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Ruderal vegetation of Ukraine: *Stellarietea mediae* Tx. *et al.* in Tx. 1950

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Abstract. Between 2015 and 2020 a study was conducted on the diversity of ruderal vegetation of the *Stellarietea mediae* class on the territory of Ukraine. It was discovered that this class consists of 48 associations from 12 alliances and 5 orders (*Aperetalia spicae-venti*, *Atriplici-Chenopodietalia albi*, *Eragrostietalia*, *Papaveretalia rhoeadis*, *Sisymbrietalia sophiae*). Based on the results of ordination analysis it was found that the distribution of annual ruderal communities is determined by the variation of moisture, soil aeration as well as carbonate and nitrogen content.

Key words: syntaxonomy, ordination, phytoindication, ruderal communities, Ukraine

1. Introduction

Ruderal communities are an intrazonal vegetation type and their distribution depends mainly on edaphic and climatic conditions in combination with human impact. This vegetation's species composition and territorial differentiation are determined by geomorphological and historical features. Many ruderal phytocoenoses are heterogenous and formed by alien as well as native floristic elements – that is why they have different zonal and regional characteristics.

Geobotanical studies of the ruderal vegetation of Ukraine began in the 1980s, which is being associated with the beginning of vegetation classification in Ukraine using the Braun-Blanquet approach (Solomakha *et al*. 1986). A detailed review of the synanthropic, including ruderal, vegetation of Ukraine in this period was prepared in 1992 (Solomakha *et al.* 1992). Kostylev (1990) and emphasized the broad ecological range of ruderal plants and established the main features of differentiation between these communities. Since the intense and meticulous research of the ruderal vegetation within the whole territory of Ukraine has not been completed, these communities (especially the *Stellarietea mediae* class) were studied by different authors in various regions (Papers cited in Chapter 2). Therefore we started a new study to update and add the information about ruderal vegetation of Ukraine.

The aims of this research were (*i*) to present the results of the assessment of historical and recent data on ruderal vegetation of Ukraine classified in the *Stellarietea mediae* class; (*ii*) to identify the main environmental gradients in annual vegetation of ruderal habitats.

2. Materials and methods

2.1. Study area

The study area covers the entire territory of Ukraine, which is located in three natural zones – Forest (Polissya), Forest-Steppe and Steppe zones (Fig. 1). Orographically Polissya is dominated by lowland landforms, gravel, sandy and sandy-clay deposits, with the main type of soil i.e. sod-podzolic. The Forest-Steppe zone lies in the area dominated by hills, with the edges of the hills strongly articulated by ravines and gullies – predominantly with sod-podzolic and swamp soil. The Steppe zone is dominated by flat terrain, southern and chestnut chernozems (National Atlas of Ukraine 2007).

Table 1. Values of environmental factors according to Didukh (2011) and their relations with Ellenberg's indicator values (Ellenberg *et al.* 1991)

EF	Didukh's indicator values			Ellenberg's indicator values		
	min	med	max	min	med	max
Hd (F)	Hyper-xerophytes 1	Mesophytes 11	Hyper-hydrophytes 23	Strong soil dryness (1)	Wet (9)	Underwater (12)
fH	Hyper-hydrocontrastophobes 1	Hemi-hydrocontrastophobes 5	Hyper-hydrocontrastophiles 11	–	–	–
Rc (R)	Hyper-acidophiles 1	Sub-acidophiles 7	Hyper-basophiles 15	Extremely acidic (1)	Mildly acidic (5)	Alkaline (9)
Sl (S)	Oligotrophes 1	Eutrophes 9	Super-halotrophes 19	No (0)	Average (5)	Extreme salinity (9)
Ca	Hyper-carbonatephobes 1	Hemi-carbonatophobes 5	Hyper-carbonatophiles 13	–	–	–
Nt (N)	Anitrophiles 1	Hemi-nitrophiles 5	Hyper-nitrophiles 11	Least (1)	Average (5)	Excessive supply (9)
Ae	Hyper-aerophiles 1	Hemi-aerophobes 7	Hyper-aerophobes 15	–	–	–
Tm (T)	Hekistotherms 1	Sub-mesotherms 9	Megatherms 17	Alpine-subnival (1)	Submontane-temperate (5)	Mediterranean (9)
Om	Hyper-aridophytes 1	Sub-ombrophytes 13	Hyper-ombrophytes 23	–	–	–
Kn (K)	Extra-oceanic 1	Hemi-continental 9	Ultra-continental 17	Euoceanic (1)	Intermediate (5)	Eucontinental (9)
Cr	Hyper-cryophytes 1	Sub-cryophytes 7	Thermophytes 15	–	–	–
Lc (L)	Ultra-scyophytes 1	Hemi-scyophytes 5	Heliophytes 9	Deep shade (1)	Semi-shade (5)	Full light (9)

Explanations: Ecological factors (EF): Hd – soil humidity, fH – variability of damping, Rc – soil acidity, Sl – salt regime, Ca – carbonate content, Nt – nitrogen content, Ae – soil aeration, Tm – thermoclimate, Om – ombroregime, Kn – climate continentality, Cr – cryoclimate, Lc – light regime; in the brackets are the Ellenberg's indicator values, outside the brackets are the Didukh's indicator values

2.2. Data collection and preparation

The data for analysis comes from database "Ruderal vegetation of Ukraine", registered in the Global Index of Vegetation-Plot Databases (Dengler *et al*. 2011) with the code EU-UA-11. The complete database includes 8382 vegetation plots, both the ones sampled by the authors during 2015-2020 in man-made habitats as well as those contained in various published literature sources within Ukraine: Bagrikova (1998: 10 relevés; 2004: 65); Chokha (2005: 62), Homlya (2005: 6); Lukash & Danko (2020: 3); Levon (1996: 1); Orlov & Iakushenko (2005: 1); Osypenko (1996, 1997, 1999: 39); Osypenko & Shevchyk (2001: 14); Smetana (2002: 22); Solomakha *et al*. (1992: 19); Soroka (2008: 84); Tokaryuk *et al*. (2018: 25). It also includes the unpublished relevés from manuscripts and dissertations, which were kindly provided by N. Yeremenko (351 relevés), L. Lysogor (71), B. Baranovskyi (53), D. Shyriaieva (38), L. Felbaba-Klushyna (32), Y. Bredikhina (22), D. Iakushenko (18), I. Khomyak (14), V. Datsiuk (10), V. Kolomiychuk (9), A. Kazarinova (7), L. Borsukevych (5) and D. Vynokurov (4).

All of the relevés were prepared according to the J. Braun-Blanquet's approach (Braun-Blanquet 1964) to plots, which sizes varied from 10 to 25 m^2. The relevés prepared on sites encompassed less than 10 and more than 25 m^2 were subsequently rejected and ultimately not included in the sample. Estimation of the quantitative participation of species on the plots was carried out using B.M. Mirkin's modified cover scale: + – less than 1% cover, 1 – 1-5%, 2 – 6-15%, 3 – 16-25%, 4 – 26-

49%, 5 – more than 50% (Mirkin *et al.* 2001). All vegetation plots were entered into a database created with the TURBOVEG software (Hennekens & Schaminée 2001) version 2.142 and then imported to the JUICE 7.1 software (Chytrý *et al.* 2002) with which the subsequent analyses were performed.

Some measures were taken to homogenize and balance the final dataset. To unify the nomenclature of taxa in different vegetation plots we followed by "Vascular plants of Ukraine. A nomenclatural checklist" (Mosyakin & Fedoronchuk 1999). Records of the same species in different layers were merged into one in the final data matrix. All records of juvenile trees and shrubs were deleted because some authors recorded them while others did not. Bryophytes and lichens were also removed – they were not recorded in all of the relevés and have limited ecological importance in ruderal vegetation.

2.3. Data analysis

Both divisive and agglomerative hierarchical clustering was used to detect the main groups of relevés. At first a modified TWINSPAN (Roleček *et al.* 2009) was used with the Whittaker's beta (Whittaker 1978) as heterogeneity of clusters and a "pseudospecies" cut level as 0, 5, 15 and 25%. This way we got big clusters that corresponded mainly to classes of vegetation. Then each cluster was analyzed separately using the PC-ORD algorithm (McCune & Mefford 2006) clustering with the Sörensen's coefficient (Sörensen 1948) at a "flexible beta" -0.25. The OptimClass method for identifying the optimal partition was used (Tichý *et al.* 2010).

The clusters were identified by their diagnostic species, which were determined by using the phi-coefficient as a fidelity measure (Chytrý *et al*. 2002). The threshold values for the phi-coefficient are taken at the level of 0.25. Highly diagnostic species have a *phi*-coefficient exceeding 0.5. Statistical significance of the accuracy prior to equalization of the relevés groups was calculated using the Fisher's exact test (P <0,001) (Chytrý *et al.* 2002). In the synoptic table diagnostic species were marked by light gray colour, while the highly diagnostic ones by dark gray.

Names of the syntaxa follow the Dubyna *et al*. (2019, 2021). Nomenclature of the syntaxa was checked for compliance with the International Code of Phytosociological Nomenclature (Theurillat *et al*. 2021).

Fig. 1. The location of study area in Ukraine. Natural zones (Source: National Atlas of Ukraine 2007)

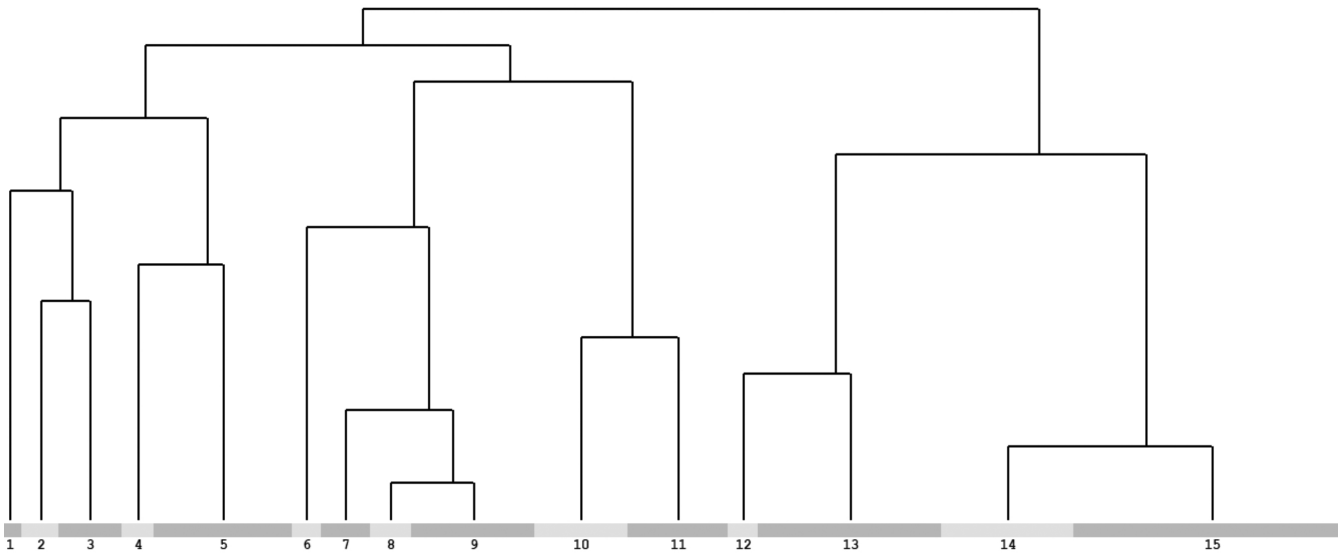

Fig. 2. Hierarchical cluster analysis of ruderal vegetation of Ukraine: general division (using modified TWINSPAN)

The ecological analysis was made by using the STATISTICA 10.0 program with the application of the Didukh's (2011) ecological scales (Table 1).

To clarify the plant communities' differentiation and to explore relationship with environment variables the DCA-ordination method was used (Hill & Gauch 1980).

The syntaxonomic structure of the *Stellarietea mediae* class was accepted according to the recent "Prodrome of the vegetation of Ukraine" (Dubyna *et al.* 2019) with several nomenclatural corrections for high rank syntaxa applied in accordance to Mucina *et al.* (2016). The classification scheme comprises supplements with synonymous names from "Vegetation of Europe: hierarchical floristic classification system of vascular plant, bryophyte, lichen, and algal communities" (Mucina *et al.* 2016).

3. Results and discussion

3.1. Position of the *Stellarietea mediae* class in the classification of ruderal vegetation

As a result of the clustering 15 units were obtained. Figure 2 shows a tree diagram, which was distinctly separated into three groups of clusters. The first group consists of five clusters. By using the list of diagnostic species they were identified as the *Stellarietea mediae* (clusters 1-3) and the *Artemisietea vulgaris* (clusters 4-5) classes. The second group of clusters unites vegetation of the nutrient-demanding herbaceous plants (clusters 6-9) and plant communities of the trampled habitats (clusters 10-11). The third and last group of clusters (12-15) combines vegetation plots with the dominance of *Robinia pseudoacacia* and other artificial forests.

The *Stellarietea mediae* class includes vegetation of the ruderal habitats and the regenerative stages of successions dominated by the annual herbaceous plants on different soil types (Appendix 1). These phytocoenoses are common in all biogeographic and administrative regions within the territory of Ukraine. Syntaxonomically they belong to 48 associations from 12 alliances and 5 orders presented in the following classification scheme. The localization of communities at the level of alliances is shown on Fig. 3.

3.2. Syntaxonomic classification of the *Stellarietea mediae* class in Ukraine

Stellarietea mediae Tx. et Al. in Tx. 1950:

1. *Aperetalia spicae-venti* J. Tx. et Tx. in Malato-Beliz *et al.* 1960
   - 1.1. *Scleranthion annui* (Kruseman et Vlieger 1939) Sissingh in Westhoff *et al.* 1946
     - 1.1.1. *Scleranthetum annui* Braun 1915
2. *Atriplici-Chenopodietalia albi* (Tx. 1937) Nordhagen 1940
   - 2.1. *Amarantho blitoidis-Echinochloion cruris-galli* Solomakha 1988
     (syn. *Spergulo arvensis-Erodion cicutariae* J.Tx. in Passarge 1964)
     - 2.1.1. *Amarantho retroflexi-Echinochloetum cruris-galli* Bagrikova 2005
     - 2.1.2. *Amaranthetum blitoidis-retroflexi* Solomakha 1988
   - 2.2. *Lactucion tataricae* Rudakov in Mirkin *et al.* 1985

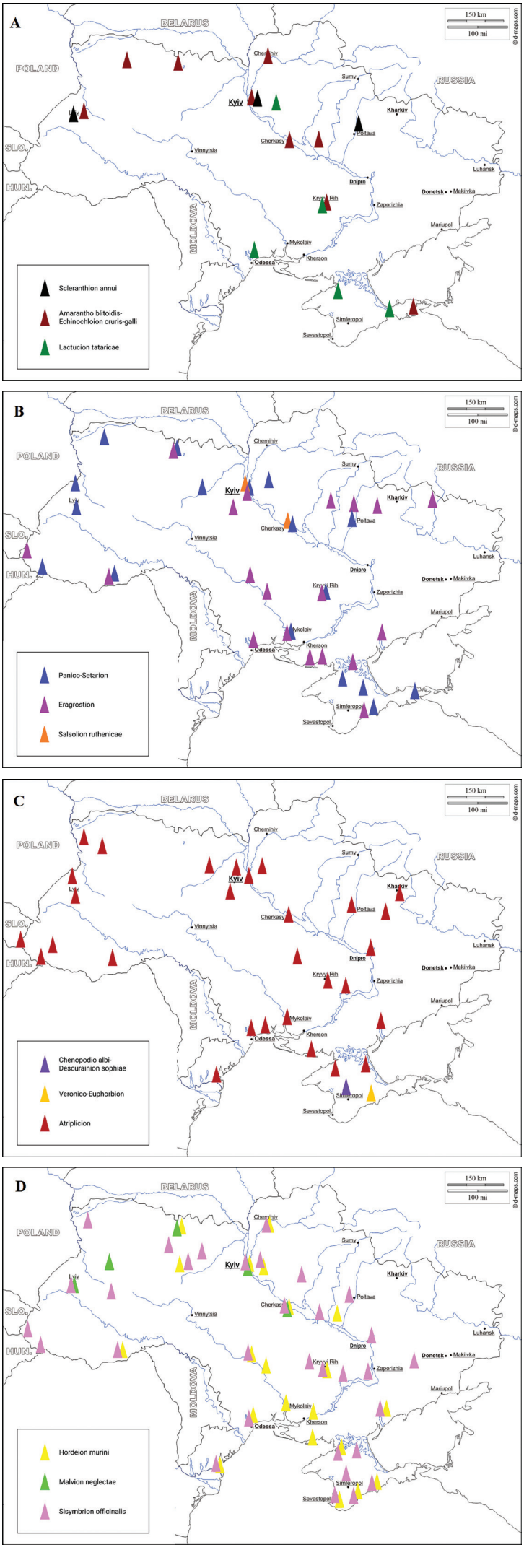

Fig. 3. Distribution maps of the alliances of the *Stellarietea mediae* class in Ukraine

Explanations: A – alliances *Scleranthion annui, Amarantho blitoidis-Echinochloion cruris-galli*, *Lactucion tataricae*; B – *Panico-Setarion*, *Eragrostion*, *Salsolion ruthenicae*; C – *Chenopodio albi-Descurainion sophiae*, *Veronico-Euphorbion*, *Atriplicion*; D – *Hordeion murini*, *Malvion neglectae*, *Sisymbrion officinalis*

2.2.1. *Lactucetum tataricae* Rudakov in Mirkin *et al.* 1985

2.3. *Panico-Setarion* Sissingh in Westhoff *et al.* 1946
(syn. *Spergulo arvensis-Erodion cicutariae* J.Tx. in Passarge 1964)

2.3.1. *Setario pumilae-Echinochloetum cruris-galli* Felföldy 1942 corr. Mucina in Mucina *et al.* 1993

2.3.2. *Setario-Digitarietum* Felföldy 1942

2.3.3. *Digitarietum ischaemii* Tx. et Preising (1942) 1950

2.3.4. *Setario viridis-Erigeronetum canadensis* Šomšák 1976

2.3.5. *Setario glaucae-Galinsogetum parviflorae* Tx. 1950

3. *Eragrostietalia* J. Tx. ex Poli 1966

3.1. *Eragrostion* Tx. in Oberd. 1954

3.1.1. *Cynodontetum dactyli* Gams 1927

3.1.2. *Digitario sanguinalis-Eragrostietum minoris* Tx. ex von Rochow 1951

3.1.3. *Eragrostio-Amaranthetum albi* Morariu 1943

3.1.4. *Portulacetum oleracei* Felföldy 1942

3.1.5. *Amarantho blitoidis-Tribuletum terrestris* Dubyna *et al.* 2018

3.2. *Salsolion ruthenicae* Philippi ex Oberd. 1983

3.2.1. *Plantagini indicae-Digitarietum sanguinalis* Papucha 1991

3.2.2. *Salsoletum ruthenicae* Philippi 1971

4. *Papaveretalia rhoeadis* Hüppe et Hofmeister ex Theurillat *et al.* 1995

4.1. *Chenopodio albi-Descurainion sophiae* Solomakha *et al.* in Solomakha 1988

4.1.1. *Fallopio convolvuli-Chenopodietum albi* Solomakha 1990

4.2. *Veronico-Euphorbion* Sissingh ex Passarge 1964

4.2.1. *Veronico-Lamietum hybridi* Kruseman et Vlieger 1939

5. *Sisymbrietalia sophiae* J. Tx. ex Görs 1966
   5.1. *Atriplicion* Passarge 1978
      5.1.1. *Ambrosio artemisiifoliae-Chenopodietum albi* Marjushkina et Solomakha 1985
      5.1.2. *Ambrosietum artemisiifoliae* Viţălariu 1973
      5.1.3. *Atriplicetum hastatae* Poli et J. Tx. 1960
      5.1.4. *Atriplicetum nitentis* Slavnić 1951
      5.1.5. *Atriplicetum tataricae* (Morariu 1943) Ubrizsy 1949
      5.1.6. *Chenopodietum stricti* (Oberd. 1957) Passarge 1964
      5.1.7. *Kochietum densiflorae* Gutte et Klotz 1985
      5.1.8. *Salsolo-Atriplicetum nitentis* (Ishbirdin et Fiodorov in Mirkin *et al.* 1986) A. Ishbirdin *et al.* 1988
   5.2. *Hordeion murini* Br.-Bl. in Br.-Bl. *et al.* 1936
      5.2.1. *Aegilopseto biuncialis-Avenetum persicae* Kostylev in Solomakha *et al.* 1992
      5.2.2. *Brometum tectorum* Bojko 1934
      5.2.3. *Bromo squarrosi-Sonchetum oleracei* Kostylev in Solomakha *et al.* 1992
      5.2.4. *Bromo sterilis-Asperugetum procumbentis* Eliáš 1981
      5.2.5. *Chamomillo recutitae-Malvetum mauritianae* Kostylev in Solomakha *et al.* 1992
      5.2.6. *Hordeetum murini* Libbert 1932
      5.2.7. *Hordeo murini-Peganetum harmalae* Kostylev in Solomakha *et al.* 1992
   5.3. *Malvion neglectae* (Gutte 1972) Hejný 1978
      5.3.1. *Hyoscyamo nigri-Malvetum neglectae* Aichinger 1933
      5.3.2. *Malvetum pusillae* Morariu 1943
   5.4. *Sisymbrion officinalis* Tx. *et al.* ex von Rochow 1951
      5.4.1. *Artemisietum annuae* Fijałkowski 1967
      5.4.2. *Asperugetum procumbentis* Eliáš 1979
      5.4.3. *Chamaeplietum officinalis* Hadač 1978
      5.4.4. *Cirsio-Lactucetum serriolae* Mucina 1978
      5.4.5. *Cirsio incani-Sisymbrietum orientalis* Levon 1997
      5.4.6. *Diplotaxio muralis-Erodietum cicutarii* Bagrikova 2002
      5.4.7. *Conyzo canadensis-Lactucetum serriolae* Lohmeyer in Oberd. 1957
      5.4.8. *Ivaetum xanthiifoliae* Fijałkowski 1967
      5.4.9. *Lactuco serriolae-Diplotaxietum tenuifoliae* (Oberd. 1957) Mucina 1978
      5.4.10. *Matricarietum perforatae* Kępczyński 1975
      5.4.11. *Sisymbrietum loeselii* Gutte 1972
      5.4.12. *Descurainietum sophiae* Passarge 1959
      5.4.13. *Sisymbrietum altissimi* Bornkamm 1974

3.3. Overview and characteristics of the *Stellarietea mediae* class associations

The *Aperetalia spicae-venti* order includes ruderal communities on alfisol soil in the Forest (Polissya), the Forest-Steppe zones of Ukraine and in the lower regions of the Ukrainian Carpathians. Within the territory of Ukraine this order is represented by the one *Scleranthion annui* alliance and its one association.

- Ass. 1.1.1. *Scleranthetum annui* Braun 1915

Diagnostic species: *Achillea collina*, *Agrostis capillaris*, *Anagallis arvensis*, *Anthemis cotula*, *Centaurea cyanus*, *Equisetum arvense*, *Holcus lanatus*, *Myosotis stricta*, *Phleum pratense*, *Polygonum arenarium*, *P. patulum*, *Ranunculus acris*, *Raphanus raphanistrum*, *Scleranthus annuus*, *Spergula arvensis*, *Stellaria media*, *Trifolium arvense*, *T. repens*, *Veronica dillenii*, *Vicia sativa*, *V. hirsuta*, *V. villosa*.
Habitat: Open ruderal areas near settlements, lawns and flowerbeds in the urban areas.
Distribution in Ukraine: Mostly western regions, in particular within the Ukrainian Carpathians and the Transcarpathia, can also be found in Polissya.
Structure: The herb layer has a 40-50% cover. The floristic composition includes 7-9 species per relevé.

The *Atriplici-Chenopodietalia albi* order includes communities of row crops, gardens, vineyards, orchards, flower beds and badlands, which are permanently suffering from cultivation measures on various soil types. They are widely distributed throughout the whole territory of Ukraine and are represented by three alliances.

The *Amarantho blitoidis-Echinochloion cruris-galli* alliance includes communities of row crops, orchards, vineyards, rice fields (alfalfa, oat), ornamental plantations on southern chernozems and brown soil. They are characterized by irrigated lands within the Steppe zone of Ukraine and the Crimean Peninsula. This alliance includes two associations.

- Ass. 2.1.1. *Amarantho retroflexi-Echinochloetum cruris-galli* Bagrikova 2005

Diagnostic species: *Alliaria petiolata*, *Amaranthus retroflexus*, *Echinochloa crus-galli*, *Setaria pumila*.
Habitat: Abandoned cultivated areas, wastelands, young fallow lands, territories of summer cattle camps, railway embankments etc. These communities can be found sporadically in settlements as well as in the urban areas.
Distribution in Ukraine: Southern regions of the Steppe zone and the Crimea.

Structure: The total coverage ranges from 30 to 100%, number of species – from 4 to 21. The complete floristic composition includes 121 species, mainly formed by ruderal plants which are characterized by the *Stellarietea mediae*, *Artemisietea vulgaris* and *Plantaginetea majoris* classes.

- Ass. 2.1.2. *Amaranthetum blitoidis-retroflexi* Solomakha 1988

Diagnostic species: *Amaranthus blitoides*, *A. retroflexus*, *Diplotaxis muralis*, *Echinochloa crus-galli*, *Lactuca tatarica*, *Setaria viridis*, *Sinapis arvensis*, *Sonchus asper*.
Habitat: Flower beds and lawns with loose soil, railway slopes.
Distribution in Ukraine: The Steppe and the Forest-Steppe zones (southern regions), the Crimea.
Structure: The total coverage ranges from 30 to 85%. The complete floristic composition includes 51 species (from 6 to 18 in a separate relevé).

The *Lactucion tataricae* alliance includes ruderal communities on the chernozem soil within the Steppe zone and in the Crimea (mostly in the Northern Black Sea region). It includes one association.

- Ass. 2.2.1. *Lactucetum tataricae* Rudakov in Mirkin *et al.* 1985

Diagnostic species: *Bromus japonicus*, *Centaurea solstitialis*, *Cynanchum acutum*, *Erucastrum armoracioides*, *Lactuca tatarica*, *Polygonum patulum*, *Seseli tortuosum*, *Tripolium pannonicum*, *Xanthium strumarium*.
Habitat: Near residential areas, along roads, fences and railways, waste places, with typical, saline and degraded southern chernozem soil.
Distribution in Ukraine: The Steppe zone.
Structure: The herb layer is dense, with total coverage up to 100%. The floristic composition consists of 57 species (from 5 to 12 in a separate relevé), most of them are diagnostic ones from the *Stellarietea mediae* class.

The *Panico-Setarion* alliance includes communities, dominated by grasses on open arid areas with various types of soil. Within the research territory it is represented by five associations.

- Ass. 2.3.1. *Setario pumilae-Echinochloetum crurisgalli* Felföldy 1942 corr. Mucina in Mucina *et al.* 1993

Diagnostic species: *Chenopodium ambrosioides*, *Festuca regeliana*, *Setaria pumila*.
Habitat: roadsides, railway embankments and badlands in the urban areas (flowerbeds, lawns, etc.) with various types of soil.
Distribution in Ukraine: Within the whole territory.
Structure: The herb layer has total coverage from 50 to 100%. The complete floristic composition includes 173 species (from 4 to 26 in a separate relevé).

- Ass. 2.3.2. *Setario-Digitarietum* Felföldy 1942

Diagnostic species: *Digitaria sanguinalis*.
Habitat: Widely distributed in backyards, along roadsides as well as railways with sandy, loamy and pebbled soil. Several areas were also described on transformed, alluvial lowland pastures.
Distribution in Ukraine: Within the whole territory.
Structure: The total coverage ranges from 15 to 95%. The complete floristic composition includes 69 species (from 5 to 17 in a separate relevé).

- Ass. 2.3.3. *Digitarietum ischaemii* Tx. et Preising (1942) 1950

Diagnostic species: *Agrostis canina*, *Apera spica-venti*, *Centaurea cyanus*, *Digitaria ischaemum*, *Medicago falcata*, *Raphanus raphanistrum*, *Rumex acetosella*, *Spergula arvensis, Viola arvensis*.
Habitat: roadsides, railway slopes and early cultivated areas on nutrient-poor, loamy and sandy soil.
Distribution in Ukraine: The Forest zone and the northern part of the Forest-Steppe zone.
Structure: The herb layer is dense with total coverage of 80-90%. The complete floristic composition consists of 56 species (from 7 to 13 species in a separate relevé).

- Ass. 2.3.4. *Setario viridis-Erigeronetum canadensis* Šomšák 1976

Diagnostic species: *Grindelia squarrosa*, *Lactuca serriola*, *Setaria viridis.*
Habitat: Along fences, railways, roadsides, wastelands, lawns, abandoned places. These communities are characterized by degraded chernozems, gravelly and sandy soil.
Distribution in Ukraine: Within the whole territory.
Structure: The total coverage ranges from 40 to 100%. The complete floristic composition includes 105 species, from 7 to 21 per relevé. A major part of the herb layer is comprised by representatives of the *Stellarietea mediae* as well as *Artemisietea vulgaris* classes.

- Ass. 2.3.5. *Setario glaucae-Galinsogetum parviflorae* Tx. 1950

Diagnostic species: *Cerastium arvense*, *Galinsoga parviflora*, *G. urticifolia*, *Geranium pusillum*, *Mentha arvensis*, *Myosotis arvensis*, *Vicia tetrasperma*, *Viola tricolor*.

Habitat: Plantations of ornamental plants and disturbed habitats in settlements.
Distribution in Ukraine: Within the whole territory.
Structure: The total coverage ranges from 30 to 100%. The complete floristic composition includes 110 species, from 5 to 25 in a separate relevé. Representatives from the *Stellarietea mediae* and *Artemisietea vulgaris* classes are characteristic.

The *Eragrostietalia* order includes thermophilous summer communities on dry habitats. They are formed on mechanically disturbed chernozems and kastanozems, saline, gray, poor-sandy, sod-sandy and clay-sandy or gravelly soil. On the research territory the order consists of two alliances.

The alliance *Eragrostion* includes ruderal communities of dry habitats mostly dominated by grass plants. It is represented by five associations.

- Ass. 3.1.1. *Cynodontetum dactyli* Gams 1927

Diagnostic species: *Cynodon dactylon*, *Medicago minima*, *Poa annua*.
Habitat: Roadsides, disturbed areas near rice fields and flooded rice fields.
Distribution in Ukraine: The southern regions of the Forest-Steppe (rare), the Steppe zone and the Crimea.
Structure: The stands are usually dense, total coverage ranges from 40 to 100%. The complete floristic composition includes 77 species, 4-15 per revelé.

- Ass. 3.1.2. *Digitario sanguinalis-Eragrostietum minoris* Tx. ex von Rochow 1951

Diagnostic species: *Cenchrus longispinus*, *Chenopodium strictum*, *Digitaria sanguinalis*, *Eragrostis minor*.
Habitat: Embankments, ditches, lawns, roadsides on sandy or degraded soil.
Distribution in Ukraine: Within the whole territory.
Structure: The herb layer varies from medium to dense with a total projective coverage from 50 to 90%. The complete floristic composition includes 84 species (from 5 to 23 in a separate relevé).

- Ass. 3.1.3. *Eragrostio-Amaranthetum albi* Morariu 1943

Diagnostic species: *Amaranthus albus*, *Artemisia pontica*, *A. vulgaris*, *Erysimum repandum*, *Fallopia dumetorum*, *Iva xanthiifolia*, *Lappula squarrosa*, *Medicago sativa*, *Pastinaca sativa*, *Vicia cracca*.
Habitat: wastelands, lawns, flowerbeds and abandoned places.
Distribution in Ukraine: The Forest and the Forest-Steppe zones.
Structure: The total coverage reaches 80%. The complete floristic composition consists of 27 species. The high frequency of diagnostic species from the *Artemisietea vulgaris* class is a characteristic feature of this association.

- Ass. 3.1.4. *Portulacetum oleracei* Felföldy 1942

Diagnostic species: *Portulaca oleracea*.
Habitat: Mechanically disturbed, open areas of flowerbeds, lawns, abandoned gardens and homesteads on kastanozems, chernozems or sandy soil. These communities can occasionally be found along roads, sidewalks and railways.
Distribution in Ukraine: Within the whole territory.
Structure: The herb cover varies from medium to dense, with a total coverage ranging from 30 to 90%. The complete floristic composition includes 172 species, from 3 to 24 in a separate relevé.

- Ass. 3.1.5. *Amarantho blitoidis-Tribuletum terrestris* Dubyna *et al.* 2018

Diagnostic species: *Amaranthus blitoides*, *Convolvulus arvensis*, *Echinochloa crus-galli*, *Heliotropium dolosum*, *Hibiscus trionum*, *Salsola soda*, *Setaria viridis*, *Tribulus terrestris*.
Habitat: Roadsides on kastanozems.
Distribution in Ukraine: the southern part of the Steppe zone.
Structure: The total coverage equals 70-100%. The complete floristic composition includes 16 species (from 5 to 12 per plot).

The *Salsolion ruthenicae* alliance includes secondary communities of xerophytes on dry, mainly sand embankments, anthropic substrates on river floodplains and in settlements. Within Ukraine this alliance consists of two associations.

- Ass. 3.2.1. *Plantagini indicae-Digitarietum sanguinalis* Papucha 1991

Diagnostic species: *Artemisia austriaca*, *Centaurea borysthenica*, *Corispermum intermedium*, *Erechtites hieracifolia*, *Lepidium densiflorum*, *Plantago arenaria*, *Salsola tragus*, *Tragopogon borysthenicus*, *T. ucrainicus*.
Habitat: Alongside the railway tracks with light and warmed sandy soil.
Distribution in Ukraine: The Forest zone (Chernihiv region).
Structure: The herb cover is sparse and varies from 20 to 60%. The complete floristic composition includes 32 species (11-16 in a separate relevé).

- Ass. 3.2.2. *Salsoletum ruthenicae* Philippi 1971

Diagnostic species: *Anthemis arvensis*, *Anisantha tectorum*, *Chenopodium rubrum*, *Diplotaxis tenuifolia*,

Helichrysum arenarium, *Poa bulbosa*, *Portulaca oleracea*, *Salsola tragus*.
Habitat: New built-up areas with devastated soil, railway slopes, landfills.
Distribution in Ukraine: Within the whole territory.
Structure: The total coverage ranges from 30 to 90%. The complete floristic composition includes 26 species (from 7 to 15 in a separate relevé).

The *Papaveretalia rhoeadis* order includes ruderal communities on different types of soil. In the research territory it is represented by two alliances.

The *Chenopodio albi-Descurainion sophiae* alliance includes ruderal communities on typical chernozem soil. This alliance is monotypic and as such has one association.

- Ass. 4.1.1. *Fallopio convolvuli-Chenopodietum albi* Solomakha 1990

Diagnostic species: *Anagallis arvensis*, *Artemisia austriaca*, *Convolvulus arvensis*, *Crepis setosa*, *Dasypyrum villosum*, *Fallopia convolvulus*, *Hordeum leporinum*, *Linaria vulgaris*, *Picris hieracioides*, *Polygonum arenarium*, *Rubus caesius*, *Rumex pulcher*, *Scariola viminea*.
Habitat: Lawns, flowerbeds and roadsides on chernozems.
Distribution in Ukraine: The Forest-Steppe (mainly in the southern regions), the Steppe zones and the Crimea.
Structure: The total coverage ranges from 80-90%. The complete floristic composition includes 44 species (12-18 per relevé).

The *Veronico-Euphorbion* alliance includes communities of row crops and gardens on chernozem soil. This alliance includes one association.

- Ass. 4.2.1. *Veronico-Lamietum hybridi* Kruseman et Vlieger 1939

Diagnostic species: *Alopecurus myosuroides*, *Anisantha sterilis*, *Anthemis dumetorum*, *Arctium lappa*, *Arenaria serpyllifolia*, *Capsella bursa-pastoris*, *Carduus uncinatus*, *Cerastium perfoliatum*, *Cirsium arvense*, *Consolida orientalis*, *Crepis pulchra*, *Daucus carota*, *Geranium molle*, *G. rotundifolium*, *Lamium amplexicaule*, *L. purpureum*, *Lepidium campestre*, *Plantago media*, *Rorippa austriaca*, *Rumex crispus*, *Senecio vulgaris*, *Stellaria media, Taraxacum officinale*, *Thlaspi arvense*, *Veronica hederifolia*, *V. persica*, *Vicia cordata*, *Viola kitaibeliana*.
Habitat: Late spring and early summer communities, formed in conditions of sufficient moisture on mechanically disturbed soil, flowerbeds, roadsides, etc.
Distribution in Ukraine: The Crimea.
Structure: The total coverage ranges from 70-90%. The complete floristic composition of these communities includes from 13 to 27 species.

The *Sisymbrietalia sophiae* order comprises xerophytic communities on polluted and mechanically disturbed areas in the first stage of the restoration process with a possible influence of grazing on nitrified soil (within the Forest-Steppe and the Steppe zones). These ruderal communities are common in the studied territory and represented by four different alliances.

The *Atriplicion* alliance includes the xerophytic phytocoenoses on the outskirts of fields, roadsides, early transformed areas dominated by species from the *Atriplex* L. and *Chenopodium* L. s.l genera. It is represented by eight associations.

- Ass. 5.1.1. *Ambrosio artemisiifoliae-Chenopodietum albi* Marjushkina et Solomakha 1985

Diagnostic species: *Ambrosia artemisiifolia*, *Elytrigia maeotica*.
Habitat: Landfills, wastelands, roadsides, abandoned areas, transformed river slopes on loess and chernozem soil.
Distribution in Ukraine: The Forest-Steppe, the Steppe zones and the Crimea.
Structure: The herb layer has a total coverage ranging from 50 to 100%. The complete floristic composition includes 142 species (from 5 to 23 in a separate relevé).

- Ass. 5.1.2. *Ambrosietum artemisiifoliae* Viţălariu 1973

Diagnostic species: *Ambrosia artemisiifolia.*
Habitat: Abandoned areas, landfills, wastelands, fallows, roadsides, lawns, railways with degraded chernozems, gravelly and sandy soil.
Distribution in Ukraine: Within the whole territory.
Structure: The total coverage ranges from 30 to 100%. The complete floristic composition includes 308 species (from 3 to 41 in a separate relevé).

- Ass. 5.1.3. *Atriplicetum hastatae* Poli et J. Tx. 1960

Diagnostic species: *Atriplex prostrata*.
Habitat: Areas with slightly saline soil, pastures, disturbed floodplains with meadow soil.
Distribution in Ukraine: The Forest-Steppe (southern part), the Steppe zones and the Crimea.
Structure: The herb layer varies from medium to dense with a total coverage ranging from 50 to 100%. The complete floristic composition consists of 96 species, from 3 to 20 (mainly 6-8) in a separate relevé.

- Ass. 5.1.4. *Atriplicetum nitentis* Slavnić 1951

Diagnostic species: *Atriplex micrantha*, *A. sagittata*, *Chenopodium hybridum*, *Parthenocissus quinquefolia*, *Puccinellia distans*, *Setaria verticillata.*

Habitat: Open and shaded space with weakly nitrified substrates of agglomerative origin in the urban areas.
Distribution in Ukraine: Within the whole territory.
Structure: The herb layer is dense, with a total coverage ranging from 60 to 90%. The complete floristic composition includes 29 species (from 6 to 12 in separate relevé).

- Ass. 5.1.5. *Atriplicetum tataricae* (Morariu 1943) Ubrizsy 1949

Diagnostic species: *Atriplex tatarica*.
Habitat: Open areas with anthropogenically trampled soil – pastures, roadsides, urban areas, etc.
Distribution in Ukraine: Within the whole territory (mainly in the southern regions).
Structure: The total coverage ranges from 40 to 100%. The complete floristic composition includes 102 species, from 3 to 12 in a separate relevé. These communities have significant variability and are formed by different species from the *Stellarietea mediae*, *Artemisietea vulgaris* and *Plantaginetea majoris* classes (on wet habitats).

- Ass. 5.1.6. *Chenopodietum stricti* (Oberd. 1957) Passarge 1964

Diagnostic species: *Chenopodium album*.
Habitat: Disturbed and nitrified substrates, well-lit and moderately shaded spaces – young fallows, border areas along paths, sidewalks, lawns, slopes exposed to water erosion, wastelands, dumps, etc.
Distribution in Ukraine: Within the whole territory.
Structure: The total coverage ranges from 20 to 100%. The complete floristic composition includes 170 species (from 3 to 28 in a separate relevé).

- Ass. 5.1.7. *Kochietum densiflorae* Gutte et Klotz 1985

Diagnostic species: *Bassia scoparia*.
Habitat: Transfromed areas in the initial stages of overgrowing, badlands, lawns, roadsides, railway slopes.
Distribution in Ukraine: The Steppe zone.
Structure: The herb layer has a total coverage ranging from 40 to 90%. The complete floristic composition includes 139 species (from 3 to 29 in a separate relevé).

- Ass. 5.1.8. *Salsolo-Atriplicetum nitentis* (Ishbirdin et Fiodorov in Mirkin *et al.* 1986) A. Ishbirdin *et al.* 1988

Diagnostic species: *Atriplex sagittata*, *Cardaria draba*, *Eremopyrum orientale*, *Lepidium perfoliatum*, *Rapistrum rugosum*, *Roemeria hybrida*, *Salsola tragus*.
Habitat: Open and disturbed habitats.
Distribution in Ukraine: The Crimea.
Structure: The herb layer is dense, its total coverage ranges from 80-100%. The complete floristic composition includes 7-8 species in a separate relevé.

The *Hordeion murini* alliance includes the most xerophytic annual grass communities in ruderal places on mechanically disturbed soil in the Steppe and the Forest-Steppe zones of Ukraine. It consists of seven associations.

- Ass. 5.2.1. *Aegilopseto biuncialis-Avene tum persicae* Kostylev in Solomakha *et al.* 1992

Diagnostic species: *Aegilops biuncialis*, *Anthemis subtinctoria*, *Avena ludoviciana, Centaurea diffusa*, *Dorycnium herbaceum*, *Eryngium campestre*, *Glaucium flavum*, *Hordeum bulbosum*, *Malva sylvestris*, *Medicago falcata*, *M. orbicularis*, *Melica transsilvanica*, *Sanguisorba officinalis*, *Satureja taurica*, *Scrophularia rupestris.*
Habitat: Roadsides and other urban areas with brown soil.
Distribution in Ukraine: The Crimean Mountains.
Structure: The total coverage ranges from 70 to 95%. The complete floristic composition includes 27 species (7-11 in a separate relevé).

- Ass. 5.2.2. *Brometum tectorum* Bojko 1934

Diagnostic species: *Anisantha tectorum*.
Habitat: Ruderal areas alongside roads and railways, dam slopes, field borders, abandoned gardens with various, mechanically disturbed soil.
Distribution in Ukraine: Within the whole territory.
Structure: The total coverage ranges from 30 to 100%. The complete floristic composition includes 215 species (from 4 to 34 in a separate relevé).

Ass. 5.2.3. *Bromo squarrosi-Sonchetum oleracei* Kostylev in Solomakha *et al.* 1992
Diagnostic species: *Aegilops cylindrica*, *Bromus japonicus*, *B. squarrosus*, *Centaurea adpressa*, *Grindelia squarrosa*, *Lepidium ruderale*, *Medicago minima*, *Tragopogon major*.
Habitat: Near forest belts, alongside roads as well as canal banks on loose soil and chernozems.
Distribution in Ukraine: The Forest-Steppe, the Steppe zones and the Crimea.
Structure: The total coverage ranges from 90-100%. The complete floristic composition includes 95 species (from 8 to 16 in a separate relevé).

- Ass. 5.2.4. *Bromo sterilis-Asperugetum procumbentis* Eliáš 1981

Diagnostic species: *Anisantha sterilis*, *Anthriscus cerefolium*, *Calepina irregularis*, *Caucalis platycarpos*, *Clematis vitalba*, *Cynoglossum creticum*, *Galium*

humifusum, *Hordeum leporinum*, *Picnomon acarna*, *Trifolium diffusum*, *Valerianella carinata*, *Veronica hederifolia*, *Xanthium albinum*.
Habitat: Open and disturbed habitats.
Distribution in Ukraine: The Steppe zone and the Crimea.
Structure: The herb layer is dense, its total coverage ranges from 90-100%. The complete floristic composition consists of 43 species (from 7 to 18 per relevé).

- Ass. 5.2.5. *Chamomillo recutitae-Malvetum mauritianae* Kostylev in Solomakha *et al.* 1992

Diagnostic species: *Carduus pycnocephalus*, *Diplotaxis muralis*, *Malva sylvestris*, *Zygophyllum fabago*.
Habitat: Anthropogenically transformed spaces near residential areas.
Distribution in Ukraine: The southern part of the Steppe zone and the Crimea.
Structure: The total coverage ranges from 75-90%. The complete floristic composition consists of 22 species, from 5 to 10 in a separate relevé.

- Ass. 5.2.6. *Hordeetum murini* Libbert 1932

Diagnostic species: *Hordeum murinum*.
Habitat: Border areas with trampled soil, irrigation canals' banks, urban spaces.
Distribution in Ukraine: Within the whole territory.
Structure: The total coverage ranges from 40 to 95%. The complete floristic composition includes 158 species, from 3 to 22 in a separate relevé.

- Ass. 5.2.7. *Hordeo murini-Peganetum harmalae* Kostylev in Solomakha *et al.* 1992

Diagnostic species: *Bassia prostrata*, *Cardaria draba*, *Carthamus glaucus*, *Consolida regalis*, *Euphorbia peplus*, *Hyoscyamus niger*, *Leopoldia comosa*, *Peganum harmala*, *Sisymbrium altissimum*, *S. loeselii*, *Verbascum ovalifolium*.
Habitat: Transformed areas based on substrates of anthropogenic origins, mainly within territories comprising recreational facilities.
Distribution in Ukraine: The southern regions of the Steppe zone and the Crimea.
Structure: The total coverage ranges from 70 to 100%. The complete floristic composition consists of 24 species, from 5 to 12 in a separate relevé.

The *Malvion neglectae* alliance includes border roadside communities on loose and dense substrates of moderate moisture. Within the research territory it consists of two associations.

- Ass. 5.3.1. *Hyoscyamo nigri-Malvetum neglectae* Aichinger 1933

Diagnostic species: *Lolium perenne*, *Malva neglecta*, *Urtica urens*.
Habitat: Nitrophilous trampled habitats – alongside paths, roads, sidewalks, urban and settlement areas with chernozems, gley and brown soil.
Distribution in Ukraine: Within the whole territory (most commonly in the Steppe zone and in the Crimea).
Structure: The herb layer is dense with a total coverage ranging from 95-100%. The characteristic features of these communities is the presence of diagnostic species from the *Artemisietea vulgaris* class, distinguished by high values in its constancy (*Artemisia vulgaris*, *Ballota nigra*, *Elytrigia repens* etc.). The complete floristic composition includes 46 species, from 21 to 25 in a separate relevé.

- Ass. 5.3.2. *Malvetum pusillae* Morariu 1943

Diagnostic species: *Apera spica-venti*, *Berteroa incana*, *Carex hirta*, *Chamomilla suaveolens*, *Chelidonium majus*, *Deschampsia cespitosa*, *Festuca ovina*, *Fragaria vesca*, *Glechoma hederacea*, *Lolium perenne*, *Malva pusilla*, *Melandrium album*, *Pastinaca sativa*, *Petasites hybridus*, *Potentilla reptans*, *Tanacetum vulgare*, *Veronica chamaedrys*.
Habitat: Various trampled sites – rural yards, bird pens, small landfills, roadsides, wastelands (mainly in sunny and warm parts).
Distribution in Ukraine: Within the whole territory.
Structure: The herb layer is usually dense, its total coverage ranges from 60 to 100%. The complete floristic composition includes 39 species (from 5 to 25 in a separate relevé).

The *Sisymbrion officinalis* alliance includes ruderal communities of landfills, dumps, border localities, post-forest areas on poorly disturbed soil and enriched with organic compounds. On the research territory this alliance comprises 13 associations.

- Ass. 5.4.1. *Artemisietum annuae* Fijałkowski 1967

Diagnostic species: *Acinos arvensis*, *Agrostis canina*, *A. capillaris*, *Artemisia annua*, *Centaurea rhenana*, *Galeopsis ladanum*, *Lamium album*, *Polygonum hydropiper*, *Potentilla neglecta*, *Thymus serpyllum*, *Verbascum lychnitis*.
Habitat: Along railways, roadsides, landfills, abandoned gardens, near settlements and urban areas.
Distribution in Ukraine: Within the whole territory.
Structure: The total coverage ranges from 60 to 100%. The complete floristic composition includes 74 species (from 6 to 18 in a separate relevé).

• Ass. 5.4.2. *Asperugetum procumbentis* Eliáš 1979
Diagnostic species: *Aegilops cylindrica*, *Arctium lappa*, *Asperugo procumbens*, *Bromus squarrosus*, *Chenopodium urbicum*, *Cirsium oleraceum*, *Conium maculatum*, *Epilobium parviflorum*, *Erucastrum armoracioides*, *Humulus lupulus*, *Lamium purpureum*, *Lathyrus tuberosus*, *Lepidium latifolium*.
Habitat: Open and disturbed habitats, which can be found alongside roads.
Distribution in Ukraine: Within the whole territory.
Structure: These early-spring communities have a dense herb layer, its total coverage equals up to 100%. The complete floristic composition consists of 23 species (from 7 to 15 species in a separate relevé).

• Ass. 5.4.3. *Chamaeplietum officinalis* Hadač 1978
Diagnostic species: *Achillea setacea*, *Asperugo procumbens*, *Bromus squarrosus*, *Erysimum repandum*, *Geranium pusillum*, *Hordeum murinum*, *Lepidium ruderale*, *Sisymbrium officinale*.
Habitat: Mechanically disturbed habitats, compacted areas in urban territories with brown soil.
Distribution in Ukraine: Within the whole territory.
Structure: The herb layer is dense, its total coverage reaches 100%. The complete floristic composition includes 30 species (12-16 in a separate relevé).

• Ass. 5.4.4. *Cirsio-Lactucetum serriolae* Mucina 1978
Diagnostic species: *Cirsium arvense*, *Heliotropium europaeum*, *Stachys annua*, *Torilis arvensis*.
Habitat: Along roadsides, urban areas, on the outskirts of vineyards and orchards on chernozems and kastanozems.
Distribution in Ukraine: Within the whole territory.
Structure: The herb layer varies from medium to dense, with a total coverage ranging from 50 to 100%. The complete floristic composition includes 110 species (from 5 to 16 in a separate relevé).

• Ass. 5.4.5. *Cirsio incani-Sisymbrietum orientalis* Levon 1997
Diagnostic species: *Arctium tomentosum*, *Anisantha sterilis*, *Calamintha parviflora*, *Centaurea diffusa, Dactylis glomerata*, *Erodium cicutarium*, *Falcaria vulgaris*, *Galium mollugo*, *Hordeum bulbosum*, *Lapsana intermedia*, *Lepidium graminifolium*, *Melilotus officinalis*, *Onopordum tauricum*, *Papaver dubium*, *P. hybridum*, *Physocaulis nodosus*, *Poa bulbosa*, *Sanguisorba officinalis*, *Sisymbrium orientale*, *Urtica dioica*, *Veronica persica.*
Habitat: Dry and open habitats with slightly disturbed soil.
Distribution in Ukraine: The Steppe zone and the Crimea.
Structure: The total coverage equals 100%. These communities include 24-26 species.

• Ass. 5.4.6. *Diplotaxio muralis-Erodietum cicutarii* Bagrikova 2002
Diagnostic species: *Althaea hirsuta*, *Anchusa leptophylla*, *Crepis micrantha*, *C. pannonica*, *Erodium cicutarium*, *Leopoldia comosa*, *Ornithogalum ponticum*, *Pilosella officinarum*, *Reseda lutea*, *Sonchus asper*, *Tragopogon dubius*.
Habitat: Mechanically disturbed and dry habitats on sod-carbonate and brown soil.
Distribution in Ukraine: The Crimea.
Structure: The total coverage ranges from 80-100%. The complete floristic composition consists of 37 species (from 5 to 16 per relevé).

• Ass. 5.4.7. *Conyzo canadensis-Lactucetum serriolae* Lohmeyer in Oberd. 1957
Diagnostic species: *Cirsium setosum*, *Linaria genistifolia*, *Pilosella echioides*, *Senecio erucifolius*.
Habitat: Nitrified areas along roadsides and railways, urban areas, borders of broadleaved forests, ruderal sites in floodplains of rivers, gardens on chernozems, kastanozems and sandy soil.
Distribution in Ukraine: Within the whole territory.
Structure: The total coverage of the herb layer ranges from 15 to 100%. The complete floristic composition includes 126 species (from 5 to 21 in a separate relevé).

• Ass. 5.4.8. *Ivaetum xanthiifoliae* Fijałkowski 1967
Diagnostic species: *Iva xanthiifolia*.
Habitat: landfills, dumps, wastelands, embankments, territories of summer cattle camps, etc.
Distribution in Ukraine: Within the whole territory.
Structure: The total coverage ranges from 40 to 100%. The complete floristic composition includes 224 species (from 4 to 24 in a separate relevé).

• Ass. 5.4.9. *Lactuco serriolae-Diplotaxietum tenuifoliae* (Oberd. 1957) Mucina 1978
Diagnostic species: *Agrimonia eupatoria*, *Diplotaxis muralis*, *Xanthium spinosum*.
Habitat: Urban areas, transformed pastures with chernozem and gravelly soil.
Distribution in Ukraine: The Steppe zone and the Crimea.
Structure: The total coverage ranges from 40 to 100%. The complete floristic composition includes 49 species (from 6 to 12 in a separate relevé).

• Ass. 5.4.10. *Matricarietum perforatae* Kępczyński 1975

Diagnostic species: *Achillea setacea*, *Carduus crispus*, *Conium maculatum*, *Lepidium campestre*, *Lotus corniculatus*, *Matricaria perforata*, *Psammophiliella muralis*, *Senecio vulgaris*, *Thlaspi arvense.*

Habitat: Mechanically disturbed habitats, adjacent field areas, abandoned lands on various (except nitrified) soil.

Distribution in Ukraine: Within the whole territory.

Structure: The total coverage ranges from 80-100%. The complete floristic composition consists of 39 species (9-18 in a separate relevé).

• Ass. 5.4.11. *Sisymbrietum loeselii* Gutte 1972

Diagnostic species: *Bromopsis inermis, Cannabis sativa, Carduus acanthoides, Carex caryophyllea, Festuca valesiaca, Poa compressa, Sisymbrium loeselii.*

Habitat: Roadsides, railways, abandoned areas, young fallows, dumps and abandoned arable lands with various soil types (from chernozems to sands).

Distribution in Ukraine: Within the whole territory.

Structure: The herb layer is dense, with a total coverage ranging from 60 to 100%. The complete floristic composition includes 56 species (from 6 to 15 in a separate relevé).

• Ass. 5.4.12. *Descurainietum sophiae* Passarge 1959

Diagnostic species: *Artemisia vulgaris*, *Capsella bursa-pastoris*, *Chamomilla suaveolens*, *Descurainia sophia*, *Equisetum ramosissimum*, *Lapsana communis*, *Potentilla anserina*, *Ranunculus repens*, *Rorippa sylvestris*, *Sisymbrium officinale*, *Urtica dioica*.

Habitat: Pastures, gravel railway embankments.

Distribution in Ukraine: Within the whole territory.

Structure: The total coverage ranges from 45 to 100%. The complete floristic composition consists of 74 species, from 10 to 30 (mainly 11-14) in a separate relevé.

• Ass. 5.4.13. *Sisymbrietum altissimi* Bornkamm 1974

Diagnostic species: *Atriplex tatarica*, *Anisantha tectorum*, *Phalacroloma annuum*, *Sisymbrium altissimum.*

Habitat: Open habitats with a dry substrate (mainly sandy and depleted), roadsides, dumps, landfills, badlands around warehouses and buildings.

Distribution in Ukraine: Within the whole territory.

Structure: The total coverage ranges from 75-80%. The complete floristic composition includes 5-8 species in a separate relevé.

The syntaxonomical position of the ruderal communities in regeneration stages of succession with the dominance of annual plants is quite debatable. In particular, Romanian geobotanists have considered such phytocoenoses as alliances *Caucalidion lappulae* (Tx. 1950) von Rochow 1951, *Panico-Setarion* Sissingh in Westhoff *et al.* 1946, *Trifolio-Medicaginion sativae* (Balaz 1944) Soó et Timar in Timar 1954 in the order *Centauretalia cyani* Tx. *et al.* in Tx. 1950; alliances *Scleranthion annui* (Kruseman et Vlieger 1939) Sissingh in Westhoff *et al.* 1946, *Veronico-Euphorbion* Sissingh in Passarge 1974 and *Polygono-Chenopodion polyspermi* (Koch 1926) Sissingh in Westhoff *et al.* 1946 – in the order *Chenopodietalia albi* (Tx. 1937) Tx. et Lohmeyer in Tx. 1950; alliance *Lolio remotae-Linion* Tx. 1950 – in the order *Lolio-Linetalia* J. Tx. et Tx. 1961; alliances *Amarantho-Chenopodion albi* Morariu 1943, *Tribulo-Eragrostion minoris* Soó et Timar 1957 and *Matricario-Chenopodion albi* Timar 1957 – in the order *Eragrostietalia* J. Tx. ex Poli 1966; alliances *Sisymbrion officinalis* Tx. *et al.* in Tx. 1950, *Atriplicion nitentis* Passarge 1978, *Malvion neglectae* (Gutte 1966) Hejny 1978, *Salsolion ruthenicae* Philippi 1971 – in the order *Sisymbrietalia* J. Tx. in Lohmeyer *et al.* 1962 (Morariu 1943; Sanda *et al.* 1998, 2008). In the Czech Republic there are 11 alliances considered within the class. A similar interpretation of communities within the alliances *Veronico-Euphorbion* Sissingh ex Passarge 1964, *Scleranthion annui* (Kruseman & Vlieger 1939) Sissingh in Westhoff *et al.* 1946, *Sisymbrion officinalis* Tx. *et al.* ex von Rochow 1951, *Atriplicion* Passarge 1978, *Salsolion ruthenicae* Philippi 1971 and *Malvion neglectae* (Gutte 1972) Hejný 1978; *Eragrostion cilianensi-minoris* Tüxen ex Oberdorfer 1954 is synonymous with the name of *Eragrostion* Tx. in Oberd. 1954; by *Spergulo arvensis-Erodion cicutariae* J. Tüxen in Passarge 1964 is understood as *Panico-Setarion* Sissingh in Westhoff *et al.* 1946, composition and diversity of communities which are much smaller in number; and three alliances, which are not separately distinguished in the syntaxonomic scheme of Ukraine – *Caucalidion* von Rochow 1951, *Arnoseridion minimae* Malato-Beliz *et al.* 1960, *Oxalidion fontanae* Passarge 1978 (Vegetation of the Czech Republic 2010). Studies of ruderal vegetation in Poland are mainly concentrated in cities and villages (Wojterska *et al.* 2016), but there are also studies being conducted on abandoned cemeteries (Rahmonov *et al.* 2010) and roadsides of highways (Bacieczko *et al.* 2014). An understanding of the content and composition of the *Stellarietea mediae* class, similar to the interpretation of geobotanists from Romania is for example for the orders *Polygono-Chenopodietalia*, *Sisymbrietalia* and *Centauretalia cyani* (Matuszkiewicz 2013; Klarzyńska *et al.* 2020). In contemporary papers from Slovakian authors the *Sisymbrietalia* order included

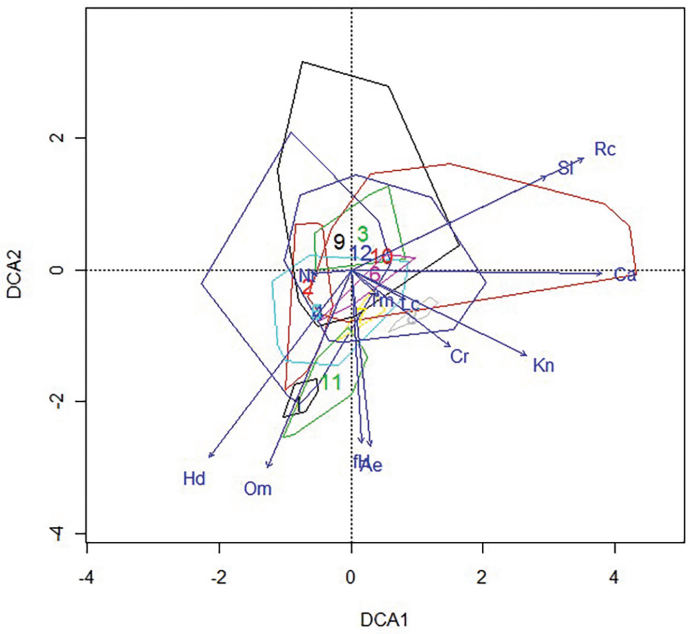

Fig. 4. Results of the DCA-ordination of alliances of the *Stellarietea mediae* class by ecological factors

Explanations: Hd – soil humidity, fH – variability of damping, Rc – soil acidity, Sl – salt regime, Ca – carbonate content, Nt – nitrogen content, Ae – soil aeration, Tm – thermoclimate, Om – ombroregime, Kn – climate continentality, Cr – cryoclimate, Lc – light regime; 1 – *Scleranthion annui;* 2 – *Amarantho blitoidis–Echinochloion cruris-galli;* 3 – *Lactucion tataricae;* 4 – *Panico–Setarion;* 5 – *Eragrostion;* 6 – *Salsolion ruthenicae;* 7 – *Chenopodio albi–Descurainion sophiae;* 8 – *Veronico–Euphorbion;* 9 – *Atriplicion;* 10 – *Hordeion murini;* 11 – *Malvion neglectae;* 12 – *Sysimbrion officinalis*

only the *Sisymbrion officinalis* and *Convolvulo arvensis-Elytrigion repentis* alliances (Medvecká *et al.* 2009; Rendeková 2016). Recent European prodrome of the vegetation (Mucina *et al.* 2016) proposed to reject the name *Stellarietea media* and divide all anthropogenic communities, with the dominance of annual plants, into four separate classes: *Papaveretea rhoeadis* S. Brullo *et al.* 2001 (the *Aperetalia spicae-venti* and *Papaveretalia rhoeadis* orders), *Digitario sanguinalis-Eragrostietea minoris* Mucina *et al.* 2016 (the *Eragrostietalia* order), *Sisymbrietea* Gutte et Hilbig 1975 (the *Sisymbrietalia sophiae* order) and *Chenopodietea* Br.-Bl. in Br.-Bl. *et al.* 1952. In our opinion, this decision is controversial, therefore the further research and analysis of the ruderal communities in Ukraine and other European countries are appropriate.

The ordination analysis of the alliances of the *Stellarietea mediae* class determined that the main factors of their ecological differentiation are the content of carbonates and nitrogen compounds in the soil as well as the variability of damping and the aeration of substrates. The vectors of these gradients are the closest to the ordinal axes (Fig. 4).

The phytoindication analysis of the *Stellarietea mediae* alliances revealed some features of the syntaxa, in accordance with their ecological optimums and degrees of tolerance for the leading abiotic gradients. Therefore the arrangement of communities by the soil humidity factor (Fig. 5) showed that most of them are submesophytic and can develop in conditions of temperate humidity. At the same time, the phytocoenoses of *Scleranthion annui*, *Amarantho blitoidis-Echinochloion cruris-galli*, *Veronico-Euphorbion* and *Malvion neglectae* are formed by a greater wetting of the root-containing soil layer. With view to the ecological amplitude of this factor, the largest range is characterized by *Atriplicion*, confined to different types of soil, with different structure and genesis. The narrowest ecological amplitude in the humidity gradient is characterized by the *Chenopodio albi-Descurainion sophiae* alliance, in which the communities are more typical for agrophytocoenoses. In ruderal habitats these communities are confined exclusively to the areas with loose chernozem soil, usually used for the formation of the ornamental flower plantations during the landscaping of settlements.

The differentiation of the *Stellarietea mediae* communities by the variability of damping (Fig. 6) revealed

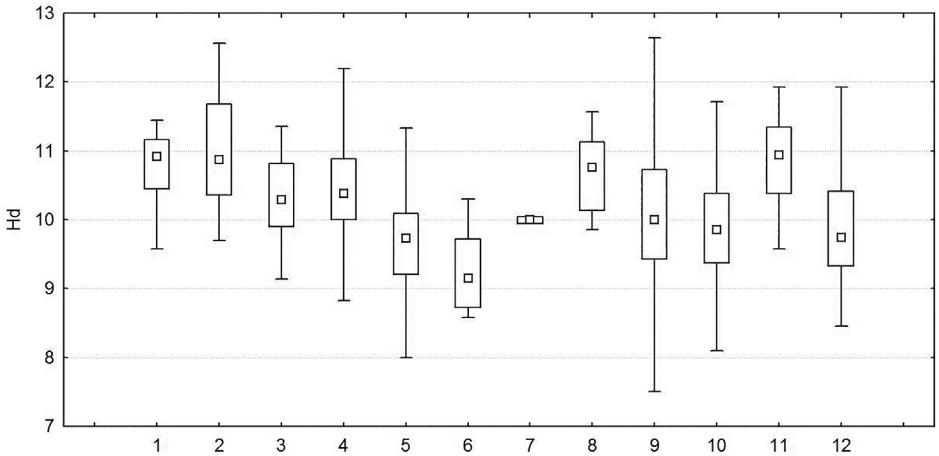

Fig. 5. The arrangement of alliances of the *Stellarietea mediae* class by the soil humidity (numbers on the abscissa axis in Figs. 5-16 correspond with the number of alliances in Fig. 4, on the ordinate axis – values of ecological factors)

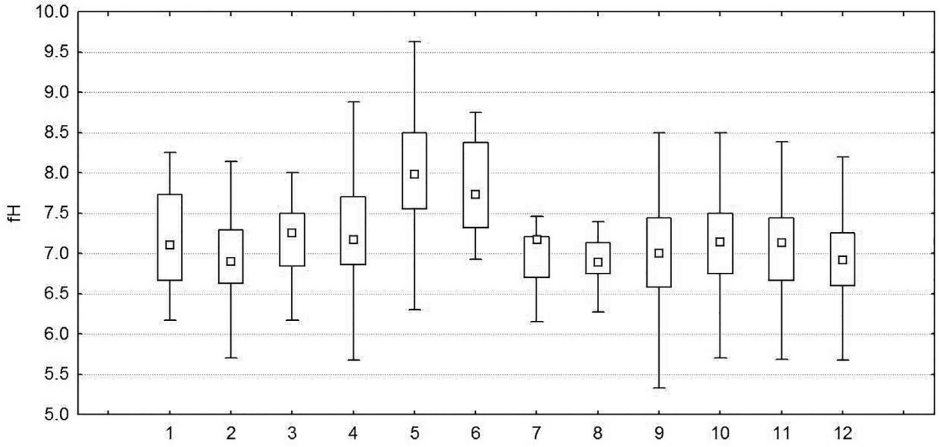

Fig. 6. The arrangement of the alliances by the variability of damping

their hemihydrocontrastophilicity, which can be explained by the predominant confinement to dry habitats with irregular wetting of the root-containing soil layer. The vast majority of the communities are hemistenotopic in relation to the fluctuation of this abiotic factor.

The analysis of the alliances by the degree of soil aeration (Fig. 7) showed their predominant subaerophilicity, except for *Scleranthion annui*, *Veronico-Euphorbion* and *Malvion neglectae*, which are formed on a dense gleyed or sod-podzolic, relatively wet soil with

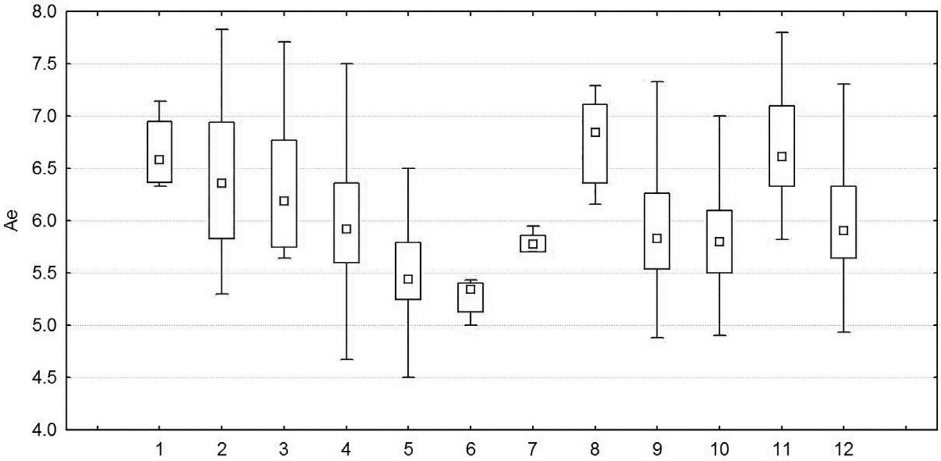

Fig. 7. The arrangement of the alliances by the soil aeration

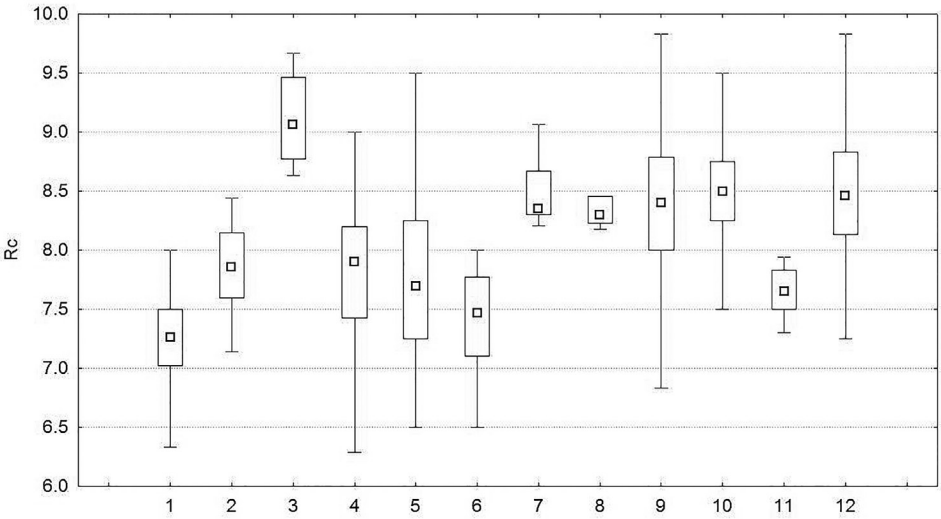

Fig. 8. The arrangement of the alliances by the soil acidity

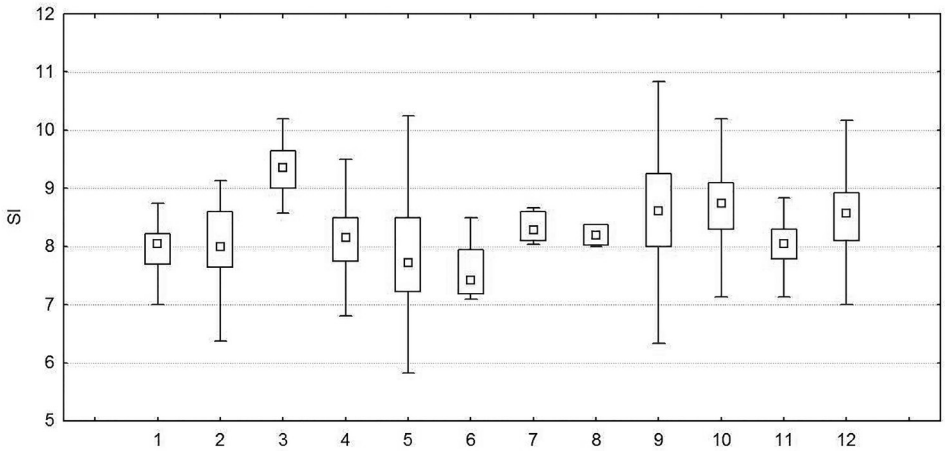

Fig. 9. The arrangement of alliances by the salt regime

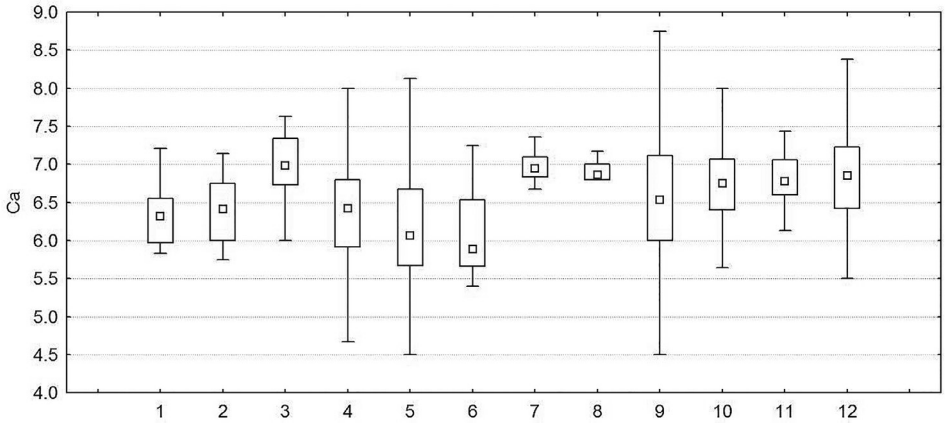

Fig. 10. The arrangement of the alliances by the carbonate content

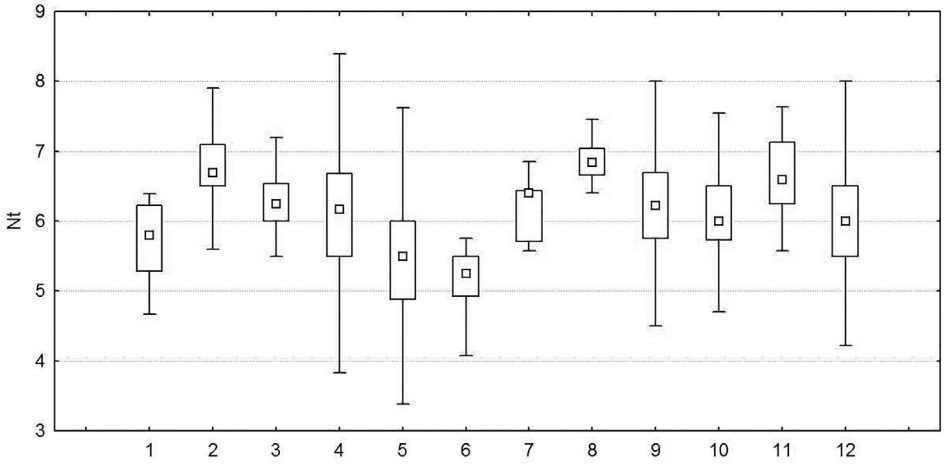

Fig. 11. The arrangement of the alliances by the nitrogen content

moderate aeration. Only four out of all of the studied syntaxa (*Scleranthion annui*, *Salsolion ruthenicae*, *Chenopodio albi-Descurainion sophiae* and *Veronico-Euphorbion*) have the narrow amplitude according to this factor.

The arrangement of the alliances based on soil acidity (Fig. 8) revealed that the a major part of them is neutrophilic. The communities of *Scleranthion annui*, *Amarantho blitoidis-Echinochloion cruris-galli*, *Panico-Setarion*, *Eragrostion*, *Salsolion ruthenicae* and *Malvion neglectae* are formed in conditions of slightly acid soil. Significant ecological amplitudes along this gradient are characterized by *Panico-Setarion*, *Eragrostion*, *Atriplicion*, *Hordeion murini* and *Sysimbrion officinalis*. The phytocoenoses of *Chenopodio albi-Descurainion sophiae*, *Veronico-Euphorbion* and

Malvion neglectae have low ecological tolerance for the fluctuation of this factor.

The arrangement of the alliances according to the salt regime of soil (Fig. 9) showed that the studied communities are formed in subeutrophic and eutrophic conditions with the absence of salinization or with traces of chlorides or sulfates in the soil. The communities of *Chenopodio albi-Descurainion sophiae* and *Veronico-Euphorbion* are most sensitive to changes of this gradient.

The analysis in relation to the carbonate content (Fig. 10) showed that a major part of the communities are confined to soil with a low content of CaO compounds (except for *Panico-Setarion*, *Eragrostion* and *Salsolion ruthenicae*, which were confirmed to be hemicarbonatephobes). The narrowest ecological amplitude is characterized by ruderal communities of the *Chenopodio albi-Descurainion sophiae* and *Veronico-Euphorbion* alliances.

The differentiation by the content of nitrogen compounds in the substrate (Fig. 11) revealed that all ruderal communities of the *Stellarietea mediae* class are formed mainly on relatively nitrogen-poor soil. Moderate nitrophilicity is shown by *Amarantho blitoidis-Echinochloion cruris-galli*, *Veronico-Euphorbion*

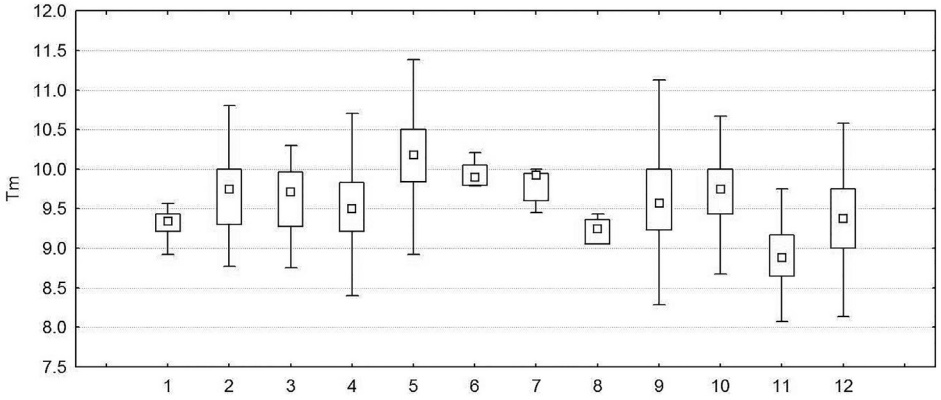

Fig. 12. The arrangement of the alliances by the thermoregime

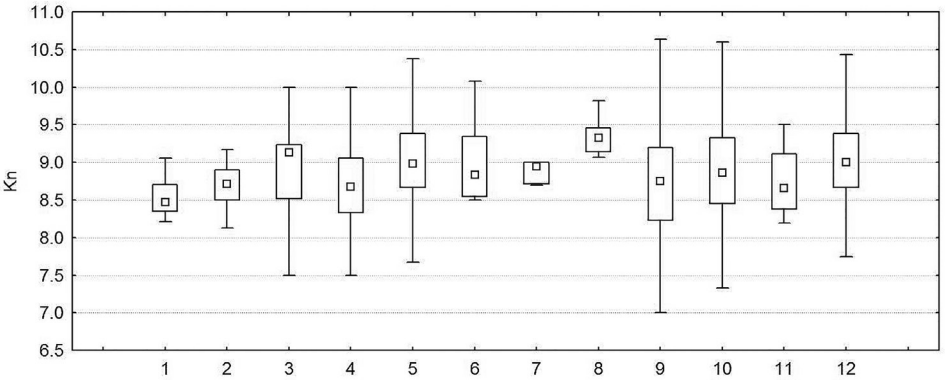

Fig. 13. The arrangement of the alliances by the continentality of climate

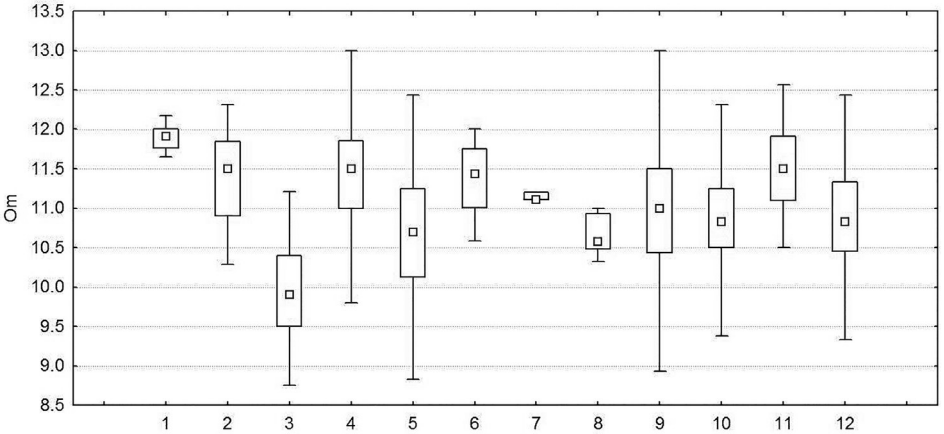

Fig. 14. The arrangement of the alliances by the ombroregime

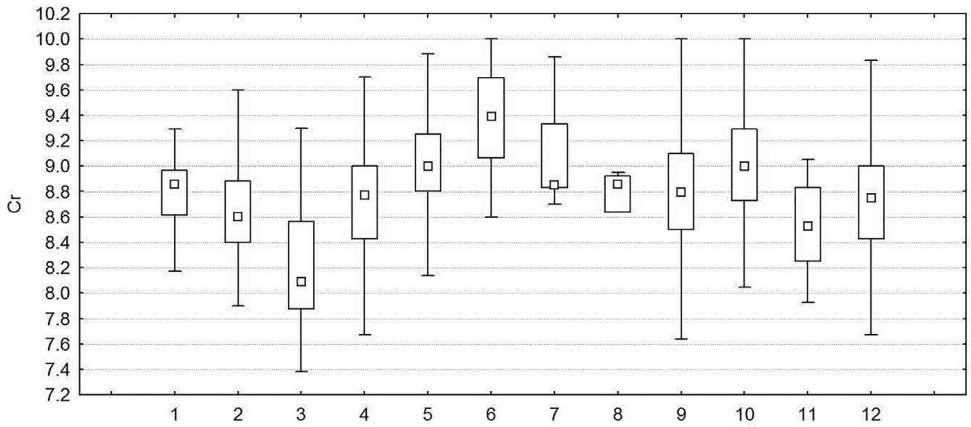

Fig. 15. The arrangement of the alliances by the cryoregime

and *Malvion neglectae*. The communities of *Panico-Setarion*, *Eragrostion*, *Atriplicion*, *Hordeion murini* and *Sysimbrion officinalis* have significant amplitude along this gradient.

The differentiation of the *Stellarietea mediae* alliances according to the main climate indicators revealed that they are all submesothermic in terms of the thermoregime (Fig. 12) and hemicontinental in terms of the climate continentality degree (Fig. 13). It was found that the communities of *Lactucion tataricae* tend to arider conditions compared to other predominantly mesoaridophytic alliances of the *Stellarietea mediae* (Fig. 14). They are also characterized by greater frost resistance. Other phytocoenoses are hemicryophytic (Fig. 15).

The phytoindication analysis by light regime of the habitats (Fig. 16) showed a correlation between the heliophyticity of the communities and the types of habitats where they formed – open and well lit by the sun.

The class is represented by native and alien species. Their ratio depends on the ecological conditions of the habitats and the proximity of natural vegetation. The coenoses of the class from the southern regions are characterized by higher rates of thermophilic as are the ones from the western regions of evoceanic and eurioceanic and the ones from the eastern regions of eucontinental species of vascular plants. Among the more common alien species are *Aethusa cynapium*, *Anagallis arvensis*, *Anisantha tectorum*, *Anthemis annua*, *A. cotula*, *Amaranthus albus*, *A. retroflexus*, *Ambrosia artemisiifolia*, *Bromus arvensis*, *Capsella bursa-pastoris*, *Chenopodium ficifolium*, *Ch. suecicum*, *Conyza canadensis*, *C. parviflora*, *Phalacroloma annuum*, *Fallopia convolvulus*, *Hyoscyamus niger*, *Galium spurium*, *Geranium pusillum*, *Lactuca serriola*, L. *suaveolens*, *Lappula squarrosa*, *L. arvensis*, *Malva neglecta*, *M. pusilla*, *Matricaria perforata*, *Raphanus raphanistrum*, *Senecio vulgaris*, *S. oleraceus*, *Setaria glauca*, *S. viridis*, *Urtica urens*, *Sisymbrium officinale*, *Spergula arvensis*, *Verbena officinalis* and *Veronica arvensis* (Dubyna *et al*. 2021).

The participation of rare species of national and regional ranks in the communities of the *Stellarietea*

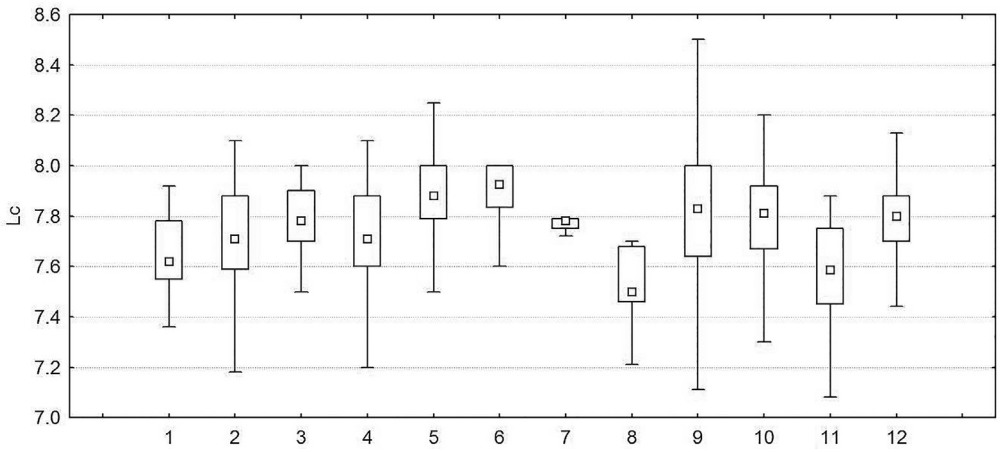

Fig. 15. The arrangement of the alliances by the cryoregime

mediae class is low. These are mainly elements of natural flora in the areas that have undergone a catastrophic transformation and expansion of ruderal coenoses (roadside, railways, areas of excessive recreation, etc.).

The peculiarities of the class are a high total coverage of the stands, a stable position of the dominant species with a low species composition as well as the predominance of the uniform-group and one-layer structure of the plant communities. The communities are pioneers of the newly formed areas and form the first stages of succession. They are regulated by the economic activity. In succession series they are more often replaced by the *Artemisietea vulgaris* coenoses. In particular the *Scleranthion annui*, *Salsolion ruthenicae* and *Malvion neglectae* communities are confined mainly to the anthropogenic ecotopes of the Forest and the Forest-Steppe zones. On the other hand, thermophilic and xerophilic phytocoenoses of the *Hordeion murini* and *Lactucion tataricae* were mostly found in the Steppe.

From all of the coenoses of *Stellarietea mediae* in Ukraine the most common ones, also occupying the largest areas, are the phytocoenoses of such associations as *Setario pumilae-Echinochloetum cruris-galli*, *Ambrosietum artemisiifoliae*, *Atriplicetum tataricae*, *Chenopodietum stricti*, *Brometum tectorum*, *Hordeetum murini*, *Conyzo canadensis-Lactucetum serriolae*, *Portulacetum oleracei* and *Ivaetum xanthiifoliae*.

4. Conclusions

Ruderal vegetation of the *Stellarietea mediae* class in Ukraine shows a high level of syntaxonomical diversity. The classification scheme of these communities includes 48 associations from 12 alliances and 5 orders. Finding a significant number of syntaxa on this territory is the result of different ecological, edaphic and climatic conditions of various natural zones as well as different levels of anthropogenic transformation of habitats. The peculiarity of the coenotic structure of a major part of the studied syntaxa evinces itself in a rather high coverage with a low floristic composition.

The features of a biogeographical distribution can be seen mainly in the alliance rank. According to the results of a DCA-ordination it was found that ecological differentiation of the *Stellarietea mediae* communities is determined by the variability of damping, soil aeration as well as carbonate and nitrogen content. Thermophilic and xerophilic phytocoenoses such as *Atriplicion, Hordeion murini, Lactucion tataricae, Amarantho blitoidis-Echinochloion cruris-galli, Chenopodio albi-Descurainion sophiae, Veronico-Euphorbion* and particularly *Sisymbrion officinalis* are confined to the Steppe and the Forest-Steppe zones. Synecological tolerance of coenoses in the alliances between *Scleranthion annui, Eragrostion, Salsolion ruthenicae* and *Malvion neglectae* enabled their appearance within the whole territory of Ukraine. Other syntaxa are not as common and can only be found locally in the Crimea, the Ukrainian Carpathians and in the Forest zone.

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Drafting the article: D. Dubyna, A. Davydova, S. Iemelianova, T. Dziuba, D. Davydov
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Appendix 1. Synoptic table of *Stellarietea mediae* associations

Number of association	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Numbers of relevés	12	25	4	16	76	31	23	36	35	40	42	7	80	9	3	5
Scleranthus annuus	85.5	–	–	–	–	–	18.5	–	–	–	–	–	–	–	–	–
Trifolium arvense	46.0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Holcus lanatus	40.1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Vicia sativa	40.1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Anthemis cotula	40.1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Equisetum arvense	37.9	7.7	–	–	3.5	–	8.8	–	–	–	–	–	–	–	–	–
Agrostis capillaris	32.1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Polygonum patulum	30.3	20.6	–	–	6.6	–	–	–	10.5	–	–	–	–	–	–	–
Phleum pratense	28.3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Vicia villosa	28.3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Veronica dillenii	28.3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Myosotis stricta	28.3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Vicia hirsuta	28.3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Ranunculus acris	27.2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Alliaria petiolata	–	25.9	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Amaranthus retroflexus	–	16.6	33.3	–	–	–	–	8.8	–	–	–	–	–	17.8	–	–
Sinapis arvensis	–	–	28.2	–	–	–	–	–	–	–	–	–	–	–	–	–
Lactuca tatarica	–	–	25.6	58.6	–	–	–	–	–	5.8	–	20.9	–	–	–	–
Polygonum patulum	–	–	–	44.2	–	–	–	–	–	–	–	–	4.6	–	–	–
Cynanchum acutum	–	–	–	49.0	3.9	–	–	–	–	–	–	–	–	–	–	–
Seseli tortuosum	–	–	–	39.1	–	–	–	–	–	–	–	–	–	–	–	–
Tripolium pannonicum	–	–	–	34.7	–	–	–	–	–	–	–	–	–	–	–	–
Xanthium strumarium	–	–	–	33.3	–	–	–	–	–	–	–	–	–	–	–	–
Erucastrum armoracioides	–	–	–	31.3	–	–	–	–	–	–	–	–	–	–	–	–
Bromus japonicus	–	–	–	30.2	–	–	–	–	–	–	–	–	–	–	–	–
Chenopodium ambrosioides	–	–	–	–	39.0	–	–	–	–	–	–	–	–	–	–	–
Festuca regeliana	–	–	–	–	25.1	–	–	–	–	–	–	–	–	–	–	–
Digitaria ischaemum	–	–	–	–	–	–	93.9	–	–	–	–	–	–	–	–	–
Rumex acetosella	–	12.7	–	–	–	–	31.4	–	–	–	–	–	–	–	–	–
Viola arvensis	–	–	–	–	–	–	33.4	–	16.3	–	–	–	–	–	–	–
Medicago falcata	–	–	–	–	–	–	25.7	–	–	–	–	–	–	–	–	–
Grindelia squarrosa	–	–	–	–	–	–	–	32.2	–	–	–	–	–	–	–	–
Galinsoga parviflora	–	–	–	–	–	–	–	–	73.9	–	–	–	–	–	–	–
Galinsoga urticifolia	–	–	–	–	–	–	–	–	35.3	–	–	–	–	–	–	–
Geranium pusillum	–	–	–	–	–	–	14.0	–	35.2	–	–	–	–	–	–	–
Cerastium arvense	–	–	–	–	–	–	–	–	33.2	–	–	–	–	–	–	–
Myosotis arvensis	–	–	–	–	–	–	–	–	33.2	–	–	–	–	–	–	–
Viola tricolor	–	–	–	–	–	–	–	–	28.8	–	–	–	–	–	–	–
Mentha arvensis	–	–	–	–	–	–	–	–	28.7	–	–	–	–	–	–	–
Vicia tetrasperma	–	–	–	–	–	–	–	–	24.8	–	–	–	–	–	–	–
Cynodon dactylon	–	–	–	–	–	–	–	–	–	85.1	–	–	–	–	–	–
Medicago minima	–	–	–	–	–	–	–	–	–	29.9	–	–	–	–	–	–
Eragrostis minor	–	–	–	–	–	–	–	–	–	–	53.0	–	19.4	–	–	–
Chenopodium strictum	–	–	–	–	–	–	–	–	–	–	35.5	–	7.7	–	–	–
Cenchrus longispinus	–	–	–	–	–	–	–	–	–	–	30.5	–	–	–	–	–
Amaranthus albus	–	–	–	–	–	–	–	–	–	–	–	87.0	6.5	–	–	–
Medicago sativa	–	–	–	–	4.0	–	7.7	–	–	–	–	63.5	–	–	–	–
Erysimum repandum	–	–	–	–	–	–	–	–	–	–	–	50.0	–	–	–	–
Artemisia pontica	–	–	–	–	–	–	–	–	–	–	–	37.1	–	–	–	–

Number of association	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Fallopia dumetorum	–	–	–	–	–	–	–	–	–	–	–	37.1	–	–	–	–
Lappula squarrosa	–	–	–	15.5	–	–	–	–	–	–	–	39.3	–	–	–	–
Pastinaca sativa	–	–	–	–	–	–	–	–	–	–	–	33.9	–	–	–	–
Tribulus terrestris	–	–	–	–	–	–	–	–	–	–	–	–	22.7	81.0	–	–
Hibiscus trionum	–	–	–	–	–	–	–	–	–	–	–	–	–	78.8	–	–
Heliotropium dolosum	–	–	–	–	–	–	–	–	–	–	–	–	–	65.9	–	–
Salsola soda	–	–	–	–	–	–	–	–	–	–	–	–	–	32.7	–	–
Plantago arenaria	–	–	–	–	–	–	–	–	–	–	–	–	–	–	97.5	–
Erechtites hieracifolia	–	–	–	–	–	–	–	–	–	–	–	–	–	–	81.1	–
Tragopogon ucrainicus	–	–	–	–	–	–	–	–	–	–	–	–	–	–	56.9	–
Corispermum intermedium	–	–	–	–	–	–	–	–	–	–	–	–	–	–	56.9	–
Tragopogon borysthenicus	–	–	–	–	–	–	–	–	–	–	–	–	–	–	56.9	–
Salsola tragus	–	–	–	–	–	–	–	–	–	–	–	–	–	–	56.9	–
Lepidium densiflorum	–	–	–	–	–	–	–	–	–	–	–	–	–	–	48.3	–
Centaurea borysthenica	–	–	–	–	–	–	–	5.8	–	–	4.5	–	–	–	48.8	–
Anthemis arvensis	–	–	–	–	–	–	5.0	–	–	–	–	–	–	–	–	80.8
Diplotaxis tenuifolia	–	–	–	–	–	–	–	–	–	–	3.1	–	–	–	–	58.0
Helichrysum arenarium	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	42.6
Chenopodium rubrum	–	–	–	–	–	13.8	–	–	–	–	–	–	6.4	–	–	40.1
Convolvulus arvensis	–	–	–	–	–	–	7.4	–	5.0	–	–	–	–	26.2	–	–
Artemisia vulgaris	–	–	–	–	–	–	–	–	–	–	–	25.0	–	–	–	–
Spergula arvensis	47.5	–	–	–	–	–	31.7	–	4.5	–	–	–	–	–	–	–
Centaurea cyanus	35.2	–	–	–	8.5	–	26.7	–	6.2	–	–	–	–	–	–	–
Anagallis arvensis	35.5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Raphanus raphanistrum	34.1	–	–	–	–	–	25.8	–	–	–	–	–	–	–	–	–
Polygonum arenarium	33.3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Stellaria media	26.9	–	–	–	–	–	–	–	9.8	–	–	–	–	–	–	–
Setaria pumila	–	26.0	–	–	24.8	10.4	10.6	–	–	–	–	–	–	–	–	–
Amaranthus blitoides	–	–	67.2	–	–	–	–	–	–	–	–	–	–	59.0	–	–
Apera spica-venti	–	–	–	–	–	–	44.9	–	15.1	–	–	–	–	–	–	–
Agrostis canina	–	–	–	–	–	–	41.0	–	–	–	–	–	–	–	–	–
Portulaca oleracea	–	–	–	–	–	–	–	–	–	–	20.8	–	37.1	20.8	–	27.3
Salsola tragus	–	–	–	6.8	–	–	–	–	–	–	–	–	–	–	–	88.8
Poa bulbosa	–	–	–	–	–	–	–	–	–	–	–	–	10.7	–	–	42.8
Anisantha tectorum	–	–	–	–	–	–	–	–	–	–	–	21.9	–	–	–	34.5
Diplotaxis muralis	–	–	41.7	–	–	–	–	23.6	–	–	–	–	–	–	–	–
Poa annua	–	13.7	–	–	–	–	–	–	–	28.5	–	–	–	–	–	–
Iva xanthiifolia	–	–	–	–	–	–	–	–	–	–	–	32.1	–	–	–	–
Echinochloa crus-galli	–	32.2	31.6	–	15.7	–	–	–	9.3	–	–	–	–	27.1	–	–
Setaria viridis	–	–	31.9	–	–	4.0	–	25.5	–	–	8.0	–	–	26.8	–	–
Digitaria sanguinalis	–	–	–	–	–	49.1	–	–	–	–	36.7	–	10.7	–	–	–
Artemisia austriaca	–	–	–	–	–	–	–	–	–	–	–	–	–	–	40.8	–
Lactuca serriola	–	–	–	–	–	–	–	31.1	–	–	–	–	–	–	–	–
Sonchus asper	–	–	26.8	–	–	–	–	–	–	–	–	–	–	–	–	–
Vicia cracca	–	–	–	–	–	–	–	–	–	–	–	32.0	–	–	–	–
Centaurea solstitialis	–	–	–	30.1	–	–	–	–	–	–	–	–	–	–	–	–
Achillea collina	28.9	–	–	–	–	–	–	19.0	–	–	–	–	–	–	–	–
Trifolium repens	31.7	–	–	–	–	–	9.9	–	–	–	–	–	6.6	–	–	–

Numbers of associations: 1 – *Scleranthetum annui*; 2 – *Amarantho retroflexi–Echinochloetum cruris-galli*; 3 – *Amaranthetum blitoidis–retroflexi*; 4 – *Lactucetum tataricae*; 5 – *Setario pumilae-Echinochloetum cruris–galli*; 6 – *Setario-Digitarietum* 7 – *Digitarietum ischaemii*; 8 – *Setario viridis-Erigeronetum canadensis*; 9 – *Setario glaucae-Galinsogetum parviflorae*; 10 – *Cynodontetum dactyli*; 11 – *Digitario sanguinalis-Eragrostietum minoris*; 12 – *Eragrostio-Amaranthetum albi*; 13 – *Portulacetum oleracei*; 14 – *Amarantho blitoidis-Tribuletum terrestris*; 15 – *Plantagini indicae-Digitarietum sanguinalis*; 16 – *Salsoletum ruthenicae*. Only species with a fidelity measure ≥ 25.0% are given

Continuation of Appendix 1

Number of association	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Numbers of relevés	5	6	58	162	38	5	93	81	45	2	5	123	36	31	7	197
Crepis setosa	76.3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Artemisia austriaca	73.3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Fallopia convolvulus	53.0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Rumex pulcher	51.8	20.7	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Dasypyrum villosum	41.0	–	–	–	–	–	–	–	–	–	–	–	–	5.8	–	–
Rubus caesius	40.5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Scariola viminea	38.9	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Linaria vulgaris	36.8	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Picris hieracioides	35.7	–	–	5.9	–	–	–	–	–	–	–	–	–	–	–	–
Convolvulus arvensis	25.8	–	–	3.1	–	–	–	–	–	–	–	–	6.9	17.0	–	–
Consolida orientalis	–	76.9	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Rumex crispus	–	62.7	–	–	–	–	–	–	–	–	–	–	–	7.3	–	–
Cerastium perfoliatum	–	57.3	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Viola kitaibeliana	–	57.3	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Anthemis dumetorum	–	57.3	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Alopecurus myosuroides	21.5	56.6	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Geranium rotundifolium	–	56.3	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Lamium amplexicaule	–	47.7	–	–	–	–	–	–	–	–	–	–	–	17.6	–	–
Arenaria serpyllifolia	23.8	40.8	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Geranium molle	–	40.5	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Taraxacum officinale	–	36.1	–	–	–	–	–	–	–	–	–	4.3	–	10.4	–	8.4
Carduus uncinatus	–	34.6	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Plantago media	–	34.3	–	2.9	–	–	–	–	–	–	–	–	–	–	–	–
Crepis pulchra	–	33.7	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Rorippa austriaca	–	31.8	–	–	–	–	–	–	–	–	–	–	–	11.7	–	–
Vicia cordata	–	29.6	–	–	–	–	–	–	–	–	–	–	–	16.7	–	–
Daucus carota	–	25.8	–	5.8	–	–	–	–	–	–	–	–	–	–	–	–
Elytrigia maeotica	–	–	31.7	9.5	–	–	–	–	–	–	–	–	–	–	–	–
Ambrosia artemisiifolia	–	–	24.8	26.6	–	–	–	–	–	–	–	–	–	–	–	–
Atriplex prostrata	–	–	–	–	41.7	–	4.4	–	–	–	–	–	6.6	–	–	–
Parthenocissus quinquefolia	–	–	–	–	–	55.3	–	–	–	–	–	–	–	–	–	–
Setaria verticillata	–	–	–	–	–	39.0	–	–	–	–	–	–	–	–	–	–
Chenopodium hybridum	–	–	–	–	–	38.7	–	–	–	–	–	–	–	–	–	–
Atriplex micrantha	–	–	–	–	–	34.4	–	–	–	–	–	–	–	–	–	–
Puccinellia distans	–	–	–	–	–	30.9	2.1	–	–	–	–	–	–	–	–	–
Chenopodium album	9.0	–	15.6	–	–	–	–	21.5	–	–	–	–	–	–	–	4.1
Bassia scoparia	–	–	–	–	–	–	–	–	80.4	–	–	–	–	–	–	–
Roemeria hybrida	–	–	–	–	–	–	–	–	–	100.0	–	–	–	–	–	–
Eremopyrum orientale	–	–	–	–	–	–	–	–	–	70.3	–	–	–	–	–	–
Rapistrum rugosum	–	–	–	–	–	–	–	–	–	68.7	–	–	–	17.7	–	–
Lepidium perfoliatum	–	–	–	–	–	–	–	–	–	63.7	–	–	–	9.6	–	–
Avena ludoviciana	–	–	–	–	–	–	–	–	–	–	100.0	–	–	–	–	–
Aegilops biuncialis	–	–	–	–	–	–	–	–	–	–	89.3	–	–	–	–	–
Sanguisorba officinalis	–	–	–	–	–	–	–	–	–	–	62.8	–	–	–	–	–
Scrophularia rupestris	–	–	–	–	–	–	–	–	–	–	62.8	–	–	–	–	–
Anthemis subtinctoria	–	–	–	–	–	–	–	–	–	–	62.2	–	–	–	–	–
Glaucium flavum	–	–	–	–	–	–	–	–	–	–	44.3	–	–	–	–	–

Satureja taurica	–	–	–	–	–	–	–	–	–	–	44.3	–	–	–	–	–
Dorycnium herbaceuma	–	–	–	–	–	–	–	–	–	–	44.3	–	–	–	–	–
Medicago orbicularis	–	–	–	–	–	–	–	–	–	–	40.3	–	–	–	–	–
Melica transsilvanica	–	–	–	–	–	–	–	–	–	–	35.1	–	–	–	–	–
Medicago falcata	–	–	–	5.8	–	–	–	–	–	–	31.4	–	–	–	–	–
Eryngium campestre	–	–	–	–	–	–	–	–	–	–	27.6	–	–	–	19.3	–
Medicago minima	–	–	–	–	–	–	–	–	–	–	–	–	35.6	–	–	–
Grindelia squarrosa	–	–	5.4	–	–	–	–	–	6.3	–	–	–	32.2	–	–	–
Tragopogon major	–	–	–	–	–	–	–	–	–	–	–	–	30.4	–	–	–
Bromus japonicus	–	–	–	–	–	–	–	–	–	–	–	–	28.0	–	–	–
Centaurea. adpressa	–	–	–	–	–	–	–	–	–	–	–	–	26.9	–	–	–
Calepina irregularis	–	–	–	–	–	–	–	–	–	–	–	–	–	35.6	–	–
Anthriscus cerefolium	–	–	–	–	–	–	–	–	–	–	–	–	–	35.6	–	–
Picnomon acarna	–	–	–	–	–	–	–	–	–	–	–	–	–	35.6	–	–
Clematis vitalba	–	–	–	–	–	–	–	–	–	–	–	–	–	30.8	–	–
Galium humifusum	–	–	–	–	7.9	–	–	–	–	–	–	–	–	29.7	–	–
Caucalis platycarpos	–	–	–	–	–	–	–	–	–	–	–	–	–	25.2	–	–
Trifolium diffusum	–	–	–	–	–	–	–	–	–	–	–	–	–	25.2	–	–
Cynoglossum creticum	–	–	–	–	–	–	–	–	–	–	–	–	–	25.2	–	–
Valerianella carinata	–	–	–	–	–	–	–	–	–	–	–	–	–	25.2	–	–
Zygophyllum fabago	–	–	–	–	–	–	–	–	–	–	–	–	–	–	65.4	–
Cardaria draba	–	15.6	–	–	–	–	–	–	–	54.6	–	–	–	22.5	12.8	–
Hordeum murinum	–	–	–	–	13.4	–	7.6	–	–	–	–	–	10.9	–	–	37.0
Stellaria media	–	57.9	–	–	–	–	–	–	–	–	–	–	–	4.0	–	1.8
Lamium purpureum	–	62.2	–	–	3.5	–	–	–	–	–	–	–	7.5	–	–	–
Arctium lappa	–	42.1	3.5	–	–	–	–	–	–	–	–	–	3.6	–	–	–
Capsella bursa-pastoris	–	34.8	–	–	–	–	–	–	–	–	–	–	–	10.4	–	2.8
Centaurea diffusa	–	–	–	2.0	–	–	–	–	–	–	31.6	–	–	15.2	–	–
Anisantha tectorum	–	–	–	–	–	–	4.9	–	–	–	–	28.5	–	–	23.3	–
Diplotaxis muralis	–	–	–	–	–	–	–	–	8.9	–	–	–	–	–	49.8	2.0
Carduus pycnocephalus	–	–	–	–	–	–	–	–	–	–	–	–	–	–	25.8	–
Salsola tragus	–	–	–	–	–	–	–	–	–	62.4	–	–	–	5.1	–	–
Hordeum leporinum	34.3	–	–	–	–	–	–	–	–	–	–	–	–	47.9	–	–
Thlaspi arvense	–	41.9	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Veronica hederifolia	–	40.8	–	–	–	–	–	–	–	–	–	–	–	35.3	–	–
Cirsium arvense	–	29.2	–	–	–	–	–	–	–	–	–	–	–	13.1	–	–
Atriplex tatarica	–	–	4.4	–	5.8	–	41.3	–	–	–	–	4.7	–	–	1.5	5.9
Atriplex sagittata	–	–	–	–	–	56.8	–	2.2	–	56.8	–	–	–	11.9	–	–
Malva sylvestris	–	–	–	–	–	–	–	–	–	–	40.0	–	–	–	68.7	–
Hordeum bulbosum	–	–	–	–	–	–	–	–	–	–	30.4	–	–	–	9.2	–
Anisantha sterilis	–	28.9	–	–	–	–	–	–	–	–	–	–	–	45.7	–	–
Bromus squarrosus	–	–	–	–	–	–	–	–	–	–	–	–	47.0	–	–	–
Anagallis arvensis	28.9	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Polygonum arenarium	26.0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Setaria pumila	–	–	–	–	–	–	–	5.5	–	–	–	–	–	–	–	–
Xanthium albinum	–	–	–	–	–	–	–	–	–	–	–	–	–	29.6	–	–
Lepidium campestre	–	53.1	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Veronica persica	–	44.9	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Senecio vulgaris	–	37.6	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Lepidium ruderale	–	–	–	–	–	–	–	–	–	–	–	–	29.4	–	–	–

Aegilops cylindrica	–	–	–	–	–	–	–	–	–	–	–	–	25.1	–	–	–

Numbers of associations: 17 – *Fallopio convolvuli-Chenopodietum albi*; 18 – *Veronico-Lamietum hybridi*; 19 – *Ambrosio artemisiifoliae-Chenopodietum albi*; 20 – *Ambrosietum artemisiifoliae*; 21 – *Atriplicetum hastatae*; 22 – *Atriplicetum nitentis*; 23 – *Atriplicetum tataricae*; 24 – *Chenopodietum stricti*; 25 – *Kochietum densiflorae*; 26 – *Salsolo-Atriplicetum nitentis*; 27 – *Aegilopseto biuncialis-Avenetum persicae*; 28 – *Brometum tectorum*; 29 – *Bromo squarrosi-Sonchetum oleracei*; 30 – *Bromo sterilis-Asperugetum procumbentis*; 31 – *Chamomillo recutitae-Malvetum mauritianae*; 32 – *Hordeetum murini*

Continuation of Appendix 1

Number of association	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
Numbers of relevés	6	16	10	12	3	4	34	4	10	62	101	33	3	21	13	4
Peganum harmala	99.6	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Verbascum ovalifolium	40.5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Carthamus glaucus	40.5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Euphorbia peplus	38.9	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Hyoscyamus niger	38.3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Consolida regalis	28.6	–	–	–	–	–	–	–	–	11.1	5.9	–	–	–	–	–
Bassia prostrata	28.4	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Malva neglecta	–	80.9	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Urtica urens	–	64.8	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Malva pusilla	–	–	85.0	–	–	–	–	–	–	–	–	–	–	–	11.0	–
Potentilla reptans	–	–	54.8	10.2	–	–	–	–	–	–	–	–	–	–	–	–
Veronica chamaedrys	–	–	53.8	–	–	–	–	–	–	–	–	–	–	–	–	–
Melandrium album	–	–	48.8	–	–	–	–	–	–	–	–	–	–	17.8	17.2	–
Deschampsia cespitosa	–	–	47.0	–	–	–	–	–	–	–	1.9	–	–	–	11.1	–
Petasites hybridus	–	–	43.2	–	–	–	–	–	–	–	–	–	–	–	–	–
Carex hirta	–	–	36.1	–	–	–	–	–	–	–	–	–	–	–	–	–
Tanacetum vulgare	–	–	35.8	–	–	–	–	–	–	–	–	–	–	–	19.7	–
Festuca ovina	–	–	33.8	–	–	–	–	–	–	–	–	–	–	–	–	–
Chelidonium majus	–	–	31.6	–	–	–	–	–	–	–	–	–	–	–	–	–
Berteroa incana	–	–	28.4	–	–	–	–	–	–	–	–	5.6	–	21.6	–	–
Fragaria vesca	–	–	28.0	–	–	–	–	–	–	–	–	–	–	–	–	–
Pastinaca sativa	–	–	27.7	–	–	–	–	–	–	–	–	–	–	–	–	–
Glechoma hederacea	–	–	26.8	–	–	–	–	–	–	–	–	–	–	–	–	–
Artemisia annua	–	–	–	84.7	–	–	–	–	–	–	–	–	–	–	–	–
Galeopsis ladanum	–	–	–	46.0	–	–	–	–	–	–	–	–	–	–	–	–
Centaurea rhenana	–	–	–	40.5	–	–	–	–	–	–	–	–	–	–	–	–
Acinos arvensis	–	–	–	40.5	–	–	–	–	–	–	–	–	–	–	–	–
Potentilla neglecta	–	–	–	39.6	–	–	–	–	–	–	–	–	–	–	–	–
Verbascum lychnitis	–	–	–	32.7	–	–	–	–	–	–	–	–	–	24.5	–	–
Thymus serpyllum	–	–	–	28.6	–	–	–	–	–	–	–	–	–	–	–	–
Polygonum hydropiper	–	–	–	27.4	–	–	–	–	–	–	–	–	–	–	–	–
Lamium album	–	–	–	27.3	–	–	–	–	–	–	–	–	–	–	–	–
Agrostis capillaris	–	–	20.0	25.5	–	–	–	–	–	–	–	–	–	–	14.9	–
Epilobium parviflorum	–	–	–	–	57.3	–	–	–	–	–	–	–	–	–	–	–
Cirsium oleraceum	–	–	–	–	51.9	–	–	–	–	–	–	–	–	–	–	–
Lepidium latifolium	–	–	–	–	50.6	–	–	–	–	–	3.3	–	–	–	–	–
Humulus lupulus	–	–	–	–	45.5	–	–	–	–	–	–	–	–	–	–	–

Chenopodium urbicum	–	–	–	–	42.4	–	–	–	–	–	–	–	–	–	–	–
Lathyrus tuberosus	–	–	–	–	38.6	–	8.9	–	–	4.1	–	–	–	–	–	–
Erucastrum armoracioides	–	–	–	17.6	37.0	–	–	–	–	–	–	–	–	–	–	–
Erysimum repandum	–	–	–	–	23.1	55.5	–	–	–	–	–	–	–	–	–	–
Geranium pusillum	–	–	–	–	–	25.8	–	–	–	–	–	–	–	–	15.1	–
Torilis arvensis	–	–	–	–	–	–	50.3	–	–	–	–	–	–	–	–	–
Stachys annua	–	–	–	–	–	–	45.0	–	–	–	–	–	–	–	–	–
Heliotropium europaeum	–	–	–	–	–	–	29.8	–	–	–	–	–	–	–	–	–
Lapsana intermedia	–	–	–	–	–	–	–	100.0	–	–	–	–	–	–	–	–
Calamintha parviflora	–	–	–	–	–	–	–	100.0	–	–	–	–	–	–	–	–
Lepidium graminifolium	–	–	–	–	–	–	–	100.0	–	–	–	–	–	–	–	–
Physocaulis nodosus	–	–	–	–	–	–	–	100.0	–	–	–	–	–	–	–	–
Onopordum tauricum	–	–	–	–	–	–	–	100.0	–	–	–	–	–	–	–	–
Sanguisorba officinalis	–	–	–	–	–	–	–	95.9	–	–	–	–	–	–	–	–
Galium mollugo	–	–	–	–	–	–	–	95.4	–	–	–	–	–	–	–	–
Papaver hybridum	–	–	–	–	–	–	–	95.4	–	–	–	–	–	–	–	–
Arctium tomentosum	–	–	–	–	–	–	–	92.5	–	–	–	–	–	–	–	–
Falcaria vulgaris	–	–	–	–	–	–	–	90.9	–	–	–	3.3	–	–	–	–
Sisymbrium orientale	–	–	–	–	–	–	2.5	83.5	14.7	–	–	–	–	–	–	–
Papaver dubium	–	–	–	–	–	–	–	73.2	–	–	–	–	–	–	–	–
Dactylis glomerata	–	–	10.6	–	–	–	–	66.0	–	–	0.9	–	–	–	–	–
Melilotus officinalis	–	–	–	–	–	–	–	64.7	–	3.3	–	–	–	–	–	–
Pilosella officinarum	–	–	–	–	–	–	–	–	67.4	–	–	–	–	–	–	–
Tragopogon dubius	–	–	–	–	–	–	–	–	34.3	–	–	–	–	–	–	–
Reseda lutea	–	–	–	–	–	–	–	–	31.6	4.3	–	–	–	–	–	–
Ornithogalum ponticum	–	–	–	–	–	–	–	–	31.3	–	–	–	–	–	–	–
Anchusa leptophylla	–	–	–	–	–	–	–	–	31.3	–	–	–	–	–	–	–
Althaea hirsuta	–	–	–	–	–	–	–	–	31.3	–	–	–	–	–	–	–
Crepis pannonica	–	–	–	–	–	–	–	–	29.0	–	–	–	–	–	–	–
Crepis micrantha	–	–	–	–	–	–	–	–	27.1	–	–	–	–	–	–	–
Sonchus asper	–	–	–	–	–	–	8.7	–	25.8	–	–	–	–	–	–	–
Pilosella echioides	–	–	–	–	–	–	–	–	–	56.3	–	–	–	–	–	–
Senecio erucifolius	–	–	–	–	–	–	–	–	–	37.5	–	–	–	–	–	–
Cirsium setosum	–	–	–	–	–	–	–	–	–	37.0	10.4	–	–	–	–	–
Linaria genistifolia	–	–	–	–	–	–	–	–	–	35.6	–	–	–	–	–	–
Iva xanthiifolia	–	–	–	16.8	–	–	–	–	–	–	39.0	–	–	–	–	–
Xanthium spinosum	–	–	–	–	–	–	–	–	–	–	–	29.9	–	–	–	–
Agrimonia eupatoria	–	–	–	–	–	–	–	–	–	–	–	25.9	–	–	–	–
Matricaria perforata	–	12.2	–	–	–	–	–	–	–	–	–	–	59.5	–	–	–
Carduus crispus	–	–	–	–	–	–	–	–	–	–	–	–	51.7	–	–	–
Psammophiliella muralis	–	–	–	–	–	–	–	–	–	–	–	–	41.7	–	–	–
Lotus corniculatus	–	–	–	–	–	–	–	–	–	–	–	–	37.8	–	–	–
Cannabis sativa	–	–	–	–	–	–	–	–	–	–	–	–	–	37.5	–	–
Poa compressa	–	–	–	–	–	–	–	–	–	–	–	–	–	30.2	–	–
Bromus inermis	–	–	24.3	–	–	–	–	–	–	–	–	–	–	29.3	–	–
Carduus acanthoides	–	–	–	–	–	–	–	–	–	–	–	–	–	27.3	–	–
Carex caryophyllea	–	–	–	–	–	–	–	–	–	–	–	–	–	27.1	–	–
Festuca valesiaca	–	–	–	–	–	–	–	–	–	7.8	–	–	–	25.2	–	–
Descurainia sophia	–	–	–	–	–	–	2.9	–	–	–	–	–	–	–	54.1	–
Potentilla anserina	–	14.2	–	–	–	–	–	–	–	–	–	–	–	–	47.2	–

Ranunculus repens	–	-	–	–	–	–	–	–	–	–	–	–	–	–	41.5	–
Lapsana communis	–	-	–	–	–	–	–	–	–	–	–	–	–	–	38.9	–
Rorippa sylvestris	–	12.6	–	–	–	–	–	–	–	–	–	–	–	–	32.5	–
Equisetum ramosissimum	–	–	–	–	–	–	–	–	–	–	–	–	–	–	27.5	–
Artemisia vulgaris	–	–	–	19.4	–	–	–	–	–	–	3.8	-	–	–	25.0	–
Phalacroloma annuum	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	30.0
Apera spica-venti	–	–	32.4	–	–	–	–	–	–	–	–	–	–	–	–	–
Agrostis canina	–	–	–	37.6	–	–	–	–	–	–	–	–	–	–	–	–
Poa bulbosa	–	–	–	–	–	–	–	68.3	–	–	–	–	–	–	–	–
Lamium purpureum	–	–	–	–	40.3	–	–	–	–	–	–	–	–	–	6.7	–
Lepidium campestre	–	–	–	–	–	–	–	–	–	–	–	–	34.7	–	–	–
Veronica persica	–	–	–	–	–	–	–	68.9	–	–	–	–	–	–	–	–
Arctium lappa	–	–	–	–	32.8	–	–	–	–	–	–	–	–	–	12.9	–
Thlaspi arvense	–	–	–	–	–	–	5.4	–	–	–	–	–	27.1	–	–	–
Senecio vulgaris	–	–	–	–	–	–	5.1	–	–	–	–	–	37.6	–	–	–
Capsella bursa-pastoris	–	–	–	–	–	–	–	–	–	–	–	–	–	–	28.1	–
Cirsium arvense	–	–	–	–	–	–	33.8	–	6.8	–	–	–	–	–	–	–
Atriplex tatarica	–	–	–	–	–	–	–	–	–	–	9.1	–	–	–	–	41.3
Cardaria draba	25.4	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Centaurea diffusa	–	–	–	–	–	–	4.8	55.3	–	–	–	–	–	10.2	–	–
Hordeum bulbosum	–	–	–	–	–	–	–	80.0	–	–	–	–	–	–	–	–
Anisantha tectorum	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	28.5
Lepidium ruderale	–	–	–	–	–	43.3	–	–	–	–	–	–	–	–	–	–
Aegilops cylindrica	–	–	–	–	34.1	–	–	–	–	–	–	–	–	–	–	–
Diplotaxis muralis	–	–	–	–	–	–	–	–	17.4	–	–	31.8	–	–	–	–
Hordeum murinum	22.8	–	–	–	–	26.3	–	–	–	–	–	11.1	–	–	–	–
Sisymbrium altissimum	39.1	–	–	–	–	-	–	–	–	–	–	–	–	–	–	80.9
Sisymbrium loeselii	32.9	9.7	–	–	–	–	–	–	–	–	4.1	–	–	51.4	12.9	–
Leopoldia comosa	26.6	–	–	–	–	–	–	–	32.2	–	–	–	–	–	-	–
Lolium perenne	–	31.7	27.1	–	–	–	–	–	–	–	–	–	–	–	23.8	–
Chamomilla suaveolens	–	14.1	32.8	–	–	–	–	–	–	–	–	–	–	–	38.3	–
Asperugo procumbens	–	–	–	–	71.3	34.2	–	–	–	–	–	–	–	–	–	–
Conium maculatum	–	–	–	–	25.7	–	–	–	–	–	–	–	25.7	–	–	–
Sisymbrium officinale	–	8.4	–	–	–	60.1	–	–	–	–	–	–	–	–	25.8	–
Achillea setacea	–	–	–	–	–	25.3	–	–	–	–	–	–	34.4	–	–	–
Urtica dioica	–	15.5	–	11.7	–	–	–	57.7	–	–	1.2	–	–	–	29.4	–
Erodium cicutarium	14.6	–	–	–	–	–	–	52.1	52.1	–	–	–	–	–	–	–
Anisantha sterilis	–	–	–	–	–	–	4.2	45.7	15.5	1.0	–	–	–	–	–	–
Bromus squarrosus	–	–	–	–	47.0	47.0	–	–	–	–	–	–	–	–	–	–

Numbers of associations: 33 – *Hordeo murini-Peganetum harmalae*; 34 – *Hyoscyamo nigri-Malvetum neglectae*; 35 – *Malvetum pusillae*; 36 – *Artemisietum annuae*; 37 – *Asperugetum procumbentis*; 38 – *Chamaeplietum officinalis*; 39 – *Cirsio-Lactucetum serriolae*; 40 – *Cirsio incani-Sisymbrietum orientalis*; 41 – *Diplotaxio muralis-Erodietum cicutarii*; 42 – *Conyzo canadensis-Lactucetum serriolae*; 43 – *Ivaetum xanthiifoliae*; 44 – *Lactuco serriolae-Diplotaxietum tenuifoliae*; 45 – *Matricarietum perforatae*; 46 – *Sisymbrietum loeselii*; 47 – *Descurainietum sophiae*; 48 – *Sisymbrietum altissimi*