TRAVNIŠKA KADULJA (*Salvia pratensis* L.) V SLOVENIJI
MEADOW CLARY (*Salvia pratensis* L.) IN SLOVENIA

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TRAVNIŠKA KADULJA (*Salvia pratensis* L.)

Jože Bavcon, Blanka Ravnjak

PREDGOVOR

Ko na travnikih zavalovijo kadulje, je to znak bližajočega se vročega poletja. Ob dotiku suhih kaduljinih socvetji med pokošeno travo, le-te prav zašelestijo. Čeprav že odcvetelo, je kaduljino socvetje z dvoustnatimi čašami srhkodlakavo in pri dotiku ene čaše z drugo, te prav posebno zašelestijo. Vendar tega ni več slišati pogosto, le kdo namreč danes še uporablja grablje, s katerimi bi tu in tam podrgnil ob suha socvetja in ustvaril poletno travniško melodijo?! Koso so nadomestile traktorske kosilnice, košnji sledi strojno grabljenje v črte in zatem baliranje. Barvitosti kadulj in šelestenja njihovih suhih odcvetelih socvetij tako skoraj ni več. Kadulje bodo to sicer preživele, le umaknile se bodo na robove. Tiste barvitosti pa kmalu ne bomo več poznali. Čas je že, da kadulje pridejo na zelenice naših vrtov, kjer lahko z njimi zlahka ustvarimo manjše travnate zaplate.

Cvetoč travnik s kaduljami / Flowering meadow with meadow clary Photo: J. Bavcon

Povzetek

Travniška kadulja (*Salvia pratensis*) je v Evropi splošno razširjena vrsta, vendar je zaradi neustreznega upravljanja z okoljem ponekod že ogrožena rastlinska vrsta in zaradi tega tudi zavarovana. Vrsta je splošno razširjena v Sloveniji in raste vse od nižin do subalpinskega pasu. Najpogosteje jo najdemo na suhih travnikih z apnenčasto podlago. S travnikov, ki jih kosijo že zelo zgodaj, travniška kadulja počasi izginja in se tako umika na cestne robove, kolovoze in ruderalne površine. Njeno počasno izginjanje s travnikov povzroča tudi zaraščanje travnatih območij. Zaradi tega je potrebno za njeno ohranjanje primerno upravljati z okoljem in upoštevati nekatera priporočila kot so npr. pozna košnja, ki omogoča dokončanje semenenja rastlin in obnovo populacij, izogibanje baliranju idr. Ob njenem obilnem pozno pomladanskem cvetenju, v ponekod še vedno velikih populacijah, je izrazita modro vijolična obarvanost cvetov res veličastna. A kljub temu je ponekod možno najti rožnato, bledo rdeče ali celo belo obarvane manjše populacije ali posamezne primerke. Takšni primerki vsekakor spadajo med redkosti in so prav zaradi tega hortikulturno zanimivi. Tudi v različnih delih Slovenije smo do sedaj mestoma našli predvsem rožnato obarvane primerke, le redko pa tudi bele. Na osnovi naših najdb smo poimenovali dve sorti in sicer *S. pratensis* 'Roza' in *S. pratensis* 'Bela'. Obe sorti sta del zbirke Botaničnega vrta Univerze v Ljubljani. Opisana vrsta pa ni v okolju ter v vrtu samo lep okras, ampak je tudi izredno pomembna čebelja paša in vsekakor zasluži našo pozornost ter skrb za njeno ohranitev v naravi.

Ključne besede

Salvia pratensis, pestrost, suhi travnik

Uvod

Travniška kadulja (*Salvia pratensis* L.) je v Evropi bolj ali manj splošno razširjena vrsta. Sega do Anglije in Rusije. Tutin s sod. (1972), Philips & Rix (1994), Clebsch (1997) jo omenjajo še za sever Afrike. Mišić & Lakušić (1990) navajata poleg Evrope za njen areal še jugozahodno Azijo. V Sloveniji je splošno razširjena vrsta. Raste od nižin do subalpinskega pasu.

Poleg ivanjščic, zlatic in kukavičjih lučc je travniška kadulja ena najpogostejših vrst na naših manj gnojenih travnikih. Mišić in Lakušić (1990) kot najpogostejšo optimalno združbo za travniško kaduljo (*S. pratensis*) opisujeta ekosistem razreda *Festuco-Brometea*. Seliškar in Wraber T. (1986) poleg omenjene združbe navajata še, da se pojavlja tudi na bolj suhih travnikih na Primorskem iz

reda *Scorzoneretalia villosae*. Najraje so kadulje prisotne na tistih suhih travnikih, kjer je apnenčast podlaga (Hegi 1908-1931).

Pobočje prekrito z veliko populacijo kadulje
Slope covered with medaow clary population Photo: B. Ravnjak

So prave krasotice. Bolj suho kot je leto, prej zacvetijo – prve že v začetk maja, potem pa vse tja do junija. Ker njihova modrina prav močno obarva travnike, so zelo dobro vidne. Rade imajo tudi nekoliko bolj utrjena tla, zato jih najdemo sredi kolovozov ali na njihovih robovih. Zasedajo pa tudi mesta ob cestah, na z gramozom nasipanih bankinah. Kadulje se s tem iz povsem travniške vrste hitro spremenijo v povsem ruderalne, saj so včasih prve, ki naseljujejo takšna mesta. Rastlina je zelo lepljiva, zaradi česar se cvetne čaše rade primejo na obleko ali živalsko dlako in se na ta način semena v čaši prenesejo na dolge razdalje. To lepljivost rastlina ohranja tudi kasneje, ko cvetovi odpadejo. S to svojo lastnostjo se kadulja hitro prenaša naokrog. Skupaj s še več kot 900 vrstami travniško kaduljo uvrščamo v rod *Salvia* (Clebsch 1997), kamor spada nekoliko bolj poznano zdravilno zelišče žajbelj (*Salvia officinalis*). Tako kot žajbelj in še veliko drugih kadulj, tudi travniška kadulja vsebuje eterična olja in še nekatere druge sekundarne metabolite. Tako so pri travniški kadulji ugotovili vsebnost monoterpenskih ogljikovodikov, oksigeniranih monoterpenov, seskviterpenskih

ogljikovodikov, oksigeniranih seskviterpenov in alifatskih komponent. Pri čemer je seskviterpen E-kariofilen glavna komponenta eteričnih olj travniške kadulje (Anačkov s sod. 2009).

Je značilna travniška rastlina z večjimi listi in pritlehno rozeto. Le-ta ji omogoča preživetje še po košnji, s čimer si nato nabere dovolj hraniv za naslednje leto. Takrat iz korenike ponovno najprej zraste rozeta, iz katere se šele nato dvigne po eno ali več olistanih stebel. Za prvo cvetenje in nadaljnjo reprodukcijo morajo rozete biti stare vsaj 4-5 let (Ouborg s sod. 1991, Ouborg in van Treuren 1994). Rastlina iz semena vzkali v jesenskem času (Muller 1978). Kadulja ima globoke korenine, ki lahko segajo v talni horizont C (Rich s sod. 1999). Steblo je velikokrat vilasto razvejeno, vendar iz rozete rado lokasto izrašča, tako da se šele nato obrne navzgor. Na steblu so rahlo srčasto ovalni, dolgi, včasih tudi zašiljeni, grobo nazobčani listi, ki navzgor po steblu postajajo vedno manjši in imajo vse krajše peclje. Pri prvih cvetovih so listi že povsem brez pecljev in že skoraj tako veliki, kot je dolžina cveta. Tako zgornja kot spodnja stran listov sta prekriti s trihomi, spodnja stran pa še žleznimi laski (Anačkov s sod. 2009).

Photo: J. Bavcon

Socvetje je dolgo in cvetovi so v navideznih vretencih. Čaša in cvet sta značilno dvoustnata z dolgo štrlečo modrikasto brazdo. Socvetje je žlezasto. Posamezen cvet je temnomoder in ima značilno srpasto zgornjo ustno, spodnja pa je širša in služi zato, da se lahko nanjo usedejo opraševalci. Prav cvet omenjene vrste je tisti, na katerem so preučili dovršen sistem koevolucije med rastlinami in njihovimi opraševalci. Ta dovršenost se kaže predvsem v zgradbi cveta oz. natančneje v zgradbi prašničnih niti. Le-ti sta na bazi zraščeni in tvorita obročasto strukturo, ki zoži vhod v cevasti del cveta. Ta obročasta struktura je s filamenti pripeta na spodnjo in zgornjo ustno, ob ustju cveta, kjer se obe ustni

razpirata. Zgradba celotnega prašnika deluje torej kot ročica, ki jo opraševalec sproži in le-ta na koncu na opraševalcu odloži pelod. Obisk opraševalca na cvetu kadulje bi lahko tako razdelili na tri faze. V prvi fazi opraševalec – čebela, sproži vzvod prašnika. To stori tako, da svoj jeziček potisne skozi obročasto strukturo na bazi prašničnih niti, saj je to namreč edina odprtina, ki vodi do medovnih žlez. Pri tem z glavo še dodatno pritisne na vzvod (obročasto strukturo) in prašnične niti s prašnicami zanihajo ter se dotaknejo čebeljega hrbta, pri čemer se na dlačice odloži pelod. Druga faza je nekoliko bolj statična in označuje čas, v katerem čebela srka nektar. Tretja faza pa pomeni zaključni del, ko čebela potegne jeziček iz cevastega dela in obročaste strukture prašničnih niti ter zapusti cvet. Sila na vzvodu prašničnih niti popusti in prašnika se vrneta v prejšnjo pozicijo.

Celotna količina cvetnega prahu se sprosti na opraševalce v 12-17 zaporednih obiskih. Med najpogostejšimi opraševalci travniške kadulje so čebele saj je njihova velikost in dolžina jezička ravno pravšnja za učinkovito proženje

Kaduljini opraševalci
Meadow clary polinators Photo: J. Bavcon

Kaduljina semena
Meadow clary seeds Photo: J. Bavcon

oprašitvenega mehanizma v cvetu. Kajti, če je jeziček opraševalca prekratek, potem le-ta ne dobi nagrade (medičine) in se na cvet ne vrne več. A če je opraševalec prevelik, se ne more dobro približati ustju cveta in lahko s svojo preveliko silo cvet poškoduje oz. ga pretrga. Opraševalce travniške kadulje lahko razvrstimo v dve funkcionalni skupini. V prvi so tisti opraševalci, ki 'kradejo' nektar in cvetni prah ne da bi pri tem sprožili oprašitveni mehanizem. V drugi skupini pa so tisti, ki ta mehanizem sprožijo in nato resnično sodelujejo pri oprašitvi cveta (Reith s sod. 2007). Glede na to, da se oprašitveni mehanizem med posameznimi vrstami kadulj razlikuje (po dolžini prašničnih niti, ligamentih s katerimi so prašnične niti pritrjene, velikosti obročaste strukture) je tudi križanje med njimi manj verjetno.

Križanje pa bi lahko bilo možno med vrsto *S. pratensis* z majhnimi cvetovi in vrsto *S. nemorosa* z velikimi. Takšne hibride imenovane *S.* x *sylvestris* L. je našel Kerner von Marilaun (1891). Le-ti so imeli kar 60 % fertilnih semen (Claßen-Bockoff s sod. 2004). Semena travniške kadulje dozorijo po 30 dneh, pri čemer ocenjena količina semen na eno rastlino znaša kar 1500 semen. Ob ugodnih pogojih semena kalijo po 12 dneh sprostitve iz čaše (King 2004). Pri preučevanju populacij travniške kadulje v Veliki Britaniji so ugotovili, da je bilo v populacijah 1-9% osebkov s sterilnim moškim delom cveta. Ta procent pa se je še večal z izpostavljenostjo intenzivnejši senci in poškodbam zaradi herbicidov (Rich s sod. 1999). Travniška kadulja je prav tako ena izmed zelo medonosnih rastlin in predstavlja pomembno čebeljo pašo. Ugotovili so (Nicoleta 2008), da njeni cvetovi vsebujejo kar 67% medičine, kar pomeni cca 171 kg/ha. Kadulja pa ne pritegne samo opraševalcev, ki iščejo med in cvetni prah ampak tudi druge živali. Z nezrelimi semeni se tako hranijo nekateri sesalci, s cvetovi pa gosenice rodu *Aglaostigma.* Pojedo lahko 20 % cvetov na posamezni rastlini (King 2004).

Ker se cvetovi odpirajo od spodaj navzgor, rastlina sorazmerno dolgo cveti, če le nista pomlad in začetek poletja preveč sušna. Takrat se namreč lahko izredno hitro razprejo. V *Mali flori Slovenije* (Jogan 2007) ločijo tri podvrste travniške kadulje:

S. pratensis L. subsp. *saccardiana* (Pamp.) Poldini: ta kadulja je visoka od 0,5 do 1,2 m, ima dolgopecljate pritlične liste, pecelj je tako dolg kot listna ploskev, čaša je dolga 12 do 13 mm, venec pa je tudi zelo dolg, saj meri od 28 do 35 cm. Je rastlina toplih gozdnih obronkov.

S. pratensis L. subsp. *pratensis*: rastlina je nižja, visoka le 0,3 do 0,6 m, pritlični listi so kratkopecljati, čaša je dolga od 7 do 11 mm venec pa od 12 do 30 mm. Socvetje je v obrisu valjasto, podporni listi zeleni, ima veliko zgornjo ustno

venca, ki je lokasto ukrivljena, venec je temno modro vijoličast, redkeje bel. Prisotna je na suhih travnikih in svetlih toplih gozdovih.

S. pratensis L. subsp. *bertolonii* (Vis.) Soó.: je večinoma prisotna na kraških suhih travnikih v submediteranskem območju. Njeno socvetje je proti vrhu postopno zoženo, podporni listi so temno škrlatni. Zgornja ustna venca je majhna, skoraj ravna, venec pa je škrlatno vijoličast, redkeje bel.

Med populacijo vijoličnih kadulj lahko najdemo tudi belo
Among violet medaow clary also the white one can be found Photo: J. Bavcon

Za vse torej velja, da je venec moder do temno moder ali škrlatno vijoličast. Pri podvrsti *S. pratensis* subsp. *pratensis* in podvrsti *S. pratensis* subsp. *bertolonii* je navedeno, da je venec lahko redko tudi bel (Jogan 2007 v MFS). Travniška kadulja velja za zelo raznoliko vrsto (Tutin s sod. 1972). Različne barve cvetov od modre, rožnate do bele navajajo številni avtorji, a belo običajno kot redko: Hegi (1908-1931), Tutin s sod. 1972, Seliškar & Wraber T. (1986) in Mišić & Lakušić (1990) Philips & Rix (1994), Clebsch (1997). Z izjemo Hegija (1908-1931) vsi omenjeni avtorji ne opredeljujejo posameznih podvrst. Razvrstitve v podvrste po Jogan (2007) kažejo prav na to, da je variabilnost znotraj te vrste velika.

O različni barvi cvetov pri kadulji so poročali že v starejši delih. Host (1827-1831) v svojem znamenitem delu *Flora Austriaca* za vrsto *S. pratensis* kot habitat navede travnike, za barvo cveta pa navaja modro, redko belo in rožnato. V Wulfenovi posmrtno objavljeni knjigi *Flora Norica Phanerogama* (1858) je prav tako omenjena rožnata in redko bela barva. Dodaja še, da je pogosta na travnikih v okolici Gorice (Slovenija, Italija), Ljubljane in Celovca (Avstrija). Pacher (1881-1887) je še malo bolj natančen in pravi, da je vrsta redko belkasta. Pospichal (1897-1899) za floro Avstrijskega primorja navaja kot redko tudi belo cvetočo različico vrste *S. pratensis*.

Kljub temu pa bomo pri Scopoliju (1772) v drugi izdaji dela *Flora Carniolica*, v katerem opisuje rastlinstvo Kranjske - večjega dela današnje Slovenije, zaman iskali omembo bele različice. Kot barvo cveta navaja samo modro. Podobno tudi Linné (1753) kot barvo cveta pri kadulji omeni samo modro.

V ključih za določanje rastlin v Sloveniji se za travniško kaduljo navajajo različni barvni odtenki, vendar ni vedno prisotna bela barva. Piskernik (1941, 1951) navaja samo temno modro vijolično obarvanost in umazano rdečo. Kasneje Mayer (1952) in Martinčič & Sušnik (1969) zopet ponovno navajajo belo obarvanost.

Vse te različice oz. podvrste so najverjetneje samo Gaussova krivulja ene same vrste, ki pa na rastiščih prevladujejo glede na različno okolje. Čeprav je pri dveh podvrstah navedeno, da so cvetovi tudi beli, je bela barva pri kaduljah res prava redkost. Po dolgoletnih opazovanjih naših travnikov to lahko povsem zanesljivo trdimo, saj smo doslej nekaj več belih primerkov našli le na enem koncu Slovenije in to na Dolenjskem, šele v zadnjih letih po močnejših sušah pa smo bele primerke našli tudi v različnih drugih delih Slovenije. Pogosteje pa se v Sloveniji najdejo bledo rdeče različice, a tudi te le posamezno, vendar v različnih predelih.

Metodologija

Rastlinski material travniške kadulje smo zbirali že več let. Do nedavnega so bile rastline posajene v različnih delih Botaničnega vrta in jih nismo obravnavali sistematično. V zadnjem sedemletnem obdobju pa smo se njihovega preučevanja lotili sistematično in jim v gojitvenih gredah namenili svoj del. Travniške kadulje za gojitev v kulturi niso tako enostavne kot druge pri nas raziskovane vrste. Pogosto rastejo v zelo pustih in peščenih tleh in imajo zato najlepše rastline dolgo glavno korenino, ki se rada ob nabiranju zatrga. Četudi nam običajno uspe pridobiti nepoškodovano rastlino, to ni dovolj. Kadulja ob

presajanju vedno oveni, ne glede na to koliko nege ji posvetimo. Je namreč zelnata rastlina, ki je v polnem razvoju ravno takrat, ko je že zelo toplo ali je celo že suša. Kljub senčenju in vlaženju predstavlja za rastlino prenos iz narave stres. Zato običajno rastlino porežemo in pustimo samo rozeto. Seveda to pomeni, da v tistem letu ne dobimo njenega semena. Če suša ni prevelika se sicer zgodi, da ponovno pocvita, vendar velikokrat tedaj razvoj semen ni več tako uspešen. Tudi oprašitev tedaj ni več tako učinkovita, ker kadulja za opraševalce takrat ni več tako zanimiva. Morda je takrat celo vsebnost medičine manjša.

Problem gojenja kadulje v kulturi predstavljajo polži in gosenice, ki vrsto v kulturi zelo radi napadejo. V kulturi jih pogosto obžirajo, saj so te rastline nežnejše kot v naravi. Kljub vsakodnevni pazljivosti lahko do njihovega napada pride zelo hitro. Predvsem v poletnem menjavanju sončnega in deževna vremena je aktivnost polžev velika in je lahko že ena noč za rastline usodna v toliko, da ostanejo smo še štrclji rastline. Takšna rastlina pa skoraj nima več možnosti za razvoj. Velikokrat je takšno obžiranje povzroči propad primerka v kulturi. Kaduljam je tako potrebno posvetiti bistveno več nege kot drugim vrstam, ki jih imamo v raziskovalnem delu vrta. Prav tako potrebujejo več prostora za rast, kar pomeni večje oz. predvsem globlje lončke. Vse to pa zopet zahteva več ustreznega prostora. Travniška kadulja je na čašah rahlo lepljiva in zaradi tega se rastline rade sprimejo. To pa potem posamezno rastlino ob premikanju kaj hitro poškoduje. Zato vsak lonček v kulturi potrebuje več prostora, za dobro razrast rastlin. Prav tako jo je nato zaradi opazovanja in ugotavljanja razlik lažje premakniti. Če so rastline preveč skupaj in se zanje prej ustrezno ne poskrbi, so le-te potem preveč prepletene in premikanje ni več možno. To pomeni, da so vse podvržene prosti oprašitvi, kar pa vsekakor ni želja selekcioniranja v kulturi.

Lončki kadulj v kulturi v Botaničnem vrtu
Pots with meadow clary in Botanic garden plant culture Photo: J. Bavcon

Pogost in hitro opazen problem pri

kaduljah je medsebojno križanje, katerega rezultat so različne manj izrazite barve. Zelo hitro postanejo modrikaste bele kadulje, če le-te niso izolirane od drugače obarvanih. Še najbolj so od odstopajočih različic obstojne roza vijolično do rdeče obarvane različice. V prejšnjih letih so bile tudi bistveno pogostejše kot pa povsem bele različice. Zaradi preprečitve opraševanja uporabljamo mrežnike, ki so pri kaduljah dokaj učinkoviti.

Za učinkovito delo in preučevanje kadulj bi potrebovali več površine in stalnega vrtnarja, ki bi skrbel samo za ta del. A v danih razmerah to ni možno. Kar pa pomeni, da so rezultati raziskav v določenem letu slabši, kot bi lahko bili. Še posebej se to pozna v zelo mokrih letih, ko so kadulje zaradi prevelike količine vode v plastičnih lončki videti bistveno slabše kot pa so dejansko v naravi. Do takšnega pojava je prišlo v poletju 2014. V sušnih letih so kadulje v lončkih lepše, če se jih le ustrezno oskrbuje z vodo. Problem njihovega preživetja pa se kaže tudi v mokrih zimah. V takih zimah smo rastline ščitili s stekli in tako preprečili prekomerno zalitje z vodo. V tem hladnem obdobju leta kaduljam vlažna klima prav nič ne ustreza. Najbolje je, da so zime mrzle in snežne. Kadulje to najbolje prenesejo, ker jih sneg zaščiti. Dobro prenašajo celo zmerno močo ob počasnem taljenju snega.

Photo: J. Bavcon

V naravi je delo potekalo tako, da smo površine, kjer so bile lokalne populacije res številčne, natančno prehodil in pregledali. Enako smo pregledovali tudi male robne populacije. Nekatere najbolj odstopajoče primerke smo nabrali takoj, druge šele po pregledu večjega dela posamezne lokalne populacije.Vsak primerek smo najprej fotografiral na rastišču, nato smo ga izkopali in še enkrat fotografiral. Tako smo namreč lažje zabeležili posamezen odstopajoč primerek. Vsak primerek smo dali v svojo plastično vrečko. Rastlinam smo po potrebi dodali nekaj zemlje in vode ter jih potem odnesli v botanični vrt. Tam smo vsako rastlino posebej opisali, posadil v mešanico komposta in listovke ter jih posadili

v kvadratasteplastične lončke velikosti do 14 x 14 cm zadostnim številom drenažnih lukenj. Vsak tak lonček je dobil etiketo s podatki. Lončke smo postavili na ustrezno mrežasto folijo za prekrivanje tal, v z betonskimi ploščami obrobljene betonske gojitvene grede. Ker te rastline potrebujejo več prostora kot mnoge druge, smo jim zato med posameznimi vrstami lončkov namenili več prostega prostora. Tako je bilo rastline pri opazovanju lažje premikati. Pred začetkom cvetenja smo vse bele predstavnike umaknili v mrežnik. Enako smo storili tudi z drugimi barvnimi različicami, odvisno od tega katerih cvetenje je bilo prevladujoče. Glede na cvetenje posameznih različic v posameznih letih smo tako z izolacijo preprečevali oprašitev. Rastline smo redno zalivali in po potrebi senčili. Pri vseh rastlinah, ki so semenile, smo pobrali semena in jih kasneje posejali. Vsako leto smo vse zanimive primerke ponovno popisali in fotografirali, da je bila primerjava med leti potem manj subjektivna. Stabilnost posameznih lastnosti smo primerjali na več let.

Spremenjen način gospodarjenja s travniki povzroča probleme tudi pri nabiranju kadulj. Zaradi uporabe metode baliranja kadulje pokosijo, še preden te zacvetijo, pri čemer je nato seveda precej težko najti ustrezne različice travniške kadulje. Do njenega izginotja prav tako prihaja na intenzivno gnojenih travnikih. Po gnojenju z mineralnimi gnojili se močno razrastejo trave in tam kadulj že tisto leto ni več oz. le še komaj kje cvetijo. Kadulje so bolj svetloljubne rastline in ko jih gosta trava zamori, njihovega cvetenja ni več. Kar nekaj izredno zanimivih lokalnih populacij je tako v samo enem letu lahko zgubljenih. Še posebej v sušnih pomladih kmetje travnike kosijo še bolj zgodaj in takrat kadulje sploh ne zacvetijo. V mokrih in hladnih pomladih je njih cvetenje sicer poznejše, a v obdobju sončnega vremena kadulje zopet prej podležejo kosi kot pa uspejo zacveteti.

Kadulje smo tako največkrat našli na ekstenzivnih travnikih, kolovozih, cestnih robovih in na raznih melioracijah na kraškem svetu, kjer so kadulje pionirske vrste. Vendar rastlinska pisanost cestnih robov povsod ne traja tako dolgo, da bi kadulje zacvetele. Ponekod jih zelo hitro pokosijo in s tem se zopet izgublja raznolikost. Skratka kadulje postajajo zaradi spremenjenega načina gospodarjenja vse manj številčno prisotne na intenzivno obdelanih travnih površinah. Na površinah, ki se zaraščajo, kadulje hitro začno izgubljati svojo moč. Tako je obdobje za raziskovanje in nabiranje kadulj vsako leto krajše in borba s časom za najdbe dovolj zanimivih populacij večja. Pogoste tople jeseni pa povzročajo, da kadulje mnogokrat ne le pocvitajo, ampak normalno cvetijo še septembra in oktobra. Še pred desetletjem tega ni bilo mogoče videti. Jesenske populacije po barvi cvetov sicer res niso tako raznolike, a se tudi med njimi

najdejo posebnosti, vendar res v manjši meri. Na mestnih zelenicah je vsaj ponekod cvetenje kadulj po zelo zgodnji prvi košnji dokaj normalno. Seveda le takrat, če naslednja košnja ni zopet prehitra. Zgodnja košnja kadulj na zelenicah še ne uniči, saj so takrat še v fazi rozete. Če torej naslednja košnja ni prehitra, potem kadulje še prav lepo zacvetijo. Zato bi bilo priporočljivo, da se na take zanimivosti v mestih gleda drugače in se kosi šele tedaj, ko takšne površine odcvetijo.

Photo: J. Bavcon

Diskusija

Skupaj s travami kadulje zelo lepo valovijo in njihova socvetja na vrhu dosežejo višino trav. Kadulje so pogosteje prisotne na suhih travnikih. Še posebej na travnikih z apnenčasto podlago – torej tam, kjer je zanje še dovolj prostora, da lahko svoje bogato socvetje razpirajo med zelenino trav in pisanostjo drugih rastlin. Ne manjkajo tudi na nekoliko bolj vlažnih travnikih, le intenzivno gnojenje in zgodnja košnja jih počasi redčita. Tako se pisanost travnikov zmanjšuje. Njihovega cvetenja prav tako ni na zaraščajočih se površinah. Tam kadulja hitro izgine, saj je svetloljubna rastlina. Zato se umika na cestne robove in včasih sega že povsem v cesto. Tam tudi ostaja, če le mulčerji ne povzročijo preveč erozije. Velikokrat so prav cestni robovi najlepši, kajti tam kadulje najprej zacvetijo. Običajno je namreč tam najbolj plitva zemlja. Drugje na travnikih je potrebno že pohiteti, da jih vidimo, kajti dandanes zaradi spremenjenega načina pridelovanja krme – zaradi baliranja – kadulje težko

vidimo cveteti, saj jih kmetje že prej pokosijo. Za ohranitev stabilnih populacij kadulje je nujna pozna košnja travnikov. Pri primerjavi treh strukturnih populacijskih tipov travniške kadulje na Nizozemskem so ugotovili (Hegland s sod. 2001), da so na pozno košenih travnikih prevladovale dinamične (z velikim deležem juvenilnih rastlin) in normalne populacije (s prevladujočimi mladimi rastlinami in deležem starih rastlin). Prav tako so bile le-te večje v primerjavi z nekošenimi travniki. V teh dinamičnih populacijah so ugotovili tudi velik delež sejančkov in večjo vrstno pestrost ostalih rastlin. Potrdili so namreč prisotnost vrst *Veronica austriaca* subsp. *teucrium*, *Thalictrum minus*, *Orobanche caryophyllacea*, *Centaura scabiosa*, *Rhinanthus angustifolius*, *Eryngium campestre* idr., ki so sicer na Nizozemskem v naravi že redke. Pozno košenje pa ugodno vpliva na sejančke, saj po eni strani omogoča, da rastline dozorijo in semenijo, po drugi strani pa se s košnjo odstrani zgornji vegetacijski sloj in zagotovi dovolj svetlobe za jesensko kalitev kaduljinih semen (Hegland s sod. 2001). V isti raziskavi so ugotovili tudi pozitivno korelacijo med pustimi tlemi ter številom sejančkov in mladih rastlin. Več jih je bilo na pustih tleh, pri čemer lahko takšne zaplate predstavljajo donorske populacije za ponovno poselitev preveč intenzivno obdelanih travnikov ali prezgodaj košenih.
Tudi pri nas za opazovanje pisanosti kadulj ostaja vedno manj površin. Potrebno se je odpraviti v nekoliko višje lege na pašnike ali senožeti, ki jih še kosijo. Vsekakor je to ena izmed naših prav atraktivnih rastlin, ki je še vedno najlepša med zelenino trav. V nekaterih državah je kadulja že zelo redka vrsta (Treuren s sod. 1991). Tako je na primer v Veliki Britaniji ta vrsta že redka in zaščitena (Rich s sod. 1999), prav tako pa je redka in na rdečem seznamu ogroženih rastlinskih v Nizozemski (Ouborg in van Treuren 1995).

V raziskavah v različnih delih Slovenije se je pokazalo, da ima travniška kadulja socvetje večinoma temno modre barve. V posameznih delih Slovenije, predvsem Primorske, postaja socvetje zelo svetlo modro. Tudi v notranjosti Slovenije so v osrednjem delu lokalne populacije z zelo svetlo modrimi primerki (ljubljanska okolica), bolj proti Štajerski pa je pogostejša le temno modra obarvanost. V različnih delih Slovenije so mestoma prisotne roza obarvane različice, ki jih Mala flora Slovenije (Jogan 2007) ne obravnava. Rožnata obarvanost je v Sloveniji bistveno pogostejša kot bela barva, vendar je v Mali flori navedena samo bela. Pri terenskem delu v različnih delih Slovenije smo do sedaj rožnate variante našli na različnih nahajališčih v pravem submediteranskem območju, na različnih nahajališčih v submediteranskem, ki prehaja v dinarsko in v dinarskem območju. Tukaj smo jih do sedaj našli večkrat v istih lokalnih populacijah. A to ne pomeni, da v drugih območjih niso prisotne. Povsem lahko jih je spregledati, saj travnike zelo zgodaj kosijo in pogosto kadulje tedaj niti še ne cvetijo. Vse

rožnate različice smo do sedaj našli na zelo suhih in gruščnatih mestih. Za razliko od rožnate obarvanosti, smo bele primerke sprva našli le na eni sami lokaciji na Dolenjskem, ki že spada v mejno območje preddinarskega s subpanonskim. Za razliko od rožnatih različic so se nahajale sredi travnika. V letu 2013 pa se je pogostost belih kadulj povečala in smo jih poleg že omenjene lokacije na Dolenjskem našli še v različnih predelih: na Cerkljanskem, v Slovenski Istri in na Krasu. O najdbah so nam poročali še z Idrijskega (Mohorič in litt. 2013). Glede na enako obiskanost travnikov v prejšnjih letih je po dveh letih opaziti porast belih primerkov.

Barvna variabilnost cvetov travniške kadulje
Flower colour variety of meadow clary Photo: J. Bavcon

Bele različice so v naravi običajno manjše in manj cvetoče kot običajne modro cvetoče, kjer je socvetje bolj razvejano. Povsem drugače se obnašajo v vrtni kulturi. Tam se bele različice razvijejo v enako bujne rastline kot so modro obarvane. Čeprav bi glede na veliko pogostost kadulje v lokalnih populacijah v različnih delih Slovenije pričakovali, da je bela različica lažje dosegljiva in pogostejša, je bilo potrebno za njeno odkritje kar veliko let sistematičnega dela.

Podobno se roza različice pojavljajo vedno v istih lokalnih populacijah, le da so te pogostejše.

S hortikulturnega vidika so barvne različice vedno zanimive, če le ohranjajo svojo stabilnost, kar navadno opisujemo kot nove sorte. Roza in bela različica sta to potrdili, zato sta povsem upravičeno dve zanimivi sorti, ki sta v vrtu ohranili te lastnosti.

Sorta *Salvia pratensis* 'Roza' se od običajne modro cvetoče travniške kadulje loči po tem, da ima, kot že slovensko ime pove, roza cvetove. Različica spada med večje in ima zelo razraslo socvetje, ki tudi ni tako zbito kot običajno pri modrih primerkih kadulje. Tipično razrast ohranja tudi v kulturi, kjer je že kar nekaj let. V tem času sem nabral še različice iz drugih predelov Slovenije, ki imajo podobne lastnosti (Bavcon 2010).

Sorta *Salvia pratensis* 'Bela' se od običajne kadulje loči po tem, da ima socvetje

Photo: B. Ravnjak

v naravi bolj rahlo, nekoliko manjše, s povsem belimi cvetovi. Tudi sama rastlina daje bolj svetlo zelenkast izgled, za razliko od običajnih kadulj, ki imajo liste bolj temno zelene. Socvetje je običajno nekoliko manj razraslo. V kulturi pa se socvetje povsem enako razraste in je rastlina zelo bogato cvetoča, z enako zbitostjo cvetov kot pri modro obarvanih različicah (Bavcon 2014).

Čeprav v hortikulturi pogosto uporabljajo različne vrste kadulj (Philips & Rix 1994, Clebsch 1997, Niederer 2009, Kühn 2012), pa travniško kaduljo omenjajo tudi kot invazivno vrsto za Kalifornijo. Že od leta 1968 se semen ne sme izvažati. Dolgo so namreč predvidevali, da se je tam naturalizirala. Vendar se je izkazalo, da gre za drugo vrsto *S. virgata* Jacq. Kljub temu od leta 1995 še vedno velja, da tja ni priporočljivo pošiljati semen travniške kadulje (Clebsch 1997). Zadnja sušna leta so pokazala, da kadulja v dovolj mokrem in toplem septembru (Cegnar & Gorup 2013) še enkrat ponovno množično cveti in se njeno cvetenje podaljša celo v oktober. Nekoč ta pojav ni bil pogost za notranjost Slovenije.

Zaključek

Glede na to, da travniška kadulja v širšem smislu raste od nižine do subalpinskega pasu, je povsem normalno, da se oblika in razrast rastline spreminjata glede na razmere v katerih raste. V tej veliki znotrajvrstni raznolikosti lahko potem ločimo posamezne različice. Včasih se zazdi, da imajo

Ličinke slinaric na kadulji
Froghopper larvae on meadow clary Photo: J. Bavcon

kadulje med cvetovi nekaj beline. Večinoma so za ta pojav odgovorne ličinke slinaric (*Cercopoidea*), ki se rade zadržujejo tudi pod cvetovi kadulj. Res pa je, da imajo tudi nekateri cvetovi na spodnji ustni rahlo belino. Med modrino kadulj najdemo vse odtenke modre – od svetlo modre do povsem temno modre, ki je bolj značilna za njeno sorodnico vretenčasto kaduljo (*Salvia verticillata*). Vendar slednja cveti v otavi – drugi košnji in je med prvo redko prisotna. Tu in tam se v modrini kadulje najde še kak drug odtenek barve. Izredno opazne so kadulje, katerih barva sega od vijolične do povsem bledo rdeče in bolj rdeče vijolične. Možno je najti celo paleto odtenkov, a so kljub temu to prave redkosti, ki se sicer pojavljajo v različnih delih Slovenije in so pogostejše kot beli primerki. Prav lepo je pisanost kadulj opazovati povsem od blizu. Vijolične in bledo rdeče različice se velikokrat pojavljajo na zelo suhih in gruščnatih mestih.

MEADOW CLARY (*Salvia pratensis* L.)

Jože Bavcon, Blanka Ravnjak

PREFACE

When claries start undulating on meadows, it is a sign of the approaching hot summer. When dry clary inflorescences touch in the mown grass, they really rustle. Even though already withered, the clary inflorescence with their bilabiate calyxes is hispid, and when calyxes touch each other, they make a special rustle. But this sound is not often heard anymore. Who uses a rake nowadays to occasionally rub the dry inflorescences, creating the summer meadow melody?! Scythes were replaced by tractor lawn mowers, mowing is followed by mechanical raking and then hay baling. The colourfulness of claries and the rustling of their dry withered inflorescences are now almost gone. The clary will survive this, it will only move to the edges. And we will soon knownothing about that colourfulness. It is time now that clary comes to the greens of our gardens, where we can easily make small patches of grass with them.

Photo: B. Ravnjak

Abstract

Meadow clary (*Salvia pratensis*) is a widespread species in Europe, however, due to inadequate environmental management, is now an endangered plant species in some places and therefore also protected. The species is widespread in Slovenia, and grows from lowlands to the subalpine zone. We can most frequently find it on dry meadows with the limestone rock base. The meadow claryis disappearing from meadows that are mowed very early, and it thus withdraws to roadsides, cart tracks and ruderal surfaces. Its slow disappearance from meadows is also caused by the overgrowth of grassy areas. Because of that, it is necessary for its preservation to appropriately manage the environment and comply with some recommendations, for example late mowing, which enables completion of seed production and population renewal, avoiding hay baling, etc. At its late spring heavy flowering, in some places still in big populations, the pronounced blue-purple colouration of flowers is really magnificent. But it is still possible to find pink, light red or even white coloured smaller populations or individual specimens in some places. These specimens definitely belong among rarities, and are for this reason horticulturally interesting. Even in some parts of Slovenia, we have found mainly pink coloured specimens, very rarely white ones. On the basis of our findings, we have named two varieties, namely *S. pratensis* 'Roza' (pink) and *S. pratensis* 'Bela' (white). Both varieties are a part of the collection of the University Botanic Gardens Ljubljana. The described variety is not just a nice decoration in the environment or in the garden, but is also a very important bee pasture, and definitely deserves our attention and care for its preservation in nature.

Key words

Salvia pratensis, diversity, dry meadow

Introduction

Meadow clary (*Salvia pratensis* L.) is more or less widespread throughout Europe. It grows from England to Russia. Tutin et al. (1972), Philips & Rix (1994), and Clebsch (1997) mention it also for the north of Africa. Mišić & Lakušić (1990) also state the south-westernAsia as its areal, in addition to Europe. In Slovenia, it is a generally widespread species. It grows from lowlands to the Subalpine zone.

In addition to moon daisies, buttercups and ragged robins, the meadow clary is one of the most common species on our less fertilised meadows. Mišić and Lakušić (1990) describe the ecosystem of the class *Festuco-Brometea* as the most common optimum group for the meadow clary (*S. pratensis*). Seliškar and Wraber T. (1986), in addition to the mentioned group, also state that the species appears on more dry meadows of ordo community *Scorzoneretalia villosae* in the Littoral region as well. Clary most prefers those dry meadows, where the foundation consists of limestone (Hegi 1908–1931).They are real beauties. The drier the year, the sooner they flower – the first ones already in the beginning of May, and then all the way to June. Since their blue colour stands out on the meadows, they are very visible. They also like slightly more hardened soil and so they often grow in the middle of cart tracks or on their edges. They also occupy roadsides, on gravelled verges. Therefore, clary quickly transforms from a completely meadow species into a completely ruderal, since it is sometimes the first plant to grow on such places. The plant is very sticky and floral calyxes often stick to clothes or animal hair, causing the seeds in the floral calyx to get transported long distances. The plant preserves this stickiness later, too, when flowers fall off. With this feature, clary spreads very quickly. Along with more

Photo: B. Ravnjak

Photo: J. Bavcon

than 900 species, the meadow clary is classified in the genus *Salvia* (Clebsch 1997), which also includes a slightly more known medicinal herb, the common sage (*Salvia officinalis*). Like common sage and many other varieties of sage, meadow clary also contains essential oils and some other secondary metabolites. They have thus found contents of monoterpene hydrocarbons, oxygenated monoterpenes, sesquiterpene hydrocarbons, oxygenated sesquiterpenes and aliphatic components. Among them, the sesquiterpene E-caryophyllene is the main component of essential oils of meadow clary (Anačkov et al. 2009).

The meadow clary is a characteristic meadow plant with larger leaves and a ground-hugging rosette. This allows it to survive even after mowing, thus getting enough nutrients for the next year. Then the rosette once again grows from the root, with one or more leaved stems rising from it. The rosettes have to be at least 4–5 years old for the first flowering and further reproduction (Ouborg s sod. 1991, Ouborg and van Treuren 1994). The plant germinates from the seed during autumn (Muller 1978). Clary has deep roots that may reach the soil horizon C (Rich et al. 1999). The stem is often branched fork-like, but it usually grows in arcs from rosettes and turns up later on. On the stem, there are slightly heart-shaped oval, long, sometimes pointed, rough serrated leaves that become smaller up the stem and with smaller petioles. With first flowers, the leaves are completely without petioles and almost as big as the length of the flower. Both sides of the leaves are covered with trichomes, and the bottom side is also covered with glandular hairs (Anačkov et al. 2009).

The inflorescence is long and the flowers are in apparent whorls. The calyx and the flower are characteristically bilabiate with a long protruding blue crease. The florescence is glandular. Each flower is dark blue and has a typical sickle-shaped upper corolla lip, whereas the lower one is wider and serves as a place for pollinators to sit on. A flower of this specific species was studied as a perfected

system of co-evolution of plants and their pollinators. This perfection is shown primarily in the structure of the flower, or more precisely, in the structure of filaments. They are joined together at the base and form a ring structure that narrows the entrance into the tubular part of the flower. This ring structure is attached with filaments to the upper and lower corolla lip at the mouth of the flower, where both lips open up. The structure of the whole stamen works as a lever that the pollinator triggers, and finally deposits the pollen on the pollinator. We could divide a pollinator's visit onto a clary flower into three phases. In the first phase the pollinator, a bee, triggers the lever of the stamen. It does this by pushing its tongue through the ring structure of filaments; this is the only opening that leads to the nectar glands. By doing so, it additionally presses its head on the lever (ring structure), and filaments with anthers swing and touch the back of the bee where pollen is laid on the hairs. The second phase is a little more static and marks the time in which the bee sips the nectar. The third phase is the final part, when the bee pulls its tongue out of the tubular part and ring structure of filaments, and leaves the flower.

The force on the lever of filaments is reduced and stamens return to the previous position. The entire amount of pollen is released onto the pollinators in 12–17 consecutive visits. Bees are among the most common pollinators of the meadow clary, because the size and length of their tongues is perfect for effective triggering of pollination mechanism. If the tongue of the pollinator is to short, they will not get the prize (nectar), and will therefore not return to the flower again. But if the pollinator is too big, it cannot approach the mouth of the flower well enough, and may, with its excessive force, damage the flower or tear it apart. We can arrange the pollinators of meadow clary into two functional groups. The first group contains pollinators that "steal" the nectar and pollen without triggering the pollinating mechanism. The second group consists of those that trigger this mechanism, and are then truly involved in the pollination of the flower (Reith et al. 2007). Due to the fact that pollinating mechanism differ among different species of clary (in length of filaments, ligaments with which the filaments are attached, size of the ring structure), the crossover between them is less likely. However, the crossover between the species *S. pratensis* with small flowers and species *S. nemorosa* with big ones could be possible. Such hybrids called *S.* x *sylvestris* L. were found by Kerner von Marilaun (1891). They had as many as 60% of fertile seeds (Claßen-Bockoff et al. 2004).The seeds of meadow clary mature after 30 days, the estimated amount of seeds in one plant is as many as 1500 seeds. In favourable conditions, the seeds germinate after 12 days of release from the calyx (King 2004). When studying the populations of meadow clary in Great Britain, 1–9% specimens

with sterile male part of the flower were discovered in the populations. This percentage was increased by exposure to intensive shade and damage due to herbicides (Rich et al. 1999). Meadow clary is also one of the very melliferous plants and represents an important bee pasture. It was discovered (Nicoleta 2008) that their flowers contain as much as 67% of nectar, which isapproximately 171 kg/ha. But clary does not attract only pollinators, which look for honey and pollen, but other animals as well. Some mammals may feed on immature seeds, whereas caterpillars of the genus *Aglaostigma* eat the flowers. They can eat up to 20% of flowers on an individual plant (King 2004).

Because the flowers open from the bottom up, the plant flowers for a relatively long time, if only spring and the beginning of summer are not to droughty. In that case, they may open incredibly fast. In the book *Mala flora Slovenije* (Jogan 2007), three subspecies of meadow clary are distinguished:

S. pratensis L. subsp. *saccardiana* (Pamp.) Poldini, which is a plant of warm forest margins. It is from 0.5 to 1.2 m tall. It has petiolate basal leaves whose petiole is as long as the lamina. The calyx is from 12 to 13 mm and the corolla from 28 to 35 m mlong.

S. pratensis L. subsp. *pratensis*, present in dry meadow sandlight warm forests. It is lower than the above subspecies, measuring just 0.3 to 0.6 m in height. The basal leaves have short petioles. The calyx is from 7 to 11 mm and the corolla from 12 to 30 mm long. Theo utline of the inflorescence is oval, the bracts green. It has a large arched uppercorolla lip. The corolla is darkblue-purple, more rarely white.

S. pratensis L. subsp. *bertolonii* (Vis.) Soó, more frequently present in dry karst meadows of the submediterranean region. The inflorescence gradually narrows toward the top, the bracts are deep crimson. The uppercorolla lip is small, almost straight, the corolla is crimson-purple, rarely white.

As evident from the above, all three of them have a blue to dark blue or crimson corolla. Concerning the subspecies *S. pratensis* subsp. *pratensis* and *S. pratensis* subsp. *bertolonii*, it is reported that their corolla can in rare instances be white as well (Jogan 2007 in MFS). Meadow clary is considered to be a very diverse species (Tutin et al. 1972). Various colours of their flowers, from blue, pink to white, are reported by numerous authors, whereas the colour white is usually described as rare: Hegi (1908–1931), Tutin et al. (1972), Seliškar and Wraber (1986), Mišić and Lakušić (1990), Philips and Rix (1994), and Clebsch (1997). With the exception of Hegi (1902–1931), none of these authors define any single

subspecies. According to Jogan (2007), classifications into subspecies suggest high variability within the species.

Different flower colours of meadow clary were already mentioned in older works. In his famous *Flora Austriaca*, Host (1827–1831) indicates meadows as habitats of *S. pratensis*, and lists blue, rarely white and pink as the colours of its flowers. In Wulfen's posthumously published book, *Flora Norica Phanerogama* (1858), the flower colours are also described as pink and rarely white. He adds that the plant is frequent in the meadows around Gorizia (Italy, Slovenia), Ljubljana and Klagenfurt (Austria). Pacher (1887) is even more precise, and says that the species is rarely white. Pospichal (1897–1899) also lists as rare the white flowering variety of the species *S. pratensis* for the flora of the Austrian Littoral.

However, in Scopoli's (1772) second edition of *Flora Carniolica,* where he describes the flora of Carniola – the major part of present-day Slovenia, we will seek in vain a mention of a white variety. He only mentions blue as the colour of the flower. Linné (1753) also only mentions the colour blue as the colour of the clary flower.

In the identification keys for plants in Slovenia, many different shades of colour

Photo: J. Bavcon

are reported for meadow clary, but the colour white is not always present. Piskernik (1941, 1951) reports only dark blue-purple and dirty-red colouration. Later, Mayer (1952) and Martinčič & Sušnik (1969) once again report the white colouration.

All these varieties or subspecies are probably only the Gaussian curve of a single species, but which dominate on sites depending on different environments. Even though white flowers are listed with two subspecies, the white colouration is truly a rarity with the clary. After long years of monitoring our meadows, we can now be completely certain in this claim, since we have only found some more white specimens in one part of Slovenia, namely in Lower Carniola, and only in the last years after some severe droughts have we found white specimens in different, other parts of Slovenia. More often one can find pale red varieties. And even these can only be found individually, but in different areas.

Methodology

We have been collecting the plant material of meadow clary for many years. Until recently, the plants were planted in different parts of the Botanic Gardens, and have not been studied systematically. In the last seven years, we have started studying them systematically, and gave them their own part in the cultivating beds. Meadow clary is not as simple to grow in culture as are some other species studied here. They often grow in very arid and sandy ground, and the most beautiful plants therefore have a long main root, which often tears during picking. Even though we usually manage to get an intact plant, this is not enough. When transplanting, the clary always withers, no matter how much care we devote. It is an herbaceous plant that is in full development when it is very warm or even droughty. Despite shading and moisturising, the transplantation of a plant from nature is stressful. That is why we usually cut the plant and leave only the rosette. Of course, this means that we do not get its seed that year. If the drought is not too severe, it may happen that it flowers again, but at that point the development of seeds is often not as successful. The pollination is also not as successful then, because clary is not as interesting for pollinators as before. Perhaps even the content of nectar is smaller at that time.

The problems of growing claries in culture also include snails and caterpillars, which often attack the species in culture. They often devour them in culture, because these plants are gentler than in the nature. Their attack may occur very quickly, despite everyday care. Especially during summer, when sunny and rainy weather alternate, the snail activity is high, and just one night can be fatal for the plants, leaving only the stubs of the plant. Such a plant has almost no more

chances for development. Many times, such devouring ruins the specimen in culture. We therefore have to devote much more care to clary than to other species in the research part of the gardens. They also need more room for growth, which means larger or especially deeper pots. All this again requires more appropriate space. Meadow clary is slightly sticky on the calyxes and therefore plants tend to stick together. And this might damage an individual plant during moving. That is why each pot in the culture needs more room for a good plant growth. Furthermore, it is also easier to move them for monitoring and identifying differences. If plants are too close together, and if they are not given the appropriate care, they are too intertwined and moving them around is then impossible. This means that they are all subject to free pollination, which is definitely not desired for selection in culture.

A frequent and quickly noticeable problem with claries is cross-pollination, the result of which are various less intense colours. They very quickly become bluish-white, if they are not isolated from other colours. The most persistent among divergent varieties are pink-purple to red coloured varieties. In previous years, they were substantially more frequent than completely white ones. To prevent pollination we use nets, which are fairly effective with claries.

For effective work and study of claries, we would need a larger area and a permanent gardener, who would take care of only this part. In given circumstances, this is not possible. And that means that study results in a particular year are not as good as they could be. This is especially evident in very wet years, when claries, due to an excessive amount of water in pots, seem much worse than they actually are in nature. Such an event occurred during the summer of 2014. In droughty years, the claries in pots are much more beautiful, if only they are appropriately supplied with water. The problem of their survival can also be seen in wet winters. In such winters, we protected the plants with glass, thus preventing excessive pour

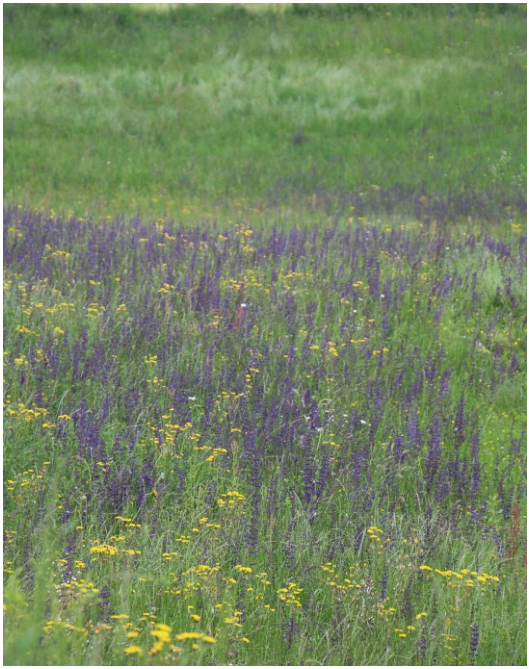

Photo: B. Ravnjak

of water. In the cold part of the year, the humid climate does not suit claries at all. It is best when winters are cold and snowy. These are the best condition for claries, because snow protects them. They even tolerate moderate abundance of water, when snow slowly melts down.

The work in nature was carried out by walking around and carefully examining the areas where the local populations were really dense. In the same way, we also monitored smaller populations on the edges. We immediately picked some of the most deviating specimens; others were picked only after checking the bigger part of an individual local population, especially where they were very numerous. Each specimen was first photographed on its site, then dug out and photographed again. This way it was easier to record an individual divergent specimen. Each specimen was then put in its own plastic bag, with soil and water if necessary, and taken to the Botanic Gardens. There, each individual plant was described, put in a mixture of compost and leaf mould, and planted in a square plastic pot with the size up to 14 by 14 centimetres with sufficient number of drainage holes. Every pot was equipped with a data label. We put the pots on a suitable net foil for floor covering, into concrete flower beds, edged by concrete plates. Since these plants need more space than many others, we gave them more

Travniška kadulja je zelo pogosta na cestnih robovih
Meadow clary is quite frequent at road sites Photo: J. Bavcon

free space between separate rows of pots. It was then easier to move plants during examinations. Before the start of flowering, we moved away all white plants and segregated them with a net. We did the same with other colour varieties, depending on which variety was dominant during flowering. According to the flowering of different varieties in different years, we used isolation to prevent pollination. We regularly watered the plants and put them in shade, if necessary. We picked seeds from all plants that were seeding and planted them later. Every year, we re-catalogued and photographed all interesting specimens, to make the comparisons between the years less subjective. We have compared the stability of different characteristics for several years.

The changed meadow management practices causes problems also for picking claries. Because of the hay bailing methods, the claries are mowed even before flowering. After that it is, of course, quite difficult to find suitable varieties of meadow clary. It is also disappearing from excessively fertilised meadows. After fertilising with mineral fertilisers, the grass strongly overgrows, and in such places claries disappear that same year or perhaps flower only in a few places. Clary is a light-loving plant, and when dense grass kills the light, their flowering is finished. Quite a few extremely interesting local populations can thus be lost in only one year. Especially in droughty springs, farmers mow meadows even earlier, preventing claries from ever flowering. They flower later in wet and cold springs, but in periods of sunny weather, claries again sooner succumb to scythes than manage to flower.

We have mostly found claries in extensive meadows, cart tracks, roadsides and in different ameliorations in the karst world, where claries are a pioneer species. But in many places, the floral diversity of roadsides does not last long enough for claries to flower. In same places, they mow them down very quickly, thus once again losing the diversity. All in all, claries are becoming less numerous on intensively processed meadow sites due to the changed way of managing. On sites where claries grow, they quickly start losing their power. Therefore, the period for examining and picking claries is getting shorter every year, and the battle with time to get enough interesting populations is getting more intensive. Frequent warm autumns cause claries not only to flower again, but to normally continue to flower during September and October. Just a decade ago, this could not be seen. Autumn populations are really not as diverse in colours of their flowers, but there could still be some peculiarities, albeit in smaller degrees. On city meadows, at least in some places, flowering of claries is quite normal after early first mowing. Of course, only if the next mowing is not too early again. Early mowing of meadows does not destroy claries, because at that time they are

still in the rosette phase. So, if the next mowing is not too early, claries might still flower beautifully. Therefore, it would be recommended to look at these sites differently in cities, and mow only when these surfaces wane.

Discussion

Together with grasses, claries undulate beautifully, and their inflorescences reach the heights of grasses. Meadow claries are more common in dry meadows, especially on those with a limestone base (Hegi 1908–1931), i.e. where they are left enough room to fully develop their rich inflorescence amid green grasses and other variously coloured plants. They are also not absent from slightly damper meadows, though intensive fertilising and early mowing are reducing their abundance. Consequently, this also decreases thecolour diversity of meadows. Similarly, they do not flower in areas that are being overgrown. Meadow clary quickly disappears from such places, since it is a light-loving plant. It therefore retreats to roadsides, pushing almost onto roads. It stays there, if only mulchers do not cause too much erosion. Such roadsides are often a very pretty sight, because meadow clary flowers there very early, since the soil there is most shallow. Elsewhere in meadows, you have to hurry to see them, since farmers mow it down well ahead of its flowering – due to changed methods of fodder

Populacija travniške kadulje na pašniku
Population of meadow claries on the pasture. Photo: J. Bavcon

production – hay bailing, and we rarely see meadow claries flower. Late meadow mowing is necessary for preservation of stable meadow clary populations.

When three structural population types of meadow clary were compared in the Netherlands, it was discovered (Hegland et al. 2001) that late-mowed meadows were dominated by dynamic (with a great share of juvenile plants) and normal populations (with dominating young plants and a share of old plants). Furthermore, they were larger in comparison withnon-mowed meadows. In these dynamic populations, they have also found a big share of seedlings and a bigger diversity of species of other plants. Namely, they have confirmed the presence of species *Veronica austriaca* subsp. *teucrium*, *Thalictrum minus*, *Orobanche caryophyllacea*, *Centaura scabiosa*, *Rhinanthus angustifolius*, *Eryngium campestre* etc., which are becoming rare in nature in the Netherlands. Late mowing has a beneficial effect on seedlings, because, on one hand, it enables the plants to mature and seed, and, on the other, the mowing removes the upper vegetation part and thus ensures enough light for the autumn germination of clary seeds (Hegland et al. 2001). In that same research, a positive correlation between arid ground and the number of seedlings and young plants was discovered. There were more seedlings and young plants on arid ground, where such patches may represent donor populations for the resettlement of too intensively cultivated or too early mowed meadows. Here, there are also less and less areas for observing the colour diversity of meadow claries. You have to go to slightly higher regions, to pastures or meadows that are still mowed. It is definitely one of our truly attractive plants, and still the most beautiful among the greenness of grasses. In some countries, the meadow clary is already a rare plant (Treuren et al. 1991). For example, in Great Britain, this species is rare and protected (Rich et al. 1999), and it is also rare and on the red list of endangered plant species in the Netherlands (Ouborg and van Treuren 1995).

Studies in different parts of Slovenia have shown that the inflorescence of the meadow clary is mostly dark blue coloured. In some parts of Slovenia, especially in the Littoral region, the inflorescence is becoming very light blue. Also, in the interior of Slovenia, there are local populations with very light blue specimens (Ljubljana region), whereas towards Styria only dark blue colouration is common. In various parts of Slovenia, there are also parts with pink coloured variations that Mala flora Slovenije (Jogan 2007) does not mention. The pink colouration is considerably more common in Slovenia than the colour white, but only white is listed in *Mala flora Slovenije*. During fieldwork in different parts of Slovenia, we have found pink versions in various sites in the real Submediterranean area, in various sites in Submediterranean area that transitions

to the Dinaric and in Dinaric area. There, we have found them in the same local populations several times. But that does not mean that they are not present in other areas. It is quite easy to miss them, because meadows are mowed very early, and claries often do not flower yet. All pink specimens that we have found have been on very dry and gravelly sites. As opposed to pink ones, we have first found white specimens only on one location in Lower Carniola, which belongs in the border area between Predinaric and Subpannonian, and, as opposed to the pink ones, they were in a middle of a meadow. In 2013, the frequency of white meadow clary increased, and we did not only find them in the said location in Lower Carniola, but also in other parts: Cerklje region, Slovenian Istria, and in Karst. There have also been some reports of findings in the Idrija area (Mohorič in litt. 2013). Considering the same frequency of visits of meadows in previous years, it is possible to notice an increase of white specimens after two years.

White specimens are usually smaller and less richly flowering in nature than common blue ones, where the inflorescence is more branched. They behave completely differently in garden culture. There, white specimens develop into equally exuberant plants as the blue ones. Even though it could be expected that the white version is more easily obtainable and more frequent, considering the frequency of claries in local populations in various parts of Slovenia, there were actually several years of systematic work required to discover it. Similarly, pink specimens always appear in the same local populations, they are just more frequent.

Photo: J. Bavcon & B. Ravnjak

Photo: J. Bavcon

From the horticultural point of view, the differently coloured specimens are always interesting, if only they keep their stability, and we usually describe them as new varieties. The pink and white varieties have confirmed this, so they are two justifiably interesting varieties that have kept their characteristics in the garden.

Salvia pratensis 'Roza' differs from the usual blue-flowered meadow clary in that it has pink flowers, as indicated already by its Slovenian name. It belongs to bigger varieties, having a much-branched inflorescence which is less compact than in blue specimens. It maintains its typical growth habit also in culture, where it has spent quite a number of years. I have meanwhile also collected varieties from other parts of Slovenia that exhibit similar characteristics (Bavcon 2010).

Salvia pratensis 'Bela' differs from the usual meadow clary in a looser inflorescence, smaller but perfectly white flowers, with the plant as a whole creating a more light green impression in distinction to the usual meadow claries, whose leaves are deeper green. The inflorescence is normally a little less branched. In culture, however, its growth equals that of the usual specimens, as it develops into a richly blooming plant whose inflorescence is as compact as that of the blue-coloured varieties.

Although many different species of clary are used in horticulture (Philips & Rix 1994 b, Clebsch 1997, Niederer 2009, Kühn 2012), the meadow clary is also mentioned as an invasive species for California. Since 1968, it is forbidden to export the seeds. It was presumedfor a long time that it had naturalised there. But, as it turned out, it was a different species, *S. virgata* Jacq. Despite that, since 1995 it is still not recommended to send seeds of meadow clary there (Clebsch 1997). The last few droughty years have shown that in the sufficiently wet and

warm September (Cegnar & Gorup 2013) clary again flowers nicely, and that its flowering extends even through October. In previous times, this occurrence was not frequent for the interior of Slovenia.

Conclusion

Considering the fact that, in a broader sense, meadow clary grows from lowlands to Subalpine zone, it is perfectly normal that the shape and growth of the plant vary according to the conditions in which the plant is growing. In this great intraspecific diversity, we can then identify various varieties. Sometimes it seems that claries have some whiteness between their flowers. Froghopper larvae (*Cercopoidea*) are mostly responsible for this. They like to remain under the flowers of claries. But it is also true that some flowers have slight whiteness on the lower corolla lip. We can find all shades of blue among the blueness of claries from up close. Purple and light red varieties often occur in very dry and gravelly sites.

Photo: J. Bavcon & B. Ravnjak

Vretenčasta kadulja (*Salvia verticillata)*
Whorled clary (*Salvia verticillata)* Photo: J. Bavcon

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KRONIKA

Jože Bavcon, Alenka Marinček, Blanka Ravnjak

Uvod

Botanični vrt je po letu praznovanja svoje 200 letnice v javnosti dobil le še večjo prepoznavnost. Vsaj v domači javnosti je k temu nedvomno veliko pripomogel tropski rastlinjak, katerega smo odprli prav ob koncu praznovanja 200 letnice (Bavcon s sod. 2011). Zagotovo je k privlačnosti rastlinjaka veliko prispevala uspešna zasaditev in dobra rast rastlin. Vsekakor je k zanimivosti tropske rastlinske zbirke botrovalo dobro sodelovanje z drugimi botaničnimi vrtovi, saj smo veliko zanimivih rastlin dobili z izmenjavo oz. donacijami iz drugih vrtov. Največ jih je prispeval Bonnski botanični vrt, vrt iz Gradca in nekaj še vrt iz Zagreba. Iz drugih vrtov pa smo rastline dobili predvsem v obliki semen. Zelo pomembno je bilo, da smo kljub težkim finančnim razmeram že spomladi uredili

Posledica žleda
Consequence of sleet Photo: J. Bavcon

okolico rastlinjaka, tako gojitveni kot servisni del vrta. S tem smo lahko ponovno normalno začeli gojiti rastline, predvsem enoletnice, za potrebe posaditve v ostale dele vrta. Prav tako velja omeniti, da smo ob rastlinjaku naredili majhen kuhinjski vrt, ki je postal kar televizijski vrt oddaje Dobro jutro. Vsak teden smo v živo gledalcem svetovali o rastlinah in vrtnarjenju, tako je oddaja ponesla ime vrta tudi na televizijo. Ljudje so oddajo zelo dobro sprejeli in v vrt je prišlo vedno več obiskovalcev. V letu 2013 je bilo delo Botaničnega vrta predstavljeno v knjigi Der Garten als Wissensraum (Vrt kot prostor znanja) (Standler 2013), kjer so predstavljeni najpomembnejši botanični vrtovi v Evropi. Tokrat nas uvrščajo med 90 podobnih inštitucij, s tem da je tovrstnih inštitucij na svetu okrog 3000.

Obdobje po 200. obletnici je bilo za vrt finančno težko. Globalna finančna kriza je postajala vse ostrejša, sredstva so se iz leta v leto manjšala, a vrt je za povečan obseg svoje dejavnosti potreboval več denarja. Nismo oklevali, ampak smo se resno lotili dela. Kljub temu, da smo bili uspešni in smo vrt kljub zmanjšanim sredstvom pripeljali do pozitivnega stanja, smo ob koncu leta 2012 žal izgubili dve začasni delovni mesti. Izguba delovnih mest je vrtu povzročilo velike težave. Tudi te smo uspešno premagali, pričeli in dokončali obnovo starega rastlinjaka ter še povečali medijsko prepoznavnost vrta. Februarja 2014 je vrt doživel še hud udarec s strani narave. V žledolomu se je podrlo 25 različnih drevesnih vrst, vsega skupaj pa 30 dreves. Tudi mnogo grmičevja je bilo poškodovanega. Potrebovali smo kar sedem mesecev, da smo uspeli nastalo škodo sanirati in vrt zopet urediti.

Dejavnost vrta pa ni omejena le na del ob Gruberjevem prekopu, ampak ima še tri dodatne lokacije: rastlinjak v tivolskem parku, rastlinjak sredozemskih rastlin in sočnic z nasadom japonskih češenj na Večni poti ter suhi travnik v Rojah. Vse to mu omogoča dejavnost izven matične lokacije in širitev publike. Na ta način smo v stiku z ljudmi v različnih delih mesta. Kar je poleg stalne prisotnosti v medijih še dodaten direkten stik z meščani in obiskovalci mesta.

Raziskovalna dejavnost

Naša raziskovalna dejavnost je že vsa leta povezana predvsem z avtohtonimi rastlinskimi vrstami, kar pomeni, da še po več kot 200 letih nadaljujemo tradicijo

vrta domovinske flore. Tako smo v jubilejnem letu izdali monografijo o žafranih v Sloveniji, v kateri smo predstavili vse raziskovalno delo na rodu žafranov (*Crocus* sp.), ki rastejo v Sloveniji (Bavcon 2010). Delo je povezano tudi z raziskovalno zbirko posameznih primerkov žafranov, ki jo še vedno dopolnjujemo v raziskovalnem delu vrta. Omenjena monografija in naše raziskovalno delo sta bila tudi povod za povabilo k sodelovanju v Cost projektu Safronomics COST FA1101, ki obravnava pravi žafran (*Crocus sativus*) in tudi vse druge naravne vrste. V projekt smo se vključili leta 2012 in v okviru le-tega predstavili še nekaj novosti o žafranih v Sloveniji: križance med spomladanskim in progastim žafranom (Bavcon 2012a), raznolikost spomladanskega žafrana (*Crocus vernus* subsp. *vernus*) (Bavcon 2013a) ter še križance med nunko (*C. vernus* subsp. *albiflorus*) in progastim žafranom (*C. reticulatus*) (Bavcon 2014c).

Nadaljevali smo z raziskavami navadnih malih zvončkov (*Galanthus nivalis* L.) in še drugih zgodnje pomladanskih čebulnic (Bavcon 2011a). Raziskave o zvončkih smo leta 2011 v enournem predavanju predstavili na dnevu zvončkov v Arboretumu Kalmthout v Belgiji in v članku v letni publikaciji Kraljevega hortikulturnega združenja RHS v Angliji (Bavcon 2011b).V letu 2009 izdano delo o ciklami (*C. purpurascens* Mill.) in njeni raznolikosti v Sloveniji, je v letu 2011 doživelo mednarodno recenzijo v strokovni reviji društva Cyclamen society iz Londona. Z zbiranjem različnih posebnosti in ugotavljanjem genetske stabilnosti smo nadaljevali pri že omenjenih vrstah in še pri nekaterih drugih kot so *Narcisus poeticus* subsp. *radiiflorus* in *Leucojum vernum.* Prav tako smo preučevali barvne različice nekaterih drugih vrst. V letu 2012 smo dobili povabilo za predavanje na največjo prireditev, ki obravnava zvončke Galanthus Gala v Anglijo, kjer smo predstavili Raznolikost zvončkov v Sloveniji. Predavanje je izšlo v publikaciji v letu 2013. V tem letu je izšel seznam z novimi sortami pri rodu *Galanthus* (Hanneke & Snoeijer 2013), kjer so priznane v letu 2008 opisane sorte (Bavcon 2008) našega navadnega malega zvončka iz Slovenije.

Pošiljka semen za Milenijsko semensko banko v Kew Gardens
Seed shipment for Miilenium Seed Bank in Kew Gardens Photo: J. Bavcon

V Sloveniji smo sodelovali na 6. kongresu genetskega društva Slovenije Genetika 2012 s prispevkom o navadnem malem zvončku (*G. nivalis*) z naslovom Karyological differentiation of cytotypes in Slovenian wetlands (Paradiž & Bavcon 2012). Jeseni smo bili povabljeni v Bergam na pripravo projekta alpski travniki, kjer je sodelovalo deset ustanov iz Italije, Avstrije in Slovenije, iz Švice in Francije, pod vodstvom predstavnikov Kew Gardens. Z naše strani smo projekt v celoti pripravili, le da do sedaj še ni zaživel.

V letu 2013 je botanični vrt sodeloval v svetovnem programu ohranjanjanja rastlinskih vrst preko semenskih bank – *ex-situ* varstvo, ki ga vodi Royal Kew Gardens- Kew Gardens Millenium seed bank. Cilj tega projekta je do leta 2020 zbrati v obliki semen 25 % svetovne flore. V okviru tega smo dobili enoletni projekt. Zanje smo nabrali semena 80 vrst slovenske flore. S tem bodo nekatere

redke in ogrožene vrste shranjene v semenski obliki v svetovni semenski banki kraljevega botaničnega vrta Kew. Delo je obsegalo okrog 60 dni terenskega dela, urejanje, določanje, čiščenje semen, pisanje protokolov in poročila o nabiranju.

Kew Gardens je v letu 2013 skupaj s Cyclamen society izdal obsežno delo o rodu ciklam Cyclamen (Mathew 2013), kjer so predstavljene tudi naše raziskave na navadni ciklami (*C. purpurascens*) in prav tako knjiga o navadni ciklami v Sloveniji (Bavcon 2009a) .

S soudeležbo botaničnega vrta sta bila objavljena tudi dva članka. V reviji Acta Botanika je izšel članek z naslovom Seed banks as a partnership for global plant conservation (Bavcon & Ravnjak 2014), ki obravnava semenske banke in sodelovanje botaničnega vrta pri nabiranju semen za milenijsko semensko banko Royal Kew Gardens. Drugi članek Foliage identification of different autochtonous common cyclamen genotypes (*Cyclamen purpurascens* Mill.) using various biochemical parameters (Osterc s sod. 2014) pa obravnava zbirko ciklam iz Slovenije v Botaničnem vrtu v Ljubljani.

Botanični vrt kot izobraževalna ustanova

V botaničnem vrtu vsako leto vodimo veliko število skupin vse od vrtcev, osnovnih in srednjih šol do študentov z naših univerz in iz tujine ter tudi različne interesne skupine. Prav ogledi interesnih skupin so se z izgradnjo tropskega rastlinjaka zelo povečali. Za vsa vodstva pa dodatno izobražujemo študente biologije in tudi drugih smeri iz matične Biotehniške fakultete ter Pedagoške fakultete, ki jih v vrtu usposobimo za samostojna vodstva. Okrog 20 študentov vsako leto gre skozi ta dodatni program. Po nekaj letih imajo tako dovolj znanja, da bi to delo lahko opravljali tudi drugje in se lahko samozaposlili tudi kot vodiči, če bi s tem izpopolnjevanjem kot ga dobijo v vrtu, nadaljevali. Največji delež vodenih obiskovalcev predstavljajo skupine iz osnovnih šol, obiščejo nas tudi skupine iz vrtcev, različna društva, turistične skupine in tudi skupine iz tujine. (Priloga 1)

- 2011: 105 šol, vrtcev = 4469 oseb

4 fakultete = 136 oseb

48 interesnih skupin = 1228 oseb

- 2012: 138 šol, vrtcev = 5668 oseb

6 fakultet = 541 oseb

46 interesnih skupin = 980 oseb

- 2013: 112 šol, vrtcev = 4266 oseb

8 fakultet = 293 oseb

53 interesnih skupin = 1226 oseb

-2014: 125 šol, vrtcev = 5191 oseb

17 interesnih skupin = 482 oseb

Photo: J. Bavcon

Od odprtja tropskega rastlinjaka smo pričeli tudi z izvajanjem javnih vodstev vsaj enkrat mesečno v času sezone. V letih 2012 in 2013 smo izvedli tri takšna vodenja, v letu 2014 pa kar sedem. Z ureditvijo poti do špice in otvoritvijo brvi, ki so jo poimenovali po Francu Hladniku, je Botanični vrt v letu 2009 postal zelo priljubljena točka za obisk. Število obiskovalcev se je tako v teh letih nekajkrat povečalo in po oceni verjetno že dosega blizu 100 000 obiskovalcev letno.

Izobraževanje pa ne obsega le vodstev po vrtu in individualnih ogledov, ampak v Botaničnem vrtu za javnost prirejamo odprta predavanja, ki so vsaj enkrat mesečno,včasih tudi večkrat. Nudimo tudi prostor nekaterim društvom, ki v okviru svojih dejavnosti tukaj prav tako prirejajo tematska predavanja za svoje člane in širše občinstvo. Letno se tako zvrsti večje število predavanj. Tekom leta prav tako mesečno organiziramo različne tematske izobraževalne delavnice, ki so namenjene najširši javnosti in vključujejo tako najmlajše kot starejše udeležence. Bistvo naših delavnic je v tem, da se obiskovalci naučijo ročnih spretnosti v povezavi z rastlinami, spoznajo njih uporabo v različne namene in se tako preko tega naučijo še nekaj o rastlinah. Delavnice so tudi etnobotanično obarvane in na ta način ohranjamo nekdanjo tradicijo Vrta domovinske flore. Nekatere delavnice so bile pripravljene ob posebnih priložnostih, kot na primer sklop počitniških delavnic za otroke 'Rastline in čebele' v času razstave Urbanbees v začetku leta 2014 in delavnic za otroke v času gostujočih razstav o žabah in žuželkah leta 2013 in 2014. Delavnice prirejamo za najavljene šolske skupine in za širšo javnost v popoldanskem času. Skupine otrok iz vrtcev, osnovnošolci in srednješolci pogosto želijo voden ogled dopolniti tudi s praktičnim delom na delavnicah. Teme delavnic se navezujejo na vodene oglede in jih tako obogatijo in nadgradijo. Pogosto se odločajo za delavnice na temo rastlinskih organov (spoznavanje in risanje teh s pomočjo lupe ali izdelava modela cveta, izdelava kalilnikov,...), spoznavanje in uporaba določevalnih ključev, spoznavanje vodnih in obvodnih rastlin ter živali, zdravilnih rastlin, lesnih rastlin (izdelava modela ploda javorja in lipe, odtisov lubja,...), spoznavanje prehranjevalnih verig in spletov preko igre idr.

- 2011: 12 delavnic in 11 predavanj

- **2012:** 14 delavnic in 17 predavanj

- **2013:** 13 delavnic in 12 predavanj

- **2014:** 17 delavnic in 12 predavanj

Leta 2010 smo v Botaničnem vrtu začeli izvajati tudi počitniško varstvo in sicer zadnji teden v avgustu. V program so bile vključene delavnice, pri katerih so otroci skozi igro pridobivali znanje o rastlinah.

Poleg tega vrt sodeluje na različnih festivalih in prireditvah, ki jih prirejajo druge organizacije - Taborniški festival, Festival Hokus Pokus, Dan očarljivih rastlin, Noč raziskovalcev in Bolšji sejem. Sodelovali pa smo tudi že na sejmih izven Ljubljane kot tudi na različnih prireditvah, kjer že tradicionalno vodimo skupine po naravi v različnih delih Slovenije ali imamo predavanja v različnih društvih po Sloveniji. Še posebej smo v letu 2013 poleg že tradicionalnih vodenj za posamezne skupine imeli večje število predavanj ob izidu knjige Naše rastline. Predavanja so se vrstila v različnih delih Slovenije (Šentjanžu, Ljubljani (Knjižnica Bežigrad, Knjižni sejem v Cankarjevem domu), Centru Gašperlin, Arboretumu Volčji potok, Ložu, Kopru in Šentrupertu), pri čemer smo vanje vpletali tudi lokalno problematiko, saj so v knjigi opisane običajne rastline, ki rastejo tu in tam.

Pomemben del prenosa praktičnega znanja je usposabljanje študentov v okviru praktičnega pouka, ki ga izvajamo tako za srednje šole z naravoslovno vsebino kot za poklicne in visoke šole ter za univerzitetni program. Tako k nam na prakso prihajajo dijaki in študentje različnih smeri od matične biologije do krajinske arhitekture, agronomije ter posamezniki iz drugih smeri. V okviru redne prakse spoznajo delo v vrtu, se srečajo z rastlinami, delajo skupaj z našimi vrtnarji in na ta način najbolje osvojijo praktična znanja, ki v današnjem času pogosto manjkajo. Od leta 2010 je v vrtu opravilo prakso 31 dijakov Biotehničnega centra Ljubljana, 6 dijakov Šole za hortikulturo in vizualne umetnosti Celje, 1 dijakinja Srednje ekonomske šole in 1 študentka krajinske arhitekture.

Od leta 2013 pripravljamo približno na 14 dni tudi četrtkove vrtnarske urice za vedoželjne, na katerih obiskovalci pridobijo nova teoretična in praktična znanja o

vzgoji in negi rastlin. S februarjem 2014 pa smo začeli izvajati v okviru Vrtnarskih uric tečaj vrtnarjenja.

Sodelovanje z drugimi institucijami

Botanični vrt svoje strokovno znanje in nasvete nudi tudi drugim različnim inštitucijam. Gre za svetovanje pri umeščanju rastlin v prostor, njihovo vzdrževanje, izbor vrst za posamezna okolja, svetovanje pri različnih posegih v okolje. To praktično in teoretično znanje je vse bolj pomembno, kar se vidi po številnih delih in knjigah izdanih v vrtu ali izdanih pod našim avtorstvom pri različnih založbah. Tako smo zelo povezani z mestno občino Ljubljana. V parku Tivoli poleg Čolnarne upravljamo rastlinjak, ki je v lasti MOL (Šport Ljubljana). Različnim službam MOL-a svetujemo pri različnih posegih v okolje, ureditvi okolice ali dajemo mnenja in odgovore na tovrstna okoljska vprašanja.

Brežina Ljubljanice zasajena z zvončki in ciklamami
Ljubljanica river shore planted with common snowdrops and cyclamen Photo: J. Bavcon

Mestni občini Ljubljana smo vzgojili rastline vrst *Cyclamen purpurascens, Galanthus nivalis* in *Leucojum vernum*, s katerimi smo nato ozelenili mestne brežine ob Ljubljanici. Pri zasaditvi smo strokovno sodelovali z nasveti. Ob železnici v neposredni bližini Botaničnega vrta smo uredili degradirano občinsko zemljišče in ga nato skupaj z občino razdelili med vrtičkarje. Tam so nekoč rasle invazivne rastline in s tem, ko je sedaj zemlja obdelana, tudi invazivnih rastlin ni več prisotnih. Vrtičkarjem ves čas pomagamo z nasveti. Za Mestno občino Ljubljana smo prav tako izvedli recenzijo zasaditve Slovenske ceste z drevesi. Strokovno smo utemeljili, katere vrste dreves bi bile najprimernejše in kakšna bi morala biti ustrezna zasaditev. Na območje Ljubljanskega gradu smo tudi uspešno reintroducirali rastlinsko vrsto *Pastinaca sativa* var. *fleischmanni*, ki v naravi velja za izumrlo. Njeno originalno nahajališče je bilo na grajskem griču, rastlina pa se je ohranila le v populaciji v Botaničnem vrtu. Reintrodukcija nazaj na Ljubljanski grad je bila uspešna. V mestni občini Ljubljana izvajamo *in-situ* varstvo rastlin na ekstenzivnem travniku v Rojah, kjer je bilo do sedaj evidentiranih preko 120 različnih vrst, od katerih so nekatere na Rdečem seznamu ogroženih rastlinskih vrst. Na travniku izvajamo monitoring rastlinskih vrst in ga sonaravno vzdržujemo. Travnik je namreč živa semenska banka za okoliške degradirane površine. Poleg *in-situ* varstva izvajamo še *ex-situ* varstvo nekaterih rastlinskih vrst z Ljubljanskega barja, saj jih tam zaradi spremenjenega okolja ni več. Mestni občini Koper smo svetovali pri urejanju javnih zelenih površin z udeležbo na posvetu na Komunali Koper. Poleg tega smo svetovali pri sanaciji škode na palminem drevoredu po burji. V mestni občini Koper smo prav tako naredili idejni načrt

Pastinaca sativa var. *fleischmanni*
Photo: J. Bavcon

zasaditve pred RTV SLO Regionalnim studiom Koper. Poleg idejne zasnove je Botanični vrt prispeval rastline in tudi izvedel zasaditev. Skupaj z združenjem krajinskih arhitektov in študentov krajinske arhitekture PaziPark smo sodelovali pri izvedbi delavnice KaBum, kjer so udeleženci izdelovali semenske bombe. Za te semenske bombe smo prispevali semena in strokovno znanje za izdelavo. Ideja delavnice je bila, odvreči semenske bombe na degradirane mestne površine in tako na enostaven način ozeleniti te površine.

Poleg tega smo sodelovali z nasveti ali bili kot sestavni del skupine pri načrtovanju vrta zdravilnih zelišč v Izoli. Z našim znanjem smo naredili zasaditveni načrt strešnih vrtov in dvorišča s parkiriščem Gimnazije Ledina. Za to zasaditev smo prispevali rastline vzgojene v Botaničnem vrtu. Z rastlinami smo oskrbeli tudi druge različne šolske vrtove po Sloveniji in nekatere vrtce.

Na pobudo Agencije RS za varstvo narave smo preučili različne možnosti odstranjevanja invazivne rastline kavkaškega dežena in v študiji tudi predstavili učinkovitost posamezne metode odstranjevanja. V opisovanem obdobju smo dvakrat od Agencije RS za varstvo narave v azil prejeli različne vrste zaščitenih vrst orhidej, ki jih je na meji zasegla carina. Vse vrste so sedaj v oskrbi Botaničnega vrta.

Na ministrstvu za zdravje, na Zdravstvenem inšpektoratu RS smo v okviru Internega izobraževanja s področja otroškega varstva izvedli predavanje o strupenih grmih in rastlinah, ki ne smejo biti posajeni na otroških igriščih vrtcev. Za Veterinarsko fakulteto smo identificirali rastline, ki so povzročile zastrupitev goveje živine in konjev. Ob zastrupitvah z rastlinami pomagamo z identifikacijo rastlin Medicinski fakulteti kot tudi drugim zdravstvenim inštitucijam.

Pedagoški fakulteti in Biotehniški fakulteti smo vsako leto nudili rastlinski material za izvedbo praktičnih vaj kot tudi prostor za gojenje rastlin za potrebe poizkusov pri različnih diplomskih, magistrskih in doktorskih nalogah, ter za različne druge raziskave. Kmetijskemu inštitutu smo strokovno svetovali pri snovanju načrta za nov rastlinjak.

Japonskemu veleposlaništvu nudimo prostor za srečevanje in skrbimo za nasad japonskih češenj, katere so bile darilo države Japonske Sloveniji.

Mednarodno sodelovanje

Botanični vrt ima zelo razvejano mednarodno sodelovanje. V teh letih smo bili povabljeni na nekaj predavanj po Evropi. Z uvodnim predavanjem 'Botanički vrt Sveučilišta u Ljubljani smo naš vrt predstavili na simpoziju o vrtovih z naslovom Botanički vrtovi i Arboretumi Hrvatske (Bavcon 2011c) in na predavanju v Gradcu (Bavcon 2011d). V letu 2012 smo s predavanjem "Slovenian Snowdrops", covering all aspects of snowdrops in Slovenia and the many amazing forms discovered there (dr. Jože Bavcon) sodelovali na najprestižnejši letni prireditvi v Anglji z mednarodnim značajem Galanthus gala. Na tem predavanju smo predstavili slovenske različice navadnega malega zvončka.

S predavanjem o naših avtohtonih vrstah smo sodelovali na simpoziju Back to Eden v Katovicah na Poljskem. V Helsinkih pa je izšel članek o izmenjavi semen na osnovi *Index seminum* (Bavcon 2012c). Prisostvovali smo tudi na 6. kongresu botaničnih vrtov na Chiosu v Grčiji, kjer smo se predstavili s temo Telohi v Sloveniji. Prav tako smo se redno udeleževali sestankov evropskega konzorcija botaničnih vrtov v Katovicah na Poljskem (maj 2011), v Meissu v Belgiji (december 2011), na Chiosu v Grčiji (junij 2012), v Gijonu v Španiji (december 2012), Pragi (maj 2013), na Gibraltarju (december 2013) in v Zagrebu (junij 2014). Enako smo bili redno prisotni na Cost sestankih v Španiji – Cuenca (2012), Avstriji – Dunaj, Tulln (2013) in Nizozemski – Wageningen (2014). V letu 2014 smo sodelovali še na kongresu Serbian genetic society v Kladovu (Paradiž s sod. 2014). Na sestankih BGCI soustvarjamo smernice botaničnih vrtov in ves čas sledimo trendom in zahtevam ki jih določa evropski konzorcij. V skladu z zahtevami BGCI tako naš botanični vrt varuje rastlinske vrst v *ex-situ* ter v in situ pogojih. V ex situ pogojih se trudimo, da bi zadostili čim večjemu številu ciljev o varovanju, ki so opredeljeni v GPSC in jih predvideva globalna strategija ohranjanja rastlinskih vrst. V ta namen posvečamo pozornost predvsem našim ogroženim vrstam. V vrtu že vse od 1. četrtine 19. st. uspešno vzdržujemo različico navadnega rebrinca *Pastinaca sativa* var. *fleischmanni*. Po letu 1840 je izginila z naravnega nahajališča in se je do današnjih dni ohranila le v Botaničnem vrtu (Hegi 1908 - 1933). V letu 2011 smo jo uspešno ponovno reintroducirali na njeno nahajališče - območje Ljubljanskega gradu. Od tedaj se tam znotraj gradu ob vinski trti potomki najstarejše vinske trte iz Maribora rastlina sedaj sama uspešno obnavlja. Dali smo ji podobno rastišče kot ga ima v

naravi (peščena tla). V skladu s priporočili BGCI smo leta 2014 seznam vseh rastlinskih vrst v Botaničnem vrtu uskladili z Nagoya protokolom in ga overovili pri notarju.

Potujoča razstava Urbanbees
Traveling exhibition Urbanbees Photo: J. Bavcon

Članstvo v BGCI in naša prepoznavnost v Evropi, je botrovala tudi ponudbi gostovanja francoske razstave Urbanbees v našem botaničnem vrtu. Na ponudbo avtorjev razstave smo se z veseljem odzvali in tako v letu 2014 gostili omenjeno potujočo razstavo. Potujoča razstava URBANBEES je bila rezultat 5-letnega projekta v programu Life+ Biodiversity. Njen cilj je bil ohraniti in izboljšati stanje biodiverzitete divjih čebel v urbanih okoljih v Evropi. Koordinatorji projekta so bili INRA Science & Impact in ArthroPologia iz Francije. Mnoga mesta v Franciji so v okviru projekta že ozelenila svoje površine z vrstno pestro vegetacijo in s tem pripomogla k izboljšanju okolja za čebele, ki so v okolju ene ključnih opraševalcev in dobrih pokazateljev stanja okolja. Sama razstava URBANBEES je na interaktiven in zanimiv način prikazovala življenje čebel,

njihovo vlogo v okolju in kako ohraniti njihovo biodiverziteto. V času odprtja razstave smo organizirali še predavanja in delavnice. Obiskovalcem pa smo ponudili še domovanja za divje čebele. Bili smo prvi, ki smo omenjeno razstavo gostili izven Francije. Od nas je razstava nato potovala še v druga evropska mesta.

Tudi med drugimi evropskimi izobraževalnimi inštitucijami smo precej poznani, kar dokazuje dejstvo, da se je v zadnjih letih povečal obisk tujih študentov, ki želijo v našem vrtu opraviti strokovno prakso. Leta 2013 so v okviru Erazmus programa pri nas za dlje časa, od tri do šest mesecev, prakso opravljali študentje iz različnih univerz in visokih šol iz Nemčije in Poljske. V nekoliko krajših enomesečnih programih Intership pa so bili pri nas še študentje iz Turčije. Študentje so bili različnih študijskih smeri: biologije, hortikulture in krajinske arhitekture. Tudi v letu 2014 so bili na praksi študentje iz programa Intership. Poleg dela v vrtu so spoznali tudi delo v naravi in se naučili prepoznati različne rastlinske vrste v njihovem naravnem okolju in različna fitogeografska območja v Sloveniji.

V letu 2013 se je vrt vključil še v mrežo inštitucij, ki ohranjajo tradicijo preživelih dreves Hirošime. Na pobudo gospoda prof. dr. Shin-Ichi Uya z Univerze v Hirošimi, aktivista, ki ohranja tradicijo preživelih dreves po atomski bombi odvrženi na Hirošimo, prof. dr. Radovana Stanislava Pejovnika in prof. dr. Alenke Malej je Botanični vrt zaprosil za semena preživelih dreves iz Hirošime. Izbrali smo nekaj vrst in ta semena junija 2013 posejali v Botaničnem v vrtu. Uspešno smo vzgojili nekaj rastlinic ginka in japonskega koprivovca. Le ta smo v letu 2014 slovesno posadili v glinene lonce, da jih bodo, ko bodo dovolj velika, posadili na stalno mesto ob nove fakultete na Večni poti prav zraven nasada japonskih češenj. Tako drevesa Hirošime kot japonske češnje prinašajo sporočilo miru.

Z drugimi botaničnimi vrtovi po svetu sodelujemo tudi preko izmenjave semen na osnovi znanstvene publikacije *Index seminum*, ki jo je leta 1889 prvič izdal Alfonz Paulin (Lazar 1960, Strgar 1973, Bavcon 2009b, 2012c). Vrt je pa je danes vključen v izmenjavo s 300 botaničnimi vrtovi, preko svetovne organizacije botaničnih vrtov BGCI, pa z vsemi vrtovi po svetu. V današnjem času prihajajo naročila semen preko elektronske pošte, katere poleg že utečene izmenjave pošilja še omenjena organizacija. Vsako leto seme iz našega vrta v

povprečju naroči 130 vrtov. Ponavadi naročijo semena do 12 vrst. Botanični vrt ima okoli 11 000 enot semen v svoji semenski banki, ki jih vsako leto dopolnjuje in obnavlja. Poleg nabiranja semen v vrtu semena nabiramo tudi v naravi. Dolgoletna tradicija nabiranja semen in izdajanje *Index seminum*-a je bila razlog povabilu na mednarodno delavnico o semenskih bankah (Workshop Millenium seed bank) na Dunaj. Tam smo pridobili še dodatna znanja o vzpostavitvi in upravljanju s semenskimi bankami.

Tovornjak doniranih rastlin iz Botaničnega vrta v Bonnu
Truck of donated plants from Bonn botanic garden Photo: B. Ravnjak

Poleg semen z drugimi botaničnimi vrtovi izmenjujemo tudi živi rastlinski material. A kar nekaj rastlin smo iz drugih botaničnih vrtov dobili tudi mi. Tukaj je posebej potrebno poudariti dobro sodelovanje z Botaničnim vrtom Univerze v Bonnu. Prav od tam smo dobili kar štiri velike pošiljke rastlin za zasaditev tropskega rastlinjaka. Njim smo posredovali nekaj materiala naših rastlinskih vrst. Kar nekaj rastlin pa smo dobili še iz Botaničnega vrta v Gradcu.

Z veseljem se vedno vključimo tudi v mednarodne projekte, ki promovirajo rastline, njihovo pestrost in uporabnost. Že skoraj tradicionalno sodelujemo (od leta 2012) na mednarodnem dnevu Očarljivih rastlin (Fascination Plants Day). Takrat se prostor botaničnega vrta prelevi v center predstavitve inštitucij, ki se kakorkoli ukvarjajo z rastlinami. Vsaka inštitucija predstavi svojo dejavnost z rastlinami na zanimiv način v obliki delavnic. Dan je namenjen predvsem šolskim skupinam, katerim zagotovimo poučen in zanimiv sprehod skozi kraljestvo rastlin.

Ne le vrt, ampak tudi center druženja

Nedvomno ima Botanični vrt Univerze v Ljubljani poleg svoje raziskovalno-izobraževalne vloge tudi vlogo povezovalne inštitucije. Predstavlja mesto, kjer se ob različnih dogodkih srečujejo različne generacije, različne stroke in interesne skupine. Od leta 2010 v avli tropskega rastlinjaka gostimo različne razstave, ki so povezane z rastlinami. Do sedaj so se poleg že mednarodne razstave Urbanbees zvrstile še fotografska razstava Deževni gozd Costa Rice, fotografska razstava Senožeti – pisani vrtovi, Razstava akvarelov alpskih rastlin, Razstava slik o sončnicah, Razstava slik ptičev Slovenije, razstava Krajinskega parka Ljubljansko barje, razstava Naših rastlin, razstava študijskih risb svetovnih mojstrov ter razstava ob 20 letnici National Geographic. V prostorih Botaničnega vrta sta vsakoletno tudi dve razstavi plazilcev in dvoživk Bioexo. Društvo Bioexo vsako leto en jesenski in en spomladanski vikend spremeni rastlinjak v pravo džunglo z različnimi plazilci. Dneve popestrijo še s predavanji in različnimi delavnicami. V letu 2011 pa smo skupaj z Društvom ljubiteljev orhidej organizirali mednarodno razstavo različnih vrst in sort orhidej v Tivolskem rastlinjaku in v okviru le-te tematska predavanja ter nasvete o gojenju orhidej. Leto 2014 pa smo zaključili z razstavo o Francu Hladniku, ustanovitelju Botaničnega vrta. Razstava je širši publiki predstavila njegovo življenje, delo in predanost rastlinam. Z razstavo smo obeležili 170 let od njegove smrti.

Sloves rastlin rastočih v Botaničnem vrtu, je dosegel tudi Pošto Slovenije, ki je leta 2012 izdala štiri poštne znamke, na katerih so bile predstavljene Hladnikov volčič (*Scopolia carniolica* f. *hladnikiana*), Hladnikov grintavec (*Scabiosa hladnikiana*), idrijski jeglič (*Primula* x *venusta*) in Fleischmannov rebrinec

(*Pastinaca sativa* var. *fleischmanni*). S tem so naše rastline prišle do različnih slovenskih in verjetno tudi tujih domov.

Pravijo, da tudi rastline lepše rastejo ob glasbi. Tako smo pretekla tri leta v botaničnem vrtu gostili mladega glasbenika in skladatelja Timoteja Kosovinca. Pravi virtuoz na kitari je navdušil glasbe in rastlin željne poslušalce. A tudi za najmlajše ali otroke po srcu vedno dobro poskrbimo. V letu 2014 smo skupaj z Društvom likovnih ustvarjalcev pripravili interaktivno lutkovno predstavo Guliverjevo potovanje v Liliput.

Pomen in poslanstvo botaničnega vrta pa spoznava tudi vedno več podjetij. Uporabljajo ga kot središče aktivnega druženja svojih zaposlenih in možnost družbeno koristnega dela. V letu 2014 so zaposleni podjetja Loreal ponudili svojo pomoč pri delu v botaničnem vrtu. V skupinah so sodelovali pri vrtnarskih delih, se med seboj družili in pridobili koristne informacije o vrtnarjenju s strani vrtnarjev botaničnega vrta.

Hkrati je botanični vrt kot center druženja tudi mednarodnih razsežnosti. Že nekaj let zapored ljubitelji japonskih češenj ob času cvetenja japonskih češenj v botaničnem vrtu priredijo Hanami, ki predstavlja druženje in spoznavanje japonske kulture. Številni obiskovalci se udeležijo različnih delavnic: origami, risanje cvetočih češenj, japonske pisave, otroških pravljic, predstavitve in branja haikujev, ogled japonskih rastlin v botaničnem vrtu in razstave narisanih del. Umetniški pečat pa dogodku dodajo še instrumentalne skupine. Ob pitju čaja se tako prijetno druženje vsako leto nadaljuje preko celega dneva.

Vsekakor pa je botanični vrt pravo mesto za srečevanje vrtoljubcev in rastlinoljubcev nasploh. Tako je v letu 2014 potekal že tradicionalni in hkrati 10. jubilejni bolšji sejem rastlin. Kljub slabemu vremenu je bil odziv razstavljavcev in obiskovalcev velik. Okroglo obletnico sejma smo obeležili tudi z fotografsko razstavo "Prvih 10 let bolšjega sejma". Dan smo popestrili s štirimi predavanji in podelili plaketo idejni avtorici bolšjega sejma gospe Nuši Zanoškar.

Prostovoljci v Botaničnem vrtu

Posamezni prostovoljci prihajajo v vrt že vrsto let, a bolj organizirano delo z njimi se je začelo leta 2011 v sodelovanju z Univerzo za tretje življenjsko obdobje, v okviru katere se je osnovala skupina vrtnih prostovoljcev (Posvet 'Kako postati vrtni prostovoljec v Botaničnem vrtu', 11.5.2011). Poleg teh prihajajo v vrt seveda tudi drugi, bodisi upokojenci ali mlajši, ki trenutno nimajo službe. Slednji pridobivajo nove izkušnje in reference pri iskanju nove zaposlitve. Tako je v letu 2013 in prav tako v letu 2014 v vrtu delalo cca 20 prostovoljcev. Leta 2013 so opravili prostovoljci 1270 ur prostovoljnega dela v Botaničnem vrtu (324 ur vrtnarskih del in 946 ur dežurstva v rastlinjakih), v letu 2014 pa že 1653 ur (779 ur vrtnarskih del in 874 ur dežurstva v rastlinjakih).

Prostovoljci v vrtu delajo kot receptorji v tropskem rastlinjaku, pomagajo pri različnih vrtnarskih opravilih, pri pripravi materiala za delavnice in rojstne dneve, pri pripravi in izdelavi prodajnih izdelkov. Dve prostovoljki pa pomagata tudi kot vodički, mnoge druge tudi pri izvedbi različnih delavnic. V lanskem in predlanskem letu so bili vrtni prostovoljci in Botanični vrt vključeni tudi v dva projekta na temo invazivnih rastlin in v ta namen sta bili v Botaničnem vrtu izvedeni dve konferenci:

- Konferenca o tujerodnih invazivnih rastlinskih vrstah pri nas (9.5.2012)
- Konferenca: Japonski dresnik (*Fallopia japonica*). Prepoznavanje in odstranjevanje japonskega dresnika ter vloga vrtnih prostovoljcev – ambasadorjev rastline (17.6.2013)

V izbor akcije ‘Ljudje odprtih rok 2012’ revije Naša žena, ki podeljuje priznanja in zahvale posameznikom, humanitarnim društvom ter družbeno odgovornim organizacijam za njihova dobra dela, se je leta 2012 uvrstila tudi skupina vrtnih prostovoljcev in prejela priznanje za svoje delo v Botaničnem vrtu. Svoje dobro sodelovanje s starejšimi prostovoljci smo predstavili tudi z udeležbo na posvetu 'Prostovoljstvo starejših za razvoj lokalne skupnosti' 13.3.2013, ki ga je organizirala Slovenska univerza za tretje življenjsko obdobje v Ljubljani. V letu 2012, ki je bilo tudi evropsko leto aktivnega staranja in medgeneracijske solidarnosti, so na UTŽO Ljubljana razvili projekt KIPARIMO SKUPAJ, v katerega so bili vključeni vrtni prostovoljci in dijaki Gimnazije Šentvid, odvijal pa se je v Botaničnem vrtu. Izdelane plastike so bile v poletnih mesecih razstavljene v tivolskem rastlinjaku. Delo vrtnih prostovoljcev je bilo predstavljeno tudi v medijih in sicer v Dnevniku ('Kar delajo prostovoljci, bi

sicer ostalo neopravljeno', 2011), na Radio SLO1 ('Dobra dela - prostovoljke Botaničnega vrta', 2011) in Naši ženi ('Skrivni vrt, Prostovoljke v Botaničnem vrtu', 2012).

Delavnica o invazivnih rastlinah za vrtne prostovoljce
Workshop about invasive plants for garden volunteers Photo: J. Bavcon

Botanični vrt v medijih

Botanični vrt je v medijih zelo prisoten. O njem pišejo različni tiskani mediji, redno pa ga spremljajo tudi različne nacionalne ali lokalne radijske postaje ter nacionalna in različne komercialne televizije. Pogosto v njem posnamejo še razne intervjuje in napovednike, saj prijetno okolje vrta nudi vedno dovolj zanimivih kotičkov za snemanje. Naši strokovnjaki v različnih medijih dajejo svoje nasvete, sodelujejo v kontaktnih oddajah in dajejo tudi obsežnejše intervjuje za različne časopise ali audiovizualne medije. V vsakem takšnem prispevku nagovorimo čim bolj raznoliko publiko, kateri poudarimo pomen vrta in pomen spoznavanja raznolikosti rastlinskega sveta tako Slovenije kot tujine.

Snemanje v živo prispevka oddaje Dobro jutro
Filming of live broadcast Dobro jutro Photo: J. Bavcon

Že od leta 2011 pa redno sodelujemo z našimi nasveti v oddaji Dobro jutro kjer se enkrat tedensko ob ponedeljkih ali sredah direktno dvakrat vključimo v živo z vrtno tematiko. V letu 2011 smo najprej uredili majhen kuhinjski vrtiček ob še povsem neurejeni zunanji površini tropskega rastlinjaka. Vrtiček je začel nastajati z oddajo in smo ga spremljali preko cele sezone. V letu 2013 pa smo skupaj z mestno občino Ljubljana in RTV Slovenija na povsem degradirani površini izven vrta začeli z akcijo urbanih vrtičkov. To degradirano območje nam je kot lastnica v rabo posodila Mestna občina Ljubljana. Cilj projekta je bil z načrtovanim in trajnostnim gospodarjenjem urediti zanemarjene površine zaraščene z invazivnimi rastlinskimi vrstami, v takšne površine na katerih je možno pridelati zelenjavo za domačo uporabo. V ta namen smo izbrali zagnane vrtičkarje, ki so bili pripravljeni s pomočjo strokovnjakov iz vrta poprijeti za delo in tem površinam dati nov smisel. Uspeh je bil popoln in tako vrtičkarji kot gledalci so z navdušenjem spremljali urejanje vrtičkov od samih začetkov, ko tam še ni bilo ničesar, do prvih pridelkov. S tem so spoznavali različne načine

vrtnarjenja in pridobivanja zelenjave za domačo porabo. Akcija je bila uspešna, zato smo površino še razširili in tako uredili celotno zanemarjeno zemljišče ob progi in hkrati ustvarili skupnost vrtičkarjev, ki je sama prevzela nadaljnje delo urejanja te okolice. Iz degradirane površine je tako nastala uporabna površina, ki tej skupini vrtičkarjev služi za sprostitev in hkrati pridelavo zelenjave za domače namene.

Gledalce smo z rastlinskim kraljestvom spoznavali tudi v oddaji Dobra ura in botanični vrt kot vedno primerno izletniško točko predstavili v oddaji Na lepše. V letu 2014 smo se pridružili tudi projektu Kabinet čudes. Skupaj s še nekaterimi znanstveno raziskovalnimi inštitucijami na spletnem Delu objavljamo kratke prispevke, ki popularizirajo znanost. Tematika naših prispevkov so zanimive rastline, ki jih lahko obiskovalci vidijo v vrtu.

Izdane publikacije

V letu 2011 so izšla tri knjige. Prva je monografija o ustanovitelju botaničnega vrta Francu Hladniku. Sprva je bil tekst o Hladniku le del vsakoletnega seznama semen s prispevki simpozija o Francu Hladniku v njegovem rodnem mestu Idrija. Drugo delo pa obravnava problematiko mestnega drevja in ravnanja z njim (Šiftar s sod. 2011). Delo vključuje pravilen izbor vrst z namenom, da bi izbrano mestno drevo v vsej življenjski dobi služilo svojemu poslanstvu in mu bi mesto nudilo vse kar mu lahko. Hkrati so v knjigi tudi napotki za pravilno oskrbo. Tretja pa obravnava teme simpozija botaničnih vrtov in biodiverzitete v Ljubljani (Bavcon 2011f). V začetku leta 2012 pa je izšlo še obsežnejše delo o ustanovitelju vrta Francu Hladniku, ki predstavlja vse dotedanje izdane biografije- faksimile s prevodi v slovenščino in angleščino, obdelavo njegovega dela ter življenja od njegove smrti pa do današnjih dni, s komentarji naše raziskovalke zgodovine botanike na Slovenskem dr. Nade Praprotnik. Prav tako v letu 2012 smo skupaj z vsakoletnim indeksom izdali še delo, ki obravnava tropski rastlinjak in zgodovino rastlinjakov v Ljubljani (Bavcon s sod. 2012a). Ob koncu leta 2012 pa smo izdali delo treh avtorjev (Bavcon, Eler, Sušek 2012b) z naslovom Telohi v Sloveniji. Monografija z različnih vidikov obravnava problematičen rod telohov na ozemlju Slovenije. V začetku leta 2013 je izšla še elektronska knjiga z naslovom Nabiranje semen v sušnem letu 2012 (Bavcon s

sod. 2013), ki obravnava vpliv suše na rastline hkrati z vsakoletnim *Index semimum*.

V letu 2013 je pri Mohorjevi založbi v Celovcu izšla obsežna knjiga o naših rastlinah, kjer so na poljudno strokoven način predstavljene rastline rastoče v Sloveniji (Bavcon 2013b). Ob koncu leta je sledilo še delo Rastlinstvo okolice Franje (v elektronski obliki), kjer pa je na poljudno strokoven način predstavljeno rastlinstvo te zanimive soteske (Bavcon 2013c).

V letu 2014 je v elektronski obliki skupaj z vsakoletnim *Index seminum* izšlo delo z naslovom Seed collecting for in-situ and ex-situ conservation purpose, ki obravnava nabiranje semen za Milenijsko semensko banko (Ravnjak & Bavcon 2014).

Ob koncu leta 2014 pa sta izšli še dve obsežni monografiji z naslovom Belo cvetoče različice v slovenski flori (Bavcon 2014a) in Navadni mali zvonček (*Galanthus nivalis* L.) v Sloveniji (Bavcon 2014b).

Novosti za naše obiskovalce

Po letu odprtja tropskega rastlinjaka v letu 2010 smo v botaničnem vrtu za obiskovalce uredili še veliko novosti. V letu 2011 smo uredili okolico rastlinjaka, ki je vključevala že omenjeni kuhinjski vrt, gojitvene grede in kompostnik. Na novo smo postavili lopo za orodje, in ponovno postavili stari mali rastlinjak, ki smo ga ob gradnji morali umakniti. Uredili smo nekdanjo senčnico za rastline in okolico starega rastlinjaka spremenili v prodajni del. Tam so naprodaj avtohtone in samo v vrtu vzgojene rastline, s čimer preprečujemo ropanje naravnih nahajališč.

V letu 2013 je mestna občina Ljubljana začela z urejanjem zunanjega parkirišča, ki ga je v letu 2014 tudi dokončala, tako da imajo obiskovalci vrta sedaj urejene parkirne prostore. Leto 2013 je bilo prelomno tudi za stari rastlinjak. Veliko let je zaradi pomanjkanja sredstev ostajal v zelo slabem stanju. V letu 2013 pa smo se kljub finančni krizi lotili njegove vsaj delne obnove, ki se je potem ob pomoči MOL-a, oddelka za biologijo BF in velikim lastnim vložkom spremenila v celovito prenovo. A kljub obnovi smo rastlinjak ohranili takšen kot je bil nekoč.

Septembra smo rastlinjak odprli za javnost in od tedaj naprej je rastlinjak ponovno namenjen za ogled najširši javnosti.

Obnovljen star rastlinjak, po katerem se je prvi sprehodil župan Mestne občine Ljubljana g. Zoran Jankovič
Renovated glasshouse, the first one who walked through it was a mayor of Municipalty of Ljubljana, Mr. Zoran Jankovič Photo: D. Bavcon

V letu 2013 smo 27.9. v stari upravni zgradbi slovesno odprli tudi knjižnico pokojnega prof. botanike dr. Toneta Wraberja. Bogato knjižnico je podarila družina pokojnega profesorja. Knjige smo v celoti popisali, podatke vnesli v elektronsko bazo in za knjige naredili nove police. Knjižnica je tako postala uporabna in dostopna za različne raziskovalce (Bavcon 2013d).

V letu 2014 pa smo s pomočjo MOL – Turizma Ljubljana in sosednje šole Biotehniškega izobraževalnega centra Ljubljana v stari upravni zgradbi in ob njej uredili še čajnico Primula, ki pomeni dodaten prostor za srečevanje v Botaničnem vrtu. Odprtje čajnice je bilo 3. junija 2014. Čajnica je zelo dobro zaživela in pomeni dodatno popestritev vrta, predvsem pa možnost, da se obiskovalci v vrtu dlje zadržijo. Še pred ureditvijo čajnice je v stari upravni stavbi od leta 2011 potekal projekt Moje ulice Zavoda divja misel, v okviru katerega so enkrat na teden junija in julija znani Ljubljančani pripovedovali o

svojem življenju v mestu Ljubljana. Z ureditvijo čajnice pa je bilo pripovedovanje in poslušanje še toliko lepše. Ponudbo vrta smo tako zaokrožili in vrt spremenili v resnični prostor za izobraževanje, raziskovanje in prijetno druženje za najširše množice ob spoznavanju z rastlinami. V istem letu smo v okviru mestnega projekta WiFree Ljubljana dobili pokritost območja Botaničnega vrta s prostim brezžičnim internetnim omrežjem. Tako marsikateri obiskovalec z veselјem v zelenem okolju botaničnega vrta brska po zanimivih spletnih vsebinah.

Spominska soba in knjižnica prof. dr. Toneta Wraberja
The memory room and library of Prof. dr. Tone Wraber Photo: D. Bavcon

Prav simbolično sta od leta 2013 mesto Ljubljana in Botanični vrt povezana preko Hladnikove brvi na Špici. Ime je dobila po ustanovitelju Botaničnega vrta Francu Hladniku (Uradni list RS, št. 10/2013) in sicer na našo pobudo in s sledečim dopisom, ki smo ga poslali na mestni svet:

Otvoritev čajnice Primula
Opening of Primula teahouse Photo: J. Bavcon

»Franc Hladnik (29. 3. 1773 – 25. 11. 1844) ustanovitelj Botaničnega vrta v Ljubljani (1810) je uspel iz francoske Ilirije nastali vrt ohraniti tudi v obnovljeni Habsburški monarhiji (Bavcon 2011e, Praprotnik 2012). Vse ustanove, ki so jih postavili Francozi, so z obnovo Habsburške oblasti ukinili. Hladnik je znal vrt obdržati in tako povezati novo s starim, dva različna pristopa, torej je most pravi simbol zanj, ker povezuje dva bregova. Bil je pomemben mož, prvi univerzitetni prof. botanike na visokih šolah. Prvi, ki se je uspel celo upreti cerkveni oblasti, ker kljub posvetitvi ni izpolnil ukaza, da mora na faro. Kljub vsemu je uspešno napredoval iz knjižničarja do univerzitetnega profesorja v času Ilirije, nato pa ravnatelja tedanje gimnazije. Slednjo je uspel dvigniti med najboljše v Habsburški monarhiji, zato je prejel cesarjevo odlikovanje (1819). Bil je skromen, znal je poslušati, pa vendar cenjen med tedanjimi botaniki v srednji Evropi. Bil je učitelj mnogim botanikom, tudi tržačanu Tommasiniju, kasnejšemu županu Trsta. Henriku Freyerju, prvemu kustosu Deželnega muzeja v Ljubljani in nato Trstu. Prizadeval si je za ustanovitev Deželnega muzeja in za odkup Zoisove zbirke mineralov zanj. Vrt, do katerega most vodi, je tako ostal

na tem mestu do današnjih dni. Prav to dejstvo ga uvršča med srednje stare vrtove v Evropi, ker pa neprekinjeno deluje na istem mestu, ima bistveno večji pomen.«

Mestni svet je pobudo sprejel in torej brv poimenoval po Hladniku. Do vrta tako sedaj iz centra mesta vodi prijetna sprehajalna pot, za romantike pa je pot do vrta seveda še vedno najlepša z ladjico. V prihodnjih letih pričakujemo ob Gruberjevem prekopu tudi novi pristan.

CHRONICLE

Jože Bavcon, Alenka Marinček, Blanka Ravnjak

Introduction

After their bicentennial year, the Botanic Gardens have been enjoying an even greater public recognition. For the local public, this can undoubtedly be attributed, at least partially, to the tropical glasshouse that was opened towards the end of the bicentennial year (Bavcon et al. 2011). Successful planting and good growth of plants have certainly contributed greatly to the appeal of the glasshouse. Good cooperation with other botanic gardens has undoubtedly greatly contributed to the attractiveness of the tropical plant collection, since we acquired numerous interesting plants via exchanges or donations from other gardens. The greatest contributions came from Bonn University Botanic Gardens, Botanical Garden Graz, and Zagreb Botanical Gardens. Other gardens primarily contributed plants in the form of seeds. It was very important that, despite harsh financial circumstances, we managed to organise the surrounding of the glasshouse, as well as the breeding and service sections of the gardens, as early as spring. We could thus once again normally breed plants, especially annuals, for the purpose of reseeding in other parts of the gardens. I should also mention that we built a small kitchen garden by the glasshouse, which became a television garden for the show *Dobro jutro*. Each week during a live broadcast, we advised our viewers on plants and gardening, thus promoting the Botanic Gardens via television. The show was well received by the audience, increasing the number of visitors. In year 2013 the work of Botanic garden was represented in book Der Garten als Wissensraum (Garden as a knowledge place) (Standler 2013), where only the most important gardens of Europe are represented. This time we are placed among 90 similar institutions from 3000 all together.

The period after the bicentennial year was financially stressful for the Gardens. The global financial crisis was becoming increasingly severe, and our resources were decreasing each year, however, the Gardens required more resources due to expanded activities. We did not hesitate, but got down to business earnestly. Even though we were successful and had a positive balance despite reduced resourced, we unfortunately lost two temporary positions of employment at the

end of 2012. The loss of position caused a lot of problems in the Gardens. But we managed to overcome these problems, and start and complete the renovation of the old glasshouse, thus increasing the recognisability of the Gardens in the media even further. In February, 2014, nature dealt a harsh blow to the Gardens. 25 different tree species, a total of 30 trees, were felled by the ice damage. Numerous bushes were also damaged. We needed seven months to recover from the damage and fix the Gardens.

The activities of the Garden are not restricted to the section by the Gruber canal, but extend to three additional locations: the glasshouse in the Tivoli Park, the glasshouse for Mediterranean plants and succulents with the Japanese cherry plantation by Večna pot, and the dry meadow in Roje. All these allow the Gardens to operate outside its home locations and expand its audience base. We are thus in contact with people in various parts of the city, achieving another direct contact with citizens and visitors, in addition to our regular presence in the media.

Research activities

Throughout the years, our research activities have been linked primarily to autochthonous plant species – and even after 200 years, we continue to uphold the tradition of a garden of domestic flora. In our bicentennial year, we have therefore published a monograph on crocuses in Slovenia, were we present all the research studies on the genus of crocuses (*Crocus* sp.) that grow in Slovenia (Bavcon 2010). The work is also related to the research collection of individual crocus specimens that is still being expanded in the research section of the Garden. This monograph and our research study were also the reason for our invitation to participate in the Cost project Safronomic COST FA1101, which studies the saffron crocus (*Crocus sativus*) and other naturally occurring species. We joined the project in 2012, and, within the project, presented some new findings regarding crocuses in Slovenia: hybrids between spring crocus and striped crocus (Bavcon 2012a), the diversity of spring crocus (*Crocus vernus* subsp. *vernus*) (Bavcon 2013a), and hybrids between *C. vernus* subsp. *albiflorus* and striped crocus (*C. reticulatus*) (Bavcon 2014c).

Svetovna banka žafranov
Crocus bank Spain Photo: J. Bavcon

We continued with studies of common snowdrops (*Galanthus nivalis* L.) and other early-spring geophytes (Bavcon 2011a). In 2011, we presented our research on common snowdrop during a one-hour presentation at the snowdrop show in Kalmthout Arboretum in Belgium, and with an article in the annual publication of the Royal Horticultural Society in England (Bavcon 2011b). The book Common cyclamen (*C. purpurascens* Mill.) and its diversity in Slovenia, published in 2009, was reviewed internationally in the Cyclamen Society Journal from London. We continued to collect various peculiarities and determining genetic stabilities for the aforementioned species, as well as some others, like *Narcisus poeticus* subsp. *radiiflorus*, *Leucojum vernum.* Furthermore, we studied colour varieties of some other species. In 2012, we were invited to give a lecture at the largest event on snowdrops, Galanthus Gala in England, where we presented the diversity of common snowdrop in Slovenia. The lecture was published in 2013. During this year, a list of new varieties in the genus *Galanthus* was also published (Hanneke & Snoeijer 2013), which also acknowledges the common snowdrop varieties from Slovenia, described in 2008 (Bavcon 2008).

In Slovenia, we participated at the 6th congress of Genetic Society of Slovenia, *Genetika2012*, with a contribution about the common snowdrop (*G. nivalis*), titled Karyological differentiation of cytotypes in Slovenian wetlands (Paradiž & Bavcon 2012). In autumn, we were invited to Bergam for the preparation of an alpine meadow project, which included ten institutions from Italy, Austria, Slovenia, Switzerland, and France, led by representatives of Kew Gardens. We completed our part of the project, however, it has not yet been implemented.

In 2013, the Botanic Gardens participated in the global programme of sustaining plant species through seed banks – *ex-situ* conservation, led by Royal Kew Gardens – Kew Gardens Millennium Seed Bank. The goal of this project is to collect seeds of 25 % of the global flora until 2020. We were given a one-year project, and collected seeds of 80 Slovenian flora species, thus ensuring conservation of seeds of some rare and endangered species in the Kew Gardens Millennium Seed Bank. The work included about 60 days of fieldwork, processing, identification, cleaning of seeds, and writing protocols and reports on gathering.

In 2013, Kew Gardens, in cooperation with Cyclamen Society, published an extensive work on the cyclamen genus, Cyclamen (Mathew 2013), which included our research on common cyclamen (*C. purpurascens*), as well as a book about the common cyclamen in Slovenia (Bavcon 2009a).

Furthermore, two articles were published with the cooperation of the Botanic Gardens. An article titled Seed banks as a partnership for global plant conservation (Bavcon & Ravnjak 2014) was published in *Acta Botanika*, discussing seed banks and the cooperation of the Botanic Gardens in seed gathering for the Royal Kew Gardens Millennium Seed Bank. The second article, Foliage identification of different autochthonous common cyclamen genotypes (*Cyclamen purpurascens* Mill.) using various biochemical parameters (Osterc et al. 2014) discusses the collection of cyclamens from Slovenia in the University Botanic Gardens Ljubljana.

Botanic Gardens as an educational institution

In the Botanic Gardens, we organise numerous tours for various groups, from kindergarten, elementary, secondary school groups to university students from domestic or foreign universities, or even various interest groups. Interest groups' visits, specifically, have increased significantly with the construction of the tropical glasshouse. We also provide additional education for biology students and students of other courses from the parent Biotechnical Faculty and Faculty of Education, so they can conduct independent tours. Around 20 students complete this additional programme each year. After a few years, they acquire enough knowledge to be able to perform this type of work in other gardens, or become self-employed as tour guides, if they were to continue with the type education offered in the Gardens. The largest share of guided tour groups is represented by elementary school group, but we also get visitors from kindergartens, various societies, tourist group, as well as groups from abroad (Attachment 1).

Delavnica izdelovanja piščalk
Whistle making workshop Photo: J. Bavcon

4 faculties = 136 visitors

48 interest groups = 1228 visitors

- 2012: 138 schools, kindergartens = 5668 visitors

6 faculties = 541 visitors
46 interest groups = 980 visitors

- 2013: 112 schools, kindergartens = 4266 visitors

8 faculties = 293 visitors

53 interest groups = 1226 visitors

-2014: 125 schools, kindergartens = 5191 visitors

17 interest groups = 482 visitors

Since we opened the tropical glasshouse, we also started conducting public tours at least once a month during season. In 2012 and 2013, we conducted 3 such tours, and 7 in 2014. With the renovated path to Špica and the newly built footbridge, the Botanic Gardens have become a very popular tourist attraction, and the number of visitors increasing many fold over these years, reaching an estimated 100,000 annually.

Education does not include only group or individual tours through the Gardens; we also conduct open public lectures at least once a month, sometimes more. We offer our premises to some societies that within their activities organise thematic lectures for their members and wider audience. We thus hold numerous lectures every year. We also organise various monthly thematic educational workshops, aimed towards the widest possible public, and include the youngest and oldest participants. The essence of our workshops is to teach the participants crafts related to plants, to familiarise them with the use of plants for various purposes, thus learning something about plants themselves. The workshops are also ethnically and botanically orientated, thus maintaining the former tradition – gardens of domestic flora. Some workshops were organised for special occasions, e.g. the holiday workshops for children, “Plants and bees”, during the

exhibit Urbanbees at the beginning of 2014, and the workshops for children during the visiting exhibit on frogs and insects in 2013 and 2014. We organise workshops for prearranged school group and wider public during afternoons. Groups of children from kindergartens, elementary schools, and secondary schools often want to complement their guided tours with practical work at workshops. Workshops themes relate to the guided tours, thus enriching and building upon them. They often decide to participate in workshops on themes of plant organs (learning about and drawing plant organs with the help of a magnifying glass, making a flower model, making germination pots, etc.), learning about and using plant identification keys, studying aquatic and riparian plants and animals, medicinal plants, woody plants (making a model of the maple or linden tree fruits, bark impressions, etc.), studying food chains and networks through games, etc.

- 2011: 12 workshops and 11 lectures

- **2012:** 14workshops and 17 lectures

- **2013:** 13workshops and12 lectures

- **2014:** 17workshops and 12 lectures

In 2010, we began organising a holiday day-care in the Botanic Gardens, specifically in the last week in August. We included workshops into our programme, where children learned about plants through games.

Furthermore, the Gardens participate in various festivals and events organised by other organisations – Scout festival, Festival Hokus Pokus, Fascination of Plants Day, Researchers' Night, and Flea market. We have also participated in fairs outside Ljubljana, as well as various events where we traditionally conduct nature tours in different parts of Slovenia, or hold lectures for various societies throughout Slovenia. Especially in 2013, we conducted numerous lectures, in addition to traditional tour guides for individual groups, for the book release of *Naše rastline*. Lectures were held in different parts of Slovenia (Šentjanež, Ljubljana (City Library Bežigrad, Book Fair in the Culture and Congress Centre

Cankarjev dom), Centre Gašperlin, Volčji Potok Arboretum, Lož, Koper, and Šentrupert), and included local issues, since the book discussed commonplace plants that grow here and there.

Dan očarljivih rastlin
Plants Fascination Day Photo: D. Bavcon

An important part of imparting the practical knowledge is training students during practical lessons, which we hold for both natural sciences middle schools, as well as for vocational schools, institutions of higher education, and university programmes. Students of various programmes thus come to us for an internship, from biology students to landscape architecture and agronomy students, as well as individuals from other programmes. During their regular internship, they familiarise themselves with work in the gardens, discover plants, work with our gardeners, thus mastering in the best possible way the practical know-how, which is often lacking nowadays. Since 2010, 31 students of the Biotechnical Education Centre Ljubljana, 6 students of School for Horticulture and Visual Arts Celje, 1 student of Secondary School of Economics, and 1 student of landscape architecture have finished an internship in the Botanic Gardens.

Since 2013, we have been organising Thursday Gardening Hours every 14 days for those eager to learn, where visitors acquire new theoretical and practical knowledge on breeding and caring for plants. And in February 2014, we started a gardening class within the Gardening Hours programme.

Cooperation with other institutions

The Botanic Gardens offer their expert knowledge and advice to various other institutions. These include consulting on placement of plants in an area, their maintenance, selection of species for specific environments, and consulting on various developments in the environment. This practical and theoretical knowledge is increasingly important, which is reflected by the numerous works and books publishes in the Gardens, or written by the Gardens and published by various publishers. We cooperate closely with the City of Ljubljana. In Tivoli Park, next to Čolnarna Tivoli, we manage a glasshouse owned by the City of Ljubljana (Šport Ljubljana). We advise various departments of the City of Ljubljana on various environmental developments and landscaping, or provide opinions and answers to such environmental questions.

For the City of Ljubljana, we cultivated plants of species *Cyclamen purpurascens, Galanthus nivalis* and *Leucojum vernum*, which were then planted along the banks of the Ljubljanica River. We participated in planting with expert advice. Along the railway tracks, in direct vicinity of the Botanic Gardens, we landscapes a degraded plot, and divided it, in cooperation with the City of Ljubljana, among local gardeners. Invasive species used to grow on this plot, however, since the ground was cultivated, these plants no longer grow. We constantly help the gardeners with advice. We also reviewed the planting of trees along the Slovenska cesta for the City of Ljubljana, providing expert rationale for the most suitable tree species and the most appropriate planting arrangement. In the area of Ljubljana Castle, we successfully reintroduced the species *Pastinaca sativa* var. *fleischmanni*, which is considered extinct in nature. Its original habitat was on the Castle hill, but the species has only been preserved in the Botanic Gardens. The reintroduction to the Ljubljana Castle was successful. In the municipality of Ljubljana, we conduct *in situ* conservation of plants on the extensive meadow in Roje, where we have so far documented over 120 different

species, some of which are included on the Red List of endangered plant species. We monitor the plant species on the meadow, and maintain the meadow naturally. This meadow is, in fact, a live seed bank for surrounding degraded areas. In addition to *in situ* conservation, we also conduct *ex-situ* conservation of some plant species from the Ljubljana Marshes, since they are no longer present there due to changes in the environment. We advised the City of Koper regarding landscaping of green spaces, by attending a conference at Komunala Koper. Furthermore, we advised for the remediation of damage on the palm avenue after the bora. We also made a preliminary planting design for the location in front of RTV SLO Regional Studio Koper in the municipality of Koper. In addition to the conceptual design, the Botanic Gardens contributed and planted the plants. Together with Slovenian Association of Landscape Architects and students of landscape architecture PaziPark, we participated in the workshop KaBum, where participants made seed bombs. We contributed the seeds for these seed bombs, as well as the expert knowledge on how to make them. The idea of the workshop was to throw the seed bombs on degraded city surfaces, thus easily turning them green once again.

Strešni vrt na gimnaziji Ledina
Roof garden on Ledina higschool Photo: J. Bavcon

We have cooperated as an advisory body or a participating group member for the planning of the medicinal herb garden in Izola. Using our knowledge, we made a planting design of rooftop gardens and the courtyard with the parking lot for Gymnasium Ledina. For this planting, we contributed plants grown in the Botanic Gardens. We also provided plants for various other school gardens across Slovenia, and for some kindergartens.

On an initiative of the Slovenian Environment Agency, we studied the various possibilities of removing the invasive species of giant hogweed, and

presented the effectiveness of different removal methods in the study. During this period, we received plants of various protected orchid species from the Slovenian Environment Agency on two different occasions, which were seized on the border by customs. All plants are now being taken care of in the Botanic Gardens.

At the Ministry of Health, the Health Inspectorate of the Republic of Slovenia, as part of a programme of internal education in the field of childcare, we conducted a lecture on poisonous bushes and plants that should not be planted in kindergarten playgrounds. For the Veterinary Faculty, we identified plants that caused the poisoning of cattle and horses. In the event of poisoning due to plants, we help identify the plants for the Faculty of Medicine and other health care institutions.

Each year, we provided the Faculty of Education and the Biotechnical Faculty with the plant material for their practical exercises, as well as with the space for breeding plants for testing purposes in different diploma papers, master's theses, and doctoral dissertations, as well as for other research activities. We provided expert consultations for the Agricultural Institute for the design of their new glasshouse.

For the Japanese Embassy space for meetings, and take care of the plantation of Japanese cherries, which were a gift from Japan to Slovenia.

International cooperation

The Botanic Gardens participate in very diverse international venues. During these years, we were invited to a few lectures throughout Europe. With our initial lecture, "University Botanic Gardens Ljubljana", we presented our gardens at a symposium on gardens, Botanic Gardens and Arboretums of Croatia (Bavcon 2011c) and with a lecture in Graz (Bavcon 2011d). In 2012, we participated in the most prestigious annual international event in England, Galanthus Gala, with our lecture "Slovenian Snowdrops", covering all aspects of snowdrops in Slovenia and the many amazing forms discovered there (Dr. Jože Bavcon). During this lecture, we presented Slovenian varieties of the common snowdrop.

We participated in the symposium Back to Eden in Katowice in Poland with a lecture on autochthonous species, and an article on seed exchange on the basis of *Index seminum* (Bavcon 2012c) was published in Helsinki. We also attended the 6th congress of botanic gardens in Chios, Greece, where we presented our gardens with the theme Helleborus in Slovenia. We also regularly attended the meetings of the European Botanic Gardens Consortium: Katowice, Poland (May, 2011); Meiss, Belgium (December, 2011); Chios, Greece (June, 2012); Gijon, Spain (December, 2012); Prague, Czech Republic (May, 2013); Gibraltar (December, 2013); and Zagreb, Croatia (June, 2014). We also attended Cost meetings in Spain – Cuenca (2012), Austria – Wien, Tulln (2013), and Netherlands – Wageningen (2014). In 2014, we participated at the Congress of Serbian Genetic Society in Kladovo (Paradiž et al. 2014). At BGCI meetings, we help set the guidelines for botanic gardens, following the trends and requirements set by the European Consortium. In accordance with BGCI requirements, our Botanic Gardens thus protects plant species in *ex-situ* and *in-situ* circumstances. In *ex situ* circumstance we try to fulfil conservation goals as possible that are defined in GSPC and included in the global strategy of plant species conservation. For this purpose, we pay special attention to Slovenian endangered species. Ever since 1819, we have been successfully maintaining a variety of the *Pastinaca sativa* var. *fleischmanni*. After 1840, it had disappeared from its natural habitat, and has been preserved only in the Botanic Gardens (Hegi 1908–1933). In 2011, we successfully reintroduced it back to its habitat – the area of the Ljubljana Castle. Since then, it has been successfully growing inside the Castle, along the descendent of the oldest grape vine in the world, from Maribor. We have ensured similar conditions as in its natural habitat (sandy soil). In accordance with the recommendations of BGCI, we harmonised the list of plant species in the Botanic Gardens with the Nagoya protocol, and had it verified by a notary.

Membership in BGCI and our renown in Europe have led to the French exhibit Urbanbees offering to visit our Botanic Gardens. We gladly accepted the authors' offer, and hosted the traveling exhibit in 2014. The traveling exhibit URBANBEES was the result of a five year project in the LIFE +Biodiversity programme. Its goal was to retain and improve the biodiversity of wild bees in urban environments in Europe. Project coordinators were INRA Science &

Impact and ArthroPologia from France. Many cities in France participating in the project have already made city surfaces greener with a diverse vegetation, thus improving the environment for bees, which are one of the key pollinators and a good indicator of the environment state. The show URBANBEES showed the life of bees in an interactive and interesting way, as well their role in the environment and ways to maintain their biodiversity. During the exhibit, we also organised lectures and workshops, and offered visitors hives for wild bees. We were the first to host the exhibit outside of France. The exhibit then travelled to other European cities.

Potujoča razstava Urbanbees
Traveling exhibition Urbanbees Photo: J. Bavcon

Even among other European educational institutions, we are quite renowned, which is reflected by the increasing number of visits of foreign students, who want to complete their professional internship in our Gardens. In 2013, students from various Universities and Colleges from Germany and Poland were doing their internships for longer periods of time, from three to six months. We also had students from Turkey in the shorter, one month programmes Internship. The

students came from different fields of study: biology, horticulture, and landscape architecture. We also has students from the programme Internship in 2014. In addition to working in the Gardens, they also familiarised themselves with work in nature, learned to identify various plant species in their natural environment and different phytogeographic areas in Slovenia.

In 2013, the Gardens joined the network of institutions that preserve the tradition of Hiroshima survivor trees. In an initiative of Prof. Dr. Shin-Ichi Uya from the Hiroshima University, an activist that has been preserving the tradition of survivor trees after the atomic bombing of Hiroshima, Prof. Dr. Radovan Stanislav Pejovnik and Prof. Dr. Alenka Malej, the Botanic Gardens asked for the seeds of the Hiroshima survivor trees. We selected a few species, and in June, 2013, planted these seeds in the Botanic Gardens. We successfully grew a few plants of gingko trees and Japanese hackberry. During a ceremony in 2014, these trees were planted into clay pots, and when they grow large enough, they will be planted in permanent spots along the new faculties by Večna pot, right next to the Japanese cherry plantation. The Hiroshima trees and the Japanese cherry trees symbolise a message of peace.

We also cooperate with other botanic gardens through an exchange of seeds, based on the scientific publication *Index seminum*, which was published for the first time in 1889 by Alfonz Paulin (Lazar 1960, Strgar 1973, Bavcon 2009b, 2012c). Furthermore, the Gardens currently participate in an exchange with 300 botanic gardens, and with gardens throughout the world through the global organisation of botanic gardens, BGCI. Nowadays, orders for seeds arrive through e-mail, both from established exchange partners and the aforementioned organisation. On average, about 130 gardens order seeds from our Gardens annually, usually 12 different species per order. The Botanic Gardens has about 11,000 units of seeds in the seed bank, which is expanded and restored each year. In addition to gathering seeds in the Gardens, we also gather seeds in nature. Due to our long tradition of gathering seeds and publishing *Index seminum*, we received an invitation to the international workshop on seed banks (Workshop Millennium Seed Bank) in Vienna. There we acquired additional knowledge on setting up and managing seed banks.

Donirane rastline iz Botaničnega vrta v Bonnu
Donated plants from Bonn botanical garden Photo: J. Bavcon

In addition to seeds, we also exchange live plant materials with other botanic gardens, and we received quite a few plants from other botanic gardens. Here, we must point out the excellent cooperation with the Bonn University Botanic Gardens, which sent us four large shipments of plants for the planting of the tropical glasshouse. We sent them a lot of material of our plant species. We also received quite a lot of plants from the Botanical Gardens Graz.

We enjoy participating in international projects that promote plants, their diversity, and use. Our participation in the international Fascination Plants Day has become almost traditional (since 2012). During these days, the space of the

Botanic Gardens transforms into an informational centre for institutions that deal with plants in any way. Each institution presents its activities with plants in various, interesting workshops. The day is primarily dedicated to school groups, and we provide an educational and interesting stroll through the plant kingdom.

Not only a garden, but a gathering venue

The University Botanic Gardens Ljubljana, in addition to their research and educational role, undoubtedly have a role as a connecting institutions. They represent a spot, where different generations, different professions, and interest groups can meet during various events. Since 2010, we have been hosting various exhibits related to plants in the lobby of the tropical glasshouse. In addition to the international exhibit Urbanbees, we have hosted the international photographical exhibit Rainforests of Costa Rica, the photographical exhibit Meadows – Colourful Gardens, a watercolour exhibit of Alpine plants, a sunflower photographic exhibit, an exhibit of Slovenian birds, an exhibit of the Ljubljana Marshes Landscape Park, an exhibit of Slovenian plants, an exhibit of student drawings of the great masters, and a 20-year anniversary exhibit of National Geographic. We also hold two exhibits of reptiles and amphibians, Bioexo, on the premises of the Botanic Gardens each year. Every year, the Bioexo society transforms the glasshouse, for one spring and one autumn weekend, into a true jungle with various reptiles. They also liven up these days with lectures and various workshops. In 2011, together with the Slovenian Orchid Society, we organised an international exhibit of various orchid species and varieties in the Glasshouse Tivoli, and thematic lectures and advice for breeding orchids. And we concluded 2014 with an exhibit on Franc Hladnik, the founder of the Botanic Gardens. The exhibit presented his life, work, and dedication to plants to a wider audience. This exhibit commemorated the 170-year anniversary of his passing.

The renown of plants growing in the Botanic Gardens also reached the Post of Slovenia, which issued four postage stamps in 2012, representing Hladnik's Scopolia (*Scopolia carniolica* f. *hladnikiana*), Hladnik's Scabiosa (*Scabiosa hladnikiana*), Idrija primrose (*Primula* x *venusta*), and Fleischmann's parsnip (*Pastinaca sativa* var. *fleischmanni*). In this way, our plants reached not only Slovenian, but probably also foreign homes.

It has been said that plants grow better by music. For the past three years, we have hosted a young musician and composer Timotej Kosovinec in the Botanic Gardens. A true guitar virtuoso impressed music and plant aficionados. Nevertheless, we always take care of the young or those young at heart. In 2014, we organised, together with the Visual Artists Society, an interactive puppet show, Gulliver's travels to Lilliput.

More and more companies are becoming familiar with the importance and mission of the Botanic Gardens, and are using it as a centre for active socialising of their employees and as a possibility for volunteer community work. In 2014, employees of L'Oreal offered to help in the Botanic Gardens. They helped in groups with gardening work, socialised, and acquired helpful information on gardening from our gardeners.

At the same time, the Botanic Gardens serves as a socialising venue for international events. In the last couple of years, Japanese cherry aficionados have organised Hanami in the Botanic Gardens, an event for socialising and learning about Japanese culture. Numerous visitors also attend various workshops: origami, drawing Japanese cherries, Japanese handwriting, children's stories, haiku introduction and reading, exhibit of Japanese plants in the Botanic Gardens, and an exhibit of drawings. An artistic impression is provided by live music. Every year, this pleasant socialising accompanied by tea lasts throughout the day.

Of course, the Botanic Gardens are the one and only place for meeting gardening and plant aficionados. In 2014, we held a traditional and also 10th anniversary flea market for plants. Despite the bad weather, the response of exhibitors and visitors was great. We also commemorated the 10th anniversary with a photographic exhibit, The First 10 Years of the Flea Market. We livened up the event with four lectures, and awarded the conceptual author, Mrs Nuša Zanoškar, a commemorative plaquette.

Bolšji sejem rastlin v Botaničnem vrtu
Plants flea market in Botanic garden Photo B. Ravnjak

Volunteers in the Botanic Gardens

Individual volunteers have been coming to the Gardens for many years, however, more organised work began in 2011 in cooperation with the Third Age University, which formed a group of gardening volunteers (consultation "How to become a gardening volunteer in the Botanic Gardens", May 11, 2011). Furthermore, other people come to the Gardens, either retirees or the currently unemployed young. The latter acquire new experiences and references for seeking new employment. In 2013 and 2014, we had about 20 volunteers working in the Gardens, who performed 1270 man-hours of work in the Botanic Gardens in 2013 (324 man-hours of gardening and 946 man-hours of standby duty in the glasshouses), and 1653 man-hours in 2014 (770 man-hours of gardening and 874 man-hours of standby duty in the glasshouses).

Volunteers in the Gardens work as receptionists in the tropical glasshouse and help with various gardening tasks, preparation of material for workshops and birthday celebrations, and preparation and manufacture of sales products. Two volunteers also help as guides, while others help with various workshops. In

2012 and 2013, volunteers and the Botanic Gardens participated in two projects on invasive plants, and two conferences were held in the Botanic Gardens for this purpose:

- Conference on non-native invasive plant species in Slovenia (May 9, 2012).
- Conference: Japanese knotweed (*Fallopia japonica*). Recognising and removing the Japanese knotweed, and the role of gardening volunteers – plant ambassadors (June 17, 2013).

A group of gardening volunteers from Botanic Gardens was also chosen and received an award in the campaign *Ljudje odprtih rok 2012* by magazine Naša žena, which gives recognition awards and acknowledgements to individuals, humanitarian societies, and socially responsible organisations for their work. We presented our good cooperation with elderly volunteers at a consultation "Volunteerism of elderly for the development of local community" on March 13, 2013, organised by the Third Age University of Slovenia, Ljubljana. In 2012, the European year of active ageing and intergenerational solidarity, the Third Age University of Slovenia, Ljubljana, developed the project *KIPARIMO SKUPAJ* (SCULPTING TOGETHER), which included gardening volunteers and students of Gymnasium Šentvid, and took place in the Botanic Gardens. The produced sculptures were exhibited in the Glasshouse Tivoli. The work of the gardening volunteers was also presented in the media, specifically in newspaper Dnevnik ("The work of volunteers would otherwise remain unfinished", 2011), on Radio SLO1 ("Good works – volunteers of the Botanic Gardens", 2011), and magazine Naša žena ("Secret garden, volunteers in the Botanic Gardens", 2012).

Botanic Gardens in the media

The Botanic Gardens have quite a presence in the media. They are discussed by various printed media, and are regularly followed by various national or local radio stations, as well as the national and various commercial television stations. They are often used for interviews and trailers, since the pleasant garden environment provides plenty of interesting filming locations. Our experts also provide advice on various media, participate in call-in shows, and give extensive interviews for various newspapers or audio-visual media. Through all these segments, we address a very diverse public, while emphasising the importance of the Gardens and the importance of discovering the diversity of the plant world, both in Slovenia and abroad.

Urbani vrtički za progo, ki so rezultat sodelovanja med Botaničnim vrtom, RTV Slovenijo in Mestno občino Ljubljana
Urban gardens, which are a result of collaboration between Botanic Garden, Slovenia television and Municipality of Ljubljana Photo: J. Bavcon

Ever since 2011, we regularly participate with advice on the morning show *Dobro jutro*, where we once a week, on Monday or Wednesday, have a live, direct broadcast on the subject of gardening. In 2011, we arranged a small kitchen garden by the external area of the tropical glasshouse, which was still unprepared at that time. The little garden started growing with the show, and we could follow it throughout the season. In 2013, together with the City of Ljubljana and RTV Slovenia, we started the campaign of urban gardens on the degraded surfaces outside the Gardens. The use of this degraded area was granted to us by the owner, the City of Ljubljana. The goal of the project was to landscape the neglected surfaces, overgrown with invasive plant species, into surfaces that could support growing vegetables for home use, using planned and sustainable management. With that in mind, we selected enthusiastic gardeners that were ready to do the work, with support from experts from the Gardens, and

give these surfaces a new purpose. The project was a complete success, and both gardeners and viewers followed the landscaping with interest, from the very first steps, when nothing was growing, to first produce. Along the way, they were getting to know new methods of gardening and growing vegetables for home use. The campaign was successful, and we have expanded the surface, fixing up the entire degraded land plot along the tracks, and at the same time formed a community of gardeners that has taken over the task of maintaining this area. A degraded surface was thus transformed into a usable area, which provides this group of gardeners with means of relaxation and production of vegetables for home use.

We also introduced the audience to the plant kingdom in the show *Dobra ura*, and presented the Botanic Gardens as a place that can be visited any time in the show *Na lepše*. In 2013, we joined the project *Kabinet čudes* (Cabinet of Wonders). Together with some other scientific research institutions, we have been publishing short articles for the popularisation of science on website Delo. The subjects of our contributions are interesting plants that visitors can find in the Gardens.

Publications

In 2011, we published three books. The first was a monograph on the founder of the Botanic Gardens, Franc Hladnik. At first, the text on Hladnik was just a part of the annual list of seeds with the contributions of the symposium on Franc Hladnik in his hometown, Idrija. The second book discussed the issue of city trees and their management (Šiftar et al. 2011). The work includes the correct selection of species, so the chosen city tree could serve its purpose throughout its live, and be provided for by the city with everything the tree needs. Furthermore, the book includes advice for proper care. The third deals with themes of the symposium botanic gardens and biodiversity in Ljubljana (Bavcon 2011f). In the beginning of 2012, we also published an extensive work on the founder of the Gardens, Franc Hladnik, which includes all his published biographies, copies with translations into Slovene and English, reviews of his work and life, from his death to today, with commentary of Slovenian botanic history researcher, Dr. Nada Praprotnik. Along with the annual index, we also published in 2012 a book that discusses the tropical glasshouse and the history of glasshouses in Ljubljana

(Bavcon et al. 2012a). And, at the end of 2012, we published a work by three authors (Bavcon, Klemen, Sušek, 2012b), titled Helleborus in Slovenia. The monograph discussed the problematic genus *Helleborus* in the territory of Slovenia from various perspectives.

At the start of 2013, along the annual *Index seminum*, we also published an e-book, titled Seeds collecting in the dry year 2012 (Bavcon et al. 2013), which discusses the effect of draught on plants.

In 2013, Mohorjeva založba in Klagenfurt published an extensive book on our plants, which described the plants growing in Slovenia with a popular science approach (Bavcon 2013b). Towards the end of the year, it was followed by *Rastlinstvo okolice Franje*, which presents the plant life of this interesting canyon with a popular science approach (Bavcon 2013c).

In 2014, together with the annual *Index Seminum*, we published an e-book, Seeds collecting for *in-situ* and *ex-situ* conservation purpose, which discussed collecting seeds for the Millennium Seed Bank (Ravnjak & Bavcon 2014).

At the end of 2014, two extensive monographs were published, White-Flowered Varieties in Slovenian Flora (Bavcon 2014a) and Common Snowdrop (*Galanthus nivalis* L.) in Slovenia (Bavcon 2014b).

Something new for our visitors

After opening the tropical glasshouse in 2010, we arranged plenty new sights for our visitors in the Botanic Gardens. In 2011, we renovated the surrounding of the glasshouse, which included the aforementioned kitchen garden, breeding plant beds, and the composting facility. We built a new tool shed and rebuilt the old small glasshouse, which we had to move during construction. We fixed the old pergola and changed the surrounding of the old glasshouse into a shopping section. There, we sell autochthonous plants that were grown in the Gardens, thus preventing pillaging of natural habitats.

Obnova starega rastlinjaka
Old glasshouse renovation Photo: J. Bavcon

In 2013, the City of Ljubljana began renovating the external parking lot, and finished it in 2014. Visitors to the Gardens thus finally have arranged parking spaces. 2013 was a turning point for the old glasshouse. For many years, it remained in bad condition due to lack of resources. However, in 2013, despite the financial crisis, we began a partial renovation, which turned into a full renovation with the help of the City of Ljubljana, biology department of the Biotechnical Faculty, and our own large investment. Despite the renovation, we preserved the former appearance of the glasshouse. The glasshouse opened for the public in September, and ever since then it is available for the general public.

In 2013, we held a ceremonious opening of the library of the late botany professor Dr. Tone Wraber in the old administrative building. The rich library was donated by the family of the late professor. The books was completely catalogued, data was entered into an electronic data base, and new shelves were constructed for the books. The library thus became useful and available for various researchers (Bavcon 2013d).

In 2014, with the help of the City of Ljubljana – Ljubljana Tourism and the neighbouring school of the Biotechnical Centre Ljubljana, we built a teahouse Primula in the old administrative building and next to it, which represents an additional venue for friendly gathering in the Botanic Gardens. The teahouse was opened on June 3, 2014. Since then, it has really come to life, and represent an additional diversification of the Gardens, and above all an opportunity for visitors to remain in the Gardens longer. Since 2011 and before the teahouse, the old administrative building has been the home to the project *Moje ulice* by

institute *Divja misel*, where famous citizens of Ljubljana told about their life in the city of Ljubljana, once a week in June and July. With the new teahouse, listening, as well as telling these stories, became so much more enjoyable. The offer of the Gardens has thus been expanded, turning the Gardens into a proper location for education, research, and pleasant socialising for the wider public, while discovering the rich plant life. During the same year, the area of the Botanic Gardens was provided coverage with a free Wi-Fi internet access, under the project WiFree Ljubljana. Many visitors can thus enjoy browsing interesting websites while relaxing in the lush environment of the Botanic Gardens.

Photo: D. Bavcon

Since 2013, the city of Ljubljana and the Botanic gardens have been symbolically connected by the Hladnik's footbridge at Špica. It was named after the founder of the Botanic Gardens, Franc Hladnik (Official Gazette of the Republic of Slovenia, No. 10/2013), specifically on our initiative and with the following letter sent to the City Council:

“Franc Hladnik (March 29, 1773 to November 25, 1884), the founder of the Botanic Gardens Ljubljana (1810), managed to preserve the gardens, built during the Illyrian Provinces, even during the restored Habsburg Monarchy (Bavcon 2011e, Praprotnik 2012). All the institutions established by the French were abolished in restored Habsburg Monarchy. Hladnik managed to retain the gardens, thus connecting the new with the old, or two different approaches. Therefore, a bridge, connecting two banks, is a true symbol of Hladnik. He was an important person, the first university professor of botany in institutions of higher learning. He was the first to successfully resist the authority of the Church, since he did not obey the command to leave for the parish, despite the consecration. Nevertheless, he was successfully promoted from a librarian to a university professor during the time of Illyrian Provinces, and then to a principle of the contemporary Gymnasium, which he managed to elevate among the best in the Habsburg Monarchy, for which he was honoured by the Emperor with a great gold medal (1819). He was a humble man, he knew how to listen, but was nevertheless esteemed amongst the contemporary botanists in Middle Europe. He taught many botanists, including Tommasini from Trieste, who later became the mayor of Trieste, Henrik Freyer, the first custodian of the Provincial Museum in Ljubljana and then Trieste. He strived to establish the Provincial Museum and to acquire the Zois mineral collection for said museum. The Gardens, which the footbridge leads to, have thus remained in the same spot all this time. Because of this, our Gardens are among those considered middle-aged in Europe. However, since they have operated uninterrupted in the same location, they have a much greater significance.”

The City Council adopted our initiative and named the footbridge after Hladnik. Since then, a pleasant footpath leads from the city centre to the Botanic Gardens. However, for those romantically inclined, the boat trip through the Gardens is still the best. In the next couple of years, we also expect a new wharf on the Gruber’s canal.

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URADNI LIST RS, št. 10/2013 ODLOK o določitvi imen ulic, mostov, brvi in sprememb potekov ulic na območju Mestne občine Ljubljana

PRILOGA 1 / ATTACHMENT 1

Strokovna vodenja za širšo javnost

2011:
- Junij: Medovite rastline

2012:
- Junij: Medovite rastline
- September: Tujerodne invazivne rastline

2014:
- Januar: Uporabne rastline iz eksotičnih krajev

Delavnice

2011:
- Januar: Eksotični sadeži
- Februar: Slike iz semen
- Marec: Znanilci pomladi
- Maj: Drevesa
- Junij: Cepljenje citrusov
- September: Čarobne rastline junakov Harryja Potterja
- Oktober: Izrezovanje strahcev iz buč, Mesojede rastline (rastlinjak Tivoli)
- November: Čarobne rastline junakov Harryja Potterja, Živali iz rastlin, Izdelovanje venčkov
- December: Izdelovanje voščilnic iz posušenih delov rastlin, Izdelajmo praznični šopek

2012:
- Januar: Eksotični sadeži
- Februar: Slike iz semen
- Marec: Izdelovanje pletenih opor, Slovenske butarice, Polžja hišica – dom za rastline, Izdelovanje 'Gregorčkov'
- April:, Izdelovanje piščalk iz vrbovih vej, Izdelovanje sladkih šopkov
- Maj: Dišeči svet zelišč
- Junij: Cepljenje citrusov

- Avgust: Poskočno v novo šolsko leto (akrobatske delavnice – Sokol, Tivoli)
- September: Razmnoževanje rastlin
- Oktober: Izrezovanje strahcev iz buč
- November: Izdelovanje venčkov
- December: Izdelajmo praznični šopek

2013:
- Januar: Uporabne rastline iz eksotičnih krajev
- Februar: Ustvarjamo iz bambusa
- Marec: Izdelovanje pletenih opor
- April: Izdelovanje piščalk iz vrbovih vej, Čemaž – kako ga spoznamo in uporabimo
- Maj: Dišeči svet zelišč
- Junij: Cepljenje citrusov
- Avgust: Poskočno v novo šolsko leto (akrobatske delavnice – Sokol, Tivoli)
- September: Netopirji in rastline – kaj imajo skupnega?', Dišeči svet začimb in zelišč
- Oktober: Od semena do semena, Izrezovanje strahcev iz buč, Nagrobni aranžma iz naravnih materialov
- November: Izdelovanje venčkov

2014:
- Januar: Ličkanje koruze in ustvarjanje iz ličkanja
- Februar: Domovanje za divje čebele, počitniške delavnice 'Rastline in čebele' (Oprašimo rastline, Cvet ni samo lep, Kdo je najboljši opraševalec, Pridna čebela, Pokaži mi cvet, pa ti povem kdo je tvoj opraševalec)
- Marec: Izdelovanje 'Gregorčkov', Izdelovanje pletenih opor
- April: Izdelovanje origami žab, Gojenje žab podrevnic, Spoznavanje žab ali kako pravilno primemo žabo (Bioexo), Butara za cvetno nedeljo, Izdelovanje piščalk iz vrbovih vej
- Maj: Dišeči svet zelišč
- Junij: Cepljenje citrusov

- Jujij: Liliput (Društvo lutkovnih ustvarjalcev)
- Avgust: Liliput (Društvo lutkovnih ustvarjalcev), Poskočno v novo šolsko leto (akrobatske delavnice – Sokol, Tivoli), Cepljenje citrusov
- September: Rimljani in rastline, Spoznavanje žuželk, Nabiranje in gojenje žuželk (Bioexo)
- Oktober: Od semena do semena, Izrezovanje strahcev iz buč, Izdelovanje venčkov

Predavanja

2011:
- Januar: Jutini vrtovi
- Februar: Ljubljansko barje
- Marec: Na Krokarjevi jasi – v sožitju z naravo
- April: Vrt 'Slavica Eden'
- Maj: Mavrična lepota perunik
- Oktober: Vrt Gorazda Mauerja
- November: Nastajanje in spreminjanje vrta v Rebru

2012:
- Januar: Orhideje Jadrana, Vrtovi včeraj, danes, jutri
- Februar: Tradicija on oblikovanje v hortikulturi
- Marec: Narava in vrtovi Nove Zelandije, Posebnosti pri orhidejah v Sloveniji (Nigritella)
- April: Načrtovanja vrtov in javnih zelenih površin do vzgoje sadik trajnic – sporehod skozi več kot 40 let dela
- Avgust: Netopirji in rastline – kaj imajo skupnega'
- Oktober: Aralsko jezero
- November: Navadno proso (*Panicum milliaceum* L.)-od rastline do mlečne kaše
- Paramo in Yungas (Nigritella)

2013:
- Januar: Proizvodnja orhidej v Prekmurju
- Februar: Na toplo v trope Kostarike

- Marec: Rožni vrt Svetega Ivana v Trstu
- April: Retrospektiva dela
- September: Sončnica, pomembna svetovna oljnica, medovita in okrasna rastlina
- November: Naše rastline
- December: Čebelarji in invazivke, Za volkovi (Slo Wolf)

2014:
- Januar: Kukavičevke v Halozah
- Februar: Čebelarji in invazivke, Prezrte čebele, Nekaj o medonosni čebeli
- Marec: Suprisingly new roses from amateur breeders
- April: Gojenje in oskrba nekaterih tropskih žab
- November: Vse o bučah in bučkah, Alpske rastline od tu in tam

Razstave

2011:
- Februar: Ljubljansko barje
- Marec: Mednarodna razstava orhidej 2011 (Rastlinjak Tivoli)
- Oktober, november: Izdelki iz posušenih buč
- November: prodajna razstava 'Čestitke iz naravnih materialov'

2012:
- Januar: Otvoritev razstave slik prof.dr. Alenke Gaberščik
- Marec, April: Filatelistična razstava
- April: Pomladni prazniki
- Junij: Otvoritev razstave 'Tam kjer murke cveto…', Filatelistična razstava 'Vrtnica-kraljica rož'
- Junij, julij: Razstava slik (Tivoli)
- September, oktober, november, december: Tropski deževni gozd
- December: prodajna razstava 'Čestitke iz naravnih materialov'

2013:
- April, maj: slikarska razstava 'Ko se ptički ženijo'

- Maj, junij: Juniorjeva (NGJ) razstava otroških likovnih del 'Očarljive rastline', fotografska razstava' Rastline naše pomladi', fotografska razstava rastlin Marka Masterla ' Spoznaj sosede'
- Oktober: Sončna roža – razstava o sončnicah
- December: Sončnica v vsej svoji lepoti, Jesenska opravila na kmetiji

2014:
- Januar: Sončnica v vsej svoji lepoti, Jesenska opravila na kmetiji
- Februar: Urbanbees, Jesenska opravila na kmetiji
- Marec: Razstava žab (Bioexo)
- Avgust: Senožeti – pisani vrtovi, Eksotične žuželke

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UVOD

Vremenske razmere v letih od 2011 do 2014 (Cegnar 2011 a, b, c, 2012 a, b, c, 2013 a, b, c, d) za vrt niso bilo najbolj ugodne, saj so bila poletja v teh letih (2011, 2012 in 2013) ekstremno topla, z velikokrat že zgodnjimi sušami (Cegnar 2011 a, b, c, 2012 a, b, c, 2013 a, b, c, d). Predvsem leti 2012 in 2013 sta bili res ekstremno suhi, kar se jev vrtu poznalo tudi na rasti nekaterih dreves. Predvsem so drevesa predčasno izgubila precej več listov kot običajno, pri nekaterih pa se j začelo sušenje (*Cercidiphyllum japonicum*). Težave smo imeli z zalivanje in oskrbo velikega dela rastlin, predvsem pa tudi z nabiranjem semen (Bavcon & Makše 2013, Ravnjak & Bavcon 2014). Prav tako nam je težave povzročila še relativno dolga zima v letu 2013. Hlad je vztrajal kar nekaj časa, sledila pa je ekstremna suša. A prav hitri prehodi za rastline nikoli niso najboljši (Cegnar 2013a).

Leto 2014 je bilo meseca februarja zaznamovano z močnim žledom (Cegnar 2014 a, b, c), ki je kot že omenjeno v prejšnjem prispevku, vrtu povzročil veliko poškodb, katerih odpravljanje se je zavleklo vse v maj. Izgubili smo kar 25 drevesnih vrst, samih dreves pa celo več, saj so nekatere vrste imele več dreves. Tudi v celoti je bil vrt precej poškodovan. Polomljene so bile ograje, uničene so bile poti in zelenice. Iz vrta smo tako odstranili preko 150 m^3 vejevja poleg že omenjenih velikih dreves. V tem letu se je na lipi iz leta 1810, zaradi prejšnjih suš in napada glive, začelo sušenje vrha. Lipo je bilo zato potrebno zaradi še dodatnih poškodb po žledu skrajšati in zvezati. Več zraščenih vrhov je začelo v spodnjem delu nakazovati znake razpok, kar bi lahko pomenilo, da jo bo vsak najmanjši vihar že razčesnil. Dva velika topola smo morali zaradi varnosti ceste, napada glive in vidnega hiranja, že v poletnem času odstraniti. Grozila je namreč velika nevarnost padca na cesto in sosednje stavbe. Požagali smo ju še pred poletnimi viharji, ki so v letu 2013 kar nekajkrat pustošili po Ljubljani, najmočneje 29. julija (Cegnar 2013). Posledice žleda smo tako v vrtu z veliko finančni pomočjo MOL-a odstranjevali veliko časa. V maju smo uredili vse poškodovane poti, travne površine ponovno sanirali in vrt ponovno uredili v za obiskovalce prijazno okolje. Zaradi zelo mokrega leta 2014 se je delo precej

zavleklo in tudi samo obraščenje drevja zaradi prevelike moče ni bilo najbolj učinkovito. Posledice so tako bile vidne še v jeseni. Edino travne površine so se zaradi velike moče dobro zarastle in skrile vse tiste velike rane, ki jih je vrt doživel tekom zime.

Nabiranje semen v letu 2014 pa je zaznamovala velika namočenost (Cegnar 2014, c, d, e, f) saj je bilo poletje za naše klimate neobičajno in je kazalo značilnosti tipične atlantske klime. Že zime, z izjemo omenjenega žleda, praktično ni bilo (Cegnar 2014 b), kar je pomenilo veliko več škodljivcev. Predvsem so v tem letu velike težave povzročali polži, kar se je najizraziteje pokazalo na enoletnicah. Velikokrat se je zgodilo, da so polži tekom noči pojedli kalice ali mlade rastline kljub različnim zaščitnim sredstvom. Veliko deževnih dni je pomenilo manjše možnosti za oprašitev rastlin. Nekatere rastline pa se zaradi prevelike namočenosti tal niso ustrezno razraščale ali so z svojo vegetacijsko dobo precej kasnile. Prav zaradi vseh teh vzrokov je letošnje število nabranih semen manjše, kot v preteklih letih. Pri mnogih vrstah ni prišlo do zadovoljivega razvoja semen ali pa je le-teh bilo premalo in jih zaradi tega nismo uvrstili v sam seznam semen.

Tabela 1: Število vrtov, ki so naročila semena; število vrst, katerih semena so bila poslana in povprečno število vrst, katerih semena so bila poslana glede na posamezno naročilo.

Leto	**2011**	**2012**	**2013**	**2014**
Št. Vrtov	118	85	114	77
Št. vrst poslanih semen	1437	920	1308	912
Povprečno št. vrst poslanih semen na posamezno naročilo	12	11	11	11

INTRODUCTION

Weather conditions in 2011 to 2014 (Cegnar 2011, 2012, 2013) were not the most favourable for the Gardens, since summers during these years (2011, 2012, and 2013) were extremely warm, often with early draughts (Cegnar 2011 a, b, c, 2012 a, b, c, 2013 a, b, c, d). 2012 and 2013 were extremely dry years, which reflected in the growth of certain trees in the Gardens, specifically: trees prematurely lost significantly more leaves than usual, and some trees began

drying up (*Cercidiphylum japonicum*). We had problems with watering and care for a large section of plants, and also with seed collection (Bavcon & Makše 2013, Ravnjak & Bavcon 2014). The relatively long winter in 2013 also caused problems. The cold remained for quite some time, and was followed by extreme draught. And quick transitions are never good for plants (Cegnar 2013a).

February, 2014, was marked by severe glaze ice (Cegnar 2014 a, b), which, as was already mentioned, caused severe damage to the Gardens, with recovery lasting until May. We lost 25 tree species and even more tree, since we had multiple tree of the same species. The Gardens as a whole were also damaged severely. Fences were broken, pathways and lawns were destroyed. We removed over 150 m^3 of branches, in addition to the aforementioned trees. Due to previous draughts and fungal attacks, the top of the linden from 1810 began drying up this year. It had to be cut and tied, due to additional ice damage. Multiple conjoined tops started showing signs of cracking in the lower sections, which could indicate that the linden will be broken by the smaller storm. Two large poplars had to be removed during summer because of road safety, fungal attack, and evident withering. There was a great risk of them falling on the road and neighbouring building. We cut them down before the summer storms, which buffeted Ljubljana several times during 2013, the strongest one on July 29 (Cegnar 2013). Effects of glaze ice took quite some time to fix, even with a large financial help by the City of Ljubljana. In May, we fixed all damaged pathways, restored the grass surfaces, and transformed the Gardens once again into a pleasant environment for visitors. Due to a very wet 2014, work lasted quite some time, while the undergrowth around the trees did not develop well due to excessive precipitation. The effects were still visible in autumn. Only the grass surfaces grew well due to the excessive precipitation, covering all the damage incurred by the Gardens during winter.

Collection of seeds in 2014 was marked by high precipitation (Cegnar 2014 c, d, e, f), with an unusual summer for our climate conditions, showing characteristics of a typical Atlantic climate. Even the winter, with the exception of the aforementioned glaze ice, was practically non-existen (Cegnar 2014 b), thus increasing the number of pests. Snails, primarily, caused numerous problems during this year, which were most evident on annuals. Quite often the snails ate the sprouts or young plants despite the various protective agents. Numerous wet days also significantly reduced the chances of pollination of plants. And some plants did not grow properly, or their vegetative period started very late. Due to

all these reasons, the amount of collected seeds is smaller than in previous years. With many species, seeds did not developed suitably, or developed in much smaller number, and were therefore not included into the list of seeds.

Table 1: Number of gardens, which ordered seeds; species number of which seeds were send and average species number of which seeds were send per one order.

Year	**2011**	**2012**	**2013**	**2014**
No. of gardens	118	85	114	77
No. of species seeds send	1437	920	1308	912
Average no. of species seeds send per one oreder	12	11	11	11

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CONIFEROPHYTINA (Gymnospermae)

Ginkgoaceae
1. *Ginkgo biloba* L.

Pinaceae
2. *Pinus mugo* Turra
3. *Tsuga canadensis* (L.) Carriere

Taxaceae
4. *Taxus baccata* L.

Taxodiaceae
5. *Cryptomeria japonica* D. Don

MAGNOLIOPHYTINA (Angiospermae)

Acanthaceae
6. *Acanthus balcanicus* Heywood & I. B. K. Richardson

Aceraceae
7. *Acer griseum* (Franch.) Pax.
8. *Acer obtusatum* L.
9. *Acer palmatum* Thunb.
10. *Acer pseudoplatanus* L.
11. *Acer tataricum* L.

Alismataceae
12. *Alisma plantago-aquatica* L.

Alliaceae
13. *Allium angulosum* L.
14. *Allium ericetorum* Thore
15. *Allium fistulosum* L.
16. *Allium sphaerocephalon* L.
17. *Allium tuberosum* Roxb.
18. *Allium ursinum* L.

Aloeaceae
* 19. *Aloe saponaria* Haw.

Amaranthaceae
20. *Gomphrena globosa* L.

Amaryllidaceae
21. *Galanthus nivalis* L.
22. *Leucojum vernum* L.

Anacardiaceae
* 23. *Pistacia lentiscus* L.
24. *Rhus verniciflua* Stokes
* 25. *Schinus lentiscifolius* March.
* 26. *Schinus terebinthifolius* Raddi

Apiaceae
27. *Astrantia major* L.
28. *Athamanta haynaldii* Borb. & Uechtr.
29. *Conium maculatum* L.
30. *Coriandrum sativum* L. 2013
31. *Eryngium amethystinum* L.
32. *Hacquetia epipactis* (Scop.) DC.
33. *Libanotis sibirica* (L.) C. A. Mey

34. *Libanotis sibirica* (L.) C. A. Mey subsp. *pyrenaica* (L.) O. Schwarz
35. *Pastinaca sativa* L. var. *fleischmanni* (Hladnik) Burnat
36. *Peucedanum schottii* Besser ex DC.
37. *Seseli gouani* Koch
38. *Smyrnium perfoliatum* L.

Apocynaceae
39. *Amsonia tabernaemontana* Walt.

Aquifoliaceae
40. *Ilex aquifolium* L.

Araceae
41. *Arum italicum* Mill.
42. *Calla palustris* L.

Araliaceae
43. *Acanthopanax sieboldianus* Mak.
44. *Hedera helix* L.

Arecaceae
* 45. *Howea forsteriana* (F.Muell) Becc

Asclepiadaceae
46. *Asclepias syriaca* L.
47. *Vincetoxicum fuscatum* (Hornem.) Reichenb.
48. *Vincetoxicum hirundinaria* Medik.

Asphodelaceae
49. *Asphodeline liburnica* (Scop.) Rchb.

Asteraceae
50. *Anthemis tinctoria* L.
51. *Arctium lappa* L.
52. *Artemisia abrotanum* L.

53. *Aster alpinus* L. 2013
54. *Aster amellus* L.
55. *Bellis perennis* L.
56. *Bidens tripartita* L.
57. *Buphthalmum salicifolium* L.
58. *Calendula officinalis* L.
59. *Carduus nutans* L.
60. *Centaurea cyanus* L. 2013
61. *Centaurea rhenana* Boreau
62. *Chamomilla recutita* (L.) Rauschert
63. *Cirsium eriophorum* (L.) Scop.
64. *Cirsium palustre* (L.) Scop.
65. *Coreopsis grandiflora* Hogg.
66. *Cosmos sulphureus* Cav.
67. *Echinacea purpurea* Moench
68. *Echinops exaltatus* Schrader
69. *Echinops sphaerocephalus* L.
70. *Gaillardia pulchella* Foug.
71. *Inula ensifolia* L.
72. *Inula hirta* L.
73. *Inula magnifica* L.
74. *Inula spiraeifolia* L.
75. *Liatris graminifolia* (Walt.) Willd.
76. *Matricaria perforata* Merat
77. *Pulicaria dysenterica* (L.) Bernh.
78. *Rudbeckia laciniata* L.
79. *Senecio sylvaticus* L. 2013
80. *Serratula lycopifolia* (Vill.) A. Kern.
81. *Silphium integrifolium* Michx.
82. *Silphium perfoliatum* L.
83. *Silybum marianum* (L.) Gaertner 2013
84. *Solidago graminifolia* (L.) Salisb.
85. *Tagetes erecta* L.
86. *Tagetes tenuifolia* Cav.
87. *Tanacetum corymbosum* (L.) Schultz Bip. subsp. *clusii* (Fischer ex

Reichenb.) Heywood
88. *Tanacetum vulgare* L.
89. *Telekia speciosa* (Schreb.) Baumg.
90. *Tithonia tagetiflora* Desf.
91. *Xanthium strumarium* L.
92. *Xeranthemum cylindraceum* Sibth. & Smith
93. *Zinnia elegans* Jacq.
94. *Zinnia pauciflora* L.

Balsaminaceae
95. *Impatiens parviflora* DC.

Betulaceae
96. *Alnus glutinosa* (L.) Gaertner

Boraginaceae
97. *Anchusa officinalis* L.
* 98. *Echium candicans* L. f.
99. *Echium vulgare* L.
100. *Lithospermum officinale* L.
101. *Nonea lutea* (Desr.) DC.
102. *Solenanthus scardicus* Bornm.

Brassicaceae
103. *Alyssoides sinuata* Medik.
104. *Alyssoides utriculata* (L.) Medicus
105. *Alyssum idaeum* Boiss. & Heldr.
106. *Alyssum montanum* L. subsp. *pluscanescens* (Raim. ex J.Baumg.) Trpin
107. *Alyssum petraeum* Ard.
108. *Arabis caucasica* Schlecht.
109. *Berteroa incana* (L.) DC.
110. *Cheiranthus cheiri* L.
111. *Erysimum comatum* Pančić
112. *Fibigia clypeata* (L.) Medicus
113. *Isatis tinctoria* L.

114. *Lunaria rediviva* L.
115. *Peltaria alliacea* Jacq.
116. *Sisymbrium austriacum* Jacq.

Buxaceae
117. *Buxus sempervirens* L.
118. *Sarcococca saligna* Müll. Arg.

Caesalpiniaceae
119. *Cercis siliquastrum* L.
120. *Gleditsia triacanthos* L.

Calycanthaceae
121. *Sinocalycanthus chinensis* Cheng & S.Y.Chang

Campanulaceae
122. *Campanula justiniana* Witasek
123. *Campanula patula* L.
124. *Campanula poscharskyana* Degen
125. *Campanula rapunculoides* L.
126. *Lobelia siphilitica* L.
127. *Platycodon grandiflorus* A. DC.
128. *Symphyandra hofmannii* Pant.

Cannabaceae
129. *Cannabis sativa* L.
130. *Humulus lupulus* L.

Capparidaceae
131. *Polanisia graveolens* Raf.

Carpinaceae
132. *Carpinus betulus* L.
133. *Carpinus orientalis* Mill.

Caryophyllaceae

134. *Agrostemma githago* L.
135. *Dianthus armeria* L.
136. *Dianthus barbatus* L. 'Hortensis'
137. *Dianthus deltoides* L.
138. *Dianthus diffusus* Sibth. & Sm.
139. *Dianthus giganteiformis* Borbás
140. *Dianthus giganteus* D'uru
141. *Dianthus graniticus* Jord.
142. *Dianthus monspessulanus* L.
143. *Dianthus petraeus* Waldst. & Kit. subsp. *noeanus* (Boiss.) Tutin
144. *Dianthus sternbergii* Sieber
145. *Dianthus superbus* L.
146. *Dianthus tergestinus* (Rchb.) Kerner
147. *Gypsophila scorzonerifolia* Ser.
148. *Lychnis coronaria* (L.) Desr. 2013
149. *Lychnis flos-cuculi* L. 2013
150. *Petrorhagia prolifera* (L.) P. W. Ball & Heyw.
151. *Petrorhagia saxifraga* (L.) Link
152. *Saponaria officinalis* L.
153. *Silene alpestris* Jacq.
154. *Silene nutans* L. subsp. *livida* (Willd.) Jeanmonod & Bocquet
155. *Silene vulgaris* (Moench) Garcke
156. *Silene vulgaris* (Moench) Garcke subsp. *glareosa* (Jordan) Marsden-Jones & Turrill
157. *Viscaria vulgaris* Bernh.

Celastraceae

158. *Celastrus orbiculatus* Thunb.
159. *Euonymus europaeus* L.

Cichoriaceae

160. *Crepis biennis* L.
161. *Crepis pulchra* L.
162. *Hieracium aurantiacum* L.

163. *Hieracium glaucum* All.
164. *Hieracium lanatum* Vill.
165. *Hieracium pilosella* L.
166. *Lapsana communis* L.
167. *Leontodon hispidus* L. subsp. *danubialis* (Jacq.) Simonkai
168. *Tragopogon balcanicus* Velen.
169. *Tragopogon pratensis* L. subsp. *orientalis* (L.) Čelak
170. *Tragopogon pterodes* Pančić

Cistaceae
171. *Helianthemum nummularium* (L.) Mill.

Convallariaceae
172. *Convallaria majalis* L.
173. *Danaë racemosa* (L.) Medicus

Convolvulaceae
174. *Ipomoea purpurea* (L.) Roh.

Cornaceae
175. *Cornus sanguinea* L. subsp. *australis* (C. A. Meyer) Jav.
176. *Davidia involucrata* Baill.

Crassulaceae
177. *Sedum aizoon* L.
178. *Sedum maximum* Suter
179. *Sempervivum montanum* L.

Cucurbitaceae
180. *Bryonia dioica* Jacq.
* 181. *Ecballium elaterium* (L.) Rich.

Cyperaceae
182. *Schoenoplectus lacustris* (L.) Palla

Datiscaceae
183. *Datisca cannabina* L.

Dioscoreaceae
184. *Dioscorea balcanica* Košanin

Dipsacaceae
185. *Cephalaria gigantea* (Ledeb.) Bobrov
186. *Cephalaria leucantha* (L.) Roemer & Schultes
187. *Dipsacus fullonum* L.
188. *Dipsacus laciniatus* L.
189. *Succisa pratensis* Moench

Elaeagnaceae
190. *Elaeagnus multiflora* Thunb.

Ericaceae
191. *Erica terminalis* Salisb.

Euphorbiaceae
192. *Euphorbia lathyris* L.
* 193. *Manihot palmata* Muell.
194. *Ricinus communis* L.

Fabaceae
195. *Astragalus falcatus* Lam.
196. *Desmodium canadense* (L.) DC.
197. *Glycine max* (L.) Merr. 'Lutea'
198. *Glycine max* (L.) Merr. 'Nigra'
199. *Glycyrrhiza glabra* L.
200. *Indigofera gerardiana* R. Grah.
201. *Laburnum alschingeri* (Vis.) K. Koch
202. *Laburnum anagyroides* Medik
203. *Medicago sativa* L.
204. *Melilotus albus* Medik.

Fumariaceae
205. *Corydalis cava* (L.) Schweigg. & Körte
206. *Corydalis solida* (L.) Clairv. subsp. *solida*

Gentianaceae
207. *Centaurium erythraea* Rafn

Geraniaceae
208. *Geranium macrorrhizum* L.
209. *Geranium phaeum* L.
210. *Geranium pratense* L.
211. *Geranium robertianum* L.
212. *Geranium sanguineum* L.
213. *Geranium thunbergii* Lindl. & Paxton

Grossulariaceae
214. *Ribes silvestre* (Lam.) Mertens & Koch.

Hamamelidaceae
215. *Hamamelis virginiana* L.

Hyacinthaceae
* 216. *Bowiea volubilis* Harv. 2013
217. *Muscari comosum* (L.) Miller
218. *Muscari neglectum* Guss. ex Ten.

Hydrophyllaceae
219. *Nemophila maculata* Lindl.

Hypericaceae
220. *Hypericum calycinum* L.
221. *Hypericum kalmianum* L.
222. *Hypericum olympicum* L.
223. *Hypericum tetrapterum* Fries

Iridaceae
224. *Crocus vernus* (L.) Hill subsp. *vernus*
225. *Gladiolus palustris* Gaudin
226. *Iris pseudacorus* L.
227. *Sisyrinchium bermudiana* L.

Juglandaceae
228. *Carya ovata* K. Koch
229. *Pterocarya fraxinifolia* (Lam.) Spach.

Juncaceae
230. *Luzula sylvatica* (Huds.) Gaud.

Lamiaceae
231. *Ballota rupestris* (Biv.) Vis.
232. *Betonica officinalis* L.
233. *Betonica officinalis* L. subsp. *serotina* (Host) Hayek
234. *Horminum pyrenaicum* L.
235. *Lavandula angustifolia* Mill.
236. *Leonurus cardiaca* L.
237. *Lycopus europaeus* L.
238. *Melissa officinalis* L.
239. *Mentha aquatica* L.
240. *Micromeria dalmatica* Benth
241. *Monarda fistulosa* L.
242. *Nepeta pannonica* L.
243. *Origanum vulgare* L.
244. *Physostegia virginiana* L.
245. *Salvia glutinosa* L.
246. *Salvia officinalis* L.
247. *Salvia sclarea* L.
248. *Salvia verticillata* L.
249. *Satureja montana* L.
250. *Satureja montana* L. subsp. *variegata* (Host.) P. W. Ball

251. *Satureja subspicata* Bartl. ex Vis.
252. *Scutellaria altissima* L.
253. *Teucrium arduini* L.
254. *Teucrium chamaedrys* L.
255. *Teucrium hircanicum* L.

Lauraceae
* 256. *Persea indica* XX-GZU-YY-140415 Spreng.

Liliaaceae
257. *Lilium bulbiferum* L. subsp. *croceum* (Chaix) Baker

Liliaceae
258. *Hosta ventricosa* (Salisb.) Stearn
259. *Veratrum album* L.

Linaceae
260. *Linum flavum* L.

Lythraceae
261. *Lythrum salicaria* L.

Malvaceae
262. *Abutilon theophrasti* Medik.
263. *Althaea armeniaca* Ten.
* 264. *Gossypium arboreum* L. 2013
* 265. *Hibiscus esculentus* L. 2013
266. *Hibiscus trionum* L.

Martyniaceae
* 267. *Proboscidea louisianica* (Mill.) Thell.

Meliaceae
* 268. *Melia azedarach* L.

Mimosaceae
* 269. *Leucaena leucocephala* XX-GZU-YY-110257 (Lam.) de Wit
* 270. *Mimosa pudica* L.

Moraceae
271. *Maclura pomifera* (Raf.) Schneid.

Musaceae
* 272. *Musa basjoo* Sieb. & Zucc.

Myrtaceae
* 273. *Kunzea baxteri* (Klotzsch) Schauer
* 274. *Myrtus communis* L.
* 275. *Psidium guajava* XX-GZU-YY-1102261 L.

Nyctaginaceae
276. *Mirabilis jalapa* L.
277. *Oxybaphus floribundus* Choisy

Onagraceae
278. *Circaea lutetiana* L.
279. *Clarkia amoena* Lilja
280. *Epilobium hirsutum* L.
281. *Gaura biennis* L.
282. *Oenothera biennis* L.

Paeoniaceae
283. *Paeonia lutea* Delavay
284. *Paeonia officinalis* L. subsp. *officinalis*
285. *Paeonia romanica* Brandz.
286. *Paeonia veitchii* Lynch var. *beresowskii* (Kom.) Schipcz.
287. *Paeonia wittmanniana* Hartw.

Papaveraceae

288. *Chelidonium majus* L.
289. *Papaver rhoeas* L.

Passifloraceae
* 290. *Passiflora capsularis* L.
* 291. *Passiflora edulis* Sims.
* 292. *Passiflora suberosa* L.

Pedaliaceae
* 293. *Sesamum indicum* L. 2013

Phytolaccaceae
* 294. *Rivina humilis* L.

Pittosporaceae
* 295. *Pittosporum undulatum* JM-GZU-94-130456 Vent.

Plantaginaceae
296. *Plantago media* L.

Plumbaginaceae
297. *Limonium latifolium* (Sm.) O. Kuntze

Poaceae
298. *Achnatherum calamagrostis* (L.) P. Beauv
299. *Andropogon gerardii* Vitman
300. *Festuca bosniaca* Kumm. & Sendt.
301. *Holcus lanatus* L. 2013
302. *Leersia oryzoides* (L.) Swartz
303. *Melica ciliata* L.
304. *Molinia caerulea* (L.) Moench
305. *Phragmites australis* (Cav.) Trin. ex Steud.
306. *Sesleria autumnalis* F. W. Schultz
307. *Sorghum halepense* (L.) Pers.

308. *Triticum spelta* L.

Polemoniaceae
309. *Gilia multicaulis* Benth.
310. *Phlox paniculata* L.

Polygonaceae
311. *Rumex salicifolius* Weinm.

Primulaceae
312. *Hottonia palustris* L.
313. *Lysimachia minoricensis* XX-0-PARMA-MYRS130070 J. J. Rodr.
314. *Primula denticulata* Smith.
315. *Primula veris* L. subsp. *veris*

Ranunculaceae
316. *Aconitum lycoctonum* L. em Koelle subsp. *lycoctonu*m
317. *Aconitum vitosanum* Gáyer
318. *Anemone hupehensis* Lemoine
319. *Anemone ranunculoides* L.
320. *Anemone sylvestris* L.
321. *Caltha palustris* L.
322. *Clematis recta* L.
323. *Consolida regalis* S. F. Gray
324. *Eranthis hyemalis* (L.) Salisb.
325. *Helleborus atrorubens* Waldst. & Kit.
326. *Helleborus multifidus* Vis.
327. *Hepatica nobilis* Mill.
328. *Nigella damascena* L.
329. *Ranunculus arvensis* L.
330. *Ranunculus millefoliatus* Vahl
331. *Semiaquilegia ecalcarata* (Maxim.) Sprague & Hutchinson
332. *Thalictrum aquilegiifolium* L.

Resedaceae

333. *Reseda lutea* L.

Rhamnaceae

334. *Frangula alnus* Mill.

Rosaceae

335. *Agrimonia eupatoria* L.
336. *Agrimonia procera* Wallr.
337. *Aruncus dioicus* (Walter) Fernald
338. *Cotoneaster affinis* Lindl.
339. *Cotoneaster bullatus* Bois.
340. *Cotoneaster niger* (Thunb.) Fries
341. *Crataegus monogyna* Jacq. 2013
342. *Crataegus pedicellata* Sarg.
343. *Duchesnea indica* (Andr.) Focke
344. *Filipendula ulmaria* (L.) Maxim.
345. *Fragaria vesca* L.
346. *Geum coccineum* Sibth. & Sm.
347. *Geum pallidum* Fisch. & Mey.
348. *Physocarpus malvaceus* (Greene) Kuntze
349. *Potentilla nivea* L.
350. *Potentilla recta* L.
351. *Potentilla rupestris* L.
352. *Potentilla thuringiaca* Bernh. ex Link.
353. *Prunus tenella* Batsch
354. *Rhodotypos scandens* (Thunb.) Mak.
355. *Rosa glauca* Pourr.
356. *Rosa multiflora* Thunb.
357. *Rosa pendulina* L.
358. *Rosa rugosa* Thunb.
359. *Rosa sempervirens* L.
360. *Sanguisorba officinalis* L.
361. *Stephanandra tanakae* Franch. & Sav.

Rubiaceae
362. *Galium verum* L.
* 363. *Psychotria bacteriophila* Valeton

Rutaceae
364. *Phellodendron amurense* Rupr.
365. *Poncirus trifoliata* (L.) Raf.
366. *Ruta graveolens* L.
367. *Zanthoxylum simulans* Hance

Sambucaceae
368. *Sambucus nigra* L.
369. *Viburnum lantana* L.

Sapindaceae
* 370. *Dodonaea viscosa* Jacq.

Saxifragaceae
371. *Heuchera americana* L.
372. *Saxifraga cuneifolia* L.
373. *Saxifraga peltata* Torr.
374. *Saxifraga rotundifolia* L.

Scrophulariaceae
375. *Antirrhinum majus* L.
376. *Digitalis ferruginea* L.
377. *Digitalis grandiflora* Miller
378. *Digitalis laevigata* Waldst. & Kit.
379. *Erinus alpinus* L.
380. *Kickxia elatine* (L.) Dumort.
381. *Linaria vulgaris* Miller
382. *Misopates orontium* (L.) Rafin.
383. *Penstemon alpinus* Torr.

384. *Penstemon speciosus* Douglas in Lindl
385. *Pseudolysimachion barrelieri* (Schott ex Roem. & Schult.) Holub subsp. *barrelieri*
386. *Verbascum austriacum* Schott ex Roem. & Schult.
387. *Verbascum nigrum* L.
388. *Veronica sibirica* L.

Solanaceae
389. *Datura metel* L.
390. *Datura metel* L. f. *inermis*
391. *Lycium chinense* Mill.
392. *Nicandra physalodes* (L.) Gaertner
393. *Nicotiana viscosa* Lehm.
394. *Physalis alkekengi* L.
395. *Physalis ixocarpa* Brot.
396. *Scopolia carniolica* Jacq.
397. *Solanum nigrum* L.
398. *Solanum sisymbriifolium* Lam.

Staphyleaceae
399. *Staphylea pinnata* L.

Taccaceae
* 400. *Tacca chantrieri* André

Thymelaeaceae
* 401. *Phaleria octandra* (L.) Baill

Tiliaceae
402. *Tilia platyphyllos* Scop.

Tropaeolaceae
403. *Tropaeolum majus* L.

Ulmaceae
404. *Zelkova carpinifolia* (Pall.) K. Koch
405. *Zelkova serrata* (Thunb.) Mak.

Urticaceae
406. *Parietaria officinalis* L.

Verbenaceae
407. *Callicarpa bodinieri* Levl. var. *giraldii* Rehd.
408. *Callicarpa japonica* Thunb.
* 409. *Lantana camara* L.
410. *Vitex agnus-castus* L.

Zingiberaceae
* 411. *Alpinia speciosa* K. Schum.

* Semina plantarum in caladariis cultarum.

Horti praefectus*:* dr. Jože Bavcon
Seminum Curator, hortulana*:* Janja Makše

Semina e plantis spontaneis in loco natali annis 2014 et 2013 lecta

*Jože Bavcon, Igor Dakskobler, Ljudmila Dakskobler, Branko Dolinar, Janja Makše, Blanka Ravnja*k

412. *Achillea distans* Waldst. & Kitt ex Wild. - Sveta gora, Frančiškov hrib, 2014, L. & I. D.
413. *Achillea distans* Waldst. & Kitt ex Wild. - Sveta Gora (Skalnica), 2013, L. & I. D.
414. *Aconitum anthora* L. - Sveta gora, Frančiškov hrib, 2014, L. & I. D.
415. *Adenostyles glabra* (Miller) DC. - Porezen, 2013, J. B., B. R.
416. *Agrimonia eupatoria* L. - Žadovinek, 2013, J. B.
417. *Allium angulosum* L. - Butnica ob Lijaku, 2014, L. & I. D.
418. *Allium angulosum* L. - Primorska; Ankaran, zaliv sv. Nikolaj, 2014, B. V.
419. *Allium carinatum* L. subsp. *pulchellum* - Rakitovec, 2014, J. B.
420. *Allium ericetorum* Thore - Nanos, 2014, J. B., B. R.
421. *Allium ochroleucum* Waldst. & Kitt. - pod Muzcem nad Breginjem, 2014, L. & I. D.
422. *Allium senescens* L. - Štefan, 2014, J. B.
423. *Allium senescens* L. - Kokoš, 2014, L. & I. D.
424. *Allium senescens* L. - Komen, 2014, J. B.
425. *Allium senescens* L. - Osp, 2014, J. B.
426. *Allium senescens* L. - Podgorje, 2014, J. B.
427. *Allium senescens* L. - Rakitovec - Kavčiče, 2014, J. B., B. R.
428. *Allium senescens* L. - Sočerga, 2014, J. B.
429. *Allium senescens* L. - Zaningrad, 2014, J. B.
430. *Allium sphaerocephalon* L. - Komen, 2014, J. B., B. R.
431. *Anacamptis pyramidalis* (L.) L. C. Rich - Podgozd nad Igom, 2014, B. D.
432. *Anemone hortensis* L. - Dragonja, 2013, J. B.
433. *Anemone nemorosa* L. - Planina nad Vrhniko, 650 m, 2013, J. M.
434. *Angelica sylvestris* L. - Kolovrat (nad Dreko, Italija), 2013, L. & I. D.

435. *Antennaria carpatica* (Wahlenb.) Bluff & Fingerh. - Bala, Mali Bedinji vrh, 2014, L. & I. D.
436. *Anthericum ramosum* L. - Kavčiče, 2014, J. B., B. R.
437. *Anthericum ramosum* L. - pod Muzcem nad Breginjem, 2014, L. & I. D.
438. *Anthyllis jacquinii* Kern. - Kucelj - Čaven, 2014, J. B., B. R, S. B.
439. *Anthyllis jacquinii* Kern. - Kucelj, 2013, J. B., B. R.
440. *Arabis sagittata* (Bertol.) DC. - Dragonja, 2014, J. B.
441. *Arabis sagittata* (Bertol.) DC. - Komen, 2014, J. B., B. R.
442. *Arabis sagittata* (Bertol.) DC. - Slavnik, 2014, J. B.
443. *Arabis turrita* L. - Gozd, 2014, J. B.
444. *Arabis turrita* L. - Sveta gora, Frančiškov hrib, 2014, L. & I. D.
445. *Artemisia alba* Turra - Osp, 2014, J. B.
446. *Artemisia vulgaris* L. - Kal, Hrastnik, 2014, J. B., B. R.
447. *Asphodelus albus* Mill. - Lipnik - Kavčiče, 2014, J. B.
448. *Asphodelus albus* Mill. - Vrhe, Veliko Polje, 2014, L. & I. D.
449. *Aster amellus* L. - Nanos, 2014, J. B., B. R.
450. *Aster amellus* L. - pod Muzcem nad Breginjem, 2014, L. & I. D.
451. *Aster amellus* L. - Sočerga, 2014, J. B.
452. *Aster amellus* L. - Sočerga, 2013, J. B., B. R.
453. *Aster linosyris* (L.) Bernh. - Dragonja, 2014, J. B.
454. *Astrantia major* L. - Šentvid, 2014, B. R.
455. *Atropa bella-donna* L. - Žirovše, 2014, J. M.
456. *Atropa bella-donna* L. - Predmeja, 2014, J. B., B. R.
457. *Barbarea vulgaris* R. Br. - Plave, 2013, J. B.
458. *Betonica officinalis* L. - Komen, 2014, J. B., B. R.
459. *Betonica officinalis* L. subsp. *serotina* - Sočerga, 2014, J. B.
460. *Biscutella laevigata* L. - Šentvid, 2013, J. B.
461. *Bromus hordeaceus* L. em. Hyl. - Brege, 2013, J. B.
462. *Buphthalmum salicifolium* L. - Blegoš, 2013, S. F.
463. *Bupleurum petraeum* L. - Porezen, 2013, J. B., B. R.
464. *Campanula pyramidalis* L. - Kavčiče, 2014, J. B., B. R.
465. *Campanula pyramidalis* L. - Zaningrad, 2014, J. B.
466. *Campanula thyrsoides* L. - pod Muzcem nad Breginjem, 2014, L. & I. D.
467. *Carex flacca* Schreb. - Žadovinek, 2013, J. B.
468. *Carlina vulgaris* L. - Kal, Hrastnik, 2014, J. B., B. R.

469. *Carpesium cernuum* L. - pod Mrzlim vrhom nad Volarjami, 2013, L. & I. D.
470. *Centaurea haynaldii* Borbás ex Vuk. subsp. *julica* - pod Muzcem nad Breginjem, 2014, L. & I. D.
471. *Centaurium erythraea* Rafn. - Trebnje, 2014, J. M.
472. *Cephalanthera damasonium* (Mill.) Druce - Podgozd nad Igom, 2014, B. D.
473. *Cephalanthera longifolia* (L.) Fritsch. - Podgozd nad Igom, 2014, B. D.
474. *Chaerophyllum aureum* L. - Logarska dolina, 2014, J. B., B. R.
475. *Chamaespartium sagittal*e (L.) Gibbs - Čaven, 2014, J. B., B. R., S. B.
476. *Chamerion dodonaei* (Vill.) Holub - Spodnja Trenta, 2014, L. & I. D.
477. *Chrysopogon gryllus* (L.) Trin. - Močile (Anhovo), 2013, J. B.
478. *Cirsium pannonicum* (L.f.) Link - Rakitovec - Kavčiče, 2014, J. B.
479. *Cirsium pannonicum* (L.f.) Link - Roje, 2014, J. B.
480. *Cirsium spinosissimum* Scop. - Bala, Veliki Razor, 2014, L. & I. D.
481. *Clematis alpina* (L.) Mill. - Huda luknja, 2013, J. B., B. R.
482. *Clematis vitalba* L. - Sočerga, 2014, J. B.
483. *Clematis vitalba* L. - Zazid, 2014, J. B.
484. *Colchicum autumnale* L. - Šentvid, 2014, J. B.
485. *Conium maculatum* L. - Planina Ohoje nad Breginjem, 2014, L. & I. D.
486. *Cornus mas* L. - Dolenja Trebuša, 2014, L. & I. D.
487. *Cornus sanguinea* L. - Podsreda, 2013, J. B.
488. *Coronilla emerus* L. subsp. *emeroides* Boiss. & Spruner - Osp, 2014, J. B.
489. *Coronilla emerus* L. subsp. *emeroides* Boiss. & Spruner - Vipava, 2014, J. B.
490. *Coronilla emerus* L. subsp. *emeroides* - Zaningrad, 2014, J. B.
491. *Cotinus coggygria* Scop. - Pliskovica, 2014, J. B., B. R.
492. *Cotinus coggygria* Scop. - Podpeč, 2014, J. B.
493. *Cotinus coggygria* Scop. - Sočerga, 2014, J. B.
494. *Crataegus monogyna* Jacq. - Podgorje, 2013, J. B., B. R.
495. *Crepis bocconi* P.D. Sell - Blehe pri Šoštarju, 2014, L. & I. D.
496. *Crepis pyrenaica* (L.) W. Greuter - dolina Bale, pod Prevalo, 2014, L. & I. D.
497. *Crithmum maritimum* L. - IT. - Nabrežina pri Trstu, 2014, L. & I. D.
498. *Crithmum maritimum* L. - Izola, 2014, J. B.
499. *Crocus vernus* (L.) Hill - Porezen, 2014, J. B., B. R.

500. *Dactylorhiza incarnata* (L.) Soó - Ljubljansko barje, 2014, B. D.
501. *Daphne mezereum* L. - Logarska dolina, 2014, J. M.
502. *Daucus carota* L. - Kal, Hrastnik, 2014, J. B., B. R.
503. *Daucus carota* L. - Pliskovica, 2014, J. B., B. R.
504. *Daucus carota* L. - Sočerga, 2014, J. B.
505. *Daucus carota* L. - Koper, 2013, J. B., B. R.
506. *Dianthus barbatus* L. - Podsreda, 2013, J. B.
507. *Dianthus carthusianorum* L. - Kal, Hrastnik, 2014, J. B., B. R.
508. *Dianthus tergestinus* (Rchb.) Kerner - Kavčiče, 2014, J. B., B. R.
509. *Dictamnus albus* L. - Slavnik, 2014, J. B.
510. *Dorycnium germanicum* (Gremli) Rouy. - Dragonja, 2014, J. B.
511. *Dryas octopetala* L. - Apica nad Planino Zapotok, 2014, L. & I. D.
512. *Dryas octopetala* L. - Svete Višarje, 2013, J. M.
513. *Drypis spinosa* L. subsp. *jacquiniana* Murb. et Wettst. - Čaven, 2014, E. V., A. V.
514. *Epipactis helleborine* (L.) Crantz subsp. *orbicularis* (K.Richt.) E. Klein - Sv. Lovrenc nad Gornjim gradom, 2014, B. D.
515. *Epipactis muelleri* Godfery - Podgozd nad Igom, 2014, B. D.
516. *Eryngium amethystinum* L. - Podpeč , 2014, J. B.
517. *Euonymus europaea* L. - Dragonja, 2014, J. B.
518. *Euonymus verrucosa* Scop. - Tomišelj, 2014, J. B., B. R.
519. *Eupatorium cannabinum* L. - Kal, Hrastnik, 2014, J. B., B. R.
520. *Eupatorium cannabinum* L. - Pliskovica, 2014, J. B., B. R.
521. *Eupatorium cannabinum* L. - Cerkno-Sušje, 2013, J. B.
522. *Ferulago campestris* (Besser) Grecescu - Komen, 2014, J. B., B. R.
523. *Ferulago campestris* (Besser) Grecescu - Rakitovec, 2013, J. B., B. R.
524. *Filipendula vulgaris* Moench. - Šentvid, 2014, B. R.
525. *Filipendula vulgaris* Moench. - Slavnik, 2013, J. B., B. R.
526. *Galium verum* L. - Žadovinek, 2013, J. B.
527. *Genista radiata* (L.) Scop. - Porezen, 2013, J. B., B. R.
528. *Genista sericea* Wulf. - Slavnik, 2014, J. B.
529. *Genista tinctoria* L. - Bela krajina; Velika Loza, 2014, D. C.
530. *Gentiana asclepiadea* L. - Ljubelj, 2014, J. M.
531. *Geum reptans* L. - Mangart, 2013, L. & I. D.
532. *Geum rivale* L. - Bala, Veliki Razor, 2014, L. & I. D.

533. *Gladiolus illyricus* Koch - Šentvid, 2014, J. B., B. R.
534. *Globularia cordifolia* L. - pod Muzcem nad Breginjem, 2014, L. & I. D.
535. *Globularia cordifolia* L. - Kucelj, 2013, J. B., B. R.
536. *Globularia nudicaulis* L. - Velika planina nad Planino Zapotok, 2014, L. & I. D.
537. *Globularia punctata* Hegetschw. - Žadovinek, 2014, J. B.
538. *Grafia golaka* (Hacq.) Rchb. - Kamniške Alpe; Kamniški vrh, 2013, B. V., T. Č.
539. *Gymnadenia conopsea* (L.) R. Br. - Dobravica nad Igom, 2014, B. D.
540. *Gymnadenia conopsea* (L.) R. Br. - pod Muzcem nad Breginjem, 2014, L. & I. D.
541. *Gymnadenia odoratissima* (L.) Rich. - Podgozd nad Igom, 2014, B. D.
542. *Hedera helix* L. - Dragonja, 2013, J. B.
543. *Heliosperma alpestre* Rchb. - Porezen, 2013, J. B., B. R., D. K., R. P.
544. *Helleborus niger* L. - Rodne, 2014, J. B., B. R.
545. *Heracleum sphondylium* L. - Kal, Hrastnik, 2014, J. B., B. R.
546. *Hieracium porrifolium* L. - dolina Bale, 2014, L. & I. D.
547. *Himantoglossum adriaticum* Koch - Klanec pri Kozini, 2014, B. D.
548. *Hippocrepis maculata* - Roje, 2014, J. B., B. R.
549. *Homogyne sylvestris* Cass. - Porezen, 2014, J. B., B. R., S. F.
550. *Hypericum perforatum* L. - Štefan - Dragonja, 2014, J. B.
551. *Hypericum perforatum* L. - Boštanj, 2014, J. B.
552. *Hypericum perforatum* L. - Sočerga, 2014, J. B.
553. *Hypericum perforatum* L. - Rakitovec, 2013, J. B.
554. *Hyssopus officinalis* L. - Podpeč, 2014, J. B.
555. *Ilex aquifolium* L. - Vojsko, Mrzla Rupa, 2013, L. & I. D.
556. *Inula conyza* L. - Dragonja, 2014, J. B.
557. *Inula conyza* L. - Zazid, 2014, J. B.
558. *Inula ensifolia* L. - Kavčiče, 2014, J. B., B. R.
559. *Inula hirta* L. - pod Muzcem nad Breginjem, 2014, L. & I. D.
560. *Inula salicina* L. - Vrhe, Veliko Polje, 2014, L. & I. D.
561. *Inula spiraeifolia* L. - Komen, 2014, J. B., B. R.
562. *Inula spiraeifolia* L. - Pliskovica, 2014, J. B., B. R.
563. *Inula spiraeifolia* L. - Rakitovec, 2014, J. B., B. R.
564. *Inula spiraeifolia* L. - Sočerga, 2014, J. B.

565. *Iris graminea* L. - pod Muzcem nad Breginjem, 2014, L. & I. D.
566. *Iris graminea* L. - Slavnik, 2013, J. B., B. R.
567. *Iris pallida* Lam. subsp. *illyrica* (Tommasini) T. Wraber - Kavčiče, 2014, J. B., B. R.
568. *Iris pallida* Lam. subsp. *illyrica* (Tommasini) T. Wraber - Slavnik, 2014, J. B.
569. *Iris pallida* Lam. subsp. *illyrica* - Osp, 2014, J. B.
570. *Iris pseudacorus* L. - Želodnik, 2013, B. V.
571. *Iris sibirica* L. - Butnica ob Lijaku, 2014, L. & I. D.
572. *Iris sibirica* L. - Rateče, 2013, B. V., T. Č.
573. *Iris sibirica* L. subsp. *erirrhiza* - Kavčiče, 2014, J. B., B. R.
574. *Jurinea mollis* (L.) Reichenb. - Rakitovec - Kavčiče, 2014, J. B.
575. *Laserpitium latifolium* L. - Kucelj-Čaven, 2013, J. B., B. R., S. B.
576. *Laserpitium peucedanoides* L. - Velika planina nad Planino Zapotok, 2014, L. & I. D.
577. *Laserpitium siler* L. - Slavnik, 2014, J. B.
578. *Leontopodium alpinum* Cass. - Muzec nad Breginjem, 2014, L. & I. D.
579. *Leucanthemum heterophyllum* (Willd.) DC. - Bala, Veliki Razor, 2014, L. & I. D.
580. *Leucojum aestivum* L. - Cerknica, 2014, J. B.
581. *Leucojum vernum* L. - Bohor, 2013, J. B.
582. *Ligusticum seguieri* (Jacq.) Koch - Čaven, 2014, J. B., B. R., S. B.
583. *Ligustrum vulgare* L. - Sočerga, 2014, J. B.
584. *Ligustrum vulgare* L. - Lj. - Šentvid, 2013, J. B., B. R.
585. *Lilium martagon* L. - Porezen, 2013, J. B., B. R.
586. *Limonium angustifolium* (Tausch) Degen - Koper, 2013, J. B., B. R.
587. *Linaria vulgaris* Miller - Sv. Socerb, 2014, L. & I. D.
588. *Lonicera alpigena* L. - Čaven, 2014, J. B., B. R., S. B.
589. *Lonicera alpigena* L. - Boč, 2014, J. B., B. R.
590. *Lonicera alpigena* L. - Logarska dolina, 2014, J. B., B. R.
591. *Lonicera xylosteum* L. - Logarska dolina, 2014, J. B., B. R.
592. *Luzula nivea* (L.) DC. - Planina Zapotok nad Zapodom v Trenti, 2014, L. & I. D.
593. *Lycopus europaeus* L. - Bela krajina; Velika Loza, 2014, D. C.
594. *Lysimachia punctata* L. - Sv. Socerb, 2014, L. & I. D.

595. *Malva alcea* L. - Tolminska korita, 2014, L. & I. D.
596. *Marrubium incanum* Desr. - Sočerga, 2014, J. B.
597. *Melica ciliata* L. - Osp, 2014, J. B.
598. *Melica ciliata* L. - Sočerga, 2014, J. B.
599. *Melica ciliata* L. - Rakitovec, 2013, J. B.
600. *Micromeria thymifolia* (Scop.) Fritsch - Spodnja Trenta, 2014, L. & I. D.
601. *Muscari botryoides* (L.) Mill. - Žadovinek, 2014, J. B.
602. *Muscari comosum* (L.) Miller - Podgorje, 2013, J. B.
603. *Myrrhis odorata* (L.) Scop. - Porezen, 2013, J. B., B. R., D. K., R. P.
604. *Nigella damascena* L. - Dragonja, 2013, J. B.
605. *Onosma echioides* L. - Sočerga, 2014, J. B.
606. *Ophrys apifer*a Huds. - Ravno Brdo, 2014, B. D.
607. *Ophrys holoserica* (Burm.f.) Greuter - Roje pod Klečami, 2014, B. D.
608. *Ophrys sphegodes* agg. - Dolga Poljana nad Ajdovščino, 2014, B. D.
609. *Ophrys sulcata* Devillers-Tersch. & Devillers - Podpeč, 2014, B. D.
610. *Orchis laxiflora* Lam. - dolina reke Rokave, 2014, B. D.
611. *Orchis morio* L. - Vipavska Brda, 2014, B. D.
612. *Origanum vulgare* L. - pod Nizkim vrhom v Stolovem grebenu nad Breginjem, 2014, L. & I. D.
613. *Orlaya daucoides* (L.) Greuter - Dragonja, 2013, J. B.
614. *Orlaya grandiflora* (L.) Hoffm. - Podpeč, 2014, J. B.
615. *Orlaya grandiflora* (L.) Hoffm. - Dragonja, 2013, J. B.
616. *Orobanche lycoctoni* Rhiner - Bala, Lanževica, 2014, L. & I. D.
617. *Ostrya carpinifolia* Scop. - pod Nizkim vrhom v Stolovem grebenu nad Breginjem, 2014, L. & I. D.
618. *Osyris alba* L. - Osp, 2014, J. B.
619. *Paederota lutea* Scop. - Hudo polje nad Vojskim, 2014, L. & I. D.
620. *Paeonia officinalis* L. - Kavčiče, 2014, J. B., B. R.
621. *Paliurus spina-christi* Mill. - Osp, 2014, J. B.
622. *Paliurus spina-christi* Mill. - Dragonja (Stena), 2013, J. B.
623. *Papaver rhoeas* L. - Veniše, 2013, J. B.
624. *Paris quadrifolia* L. - Logarska dolina, 2014, J. B., B. R.
625. *Peucedanum oreoselinum* (L.) Moench - Kal, Hrastnik, 2014, J. B., B. R.
626. *Peucedanum oreoselinum* (L.) Moench - Žadovinek, 2013, J. B.
627. *Peucedanum ostruthium* (L.) Koch - pod Skutnikom nad Planino Zapotok,

2014, L. & I. D.
628. *Peucedanum schottii* Besser ex DC. - Bala, Logje, 2014, L. & I. D.
629. *Phyteuma scheuchzeri* All. subsp. *columna*e - Sveta gora, 2014, L. & I. D.
630. *Pistacia terebinthus* L. - Hrastovlje, 2013, J. B., B. R.
631. *Plantago cornuti* Gouan. - Primorska; Ankaran, zaliv sv. Nikolaj, 2014, B. V.
632. *Polygonatum verticillatum* All. - Snežnik, 2013, J. B., B. R.
633. *Potentilla caulescens* Torn. - pod Strmo pečjo (Monte Cimone) nad dolino Reklanice, 2014, L. & I. D.
634. *Primula carniolica* Jacq. - Rodne, 2014, J. B.
635. *Primula veris* L. - Kucelj - Čaven, 2014, J. B., B. R., S. B.
636. *Prunella grandiflora* (L.) Scholler - Bala, Mali Bedinji vrh, 2014, L. & I. D.
637. *Prunus mahaleb* L. - Podlipnik, 2013, J. B.
638. *Prunus spinosa* L. - Lj. - Šentvid, 2013, J. B., B. R.
639. *Pulsatilla alpina* (L.) Delarbre subsp. *austroalpin*a D. M. Moser - Črna prst, 2014, L. & I. D.
640. *Pulsatilla grandis* Wenderoth - Ponikva, 2014, B. R.
641. *Pulsatilla montana* (Hoppe) Rchb. - Lipnik - Kavčiče, 2014, J. B.
642. *Pulsatilla montana* (Hoppe) Rchb. - Podgorje, 2013, J. B.
643. *Pulsatilla nigricans* Ströck. - Žadovinek, 2014, J. B.
644. *Pulsatilla nigricans* Ströck. - Brege, 2014, J. B.
645. *Pulsatilla vernalis* (L.) Miller - za Grivo pri Planini Ovčarija, 2014, I. D., B. Z.
646. *Rhinanthus angustifolius* C.C. Gmelin - Podgorje, 2013, J. B.
647. *Rhododendron hirsutum* L. - Porezen, 2013, J. B., B. R.
648. *Rhododendron luteum* Sweet - Boštanj, 2014, J. B.
649. *Rhodothamnus chamaecistus* (L.) Reichenb. - Logarska dolina, 2014, J. B., B. R.
650. *Ribes alpinum* L. - Snežnik, 2013, J. B., B. R.
651. *Rosa canina* L. - Tolminski Triglav, Poloje, 2013, L. & I. D.
652. *Rosa pendulina* L. - greben Muzec - Nizki vrh nad Breginjem, 2014, L. & I. D.
653. *Rosa pendulina* L. - Velika planina nad Planino Zapotok, 2014, L. & I. D.
654. *Rosa pimpinellifolia* L. - Slavnik, 2013, J. B., B. R.
655. *Rosa villosa* L. - Italija; Kolovrat (nad Dreko), 2013, L. & I. D.

656. *Rubus saxatilis* L. - Logarska dolina, 2014, J. B., B. R.
657. *Ruscus aculeatus* L. - Dragonja, 2014, J. B.
658. *Ruscus aculeatus* L. - Socerb, 2014, J. M.
659. *Ruta divaricata* Ten. - Kavčiče, 2014, J. B., B. R.
660. *Ruta divaricata* Ten. - Kokoš, 2014, L. & I. D.
661. *Ruta divaricata* Ten. - Podpeč, 2014, J. B.
662. *Ruta divaricata* Ten. - Sočerga, 2014, J. B.
663. *Ruta divaricata* Ten. - Hrastovlje, 2013, J. B.
664. *Salvia glutinosa* L. - Kal, Hrastnik, 2014, J. B., B. R.
665. *Salvia glutinosa* L. - Koreno, 2013, J. M.
666. *Salvia officinalis* L. - Podgorje, 2013, J. B., B. R.
667. *Salvia pratensis* L. - Močile (Anhovo), 2013, J. B.
668. *Sambucus racemosa* L. - Uršlja gora, 2013, J. B., B. R.
669. *Satureja montana* L. - Komen, 2014, J. B., B. R.
670. *Satureja montana* L. - Osp, 2014, J. B.
671. *Satureja montana* L. - Zaningrad, 2014, J. B.
672. *Satureja subspicata* Bartl. ex Vis. - Kavčiče, 2014, J. B., B. R.
673. *Satureja subspicata* Bartl. ex Vis. - Nanos, 2014, J. B., B. R.
674. *Saxifraga crustata* Vest - Bala, Veliki Razor, 2014, L. & I. D.
675. *Scilla litardierei* Breistr. - Planinsko polje, 2014, J. B.
676. *Scorzonera austriac*i Wild. - Podgorje, 2014, J. B.
677. *Scorzonera austriac*i Wild. - Rakitovec, 2014, J. B.
678. *Scorzonera rosea* Waldst. & Kit. - Črna prst, 2014, L. & I. D.
679. *Scrophularia canina* L. - Sočerga, 2014, J. B.
680. *Sedum maximum* Suter - Dragonja, 2014, J. B.
681. *Senecio abrotanifolius* L. - Planina Zapotok nad Zapodom v Trenti, 2014, L. & I. D.
682. *Senecio doronicum* L. - Slavnik, 2014, J. B.
683. *Senecio ovatus* (Gaertn., Mey. & Scherb.) Willd. - Veliki Golak, 2014, L. & I. D.
684. *Serapias vomeracea* (Burm.f.) Briq. - Mlake pri Vipavi, 2014, B. D.
685. *Serratula lycopifolia* (Vill.) A.Kern. - Rakitovec - Kavčiče, 2014, J. B., B. R.
686. *Serratula lycopifolia* (Vill.) A.Kern. - Slavnik, 2013, J. B.
687. *Serratula radiata* M. Bieb. - Rakitovec - Kavčiče, 2014, J. B., B. R.

688. *Serratula tinctoria* L. - Boštanj, 2014, J. B.
689. *Serratula tinctoria* L. subsp. *macrocephala* - Muzec nad Breginjem, 2014, L. & I. D.
690. *Sesleria autumnalis* F. W. Schultz - Kobilnik nad Zadlaz-Čadrgom, 2014, L. & I. D.
691. *Smilax aspera* L. - Nabrežina pri Trstu, 2014, L. & I. D.
692. *Smyrnium perfoliatum* L. - Rakitovec, 2014, J. B.
693. *Solanum dulcamara* L. - Radomlje, 2014, B. V.
694. *Solanum nigrum* L. - Dragonja, 2014, J. B.
695. *Solidago virgaurea* L. - Boštanj, 2014, J. B.
696. *Solidago virgaurea* L. - Kal, Hrastnik, 2014, J. B., B. R.
697. *Sorbus aria* (L.) Crantz. - pod Nizkim vrhom v Stolovem grebenu nad Breginjem, 2014, L. & I. D.
698. *Sorbus aria* (L.) Crantz. - Rakitovec, 2013, J. B., B. R.
699. *Sorbus aucuparia* L. - Porezen, 2013, J. B., B. R.
700. *Sorbus chamaemespilus* (L.) Crantz - Logarska dolina, 2014, J. B., B. R.
701. *Sorbus chamaemespilus* (L.) Crantz - Velika planina nad Planino Zapotok, 2014, L. & I. D.
702. *Spartium junceum* L. - Sočerga, 2014, J. B.
703. *Spiraea decumbens* Koch. - pod Strmo pečjo (Monte Cimone) nad dolino Reklanice, 2014, L. & I. D.
704. *Spiranthes spiralis* (L.) Chevall. - Dolenjska; Žadovinek, 2014, B. V.
705. *Stachys recta* L. - Podgorje, 2014, J. B.
706. *Staphylea pinnata* L. - Dobruška vas, 2014, J. B.
707. *Staphylea pinnata* L. - vznožje Matajurja pri Robiču, 2014, L. & I. D.
708. *Staphylea pinnata* L. - Podsreda, 2013, J. B., B. R.
709. *Stemmacantha rhapontica* (L.) Dittrich - Kamniško-Savinjske Alpe, 2014, D. C.
710. *Stemmacantha rhapontica* (L.) Dittrich - pod grebenom Muzec - Nizki vrh nad Breginjem, 2014, L. & I. D.
711. *Stipa eriocaulis* Borb. subsp. *austriaca* (Beck) Martinovsky - Podgorje, 2014, J. B.
712. *Succisella inflexa* (Kluk) G.Beck - Butnica ob Lijaku, 2014, L. & I. D.
713. *Tamus communis* L. - Kal nad Hrastnikom, 2014, J. B.
714. *Tamus communis* L. - Dragonja, 2013, J. B.

715. *Tanacetum corymbosum* (L.) Schultz Bip. - Rakitovec, 2013, J. B., B. R.
716. *Telekia speciosa* (Schreb.) Baumg. - Snežnik, 2013, J. B., B. R.
717. *Teucrium chamaedrys* L. - Podgorje, 2014, J. B.
718. *Teucrium montanum* L. - Kuk, Banjšice, 2014, L. & I. D.
719. *Thalictrum aquilegiifolium* L. - Kavčiče, 2014, J. B., B. R.
720. *Thalictrum lucidum* L. - Butnica ob Lijaku, 2014, L. & I. D.
721. *Thalictrum minus* L. - Sočerga, 2014, J. B.
722. *Tilia cordata* Mill. - Kobilnik nad Zadlaz-Čadrgom, 2014, L. & I. D.
723. *Tilia platyphyllos* Scop. - Lokev, 2014, L. & I. D.
724. *Trifolium angustifolium* L. - Dragonja, 2013, J. B.
725. *Trifolium badium* Schreb. - Bala, Veliki Razor, 2014, L. & I. D.
726. *Trifolium montanum* L. - Roje, 2014, J. B., B. R.
727. *Trifolium noricum* Wulfen. - Črna prst, 2014, L. & I. D.
728. *Trollius europaeus* L. - Logarska dolina, 2014, J. M.
729. *Verbascum blattaria* L. - Vogrsko, 2014, L. & I. D.
730. *Veronica barrelieri* Schott ex Roem. & Schult. - Štefan, 2014, J. B.
731. *Veronica barrelieri* Schott ex Roem. & Schult. - Kavčiče, 2014, J. B., B. R.
732. *Veronica barrelieri* Schott ex Roem. & Schult. - Komen, 2014, J. B., B. R.
733. *Veronica barrelieri* Schott ex Roem. & Schult. - Nanos, 2014, J. B., B. R.
734. *Veronica barrelieri* Schott ex Roem. & Schult. - Pliskovica, 2014, J. B., B. R.
735. *Veronica barrelieri* Schott ex Roem. & Schult. - Stena - Dragonja, 2014, J. B.
736. *Veronica barrelieri* Schott ex Roem. & Schult. - Sveta gora, Frančiškov hrib, 2014, L. & I. D.
737. *Viburnum tinus* L. - Strunjan, Mesečev zaliv, 2013, J. B.
738. *Vincetoxicum hirundinaria* Medik. - Sveta gora, Frančiškov hrib, 2014, L. & I. D.

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dr. Igor Dakskobler (I. D.)
Ljudmila Dakskobler (L. D.)
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Janja Makše (J. M.)

mag. Blanka Ravnjak (B. R.)
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Sara Bavcon (S. B.)
Drago Cenčič (D. C.)
dr. Tatjana Čelik (T. Č.)
Stanka Fišer (S. F.)
Dawid Kasprzak (D. K.)
Róża Pasterska (R. P.)
Elvica Velikonja (E. V.)
Anka Vončina (A. V.)
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Branko Zupan (B. Z.)

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ALPSKI BOTANIČNI VRT JULIANA

Špela Novak

Alpski botanični vrt Juliana leži v dolini Trente (severozahodna Slovenija), nad cesto Kranjska Gora - Bovec, v bližini zaselka Pri Cerkvi. Nahaja se na nadmorski višini približno 800 m n. m. in pokriva 2.572 m^2. Vrt je leta 1926 ustanovil tržaški posestnik Albert Bois de Chasne. Pri tem mu je z nasveti pomagal tudi znameniti Julius Kugy. Juliana je zavarovana od leta 1951, danes velja za botanično naravno vrednoto državnega pomena, kot naravni spomenik pa je tudi del ožjega zavarovanega območja Triglavskega narodnega parka. Vrt je zanimiv predvsem zaradi pestre mešanice alpskih in kraških rastlin, ki jo omogočata nizka nadmorska višina in vpliv toplega sredozemskega podnebja, ki prihaja z juga. V Juliani uspeva okoli 600 vrst rastlin, med njimi so številne redke in endemične vrste, ki so edinstvene za Slovenijo in njeno okolico, npr. rebrinčevolistna hladnikija (*Hladnikia pastinacifolia)*, Hladnikov volčič (*Scopolia carniolica* f. *hladnikiana)*, kranjski jeglič (*Primula carniolica*), idrijski jeglič (*Primula x venusta*)... Vrt je odprt vsak dan od 1. maja do 30 septembra. Vabljeni!

»Juliana« Alpine Botanical Garden

Špela Novak

The Juliana Alpine Botanical Garden is situated in the Trenta Valley (NW Slovenia), above the Kranjska Gora - Bovec road near the hamlet of Pri Cerkvi. It is located at an altitude of about 800 m a.s.l. and it covers 2,572 m^2. Juliana was founded in 1926 by the Trieste proprietor and merchant Albert Bois de Chasne, who's adviser was Julius Kugy. In 1951 the garden was protected as a natural feature and today it is also included (as a nature monument) among the central protected areas in Triglav National Park. The relatively low altitude and the warm impact of the sea, that comes from the south, enable good growth of

karst and pre-alpine species. Therefore the garden is interesting because of its mixture of alpine and karst species. Among them you can find several endemic species, that are unique for Slovenia and its surroundings (for example *Hladnikia pastinacifolia*, *Scopolia carniolica* f. *hladnikiana*, *Primula carniolica*, *Primula x venusta*...). Today, there are about 600 species held in Juliana. The garden is opened from from May 1 to September 30. Welcome!

Semina in horto alpino Juliana Museum historiae naturalis Sloveniae anno 2014 lecta

Špela Novak, Marija Završnik, Klemen Završnik

739. *Aconitum angustifolium* Bernh. ex Rchb.
740. *Aconitum degenii* Gáyer subsp. *paniculatum* (Archang.) Mucher
741. *Aconitum lycoctonum* L. em. Koelle subsp. *ranunculifolium* (Rchb.) Schnitz & Keller
742. *Actaea spicata* L.
743. *Adenophora liliifolia* (L.) DC.
744. *Adenostyles glabra* (Miller) DC.
745. *Aethionema saxatile* (L.) R. Br.
746. *Agrimonia eupatoria* L.
747. *Ajuga reptans* L.
748. *Alchemilla vulgaris* L.
749. *Alisma plantago-aquatica* L.
750. *Allium ericetorum* Thore
751. *Allium senescens* L.
752. *Allium ursinum* L.
753. *Alyssum montanum* L.
754. *Androsace lactea* L.
755. *Androsace villosa* L.
756. *Anemone ranunculoides* L.
757. *Anemone trifolia* L.
758. *Angelica sylvestris* L.
759. *Anthericum ramosum* L.
760. *Anthyllis jacquinii* A. Kern.
761. *Aposeris foetida* (L.) Less.
762. *Aquilegia bertolonii* Schott
763. *Aquilegia einseleana* F. W. Schultz
764. *Aquilegia nigricans* Baumg.
765. *Aquilegia vulgaris* L.
766. *Arabis alpina* L. subsp. *alpina*
767. *Arabis bellidifolia* Crantz subsp. *bellidifolia*

768. *Arabis hirsuta* agg.
769. *Arabis vochinensis* Sprengel
770. *Armeria alpina* (DC.) Willd.
771. *Aruncus dioicus* (Walter) Fernald
772. Asarum europaeum L.
773. *Asparagus tenuifolius* Lam.
774. *Asperula taurina* L.
775. *Aster alpinus* L.
776. *Aster amellus* L.
777. *Aster bellidiastrum* (L.) Scop.
778. *Astrantia carniolica* Jacq.
779. *Astrantia major* L.
780. *Athamanta cretensis* L.
781. *Athamanta turbith* (L.) Brot. p. p., em. H. Karst.
782. *Aurinia petraea* (Ard.) Schur
783. *Betonica alopecuros* L.
784. *Betonica officinalis* L.
785. *Biscutella laevigata* L.
786. *Braya alpina* Sternb. & Hoppe
787. *Buphthalmum salicifolium* L.
788. *Bupleurum falcatum* L. subsp. *cernuum* (Ten.) Arcang.
789. *Bupleurum petraeum* L.
790. *Bupleurum ranunculoides* L. subsp. *ranunculoides*
791. *Calamintha einseleana* F. W. Schultz
792. *Calluna vulgaris* (L.) Hull.
793. *Caltha palustris* L.
794. *Campanula cespitosa* Scop.
795. *Campanula glomerata* L. subsp. *glomerata*
796. *Campanula rapunculoides* L.
797. *Campanula spicata* L.
798. *Campanula thyrsoides* L. subsp. *thyrsoides*
799. *Campanula trachelium* L.
800. *Cardamine pentaphyllos* (L.) Crantz
801. *Carduus defloratus* L. sensu Kazmi
802. *Carex flava* L.
803. *Centaurea alpina* L.
804. *Centaurea dichroantha* A. Kerner
805. *Centaurea scabiosa* L. subsp. *fritschii* (Hayek) Hayek
806. *Centaurea scabiosa* L. subsp. *scabiosa*
807. *Cephalanthera longifolia* (L.) Fritsch

808. *Cephalanthera rubra* (L.) L. C. Rich.
809. *Cephalaria leucantha* (L.) Roemer & Schultes
810. *Cerastium carinthiacum* Vest subsp. *carinthiacum*
811. *Cerastium subtriflorum* (Rchb.) Pacher
812. *Cerinthe glabra* Miller
813. *Chaerophyllum hirsutum* L.
814. *Chamaecytisus purpureus* Scop.
815. *Chamaecytisus supinus* (L.) Link
816. *Chamaespartium sagittale* (L.) P. E. Gibbs
817. *Chenopodium bonus-henricus* L.
818. *Cirsium eriophorum* (L.) Scop.
819. *Cirsium erisithales* (Jacq.) Scop.
820. *Cirsium oleraceum* (L.) Scop.
821. *Clematis recta* L.
822. *Clinopodium vulgare* L.
823. *Convallaria majalis* L.
824. *Coronilla coronata* L.
825. *Coronilla emerus* L.
826. *Cotoneaster dielsianus* E. Pritz. ex Diels
827. *Cotoneaster integerrimus* Medik.
828. *Crocus vernus* (L.) Hill subsp. *albiflorus* (Kit.) Ascherson & Graebner
829. *Crocus vernus* (L.) Hill subsp. *vernus*
830. *Cypripedium calceolus* L.
831. *Cytisus pseudoprocumbens* Markgr.
832. *Dactylorhiza maculata* (L.) Soó
833. *Daphne alpina* L.
834. *Daphne cneorum* L.
835. *Dianthus barbatus* L. subsp. *barbatus*
836. *Dianthus hyssopifolius* L.
837. *Dianthus petraeus* Waldst. & Kit.
838. *Dianthus sternbergii* Sieber
839. *Dianthus sylvestris* Wulfen
840. *Dictamnus albus* L.
841. *Digitalis grandiflora* Miller
842. *Digitalis laevigata* Waldst. & Kit.
843. *Dorycnium germanicum* (Gremli) Rikli
844. *Draba aizoides* L.
845. *Dryas octopetala* L.
846. *Drypis spinosa* L. subsp. *jacquiniana* Murb. et Wettst.
847. *Epilobium montanum* L.

848. *Epimedium alpinum* L.
849. *Epipactis atrorubens* (Hoffm. ex Bernh.) Besser
850. *Epipactis helleborine* (L.) Crantz
851. *Epipactis palustris* (L.) Crantz
852. *Erigeron glabratus* Hoppe & Hornsch. ex Bluff & Fingerh.
853. *Erinus alpinus* L.
854. *Eryngium alpinum* L.
855. *Erysimum sylvestre* Scop.
856. *Euonymus latifolius* (L.) Mill.
857. *Euphorbia amygdaloides* L.
858. *Euphorbia triflora* Schott, Nyman & Kotschy subsp. *triflora*
859. *Filipendula ulmaria* (L.) Maxim.
860. *Filipendula vulgaris* Moench
861. *Frangula rupestris* (Scop.) Schur
862. *Fumana procumbens* (Dunal) Gren. & Godr.
863. *Galium purpureum* L.
864. *Galium sylvaticum* L.
865. *Genista germanica* L.
866. *Genista januensis* Viv.
867. *Genista radiata* (L.) Scop.
868. *Genista sericea* Wulfen
869. *Genista tinctoria* L.
870. *Gentiana angustifolia* Vill.
871. *Gentiana asclepiadea* L.
872. *Gentiana clusii* Perr. & Song.
873. *Gentiana cruciata* L.
874. *Gentiana lutea* L. subsp. *symphyandra* Murbeck
875. *Geranium macrorrhizum* L.
876. *Geranium nodosum* L.
877. *Geranium phaeum* L. subsp. *phaeum*
878. *Geranium sanguineum* L.
879. *Geum speciosum* Albov
880. *Gladiolus illyricus* Koch
881. *Globularia nudicaulis* L.
882. *Grafia golaka* (Hacq.) Rchb.
883. *Gymnadenia conopsea* (L.) R. Br.
884. *Gypsophila repens* L.
885. *Hacquetia epipactis* (Scop.) DC.
886. *Helianthemum alpestre* (Jacq.) Griseb.
887. *Helianthemum nummularium* (L.) Mill. subsp. *grandiflorum* (Scop.) Schinz

& Thell.
888. *Heliosperma alpestre* (Jacq.) Griseb.
889. *Heliosperma pusillum* (Waldst. & Kit.) Rchb. subsp. *pusillum*
890. *Helleborus niger* L.
891. *Helleborus odorus* Waldst. & Kit.
892. *Hemerocallis lilioasphodelus* L.
893. *Hepatica nobilis* Mill.
894. *Hesperis candida* Kit.
895. *Hieracium glaucinum* Jord.
896. *Hieracium gymnocephalum* Griseb. ex Pant.
897. *Hieracium pilosum* Schleicher ex Froelich in DC.
898. *Hieracium pilosella* L.
899. *Hieracium piloselloides* Vill.
900. *Hieracium porrifolium* L.
901. *Hieracium valdepilosum* Vill.
902. *Hieracium villosum* Jacq.
903. *Hippocrepis comosa* L.
904. *Hladnikia pastinacifolia* Reichenb.
905. *Homogyne sylvestris* Cass.
906. *Horminum pyrenaicum* L.
907. *Hypericum montanum* L.
908. *Hypericum perforatum* L.
909. *Hypochoeris maculata* L.
910. *Inula ensifolia* L.
911. *Inula spiraeifolia* L.
912. *Iris graminea* L.
913. *Iris sibirica* L. subsp. *sibirica*
914. *Juniperus alpina* S. F. Gray
915. *Kernera saxatilis* (L.) Reichenb.
916. *Knautia arvensis* (L.) Coulter
917. *Knautia drymeia* Heuffel subsp. *drymeia*
918. *Knautia fleischmannii* (Hladnik ex Reichenb.) Pacher
919. *Knautia illyrica* G. Beck
920. *Knautia longifolia* (Waldst. & Kit.) Koch
921. *Laserpitium archangelica* Wulfen
922. *Laserpitium latifolium* L.
923. *Laserpitium siler* L.
924. *Lathyrus occidentalis* (Fisch. & Meyer) Fritsch var. *montanus* (Scop.) Fritsch
925. *Lathyrus pannonicus* (Jacq.) Garcke subsp. *varius* (C. Koch) P. W. Ball

926. *Lathyrus vernus* (L.) Bernh. subsp. *vernus*
927. *Leontodon hispidus* L.
928. *Leucanthemum ircutianum* (Turcz.) DC.
929. *Leucojum vernum* L.
930. *Libanotis sibirica* (L.) C. A. Mey. subsp. *montana* (Crantz) P. W. Ball
931. *Ligusticum seguieri* (Jacq.) Koch
932. *Lilium carniolicum* Bernh.
933. *Linum julicum* Hayek
934. *Listera ovata* (L.) R. Br.
935. *Lithospermum officinale* L.
936. *Lonicera xylosteum* L.
937. *Lunaria rediviva* L.
938. *Luzula nivea* (L.) DC.
939. *Luzula sylvatica* (Huds.) Gaudin subsp. *sylvatica*
940. *Lycopus europaeus* L. subsp. *europaeus*
941. *Lysimachia punctata* L.
942. *Lysimachia vulgaris* L.
943. *Lythrum salicaria* L.
944. *Medicago pironae* Vis.
945. *Melittis melissophyllum* L.
946. *Mentha longifolia* (L.) Huds.
947. *Meum athamanticum* Jacq.
948. *Minuartia capillacea* (All.) Graebn.
949. *Minuartia gerardii* (Willd.) Hayek
950. *Muscari botryoides* (L.) Miller
951. *Mycelis muralis* (L.) Dumort.
952. *Myrrhis odorata* (L.) Scop.
953. *Narcissus poeticus* L. subsp. *radiiflorus* (Salisb.) Baker
954. *Orchis militaris* L.
955. *Paris quadrifolia* L.
956. *Peltaria alliacea* Jacq.
957. *Petasites albus* (L.) Gaertner
958. *Petrorhagia saxifraga* (L.) Link
959. *Peucedanum austriacum* (Jacq.) Koch var. *rablense* (Wulfen) Koch
960. *Peucedanum oreoselinum* (L.) Moench
961. *Peucedanum schottii* Besser.
962. *Peucedanum verticillare* (L.) Koch
963. *Phyteuma orbiculare* L.
964. *Phyteuma spicatum* L. subsp. *spicatum*
965. *Phyteuma zahlbruckneri* Vest

966. *Pimpinella saxifraga* L.
967. *Plantago atrata* Hoppe subsp. *fuscescens* (Jord.) Pilg.
968. *Platanthera bifolia* (L.) Rich.
969. *Polygonatum multiflorum* (L.) All.
970. *Polygonatum odoratum* (Miller) Druce
971. *Polygonum viviparum* L.
972. *Potentilla alba* L.
973. *Potentilla carniolica* A. Kern.
974. *Potentilla caulescens* L.
975. *Potentilla erecta* (L.) Raeusch.
976. *Potentilla micrantha* Ramond. ex DC.
977. *Potentilla rupestris* L.
978. *Prenanthes purpurea* L.
979. *Primula auricula* L.
980. *Primula elatior* (L.) Hill
981. *Primula farinosa* L.
982. *Primula veris* L. subsp. *columnae* (Ten.) Lüdi in Hegi
983. *Primula x venusta* Host
984. *Prunella grandiflora* (L.) Scholler
985. *Pulsatilla alpina* (L.) Delarbre subsp. *austroalpina* D. M. Moser
986. *Ranunculus platanifolius* L.
987. *Reseda lutea* L.
988. *Rhamnus saxatilis* Jacq.
989. *Rhodiola rosea* L.
990. *Rhododendron hirsutum* L.
991. *Rhodothamnus chamaecistus* (L.) Reichenb.
992. *Rubus saxatilis* L.
993. *Rumex scutatus* L.
994. *Ruta divaricata* Ten.
995. *Salvia glutinosa* L.
996. *Salvia verticillata* L.
997. *Sanguisorba minor* Scop.
998. *Saponaria officinalis* L.
999. *Satureja subspicata* Bartl. ex Vis. subsp. *liburnica* Šilić
1000. *Saxifraga burseriana* L.
1001. *Saxifraga crustata* Vest
1002. *Saxifraga hostii* Tausch
1003. *Scabiosa caucasica* Bieb.
1004. *Scabiosa graminifolia* L.
1005. *Scabiosa lucida* Vill. subsp. *stricta*

1006. *Scopolia carniolica* Jacq.
1007. *Scorzonera villosa* Scop.
1008. *Scrophularia juratensis* Schleicher
1009. *Scrophularia vernalis* L.
1010. *Sedum album* L.
1011. *Sedum dasyphyllum* L.
1012. *Senecio abrotanifolius* L.
1013. *Senecio doronicum* L.
1014. *Senecio ovatus* (Gaertn., Mey. & Scherb.) Willd.
1015. *Seseli gouanii* Koch
1016. *Sibiraea croatica* Degen
1017. *Silene dioica* (L. em Mill.) Clairv.
1018. *Silene hayekiana* Hand.-Mazz. & Janchen
1019. *Silene latifolia* Poiret
1020. *Silene nutans* L.
1021. *Silene vulgaris* (Moench) Garcke subsp. *glareosa* (Jordan) Marsde-Jones & Turill
1022. *Silene vulgaris* (Moench) Garcke subsp. *vulgaris*
1023. *Soldanella minima* Hoppe
1024. *Solidago virgaurea* L. subsp. *minuta* (L.) Arcangeli
1025. *Solidago virgaurea* subsp. *virgaurea*
1026. *Spiraea decumbens* Koch subsp. *decumbens*
1027. *Stachys sylvatica* L.
1028. *Succisa pratensis* Moench
1029. *Tanacetum corymbosum* (L.) Schultz Bip. subsp. *clusii* (Fischer ex Reichenb.) Heywood
1030. *Taraxacum officinale* agg.
1031. *Taxus baccata* L.
1032. *Telekia speciosa* (Schreber) Baumg.
1033. *Tephroseris pseudocrispa* (Fiori) Holub
1034. *Thalictrum minus* L.
1035. *Thlaspi praecox* Wulfen
1036. *Tofieldia calyculata* (L.) Wahlenb.
1037. *Trifolium montanum* L.
1038. *Trifolium rubens* L.
1039. *Trollius europaeus* L.
1040. *Tussilago farfara* L.
1041. *Valeriana montana* L.
1042. *Valeriana officinalis* L.
1043. *Valeriana tripteris* L.

1044. *Veratrum nigrum* L.
1045. *Verbascum alpinum* Turra
1046. *Verbascum blattaria* L.
1047. *Veronica barrelieri* Schott ex Roem. & Schult. *subsp. barrelieri*
1048. *Veronica chamaedrys* L.
1049. *Veronica fruticulosa* L.
1050. *Veronica jacquinii* Baumg.
1051. *Veronica maritima* L.
1052. *Veronica officinalis* L.
1053. *Veronica urticifolia* Jacq.
1054. *Viburnum opulus* L.
1055. *Vicia oroboides* Wulfen
1056. *Vincetoxicum hirundinaria* Medik. subsp. *hirundinaria*
1057. *Wulfenia carinthiaca* Jacq.

Curator: Špela Novak
Hortulani: Marija Završnik & Klemen Završnik, dipl. inž. agr. in h.

LITERATURA / LITERATURE

MARTINČIČ, A. & T. WRABER, N. JOGAN, A. PODOBNIK, B. TURK, B. VREŠ, V. RAVNIK, B. FRAJMAN, S. STRGULC KRAJŠEK, B. TRČAK, T. BAČIČ, M. A. FISCHER, K. ELER, B. SURINA, 2007: Mala flora Slovenije. Ključ za določanje praprotnic in semenk. Tehniška založba Slovenije. Ljubljana. 967 pp.

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Alpski botanični vrt Juliana v Trenti je odprt od 1. maja do 30. septembra vsak dan od 8.30 do 18.30.

Informacije o vrtu posreduje:

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Prešernova 20, p.p. 290,
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fax.: + 386 1 241 09 53
e-mail: uprava@pms-lj.si
spletna stran: http://www2.pms-lj.si/juliana/juliana.html

The "Juliana" botanical garden in the Trenta valley is open daily from 8.30 to 18.30 between May 1st and September 30th .

For any information on the garden please contact:

Slovene Museum of Natural History,
Prešernova 20, p.p. 290,
SI - 1000 Ljubljana, Slovenija
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fax.: + 386 1 241 09 53
e-mail: uprava@pms-lj.si
website: http://www2.pms-lj.si/juliana/juliana.html

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