



Original Contribution

PLANT AND HABITAT DIVERSITY OF THE RILSKO KORITO VALLEY

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ABSTRACT

A study has been conducted of the plant biodiversity of the vascular plants in the Rilsko Korito valley. As a result, there were established 81 families, 327 genera and 639 vascular plant species. The floristic analysis performed determined the floristic elements, biological type and floristic complex of the examined local flora. The performed research managed to establish 1 Bulgarian endemite *Muscari vandasii* Velen. and 16 Balcan endemites. Eight species with conservation statuses were confirmed: critically endangered (CR) - *Dactylorhiza kalopissii* subsp. *macedonica* (J. Holz. & Kunkele) Kreutz, endangered (EN) – *Epipactis palustris* (L.) Crantz, *Ophrys apifera* Huds., vulnerable (VU) - *Anacamptis pyramidalis* (L.) Rich., *Orchis laxiflora* Lam. subsp. *palustris* (Jacq.) Bornm. et Lay., data-deficient (DD) - *Typha schuttleworthii* Koch. et Sond., least concern (LC) - *Fritillaria pontica* Wahlenb. and *Ficus carica* L. There were also 189 medicinal species were also determined (33.7% of the total number of species).

Key words: floristic analysis, habitats, vascular flora

INTRODUCTION

The Rilsko Korito valley (Kocherinovsko plain) is located in the lower course of the Rilska River (**Figure 1**). From north to east, it is surrounded by the Rila mountain. From west to south-west, the valley borders the valley of another river – Struma. The Rilsko Korito valley's altitude is 370 m and its area is 19 km². The average, annual rainfalls here are 540 mm. The average annual temperature is 11.8° C. The area's maximum precipitation is during the fall and the minimum precipitation is during the winter. The snow cover in this area stays on average for 25 days per annum. The upper river terraces of the Rilsko Korito valley have a Pliocene basis. All terraces are covered with alluvial deposits. The climate here is transitional continental, with mild winters and hot summers. The soils in the valley are alluvial and meadow-cinnamon. The climate conditions of this area are suitable for growing tobacco, cereal production, vegetable production,

orchards, viticulture and stock-raising. Most definitely, as per the above-mentioned characteristics, the first experimental station and fields for tobacco research in Bulgaria were established here in 1924. The current vegetation in this area is a derivative one and is comprised of agro-phytocenoses and meadows, replacing the precedent forests of *Quercus pubescens* Willd. and *Q. virgilliana* (Ten.) Ten.

In this area, the Rilska River has the following tributaries. From its right, there is the Rilitsa River tributary and from the left – the Grychkovets, Bukovets and Budovets Rivers. The Rilska River water is alkaline, sulphate, hydro-carbonate, fluorite and has a mineralization of 0.93 mg/l. The surface of the valley has a slope of around 8- 15 °, leaning towards southwest. The meadows and agricultural areas are abundantly irrigated with water coming from the numerous micro-dams and catchments in the Rila Mountains. Many irrigation facilities (canals) have been built here. The natural slope of the terrain was also used to get this water to all its points.

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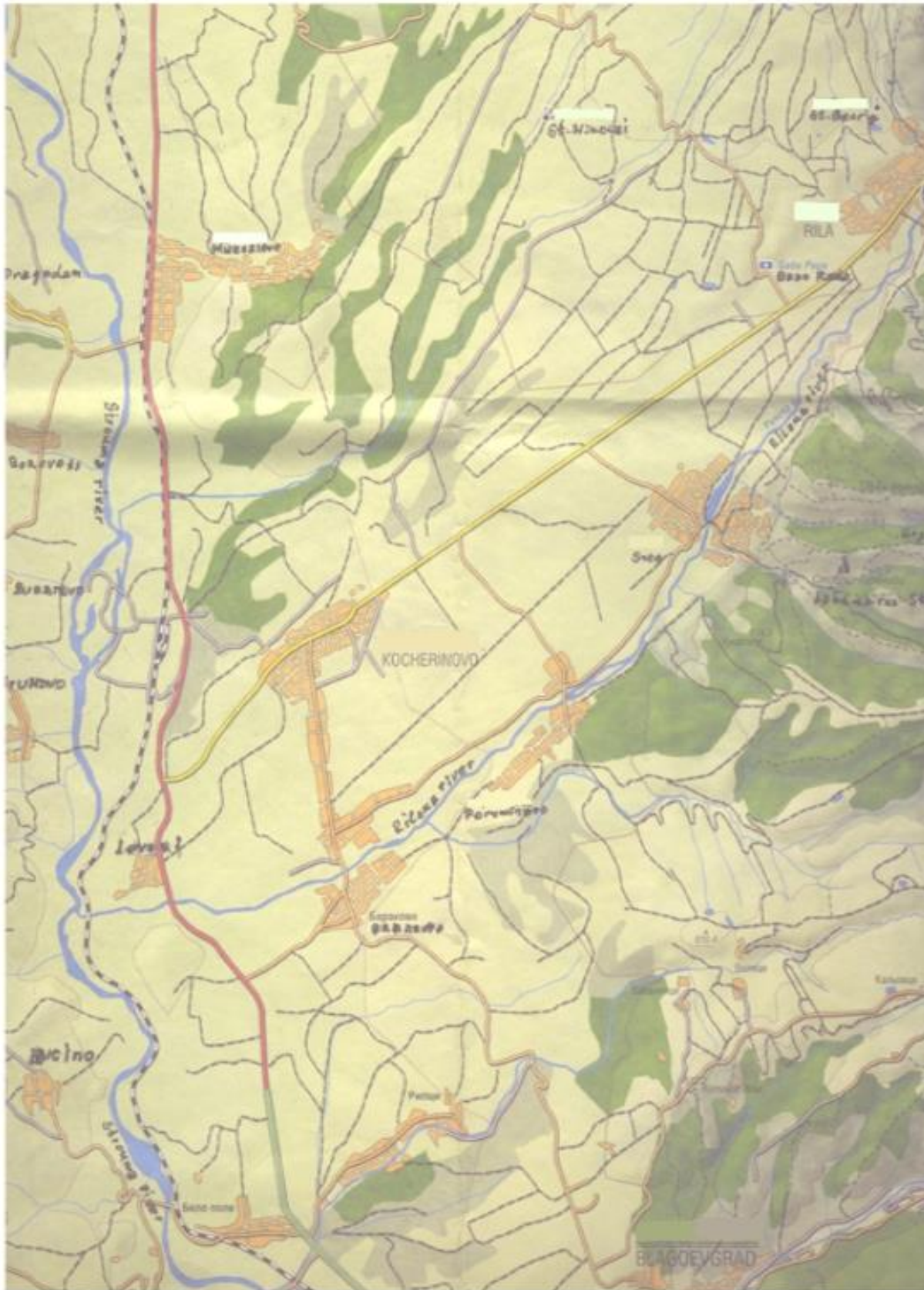


Figure 1. Map of the lower river basin of Rilska River

MATERIAL AND METHODS

For this research, the route and test-sites methods were used. The floristic material was determined according to Jordanov (1), Velchev (2), Kozuharov (3), Delipavlov (4) and Peev (5). The habitats were determined according to (6) and species with conservation statuses are of (7). The floristic elements were determined according to (8) and the biological type of the species was determined according to (9). The herbarium materials have been deposited in the Herbarium of IBER (SOM). The research of this local flora has taken place from 1982 until 2021.

RESULTS AND DISCUSSION

Until now, the plant diversity of the Rilsko Korito valley has not been thoroughly researched. So far, there have been individual records for specific, separate vascular species: Janev(10), Dimitrov & Pavlova (11), Dimitrov & Vutov (12), Kalnikova & Palpurina (13), Vutov & Dimitrov (14), Vladimirov & al. (15), Dimitrov (16). The taxonomical structure of the vascular flora of the researched area contains 639 vascular plant species, from 327 genera and 81 families. The plant division with the biggest representation is *Magnoliophyta* with 574 species, 297 genera and 83 families. *Polypodiophyta* is represented by 8 species, 7 genera and 5 families. *Pinophyta* – 5 species, 5 genera and 3 families, *Equisetophyta* – 1 species, 1 genus and 1 family and *Bryophyta* – 3 species, 3 genera and 3 families. The *Dicotyledonae* class has been predominantly represented here with 58 families, 233 (77.59%) genera and 459 (77.49%) species. *Monocotyledonae* is represented with 12 families, 65 (21%) genera and 116 (19.62%) species.

Spectrum of the family participants in the Rilsko Korito valley

The family with most numerous genera and species is *Asteraceae* – 42 genera and 89 species. It is followed by: *Poaceae* 39 and 67, *Caryophyllaceae* 18, 40, *Fabaceae* 16, 53, *Apiaceae* 22, 27, *Brassicaceae* 18, 24, *Lamiaceae* 16, 27, *Rosaceae* 11, 22, *Boraginaceae* 9, 14, *Scrophulariaceae* 6, 16, *Liliaceae* 8, 11, *Cyperaceae* 6, 19, *Polygonaceae* 4, 20, *Dipsacaceae* 4 ,6, *Papaveraceae* 4, 4, *Ranunculaceae* 3, 10, *Chenopodiaceae* 3, 8 , *Solanaceae* 3, 5, *Primulaceae* 3, 5, *Malvaceae* 3,

5, *Betulaceae* 3, 3, *Orchidaceae* 5, 5, *Rubiaceae* 3, 13, *Geraniaceae* 2, 8, *Juncaceae* 2, 7, *Salicaceae* 2, 4, *Aspleniaceae* 2, 3, *Valerianaceae* 2, 4, *Onagraceae* 3, 7, *Caprifoliaceae* 2, 3, *Iridaceae* 2, 3, *Pinaceae* 5, 5, *Fagaceae* 2, 5, *Santalaceae* 2, 2, *Saxifragaceae* 2, 2, *Moraceae* 2, 2, *Oleaceae* 2, 2, *Euphorbiaceae* 1, 10, *Crassulaceae* 1, 6, *Campanulaceae* 2, 7, *Plumbaginaceae* 2, 2, *Amaranthaceae* 1, 4, *Plantaginaceae* 1,4, *Violaceae* 1, 4, *Hypericaceae* 1, 4, *Aceraceae* 1, 2, *Equisetaceae* 1, 2, *Celastraceae* 1, 2, *Cornaceae* 1, 2, *Cuscutaceae* 1,3, *Lemnaceae* 1, 2, *Linaceae* 1, 2, *Typhaceae* 1,2. There are 26 families with 1 genus and 1 species: *Fontinalaceae* , *Grimmiaceae*, *Pottiaceae*, *Aspidiaceae*, *Athyriaceae*, *Polypodiaceae*, *Selaginellaceae*, *Cupressaceae*, *Taxodiaceae*, *Alismataceae*, *Apocynaceae*, *Araliaceae*, *Aristolochiaceae*, *Asparagaceae*, *Balsaminaceae*, *Buddlejaceae*, *Callitrichaceae*, *Cannabaceae*, *Cistaceae*, *Commelinaceae*, *Gentianaceae*, *Juglandaceae*, *Phytolaccaceae*, *Ulmaceae*, *Urticaceae* and *Zygophyllaceae*.

The genera with the biggest numbers of species are the following: *Trifolium* 18, *Centaurea* 13, *Carex* 12, *Euphorbia* 11, *Poa* 9, *Galium* 11, *Veronica* 9, *Vicia* 8, *Silene* 9, *Ranunculus* 8, *Rumex* 8, *Geranium* 7, *Bromus* 7, *Cerastium* 6, *Juncus* 6, *Sedum* 6, *Campanula* 6, *Achillea* 5, *Alyssum* 5, *Medicago* 5, *Potentilla* 5, *Amaranthus* 4, *Artemisia* 4, *Crepis* 4, *Dianthus* 4, *Epilobium* 4, *Festuca* 4, *Hieracium* 4, *Hypericum* 4, *Myosotis* 4, *Plantago* 4, *Prunus* 4, *Quercus* 4, *Rubus* 4, *Verbascum* 4, *Viola* 4, *Agrostis* 3, *Allium* 3, *Anchusa* 3, *Anthriscus* 3, *Asparagus* 3, *Astragalus* 3, *Atriplex* 3, *Bidens* 3, *Chenopodium* 3, *Cirsium* 3, *Cuscuta* 3, *Echinops* 3, *Agrostis* 3, *Allium* 3, *Filago* 3, *Koeleria* 3, *Lactuca* 3, *Lamium* 3, *Lathyrus* 3, *Linaria* 3, *Malva* 3, *Polygonum* 3, *Salix* 3, *Stachys* 3, *Stellaria* 3, *Taraxacum* 3. (Figure 2).

The number of genera represented with 2 species in this local flora are 63. The number of genera represented with only 1 species is 207.

Within the spectrum of the species (in terms of biological type), it is the hemicryptophytes (H) that are predominant – 258 (46.15%), followed by therophytes (Th) 164 (29.3%), annual 33 (5.9%), bushes (Ph) 22 (3.9%), bi-annual 21 (3.75%), trees (PH) 18 (3.22%), hemi-bushes 2 (0.35%) and perennial-bushes 1 (0.17%).

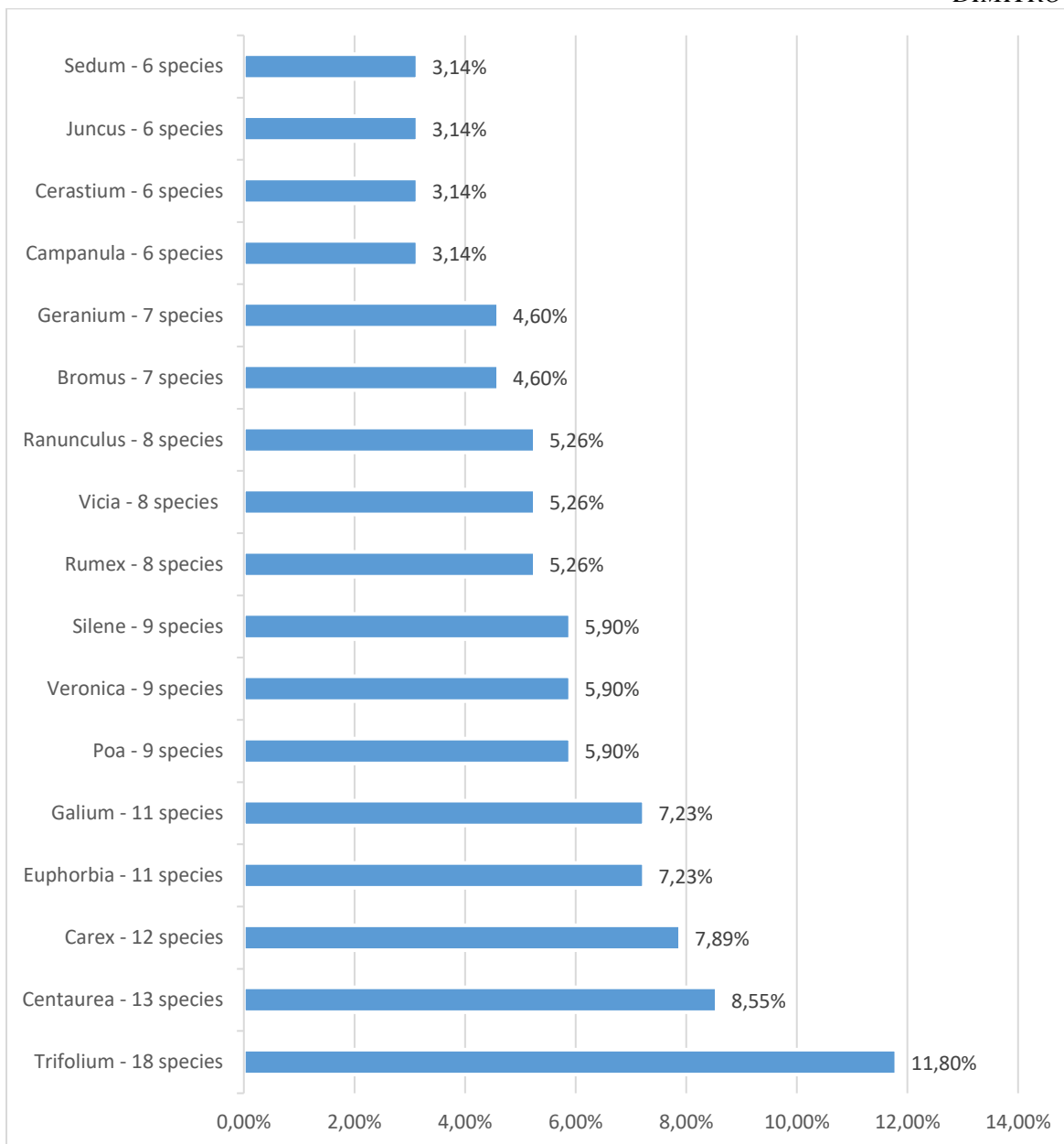


Figure 2. Spectrum of the genera with the most species in the flora of the Rilsko Korito valley

The floristic complex (endemic and relic species) is the following: 1 Bulgarian endemite *Muscari vandasii* Velen. and 16 Balkan endemites - *Achillea clypeolata* Sm., *Alyssum corymbosoides* Formanek, *Anthemis macedonica* Boiss., *Campanula scutellata* Griseb., *Campanula sphaerotherix* Griseb., *Centaurea rutifolia* Sm., *Cephalaria flava* (Sm.) Szabo, *Cerastium rectum* Friv. subsp. *petricola* Pancic, *Dactylorhiza kalopissii* subsp. *macedonica* (J. Holz. &

Kunkele) Kreutz, *Galium rigidifolium* Krendl, *Koeleria simonkaii* Adamovic, *Onobrychis degenii* Dorfl., *Scabiosa triniifolia* Friv., *Silene frivaldszkyana* Hampe, *Trifolium pignanii* Faushe & Chaub., *Verbascum roripifolium* (Halaczy) K. Ferguson.

In terms of relic species of this local flora, the following tertiary relics have been found: *Pinus nigra* Arnold, *Acer campestre* L., *Acer monspessulanum* L., *Hedera helix* L., *Alnus*

glutinosa (L.) Gartner, *Betula pendula* Roth, *Cardamine graeca* L., *Campanula lingulata* Waldst. & Kit., *Colutea arborescens* L., *Juglans regia* L., *Lycopus europaeus* L., *Fraxinus ornus* L., *Leersia oryzoides* (L.) Sw., *Clematis vitalba* L., *Sorbus aria* (L.) Crantz, *Populus nigra* L., *Salix alba* L., *Salix fragilis* L., *Salix purpurea* L., *Comandra elegans* (Rochel ex Rchb.) Rchb. f., *Ulmus minor* Mill.

DIMITROV D.

The spectrum of the floristic elements in this area shows predominantly Eur-As with 90 species, Eur-Med 77, Sub Med 74, Kos 40, Eur-Sib 36, Boreal 35, sub Boreal 23, Eur 22, Med 21, Bal 17, Eur-sub Med 8, Med-As, sub Med-As and S Pont c 5, Eur-Med-Cas, Bal-Anat c 5, Eur-OT, Ap-Bal, Pont, Med-Cas, sub Bal c 3, Pont-Cas, Bal-Dac, Pont-sub Med, Pont-Sib c 2, Atl-Med, Bal-Dac-Anat, Bul, Bal-Aeg, Pont-OT, Pont-Bal, Med-OT, Pont-As and CAs c 1 with 1 species. (Figure 3).

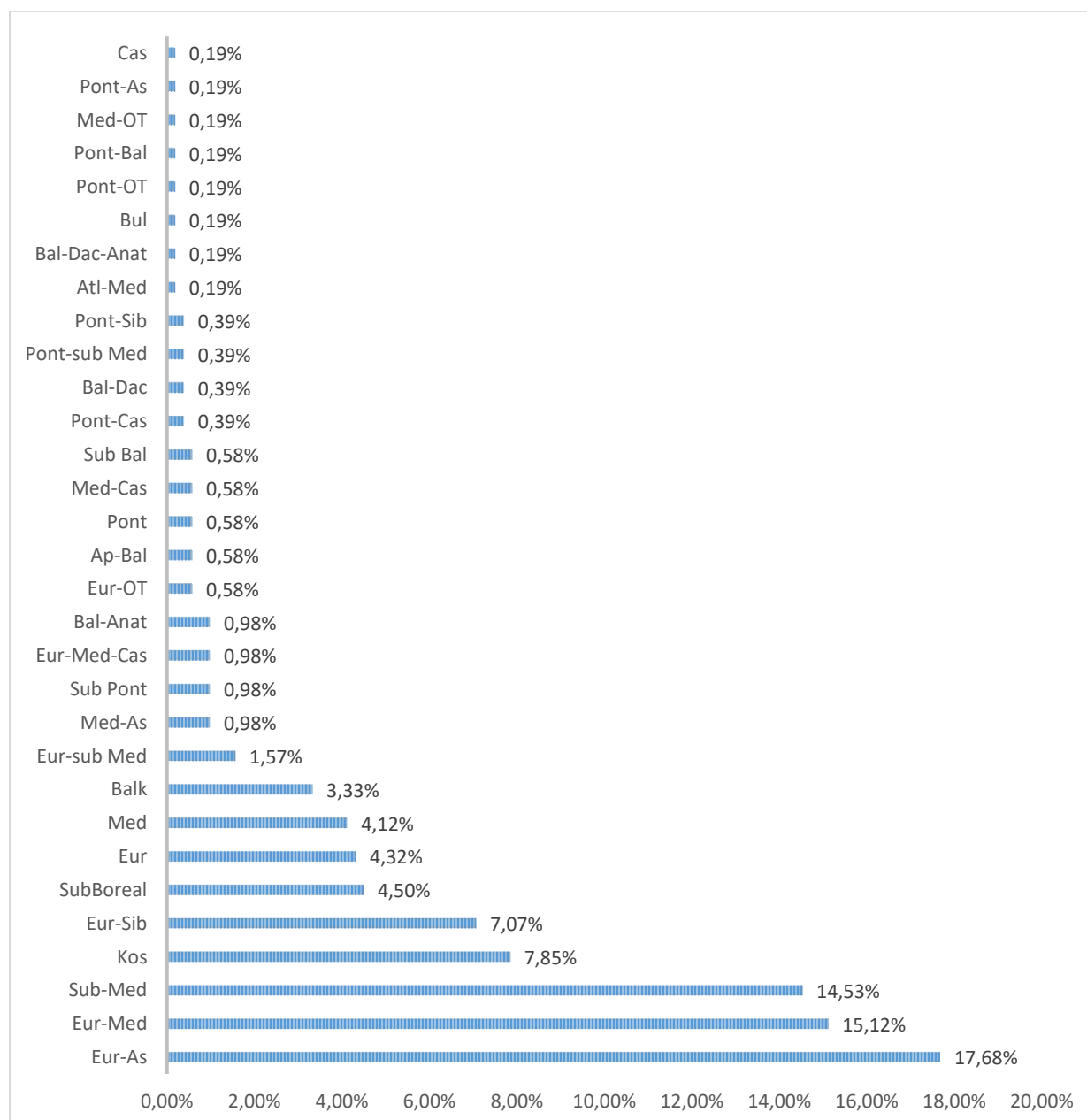


Figure 2. Spectrum of the species of the vascular flora of the Rilsko Korito valley, in terms of geoelements

The weed species in the vegetable gardens in the Rilsko Korito valley are 29 species: *Abutilon theophrasti* Medicus, *Amaranthus hybridus* L., *A. hypochondriacus* L., *Arenaria leptoclados* (Rchb.) Guss., *Artemisia vulgaris* L., *Berteroa incana* (L.) DC., *Bidens frondosus* L., *B. tripartita* L., *Chondrilla juncea* L., *Chenopodium glaucum* L., *Centaurea rhenana* Boreau subsp. *rhenana*, *Cichorium inthybus* L., *Cirsium arvense* (L.) Scop., *Conyza sumatrensis* (Retz.) E. Walker, *Convolvulus arvensis* L., *Daucus carota* L., *Digitaria sanguinalis* (L.) Scop., *Echinochloa crus-galli* (L.) P. Beauv., *Echium italicum* L., *Galinsoga parviflora* Cav., *Hibiscus trionum* L., *Poa annua* L., *Persicaria hydropiper* (L.) Opiz, *Portulaca oleracea* L., *Setaria pumila* (Poir.) Schult., *Sonchus oleraceus* L., *Torilis arvensis* (Hudson) Link, *Trifolium pratense* L., *Xanthium strumarium* L. subsp. *italicum* (Moretti) D. Love.

The primary vegetation in this area in past used to be deciduous, predominantly downy oak formations (*Quercus pubescens* Willd.) and Turkey oak (*Quercus cerris* L.). Apart from these two tree species, there were also *Ulmus minor* Mill., *Paliurus spina-christi* Mill., *Ligustrum vulgare* L., *Crataegus monogyna* Jacq., *Evonymus europaeus* L., *Clematis vitalba* L., *Prunus avium* L., *Prunus cerasifera* Ehrh. This primary vegetation was slowly cut thousands of years ago by the local human population and was gradually replaced by agrophytocenoses – fields with wheat, oats and rye, sunflower, vineyards, meadows, as well as vegetable and orchard gardens.

The plant habitats in the researched area are 4 types: 15 E2 Moesio-Thracian hay meadows, 143 Common alder forests (*Alneta glutinosae*), HD 92/43 *Salix alba* and *Populus alba* galleries and 34.6344 Heleno-Balkanid andropogonid grass steppes.

HD 92/43 habitat is located along the banks of the Rilska River and its tributaries. It has a vulnerable conservation status [VU – A1, 2 B1 C1 D2 E2 F1 G1 H1 I J L2] (17). The most common habitat here is 15 E2. These wet meadows are artificially irrigated with canals coming from the mountain. This particular habitat has an endangered status [EN – A1, 2 D3 E2 F2 G2 H2 J L2] (18). The wet meadows are mowed every year and certain

vascular plants can be also found here, which are usually found in higher altitudes: *Festuca spectabilis*, *Hieracium caespitosum*, *H. grizebachii*, *H. laurinum*, *Hypochaeris maculata*, *Geranium phaeum*. In the same habitat, the following species with conservation status are found: endangered (EN) – *Dactylorhiza kalopisii* subsp. *macedonica* (J. Holz & Kunkele) Kreutz, *Epipactis palustris* (L.) Crantz and *Ophrys apifera* Huds and vulnerable (VU) – *Anacamptis pyramidalis* (L.) Rich., *Orchis laxiflora* Lam. subsp. *palustris* (Jacq.) Bornm. et Lay. Next to the fork of the road to the village of Stob, the following populations of these three protected species of orchids can be found in an area of 50 daa. Within 1 m², there are 16 individuals from *Orchis laxiflora* subsp. *palustris* – *Juncus lamprocarpus*, *Holcus mollis*, *Lychnis floccuculi*, *Carex cuprina*, *Trifolium pratense*, *Lysimachia vulgaris*, *Ranunculus polyanthemus*, *Juncus articulatus*, *Poa angustifolia*, *Juncus effusus*, *Carex pallescens*, *Agrostis capillaris*, *Equisetum arvense*, *Rumex sanguineum*, *Mentha longifolia*, *Melilotus officinalis*, *Galium palustre*, *Phragmites australis*, *Trifolium michelianum*, *Lotus corniculatus*, *Dipsacus laciniatus*, *Galium verum*, *Oenanthe fistulosa*, *Medicago lupulina*, *Epipactis palustris*, *Calystegia sepium*, *Erigeron annuus*, *Ononis arvensis*, *Gratiola officinalis*, *Agrimonia eupatoria*, *Ophrys apifera*, *Lysimachia nummularia*.

The 34.6344 Heleno-Balkanid andropogonid grass steppes habitat can be found along the river terraces to the west, above the Rilska River. Within this habitat, there are many Mediterranean species which have migrated over the time up north, along the valley of the Struma River: *Vulpia ciliata*, *Spergula pentandra*, *Campanula scutellata*, *Centaurea benedicta*, *Euphorbia barrelieri*, *Trifolium angustifolium*, *Allium sphaerocephalon*, *Parentucelia latifolia*. The conservation status of this habitat is endangered: [EN – A1, 23 E2 F2 G2 H2 J L2] (19).

CONCLUSION

The flora and vegetation of the researched area are characterized with predominantly Eurasian elements, followed by Euro-Mediterranean and sub-Mediterranean species. The endemic species are 16 and the Mediterranean species are 21. The species with conservation statuses are 6. There is

a substantial number of cosmopolitan species – 40, as well as adventitious ones – 25. The latter is due to the close proximity of the area to the “Struma” highway and the local road going to the Rila Monastery. Those main roads are characterized with very heavy car traffic during the whole year. The habitat with the biggest concentration of plant species with conservation value is 15E2 Moesio- Thracian hay meadows. There are three species with endangered status (EN): *Dactylorhiza kalopisii* subsp. *macedonica* (J. Holz & Kunkele) Kreutz, *Epipactis palustris* (L.) Crantz, *Ophrys apifera* Huds. and also, two species with status vulnerable (VU): *Anacamptis pyramidalis* (L.) Rich., *Orchis laxiflora* Lam. subsp. *palustris* (Jacq.) Bornm. et Lay. Hence, I would suggest that the Regional Inspectorate for Environment and Water in Kyustendil take action and declare the habitat of these protected species to be a protected natural area.

List of vascular plants in the Rilsko Korito valley
Bryophyta

Fontinalaceae: *Fontinalis antipyretica* Hedm.,
Grimmiaceae: *Grimmia doniana* Sm.,
Pottiaceae: *Syntrichia ruralis* Brid.

Equisetophyta

Equisetaceae: *Equisetum arvense* L., *E. palustre* L.

Polypodiophyta

Aspleniaceae: *Asplenium adianthum-nigrum* L., *A. trichomanes* L., *Ceterach officinarum* DC.,
Aspidiaceae: *Polystichum aculeatum* (L.) Roth,
Athyriaceae: *Athyrium filix-femina* (L.) Roth,
Cystopteris fragilis (L.) Bernh., **Polypodiaceae:** *Polypodium vulgare* L., **Selaginellaceae:** *Selaginella helvetica* (L.) Spreng.

Pinophyta

Cupressaceae: *Chamaecyparis lawsoniana* (A. Murray) Parl., *Platycladus orientalis* (L.) Franco,
Taxodiaceae: *Sequojadendron giganteum* (Lindley) Buchholz, **Pinaceae:** *Cedrus atlantica* (Endl.) Carriere, *Pinus nigra* Arnold, *Pseudotsuga menziesii* (Murb.) Franco

Magnoliophyta

Aceraceae: *Acer campestre* L., *A. monspessulanum* L., **Alismataceae:** *Alisma plantago-aquatica* L., **Amaranthaceae:**

Amaranthus albus L., *A. hypochondriacus* L., *A. hybridus* L., *A. retroflexus* L., **Anacardiaceae:** *Cotinus coggygria* Scop., **Apiaceae:** *Anetum graveolens* L., *Angelica sylvestris* L., *Anthriscus caucalis* M. Bieb., *A. cerefolium* (L.) Hoffm. var. *longirostris* (Bertol.) Cannon, *A. nitida* (Wahlenb.) Garcke, *Berula erecta* (Huds.) Coville, *Bifora radians* M. Bieb., *Bupleurum falcatum* L., *Chaerophyllum temulentum* L., *Daucus carota* L., *Eryngium campestre* L., *Falcaria vulgaris* Bernh., *Ferulago campestris* (Besser) Grecescu, *Foeniculum vulgaris* Mill., *Heracleum sibiricum* L., *H. ternatum* Velen., *Myrrhoides nodosa* (L.) Cannon, *Oenanthe fistulosa* L., *Orlaja daucoides* (L.) Greuter, *O. grandiflora* (L.) Hoffm., *Pastinaca sativa* subsp. *urens* (Req. ex Godr.) Celak, *Peucedanum aegopodioides* (Boiss.) Vandas, *P. austriacum* (Jacq.) Koch, *Seseli peucedanoides* (M. Bieb.) Koso-Pol., *Smyrniolum perfoliatum* L., *Tordylium maximum* L., *Torilis japonica* (Houtt.) DC., **Apocynaceae:** *Vinca herbacea* Waldst. & Kit., **Araliaceae:** *Hedera helix* L., **Aristolochiaceae:** *Aristolochia clematitis* L., **Asparagaceae:** *Yucca filamentosa* L., **Asteraceae:** *Achillea collina* J. Becker ex Rchb., *A. clypeolata* Sm., *A. coarctata* Poirr. in Lam., *A. pannonica* Scheele, *A. pseudopectinata* Janka, *Anthemis macedonica* Boiss. & Orph. subsp. *macedonica*, *A. macedonica* Boiss. & Orph. subsp. *orbelica* (Pancic) Oberpr., *Arctium lappa* L., *Artemisia absinthium* L., *A. annua* L., *A. campestris* L., *A. vulgaris* L., *Bidens cernuus* L., *B. frondosus* L., *B. tripartitus* L., *Carduus nutans* L. *Carlina vulgaris* L., *Centaurea benedicta* (L.) L., *C. biebersteinii* DC. subsp. *australis* (Panc.) Dostal, *C. calcitrapa* L., *C. degeniana* H. Wagner, *C. cuneifolia* S. et S. subsp. *cuneifolia*, *C. cyanus* L., *C. diffusa* Lam., *C. ovina* Pallas ex Willd., *C. phrygia* L. subsp. *moesiaca* (Urum. & H. Wagner) Hayek, *C. phrygia* L. subsp. *phrygia*, *C. rutifolia*, *C. salonitana* Viss., *C. solstitialis* L., *Chondrilla juncea* L., *Cichorium inthybus* L., *Cirsium arvense* (L.) Scop., *C. creticum* (Lam.) D'Urv., *C. italicum* (Savi) DC., *Conyza canadensis* (L.) Cronquist, *C. sumatrensis* (Retz.) E. Walker, *Cota austriaca* (Jacq.) Sch. Bip., *C. tinctoria* (L.) J. Gay var. *gaudinum-solis* (Velen.) Kuzmanov, *Crepis biennis* L., *C. foetida* L., *C. sancta* (L.) Bab., *C. setosa* Haller f., *Crupina*

vulgaris Cass., *Echinops banaticus* Rochel ex Schrad., *E. ritro* L., *E. sphaerocephalus* L., *Eupatorium cannabinum* L., *Erigeron annuus* (L.) Pers., *Filago arvensis* L., *F. germanica* (L.) Huds., *F. vulgaris* Lam., *Galinsoga parviflora* Cav., *Helianthus tuberosus* L., *Helminthotheca echiodides* (L.) Holub, *Hieracium caespitosum* Dumort. subsp. *caespitosum*, *H. grisebachii* A. Kern., *H. laurinum* Arvet-Tow., *H. praealtum* Vill. ex Goch. subsp. *bauchinii* (Beh) Petmn., *Hypochaeris maculata* L., *H. radicata* L., *Lactuca quercina* subsp. *chaixii* (Vill.) Celak., *L. saligna* L., *L. serriola* L., *Lapsana communis* L., *Leontodon autumnalis* L., *L. crispus* Vill., subsp. *aspermus* (Willd.) Finch. et P. Sell., *Matricaria chamomilla* L., *Onopordum acanthium* L., *O. tauricum* Willd., *Petasites hybridus* (L.) Gaertn., *Picris hieracioides* L. subsp. *hieracioides*, *Pulicaria vulgaris* Gaertn., *Senecio vernalis* Waldst. & Kit., *Silybum marianum* (L.) Gaertn., *Sonchus oleraceus* L., *Symphyotrichum novi-belgii* (L.) G. I. Nesom., *Tanacetum corymbosum* (L.) Sch. Bip., *T. vulgare* L., *Taraxacum hoppeanum* Griseb., *T. officinale* L., *T. simile* group, *Tragopogon orientalis* L., *T. pratensis* L., *Tripleurospermum tenuifolium* (Kit.) Freyn, *Xanthium spinosum* L., *X. strumarium* L. subsp. *italicum* (Moretti) D. Love, *Xeranthemum annuum* L., **Balsaminaceae**: *Impatiens glandulifera* Royle, **Betulaceae**: *Alnus glutinosa* (L.) Gaertner, *Betula pendula* Roth, *Carpinus orientalis* Mill., **Boraginaceae**: *Anchusa officinalis* L., *A. spruneri* Boiss., *Asperugo procumbens* L., *Buglossoides arvensis* (L.) I. M. Johnst., *Cynoglossum hungaricum* Simonk., *Echium italicum* L., *E. vulgare* L., *Heliotropium europaeum* L., *Myosotis nemorosa* Besser, *M. stricta* Link ex Roem. et Schult., *M. sylvatica* Ehrh. ex Hoffm., *M. umbrosa* Bess., *Onosma echiodides* L., *Symphytum officinale* L., **Brassicaceae**: *Alliaria petiolata* (M. Bieb.) Cavara & Grande, *Alyssum alyssoides* L., *A. corymbosoides* Formanek, *A. minutum* Schldtl. ex DC., *A. turkestanicum* Regel & Schmalh., *A. strigosum* Banks et Soland., *Arabidopsis thaliana* (L.) Heynh., *Arabis glabra* (L.) Bernh., *Aurinaria saxatilis* (L.) Desv., *Berteroa incana* (L.) DC., *Calepina irregularis* (Asso) Thell., *Camelina sativa* (L.) Crantz, *Capsella bursa-pastoris* (L.) Medicus, *Cardamine graeca* L., *C. hirsuta* L., *Cardaria draba* (L.) Desv., *Descurainia sophia*

(L.) Webb ex Prantl, *Draba muralis* L., *Erophila verna* (L.) Chevall., *Erysimum diffusum* Ehrh., *Lepidium latifolium* L., *Rorippa prolifera* (Heuff.) Neilr., *R. sylvestris* (L.) Besser subsp. *sylvestris*, *Sisymbrium altissimum* L., *S. orientale* L., *Thlaspi alliaceum* L., **Buddlejaceae**: *Buddleja davidii* Franchet, **Callitrichaceae**: *Callitriche stagnalis* Scop., **Campanulaceae**: *Campanula lingulata* Waldst. & Kit., *C. patula* L. subsp. *patula*, *C. persicifolia* L., *C. scutellata* Griseb., *C. sphaerothrix* Griseb., *C. trachelium* L. subsp. *athoa* (Boiss. & Heldr.) Hay., *Jasione heldreichii* Boiss. & Orph. in Boiss. var. *microcephala* Velen., **Cannabaceae**: *Humulus lupulus* L., **Caprifoliaceae**: *Sambucus ebulus* L., *S. nigra* L., *Viburnum opulus* L., **Caryophyllaceae**: *Agrostemma githago* L., *Arenaria leptocladus* (Rchb.) Guss., *A. serpyllifolia* L. var. *viscida* DC., *Cerastium fontanum* Baumg., *C. glomeratum* Thuill., *C. luridum* Guss., *C. pumilum* Curtis subsp. *pallens* (Schult.) Schinz et Thell., *C. rectum* Friv., *C. tenoreanum* Ser., *Cucubalus baccifer* L., *Dianthus armeria* L. subsp. *armeria*, *D. moesiacus* Vis. & Pancic, *D. pinifolius* Sm. subsp. *rumelicus* (Vel.) Stoj. et Acht., *D. superbus* L., *Herniaria glabra* L. subsp. *nebrodensis* Jan ex Nym. var. *nebrodensis*, *Holosteum umbellatum* L. var. *glabratum* O. Kuntze, *Lychnis coronaria* (L.) Desv., *L. flos-cucculi* L., *Minuartia viscosa* (Schreb.) Schinz. et Thell., *Moenchia graeca* Boiss. & Heldr., *M. mantica* (L.) Bartl., *Myosoton aquaticum* (L.) Moench, *Petrorhagia prolifera* (L.) P. W. Ball & Heywood, *P. saxifraga* (L.) Link, *Sagina apetala* Ard., *Saponaria officinalis* L., *Scleranthus collinus* Hornung ex Opiz, *S. perennis* L., *Silene alba* (Mill.) E. Krause, *S. conica* L., *S. dichotoma* Ehrh., *S. frivaldszkyana* Hampe, *S. gallinyi* Rchb., *S. italica* (L.) Pers., *S. otites* (L.) Wibel, *S. roemeri* Friv., *S. vulgaris* (Moench) Garcke, *Spergula pentandra* L., *Stellaria alsine* Grimm., *S. graminea* L., *S. media* (L.) Vill. var. *apetala* Speg., **Celastraceae**: *Evonymus europaeus* L., *E. verrucosus* Scop., **Cistaceae**: *Helianthemum salicifolium* (L.) Mill., **Chenopodiaceae**: *Atriplex hastata* L., *A. oblongifolia* W. et K., *A. patula* L., *Chenopodium album* L., *Ch. botrys* L., *Ch. glaucum* L., *Ch. polyspermum* L., *Polycnemum majus* A. Br., **Commelinaceae**: *Commelina communis* L., **Cornaceae**: *Cornus mas* L., *C. sanguinea* L., **Crassulaceae**: *Sedum annuum* L.,

S. caespitosum (Cav.) DC., *S. cepaea* L., *S. hispanicum* L., *S. maximum* (L.) Suter, *S. urvillei* DC., **Cupressaceae**: *Platycladus orientalis* (L.) Franco, **Cuscutaceae**: *Cuscuta approximata* Bab., *C. campestris* Yunck., *C. planiflora* Ten., **Cyperaceae**: *Carex caryophyllea* Latourr., *C. distans* L., *C. echinata* Murr., *C. flacca* Schreb., *C. hirta* L., *C. muricata* L., *C. ovalis* Good., *C. pallescens* L., *C. praecox* Schreb., *C. remota* L., *C. spicata* Huds., *C. vesicaria* L., *Cyperus fuscus* L., *C. monti* L., *Eleocharis palustris* (L.) R. Br., *Picreus serotinus* (Rottb.) Hay., *Schoenoplectus lacustris* (L.) Palla, *Sch. mucronatus* (L.) Palla, *Scirpus sylvaticus* L., **Dipsacaceae**: *Cephalaria flava* (Sm.) Szabo, *C. transsilvanica* (L.) Roem. & Schult., *Dipsacus laciniatus* L., *Knautia arvensis* (L.) Coult., *Scabiosa argentea* L., *S. triniifolia* Friv., **Euphorbiaceae**: *Euphorbia barrelierii* Savi, *E. chamaesyce* L., *E. cyparissias* L., *E. esula* L. subsp. *esula*, *E. esula* L. subsp. *thomassiniana* Bertol. var. *thomassiniana*, *E. helioscopia* L., *E. lathyris* L., *E. nicaeensis* All. subsp. *niccaensis*, *E. niciciana* Borb. f. *niciciana*, *E. palustris* L., **Fabaceae**: *Albizzia julibrissin* Durazz., *Astragalus glycyhillos* L., *A. cicer* L., *A. onobrychis* L., *Colutea arborescens* L., *Coronilla emerus* L. subsp. *emeroides* (Boiss. & Spruner) Hayek, *C. varia* L., *Dorycnium herbaceum* Vill., *Galega officinalis* L., *Genista tinctoria* L. var. *virgata* Koch, *G. lydia* Boiss., *Lathyrus cicera* L. var. *cicera*, *L. laxiflorus* (Des.) Kuntze, L., *L. pratensis* L., *Lotus corniculatus* L., *Medicago arabica* (L.) Huds., *M. falcata* L., *M. lupulina* L., *M. minima* (L.) Bartal. var. *minima*, *M. rigidula* (L.) All. var. *glandulosa*, *Melilotus alba* Medicus, *M. officinalis* (L.) Pall., *Onobrychis degenii* Dorfl., *Ononis arvensis* L., *Robinia pseudoacacia* L., *Sophora japonica* L., *Trifolium alpestre* L., *T. angustifolium* L., *T. arvense* L., *T. aureum* Pollich, *T. campestre* Schreb., *T. dubium* Sibth., *T. hirtum* All., *T. hybridum* L. subsp. *hybridum*, *T. incarnatum* L., *T. michelianum* Savi var. *michelianum*, *T. pignanii* Fauche & Chaub., *T. pratense* L., *T. purpureum* Loisel., *T. repens* L., *T. retusum* L., *T. scabrum* L., *T. striatum* L. subsp. *striatum*, *T. strictum* L., *Vicia grandiflora* Scop., *V. hirsuta* (L.) Gray, *V. lathyroides* L., *V. melanops* Sm., *V. pannonica* Crantz subsp. *striata* (M. B.) Nyman, *V. tetrasperma* (L.) Schreb., *V. varia* Host., *V. villosa* Roth

var. *monticola* Stoj., *Wisteria sinensis* (Sims) Sweet, **Fagaceae**: *Castanea sativa* Miller, *Quercus longipes* Stev., *Q. pubescens* Willd., *Q. rubra* L., *Q. virgiliana* (Ten.) Ten., **Gentianaceae**: *Centaurium erythraea* Raf., **Geraniaceae**: *Erodium cicutarium* (L.) Her., *Geranium brutium* Gasp., *G. columbinum* L., *G. lucidum* L., *G. molle* L., *G. phaeum* L., *G. pyrenaicum* Burm., *G. rotundifolium* L., **Haloragaceae**: *Myriophyllum spicatum* L., **Hypericaceae**: *Hypericum calycinum* L., *H. olympicum* L., *H. perforatum* L., *H. rumeliacum* Boiss., **Iridaceae**: *Crocus chrysanthus* (Herbert) Herbert, *Iris pseudacorus* L., *I. suaveolens* Boiss. & Reut., **Juglandaceae**: *Juglans regia* L., **Juncaceae**: *Juncus articulatus* L., *J. compressus* Jacq., *J. effusus* L., *J. gerardii* Loisel., *J. inflexus* L., *J. tenuis* Willd., *Luzula forsteri* (Sm.) DC., **Lamiaceae**: *Acinos arvensis* (L.) Dandy, *A. suaveolens* (Sm.) Don, *Ajuga genevensis* L., *Ballota nigra* L., *Calamintha sylvatica* Bromf., *Clinopodium vulgare* L., *Galeopsis bifida* Boenn., *Glechoma hederacea* L., *Lamium amplexicaule* L., *L. garganicum* L., *L. purpureum* L., *Lycopus europaeus* L., *Marrubium peregrinum* L., *M. vulgare* L., *Mentha aquatica* L., *M. spicata* L. subsp. *tomentosa* (Briq.) Harley, *Salvia sclarea* L., *S. verticillata* L., *Scutellaria altissima* L., *S. galericulata* L., *Stachys cassia* (Boiss.) Boiss., *S. palustris* L., *S. recta* L., *Teucrium chamaedrys* L., *T. polium* L., *Thymus callieri* Borbas ex Velen. subsp. *callieri*, *T. sibthorpii* Benth. var. *sibthorpii*, **Lemnaceae**: *Lemna gibba* L., *L. minor* L., **Liliaceae**: *Allium rotundum* L., *A. scorodoprasum* L., *A. sphaerocephalon* L., *Asparagus officinalis* L., *A. verticillatus* L., *Colchicum autumnale* L., *Fritillaria pontica* Wahlenb. LC, BDA, *Gagea arvensis* (Pers.) Dumort., *Muscari vandasii* Velen., *Ornithogalum kochii* Parl., *Scilla bifolia* L., **Linaceae**: *Linum austriacum* L., *L. bienne* Mill., **Malvaceae**: *Abutilon theophrasti* Medicus, *Hibiscum trionum* L., *Malva neglecta* Wallr., *M. nicaeensis* All., *M. sylvestris* Mill., **Moraceae**: *Ficus carica* L., *Morus alba* L., **Oleaceae**: *Fraxinus ornus* L., *Ligustrum vulgare* L., **Onagraceae**: *Circaea luteciana* L., *Epilobium hirsutum* L., *E. obscurum* Schreb., *E. parviflorum* Schreb., *E. roseum* Schreb. subsp. *subsessilis* (Boiss.) Raven, *Oenothera biennis* L., *O.*

glazioviana Micheli, **Orchidaceae**: *Anacamptis pyramidalis* (L.) Rich., *Dactylorhiza kalopisii* E. Nelson subsp. *macedonica* *Epipactis palustris* (L.) Crantz EN, BDA, CITES, *Ophrys apifera* Huds. var. *flavescens* EN, BDA, CITES, *Orchis laxiflora* Lam. subsp. *palustris* (Jacq.) Bornm. et Lay VU, BDA, CITES, **Papaveraceae**: *Chelidonium majus* L., *Corydalis solida* (L.) Swartz var. *caucasica* (DC.) D. Jord. et Koz., *Fumaria rostellata* Knaf, *Papaver rhoeas* L., **Phytolaccaceae**: *Phytolacca americana* L., **Plantaginaceae**: *Plantago lanceolata* L. var. *eriophylla* Decne. in DC., *P. major* L., *P. scabra* Moench., *P. subulata* L., **Plumbaginaceae**: *Plumbago europaea* L., *Goniolimon tataricum* (L.) Boiss., **Poaceae**: *Achnatherum bromoides* (L.) Beauv., *Aegilops cylindrica* Host., *A. neglecta* Req. ex Bertol., *Agrostis capillaris* L., *A. castellana* Boiss., *A. verticillata* Vill., *Aira elegantissima* Schur, *Alopecurus myosuroides* Huds., *A. pratensis* L., *Anthoxanthum odoratum* L., *Brachypodium sylvaticum* (Huds.) P. Beauv., *Bromus arvensis* L., *B. intermedius* Guss., *B. mollis* L., *B. secalinus* L., *B. squarrosus* L., *B. sterilis* L., *B. tectorum* L., *Calamagrostis epigeios* (L.) Roth, *Chrysopogon gryllus* (L.) Trin., *Cleistogenes serotina* (L.) Keng, *Cynodon dactylon* (L.) Pers., *Cynosurus cristatus* L., *C. echinatus* L., *Dactylis glomerata* L., *Dasypyrum villosum* (L.) Cand., *Dichanthium ischaemum* (L.) Roberty, *Digitaria sanguinalis* (L.) Scop., *Echinochloa crus-galli* (L.) P. Beauv., *Eleusine indica* (L.) Gaertn., *Elymus hispidus* (Opiz) Melderis, *Festuca dalmatica* Hack., *F. gigantea* (L.) Vill., *F. nigrescens* Lam., *F. spectabilis* Jan. subsp. *affinis* (Boiss. et Heldr. ex Hack.) Hack., *Glyceria fluitans* (L.) R. Br., *Holcus mollis* L., *Hordeum murinum* L., *Koeleria nitidula* Velen., *K. obscura* (Velen.) Kozuharov, *K. simonkaii* Adamovic, *Leersia oryzoides* (L.) Sw., *Lolium rigidum* Gaudin, *Melica ciliata* L., *M. uniflora* Retz., *Milium effusum* L., *Phleum graecum* Boiss. & Heldr., *Ph. phleoides* (L.) Karst., *Phragmites australis* (Cav.) Trin. ex Steud., *Poa angustifolia* L., *P. annua* L., *P. bulbosa* L. var. *vivipara* Koeler, *P. compressa* L., *P. nemoralis* L., *P. pratensis* L., *P. sylvicola* Guss., *P. timoleontis* Heldr. ex Boiss., *P. trivialis* L., *Psilurus incurvus* (Gouan) Schinz & Thell., *Sclerochloa dura* (L.) P. Beauv., *Setaria italica* (L.) Beauv., *S. pumila* (Poir.) Schult., *Sorghum halepense* (L.) Pers.,

Stipa capillata L., *Tragus racemosus* (L.) All., *Vulpia ciliata* Dumort., *V. myurus* (L.) C. C. Gmel., **Polygonaceae**: *Falopia bochemica* (Chrtek & Chrtekova) P. Baylei, *Persicaria hydropiper* (L.) Opiz, *P. minor* (Huds.) Opiz, *Polygonum arenastrum* Boreau, *P. patulum* Bieb., *P. rurivagum* Jord. Ex Boreau, *Rumex acetosa* L., *R. acetosella* L., *R. conglomeratus* Murr., *R. crispus* L., *R. hydrolapatum* Hudson, *R. patientia* L., *R. pulcher* L., *R. sanguineus* L., **Primulaceae**: *Cyclamen hederifolium* Aiton., *Lysimachia atropurpurea* L., *L. nummularia* L., *L. vulgaris* L., *Primula veris* L., **Ranunculaceae**: *Clematis vitalba* L., *Consolida hispanica* (Costa) Greuter & Burdet, *C. regalis* Gray, *Ranunculus acris* L., *R. ficaria* L. subsp. *calthifolia* (Reichenb.) Arcang. var. *pumila* (Vel.) Stoj. & Stef., *R. millefoliatus* Vahl, *R. oxyspermus* Willd., *R. polyanthemus* L., *R. repens* L., *R. rumelicus* Griseb., *R. strigosus* Schur, **Rhamnaceae**: *Paliurus spina-christi* Mill., **Rosaceae**: *Agrimonia eupatoria* L., *Aremonia agrimonoides* (L.) DC., *Crataegus monogyna* Jacq., *Malus sylvestris* Mill., *Potentilla argentea* L., *P. laciniosa* Waldst. & Kit. ex Nestl., *P. micrantha* Ramond ex DC., *P. neglecta* Baumg., *P. reptans* L., *Prunus avium* L., *P. cerasifera* Ehrh., *P. mahaleb* L., *P. spinosa* L., *Pyrus pyraeaster* Burgsd., *Rosa arvensis* Huds., *R. corymbifera* Borkh., *Rubus caesius* L. var. *arvalis* Reichenb., *R. discolor* Weihe et Nees, *R. sanguineus* Friv., *R. thyrsanthus* Focke, *Sanguisorba minor* Scop., *Sorbus aria* (L.) Cranz, **Rubiaceae**: *Asperula aristata* L., *Cruciata laevipes* Opiz, *C. pedemontana* (Bellardi) Ehrend., *Galium album* Mill., *G. aparine* L., *G. lucidum* All., *G. matteji* (M. Bald.) Hayek, *G. palustre* L., *G. rigidifolium* Krendl., *G. rivale* (Sm.) Griseb., *G. schultesii* Vest., *G. spurium* L., *G. uliginosum* L., *G. verum* L., **Salicaceae**: *Populus nigra* L., *Salix alba* L., *S. fragilis* L., *S. purpurea* L., **Santalaceae**: *Comandra elegans* (Rochel ex Rchb.) Rchb. f., *Thesium linophyllum* L., **Saxifragaceae**: *Chrysosplenium alternifolium* L., *Saxifraga rotundifolia* L., *S. tridactylites* L., **Scrophulariaceae**: *Gratiola officinalis* L., *Linaria genistifolia* (L.) Mill., *L. pelleriana* (L.) Mili., *Odontites serotina* (Lam.) Dumort., *Parentucelia latifolia* (L.) Caruel, *Verbascum longifolium* Ten. subsp. *pannosum* (Vis.) Murb., *V. niveum* Ten., *V. phoeniceum* L., *V.*

roripifolium (Halaczy) K. Ferguson, *Veronica acinifolia* L., *V. anagallis-aquatica* L. subsp. *anagallis-aquatica*, *V. arvensis* L. f. *arvensis*, *V. beccabunga* L., *V. chamaedrys* L., *V. hederifolia* L., *V. polita* Fries, *V. serpillifolia* L., *V. triphyllos* L., **Solanaceae**: *Datura innoxia* Mill., *D. stramonium* L., *Nicotiana tabacum* L., *Solanum dulcamara* L., *S. nigrum* L., **Typhaceae**: *T. schuttleworthii* Koch. et Sond., DD, BDA, Bern Convention, **Ulmaceae**: *Ulmus minor* Mill. var. *suberosa* (Moench) Wahlenb., **Urticaceae**: *Urtica dioica* L., **Valerianaceae**: *Valeriana officinalis* L., *Valerianella carinata* Loisel., *V. turgida* (Steven) Betcke, **Verbenaceae**: *Verbena officinalis* Voss., **Violaceae**: *Viola alba* Besser, *V. arvensis* Murr., *V. kitaibeliana* Schult., *V. odorata* L., **Zygophyllaceae**: *Tribulus terrestris* L.

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