Vedecká grantová agentúra Ministerstva školstva, vedy, výskumu a športu SR a Slovenskej akadémie vied

Scientific Grant Agency of the Ministry of Education, science, research and sport of the Slovak Republic and the Slovak Academy of Sciences

REGISTRATION NUMBER

2/0154/17

GRANT APPLICATION

Confidental

Commisions of S.G.A.

4 VEGA commission for biological sciences

Title of the project

Flora of Slovakia – Asteraceae family (first part): biosystematic study of critical taxa

Key words

AFLP, Carpathians, karyology, morphometry, Pannonia, taxonomy

Duration of the project (m/y)					
From	01	2017	to	12	2020

Number of	- researchers	11
	- graduate students	0

SUMMARY OF THE FINANCIAL MEANS REQUESTED	1st year	2nd year	3rd year	4th year
	(IN EUROS - €)			
INVESTMENTS (equipment)	0	0	0	0
NON-INVESTMENTS COSTS (travels expences including conferences, energies, communications, minor material/immaterial items, consumables, maintenance, services, sub-contracts)	38 232	29 520	26 460	16 812

PRINCIPAL INVESTIGATOR ***(surname, first name, title):***

Mereďa Pavol, RNDr., PhD.

List of scientific co-workers

Hodálová Iva, RNDr., CSc.
Dítě Daniel, RNDr., PhD.
Goliašová Kornélia, RNDr., CSc.
Kochjarová Judita, RNDr., CSc.
Májeková Jana, RNDr., PhD.
Michalková Eleonóra, RNDr., CSc.
Miháliková Tatiana, Mgr.
Olšavská Katarína, RNDr., PhD.
Pribulová Katarína, Mgr.
Ťavoda Ondrej, RNDr.

Date ..... **Signature of the principal investigator** .....

Project summary

The project is focused on taxonomic and chorological revision of selected representatives of the Asteraceae family in Slovakia, or in the wider Central European region, respectively. The main result of the project will be the next series of multivolume work Flora of Slovakia, volume VI/2 (Part 1). Due to the high species richness of this family in Slovakia only its initial tribes, namely Anthemideae, Astereae, Caleduleae, Gnaphalieae, and Senecioneae (with about 50 genera and 165 species) will be addressed in the project. Each taxon will be treated in terms of nomenclature, morphology, karyology, ecology, and chorology. Important part of the publication will be the identification keys (in Slovak and English), original drawings of plants, and distribution maps. Special attention will be paid to taxonomically complex groups of the genera Achillea, Aster s. l., Senecio s. l., Solidago, and Tephroseris, where we plan more detailed systematic, biogeographic, and evolutionary studies published in separate papers.

Scientific goals for whole period of this project

1. Taxonomic and chorological revision of representatives of tribes Anthemideae, Astereae, Calendulae, Gnaphalieae, and Senecioneae occurring in Slovakia, characterisation of their infrageneric and infraspecific morphological and karyological variation, descriptions of their basic biological, ecological, and phytocoenological characteristics and their current expansion in Slovakia.
2. In the genera Achillea and Aster s. l. taxonomic and chorological revision of their Central European representatives, with a particular focus on high-altitude populations of taxonomically ambiguous complex of Achillea millefolium – A. distans, and invasive North American populations from the group of Aster novi-belgii, respectively.
3. In the genus Senecio s. l. genome size determination of Central European representatives, focusing mainly on taxonomically complicated groups; screening of cytotype pattern of S. carniolicus populations occurring in Slovakia and description of expansion of two neophyte representatives of this genus on the territory of Slovakia.
4. In the genus Solidago evaluation of morphological and cytological variability of invasive populations occurring in Central Europe. This will allow us to determine their taxonomic affiliation and to detect current distribution of particular taxa/cytotypes.
5. In the genus Tephroseris elucidation of the evolutionary relationships and status of Western-Carpathian endemic T. longifolia subsp. moravica and clarification of the taxonomic position of (sub-)alpine populations of T. crispa from Tatra Mts.
6. Continue in research of selected problematic taxa within order Caryophyllales (especially those from complex genera as Atriplex, Chenopodium s. l. and Rumex), which were processed in the last volume of the Flora of Slovakia, and in which have been detected new, previously unanswered questions.

Realisation outputs and output user

This project type does not require immediate realisation output in practice.

International scientific co-operation

Cooperation with several European botanical institutions will be concentrated on the studies of herbarium collections deposited in Czech Republic, Hungary, Poland, Austria, and Romania: Prague – Institute of Botany AS CR, Depart. of Botany of Charles Univ., National Museum, Brno – Masaryk Univ.; Budapest – Hungarian National Museum; Krakow – PAN Institute of Botany, Univ. Jagielońska; Vienna – Institute of Botany of Vienna Univ., Natural History Museum; Cluj – Univ. and Botanical Gardens.
We have agreed cooperation in research of processed genera with specialists from the Czech Republic: JIŘÍ DANIHELKA, Ing., PhD. (genus Achillea); VÍT GRULICH, Doc. Ing., PhD. (both Department of Botany and Zoology, Masaryk Univ., Brno; Artemisia); DANIEL HRČKA, RNDr. (Regional Museum Prague-East; Gnaphalium); OTAKAR ŠÍDA, Mgr. (Botanical department of National Museum, Prague; Conyza and Erigeron); MILAN ŠTECH, Ing., PhD. (Department of Botany, Univ. of South Bohemia, České Budějovice; Bombycilaena, Filago, and Helichrysum)

Description of the project ***(range - maximum 5 pages)***

a) Present state of subject
b) Particular contribution expected
c) Proposal of the ways to reach the project goals, including timetable for each individual year of research
d) Working group (comment on the choice of the research group)
e) Description of applied methods and their explanation

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a) Present state of subject:
The family Asteraceae (Compositae) is one of the largest families of flowering plants, with an estimated amount of 30,000 species (Funk et al. 2009). It is very rich also in the territory of Slovakia, with about 550 species reported. Many taxa have not been taxonomically and chorologically comprehensively processed yet. Moreover, some of problematic groups are needed to be studied from the wider Central European region using modern systematic methods.
The genus Achillea is represented by 11 native species in Slovakia, with some species belonging to the taxonomically difficult aggregates with considerable morphological and cytological variation (Danihelka & Rotreklová 2001). Specific studies are needed for populations of A. distans and A. millefolium complexes occurring in higher altitudes whose taxonomic identity is unclear.
The genus Aster s. l. (incl. Symphyotrichum) includes at about 180 species. Plenty of them (hybrids and cultivars) are favourite ornamental plants due to their attractive coloured flowers. In Slovakia, besides several native species, also non-native and widely distributed North-American members from Aster novi-belgii group are presented. In Central-European region many of these alien taxa posses invasive character and cause degradation of native habitats (cf. Medvecká et al. 2012). From taxonomical, cytological, and chorological point of view the North-American asters are in Slovakia only poorly understood (in consequence of their low morphological differentiation and mutual interbreeding).
The genus Senecio s. l. (incl. Jacobaea) is in Central Europe represented by 22 species of which several representatives are morphologically very similar and their distinction is problematic (e. g., S. nemorensis agg., S. paludosus agg.). For almost any of the species genome size has been analysed. Yet, genome size is in plant kingdom regarded as one of the most important diagnostic feature and could be helpful also in the separation of morphologically similar members of the genus, as indicate our preliminary analyses (Hodálová ined.). Within S. carniolicus up to 8 ploidy levels (2x, 3x, 3x, 5x, 6x, 7x, 8x, 9x) are reported from Alps, being separated ecologically, geographically and with respect of their evolutionary history (Sonnleitner et al. 2010). In Slovakia this issue was not barely studied so far with only three plants being karyologically analysed (all with 2n = 6x = 120; Marhold et al. 2007). In the territory of Slovakia two neophyte species of the genus – S. vernalis and S. inaequidens – have been so far recorded. Until recently, they were known from Slovakia only from a few localities, currently, however, they spread exponentially, especially near the railways and roads (Mereďa ined.). In spite of this, their historical or current distribution in our country was not yet subject to any research.
The genus Solidago is in Slovakia represented by one native species (S. virgaurea) and by several North American taxa from subsection Triplinerviae (e. g., S. altissima, S. canadensis, S. gigantea; Marhold et al. 2007). Representatives of this subsection were introduced in Europe as ornamental plants in 17th and 18th century and nowadays are, thanks to extensive clonal grow and seed production, successful invaders over most of Europe. They are classified as invasive plants in Slovakia also in our legislative (Art. No. 543/2002). While morphological differentiation and cytotype distribution of taxa from subsect. Triplinerviae in their native range is intensively studied, in Europe it is still overlooked issue. Until now, the taxonomic status of invasive plants of this group spreading in Europe is not clear and also knowledge about their current distribution in Europe is insufficient. From Europe following cytotypes are reported: 2n = 18, 36, 54, but a little is known about their distribution, for example

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only 4 chromosome counts are available from Slovakia (Marhold et al. 2007).
In the genus Tephroseris two issues important for a knowledge on Slovakian flora need to be resolved. The first issue is controversial position of T. longifolia subsp. moravica. This taxon is known just from nine localities in Slovakia and Czech Republic and it is treated as endangered taxon of European importance (NATURA 2000). Surprisingly, recent biosystematic studies have shown that western-carpathians individuals are very similar in morphology and in ecological requirements to Pannonian populations of T. l. subsp. longifolia (Janišová et al. 2013, Olšavská et al. 2015). However, because the results of previously used methods (morphology, genome size, ecology) are not beyond doubts, the status of T. l. subsp. moravica requires further study using genetic analyses (AFLP markers). The second issue is unclear taxonomic position of (sub-)alpine populations of T. crispa from Tatra Mts. In preliminary study (Kochjarová 1998), these populations revealed as morphologically different from other Central European populations (including those from Alps) and could represent new endemic taxon.

b) Particular contribution expected:
Multivolume work Flora of Slovakia is of particular importance for science and national culture. The monograph aggregated results of the most recent research of Slovakian flora and significantly contribute to knowledge of the diversity of the Carpathians and the Pannonian plant taxa. Acquisition of the planned volume Flora of Slovakia VI/2 (Part 1) will be a taxonomic and nomenclatural revision of the Slovak representatives of tribes Anthemideae, Astereae, Caleduleae, Gnaphalieae, and Senecioneae (50 genera and 165 species). We plan to evaluate morphological and karyological variability, gain a new knowledge about chromosome numbers and genome size, draw up so far unpublished survey of the historical and current state of the distribution of studied taxa, give a review of species incorrectly states from our territory as well as expected taxa. Results published in this volume will be useful for various biological disciplines (agriculture, forestry, water management and others), for schools as well as in legislation (e. g., their application in NATURA 2000). Monograph Flora of Slovakia, at the national level, is used as a basis for the drafting of red books, the determination keys, atlases, and maps of vegetation. Irreplaceable importance it will has also for international projects and studies mapping the biodiversity (e. g., Flora Europaea, Atlas Florae Europaeae, Central European mapping). An important benefit of the proposed project will be also a taxonomic revision of below listed polymorphic groups on a broader territory of Central Europe (Alps, Carpathians, Pannonia).
Important results of taxonomic and chorological revision of the genus representatives of Achillea will be better understanding of their diversity and vulnerability in the Carpathian-Pannonian region. It is important also for the needs of pharmaceutical research, as several of them are economically important plants.
Study of the genus Aster s. l. will solve the pattern of wide morphological and karyological (ploidy level, genome size) variation and geographical distribution of North-American representatives from Aster novi-belgii group within the Central-European region. Explanation of karyological and morphological variation will help to clarify the position of transitional (mixed) or still non-well-identified populations, which will be useful also for the Section of Nature Protection.
Information on genome sizes of Central European Senecio s. l. species will contribute to a better distinguishing of morphologically closely related taxa, which taxonomy is still only poorly understood. Clarification of cytotype variability of Slovak populations of endangered alpine species S. carniolicus will help in species protection as well as in understanding of the biogeographical history of the Tatra Mts. Knowledge of history of expansion of two neophyte taxa S. inaequidens and S. vernalis in Slovakia (including mapping of their current distribution) help us to better explain the factors, which are responsible for spreading of alien and invasive plants in our country and to define effective ways how to eliminate their spread.
The important contribution will be finding out the current distribution range and correct taxonomic determinations of invasive populations of the genus Solidago in Central Europe. This will be based on evaluation of their morphological (multivariate analysis) and cytogenetic variability (ploidy level estimations). North-American representatives of the subsection Triplinerviae pose a threat to European native flora (the same is true also for North American representatives of the genus Aster s. l.) and their occurrence in plant communities leads to reduced biodiversity as well as altered community structure and processes. Therefore our knowledge about their current distribution and taxonomic affiliation need to be completed.
In the genus Tephroseris further study using genetic analyses will conclusively clarify the status of the endangered and endemic subspecies T. longifolia subsp. moravica and will shed light on its relationship with Pannonian populations of the nominate subspecies. New data will be important for nature protection at national as well as European level. Similarly, clarification of the taxonomic position of (sub-)alpine populations of T. crispa from Tatra Mts. will be useful for the nature conservation of this outstanding Slovak protected area and will also contribute to a better understanding of biogeography of this mountain range.
The results of biosystematic studies will be basis for treatment of monograph Flora of Slovakia VI/2 (Part 1) and for three contributions into impact journals. Finally, they will also be used for updating database Dataflos (which is

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internet freely accessible) that we plan to enrich of about 100,000 chorological (herbarium and literature) data. The database could be used in data sorting, maps generation and other outputs for further research.

c) Proposal of the ways to reach the project goals, including timetable for each individual year of research:
January 2017 – December 2017
Synthesis of current knowledge and relevant literature data; revision of herbarium specimens in selected Central European herbaria (Prague – PR, PRA, PRC, ROZ; Brno – BRNM, BRNU; Olomouc – OL; Budapest – BP; Krakow – KRA, KRAM; Vienna – W, WU; Linz – LI; Cluj – CL; Sibiu – SIB; Bratislava – BRA, SAV, SLO and other Slovak regional collections); field research and the collection of population samples in Slovakia and neighbouring countries (Czech Republic, Austria, Poland, Hungary, Ukraine, Romania); cultivation of plant material for karyological analysis; karyological analysis (chromosome counting, determination of ploidy level and absolute/relative DNA content by flow cytometry. Isolation of DNA from Tephroseris longifolia agg. and T. crispa samples; testing and optimalisation of AFLP procedure. Sampling of phytocoenological and ecological data from populations of T. cripsa in Tatra Mts.

January 2018 – December 2018
Collection of population samples (Slovakia, Czech Republic, Austria, Hungary, Poland, Ukraine, Romania); study of herbarium material in selected Central European herbaria; cultivation of plants; morphometric, karyological and AFLP analyses; evaluation of the data obtained; taxonomic and nomenclatural revisions; identification of the basic biological, ecological, and phytocoenological characteristics; collection of plants for drawing; fulfilment of Dataflos database by herbarium and literature data. AFLP study of T. longifolia agg. and T. crispa. Evaluation of morphological and ecological variability of populations of T. crispa.

January 2019 – December 2019
Completing of the collections of population samples and verifying of occurrences of selected taxa; karyological and morphological analyses and evaluation of karyological DNA data; AFLP data evaluation; collection of plants for drawing; solving nomenclatural problems; taxonomic evaluations of problematic populations; synthesis of results; preparation of manuscripts for impact journals; presentation of results at scientific meetings. The final synthesis of taxonomic-chorological treatment of individual taxa of tribes Anthemideae, Astereae, Caleduleae, Gnaphalieae, and Senecioneae for monograph Flora of Slovakia VI/2 (Part 1), production of distribution maps, illustrations and overall editing of the manuscripts.

January 2020 – December 2020
The final verification of the suspect data in herbaria and field; database editing; finalising of distribution maps, finishing of preparation of image plates, editing of the manuscripts of the monograph Flora of Slovakia VI/2 (Part 1) and subsequent preparation of the manuscript for publishing house of VEDA; preparation of manuscripts for impact journals; presentation of results at scientific meetings.

d) Working group (comment on the choice of the research group):
PAVOL MEREĎA (principal investigator) – currently a head of the Department of Vascular Plant Taxonomy at the Institute of Botany of SAS and scientific secretary of the Slovak Botanical Society. He is specializing on taxonomy, chorology, morphometrics, karyology (including flow cytometry), and molecular systematics of vascular plants. He was responsible for preparation of Karyological database of ferns and flowering plants of Slovakia and the Slovak floristic database „Dataflos“. His research is focused on taxonomically complicated genera such as Chenopodium s. l., Epipactis, Senecio s. l., Silene, Viola. Co-worker of several projects of VEGA and APVV; popularization of botany. Co-author of three volumes of Flora of Slovakia (VI/1, VI/3, VI/4). Co-editor of the forthcoming volume; he will treat genera Leucanthemum and Senecio s. l.
IVA HODÁLOVÁ (scientific co-worker) – she is specialized on vascular plant taxonomy, morphometrics, karyology (including flow cytometry), and molecular systematics. Her research if focused on taxonomy of genera Atriplex, Pilosella, Sagina, Senecio s. l., Viola. As a co-author she was several times awarded, namely by the price of the Literary Fund and Price of the SAS for publication Flora of Slovakia VI/1 (2009); she was also awarded as a member of „Excellent working group of SAS“ leaded by prof. K. Marhold (2013). She has experiences in management of two VEGA projects, 1 bilateral international project and was co-worker of several projects of VEGA, APVV and international projects. Co-author of four volumes of Flora of Slovakia (V/4, VI/1, VI/3, VI/4). Co-editor of the forthcoming volume; she will treat genera Artemisia and Senecio s. l.
DANIEL DÍTĚ (scientific co-worker) – he is specialized on phytocoenology and ecology of peat and halophytic vegetation, population dynamics, taxonomy, and chorology. He has experiences in cooperation with State Nature

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Protection and popularization of botany. Co-author of 2 volumes of Flora of Slovakia (VI/3, VI/4). He will treat genera Galatella, Leucanthemella, Ligularia, and Tripolium.
KORNÉLIA GOLIAŠOVÁ (scientific co-worker) – she is specialized on vascular plant taxonomy, chorology and nomenclature. Editor or co-editor of seven volumes of Flora of Slovakia. Co-editor of the forthcoming volume; she will treat the genus Aster s. l.
JUDITA KOCHJAROVÁ (scientific co-worker) – she is specialized on vascular plant taxonomy, karyology, phytocoenology and chorology (mainly within selected groups of Brassicaceae, Primulaceae, Asteraceae, and Hyacinthaceae). She has experiences in cooperation with State Nature Protection and popularization of botany. Co-author of 2 volumes of Flora of Slovakia (V/4, VI/4). She will treat genera Antennaria, Dendranthema, Pyrethrum, Tanacetum, and Tephroseris.
JANA MÁJEKOVÁ (scientific co-worker) – she is specialized on synanthropic flora and vegetation, mainly been focusing on the distribution of weeds on the arable lands, on the plant diversity of railway stations and on the synanthropization processes of meadow and forest communities. Co-author of one volume of Flora of Slovakia (VI/4). She will process genera Anaphalis, Artemisia, Grindelia, and Rhodanthe.
ELEONÓRA MICHALKOVÁ (scientific co-worker) – she is specialized on taxonomy and karyology of vascular plants. Co-editor of three volumes of Flora of Slovakia (V/3, VI/3, VI/4). She will treat genera Anthemis, Cota, Matricaria, Santolina, and Tripleurospermum.
TATIANA MIHÁLIKOVÁ (scientific co-worker) – she is specialized on taxonomy, morphometrics, flow cytometry, and chorology (mainly within genera of Jasione, Rheum, Rumex). Co-author of 2 volumes of Flora of Slovakia (VI/1, VI/4). She will treat genus Aster s. l.
KATARÍNA OLŠAVSKÁ (scientific co-worker) – early-stage researcher specialising on taxonomy and evolution of genera Tephroseris and Cyanus. Skilled in multivariate morphometrics, karyology (including flow cytometry), AFLP analyses, and methods of reproductive biology. Co-author of one volume of Flora of Slovakia (V/3). She will process the genus Solidago.
KATARÍNA PRIBULOVÁ (co-worker) – she is focusing on research of chorology of vascular plants. She will be responsible for fulfilment of Dataflos database and creating of distribution maps.
ONDREJ ŤAVODA (scientific co-worker) – he is focusing on research on chorology of vascular plants. Co-author of 4 volumes of Flora of Slovakia (V/4, VI/1, VI/3, VI/4). He will treat genera Ammobium, Brachyscome, and Helipterum, and will be responsible for preparation of distribution maps.

e) Description of applied methods and their explanation:
1. Traditional taxonomy and nomenclature
The basis for every taxonomic-chorological study of plants is field work (including visiting the type localities) and revision of specimens in herbarium collections. Morphological variation of the sampled plants will be studied and evaluated according to Dostál et al. (1966), and the nomenclatural issues will be solved in accordance with the latest editions of the International Code of Botanical Nomenclature (McNeill et al. 2006). The method of Central European grid mapping (Niklfeld 1971) will be employed to generate maps of geographic distribution of particular species. All distribution data will be imported into the freely accessible database Dataflos (Mereďa et al. 2011), and access to further use.
2. Morphometric analyses
Methods of multivariate morphometrics will be applied to study of morphological variation of the taxonomically complex groups. The analyses will be carry out in the program SAS v. 9.3 (SAS Institute Inc. 2011).
3. Karyological and flow cytometric analyses
Determination of chromosome numbers by a squash method (Murín 1960) is necessary for proper interpretation of ploidy level estimates, which will be assessed by flow cytometry (Doležel et al. 2007) in a large number of individuals. Flow cytometry will be used also to study of variation in nuclear DNA amount (absolute and relative DNA content), which may bring new insights to the overall variation patterns in the studied taxa, and shed light on their evolution.
4. Molecular analyses
During the study of Tephroseris genus we will utilize highly informative AFLP markers (Vos et al. 1995), which have shown to be very suitable in many of our and foreign studies (dealing with similar problematic groups). These markers were successfully used by our team for example in genera Cyanus, Pilosella, Senecio s. l., and Viola (e. g., Mereďa et al. 2011, Olšavská et al. 2011, Hodálová et al. 2015) and the methodology has for several years run-in our Molecular Laboratory at the Institute of Botany.
5. Research team
On this project will participate in a total of 21 specialists from Slovakia and the Czech Republic seeSupplemental file 1). All of them have already experiences with taxonomic and chorological revisions for previous volumes of Flora of Slovakia or for other similar works (e. g., Flora of the Czech Republic). Except for co-authors included in

(item - continued)

other parts of project proposals (see chapters international collaboration, research team and colleagues from other Slovak institutions), they will be: ELIÁŠ PAVOL, Doc. Ing., PhD (Department of Botany AF SPU Nitra; he will treat genera Callistephus, Galatella, Leucanthemella, Tripolium); FERÁKOVÁ VIERA, Doc., RNDr., CSc. (retiree; genus Artemisia); KUČERA JAROMÍR, Ing., PhD. (genera Anacyclus, Chrysanthemum, Colostephus, Dimorphoteca); LETZ DOMINIK ROMAN, RNDr., Mgr., PhD. (both Institute of Botany, Bratislava; genera Achillea, Bellis, Bellidiastrum, Erechtites, Leontopodium, Leucanthemopsis); MÁRTONFI PAVOL, prof. RNDr, CSc. (Department of Botany UPJŠ Košice; genera Adenostyles, Homogyne, Petasites, Tussilago); PENIAŠTEKOVÁ MAGDALÉNA, RNDr., CSc. (retiree, genus Anthemis).

References are attached in supplemental file 1.

PRINCIPAL INVESTIGATOR **Enclosure A**

Surname, first name, title	Highest degree & year		Age	
Mereďa Pavol, RNDr., PhD.		PhD. 2010		41

Institution and adress (street, postal code, city)
Institute of Botany of SAS
Dúbravská cesta 9
845 23 Bratislava 4

Selection of 5 most important works of the principal investigator (whole period). Please quote the total numbers of citations / numbers of citations for the last five years with each work.

Mereďa P. Jr (1996): Epipactis pseudopurpurata Mereďa, spec. nova (Orchidaceae) – eine neue autogame Sitter-Art aus der Slowakei. Preslia 68: 23–29.
Počet celkových citácií/počet citácií za posledných 5 rokov: 16/1

Mereďa P. Jr (1996): Epipactis komoricensis, spec. nova (Orchidaceae) – eine neue autogame Sitter-Art aus dem E. leptochila-Aggregat aus der Slowakei. Preslia 68: 125–134.
Počet celkových citácií/počet citácií za posledných 5 rokov: 19/0

Mereďa P. Jr & Potůček O. (1998): Epipactis futakii, spec. nova (Orchidaceae) – eine neue kleistogam blühende Sitter-Art aus der Slowakei. Preslia 70: 247–258.
Počet celkových citácií/počet citácií za posledných 5 rokov: 18/3

Marhold K., Mártonfi P., Mereďa P. Jr & Mráz P. (eds) (2007): Chromosome number survey of the ferns and flowering plants of Slovakia. VEDA, Bratislava, 640 pp.
Počet celkových citácií/počet citácií za posledných 5 rokov: 6/3

Mereďa P. Jr, Hodálová I., Mártonfi P., Kučera J. & Lihová J. (2008): Intraspecific variation in Viola suavis in Europe: parallel evolution of white-flowered morphotypes. Ann. Bot. (Oxford) 102: 443–462; doi:10.1093/aob/mcn117
Počet celkových citácií/počet citácií za posledných 5 rokov: 4/3

Selection of 5 most important works of the principal investigator in last 5 years - quote the survey of the citations of the most frequently cited work from this selection in the Appendix 1.

Mereďa P. Jr, Hodálová I., Kučera J., Zozomová-Lihová J., Letz D. R. & Slovák M. (2011): Genetic and morphological variation in Viola suavis s.l. (Violaceae) in the western Balkan Peninsula: two endemic subspecies revealed. System. Biodivers. 9: 211–231.
Počet citácií: 9

Mereďa P. Jr & Hodálová I. (2011): Cievnaté rastliny. – Vascular plants, pp. 36–119. In: Ambrós L., Čejka T., Černý J., Darolová A., Hodálová I., Krištofík J., Kubinská A., Mišíková K., Mereďa P. Jr, Šoltés R., Šubová D., Vidlička Ľ.: Atlas druhov európskeho významu pre územia NATURA 2000 na Slovensku. – The atlas of species of european interest for NATURA 2000 sites in Slovakia. SLOVART, Bratislava. 520 pp.
Počet citácií: 2

Mereďa P. Jr, Eliáš P. Jr., Dítě D. & Štrba P. (2012): Silene L. Silenka. In: Goliašová K. & Michalková E. (eds), Flóra Slovenska [Flora of Slovakia] 6/3: 410–533, Veda, Bratislava.
Počet citácií: 2

Budzáková M., Hodálová I., Mereďa P. Jr, Somlyay L., Bisbing S. M. & Šibík J. (2014): Karyological, morphological and ecological differentiation of Sesleria caerulea and S. tatrae in the Western Carpathians and adjacent regions. Preslia 86: 245–277.
Počet citácií: 0

Mereďa P. Jr, Kučera J., Marhold K., Senko D., Slovák M., Svitok M., Šingliarová B. ? Hodálová I. (2016): Ecological niche differentiation between tetra- and octoploids of Jacobaea vulgaris. Preslia 88: 113-136.
Počet citácií: 0

SURVEY OF THE CITATIONS

Citattions are in the attachment

SCIENTIFIC CO-WORKERS

Surname, first name, title	Highest degree & year		Age	
Hodálová Iva, RNDr., CSc.		CSc. 1997		52

Institution and adress (street, postal code, city)

Institute of Botany of SAS
Dúbravská cesta 9
845 23 Bratislava 4

Selection of 5 most important works of the co-worker in the last 5 years

Olšavská K., Perný M., Kučera J. & Hodálová I. (2011): Biosystematic study of the Cyanus triumfettii group in Central Europe. Preslia 83: 59–98.
Počet citácií: 4

Šingliarová B., Hodálová I. & Mráz P. (2011): Biosystematic study of the diploid-polyploid Pilosella alpicola group with variation in breeding system: Patterns and processes. Taxon 60: 450–470.
Počet citácií: 5

Olšavská K., Perný M., Loser C. J., Stimper R. & Hodálová I. (2013): Cytogeography of Europaean perennial species of Cyanus (Asteraceae). Bot. J. Linn. Soc. 173: 230–257.
Počet citácií: 1

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Počet citácií: 1

SCIENTIFIC CO-WORKERS

Surname, first name, title	Highest degree & year		Age	
Dítě Daniel, RNDr., PhD.		PhD. 2007		48

Institution and adress (street, postal code, city)

Institute of Botany of SAS
Dúbravská cesta 9
845 23 Bratislava 4

Selection of 5 most important works of the co-worker in the last 5 years

Hájek M., Roleček J., Cottenie K., Kintrová K., Horsák M., Poulíčková A., Hájková P., Fránková M. & Dítě D. (2011): Environmental and spatial controls of biotic assemblages in a discrete semi-terrestrial habitat: comparison of organisms with different dispersal abilities sampled in the same plots. J. Biogeogr. 38: 1683–1693.
Celkový počet citácií: 28

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Celkový počet citácií: 0

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SCIENTIFIC CO-WORKERS

Surname, first name, title	Highest degree & year		Age	
Goliašová Kornélia, RNDr., CSc.		CSc. 1979		69

Institution and adress (street, postal code, city)

Institute of Botany of SAS
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845 23 Bratislava 4

Selection of 5 most important works of the co-worker in the last 5 years

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Goliašová K. (2012): Cactaceae. Kaktusovité, Aizoaceae. Poludňovkovité, Portulacaceae. Portulakovité, Caryophyllaceae. Klinčekovité. Charakteristika čeľade. In Goliašová K. & Michalková E. (eds), Flóra Slovenska VI/3. Veda, Vydavateľstvo SAV, Bratislava.
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Celkový počet citácií: 0

SCIENTIFIC CO-WORKERS

Surname, first name, title	Highest degree & year		Age	
Kochjarová Judita, RNDr., CSc.		CSc. 1998		54

Institution and adress (street, postal code, city)

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Dúbravská cesta 9
845 23 Bratislava 4

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SCIENTIFIC CO-WORKERS

Surname, first name, title	Highest degree & year		Age	
Májeková Jana, RNDr., PhD.		PhD. 2010		36

Institution and adress (street, postal code, city)

Institute of Botany of SAS
Dúbravská cesta 9
845 23 Bratislava 4

Selection of 5 most important works of the co-worker in the last 5 years

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Celkový počet citácií: 1

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Celkový počet citácií: 0

SCIENTIFIC CO-WORKERS

Surname, first name, title	Highest degree & year		Age	
Michalková Eleonóra, RNDr., CSc.		CSc. 1990		63

Institution and adress (street, postal code, city)

Institute of Botany of SAS
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845 23 Bratislava 4

Selection of 5 most important works of the co-worker in the last 5 years

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Celkový počet citácií: 0

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Celkový počet citácií: 0

SCIENTIFIC CO-WORKERS

Surname, first name, title	Highest degree & year		Age	
Miháliková Tatiana, Mgr.				44

Institution and adress (street, postal code, city)

Institute of Botany of SAS
Dúbravská cesta 9
845 23 Bratislava 4

Selection of 5 most important works of the co-worker in the last 5 years

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Celkový počet citácií: 0

SCIENTIFIC CO-WORKERS

Surname, first name, title	Highest degree & year		Age	
Olšavská Katarína, RNDr., PhD.		PhD. 2012		36

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Institute of Botany of SAS
Dúbravská cesta 9
845 23 Bratislava 4

Selection of 5 most important works of the co-worker in the last 5 years

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Celkový počet citácií: 0

SCIENTIFIC CO-WORKERS

Surname, first name, title	Highest degree & year		Age	
Pribulová Katarína, Mgr.				37

Institution and adress (street, postal code, city)

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845 23 Bratislava 4

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Z dôvodu materskej dovolenky zatiaľ nemá publikácie.

SCIENTIFIC CO-WORKERS

Surname, first name, title	Highest degree & year		Age	
Ťavoda Ondrej, RNDr.				62

Institution and adress (street, postal code, city)

Institute of Botany of SAS
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Selection of 5 most important works of the co-worker in the last 5 years

Dítě D., Eliáš P. jr, Feráková V., Goliašová K., Hodálová I., Kmeťová E., Kučera J., Letz D. R., Mereďa P. jr, Michalková E., Mráz P., Peniašteková M., Perný M., Slovák M., Šingliarová B., Šípošová H., Štrba P., Ťavoda O., Valachovič M. & Walter J. (2012): Caryophyllales (1. časť). In: Goliašová K. & Michalková E. (eds), Flóra Slovenska VI/3. Veda, Bratislava, 712 pp.
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Celkový počet citácií: 0

Graduate students involved in the project (for each of them list selected works, if any and different from those listed by the project leader or scientofic co-workers):