeteries are also grown near burials (especially beautiful steppe plants, including *Stipa capillata*, *Ficaria calthifolia*, *Iris pumila*, *Ornithogalum kochii*, *Vinca herbacea*, *Viola odorata*). Thanks to this, they have a chance to spread and survive.

It is possible that some beautiful flowering local plants were not specially planted near the burials, but appeared there spontaneously, and were not destroyed during the clearing of the burials from wild plants. Such plants include *Asparagus officinalis*, *Potentilla recta*, *Salvia nemorosa*. Aboriginal plants, which are not typical for steppe, but are often cultivated

on cemeteries. We have classified some of these species as ekiophytes, including such rare plants as: *Convallaria majalis, Fraxinus excelsior, Muscari neglectum, Quercus robur*.

Some rare plants, grown in cemeteries do not show a tendency to go wild and are found only in culture. Among them *Betula borysthenica* Klokov, *Paeonia tenuifolia* L., which are included in the Red Data Book of Ukraine [RED DATA BOOK, 2009] and *Anemonoides sylvestris* L., *Stachys germanica* L. – included in the Red List of Kherson region [CHERVONYI …, 2013]. Plants that last only in the place of cultivation are not included in the list of species.

However, 65 % of all species found in old cemeteries are native plants. More than half of this group, 35 % of the total number of species are non-synanthropic plants, which are represented in old cemeteries, mainly steppe plants. The good preservation of natural flora is also indicated by the presence of protected plants in old cemeteries. In total, we found 22 species (5.65 %) of vascular plants that are subject to protection in 10 cemeteries (Fig.8). Among them are 5 species of plants are included in the Red Data Book of Ukraine [RED DATA BOOK, 2009]: *Astragalus henningii, Stipa capillata, S. lessingiana, S. ucrainica, Tulipa biebersteiniana* and 17 species of vascular plants are included in the Red List of the Kherson region [CHERVONYI …, 2013]: *Amygdalus nana, Bellevalia sarmatica, Centaurea trichocephala, Convallaria majalis, Dianthus andrzejowskianus, Elytrigia pseudocaesia, Ephedra distachya, Fraxinus excelsior, Iris halophila, Limonium platyphyllum, Linaria macroura, Muscari neglectum, Peucedanum ruthenicum, Prangos odontalgica, Quercus robur, Veronica capsellicarpa, Vinca herbacea*.

The preservation of the natural vegetation cover in cemeteries is supported by the sacred status of cemeteries that are places where economic activities are not allowed. This is evidenced by the attitude to the steppe areas in cemeteries, which were formed in places with destroyed tombstones. In the middle of the 20th century, for atheistic reasons, cemeteries were destroyed to destroy old crosses. Such places exist today in the form of plain meadows (this is where the most typical steppe vegetation is presented). Repeated burials were not performed.

The results obtained emphasize the floristic specificity and value of old cemeteries. They could play an important role in steppe phytodiversity conservation, and give perspective for the future steppe restoration actions.

Conclusions

The flora of old cemeteries in the south of Ukraine shows several specificity, its manifestations are:

a) The share of native flora – approx. 2/3 of the flora, is similar to the typical flora of cities, but among native plants, typical apophytes constitute only 20 %, and species of natural and semi-natural habitats definitely dominate.

b) The dominant share of therophytes, both native and alien, in the flora of old cemeteries indicates instability of habitats.

c) The share of species with woody shoots – phanerophytes is small, about 9.2 %, of which native trees and shrubs account for only 1/3. This reflects the location in the forestless zone (steppes).

d) Typical for cemeteries is the relatively large share of species that go wild (over 11%), both native and foreign. As might be expected, they are mostly ornamental plants. The cemetery may prove to be a "relay station" for some prairie species with sumptuous flowers. The cultivation of native (equally beautiful) steppe species should be promoted.

e) Old Ukrainian cemeteries, which survived the communist times and are now extensively used, should be subject to special protection as monuments and because they become an enclave for steppe species returning here. Among them are species that are legally protected and listed in the Red Books.

Acknowledgments

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Apendix 1.

Cheklist of the flora of old cemeteries

№	Name of species	Cemetery Dolmativka	Cemetery Ekonomiia Ivanivka	Cemetery near khutir	Cemetery Nyzhni Torhai	Cemetery Poniativka	Cemetery Posad- Pokrovske	Cemetery Stanislav	Cemetery Tiahynka	Cemetery Tokarivka	Cemetery Tryfonivka	Species occurrence	Functional group	Status in the Ukrainian flora	Life form	Life span
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	Achillea leptophylla M.Bieb.								1	1		2	HS	Ns	h	P
2	Achillea micranthoides Klokov				2							1	HS	Ns	h	P
3	Achillea nobilis L.				1				1	1	2	4	HS	Ns	h	P
4	Achillea pannonica Scheele	1	2		2		2		1	1	1	7	G	Ns	h	P
5	Achillea setacea Waldst. & Kit.		1	2			2		2		3	5	G	Ha	hg	P
6	Aegilops cylindrica Host	2			2	2	2		1			5	G	Ha	t	A
7	Aesculus hippocastanum L.							1				1	G	Eg	mf	P
8	Agropyron pectinatum (M.Bieb.) P.Beauv.	2		3	1	1	3	3	3	1	2	9	HS	Ha	h	P
9	Ailanthus altissima (Mill.) -Swingle						1	1	2	1		4	G	Ke	mf	P
10	Ajuga chia Schreb.				1							1	G	Ha	hg	A/B
11	Alcea rosea L.				1	1	1	1	1	1		6	G	Eg	h	B/P
12	Allium cepa L.					1						1	G	Eg	g	P
13	Allium guttatum Steven	2				1		1	2			4	HS	Ns	g	P
14	Allium inaequale Janka							1				1	HS	Ns	g	P
15	Allium paczoskianum Tuzs.		1		2		2	1	1			5	HS	Ns	g	P
16	Allium paniculatum L.						2		1			2	HS	Ns	g	P
17	Allium rotundum L.						2		1			2	HS	Ns	g	P
18	Alopecurus pratensis L.		1									1	G	Ns	g	P
19	Alyssum desertorum Stapf.	3		1	2			2	1	2	2	7	G	Ha	t	A
20	Alyssum hirsutum M.Bieb.	1			1				1			3	G	Ha	t	A
21	Amaranthus albus L.		1		1	1	1	2	1		1	7	G	Ke	t	A
22	Amaranthus blitoides S.Watson	1			1		1	1				4	G	Ke	t	A
23	Amaranthus retroflexus L.	1	1	1	1	1	2	1	1		1	9	G	Ke	t	A
24	Ambrosia artemisiifolia L.	1			1	1	1		1	1	1	7	G	Ke	t	A
25	Amygdalus nana L.									1		1	HS	Ns	nf	P
26	Androsace elongata L.		1	1							2	3	HS	Ns	t	A
27	Anethum graveolens L.						1					1	G	Eg	t	A
28	Anisantha sterilis (L.) Nevski					1	1	3				3	G	Ar	t	A
29	Anisantha tectorum (L.) Nevski	2	2	3	3	3	3	3	3	3	1	10	G	Ar	t	A
30	Anthemis ruthenica M.Bieb.	3				2		2	1	2	1	6	G	Ap	t	A
31	Anthriscus cerefolium (L.) Hoffm.	2				2	2		2	1	1	6	G	Ap	t	A
32	Arabidopsis thaliana (L.) Heynh.		1						1			2	G	Ke	t	A
33	Arctium lappa L.						1					1	G	Ap	h	B
34	Arctium tomentosum Mill.						1					1	G	Ap	h	B
35	Arenaria uralensis Pall. ex Spreng.	3	1	1	3	2	3	2	2	1	3	10	G	Ha	t	A
36	Armeniaca vulgaris Lam.				1	1		1	1	1		5	G	Ke	mf	P
37	Armoracia rusticana P.Gaertn., B.Mey. & Scherb.	1										1	G	Ke	g	P
38	Artemisia absinthium L.		2		1		2		1	2	2	6	G	Ar	c	P
39	Artemisia annua L.						1					1	G	Ke	t	A
40	Artemisia austriaca Jacq.	2	2	3	3	2	3	2	2	2	3	10	G	Ha	c	P
41	Artemisia santonica L.						2					1	G	Ns	c	P
42	Artemisia vulgaris L.						1					1	G	Ap	hc	P
43	Artemisia lerchiana Weber							1	1	1		3	HS	Ha	h	P
44	Artemisia pontica L.		2	3								2	G	Ns	h	P
45	Asparagus officinalis L.		2			1	1	1	1	1	1	7	HS	Ns	g	P
46	Asparagus verticillatus L.								1			1	G	Ns	g	P
47	Asperugo procumbens L.					1	3	1				3	G	Ap	t	A
48	Asperula cynanchica L.								1			1	HS	Ns	h	P
49	Astragalus cicer L.				1							1	HS	Ns	h	P
50	Astragalus henningii (Steven) Klokov										2	1	HS	Ns	h	P
51	Astragalus onobrychis L.	3			1							2	HS	Ns	h	P
52	Astragalus pallescens M.Bieb.							1				1	HS	Ns	hc	P
53	Astragalus ucrainicus Popov & Klokov	1							1			2	HS	Ns	h	P
54	Astragalus varius S.G.Gmel.	1										1	HS	Ns	hc	P
55	Astragalus corniculatus M. Bieb.				1							1	HS	Ns	h	P
56	Asyneuma canescens (Waldst. & Kit.) Griseb. & Schenk								1			1	HS	Ns	h	P
57	Atriplex patula L.							1				1	G	Ap	t	A
58	Atriplex oblongifolia Waldst. & Kit.				1	1	3		1		1	5	G	Ha	t	A
59	Atriplex prostrata Boucher ex DC.							1				1	G	Ha	t	A
60	Atriplex sagittata Borkh.						2					1	G	Ar	t	A
61	Atriplex tatarica L.	1		2	1	1	1	2	2			7	G	Ke	t	A
62	Ballota nigra L.				1	2	2		2	2	2	6	G	Ar	hc	P
63	Bassia sedoides Asch.				2		1	1	1		1	5	G	Ha	t	A
64	Bellevalia sarmatica (Pall. ex Georgi) Woronow									1		1	HS	Ns	g	P
65	Berberis vulgaris L.									1		1	G	Ns	nf	P

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
66	Berteroa incana (L.) DC.						3				1	2	G	Ap	th	A/B
67	Borago officinalis L.							1				1	G	Eg	h	A
68	Bromopsis inermis (Leyss.) Holub			2	3		2	2	2	2	3	7	G	Ha	hg	P
69	Bromus hordeaceus L.	2										1	G	Ap	th	A/B
70	Bromus squarrosus L.	2	2	2	3	2	3	3	2	2	1	10	G	Ar	t	A
71	Bromus japonicus Thunb.						2					1	G	Ha	t	A
72	Buglossoides arvensis (L.) I.M.Johnst.	3	1	2	1	2	3	2	3	2	2	10	G	Ar	t	P
73	Calamagrostis epigeios (L.) Roth		1									1	G	Ap	h	P
74	Calendula officinalis L.	1			1	2	1		1	1	1	7	G	Eg	t	A
75	Camelina microcarpa Andrz. ex DC.	2	1		1				1	1	1	6	G	Ar	th	A/B
76	Campsis radicans (L.) Seem.								1	1		2	G	Eg	nf	P
77	Cannabis sativa L.					1						1	G	Ke	t	A
78	Capsella bursa-pastoris (L.) Medik.	3	1	3	2	2	3	3	2	2	2	10	G	Ar	th	A/B
79	Cardaria draba (L.) Desv.	3	2	2			3	2	3	2	1	8	G	Ke	hg	P
80	Carduus nutans L.						2					1	G	Ar	th	A/B
81	Carduus uncinatus M.Bieb.	1			2	1	1	2	2	2	1	8	HS	Ns	th	A/B
82	Carduus acanthoides L.		1								2	2	G	Ar	th	A/B
83	Carex melanostachya M.Bieb. ex Willd.		3			1	2				2	4	HS	Ns	g	P
84	Carex praecox Schreb.		3	3		2		2	2	2	2	7	G	Ha	hg	P
85	Carex stenophylla Wahlenb.	2		2	2	1		3	2	1	3	8	HS	Ns	hg	P
86	Carex supina Willd. ex Wahlenb.					2						1	HS	Ns	hg	P
87	Centaurea adpressa Ledeb.			1								1	HS	Ns	h	P
88	Centaurea dealbata Willd.				1	1		1	1	1	1	6	G	Eg	h	P
89	Centaurea trichocephałła M.Bieb. ex Willd.		2									1	HS	Ns	h	P
90	Centaurea diffusa Lam.	1	1		3		1	1	2	1	3	8	G	Ke	th	A/B
91	Centaurea salonitana Vis.								1	1		2	HS	Ha	h	P
92	Cerastium tomentosum L.							1				1	G	Eg	c	P
93	Cerastium ucrainicum (Kleopw) Klokov	3				1		1				3	G	Ns	t	A
94	Cerasus vulgaris Mill.				2	2	1	2	3	2	1	7	G	Eg	mf	P
95	Chenopodium album L.	2	2	2	2	3	3	2	2	3	2	10	G	Ap	t	A
96	Chenopodium glaucum L.							1				1	G	Ha	t	P
97	Chenopodium opulifolium Schrad. ex W.D.J.Koch & Ziz		1								1	2	G	Ar	t	A
98	Chenopodium preissmannii Murr			2					1			2	G	Ke	t	A
99	Chenopodium striatiforme Murr			1	1	1	1	1	1			6	G	Ke	t	A
100	Chenopodium strictum Roth							1				1	G	Ke	t	A
95	Chenopodium glaucum L.							1				1	G	Ha	t	P
96	Chenopodium strictum Roth							1				1	G	Ke	t	A
97	Chenopodium × preissmannii Murr			2					1			2	G	Ke	t	A
98	Chenopodium album L.	2	2	2	2	3	3	2	2	3	2	10	G	Ap	t	A
97	Chenopodium × preissmannii Murr			2					1			2	G	Ke	t	A
98	Chenopodium album L.	2	2	2	2	3	3	2	2	3	2	10	G	Ap	t	A
99	Chenopodium opulifolium Schrad. ex W.D.J.Koch & Ziz		1								1	2	G	Ar	t	A
100	Chenopodium striatiforme J.Murr			1	1	1	1	1	1			6	G	Ke	t	A
101	Chondrilla juncea L.	2		2	1	1	2	1	2	1	3	9	G	Ha	h	P
102	Chondrilla latifolia M.Bieb.			1			1	1		1	1	5	G	Ha	h	P
103	Chorispora tenella (Pall.) DC.					1	2	1	1			4	G	Ke	t	A
104	Cichorium intybus L.		2		2		2		2	1	2	6	G	Ar	h	P
105	Cirsium vulgare (Savi) Ten.						1			1		2	G	Ap	th	A/B
106	Cirsium setosum (Willd.) Besser ex M.Bieb.			2	1		1		1		2	5	G	Ap	th	A/B
107	Cleistogenes bulgarica (Bornm.) Keng	2								1		2	HS	Ns	h	P
108	Conium maculatum L.					2	2					2	G	Ar	h	B/P
109	Consolida ajacis (L.) Schur							1	1			2	G	Ke	t	A
110	Consolida orientalis (J.Gay) Schrödinger								1			1	G	Ke	t	A
111	Consolida paniculata (Host) Schur	1	2	2	2	1	2	1	1	2	1	10	G	Ap	t	A
112	Convallaria majalis L.					1		1	1	1		4	G	Ek	g	P
113	Convolvulus arvensis L.	3	1	2	3	3	3	3	3	3	3	10	G	Ap	hg	P
114	Convolvulus lineatus L.	3		2								2	HS	Ns	h	P
115	Conyza canadensis (L.) Cronquist	2	1		1	1	2	1	2		2	8	G	Ke	th	A/B
116	Coronilla varia L.	1	1	2	3	1	2	2	2	2	2	10	G	Ha	h	P
117	Cosmos bipinnatus Cav.	1							1			2	G	Eg	t	A
118	Crataegus monogyna Jacq.		1					1				2	G	Ns	nf	P
119	Crepis ramosissima d'Urv.		2	1		2		2	1			5	G	Ha	t	A
120	Crepis rhoeadifolia M.Bieb.	1			2		1	1			1	5	G	Ap	t	A
121	Cuscuta approximata Bab.				1				1	1		3	HS	Ns	t	A
122	Cuscuta campestris Yunck.	1					1	1		1		4	G	Ke	t	A
123	Cynodon dactylon (L.) Pers.	1				2			2			3	G	Ap	hg	P
124	Cynoglossum officinale L.						1			1	1	3	G	Ar	h	P
125	Descurainia sophia (L.) Webb ex Prantl	2		1	2	2	3	3	2	1	1	9	G	Ar	t	A/B
126	Dianthus andrzejowskianus (Zapal.) Kulcz.								1			1	HS	Ns	h	P
127	Dianthus carbonatus Klokov	1		1					1	1		4	HS	Ns	h	P
128	Echium vulgare L.				1		1		1			3	G	Ar	h	B
129	Elaeagnus angustifolia L.				1	1					1	3	G	Ke	mf	P
130	Elisanthe viscosa (L.) Rupr.				1							1	G	Ns	h	P
131	Elytrigia intermedia (Host) Nevski	2										1	G	Ha	hg	P
132	Elytrigia pseudocaesia (Pacz.) Prokud.		2									1	G	Ns	g	P
133	Elytrigia repens (L.) Nevski	3	1	3	3	3	3	3	3	3	3	10	G	Ap	hg	P
134	Ephedra distachya L.					1		1	1	1		4	HS	Ns	nf	P
135	Eragrostis minor Host	2			2	1		2			2	5	G	Ke	t	A
136	Erodium neilreichii Janka	1										1	G	Ns	th	A/B

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
137	Erodium ciconium (L.) L'Hér.	1										1	G	Ha	t	A
138	Erodium cicutarium (L.) L'Hér.	3	1	1		2	3	1	1		2	8	G	Ap	th	A/B
139	Erophila verna (L.) DC.	1	2	1			1		1	1		6	G	Ha	th	A/B
140	Erucastrum armoracioides (Czern. ex Turcz.) Cruchet						2					1	HS	Ha	th	A/B
141	Eryngium campestre L.	2	3	2			2		2	2	2	7	G	Ha	th	A/B
142	Erysimum diffusum Ehrh.								1	1		2	G	Ha	th	A/B
143	Erysimum repandum L.							1				1	G	Ar	t	A
144	Euphorbia cyparissias L.							1				1	G	Ha	h	P
145	Euphorbia glareosa Pall. ex M.Bieb.									1		1	HS	Ns	h	P
146	Euphorbia marginata Pursh						1	1				2	G	Eg	t	A
147	Euphorbia virgata Waldst. & Kit.	2	2	2			2	2	1	1	2	8	G	Ha	h	P
148	Euphorbia agraria M.Bieb.			3	1	1		2	2	2	2	7	G	Ha	h	P
149	Euphorbia leptocaula Boiss.				2			3	1			3	HS	Ns	h	P
150	Euphorbia seguieriana Neck.	3		2	2				2	2	2	6	HS	Ns	h	P
151	Falcaria vulgaris Bernh.	2	2	3	2	2	3	1	2	2	2	10	G	Ha	h	B/P
152	Festuca valesiaca Schleich. ex Gaudin	2	1	3	3	2	3	3	2	2	3	10	HS	Ns	h	P
153	Ficaria calthifolia Rchb.					1		1	1		1	4	G	Ek	g	P
154	Filago arvensis L.										1	1	G	Ha	th	A/B
155	Fraxinus excelsior L.		1					1				2	G	Ek	mf	P
156	Fraxinus pennsylvanica Marshall						1	1	1		1	4	G	Ke	mf	P
157	Fumaria schleicheri Soy.-Will.				1						1	2	G	Ar	t	A
158	Fumaria vaillantii Loisel.					1						1	G	Ar	t	A
159	Gagea bulbifera (Pall.) Salisb.							1				1	HS	Ns	g	P
160	Gagea pusilla (F.W.Schmid) Sweet		1	2			1	2				4	HS	Ns	g	P
161	Gaillardia pulchella Foug.	2			1	1	2	2	2	1	1	8	G	Eg	h	A/P
162	Galatella biflora (L.) Nees		3	2		1						3	HS	Ns	h	P
163	Galatella villosa (L.) Rchb.f.								2	1		2	HS	Ns	h	P
164	Galium aparine L.	2	2	2	2	3	1	3	2	3	2	10	G	Ap	t	A
165	Galium humifusum M.Bieb.	2			2		2		2	1	2	6	G	Ha	h	P
166	Galium ruthenicum Willd.	2	3						2			3	HS	Ns	h	P
167	Galium spurium L.			1		1			1	2		4	G	Ar	t	A
168	Galium verum L.			3					1	1		3	G	Ha	h	P
169	Galium volhynicum Pobed.			2	1							2	HS	Ns	h	P
170	Geranium pusillum L.	2	1			2		3	2	2		6	G	Ar	th	A/B
171	Glaucium corniculatum (L.) Curtis								1			1	G	Ap	t	A/B
172	Gleditsia triacanthos L.	1			1			1		1		4	G	Ke	mf	P
173	Goniolimon besserianum (Schult. ex Rchb.) Kusn.						1			1		2	HS	Ns	h	P
174	Grindelia squarrosa (Pursh) Dunal						1	1				2	G	Ke	h	P
175	Gypsophila paniculata L.										2	1	HS	Ns	h	P
176	Helianthus tuberosus L.	1										1	G	Ke	g	P
177	Helianthus x laetiflorus Pers.	1										1	G	Ke	g	P
178	Helianthus annuus L.				1				1			2	G	Eg	t	A
179	Helichrysum arenarium (L.) Moench									1	1	2	HS	Ns	h	P
180	Heliotropium europaeum L.	1			1	1		2	2			5	G	Ap	t	A
181	Hemerocallis fulva (L.) L.	1	2		1	2	1	2	2	1	1	9	G	Eg	g	P
182	Herniaria besseri Fisch. ex Hornem.	1		1	2			1	1		1	6	HS	Ns	c	A/B/P
183	Holosteum umbellatum L.	3	2	2	3	2	3	3	3	2	2	10	G	Ha	t	A
184	Hordeum murinum L.	2				1	2	2	2			5	G	Ar	t	A
185	Hyoscyamus niger L.						1		1			2	G	Ar	th	A/B
186	Hypericum elegans Stephan ex Willd.		2	1			2			1	1	5	HS	Ns	h	P
187	Inula britannica L.		1				1				2	3	G	Ha	hg	P
188	Inula germanica L.										2	1	HS	Ns	h	P
189	Inula oculus-christi L.										1	1	HS	Ns	h	P
190	Iris *germanica* Mix	2	1	1	1		1		1		1	7	G	Eg	g	P
191	Iris halophila Pall.		2									1	HS	Ns	g	P
192	Iris pumila L.	3				1	2	1	3	2	2	7	HS	Ns	g	P
193	Iva xanthiifolia Nutt.	1					2				1	3	G	Ke	t	A
194	Jakobaea borysthenica (DC.) B. Nord. & Greuter.	1										1	HS	Ns	h	P
195	Jacobaea vulgaris Gaertn.						1		1		1	3	G	Ha	h	P
196	Juglans regia L.					1	1	1	2			4	G	Ke	mf	P
197	Jurinea multiflora (L.) B.Fedtsch.							2	1			2	HS	Ns	h	P
198	Kochia prostrata (L.) chrad.	1		2		1		3	2	2		6	HS	Ns	c	P
199	Kochia scoparia (L.) Schrad.	2							1			2	G	Ke	t	A
200	Koeleria cristata (L.) Pers.	2		2	2	2	1	3	2	3	2	9	HS	Ns	h	P
201	Kohlrauschia prolifera (L.) Kunth	1										1	HS	Ns	th	A
202	Lactuca saligna L.						1					1	G	Ha	th	A/B
203	Lactuca serriola L.	1	2	2	3	2	2	2	2	2	3	10	G	Ar	th	A/B
204	Lactuca tatarica (L.) C.A.Mey.	1						2	1	1		4	G	Ap	hg	P
205	Lamium amplexicaule L.	3	2	3	2	2	3	3	3	2	2	10	G	Ar	t	A
206	Lamium purpureum L.								1			1	G	Ar	th	A/B
207	Lappula patula (Lehm.) Asch. ex Gürke					1						1	G	Ke	th	A/B
208	Lappula squarrosa (Retz.) Dumort.				1						1	2	G	Ar	th	A/B
209	Lathyrus tuberosus L.		2		2						2	3	G	Ar	hg	P
210	Lavatera thuringiaca L.			1								1	G	Ns	h	P
211	Leonurus glaucescens Bunge				1		1				1	3	G	Ha	h	P
212	Lepidium perfoliatum L.				1	1	1	1	2	2	1	7	G	Ar	t	A/B
213	Lepidium ruderale L.						1	2				2	G	Ar	th	A/B
214	Leymus ramosus (Trin.) Tzvelev				3							1	G	Ha	g	P
215	Ligustrum vulgare L.						1					1	G	Ek	nf	P
216	Limonium hypanicum Klokov							2		1		2	HS	Ns	h	P
217	Limonium platyphyllum Lincz.		1								1	2	HS	Ns	h	P

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
218	Limonium alutaceum (Steven) Kuntze		2				2	1				3	HS	Ns	h	P
219	Limonium bungei (Claus) Gamajun.									1		1	HS	Ns	h	P
220	Limonium sareptanum (A.K.Becke) Gams				2							1	HS	Ns	h	P
221	Linaria macroura (M.Bieb.) M.Bieb				1							1	HS	Ns	h	P
222	Linaria biebersteinii Besser			2				1	2	1		4	G	Ha	h	P
223	Linaria genistifolia (L.) Mill.	1				1				1		3	G	Ha	h	P
224	Linum austriacum L.								1			1	HS	Ns	h	P
225	Lonicera tatarica L.		1				1					2	G	Eg	nf	P
226	Lycium barbarum L.	1			2	2	1	2	1	1	3	8	G	Ar	nf	P
227	Lycopsis orientalis L.	1			1			1	1			4	G	Ap	t	A
228	Malus domestica Borkh.							1	1		1	3	G	Eg	mf	P
229	Marrubium peregrinum L.		1	2								2	HS	Ns	h	P
230	Marrubium praecox Janka	3				2			2	2	1	5	G	Ha	h	P
231	Matricaria recutita L.							1	1	1		3	G	Ar	t	A
232	Medicago × varia Martyn	1	1				1	1	1		1	6	G	Ke	h	P
233	Medicago falcata L.	2	3	3	3	3	2	2	2	2	3	10	G	Ha	h	P
234	Medicago lupulina L.				1	1						2	G	Ap	th	A/B
235	Medicago minima (L.) L.				2	2	2	2	3			5	HS	Ns	t	A
236	Medicago sativa L.	1						2				2	G	Ke	h	P
237	Melandrium album (Mill.) Garcke		1						1	1	1	4	G	Ap	th	A/B
238	Melica transsilvanica Schur		2									1	HS	Ns	h	P
239	Melilotus officinalis (L.) Pall.	1	1		1		2	1	2	1		7	G	Ap	th	A/B
240	Melilotus albus Medik.							1				1	G	Ap	th	B
241	Meniocus linifolius (Stephan ex Willd.) DC.				1							1	HS	Ns	t	A
242	Mentha piperita L.								1			1	G	Eg	hg	P
243	Morus alba L.					1	1	1	1	1	1	6	G	Ke	mf	P
244	Muscari neglectum Guss. ex Ten.	1				2	1	1	2		1	6	G	Ek	g	P
245	Myosotis micrantha Pall. ex Lehm.	1	1	1	1					1	2	6	G	Ha	t	A
246	Nepeta cataria L.						2					1	G	Ar	c	P
247	Nigella arvensis L.							1				1	G	Ar	t	A
248	Onobrychis gracilis Besser								1	1		2	HS	Ns	h	P
249	Onopordum acanthium L.	1	1	1	1	2	2	1	1		1	9	G	Ar	h	P
250	Ornithogalum kochii Parl.					1					1	2	HS	Ns	g	P
251	Otites densiflorus (D'Urv.) Grossh.	1		2				2	2		1	5	HS	Ns	h	P
252	Papaver orientale L.					1						1	G	Eg	t	A
253	Papaver dubium L.			1	1			1	1	1		5	G	Ar	t	A
254	Papaver rhoeas L.				2			2	1	1		4	G	Ar	t	A
255	Parthenocissus quinquefolia (L.) Planch.							1				1	G	Ke	nf	P
256	Petunia × atkinsiana D. Don ex W.H. Baxter							1	1	1	1	4	G	Eg	t	A
257	Peucedanum ruthenicum M.Bieb.		3									1	HS	Ns	h	P
258	Phalacroloma annuum (L.) Dumort.							1				1	G	Ke	th	A/B
259	Phleum phleoides (L.) H.Karst.							1		1		2	HS	Ns	h	P
260	Phlomis hybrida Zelen.	1		2	3		2	1	1	1	2	8	HS	Ns	h	P
256	Phlomis pungens Willd.	3			2	2			1	2		5	HS	Ns	h	P
261	Phlomis tuberosa L.						2			1	1	3	HS	Ns	hg	P
262	Phalacroloma annuum (L.) Dumort.							1				1	G	Ke	th	A/B
263	Picris hieracioides L.			1				1			1	3	G	Ha	h	P
264	Plantago arenaria Waldst. & Kit.	1										1	G	Ha	t	A
265	Plantago major L.					1						1	G	Ap	h	P
266	Plantago lanceolata L.	3	1	1	3		2		2	2	1	8	G	Ha	h	P
267	Pleconax subconica (Friv.) Sourkova	2							1			2	HS	Ns	h	P
268	Poa angustifolia L.	3	3	3	3	3	3	2	3	2	3	10	G	Ha	hg	P
269	Poa bulbosa L.	3	2	2	3	2	3	3	3	2	2	10	G	Ha	h	P
270	Polygonum aviculare L.	2	1	1	2	1	3	2	2	1	1	10	G	Ap	t	A
271	Polygonum novoascanicum Klokov					1			1			2	G	Ns	t	A
272	Polygonum patulum M.Bieb.					1	1					2	G	Ha	t	A
273	Portulaca grandiflora Hook.					1	2	1				3	G	Eg	t	A
274	Portulaca oleracea L.	2				1	2	1	2	1	1	7	G	Ar	t	A
275	Potentilla semilaciniosa (Borbás) Borbás			2	2			2	2	1	2	6	HS	Ns	h	P
276	Potentilla argentea L.	2	2	2	2	1	1	1	2	2	3	10	G	Ha	h	P
277	Potentilla astracanica Jacq.	1			1				1	2	2	5	HS	Ns	h	P
278	Potentilla recta L.	2		2		1		1	2	2	2	7	HS	Ns	h	P
279	Prangos odontalgica (Pall.) Herrnst. & Heyn							1		2		2	HS	Ns	h	P
280	Prunus cerasifera Ehrh.		1		1	1			1			4	G	Ke	mf	P
281	Prunus stepposa Kotov		1	1		1					2	4	G	Ns	nf	P
282	Pterotheca sancta (L.) K.Koch	1	1	1	2	1	1	1	3	2	2	10	G	Ha	t	A
283	Pyrus communis L.			1					1		1	3	G	Ek	mf	P
284	Quercus robur L.		1									1	G	Ek	mf	P
285	Ranunculus scythicus Klokov			2		1	2	3	2	2		6	HS	Ns	hg	P
286	Ranunculus oxyspermus Willd.	2		2	2	1	2	3	2	1	1	9	HS	Ns	hg	P
287	Rapistrum perenne (L.) All.						1					1	G	Ke	h	P
288	Reseda lutea L.				1		1	1	1	1		5	G	Ke	th	A/B
289	Rhamnus cathartica L.								1	1		2	G	Ns	nf	P
290	Ribes aureum Pursh	3				2	1		1	1	1	6	G	Eg	nf	P
291	Robinia pseudoacacia L.	2				1	1		2	1	1	6	G	Ke	nf	P
292	Rochelia retorta (Pall.) Lipsky				1							1	HS	Ns	h	P
293	Rosa rugosa Thunb.		1		1				1			3	G	Ke	nf	P
294	Rosa canina L.	1	1		1	1	1	1	1	1	1	9	G	Ns	nf	P
295	Rosa corymbifera Borkh.		1									1	G	Ns	nf	P
296	Rubia tinctorum L.						2		1			2	G	Ke	hg	P
297	Rudbeckia hirta L.						1					1	G	Ke	h	P

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
298	Rumex crispus L.		1									1	G	Ap	h	P
299	Rumex patientia L.	1			2	2	2		1	2	1	7	G	Ke	h	P
300	Salsola tragus L.	1			3	1	1	1	1	1	1	8	G	Ap	t	A
301	Salvia nutans L.									1		1	G	Ns	h	P
302	Salvia aethiopis L.	1		1	2				1	1	1	6	HS	Ns	h	P
303	Salvia nemorosa L.	3	2	2	3	1	2	2	3	1	2	10	G	Ns	h	P
304	Sambucus nigra L.		1									1	G	Ap	nf	P
305	Saponaria officinalis L.	1	1				1					3	G	Eg	hg	P
306	Scabiosa ucranica L.	1										1	HS	Ns	h	P
307	Sclerochloa dura (L.) P.Beauv						1	1	2			3	G	Ar	t	A
308	Scorzonera mollis M. Bieb							1	1	1		3	HS	Ns	h	P
309	Sedum acre L.	1				3	1	2	1	1		6	G	Ek	hg	P
310	Sedum reflexum L.	3			1	3	1	1	3	2	1	8	G	Eg	hg	P
311	Sedum sexangulare L.						1					1	G	Ek	hg	P
312	Sedum spurium M.Bieb.					1		1	1			3	G	Eg	hg	P
313	Sempervivum ruthenicum Schnittsp. & C.B.Lehm.	2				1	1	1	1	1	1	7	G	Ek	g	P
314	Senecio erucifolius L.		2	1	1		2	1			1	6	G	Ha	h	P
315	Senecio vernalis Waldst. & Kit.	2	2	1	2	1	1	2	1	1	2	10	G	Ap	th	A/B
316	Serratula erucifolia (L.) Boriss.				1	1			1			3	HS	Ns	h	P
317	Seseli tortuosum L.	2	2	1	1	1	2	2	2	2	3	10	G	Ns	h	P
318	Setaria glauca (L.) P.Beauv.								2			1	G	Ar	t	A
319	Setaria viridis (L.) P.Beauv.	2		1	2	1	2	2	2	1	2	9	G	Ar	t	A
320	Sideritis montana L.				1						1	2	G	Ha	t	A
321	Silaum silaus (L.) Schinz & Thell.		1									1	HS	Ns	h	P
322	Silene bupleuroides L.			2			2					2	HS	Ns	h	P
323	Sisymbrium volgense M.Bieb. ex E.Fourn.				3							1	G	Ap	th	P
324	Sisymbrium altissimum L.	2	1	1	2			1	1	1	1	8	G	Ap	th	A/B
325	Sisymbrium loeselii L.	2		2	2	3	1	2	3	2	2	9	G	Ar	th	A/B
326	Sisymbrium polymorphum (Murray) Roth			2			2	1	2	2	1	6	G	Ns	th	B
327	Solanum nigrum L.						1	1	1			3	G	Ar	t	A
328	Sonchus asper (L.) Hill		1									1	G	Ar	t	A
329	Sonchus oleraceus (L.) L.				1		1					2	G	Ar	t	A
330	Spiraea media F.Schmidt							1				1	G	Eg	nf	P
331	Stachys recta L.								1	1	2	3	G	Ns	h	P
332	Stellaria media (L.) Village					1	3	1	1		1	5	G	Ap	th	A/B
333	Stipa capillata L.	2		2	1	2	1	3	2	2	1	9	HS	Ns	h	P
334	Stipa lessingiana Trin. & Rupr.							1	1			2	HS	Ns	h	P
335	Stipa ucrainica P.A.Smirn.							1	2		2	3	HS	Ns	h	P
336	Syringa vulgaris L.	2	2	1	2	3	2	2	3	2	2	10	G	Eg	nf	P
337	Tagetes patula L.								1			1	G	Eg	t	A
338	Tanacetum vulgare L.						1					1	G	Ha	h	P
339	Tanacetum millefolium (L.) Tzvelev			2	3	1		3	2	2		6	HS	Ns	hg	P
340	Taraxacum officinale Wigg. agg.					1	2	2	1			4	G	Ap	h	P
341	Taraxacum erythrospermum Andrz. ex Besser	2	1	1	3	1	2	2	2	1	2	10	HS	Ns	h	P
342	Taraxacum serotinum (Waldst. & Kit.) Fisch.						2					1	G	Ha	h	P
343	Teucrium polium L.	1		1					1	1		4	HS	Ns	h	P
344	Thalictrum minus L.		2							1		2	HS	Ns	c	P
345	Thesium arvense Horv.	1			1							2	G	Ns	h	P
346	Thlaspi arvense L.						1	1				2	G	Ar	th	A/B
347	Thlaspi perfoliatum L.								1			1	G	Ke	th	A/B
348	Thymus marschallianus Willd.	1										1	HS	Ns	c	P
349	Thymus × dimorphus Klokov & Des.-Shost.	3										1	HS	Ns	c	P
350	Torilis japonica (Houtt.) DC.					2	2		1	1		4	G	Ap	th	A/B
351	Tragopogon podolicus (DC.) S.A.Nikitin		2									1	G	Ns	h	P
352	Tragopogon major Jacq.	1	1	1	1	2	1	1	2	1	1	10	G	Ap	h	P
353	Tragus racemosus (L.) All.	1										1	G	Ke	t	A
354	Tribulus terrestris L.	2				1		1	1			4	G	Ke	t	A
355	Trifolium diffusum Ehrh.	2	2					1	1	1		5	G	Ns	t	A
356	Trifolium montanum L.		3									1	HS	Ns	h	P
357	Trifolium arvense L.	2	1	1	1	1	1	2	1	1	1	10	G	Ap	t	A
358	Trifolium campestre Schreb.							1				1	G	Ha	t	A
359	Trigonella monspeliaca L.	2				2		3	2			4	G	Ns	t	A
360	Tripleurospermum inodorum (L.) Sch.Bip.				2	2	1					3	G	Ar	t	A
361	Triticum durum Desf.			1			1					2	G	Eg	t	A
362	Tulipa biebersteiniana Schult. & Schult.f.							1	2		1	3	HS	Ns	g	P
363	Ulmus laevis Pall.		2									1	G	Ek	mf	P
364	Ulmus minor Mill.						1		1			2	G	Ek	mf	P
365	Ulmus pumila L.	1				1	1	1	2		2	6	G	Ke	mf	P
366	Valerianella carinata Loisel.	2	1	2	1	2	1	1	1	1	1	10	G	Ha	t	A
367	Verbascum × pseudophoeniceum Reichardt				1							1	HS	Ns	h	P
368	Verbascum phlomoides L.			1					2			2	G	Ha	h	P
369	Verbascum phoeniceum L.	3	2	2	2	1	2	2	2	2	2	10	G	Ns	h	P
370	Verbesina encelioides (Cav.) Benth. & Hook.f. ex A.Gray	1			1	1	2		1	1	1	7	G	Eg	t	A
371	Veronica jacquinii Baumg.					1						1	HS	Ns	h	P
372	Veronica arvensis L.	2	2	1	2	1	2	1	2	2	2	10	G	Ar	th	A/B
373	Veronica capsellicarpa Dubovik								1	1		2	HS	Ns	h	P
374	Veronica hederifolia L.								2			1	G	Ap	t	A
375	Veronica polita Fr.					1	3	1	3	1	1	6	G	Ar	t	A
376	Veronica prostrata L.									1		1	HS	Ns	c	P
377	Veronica spicata L.		3							1		2	HS	Ns	h	P
378	Veronica triphyllos L.	3	1	3	1	2	3	3	3	1	2	10	G	Ar	t	A

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
379	Veronica verna L.	2	1	1	2	1		2	1	1	2	9	G	Ha	t	A
380	Vicia hirsuta (L.) Gray			1				2				2	G	Ar	t	A
381	Vicia lathyroides L.		1					1				2	G	Ns	th	A/P
382	Vicia tenuifolia Roth		3	3						1	1	4	G	Ha	hg	P
383	Vicia villosa Roth	2	1	1	1	1	1	1	1	1	2	10	G	Ar	th	A/P
384	Vinca herbacea Waldst. & Kit.	1			1	2	1	1	1	1		7	HS	Ns,Ek	g	P
385	Vinca minor L.							1				1	G	Eg	c	P
386	Viola odorata L.	1			2	1	1	1	1	1	1	8	G	Ap	h	P
387	Viola arvensis Murray					1			1	1		3	G	Ar	th	A/B
388	Viola kitaibeliana Schult.	2	1	1	2	2	2	2	2	2	2	10	G	Ha	t	A
389	Xeranthemum annuum L.	1			3	1	1	3	3	1	2	8	G	Ha	t	A

Abbreviations applied in Appendix 1:

Status in the Ukrainian flora:
Ns – non-synanthropic native species, not established in anthropogenic habitats;
Ap – eu-apophytes, natives established in anthropogenic habitats;
Ha – hemi-apophytes, natives established only in semi-natural habitats;
Ek – ekiophytes, native species cultivated and escaped;
Ar – archaeophytes, aliens that immigrated before the year 1500;
Ke – kenophytes, aliens introduced after the year 1500;
Eg – ergasiophygophytes, alien species cultivated and escaped.

Functional group: HS – habitat specialist; G – generalist.

Life forms:
t – therophytes;
th – short-living perennials (2,3,4 years life cicle);
g – geophytes;
h – hemicryptophytes;
hg – geophytes-hemicryptophytes – perennials with resting buds subterranean or at the soil surface;
hc – hemicryptophytes-chamaephytes – perennials with resting buds on the soil surface or woody plants with resting buds borne close to the soil surface, a maximum of 25 cm above the soil surface;
c – chamaephytes;
mf – megaphanerophytes;
nf – nanophanerophytes;

Life spam: A – annual; B – biennial; P – perennial