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CUPRINS

CIOCÂRLAN V. – Contribuții la cunoașterea florei României	5
CIOCÂRLAN V., COSTEA M. – <i>Bellardia trixago</i> (L.) în flora României	9
NEGREAN G. – Genul <i>Pietrosia</i> a fost reabilitat	11
ȘTEFĂNUȚ S. – <i>Asterella gracilis</i> în România	15
CHIFU T., SÂRBU I., ȘTEFAN N. – Fitocenoze din Ordinul <i>Quercetalia pubescentis</i> Br.-Bl. 1931 em So6 1964 pe teritoriul Moldovei (România)	17
ȘTEFAN N., MARDARI C. – Contribuții la cunoașterea vegetației acvatice din Complexul Isac- Uzlina	35
BLAJ IRINA, CHIFU T. – Biomasa și productivitatea aeriană a straturilor arborescent al asociației <i>Aro orientalis</i> – <i>Carpinetum</i> (Dobrescu et Kovacs 1973) Tăuber 1991-1992 din bazinul râului Vaslui	45
OPREA AD. – Vegetația lemnoasă din Câmpia Tecuciului (jud. Galați)	53
MÂNZU C. – Contribuții la studiul florei vasculare din zona râului Moldova (județul Suceava)...	75
ZAMFIRESCU OANA – Date noi privind prezența clasei <i>Phragmiti-Magnocaricetea</i> Klika în Klica et Novac 1941 în Carpații Orientali	81
IFRIM CAMELIA – Aspecte anatomice privind perii tectori și secretori prezenți la specii de <i>Peperomia</i> cultivate în Grădina Botanică Iași	89
BUSUIOC GABRIELA, IFRIM CAMELIA – Aspecte histo-anatomice asupra frunzei de la <i>Basella alba</i> și <i>Basella rubra</i>	95
TEODORESCU GEORGETA – Complexul de Sere din Grădina Botanică “A. Fătu” Iași	101
TĂNĂȘESCU VIOLETA, OANA GACEA – Specii cu acțiune imunostimulatoare cultivate în Sectorul „Plante utile” al Grădinii Botanice din Iași	111
MITACHE M. – Pepiniera Grădinii Botanice “D. Brândză” din București – prezent și viitor	119
MITITIUC M., OPREA AD. – Grădina Botanică “A. Fătu” din Iași – Raport de activitate anual ...	125
RECENZII	131
ANIVERSALIA	133

CONTENTS

CIOCÂRLAN V. – Contributions à la connaissance de la flore de Roumanie.....	9
CIOCÂRLAN V., COSTEA M. – <i>Bellardia trixago</i> (L.) All. (<i>Scrophulariaceae</i>) dans la flore de Roumanie	5
NEGREAN G. – The genus <i>Pietrosia</i> has been restored	11
ȘTEFĂNUȚ S. – <i>Asterella gracilis</i> in Romania	15
CHIFU T., SÂRBU I., ȘTEFAN N. – Phytocénoses de l'ordre <i>Quercetalia pubescentis</i> Br.-Bl. 1931 em Soó 1964 sur le territoire moldave (Roumanie)	17
ȘTEFAN N., MARDARI C. – Contributions to aquatic vegetation of Isac-Uzlina Complex knowledge	35
BLAJ IRINA, CHIFU T. – Biomass and the aerial productivity of the arborescent layer of the <i>Aro orientalis</i> – <i>Carpinetum</i> (Dobrescu et Kovacs 1973) Täuber 1991-1992 association from the Vaslui river basin	45
OPREA AD. – Forest vegetation in the Tecuci plain (Galați county)	53
MÂNZU C. – Contributions to the study of the vascular flora from the Moldovița river's area (Suceava county)	75
ZAMFIRESCU OANA – New data on the presence of the class <i>Phragmiti-Magnocaricetea</i> Klika in Klica et Novac 1941 from the Oriental Carpathians	81
IFRIM CAMELIA – Some anatomical aspects concerning glandular and nonglandular trichomes presents on <i>Peperomia</i> species cultivated of Botanical Garden of Iasi	89
BUSUIOC GABRIELA, IFRIM CAMELIA – Some histo-anatomical aspects concerning the leaf structure of <i>Basella alba</i> and <i>Basella rubra</i>	95
TEODORESCU GEORGETA – „A. Fătu” Botanical Garden Iassy - the Greenhouse	101
TĂNĂSESCU VIOLETA, OANA GACEA – Species with immunostimulant activity cultivated in the “Useful Plants” departament of the Botanical Gardens from Iași	111
MITACHE M. – “D. Brandza” Botanical Garden nursery from Bucharest present and future references	119
MITITIUC M., OPREA AD. – Annual report upon the activity of the Botanic Garden Iași	125
BOOK REVIEW	131
ANIVERSALIA	133

CONTRIBUȚII LA CUNOAȘTEREA FLOREI ROMÂNIEI

V. CIOCÂRLAN*

Résumé: l'auteur précise:

1. *Xanthium albinum* subsp. *riparium* ne pousse pas en Roumanie;
2. *X. saccharatum* pousse en Roumanie et a été confondue avec *X. italicum*;
3. *Galinsoga quadriradiata* Ruiz. et Pavon s. str. existe en Roumanie, surtout dans la lieux rudérales et a été confondue avec *G. ciliata* (Rafin.) Blake.

Mots clé: *Xanthium*, *Galinsoga*, Roumanie.

În flora României există taxoni cu prezență nesigură, controversați din punct de vedere taxonomic. Așa sunt unele specii ale genului *Xanthium* L.

E. I. Nyárády, în volumul IX (1964), a făcut două observații referitoare la speciile genului *Xanthium*:

1. prezența speciei *X. riparium* în flora României necesită confirmare;
2. în America crește o specie vicariantă *X. saccharatum* Wallr., foarte asemănătoare cu *X. italicum* Moretti.

În prima parte a lucrării, vom da răspuns la cele două probleme de mai sus. Deși *X. riparium* este menționat în lucrări recente (3, 4, 12) și a fost distribuit în **Flora Moldaviae et Dobrogeae Exsiccata**, Centuria VI, nr. 584 (1985), material provenit din județul Vaslui-Berezeni, ultimele informații bibliografice (1, 2, 7), urmate de analiza materialului, infirmă prezența acestui taxon în România.

X. albinum (Widder) H. Scholys subsp. *riparium* (Čelak.) Widder et Wagenitz se recunoaște relativ ușor, după caracterele antodiilor fructifere și frunze. Frunzele au baza îngustată, cuneiformă, iar antodiile fructifere sunt elipsoidale, cu majoritatea spinilor, circa 70-80%, cu vârful drept, neuncinat și numai 20-30% din spini au vârful uncinat. Spinii sunt subțiri, puțin viguroși, lungi de circa 4 mm, cât jumătatea diametrului antodiilor fructifere. Taxonul menționat are arealul principal în nord-estul Germaniei și țările baltice (1, 2, 7).

Aceleași informații bibliografice (1, 2, 7, 15) ne-au determinat să analizăm comparativ și cei doi taxoni: *X. italicum* și *X. saccharatum*, întrucât unele surse pun sub semnul întrebării prezența la noi a speciei *X. italicum* (15), care ar fi înlocuită cu *X. saccharatum*.

Rezultatul analizei ne-a oferit surpriza constatării la noi și a speciei *X. saccharatum*, alături de *X. italicum*. S-a analizat materialul de *Xanthium* din ierbarele de la Cluj și București și s-a constatat că specia *X. saccharatum* a fost confundată frecvent cu *X. italicum*. *X. italicum* este prezent în județele: Arad, Timiș, Caraș-Severin, Mehedinți și Constanța. *X. saccharatum* s-a identificat în județele: Vaslui, Tulcea, Constanța, Giurgiu, Dolj, Cluj și Mureș. În mod cert, răspândirea dată este incompletă, fiind făcută numai după datele existente în herbarele cercetate. Faptul că în Germania și Austria (1, 2) *X. italicum* lipsește, fiind înlocuită de *X. saccharatum*, ne spune că specia *X. italicum* este mai

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termofilă în comparație cu *X. saccharatum*; față de factorul apă, cerințele celor două specii sunt asemănătoare.

Deosebirea dintre cei doi taxoni *X. italicum* și *X. saccharatum* este dificilă și se bazează în principal pe caracterele antodiilor fructifere.

X. italicum: spinii antodiului fructifer sunt robuști, puternic uncinați, în proporție de 100%. Lungimea spinilor este mai mult sau mai puțin egală cu diametrul antodiului fructifer, care este neglandulos sau slab glandulos.

X. saccharatum: spinii antodiului fructifer sunt mai puțin robuști, slab uncinați și 10-20% din spini au vârful drept. Lungimea spinilor este mai scurtă decât diametrul antodiului fructifer, cât circa 0,6-0,8 din diametrul antodiului, care este dens glandulos (1, 2, 7).

În continuare, ne referim la prezența în România a taxonului *Galinsoga quadriradiata* Ruiz et Pavon s. str. (*G. hispida* Benth.). Valoarea acestui taxon este foarte controversată în literatura botanică. Un grup de autori (2, 6, 10, 16) îl consideră sinonim cu *G. ciliata* (Rafin.) Blake; alți autori (5, 10, 11, 14) dimpotrivă sinonimizează pe *G. ciliata* la *G. quadriradiata*; o a treia grupă de autori (8, 13, 17) consideră cei doi taxoni specii distincte, opinie pe care o acceptăm. *G. quadriradiata* Ruiz. et Pavon s. str. a fost menționată în flora noastră de E. I. Nyárády (11) sub *G. quadriradiata* var. *quadriradiata* de la Acățari, lângă Tg. Mureș, după datele lui Soó, autor care nu mai menționează acest taxon în România (15).

Analiza comparativă a celor doi taxoni a pus în evidență caractere importante care justifică, după opinia noastră, valoarea de specie atribuită taxonului *G. quadriradiata* Ruiz. et Pavon s. str. Caracterele diferențiale dintre *G. ciliata* și *G. quadriradiata* se referă la flori și fructe.

G. ciliata (fig. 1b):

- florile marginale au ligula mare, de circa 5-6 mm (11);
- scvamele papusului sunt lungi cât corola florilor tubuloase;
- scvamele papusului florilor tubuloase sunt aristate;
- scvamele papusului sunt lungi aproape cât achena.

G. quadriradiata (fig. 1a):

- florile marginale au ligulă mică, de 1-3 mm;
- scvamele papusului sunt lungi cât jumătate din lungimea corolei florilor tubuloase;
- scvamele papusului sunt neevident aristate;
- scvamele papusului sunt cât jumătatea achenei.

Răspândirea în România a celor două specii trebuie revăzută, întrucât în Flora R.P.R. IX (11) este dată răspândirea generală pentru *G. quadriradiata* s. ampl. Datele noastre arată o răspândire largă pentru *G. quadriradiata* în locuri ruderales, dar și în rabate cu flori, în lungul căilor de comunicație, în timp ce *G. ciliata* se pare că este mai puțin răspândită.

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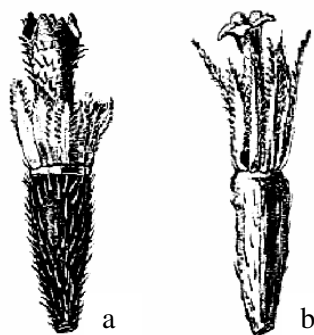


Fig. 1: Flori tubuloase
a – *Galinsoga quadriradiata*
b – *G. ciliata* (după Wagenitz)

BELLARDIA TRIXAGO (L.) ÎN FLORA ROMÂNIEI

V. CIOCÂRLAN*, M. COSTEA*

Résumé: Les auteurs publient l'espèce *Bellardia trixago* (L.) All., découverte sur le territoire du port Constanța, comme une nouveauté pour la flore de Roumanie.

Mots clé: *Bellardia trixago* (L.) All., Roumanie.

Genul *Bellardia* All. cuprinde o singură specie *B. trixago* (L.) All., specie anuală, semiparazită, noutate în flora României. Este asemănătoare cu *Bartsia* L. și unii autori o păstrează încă în genul *Bartsia* (2). Cele două genuri, *Bellardia* și *Bartsia* se deosebesc astfel:

***Bartsia* L.**

Cuprinde specii perene cu rizom. Frunze opuse, sesile. Flori grupate în raceme spiciforme, terminale. Caliciul este tubulos, terminat cu 4 dinți. Corola bilabiată, purpuriu-închis. Androceu didinam. Capsula loculică, cu puține semințe, de circa 2 mm. Tegumentul seminal prezintă 2-3 aripi membranoase, longitudinale.

***Bellardia* All.**

Asemănător cu *Bartsia*, dar anual. Caliciul este campanulat, terminat cu 2 dinți scurți. Capsula are numeroase semințe mici de circa 0,7 mm. Tegumentul seminal nu este aripat, ci prezintă numeroase striuri longitudinale și striuri transversale.

***B. trixago* (L.) All. (Fig. 1).**

Specie anuală, glandulos-păroasă, cu tulpina simplă sau ramificată, de 20-60 cm înălțime. Frunzele sunt liniar-lanceolate, serate, de 2-8 cm lungime și 2-12 mm lățime. Inflorescența este terminală, spiciformă. Florile prezintă bractee mai mult sau mai puțin ovate, întregi. Caliciul este campanulat, de 8-10 mm lungime, terminat cu 2 lobi (dinți) scurți. Corola este purpurie de 20-25 mm lungime. Capsula subglobuloasă, cu numeroase semințe mai mult sau mai puțin oblongi, mici, de circa 0,7 mm lungime. Tegumentul seminal prezintă striuri fine longitudinale și transversale. $2n = 24$ (3).

Răspândirea în România: în portul Constanța, pe nisipuri și pietrișuri înierbate.

Răspândirea generală: Europa de sud, în țările și insulele mediteraneene, din Portugalia, Spania, Italia, Albania, Grecia, Turcia, până în sud-estul Bulgariei. De menționat că în Bulgaria s-a întâlnit și în culturi de grâu (1).

Material de herbar: BUAG nr. 23781.

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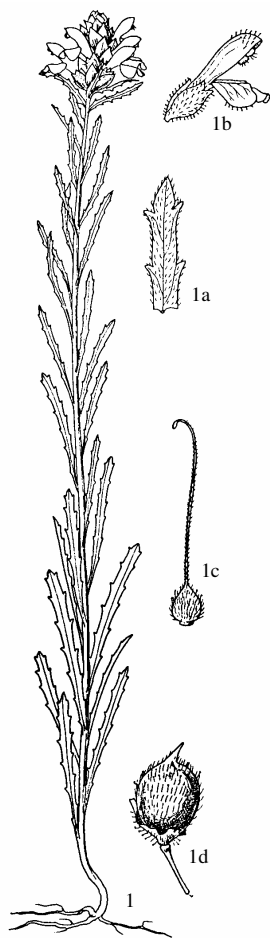


Fig. 1 – *Bellardia trixago* (L.) All.
 1 - habitus, 1a - frunză, 1b - floare, 1c - gineceu, 1d - fruct (după Andreev)

GENUL PIETROSIA A FOST REABILITAT

G. NEGREAN *

Abstract: On a basis of morphological analyses of achenas, as well as the monopodial structure of the rhizome, there it is coming to the rhizome, there it is coming to the fore the fact that Sennikov has restored the genus *Pietrosia*. Unfortunately, all the previously nomenclatural combinations, including here also those made by Sennikov himself, are not accurately and it is necessary an improvement of it. In this paper, there are made also some comments over *Pietrosia*, as a particular genus.

Key words: *Pietrosia*, Asteraceae, Romania, taxonomy, reassessment, typification.

Genul *Pietrosia* a fost descris de Nyárády în 1963 [3] din Munții Bistriței, Pietrosul Broștenilor, cu o singură specie: *Pietrosia levitomentosa* Nyár. Mai târziu Soó (1968) transferă specia la genul *Hieracium*, propunând o nouă combinație. Sell (1976), care a prelucrat genul *Andryala* și a fost coautor la prelucrarea genului *Hieracium* pentru Flora Europaea [10], a transferat planta noastră la genul *Andryala*, propunând și el o nouă combinație. Recent Sennikov [6] reanalizează cele trei genuri și ajunge la concluzia că genul *Pietrosia* trebuie reconsiderat. El se bazează mai ales pe caracterele achenei [7], [8], de dimensiuni mult mai mari ca la *Andryala* și cu coastele contopite la marginea de sus într-un inel fără dinți. Este important și caracterul monopodial al rozetelor. Mai mult, pe baza unor caractere morfologice, transferă de la *Andryala* o specie la genul *Pietrosia*. Genul *Pietrosia* pare mai primitiv și ocupă un loc intermediar între cele două genuri, *Andryala* și *Hieracium*. Personal am consultat la Cluj 10 taxoni de *Andryala*. Marea majoritate sunt specii anuale fără rozete de frunze bazale. *A. agardhii* este cea mai apropiată de *Pietrosia*, fiind perenă și având rozetă de frunze de tip *Aurinia saxatilis*.

Din păcate, Nyárády nu a indicat corect tipul nomenclatural (Art. 37), când a descris genul *Pietrosia*. Este interesant că nici Soó [9] și nici Sell [5] nu au observat acest lucru, toate combinațiile făcute de ei fiind invalide. Acest lucru l-a făcut Sennikov. Nu înțelegem însă de ce Sennikov nu a consultat materialul original de la Cluj, unde tipul este depus. A apelat la exsiccata *Flora Moldaviae et Dobrogeae exsiccata* (nr. 587), împrumutată de la Helsinki [H 1.578.347]. A indicat deci ca tip nomenclatural un isoelectotip. Cum, după Codul de nomenclatură la regăsirea materialului original, acesta ia locul unui alt tip, care nu a fost indicat de autorul descrierii - Exsiccata a fost publicată în 1985 [2], iar Nyárády a descris taxonul în 1963 și a murit în 1966, este luat automat de materialul original, care a stat la baza descrierii taxonului (Art. 8). Materialul original se află la Herbarul Grădinii Botanice Cluj [CL 443.644] pe care Nyárády a scris sp. n. Am luat legătura cu Sennikov pentru a proceda la indicarea corectă a tipului nomenclatural.

Andryala agardhii se apropie mai mult de genul *Pietrosia*, dar diferă prin unele caractere de aceasta, Sennikov transferă specia respectivă la *Pietrosia*, creînd în același timp două secții. În rezumat, noua nomenclatură propusă de Sennikov este următoarea:

Pietrosia Nyárády ex Sennikov **gen. nov.** (*Pietrosia* Nyárády, *Rev. Biol. /București/* 8(3): 250 (1963), nom invalid. (Art. 37).

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Sect. 1. *Pietrosia*, cu scvamele receptaculului prezente și foliole involucale cu peri simpli lungi.

1. *Pietrosia levitomentosa* Nyár. ex Sennik. (*P. levitomentosa* Nyár., nom. invalid. (Art. 37 și 8); *Andryala levitomentosa* (Nyár.) P. D. Sell (1976), nom. invalid. (Art. 37); *Hieracium levitomentosum* Nyár. ex Soó (1968), nom. invalid. (Art. 37).

Sect. 2. *Andryalopsis* Sennik., cu receptacul fără scvame și cu foliolele involucale cu peri glandulari scurți

2. *Pietrosia agardhii* (Haensel. ex DC.) Sennik. (*Andryala agardhii* Haensel. ex DC.).

Până la urmă, depinde pe ce caracter se pune mai mare greutate. Poate mai corect ar fi să fie creat un nou gen pentru ultima specie, gen ce ar putea fi numit *Agardhia*, respectiv *Agardhia aghardii* - dacă codul de nomenclatură o permite sau un alt nume, *Andryalopsis* (Sennik.), cu specia *Andryalopsis agardhii* (Haensel. ex DC.). Personal aş pune poate chiar mai mare preţ pe distribuţia geografică, pe izolare şi pe vârstă. *Pietrosia levitomentosa*, mai apropiată de genul *Andryala*, pare să fie izolată de acesta încă de la sfârşitul terţiului încât legăturile genetice dintre ele s-au întrerupt demult. Planta noastră este în mod cert un paleotaxon, fără legături recente cu genul *Hieracium*. Numărul de cromosomi - 18 [1] ar pleda şi el pentru gen aparte, mai apropiat de *Andryala*. Două dintre cele trei specii europene de *Andryala* rămase, au tot 18 cromosomi [5]. La sfârşitul terţiului a existat o legătură între Pirinei şi Carpaţi. Este probabil că un strămoş comun, să zicem „*Andryalites*”, a avut o vigoare deosebită extinzându-se pe un areal foarte mare. Mai târziu clima s-a schimbat mult, planta noastră a supravieţuit în mod cu totul uimitor, pentru o plantă de tip mediteranoid, în Carpaţii Orientali, rămânând izolată sute de mii de ani, transformându-se în ceea ce azi numim *Pietrosia levitomentosa*. Cea mai apropiată „rudă”, dacă e să-l credem pe Sennikov, este azi la mare distanţă, cele mai apropiate populaţii fiind în Corsica. Nu pe Coasta dalmată (Ragusa, azi Dubrovnik), aşa cum susţin Corneanu & Szabó (1980: 77), fiind vorba de altă Ragusa.

Probleme de conservare. Atenţia care s-a dat plantei noastre a dus şi la distrugerea multor exemplare prin distribuire în două exsiccate (Țopa et al. in LAZĂR & LEOCOV 1985) şi în nenumărate coli de herbar în diferite colecţii. Se încearcă şi multiplicarea ex situ a plantei. După unele informaţii inedite, planta s-ar mai afla într-un loc, deocamdată nedezevăluit.

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ASTERELLA GRACILIS IN ROMANIA

SORIN ȘTEFĂNUȚ *

Abstract: In this paper, the liverwort *Asterella gracilis* is reported from Romania, after 89 years. The samples of *Asterella gracilis* were collected from Bucegi Mountains, Cerbului Valley.

Key words: *Asterella gracilis*, liverwort, Romania.

Introduction

This paper presents the liverwort *Asterella gracilis* (F. Weber) Underw., reported for the first time from Romania, Bucegi Mountains, Cerbului Valley by Radian in 1915, as *Fimbriaria pilosa* Taylor (7,8).

Material and methods

The samples of *Asterella gracilis* were collected from the Bucegi Mountains, Cerbului Valley, Prahova County, 2175-2200 m altitude, 45° 26' 15" N / 25° 27' 38" E coordinate, leg. S. Ștefănuț, 11 July 1999, det. S. Ștefănuț, 2003 [BUCA B948, B949, B950, B951, B952].

Results and discussions

The presence of *Asterella gracilis* in Romania was uncertain during the last century, because the single report of this species was in 1915, from the lower part of Cerbului Valley alpine zone, Bucegi Mountains, leg. Radian S.Ș., 28 June 1911 (7). In the paper of Papp (1967) and Mohan (1998) the samples from Cerbului Valley are replaced, by mistake, with *Asterella saccata* (Wahlenb.) A. Evans (*Fimbriaria fragans* Nees and *F. saccata* Nees) (4,6).

During my researches in the glacial rings of Bucegi Mountains in summer 1999, I collected some interesting liverworts samples. In 2003, when I revising the samples collected from Bucegi Massif, I found, besides a species new to Romania, the fertile liverwort *Asterella gracilis*.

The features of *Asterella gracilis* collected from Romania are:

Plants green with deep purplish undersides and margins; branching dichotomous; thallus segments 0.5-1.5 cm long × 2,5 mm wide; the dorsal surface canaliculated; epidermal cells 20 × 25 μm, thin walled, trigones small; air pores surrounded by 1-2 (3) rings of (5) 6-8 cells; chlorophyllose tissue 1/2 – 2/3 of the thallus thickness at its centre; ventral scales large, purplish, with 1-2 lanceolate appendages.

Paroecious plants; androecia purplish groups of papillae posterior to base of gynoecial stalk; stalk purplish, naked, 1 cm long, at base (450) 500 μm width × (200) 250 μm width at summit, base with inconspicuous, subulate, deciduous scales, 0.5 mm long;

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carpocephala hemisphaeric, 2 mm across, 2-4 lobed below; pseudoperianths colorless, short, with 8 segments which remain connate apically until the spores are nearly mature, segments narrowly lanceolate, 2,5 mm long, free with age; capsules yellowish-brown, dehiscing by a operculum; spores yellow, 50 µm in diametre, the surfaces punctate-granulose, the areolae 9-12 µm wide; elaters yellowish, 2-3 spiral medially, 200 µm long.

The species is present in Iceland, Norway, Sweden, Finland, France, Germany, Poland, Switzerland, Austria, Czech Republik, Slovakia, Spain, Italy, Slovenia, Bosnia-Herzegovina, Macedonia, Romania, North Russia, East Russia and North Caucasus (9).

In Romania, three species of genus *Asterella* P. Beauv. exist: *A. gracilis* (F. Weber) Underw. (syn. *Marchantia pilosa* F. Weber, *Fimbriaria pilosa* Taylor), *A. lindenbergiana* (Corda ex Nees) Arnell (syn. *Fimbriaria lindenbergiana* Corda ex Nees) and *A. saccata* (Wahlenb.) A. Evans (syn. *Fimbriaria fragrans* Nees) (1,2,3,9).

Key of *Asterella* species, reported from Romania:

- 1a. Spores not alveolate, 90-100 µm; ventral scales longly projecting beyond the thallus margin at the apex; pseudoperianth with segments not free at maturity ***A. saccata***
- 1b. Spores alveolate; ventral scales not longly projecting beyond the thallus margin at the apex **2**
- 2a. Spores yellow, 50-60 µm; pseudoperianth divided into 6-8 lobes free at maturity ***A. gracilis***
- 2b. Spores red-violet, 60-90 µm pseudoperianth divided into 16 lobes not free at maturity... ***A. lindenbergiana***

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**PHYTOCÉNOSES DE L'ORDRE
QUERCETALIA PUBESCENTIS Br.-Bl. 1931 em Soó 1964
SUR LE TERRITOIRE MOLDAVE (ROUMANIE)**

CHIFU T. *, SÂRBU I. **, ȘTEFAN N. *

Résumé: on analyse les principales unités cénotaxonomiques mentionnées dans la littérature de spécialité, pour clarifier l'appartenance phytosociologique des associations de l'ordre *Quercetalia pubescentis* sur le territoire Moldave.

Ainsi, on a identifié et décrit les associations suivantes: *Piptapthero virescentis-Quercetum dalechampii* Chifu, Sârbu et Ștefan 1998, *Tilio tomentosae-Quercetum dalechampii* Sârbu 1979, *Aro orientalis-Quercetum pedunculiflorae* ass. nova et *Fraxino angustifoliae-Quercetum pedunculiflorae* Chifu, Sârbu et Ștefan 1998.

Summary: in this paper we are analysing the main coenotaxonomic units mentioned in the specialists literature in order to clarify the phytosociological classification of the *Quercetalia pubescens* orderphytocoenosys on the Moldavian territory.

We have here by identified and described the following plant associations: *Piptapthero virescentis - Quercetum dalechampii* Chifu, Sârbu et Ștefan 1998, *Tilio tomentosae - Quercetum dalechampii* Sârbu 1979, *Aro orientalis - Quercetum pedunculiflorae* ass. nova et *Fraxino angustifoliae - Quercetum pedunculiflorae* Chifu, Sârbu et Ștefan 1998.

Le territoire étudié est situé dans la partie nord-est de la Roumanie, et correspond à un relief de plaine et de plateau, la Plaine Moldave et le Plateau du Bârlad, ayant des altitudes qui ne dépassent pas 300 m.

Du point de vue climatique, le territoire se caractérise par des températures moyennes annuelles de 8-10 °C et par des précipitations atmosphériques moyennes annuelles de 400-550 mm. Les sols les plus fréquents sont des sols gris forestiers et bruns argilliques.

Biogéographiquement, la zone étudiée appartient, pour sa plus grande partie, à la région euro-sibérienne, au domaine médio-européen, qui se trouve en contact avec la région ouest-asiatique, représentée par le domaine pontique-sarmatique (1).

En ce qui concerne la zonalité latitudinale de la végétation, le territoire étudié correspond, pour sa grande partie, à la zone de steppe à forêt, ainsi qu' à la zone forestière, sous-zone des chênes mésophiles (10).

Par conséquent, on a constaté que la flore des cormophytes de ce territoire il y a une série d'éléments orientaux:

- **pontiques:** *Asparagus tenuifolius*, *Cleistogenes bulgarica*, *Dianthus membranaceus*, *Galium octonarium*, *Iris aphylla* ssp. *hungarica*, *Syrenia cana*, *Quercus pedunculiflora*, *Vinca herbacea* etc.

- **pontiques-méditerranéens:** *Achillea coarctata*, *Althaea cannabina*, *Anthriscus cerefolium* ssp. *trichosperma*, *Arum orientale*, *Cephalaria transsylvanica*, *Cornus mas*, *Coronilla varia*, *Cotinus coggygria*, *Glechoma hirsuta*, *Lathyrus venetus*,

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Melica picta, *Pyrus elaeagrifolia*, *Rosa gallica*, *Scutellaria altissima*, *Stachys germanica*, *Vitis sylvestris* etc.

- **pontiques-panoniques:** *Fraxinus angustifolia*, *Inula germanica*, *Potentilla patula* etc.

- **pontiques-balcaniques:** *Ajuga laxmannii*, *Asparagus verticillatus*, *Bupleurum affine*, *Chamaecytisus austriacus*, *Euphorbia nicaeensis*, *Iris variegata*, *Mercurialis ovata*, *Polygonatum latifolium*, *Verbascum speciosum* etc.

En plus, dans ce territoire on a constaté la présence de toute une série d'éléments méridionaux:

- méditerranéens: *Ballota nigra*, *Calamintha sylvatica*, *Carex brevicolis*, *Carpinus orientalis*, *Geranium sanguineum*, *Herniaria incana*, *Lychnis coronaria*, *Peucedanum officinale*, *Physalis alkekengi*, *Piptatherum virescens*, *Quercus dalechampii*, *Quercus pubescens*, *Quercus virgilliana*, *Teucrium chamaedrys*, *Vicia angustifolia*, *Viola alba* etc.

- balcaniques: *Digitalis lanata*, *Fritillaria orientalis*, *Galanthus elwesii*, *Melica ciliata*, *Paeonia peregrina*, *Pulsatilla montana*, *Symphytum ottomanum* etc.

- balcaniques-panoniques: *Tilia tomentosa* etc.

Il faut ajouter, aussi, le fait que dans la flore de cette zone il y a de nombreux éléments euro-asiatiques, européens et central-européens, ayant un aréal subméditerranéen: *Aristolochia clematitis*, *Asparagus officinalis*, *Astragalus glycyphyllos*, *Brachypodium sylvaticum*, *Buglossoides purpureo-coeruleum*, *Campanula persicifolia*, *Cephalanthera damasonium*, *Clematis vitalba*, *Cruciata glabra*, *Euphorbia amygdaloides*, *Fallopia dumetorum*, *Ligustrum vulgare*, *Melica nutans*, *Moehringia trinervia*, *Polygonatum odoratum*, *Pyrethrum corymbosum*, *Rubus caesius*, *Sorbus torminalis*, *Staphyllea pinnata*, *Viburnum lantana*, *Vincetoxicum hirundinaria* etc.

On remarque, aussi, que certains des éléments orientaux et méridionaux se trouvent à la limite nord de leur aréal dans cette partie de la Roumanie, dont on peut citer: *Cotinus coggygria*, *Carpinus orientalis*, *Piptatherum virescens*, *Symphytum ottomanum*, *Quercus pubescens*, *Quercus virgiliana*, *Sorbus domestica* etc.

On peut donc affirmer que tout cela imprime une certaine spécificité à la végétation, qui diffère sensiblement du reste du territoire roumain.

Il faut ajouter que le territoire en question a été bien étudié du point de vue floristique et phytosociologique (2, 4-9, 11-18), mais presque toutes les recherches réalisées jusqu'à présent ont indiqué le fait que les phytocénoses forestières sont constituées de *Quercus petraea* et *Quercus robur* et sporadiquement de *Quercus dalechampii* et *Quercus pedunculiflora*. Mais, on a constaté qu'en réalité le fond phytocénotique de ces forêts est réalisé par *Quercus dalechampii* et que *Quercus pedunculiflora* est beaucoup plus fréquent, celui-ci constituant des phytocénoses caractéristiques, lui aussi.

C'est pourquoi, par nos recherches, on désire apporter les clarifications nécessaires et identifier les associations correspondantes.

Ainsi, dans cet ouvrage on décrit quatre associations avec certaines sous-associations, qui appartiennent à la classe *Quercetalia pubescentis* Doing-Kraft ex Scamoni et Passarge 1959, à l'ordre *Quercetalia pubescentis* Br.-Bl. 1931 em Soó 1964 et à l'alliance *Quercion pubescenti-petraeae* Br.-Bl. 1931 em Tx 1931, dont certaines ont été présentées à Camerino au XXVIII^{ème} Colloque de Phytosociologie (3).

Il faut ajouter encore, que du point de vue phytosociologique la composition floristique de ces associations reflète l'interférence des espèces caractéristiques des classes *Quercetalia pubescentis* et *Quercetalia pubescentis* et *Quercetalia pubescentis*.

Ass. *Piptapthero virescentis* – *Quercetum dalechampii* Chifu, Sârbu et Ștefan 1998

(Tableau 1, rel. 1-20)

C'est une associations régionale, qui a été identifiée, jusqu'à présent, dans la réserve naturelle Roșcani et dans la forêt Rădeni, sur des versants faiblement inclinés (3-5 degrés) ou sur des terrains plans, à une exposition prédominante est et ouest et à une altitude de 170-220 m.

La composition floristique de l'association est relativement riche en espèces (100-105 espèces), dont les éléments orientaux et méridionaux représentent presque 25%.

La strate arborescente a une hauteur de 15-18 m et un recouvrement moyen de 75%, la strate arbustive est assez faiblement développée, ayant un recouvrement moyen de 5-6%, constituées surtout d'*Acer tataricum* et la strate herbacée est assez riche en espèces, ayant un recouvrement moyen de plus de 50%.

Du point de vue écologique l'association est constituée par des éléments méso- et mésoxérophiles, neutrophiles et mésotrophes.

L'analyse de la composition floristique et écologique a permis la séparation des deux sous-associations:

- *Piptapthero virescentis* – *Quercetum dalechampii quercetosum dalechampii* Chifu, Sârbu et Ștefan 1998 (tableau 1, rel. 1-10), sous-association typique, qui réunit les phytocénoses les plus riches en espèces, à une composition floristique homogène et sans espèces différentielles;

- *Piptapthero virescentis* – *Quercetum dalechampii carpinetosum orientalis* (Horeanu 1981) Chifu, Sârbu et Ștefan 1998 (tableau 1, rel. 11-20), dans laquelle *Carpinus orientalis* joue un rôle cénotique significatif, ainsi que d'autres espèces différentielles – *Asparagus tenuifolius* et *Buglossoides purpureo-coeruleum* et ayant un caractère plus thermophile et mésoxérophile. Cette sous-association a été mentionnée dans la réserve naturelle Roșcani (8) mais comme sous-association de l'association *Quercus petraea-Carpinetum* Soó et Pócs 1957.

Ass. *Tilio tomentosae* – *Quercetum dalechampii* Sârbu 1979

(tableau 2, rel. 1-20)

Cette association a une répartition plus large dans les Collines de Fălciu et le Plateau du Covurlui (18), sur des terrains plans ou des versants faiblement inclinés (3-5 degrés), à une exposition prédominante est-nord-est et ouest-sud-ouest et une altitude de 200-280 m.

La composition floristique est riche en espèces (150-160 espèces), dont les éléments orientaux et méridionaux représentent plus de 25%.

La strate arborescente a une hauteur réduite, de 10-15 m et le recouvrement de la strate arbustive a des valeurs quelquefois de 40-50%. Par contre, la strate herbacée a un recouvrement relativement faible, de 15% en moyenne.

Du point de vue écologique, l'association est constituée par des éléments mésophiles et mésoxérophiles, faiblement acido-neutrophiles et mésotrophes.

L'association est représentée par deux sous-associations:

- *Tilio tomentosae* – *Quercetum dalechampii quercetosum dalechampii* Chifu, Sârbu et Ștefan 1998 (tableau 2, rel. 1-10), à une composition floristique homogène et sans espèces différentielles;

• *Tilio tomentosae* – *Quercetum dalechampii cotinetosum coggygriae* Sârbu 1979 dans laquelle *Cotinus coggygia* joue un rôle cénotique important ainsi que d'autres espèces différentielles – *Sorbus domestica* et *Viola hirta*. La sous-association a un caractère plus thermophile, mésoxérophile et a été mentionnée dans la réserve naturelle Ceornohal (7) mais comme la sous-association de l'association *Quercus petraeae* – *Carpinetum* Soó et Pócs 1957.

Ass. *Aro orientalis* – *Quercetum pedunculiflorae* ass. nova
(tableau 2, rel. 1-20)

L'association a été identifiée dans la forêt Roșcani, à une altitude de 180-210 m, sur des versants faiblement inclinés (5-10 degrés) et à une exposition prédominante ouest.

La composition floristique est riche en espèces (115-120 espèces) dont les éléments orientaux et méridionaux représentent presque 20% et les espèces caractéristiques sont *Arum orientale* et *Carex brevicolis*.

La structure verticale de l'association montre que la strate arborescente est constituée surtout de *Quercus pedunculiflora* et *Quercus robur*, ayant une hauteur de 18-20 m et un recouvrement moyen de 75%. La strate arbustive est relativement bien développée, ayant un recouvrement de 15-20%, dans laquelle participent surtout les espèces *Acer tataricum*, *Sambucus nigra*, *Crataegus monogyna* etc. On remarque, aussi, la strate herbacée qui a un recouvrement très élevé (505 en moyen), dans laquelle *Carex brevicolis* est prédominante.

Du point de vue écologique l'association se caractérise par des éléments mésophiles, faiblement acido-neutrophiles et mésotrophes.

Ass. *Fraxino angustifoliae* – *Quercetum pedunculiflorae* Chifu, Sârbu et Ștefan 1998
(tableau 3, rel. 11-20)

C'est une association répandue dans la vallée du Prut, identifiée dans la réserve naturelle Madeleni, une altitude de 50-70 m, sur des terrains plans.

La composition floristique, riche en espèces, montre l'existence d'un noyau d'espèces qui appartiennent à l'alliance *Alno* – *Ulmion* (*Rubus caesius*, *Galium aparine*, *Festuca gigantea*, *Arctium nemorosum* etc) et la présence de nombreuses espèces caractéristique à la classe *Quercus-Fagetea*.

La strate arborescente est constituée surtout de *Quercus pedunculiflora*, à laquelle s'ajoutent *Quercus robur*, *Fraxinus angustifolia*, *Fraxinus excelsior*, *Ulmus procera*, *Ulmus minor*, *Acer campestre* etc, ayant une hauteur de 22-25 m. La strate arbustive est assez bien développée, les espèces *Rubus caesius*, *Swida sanguinea*, étant bien représentées. De même, la strate herbacée réalise un recouvrement important, de 50% en moyenne.

Du point de vue écologique l'association se caractérise par des éléments mésohygro- et mésophiles, neutrophiles et mésotrophes.

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Tableau 1
Ass. Piptapthero virescenti – Quercetum dalechampii

Sous-association	quercetosum dalechampii										carpinetosum orientalis										K
Numéro du relevé	1	2	3	4	5	6 ⁸	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Altitude (m.s.m.)	200	210	215	215	200	190	190	200	210	180	170	175	180	190	200	185	195	215	210	190	
Exposition	E	E	-	-	V	V	-	-	V	V	E	E	E	E	E	S	S	SV	-	-	
Pente (degrés)	5	5	-	-	5	5	-	-	5	5	5	5	10	5	5	5	5	5	-	-	
Recouvrement de la strate arborescente %	80	70	80	70	80	70	70	75	80	75	70	75	70	80	75	70	70	70	70	80	
Recouvrement de la strate arbustive %	30	15	5	5	-	5	-	-	-	-	5	5	-	-	-	30	15	5	5	-	
Recouvrement de la strate herbacée %	45	65	70	60	60	80	60	50	40	45	60	50	35	70	60	35	35	30	30	50	
Caract. d'ass.																					
Carex pairei	-	+	-	-	+	+	+	+	+	+	-	+	+	+	-	+	-	+	+	-	III
Piptaptherum virescens	+	+	+	+	1	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	V
Ulmus procera	+	+	+	+	+	+	+	+	+	+	-	-	+	-	+	+	-	+	+	+	IV
Diff. de la sous-ass. carpinetosum orientalis																					
Asparagus tenuifolius	-	-	+	-	-	+	-	+	+	+	-	-	+	-	-	+	+	-	+	+	III
Buglossoides purpureo-coeruleum	+	-	-	-	+	+	+	-	-	-	+	+	-	-	+	+	+	+	-	+	III
Carpinus orientalis	-	-	-	-	-	-	-	-	-	-	2	3	1	+	+	1	1	1	+	1	III
Quercion pubescenti-petreae																					
Acer tataricum	1	1	+	+	+	+	+	+	+	+	1	+	+	+	+	2	1	1	+	+	V
Carex brevicolis	+	1	4	3	3	4	3	3	3	3	3	2	3	3	3	2	2	2	3	3	V
Cruciata glabra	+	-	+	-	+	+	+	-	+	-	-	-	-	+	-	+	-	+	-	-	II
Melica picta	+	-	-	+	-	+	+	-	+	+	+	+	+	+	+	+	+	-	+	+	IV
Lathyrus niger	+	+	-	+	-	+	+	-	+	+	-	+	-	+	-	+	+	-	+	-	III
Primula veris	+	-	+	-	-	+	-	+	-	-	-	+	-	-	+	-	-	+	-	+	II
Vicia cassubica	+	-	-	-	-	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-	I
Viola suavis	-	-	+	-	-	+	-	-	+	-	-	-	-	+	-	-	+	-	-	-	II
Quercetalia pubescentis																					
Arum orientale	+	-	-	+	-	+	-	+	-	+	+	-	+	+	-	+	+	+	+	+	III
Asparagus officinalis	+	+	-	+	+	+	+	-	-	+	+	-	-	+	-	+	+	+	-	-	III
Campanula persicifolia	+	-	-	+	-	+	-	-	-	-	+	-	-	-	-	+	-	-	-	-	II
Coronilla varia	+	-	-	+	-	+	-	-	+	-	-	-	-	-	-	-	+	-	-	-	I
Fragaria viridis	-	-	+	-	-	+	-	+	-	-	-	-	+	+	+	-	-	-	+	-	II

<i>Sorbus torminalis</i>	+	+	-	-	-	+	-	-	-	-	-	-	-	-	+	-	-	-	-	I
<i>Vincetoxicum hirundinaria</i>	-	-	-	+	-	+	-	+	-	-	-	-	-	+	-	-	+	-	-	I
<i>Viola hirta</i>	+	+	+	+	-	+	+	-	+	+	+	+	-	-	+	+	+	+	+	IV
<i>Prunetalia</i>																				
<i>Prunus spinosa</i>	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	I
<i>Rosa canina</i>	+	-	-	-	+	-	-	-	-	-	+	-	+	+	+	-	-	+	-	II
<i>Rosa corymbifera</i>	-	-	+	-	-	-	+	-	+	-	-	-	+	-	+	-	-	+	-	II
<i>Veronica chamaedrys</i>	-	-	-	-	+	-	-	-	-	-	-	+	-	-	-	-	+	-	-	I
<i>Quercetea pubescentis</i>																				
<i>Agrimonia eupatoria</i>	+	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	I
<i>Astragalus glycyphyllos</i>	-	-	+	-	-	+	+	-	-	+	-	-	-	-	-	+	-	-	+	III
<i>Bromus benekenii</i>	-	-	+	-	+	+	-	+	-	-	+	-	+	-	+	-	+	-	+	III
<i>Clinopodium vulgare</i>	-	+	-	+	-	+	+	-	-	+	-	-	-	-	+	-	-	-	-	II
<i>Cornus mas</i>	2	+	+	-	-	+	-	+	+	+	-	-	-	-	-	-	-	+	+	III
<i>Euonymus verrucosus</i>	+	+	+	-	+	+	-	-	+	+	+	-	-	+	+	-	+	-	+	III
<i>Polygonatum odoratum</i>	+	+	-	-	+	+	+	-	-	+	-	-	-	-	-	+	+	-	-	II
<i>Pyrethrum corymbosum</i>	-	-	+	-	-	+	-	+	-	-	-	-	-	-	-	-	-	-	-	I
<i>Quercus dalechampii</i>	4	4	2	3	3	3	4	4	4	4	3	2	3	3	3	3	3	3	3	V
<i>Quercus pedunculiflora</i>	-	-	-	-	-	+	-	-	-	-	+	-	+	-	-	-	-	-	-	I
<i>Rhamnus cathartica</i>	-	-	-	+	-	-	-	+	-	-	-	-	-	-	+	-	+	+	-	II
<i>Sedum maximum</i>	-	-	-	-	+	+	-	+	-	-	-	-	-	-	-	-	-	-	-	I
<i>Scutellaria altissima</i>	+	+	+	-	+	+	+	+	-	+	+	-	-	+	-	-	-	+	-	III
<i>Viburnum lantana</i>	+	-	+	-	+	+	+	-	+	-	+	-	+	-	+	+	-	+	-	III
<i>Lathyro hallersteinii-Carpinetum</i>																				
<i>Carex pilosa</i>	+	-	-	-	-	-	-	+	-	-	+	-	-	+	-	-	-	-	+	II
<i>Carpinus betulus</i>	+	-	-	-	+	+	-	-	+	-	-	-	-	+	+	-	+	-	+	III
<i>Cerasus avium</i>	-	+	-	-	-	+	-	+	-	-	-	-	-	-	-	+	-	-	+	I
<i>Dactylis polygama</i>	-	-	-	-	+	-	-	-	-	-	-	-	+	+	+	-	+	-	-	I
<i>Galium schultesii</i>	+	2	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	I
<i>Stellaria holostea</i>	1	+	1	+	+	+	1	+	+	+	1	1	1	1	2	1	1	+	1	V
<i>Tilia cordata</i>	-	1	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	I
<i>Alno-Padion</i>																				
<i>Alliaria petiolata</i>	-	-	+	-	-	-	-	-	-	-	+	-	-	-	+	-	+	+	+	II
<i>Arctium nemorosum</i>	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	+	I
<i>Galium aparine</i>	+	-	+	-	-	-	+	+	-	-	+	-	+	+	-	+	-	+	-	III
<i>Lysimachia nummularia</i>	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	I
<i>Roegneria canina</i>	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-	-	I
<i>Sambucus nigra</i>	+	-	+	+	-	-	-	-	+	-	-	-	+	-	-	-	+	-	-	II
<i>Stachys sylvatica</i>	-	-	+	-	-	+	-	+	-	-	-	-	-	-	-	-	-	-	-	I

Fagetalia																					
<i>Acer platanoides</i>	+	-	+	+	-	-	-	+	-	-	-	+	-	-	-	-	-	-	-	-	II
<i>Asarum europaeum</i>	1	1	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	I
<i>Euphorbia amygdaloides</i>	+	-	+	-	+	+	+	-	-	+	+	-	+	-	-	-	+	+	-	+	III
<i>Galeobdolon luteum</i>	+	-	-	-	+	-	-	-	+	-	-	-	-	-	-	+	-	-	-	-	I
<i>Geranium robertianum</i>	+	+	+	+	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	II
<i>Lamium maculatum</i>	-	+	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	I
<i>Lathyrus venetus</i>	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	I
<i>Melandrium nemorale</i>	-	-	+	-	+	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	I
<i>Mercurialis perennis</i>	+	+	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	I
<i>Milium effusum</i>	-	+	-	-	+	+	-	+	-	-	-	-	-	-	-	-	-	-	-	-	I
<i>Pulmonaria obscura</i>	+	-	+	+	+	+	+	-	+	-	-	-	-	-	-	-	-	+	-	+	III
<i>Ulmus minor</i>	+	-	+	-	-	+	-	-	-	-	-	-	-	-	-	-	+	-	+	+	II
Quercus-Fagetea																					
<i>Acer campestre</i>	1	+	+	+	+	+	+	+	+	+	-	+	+	+	+	1	1	+	+	+	V
<i>Brachypodium sylvaticum</i>	-	-	-	-	+	-	+	-	+	-	-	-	-	+	+	-	+	+	+	-	II
<i>Campanula rapunculoides</i>	-	+	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	I
<i>Carex divulsa</i>	-	-	+	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	V
<i>Carex spicata</i>	+	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	I
<i>Crataegus monogyna</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	1	+	+	+	+	V
<i>Euonymus europaeus</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	V
<i>Fraxinus excelsior</i>	1	+	+	+	+	+	+	+	+	+	-	+	1	2	2	-	-	+	2	2	V
<i>Geum urbanum</i>	+	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	+	V
<i>Glechoma hirsuta</i>	+	1	+	+	+	-	+	-	-	-	-	-	+	+	+	-	+	-	-	+	III
<i>Hedera helix</i>	-	1	+	-	-	+	+	-	+	-	-	-	-	-	-	+	+	-	+	+	III
<i>Hypericum hirsutum</i>	-	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	I
<i>Lapsana communis</i>	+	-	-	-	+	+	+	-	-	+	+	-	+	-	+	-	-	+	+	-	III
<i>Ligustrum vulgare</i>	+	-	-	-	-	-	+	-	+	+	-	-	-	+	-	+	-	-	-	-	II
<i>Malus sylvestris</i>	-	+	-	-	-	+	-	-	-	+	-	-	-	-	-	-	-	-	-	+	I
<i>Melica nutans</i>	-	-	+	+	+	-	-	+	-	+	-	-	-	+	-	-	-	-	-	+	II
<i>Melica uniflora</i>	2	-	+	1	+	+	1	+	+	+	-	-	+	1	1	1	+	+	-	-	IV
<i>Mycelis muralis</i>	-	+	+	-	-	-	-	+	-	-	-	-	-	-	+	-	-	-	-	-	I
<i>Poa nemoralis</i>	-	-	+	+	+	+	-	+	+	+	-	-	+	-	+	+	-	-	+	-	III
<i>Polygonatum latifolium</i>	+	+	1	+	+	+	+	+	+	+	-	-	+	+	+	+	+	+	+	+	V
<i>Pulmonaria officinalis</i>	-	+	+	+	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	I
<i>Pyrus pyraeaster</i>	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	I
<i>Scrophylaria nodosa</i>	-	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	I
<i>Staphyllea pinnata</i>	+	+	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	I
<i>Torilis japonica</i>	-	+	-	-	-	-	+	-	-	-	-	-	-	-	-	-	+	-	-	+	I

<i>Carex brevicolis</i>	2	3	2	-	-	+	-	+	-	+	-	-	-	-	-	-	-	-	-	-	II
<i>Chamaecytisus austriacus</i>	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	I
<i>Cruciata glabra</i>	-	+	-	-	-	+	-	+	-	-	-	-	-	+	-	-	-	+	-	-	II
<i>Cruciata laevipes</i>	-	-	-	+	-	-	-	-	+	+	-	-	-	-	-	+	-	-	+	-	II
<i>Galanthus elwesii</i>	+	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	I
<i>Lathyrus niger</i>	+	-	+	-	+	-	+	+	-	+	+	+	+	+	+	+	+	+	-	-	IV
<i>Melica picta</i>	+	-	+	-	+	-	+	+	-	+	+	+	+	-	+	+	+	-	-	+	III
<i>Nectaroscordum siculum</i>	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	I
<i>Primula veris</i>	-	+	-	+	-	-	-	+	-	+	-	-	+	-	-	+	-	-	+	-	II
<i>Vicia cassubica</i>	-	-	-	-	+	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	I
<i>Viola suavis</i>	+	+	+	+	+	-	+	+	-	+	-	-	+	-	+	-	-	+	-	-	III
<i>Quercetalia pubescentis</i>																					
<i>Arum orientale</i>	+	+	+	-	+	-	-	-	+	+	+	+	-	+	-	-	-	+	-	-	III
<i>Asparagus officinalis</i>	-	-	+	-	-	-	+	-	-	-	+	+	+	-	+	-	+	+	-	-	II
<i>Campanula persicifolia</i>	-	-	+	-	-	-	-	+	+	+	-	-	+	+	-	+	-	-	-	-	II
<i>Coronilla varia</i>	-	+	-	-	-	-	+	-	-	-	-	-	+	-	+	-	-	-	-	-	I
<i>Fragaria viridis</i>	+	-	+	-	+	-	-	+	-	+	-	-	+	-	-	-	-	+	-	+	II
<i>Lychnis coronaria</i>	-	-	+	-	-	+	-	+	-	-	-	-	-	-	-	-	-	-	-	-	I
<i>Sorbus torminalis</i>	-	-	-	-	+	-	-	-	-	-	-	-	-	+	+	+	-	+	-	-	II
<i>Vincetoxicum hirsutifolium</i>	-	-	-	-	+	+	-	-	-	+	-	-	-	+	-	-	-	-	-	-	I
<i>Viola jordanii</i>	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	I
<i>Orno-Cotinetalia</i>																					
<i>Asparagus tenuifolius</i>	-	+	+	-	+	+	-	+	+	+	-	-	+	+	-	+	+	-	-	+	III
<i>Piptopterum virescens</i>	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	I
<i>Prunetalia</i>																					
<i>Crataegus pentagyna</i>	-	-	-	+	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	I
<i>Prunus spinosa</i>	-	-	+	-	-	-	-	+	-	-	+	+	+	+	+	-	+	+	-	+	III
<i>Rosa canina</i>	-	-	+	+	-	-	+	+	+	+	-	-	+	-	-	-	-	+	+	-	III
<i>Swida sanguinea</i>	-	-	-	-	+	-	+	-	+	-	-	-	-	-	-	-	+	-	-	-	I
<i>Veronica chamaedrys</i>	+	+	+	-	+	-	-	+	-	+	-	-	+	-	-	-	-	-	+	-	II
<i>Quercetalia pubescentis</i>																					
<i>Agrimonia eupatoria</i>	+	-	-	+	-	+	-	-	-	-	-	-	+	-	-	-	+	-	-	-	II
<i>Astragalus glycyphyllos</i>	+	-	-	-	-	+	-	+	-	+	-	-	-	+	-	-	-	-	-	+	II
<i>Brachypodium pinnatum</i>	-	-	-	-	-	+	-	-	-	+	-	-	-	-	-	-	-	-	-	-	I
<i>Bromus benekenii</i>	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	+	-	+	I
<i>Buglossoides purpureo-coeruleum</i>	-	-	-	+	-	+	-	-	+	+	+	+	-	-	-	-	-	+	+	-	II
<i>Cephalanthera damasonium</i>	-	+	-	+	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	I
<i>Clinopodium vulgare</i>	+	+	+	+	-	+	-	+	-	-	+	+	-	-	-	+	+	-	-	+	III

<i>Cornus mas</i>	+	+	+	1	+	-	+	+	+	+	+	+	-	+	-	+	+	+	+	1	V
<i>Euonymus verrucosus</i>	+	-	-	+	-	-	+	-	+	+	-	-	+	-	-	+	+	-	-	+	III
<i>Polygonatum odoratum</i>	-	+	+	+	+	-	-	-	+	+	-	-	-	-	-	+	+	-	-	-	II
<i>Pyrethrum corymbosum</i>	-	-	+	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	I
<i>Quercus dalechampii</i>	2	3	2	3	4	4	4	3	4	3	4	5	3	4	5	5	4	4	4	5	V
<i>Quercus pedunculiflora</i>	-	-	+	-	+	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	I
<i>Quercus pubescens</i>	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	I
<i>Quercus virgiliana</i>	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	I
<i>Rhamnus cathartica</i>	-	-	-	-	-	-	-	+	-	+	-	-	-	+	-	-	-	-	-	-	I
<i>Scutellaria altissima</i>	+	-	+	-	+	+	+	+	-	+	+	+	+	+	+	+	+	+	+	+	V
<i>Sedum maximum</i>	-	-	-	-	+	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	I
<i>Teucrium chamaedrys</i>	-	-	-	-	+	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	I
<i>Trifolium alpestre</i>	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	I
<i>Viburnum lantana</i>	+	+	+	-	+	+	+	-	+	+	+	+	+	+	+	+	+	+	+	+	V
<i>Lathyro hallersteinii-Carpinion</i>																					
<i>Campanula trachelium</i>	-	-	-	-	-	+	+	-	+	-	-	-	-	-	-	-	-	-	-	-	I
<i>Carex pilosa</i>	-	-	-	-	-	+	-	-	-	+	-	-	-	-	-	-	-	-	-	-	I
<i>Carpinus betulus</i>	+	-	+	+	+	+	+	-	+	+	-	-	+	+	-	-	+	-	-	-	III
<i>Cerasus avium</i>	+	+	-	-	-	+	+	-	-	+	1	+	+	+	+	+	1	1	1	-	IV
<i>Dactylis polygama</i>	+	+	+	-	+	+	-	+	-	+	-	-	+	-	-	+	-	-	-	+	III
<i>Galium schultesii</i>	-	-	-	+	+	+	-	+	-	+	1	+	+	-	-	+	+	+	-	-	III
<i>Ranunculus cassubicus</i>	-	+	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	I
<i>Stellaria holostea</i>	+	-	+	-	+	+	-	+	+	+	+	+	1	1	+	1	1	1	1	-	IV
<i>Tilia cordata</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	I
<i>Vicia pisiiformis</i>	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	I
<i>Alno-Padion</i>																					
<i>Alliaria petiolata</i>	-	-	-	-	+	-	+	+	-	-	-	-	-	-	-	-	-	+	-	-	I
<i>Arctium nemorosum</i>	-	-	-	-	-	+	-	+	-	+	-	-	-	-	-	+	-	-	-	-	I
<i>Galeopsis speciosa</i>	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	I
<i>Galium aparine</i>	+	+	+	+	+	-	+	+	-	+	-	-	+	-	+	-	-	+	-	+	III
<i>Lysimachia nummularia</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	I
<i>Sambucus nigra</i>	-	-	-	-	-	-	+	-	+	+	-	-	-	+	-	-	-	+	+	-	II
<i>Stachys sylvatica</i>	-	-	-	-	+	+	-	+	-	-	-	-	-	-	-	-	-	-	-	-	I
<i>Thalictrum aquilegifolium</i>	-	-	-	+	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	I
<i>Urtica dioica</i>	-	-	-	+	-	+	+	+	-	+	+	+	-	+	+	+	+	-	+	+	IV
<i>Fagetalia</i>																					
<i>Acer platanoides</i>	+	+	-	-	+	+	-	+	-	+	-	-	+	-	+	-	-	-	-	+	III
<i>Ajuga reptans</i>	-	-	-	+	-	-	-	+	-	+	-	-	-	-	-	+	+	+	-	-	II
<i>Allium ursinum</i>	+	+	-	-	-	+	-	-	-	-	-	-	-	+	-	-	-	-	-	-	I

<i>Asarum europaeum</i>	-	-	-	-	-	+	-	-	+	-	-	-	-	+	-	-	+	+	-	-	II
<i>Carex sylvatica</i>	-	-	-	-	-	-	-	+	-	+	-	-	-	-	-	-	-	-	-	-	I
<i>Corydalis solida</i>	-	-	+	-	-	-	-	-	+	-	-	-	-	+	-	-	-	-	-	-	I
<i>Corydalis cava</i>	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	I
<i>ssp. marschalliana</i>																					
<i>Dentaria bulbifera</i>	-	-	-	-	+	+	-	+	+	-	-	-	+	-	-	-	+	-	-	-	II
<i>Epilobium montanum</i>	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	I
<i>Euphorbia amygdaloides</i>	+	+	+	+	+	+	+	+	+	+	-	-	-	-	+	-	-	-	-	-	III
<i>Galeobdolon luteum</i>	-	-	-	-	-	+	-	-	-	+	-	-	+	-	-	+	-	+	-	-	II
<i>Galium odoratum</i>	-	-	-	+	+	+	-	-	-	-	+	+	-	-	-	-	-	-	+	-	II
<i>Geranium robertianum</i>	-	-	-	-	-	+	+	+	-	+	-	+	-	-	-	+	-	-	-	+	II
<i>Hordelymus europaeus</i>	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	I
<i>Lamium maculatum</i>	-	-	-	-	-	+	-	-	-	+	-	+	-	+	-	-	-	-	-	-	I
<i>Lathyrus vernus</i>	+	+	+	-	-	-	-	-	+	+	-	-	-	+	-	-	-	+	-	-	II
<i>Mercurialis perennis</i>	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	II
<i>Milium effusum</i>	-	-	-	-	-	+	-	-	-	+	+	+	-	-	-	-	-	-	-	-	I
<i>Platanthera bifolia</i>	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	I
<i>Sanicula europaea</i>	-	-	-	-	-	+	-	-	+	-	-	-	-	-	-	-	-	-	-	-	I
<i>Tilia platyphyllos</i>	+	+	+	+	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	II
<i>Ulmus glabra</i>	-	+	-	-	-	+	+	-	-	+	-	-	-	-	+	-	-	-	-	-	II
<i>Ulmus minor</i>	-	-	-	+	-	-	-	-	+	-	+	-	+	-	-	-	-	-	-	-	I
Quercu-Fagetea																					
<i>Acer campestre</i>	+	+	+	-	+	+	+	+	-	+	+	-	+	+	-	+	+	+	-	+	IV
<i>Brachypodium sylvaticum</i>	+	+	+	+	+	+	-	+	-	+	+	+	-	-	-	+	+	+	-	-	IV
<i>Campanula rapunculoides</i>	+	+	+	+	-	-	-	-	+	+	+	+	+	-	-	-	-	-	+	+	III
<i>Carex divulsa</i>	+	-	-	+	-	-	+	-	+	-	-	-	-	+	-	-	-	-	-	-	II
<i>Convallaria majalis</i>	-	+	+	-	-	-	-	+	+	+	+	+	+	+	-	-	-	+	+	+	III
<i>Corylus avellana</i>	-	-	-	+	-	-	+	-	-	-	+	+	+	-	-	-	-	-	+	+	II
<i>Crataegus monogyna</i>	+	+	+	1	+	-	-	+	+	+	+	+	-	-	+	1	+	+	+	+	IV
<i>Epipactis helleborine</i>	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	I
<i>Euonymus europaeus</i>	-	-	-	-	-	+	-	+	-	+	+	+	+	+	-	+	+	-	+	+	III
<i>Fraxinus excelsior</i>	1	1	1	+	1	1	+	+	+	+	+	-	-	-	-	-	-	-	-	-	III
<i>Geum urbanum</i>	+	+	+	+	+	+	+	+	+	+	+	1	1	+	+	+	+	+	+	+	V
<i>Glechoma hirsuta</i>	+	+	+	+	+	+	-	+	+	+	+	+	+	-	-	+	-	-	+	+	IV
<i>Hedera helix</i>	+	+	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	+	I
<i>Lapsana communis</i>	+	+	+	+	+	+	+	+	-	-	+	+	+	+	+	+	+	+	+	-	IV
<i>Ligustrum vulgare</i>	-	-	+	-	-	+	-	-	-	+	+	+	+	+	+	+	-	+	+	-	III
<i>Malus sylvestris</i>	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	I
<i>Melica nutans</i>	-	-	+	-	-	-	+	-	-	-	-	-	-	+	-	+	-	-	-	-	I

Melica uniflora	+	+	+	+	+	+	+	1	2	1	+	+	+	+	-	-	-	+	-	IV
Moehringia trinervia	-	+	+	-	-	-	-	+	-	+	-	-	-	-	+	-	-	+	-	II
Mycelis muralis	-	-	-	-	-	+	-	-	+	+	+	-	+	+	+	-	+	-	+	III
Poa nemoralis	+	-	+	+	+	-	-	1	+	+	+	+	+	1	+	1	1	-	+	IV
Polygonatum latifolium	-	+	-	-	+	+	+	+	-	+	-	-	-	-	+	-	-	+	-	II
Pulmonaria officinalis	-	-	-	-	-	+	-	+	-	+	-	-	-	+	-	-	+	-	-	II
Pyrus pyraeaster	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	+	-	I
Ranunculus auricomus	-	+	+	-	-	-	-	-	-	+	-	-	+	-	-	-	+	-	-	II
Scrophularia nodosa	-	-	-	-	+	+	-	+	-	+	-	-	-	-	-	-	+	-	+	II
Staphyllea pinnata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	+	I
Torilis japonica	+	+	-	-	-	-	-	-	-	+	-	-	+	-	-	+	-	-	-	II
Ulmus procera	-	+	-	-	+	-	+	-	+	-	+	+	1	1	+	+	+	+	+	IV
Vicia dumerotum	+	+	-	-	-	-	-	-	+	+	+	+	-	+	-	-	-	+	-	II
Viola alba	-	+	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	I
Viola mirabilis	-	-	+	-	-	-	+	-	-	-	+	-	+	+	-	-	-	-	-	II
Viola reichenbachiana	+	+	-	+	+	+	+	+	-	+	+	+	-	-	+	+	-	+	-	IV
Trifolio-Geranietea s.l.																				
Betonica officinalis	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	I
Galium verum	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	I
Hypericum perforatum	-	-	+	+	+	-	+	+	-	-	-	-	-	-	+	-	-	-	-	II
Lactuca quercina	-	-	+	-	-	+	-	-	+	-	-	-	-	-	-	+	-	-	-	I
Melandrium album	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	I
Origanum vulgare	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	I
Stachys germanica	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	I
Valeriana wallrothii	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	I
Epilobietea																				
Chaerophyllum temulum	+	-	-	+	-	+	-	-	-	-	-	-	+	-	-	-	+	+	-	II
Fallopia dumetorum	+	+	+	+	+	+	+	+	+	-	+	+	+	+	-	+	+	+	-	IV
Chenopodietea s.l.																				
Ballota nigra	-	-	-	-	-	-	-	-	-	-	+	+	-	+	-	+	+	+	+	II
Geranium pusillum	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	I
Sonchus arvensis	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	I
Stellaria media	+	+	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	I
Artemisietea																				
Anthriscus cerefolium	-	+	+	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	I
ssp. trichosperma																				
Festuco-Brometea																				
Achillea setacea	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	I
Artemisia austriaca	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	I

<i>Euphorbia cyparissias</i>	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	I
<i>Euphorbia nicaeensis</i>	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	I
<i>Phleum phleoides</i>	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	I
<i>Potentilla patula</i>	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	I
<i>Poa angustifolia</i>	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	I
<i>Silene vulgaris</i>	-	-	-	-	-	-	-	+	-	+	-	-	-	-	-	-	-	-	-	-	I
<i>Verbascum phoenicum</i>	-	-	-	-	+	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	I
<i>Vinca herbacea</i>	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	I

Lieu et date des relevés: 1-3 = forêt Talasmani; 4-7 forêt Adam; 8-10 = forêt Fundeanu: 26-27.VIII.1996

11-20 = Ceomohal: 15.VIII.1997, 27.VII.1998

Tableau 3
Ass. *Aro orientalis* – *Quercetum pedunculiflorae* et *Fraxino angustifoliae* – *Quercetum pedunculiflorae*

Association	A. <i>Aro orientalis</i> – <i>Quercetum pedunculiflorae</i>										K	B. <i>Fraxino angustifoliae</i> – <i>Quercetum pedunculiflorae</i>										K
Numéro du relevé	1	2	3*	4	5	6	7	8	9	10		11*	12	13	14	15	16	17	18	19	20	
Altitude	180	190	200	185	205	195	200	175	180	185		60	50	55	70	65	50	50	55	65	60	
Exposition	V	V	V	V	-	-	SV	V	-	-		-	-	-	-	-	-	-	-	-	-	
Pente	10	15	-	-	-	5	10	5	-	-		-	-	-	-	-	-	-	-	-	-	
Recouvrement de la strate arborescente %	80	80	70	75	80	80	75	85	70	70	80	80	95	90	80	85	85	90	95	90		
Recouvrement de la strate arbustive %	20	15	25	20	10	5	10	15	10	15	60	30	40	25	30	35	20	25	20	20		
Recouvrement de la strate herbacée %	30	50	70	50	40	30	40	50	55	40	60	50	40	55	35	45	50	45	50	55		
Caract. d'ass. <i>Aro orientalis</i> – <i>Quercetum pedunculiflorae</i>																						
<i>Arum orientale</i>	+	-	+	-	+	+	-	+	-	+	III	-	+	+	-	-	+	-	-	+	-	II
<i>Carex brevicolis</i>	2	3	+	1	1	1	+	1	2	1	V	-	-	-	+	-	-	-	+	-	-	I
Caract. d'ass. <i>Fraxino angustifoliae</i> – <i>quercetum pedunculiflorae</i>																						
<i>Fraxinus angustifoliae</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	+	+	+	II
<i>Physalis alkekengi</i>	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	+	+	-	+	+	+	IV
<i>Rubus caesius</i>	-	-	-	-	-	-	-	-	-	-	-	1	1	1	1	1	+	2	1	1	1	V
<i>Quercion pubescenti-petraeae</i>																						
<i>Acer tataricum</i>	1	1	1	1	1	1	+	+	1	+	V	+	+	+	-	+	+	+	+	-	+	IV
<i>Calamintha sylvatica</i>	-	-	+	-	-	-	-	-	-	-	I	+	+	-	-	-	-	-	-	-	-	II
<i>Cruciata glabra</i>	+	-	-	-	+	+	-	-	-	+	II	-	-	+	-	-	-	+	-	-	-	I

<i>Lathyrus niger</i>	+	-	+	+	-	-	-	+	-	-	II	+	-	-	-	-	+	-	-	-	-	I
<i>Melica picta</i>	+	+	-	-	+	-	+	-	+	-	III	+	-	-	+	+	-	-	-	+	-	II
<i>Primula veris</i>	-	-	+	-	+	-	-	+	-	-	II	+	-	+	-	+	-	-	+	-	-	II
<i>Vicia cassubica</i>	-	-	-	+	-	-	+	-	-	+	II	-	-	-	+	-	-	-	-	+	-	I
<i>Viola suavis</i>	-	-	+	-	-	-	-	-	+	-	I	+	-	-	-	-	-	+	-	-	-	I
<i>Quercetalia pubescentis</i>																						
<i>Asparagus officinalis</i>	+	+	+	-	-	-	+	-	-	+	III	+	-	-	+	-	-	-	+	-	-	II
<i>Campanula persicifolia</i>	-	+	+	-	-	+	-	-	+	-	I	+	-	-	+	-	-	-	-	-	-	I
<i>Coronilla varia</i>	-	+	+	-	-	-	-	+	-	+	II	+	-	-	+	-	+	-	+	-	-	II
<i>Fragaria viridis</i>	+	-	+	-	-	+	-	-	-	+	II	-	-	-	-	-	-	-	-	-	-	-
<i>Sorbus torminalis</i>	+	-	+	+	-	-	+	+	-	-	III	+	-	-	-	+	-	-	-	-	-	I
<i>Vincetoxicum</i>	-	-	+	-	-	-	-	+	-	-	I	-	-	-	-	-	-	-	-	-	-	-
<i>hirundinaria</i>																						
<i>Viola hirta</i>	+	+	+	+	+	+	+	+	+	+	V	+	+	-	+	+	-	-	-	-	+	III
<i>Prunetalia</i>																						
<i>Prunus spinosa</i>	-	-	+	-	-	-	-	+	-	-	I	-	-	-	-	+	-	-	-	+	+	II
<i>Rosa canina</i>	-	-	+	-	-	+	-	-	-	-	I	+	-	-	-	-	+	+	-	-	-	II
<i>Rosa corymbifera</i>	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	+	-	-	-	-	I
<i>Swida sanguinea</i>	-	+	+	-	+	-	-	+	-	+	III	3	2	2	+	1	-	+	+	-	-	IV
<i>Quercetea pubescentis</i>																						
<i>Agrimonia eupatoria</i>	-	-	+	-	-	-	+	-	+	-	I	+	-	+	-	-	+	-	-	-	-	II
<i>Astragalus glycyphyllos</i>	-	-	+	-	-	-	-	-	+	-	I	+	-	+	+	-	+	-	+	+	-	III
<i>Bromus benekeni</i>	+	+	+	-	-	-	+	+	-	+	III	+	+	-	-	+	-	-	-	+	-	II
<i>Carex pairei</i>	+	+	-	-	+	+	-	+	+	-	III	-	-	-	-	+	-	-	-	-	-	I
<i>Clinopodium vulgare</i>	-	-	+	+	-	-	-	-	+	+	II	+	-	-	-	-	+	-	-	-	+	II
<i>Cornus mas</i>	+	-	+	-	+	-	+	-	+	-	III	+	-	-	+	+	-	+	-	+	+	III
<i>Euonymus verrucosus</i>	+	-	+	-	+	-	+	+	-	+	III	+	+	-	-	+	+	-	-	+	+	III
<i>Polygonatum odoratum</i>	-	+	+	-	-	-	+	-	-	-	II	+	-	-	+	-	-	+	-	-	-	II
<i>Pyrethrum corymbosum</i>	-	-	+	-	-	-	-	-	-	+	I	-	-	-	-	-	-	-	-	-	-	-
<i>Quercus dalechampii</i>	-	+	+	-	-	+	-	+	-	-	II	-	-	-	-	-	-	+	-	-	-	I
<i>Quercus pedunculiflora</i>	4	3	4	4	4	4	4	3	4	4	V	3	4	4	3	3	2	3	2	3	2	V
<i>Quercus robur</i>	+	-	+	+	-	-	-	+	+	-	III	+	+	+	+	+	1	+	1	+	1	V
<i>Quercus x valachica</i>	-	+	-	+	-	-	-	-	-	+	II	+	+	-	+	+	-	+	+	+	+	IV
<i>Rhamnus cathartica</i>	-	-	+	-	-	-	-	-	+	-	I	+	-	-	-	-	-	+	-	-	-	I
<i>Scutellaria altissima</i>	+	-	+	+	-	+	-	+	+	-	III	+	+	+	-	+	+	-	-	+	+	IV
<i>Sedum maximum</i>	-	-	+	-	-	-	+	-	-	-	I	-	-	-	+	-	-	-	-	-	-	I
<i>Viburnum lantana</i>	+	-	+	+	-	-	-	-	+	-	II	+	+	-	+	-	-	+	-	+	-	III

<i>Lathyro hallersteinii – Carpinion</i>																						
<i>Campanula trachelium</i>	-	-	+	-	-	-	-	+	-	-	I	+	+	-	-	+	-	-	-	+	+	III
<i>Carex pilosa</i>	+	-	-	-	-	-	-	-	-	-	I	-	-	+	-	-	-	-	-	-	-	I
<i>Carpinus betulus</i>	+	1	-	+	+	-	+	+	+	-	IV	+	-	-	+	+	-	+	-	+	+	III
<i>Cerasus avium</i>	-	-	+	-	+	-	-	+	-	-	II	-	-	-	-	+	-	-	-	-	-	I
<i>Dactylis polygama</i>	-	-	+	-	-	-	-	-	-	+	I	+	-	-	-	+	-	+	-	-	+	II
<i>Melampyrum bihariense</i>	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	+	-	+	+	+	III
<i>Stellaria holostea</i>	+	1	3	2	2	1	1	2	2	1	V	1	1	2	2	1	2	1	+	+	1	V
<i>Alno – Padion</i>																						
<i>Aegopodium podagraria</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	2	-	-	-	-	I
<i>Alliaria petiolata</i>	-	-	+	-	+	+	-	+	-	-	II	-	-	-	+	+	+	-	-	-	-	II
<i>Angelica sylvestris</i>	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	I
<i>Cirsium canum</i>	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	I
<i>Arctium nemorosum</i>	-	-	-	-	-	-	-	-	-	-	-	+	+	-	+	-	+	+	-	-	-	III
<i>Festuca gigantea</i>	-	-	-	-	-	-	-	-	-	-	-	+	+	-	+	+	+	-	-	+	-	III
<i>Filipendula ulmaria</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	I
<i>Frangula alnus</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	I
<i>Galeopsis speciosa</i>	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	+	-	-	-	-	II
<i>Galium aparine</i>	1	+	+	1	+	+	+	+	+	+	V	1	+	+	+	+	1	+	+	+	+	V
<i>Humulus lupulus</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	I
<i>Lysimachia nummularia</i>	-	-	+	-	-	-	-	+	-	-	I	-	-	-	-	-	-	+	+	-	-	I
<i>Sambucus nigra</i>	1	+	1	1	1	+	+	+	+	+	V	+	+	+	+	+	+	+	+	+	+	V
<i>Sisymbrium strictissimum</i>	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	I
<i>Stachys sylvatica</i>	+	+	-	-	+	-	+	+	-	+	III	-	+	+	1	+	+	+	+	+	+	V
<i>Viburnum opulus</i>	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	+	-	-	I
<i>Vitis sylvestris</i>	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	I
<i>Urtica dioica</i>	+	+	+	+	+	+	+	+	+	+	V	+	1	+	1	+	+	1	1	+	1	V
<i>Fagetalia</i>																						
<i>Acer platanoides</i>	+	-	-	-	-	-	-	+	-	-	I	-	-	-	+	-	-	+	-	-	-	I
<i>Ajuga reptans</i>	-	-	+	-	-	-	+	-	-	-	I	-	+	-	+	-	+	-	-	-	+	II
<i>Asarum europaeum</i>	+	+	-	-	-	-	-	+	-	+	II	+	+	+	1	+	1	+	+	+	+	V
<i>Euphorbia amygdaloides</i>	-	-	+	-	-	-	+	-	-	-	I	+	+	+	-	+	+	-	-	-	+	III
<i>Galeobdolon luteum</i>	-	-	-	+	-	+	-	-	-	-	I	-	-	-	+	-	-	-	+	-	-	I
<i>Geranium robertianum</i>	-	+	-	+	-	+	-	-	+	-	II	+	+	+	-	+	-	-	-	+	+	III

<i>Lamium maculatum</i>	+	+	+	-	+	+	-	+	+	+	IV	+	+	-	+	-	+	-	+	-	-	III
<i>Lathyrus vernus</i>	-	-	+	-	-	-	+	-	-	-	I	-	-	+	-	-	-	+	-	-	-	I
<i>Milium effusum</i>	-	-	+	-	+	-	-	-	+	+	II	-	-	-	+	-	-	-	-	-	-	I
<i>Pulmonaria obscura</i>	+	+	+	+	+	+	+	+	+	+	V	+	+	+	-	-	+	+	+	-	-	III
<i>Sanicula europaea</i>	-	+	-	-	-	-	-	+	-	-	I	-	-	+	-	-	-	-	-	+	-	I
<i>Ulmus minor</i>	+	2	-	-	+	+	-	+	+	-	III	-	-	-	-	-	-	-	+	+	+	I
<i>Vicia sylvatica</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	I
Quercu – Fagetea																						
<i>Acer campestre</i>	+	+	+	+	+	+	-	+	+	+	V	1	1	1	1	1	1	1	1	1	+	V
<i>Brachypodium sylvaticum</i>	+	2	+	-	+	-	+	-	1	+	IV	1	+	+	+	+	+	+	+	+	+	IV
<i>Carex divulsa</i>	+	1	-	+	-	+	-	-	+	-	III	-	-	+	-	-	-	-	-	-	-	I
<i>Carex spicata</i>	+	+	-	-	+	-	-	-	+	+	III	-	-	-	-	-	-	-	-	-	-	-
<i>Clematis vitalba</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	+	-	-	-	-	I
<i>Convallaria majalis</i>	-	-	+	-	-	-	-	-	+	-	I	1	+	+	+	+	+	1	1	+	+	V
<i>Corydalis solida</i>	-	-	-	+	-	-	-	-	-	-	I	-	-	-	+	-	-	-	-	-	-	I
<i>Corylus avellana</i>	+	+	-	-	+	+	+	-	-	-	III	-	+	-	+	+	+	+	-	-	-	II
<i>Crataegus monogyna</i>	+	+	1	+	+	+	+	+	+	1	V	+	+	+	+	+	+	+	+	+	+	V
<i>Euonymus europaeus</i>	+	+	+	+	+	+	+	+	+	+	V	+	+	+	+	+	+	+	+	+	+	V
<i>Fraxinus excelsior</i>	+	+	+	-	+	-	+	+	-	+	IV	-	-	-	-	+	-	-	+	-	-	II
<i>Geum urbanum</i>	+	+	+	+	1	+	+	+	1	+	V	+	1	1	+	+	+	1	+	+	1	V
<i>Glechoma hirsuta</i>	+	+	+	+	+	+	+	1	+	+	V	-	+	+	1	+	+	+	+	-	+	IV
<i>Heracleum sphondylium</i>	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	+	-	-	-	-	I
<i>Lapsana communis</i>	+	-	-	+	-	-	-	+	-	-	II	+	+	-	+	+	-	-	+	-	+	III
<i>Ligustrum vulgare</i>	-	-	-	-	+	-	+	-	-	-	I	+	+	+	-	-	-	-	+	+	+	III
<i>Malus sylvestris</i>	-	-	+	-	-	-	-	-	-	-	I	+	+	+	-	-	-	-	-	-	-	II
<i>Melica nutans</i>	-	-	+	-	+	-	+	-	-	-	II	-	-	-	-	-	-	-	-	-	-	-
<i>Melica uniflora</i>	+	+	2	1	1	+	+	1	1	+	V	-	-	+	-	-	+	+	-	+	-	II
<i>Mycelis muralis</i>	+	-	-	+	-	-	+	-	+	-	II	+	-	-	-	+	-	+	-	+	-	II
<i>Poa nemoralis</i>	-	-	+	+	-	-	-	+	-	-	II	-	+	-	-	+	-	-	+	-	-	II
<i>Polygonatum latifolium</i>	+	+	-	+	-	+	-	-	+	+	III	+	+	+	+	+	+	+	+	+	+	V
<i>Pulmonaria officinalis</i>	-	-	+	-	-	-	+	-	-	-	I	+	+	-	+	-	+	+	+	-	+	IV
<i>Pyrus pyraeaster</i>	-	-	-	-	-	-	+	-	-	-	I	-	-	-	-	-	-	-	+	1	+	II
<i>Ranunculus auricomus</i>	-	-	-	+	-	-	-	+	-	-	I	-	+	-	-	-	+	+	+	-	-	II
<i>Scrophularia nodosa</i>	-	+	-	-	-	-	-	-	+	-	I	-	-	+	+	-	-	-	-	-	-	I
<i>Ulmus procera</i>	1	+	+	+	+	+	+	+	+	+	V	1	+	+	+	+	+	1	1	2	1	V
<i>Vicia dumetorum</i>	-	-	+	-	-	-	-	+	-	-	I	+	-	+	-	-	-	-	-	-	+	II
<i>Vicia sepium</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	+	+	-	-	II

<i>Viola mirabilis</i>	+	-	-	-	+	-	-	+	-	-	II	+	+	+	+	+	+	-	+	-	+	IV
<i>Viola reichenbachiana</i>	+	-	+	+	-	-	+	-	+	-	III	-	-	-	+	+	-	+	+	-	+	III
<i>Trifolio – Geranietea s.l.</i>																						
<i>Aristolochia clematidis</i>	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	-	-	1	+	+	-	IV
<i>Hypericum perforatum</i>	-	-	-	+	-	-	+	-	-	-	I	-	-	-	-	-	-	-	-	-	-	-
<i>Lactuca quercina</i>	-	+	-	-	-	-	-	+	-	-	I	+	-	+	-	-	+	-	-	+	+	II
<i>Silene alba</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	I
<i>Convolvulatalia</i>																						
<i>Aethusa cynapium</i>	-	-	-	-	-	-	-	-	-	-	-	+	-	-	+	+	-	-	+	-	-	II
<i>Chaerophyllum bulbosum</i>	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	+	-	+	-	-	I
<i>Chaerophyllum temulum</i>	+	+	+	-	+	-	+	+	-	+	IV	+	1	-	+	+	1	1	1	+	+	V
<i>Cucubalus baccifer</i>	-	-	-	-	-	-	-	-	-	-	-	+	-	+	-	+	-	-	-	+	-	II
<i>Fallopia dumetorum</i>	+	+	-	+	-	+	-	-	+	-	III	+	-	+	+	-	-	-	+	-	+	III
<i>Galeopsis tetrahit</i>	+	+	-	+	-	+	-	-	+	-	III	-	-	+	-	-	-	-	-	-	-	I
<i>Artemisietea</i>																						
<i>Chelidonium majus</i>	-	-	+	-	-	-	-	-	-	-	I	-	-	-	-	+	-	-	-	-	-	I
<i>Rumex obtusifolius</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	I
<i>Chenopodietea s.l.</i>																						
<i>Anthriscus cerefolium</i>	+	+	-	-	+	-	+	+	-	-	III	+	+	+	+	-	-	+	-	+	+	IV
<i>ssp. trichosperma</i>																						
<i>Ballota nigra</i>	+	1	-	+	-	+	-	+	-	+	III	+	1	+	1	+	1	1	+	1	1	V
<i>Stellaria media</i>	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	+	-	-	-	-	I
<i>Torilis arvensis</i>	-	-	-	-	-	-	-	-	-	-	-	+	-	-	+	-	-	+	-	-	-	II

* Relevé nomenclaturel

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CONTRIBUTIONS TO AQUATIC VEGETATION OF ISAC-UZLINA COMPLEX KNOWLEDGE

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Abstract: Aquatic vegetation represents an important natural filter for the impurities charge of the Danube river water, constituting a barrier which hinders the pollutants entrance in the Black Sea. It is important to mention that the conventional industrial installations, to obtain the treatment objectives of waste waters, use the same physical, chemical and biological principles as that which acts in a natural wet zone. The Isac – Uzlina aquatic complex (Danube Delta Biosphere Reserve) was studied and a number of 13 aquatic associations was identified. For every of these, the floristic structure, composition and specific features are also given out. 40 relevés of aquatic vegetation from 40 points were used to characterize this aquatic complex.

Key words: Danube Delta, Isac-Uzlina, aquatic vegetation

Introduction

The Isac-Uzlina (DDBR) aquatic complex is situated inside of the subunity delimited by Sulina and Sf. Gheorghe branches, in the fluvial zone of Danube Delta, in the Gorgova-Isac depression. It is represented by Isac, Uzlina, Isacel and Pojarnia lakes and it is separated from Gorgova aquatic complex by Litcov channel. As area, the Isac lake is noticed with 1083 ha followed by Uzlina-470 ha, Pojarnia with 235 ha and Isacel with 173 ha. From the depth viewpoint it was observed that the lowest values, below 0 m Black Sea level, were registered in the lake depressions: -1,9 m in Isac lake and -1,8 m in Uzlina lake. These values are unsteady because of mineral and organic colmatage. The Isac-Uzlina aquatic complex genesis is directly related to Danube Delta genesis. Generally, it is accepted that on the actual Delta place could have existed a Black Sea gulf before. In time it was isolated by a sand band and transformed into a liman who was slimed by the enormous sediments quantity brought by Danube river. The result was the liman fragmentation and then the formation of main and secondary sand banks and also the formation of many lake depressions, the lakes of this complex being individualized by plaur bands generally.

From the viewpoint of evolution this complex is different to other lake systems because the colmatation process is less intense. On the other way, the limitation of Danube swamps water overflowing process and the limitation of water penetrate process from the existent envioning streams and channels is reduced in a very important proportion and it is estimated that it can not influence in a very important measure the lakes evolution process, so the organic colmatation process plays the main role. Thus, the great area of these lakes (with Gorgova complex – 2,03% of Delta's area) and their clear waters (exception is Uzlina having turbid waters because Uzlina channel which connects the lake to the river) can be explained. To characterize the evolution process, the shape coefficient representing the short and long axes ratio can also be used. Analyzing the special literature, the Isac lake

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had in 1883 a 0,74 value of this coefficient and a 0,53 value in 1983, so in 100 years period the lake presented a increasing of it's long axis and a decreasing of the short axis. The cause of this elongation process is the alluviation phenomenon from W to E direction and the result is the more and more narrow depressions formation and, in time, the lake shape change.

From hydrology viewpoint, the lake complex water supply is provided to Isac lake from Litcov channel by an intermediate channel and from Sf. Gheorghe branch via Uzlina channel to Uzlina lake. The complex drainage role, in all hydrologic conditions, is ensured by channel between Isac lake and Perivolovca channel to Sf. Gheorghe branch. As a consequence of the precarious water supply and of the insufficient drainage to Sf. Gheorghe branch, the aquatic complex (especially Isac lake) is supporting for a long and intense period the water flowering phenomenon with effects on biological productivity. Some factors as the river branches proximity, the hydrographic system, the amplitude and time of flood period are constituting in important elements which helps us understand the following three aspects: water input, sediments input and nutrients input. Sf. Gheorghe branch and numerous connecting channels are assuring the water input. Sediments input is half diminished especially because Portile de Fier I and II power plant construction. The sediments accumulation is more accentuated in Uzlina lake having a 1cm/year value and it is considered that it could be completely colmatated in the next 100-200 years only by this cause. The nutrients input has considerably increased, the industrial activity, natural processes and the water complex input increasing representing the main reasons of this phenomenon.

From lithology point of view it is observed a similitude between this and other aquatic complexes. The superficial strata belong to the fine sands clays and organic rests of aleuritic complex. Below that, there are the sand and gravels of the psamitic-aleuritic, psamo-pelitic, medium psamitic, old psamitic complexes and the terra-rosa clays representing the Delta foundation.

From the pedogenesis point of view, Danube Delta represents the youngest region of Romanian territory, the pedogenesis processes being entirely characteristic. The soils formation process begins with the marsh soils stage evolving to steppe soils gradually. In the study sector, marsh soils with the following subdivisions have been met: black alluvial soils rich in humus, CaCO_3 and vegetable rests; peaty soils; soils formed by organic silts with no structure and permanently covered by water; "plaur"- characteristic Delta element.

The Isac-Uzlina aquatic complex climate is continental-temperate with pontic influences and can be characterized by high thermic amplitude, active eolian regime and little rainfalls. The annual average temperature has a 10,8°C value. The rainfalls regime has a 350mm/year average value and the humidity is about 87%. Winds direction is from NW to SE in winter and from W to E in summer

Material and method

The Isac-Uzlina aquatic complex (Danube Delta Biosphere Reserve) was studied and a number of 13 aquatic associations was identified. For every of these, the floristic structure, composition and specific features are also given out. 40 relevés of aquatic vegetation from 40 points were used to characterize this aquatic complex. The relevés had a variable size and were made from canoe. Submerged macrophytes were collected using a rake and the abundance-dominance of each species was visually estimated using a six points scale (Braun-Blanquet scale).

Results and discussions

Cenotaxonomic summary:

LEMNETEA O. de Bolós et Masclans 1955

LEMNETALIA O. de Bolós et Masclans 1955

Lemnion minoris O. de Bolós et Masclans 1955

1. Lemnetum minoris (Oberd. 1957) Müller et Görs 1960
2. Lemno- Spirodeletum polyrhizae W. Koch 1954
3. Salvinio – Spirodeletum polyrhizae Slavić 1956

Utricularion vulgaris Pass. 1964

4. Lemno- Utricularietum vulgaris Soó 1928

HYDROCHARIETALIA Rübel 1933

Hydrocharition Rübel 1933

5. Hydrocharietum morsus- ranae Langendonck 1935
6. Ceratophyllo – Hydrocharietum I. Pop 1962
7. Salvinio- Hydrocharietum (Oberd. 1957) Boşcaiu 1966

POTAMOGETONETEA PECTINATI R. Tx. et Prsg. 1942

POTAMOGETONETALIA PECTINATI W. Koch 1926

Nymphaeion Oberd. 1957 em. Neuhäusl 1959

8. Myriophyllo verticillati – Nupharetum lutei W. Koch 1926
9. Nymphaeetum albae Vollmar 1947
10. Nymphoidetum peltatae (Allorge 1922) Oberd. et Müller 1960
11. Trapetum natantis Müller et Görs 1960
- Potamogetion lucentis Rivas Martinez 1973
12. Elodeetum canadensis Egler 1933
13. Potamogetonetum pectinati Carstensen 1955

1. **Lemnetum minoris** (Oberd 1957) Müller et Görs 1960. It is a pretty extended association in the studied aquatic complex, which vegetates better in the reed thickets clearings. It is especially localized between the reed band and shore. The dominant species is *Lemna minor*, but well represented are also *Spirodela polyrhiza* and *Salvinia natans*, two floating and unfixed species. The submerged stratum is represented by the following species: *Ceratophyllum demersum*, *Potamogeton pectinatus*, *Potamogeton crispus*, *Potamogeton fluitans*, etc. In shallow waters *Utricularia vulgaris* and *Stratiotes aloides* also appears. This aquatic association is characterized by a significant cover degree (80-100%) and is typical for mesotrophic waters (table 1, rel. 1-6).

2. **Lemno-Spirodeletum polyrhizae** W. Koch 1954. This association vegetates in stagnant and (especially) slowly waters, with a maximum growth in July-August month. It is also better developed at the Scirpo-Phragmitetum association edge. In this phytocenosis *Lemna minor* and *Spirodela polyrhiza* are sharing domination, forming sometimes a 4-5 cm thickness floating stratum at the water surface and realizing a 90-95% cover. The submerged stratum is less represented and is formed by *Ceratophyllum demersum*, *Myriophyllum spicatum* and *Potamogeton pectinatus*. Sporadically, in the floating stratum can be found *Trapa natans*, *Nymphoides peltata* or *Salvinia natans*. The presence of

Utricularia vulgaris species in shallow waters can give us about water quality, this species being characteristic to the meso-eutrophic waters (table 1, rel. 7-10).

3. **Salvinio-Spirodeletum polyrhizae** Slavnic 1956. This association is frequently met in the stagnant waters of Isac-Uzlina aquatic complex. The floating stratum is dominated by *Salvinia natans* and *Spirodela polyrhiza*; pretty abundant is *Lemna minor* too. In this association also appears *Trapa natans* and sporadically *Nymphaea alba* at the water surface. Submerged vegetation is represented by *Ceratophyllum demersum*, *Myriophyllum spicatum* and *Potamogeton pectinatus*. It is thought that the decaying organic matters sedimentation process is accelerated by this association, producing thus the colmatation pool phenomenon. The cover degree varies from 80% to 95% (table 1, rel. 11-14).

4. **Lemno-Utricularietum vulgaris** Soó 1928. The association appears in shallow waters of the complex, strongly colmatated and rich in decaying organic matters. Both strata, floating and submerged stratum are well individualized. On the water surface there are the dominant species, *Lemna minor* and *Utricularia vulgaris*. *Salvinia natans* and *Wolffia arhiza* are well represented too. In the submerged stratum *Ceratophyllum demersum*, *Potamogeton trichoides* and *Potamogeton pectinatus* vegetates. The vegetation cover degree varies from 70% to 80%. The association is characteristic to eutrophic waters (table 2, rel. 1-4).

5. **Hydrocharietum morsus-ranae** Langendonk 1935. Unlike the previous presented associations which are unstable to the wind action because the most species are not fixed to the bottom, *Hydrocharietum morsus-ranae* association is a lot more stable. However, it prefers the sheltered places of the reed thickets clearings, through the big, peripheral individuals. Beside *Hydrocharis morsus-ranae*, in the floating stratum vegetates *Lemna minor*, *Spirodela polyrhiza*, *Salvinia natans*, etc. Submerged vegetation is represented by *Myriophyllum spicatum*, *Ceratophyllum demersum* and various *Potamogeton* species. The vegetation cover degree has values between 70-80%. The illustrating species for this association is characteristic to phosphates rich waters (table 2, rel. 5-7).

6. **Ceratophyllo-Hydrocharietum** I. Pop 1962. It is a floating-submerged association, populating the shallow waters of the complex, with the maximum vegetating and fructifying period in July-August months. The characteristic species are *Hydrocharis morsus-ranae* and *Ceratophyllum demersum*. There is two strata: in the emerged stratum the first species is dominating, forming a cover containing also *Lemna minor*, *Salvinia natans* and *Spirodela polyrhiza*. The submerged stratum is abundant populated by *Ceratophyllum demersum* and sporadically *Myriophyllum spicatum* and *Potamogeton pectinatus*. Both strata are here and there penetrated by emerged hydrophytes like *Schoenoplectus lacustris*, *Butomus umbellatus*, *Typha angustifolia* or *Phragmites australis*. The cover degree average oscillates around 75% value. This association is developed on silt, organic substratum and eutrophic waters (table 2, rel. 8-9).

7. **Salvinio-Hydrocharietum** (Oberd. 1957) Boşcaiu 1966. This association represents an transition stage between the floating groups of Lemnetaea class and the fixed groups of Potametea class and prefers the 100-125 cm depth waters. Characteristic species like *Salvinia natans* and *Hydrocharis morsus-ranae* vegetates side by side with *Lemna minor*, *Spirodela polyrhiza*, *Utricularia vulgaris* and *Stratiotes aloides*. The vegetation cover degree is high, about 85-90%. The association was described as populating the strong eutrophic waters (table 2, rel. 10-12).

8. **Myriophyllo verticillati-Nupharetum lutei** W. Koch 1936. Is a large area extended association in slow waters places around lakes connection channels. It's structure is realized by emerged and submerged aquatic plants, the last of them being most numerous. The most representative species are: *Nuphar luteum*-dominant species, *Myriophyllum verticillatum*, *Myriophyllum spicatum*, *Potamogeton trichoides*, *Potamogeton natans*, *Lemna minor*, *Salvinia natans*, *Nymphoides peltata* and *Elodea nuttallii*. The association has an 85-90% cover degree and a better development on organic substratum (table 3, rel. 1-2).

9. **Nymphaeetum albae** Vollmar 1947. This association is developing in reed shelters or thickets clearings tolerating a certain shadow degree, in 180-200 cm depth slow waters. The floating stratum is better represented by *Nymphaea alba*, *Nymphaea candida*, *Trapa natans*, *Nymphoides peltata* and the submerged stratum by *Elodea canadensis*, *Elodea nuttallii*, *Potamogeton pectinatus*, *Potamogeton trichoides* and *Potamogeton lucens*. The association prefers clear and clean waters and is characterized by an 85-90% cover degree (table 3, rel. 3-5)

10. **Nymphoidetum peltatae** (Allorge 1922) Oberd et Müller 1960. The association is developing in 60-70 cm depth shallow waters, on clay substratum. *Nymphoides peltata* is the characteristic species. *Polygonum amphibium*, *Nymphaea alba*, *Nuphar luteum* and *Trapa natans* also are forming the emerged stratum. The submerged stratum is formed by *Ceratophyllum submersum*, *Elodea nuttallii*, *Potamogeton pectinatus* and *Myriophyllum verticillatum*. In the shore shallow waters also appears *Sagittaria sagittifolia*, *Alisma plantago-aquatica*, *Sparganium erectum* and *Phragmites australis*. The vegetation cover degree varies from 75% to 80%. In this association was identified also *Ranunculus trichophyllum*, species about the speciality literature tells it is developing on turbification tendency substrata situated under shallow mezotrophic waters (table 3, rel. 6-7).

11. **Trapetum natantis** Müller et Görs 1960. This association is installed in 150-300 cm depth waters, on clay substratum, resisting to their large level oscillations and having the survive possibility on swampy ground. The maximum development was found in sediments rich waters or in pools in colmatation course. Beside the characteristic species-*Trapa natans*, *Nymphoides peltata*, *Nuphar luteum*, *Elodea nuttallii*, *Salvinia natans*, *Lemna minor* and *Potamogeton natans* had been met too. The vegetation cover degree is high, around 95% (table 3, rel. 8-9).

12. **Elodeetum canadensis** Egler 1933. The association is installed on limited areas, close by the shore, in 70-85 cm depth shallow waters. This is a less rich plant community, *Elodea canadensis* being accompanied by *Elodea nuttallii*, *Potamogeton pectinatus*, *Potamogeton trichoides*, *Potamogeton crispus*, and *Vallisneria spiralis*. *Salvinia natans*, *Lemna minor* or *Trapa natans* are constituting an unpermanent stratum. The vegetation cover degree varies from 80 to 90% (table 3, rel. 10-11).

13. **Potamogetonetum pectinati** Carstensen 1955. This association vegetates in 120-150 cm depth stagnant waters on clay substratum and is characteristic to insufficiently oxygenated waters. The characteristic species – *Potamogeton pectinatus* – is accompanied by *Potamogeton trichoides*, *Potamogeton perfoliatus*, *Potamogeton crispus* and *Lemna minor*, *Salvinia natans* at the water surface and sometimes *Trapa natans*, *Nuphar luteum*, *Nymphoides peltata* or *Oenanthe aquatica* are present. The vegetation cover degree has an 85% value (table 3, rel. 12-14).

Table 1
Lemnion minoris O. de Bolós et Masclans 1955

Asociația	Lemnetum minoris						Lemno-Spirodeletum polyrhizae				Spirodela-Salvinietum natantis			
Nr. relevu	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Adâncimea apei (dm)	8	12	12	10	15	12	7	12	11	80	12	10	15	12
Acop. vegetației (%)	85	90	85	95	100	90	95	90	95	95	95	90	80	80
Suprafața de probă (m ²)	10	5	20	6	4	10	10	8	6	8	20	10	16	12
<i>Lemnion et Lemnetalia</i>														
Lemna minor	4	5	4	5	5	4	3	4	3	2	+	+	1	+
Spirodela polyrhiza	1	+	-	+	-	-	3	1	2	3	2	3	1	1
Salvinia natans	-	+	+	1	+	1	-	+	+	1	3	2	3	3
Hydrocharis morsus-ranae	+	-	-	-	-	-	-	+	1	+	+	-	-	-
Ceratophyllum demersum	-	-	+	-	-	+	+	-	-	-	-	-	1	1
Utricularia vulgaris	-	+	-	-	-	-	-	+	-	-	-	-	-	-
Stratiotes aloides	+	-	+	-	-	-	-	+	+	-	-	+	-	-
<i>Potamogetonetea pectinati</i>														
Myriophyllum spicatum	-	+	-	-	-	-	-	-	+	-	-	+	+	-
Potamogeton crispus	+	-	+	-	-	-	-	+	-	-	-	+	-	-
Potamogeton lucens	-	-	-	-	-	+	-	-	-	-	-	-	-	-
Trapa natans	+	-	-	-	-	-	-	-	+	-	1	+	-	-
Nymphaea alba	-	-	+	-	-	-	-	-	-	-	-	-	+	1
Nymphaea candida	-	-	+	-	-	-	-	-	-	-	-	-	+	1
Nymphoides peltata	+	-	-	-	-	+	+	-	-	-	-	-	-	-
Nuphar luteum	-	+	-	-	-	-	-	-	-	-	+	1	-	-
Potamogeton pectinatus	-	+	-	+	-	+	-	+	+	-	+	+	1	-
Potamogeton fluitans	-	-	+	-	-	-	-	-	-	-	-	-	-	-
<i>Phragmitetea</i>														
Phragmites australis	+	-	-	-	-	+	+	-	-	-	+	-	-	1
Typha angustifolia	+	-	-	-	-	-	-	-	-	+	-	-	-	-
Oenanthe aquatica	-	+	-	-	-	-	-	-	-	-	-	+	-	-
Alisma plantago-aquatica	-	-	-	-	-	+	+	-	-	+	-	-	-	-
Glyceria maxima	+	-	-	-	-	-	+	-	-	-	-	-	-	-
Stachys palustris	-	+	-	-	-	-	-	-	-	-	+	-	-	-
Lysimachia vulgaris	-	-	-	-	-	-	+	-	-	-	-	-	-	-
Mentha aquatica	-	-	-	-	-	-	-	+	-	-	-	-	-	-
Carex riparia	-	-	-	-	-	-	-	-	-	+	-	-	-	-

Table 2
Utricularion vulgaris Pass. 1964 **et Hydrocharition** Rubel 1933

Asociația	Lemno-Utricularietum vulgaris				Hydrocharietum morsus-ranae			Ceratophyllo-Hy- drocharietum		Salvinio- Hydrocharietum		
Nr. releveu	1	2	3	4	5	6	7	8	9	10	11	12
Adâncimea apei (dm)	12	13	10	11	12	12	9,5	15	12	11	12,5	10
Acoperirea vegetației (%)	75	80	70	70	80	85	70	75	70	90	85	90
Suprafața de probă (m ²)	8	4	6	10	4	5	8	10	12	10	20	16
Utricularion vulgaris												
Utricularia vulgaris	2	2	3	3	-	-	+	-	-	-	-	+
Lemna minor	3	3	2	2	+	+	+	1	+	+	1	+
Spirodela polyrhiza	-	-	+	-	-	+	-	-	+	-	-	1
Stratiotes aloides	-	-	-	-	+	-	-	-	+	-	-	+
Wolffia arrhiza	+	-	+	-	-	-	-	-	-	-	-	-
Salvinia natans	+	1	-	+	-	+	-	+	+	3	2	2
Hydrocharition et Hydrocharietalia												
Hydrocharis morsus- ranae	-	-	-	-	4	5	3	2	2	3	4	3
Ceratophyllum demersum	-	+	-	-	+	-	+	3	3	-	-	+
Ceratophyllum submersum	-	-	-	-	-	+	-	-	-	+	-	-
Potamogetonetea pectinati												
Myriophyllum spicatum	-	-	-	-	+	-	1	+	-	-	-	-
Nymphoides peltata	-	-	-	-	-	-	-	-	-	+	-	+
Potamogeton trichoides	-	+	-	-	-	-	1	+	-	-	+	-
Potamogeton pectinatus	-	-	-	+	-	+	+	+	+	-	-	+
Polygonum amphibium	-	-	-	-	+	-	-	-	-	-	-	-
Trapa natans	-	-	-	-	-	-	-	+	+	-	+	-
Nymphaea alba	-	-	-	-	-	+	-	-	-	+	-	-
Nuphar luteum	-	-	-	-	-	-	-	-	-	-	+	-
Ranunculus trichophyllus	-	-	-	-	+	-	-	-	-	-	-	-
Sagittaria sagittifolia	-	-	-	-	-	-	-	-	-	+	+	-
Phragmition												
Phragmites australis	-	-	-	-	-	-	+	-	+	-	-	-
Schoenoplectus lacustris	-	-	+	-	-	-	+	+	-	-	-	-
Butomus umbellatus	-	-	-	-	-	-	-	+	-	-	-	-
Alisma plantago- aquatica	+	-	-	-	-	-	-	-	-	-	-	-
Lysimachia vulgaris	-	-	-	-	-	-	-	-	+	-	-	-
Mentha aquatica	-	-	+	-	-	-	+	-	-	-	-	-

Table 3
Potamogetonetea pectinati R. Tx. et Prsg. 1942

Asociația	Myriophyllo verticilati- Nupharetum lutei		Nymphaetum albae			Nymphoidetum peltatae		Trapetum natantis		Elodeetum canadensis		Potamogetonetum pectinati		
Nr. releveu	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Adâncimea apei (dm)	23	20	18	11	21	6	7	18	22	7	13	18	15	15
Acoperirea vegetației (%)	85	90	85	90	90	75	80	95	95	90	80	80	85	80
Suprafața de probă (m²)	20	25	50	100	100	10	8	64	100	25	30	10	20	12
<i>Nymphaeion</i>														
Nuphar luteum	4	3	-	-	-	+	-	-	+	-	-	-	-	+
Nymphaea alba	-	-	4	5	5	-	+	+	-	-	-	+	-	-
Nymphoides peltata	-	+	+	-	-	4	4	-	+	-	-	-	-	+
Trapa natans	-	+	+	+	+	-	+	5	5	1	+	-	-	-
Polygonum amphibium	+	-	-	-	-	+	+	-	-	-	+	+	-	-
Nymphaea candida	-	-	1	+	+	+	-	-	-	-	+	-	+	-
<i>Potamogetion</i>														
Elodea canadensis	-	-	+	-	-	-	-	-	-	5	4	+	-	-
Elodea nuttallii	+	+	-	+	-	+	+	+	-	-	1	-	+	-
Potamogeton pectinatus	-	-	+	-	-	-	+	+	+	-	+	4	5	4
Potamogeton trichoides	+	1	-	+	-	-	-	-	-	+	+	-	-	+
Myriophyllum spicatum	+	1	-	-	-	-	-	-	-	-	-	-	-	-
Potamogeton perfoliatus	-	-	+	-	-	+	-	-	-	-	-	+	-	-
Potamogeton lucens	-	-	-	+	-	-	-	-	-	-	-	-	-	-
<i>Potamogetonetalia</i>														
Potamogeton crispus	-	-	-	-	-	-	-	-	-	+	-	-	+	-
Ceratophyllum submersum	-	+	-	-	+	-	-	-	+	-	-	-	-	-
Ranunculus trichophyllus	-	-	-	-	-	-	+	-	-	+	-	-	-	-
Potamogeton natans	-	+	-	+	-	-	-	+	-	-	-	-	-	-

[illegible]

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BIOMASS AND THE AERIAL PRODUCTIVITY OF THE ARBORESCENT LAYER OF THE *ARO ORIENTALIS* - *CARPINETUM* (DOBRESCU ET KOVACS 1973) TÄUBER 1991-1992 ASSOCIATION FROM THE VASLUI RIVER BASIN

IRINA BLAJ*, T. CHIFU*

Abstract: The hornbeam groves forming the *Aro orientalis* – *Carpinetum* (Dobrescu et Kovacs 1973) Täuber 1991-1992 association are analyzed both phytocoenologically and from the viewpoint of the biomass and aerial productivity of the arborescent layer it develops. This association achieve a density of 670 trees/ha, a biomass of 340967,47 kg/ha and a productivity of 10470 kg/ha/year.

Key words: phytocoenology, vegetation of forests, biomass, productivity.

The Vaslui river, springing from the Păun Hill, covers part of the Iassy and Vaslui countries from north to south, and flows into the Bârlad river, southward the Vaslui town. The hydrographic basin has a surface of about 646 km².

The methods applied for calculating the biomass and aerial productivity of the arborescent layer had been taken over from the studies elaborated by different Romanian and foreign investigators [1,2,5,7,9-11].

The *Aro orientalis* – *Carpinetum* (Dobrescu et Kovacs 1973) Täuber 1991-1992 association is part of the *Aro orientalis* – *Carpinenion* (Dobrescu et Kovacs 1973) Täuber 1991-1992 suballiance, the *Lathyro hallersteinii* – *Carpinion* Boșcaiu 1974 alliance, *Fagetalia sylvaticae* Pawlowski in Pawlowski et al. 1928 order, *Quercus* – *Fagetea* Br.-Bl. et Vlieger in Vlieger 1937 class (Table 1).

The woods formed by *Carpinus betulus*, *Quercus robur* and *Tilia tomentosa*, united in this association, are spreading over, at an average altitude of 300 m, on plateaus, terraces and low-sloping sides (with an average sloping of 6 degrees), with mainly-northern exposition.

The floristic composition, including 103 species, has an average number on the relevee of 27 species, of which about 80% belong to the *Quercus-Fagetea* class.

The average coverage of the arborescent layer, of 80%, is usually formed of *Quercus robur*, *Carpinus betulus* and *Tilia tomentosa*, the average density being of 670 trees/ha, with *Carpinus betulus* predominant - 230 trees/ha -, followed by *Quercus robur*, with 227 trees/ha and *Tilia tomentosa*, with 92 trees/ha. The average diameter is of 25.08 cm – which means that the phytocoenosis may be considered as belonging to the small-wood stage (with diameter between 21-36 cm).

The largest diameters are recorded for *Quercus robur* (33.80 cm), *Fraxinus excelsior* (29.85 cm), *Carpinus betulus* (25.16 cm) and *Tilia tomentosa* (22.89).

The woody species belonging to this association realize an average aerial biomass of 340967.47 kg/ha, of which trunks' biomass is of 246959.32 kg/ha (representing

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72.44%), branches' biomass – 89906.41 kg/ha (26.36%) – where branches of the 2nd and 3rd order are prevailing – and finally, leaves' biomass – 4101.76 kg/ha (1.20%).

The most significant part to the formation of biomass is brought by *Quercus robur* – 153445.26 kg/ha, *Carpinus betulus* – 123081.51 kg/ha and *Tilia tomentosa* with 36847.98 kg/ha (Table 2).

Calculation of the aerial productivity of the arborescent layer gives an average amount per association of 10470 kg/ha/year, this value being influenced by the age, density and diameter of the species forming the phytocoenosis (Table 2).

The bushy layer covers, on the average, 7% of the surface, while the herbaceous one – abundant and varied – has an average coverage of 35%, the species with high constancy being: *Viola reichenbachiana*, *Geranium robertianum*, *Melica uniflora*, *Geum urbanum*, *Asarum europaeum*.

The bioforms' spectrum evidences the predominance of hemicriptophytes (Figure 1), while the analysis of the phytogeographical elements illustrates the occurrence, in approximately equal ration, of the Euro-asian (38.7%) and European (37.73%) elements (Figure 2). The values of the ecological indices demonstrate that the species forming the association under study – which are mesophyllic, mesothermal and mesohydrophilic – are developing on neutral soils with a moderate content of mineral nitrogen (Figure 3).

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Table 1
***Aro orientalis* - *Carpinetum* (Dobrescu et Kovacs 1973) Täuber 1991-1992**

Number of releves	1	2	3	4	5	6	7	8	9	10	11	K
Altitude(m)	330	330	310	230	250	230	360	350	350	393	230	
Exposition	NE	NV	NE	NV	SV	NV	NE	NV	NE	SV	V	
Slope (degrees)	-	20	3	5	10	10	5	8	-	8	5	
Coverage of the arborescent layer (%)	75	80	70	60	60	85	90	80	90	85	75	
Coverage of the bushy and juvenile layer (%)	2	-	20	1	5	1	5	35	2	1	3	
Coverage of the herbaceous layer (%)	45	30	5	30	50	55	30	25	35	30	45	
Surface (m²)	1000											
Number of species	49	33	22	20	29	18	31	21	31	23	21	
Association's characteristics												
Arum orientale	+	-	+	-	-	-	-	-	-	-	-	I
Aro orientalis-Carpinenion												
Carpinus betulus	2	2	2	1	1	2	4	3	4	4	3	V
Carpinus betulus juv.	-	-	-	+	+	+	-	2	+	+	+	IV
Tilia tomentosa	+	2	+	+	+	+	+	-	+	+	+	V
Tilia tomentosa juv.	-	-	-	-	-	-	-	-	-	+	-	I
Lathyrus venetus	-	-	-	-	-	-	+	-	-	-	-	I
Galio schultesii-Carpinenion												
Cerasus avium	1	+	-	-	+	+	1	-	+	+	-	IV
Stellaria holostea	-	-	-	+	+	+	-	-	+	-	1	III
Campanula trachelium	+	+	+	-	-	-	-	-	-	-	-	II
Lathyrus vernus	-	-	-	-	+	-	+	-	-	+	-	II
Tilia cordata	-	-	+	-	-	-	+	-	+	1	-	II
Tilia cordata juv.	-	-	+	-	-	-	+	-	-	-	-	I
Carex pilosa	-	-	-	-	-	-	+	-	+	-	-	I
Galium schultesii	-	-	+	-	-	-	-	-	+	-	-	I
Dactylis polygama	+	+	-	-	-	-	-	-	-	-	-	I
Glechoma hirsuta	-	-	-	+	-	-	1	-	-	-	-	I
Tilio platyphyllae-Acerion pseudoplatani												
Acer pseudoplatanus juv.	-	-	-	-	-	-	-	+	-	-	-	I
Symphyto cordati-Fagion												
Epipactis helleborine	-	-	+	-	-	-	-	-	-	-	-	I
Alnion incanae												
Lamium maculatum	+	+	-	-	-	-	+	-	+	-	2	III
Urtica dioica	2	1	+	-	+	-	+	-	+	-	-	III
Alliaria petiolata	-	-	-	+	2	2	-	-	-	-	2	II
Geranium phaeum	+	-	-	-	-	-	-	-	+	+	-	II
Stellaria nemorum	-	-	2	2	2	-	-	-	-	-	-	II
Anthriscus sylvestris	-	-	-	-	+	-	+	-	-	+	+	II
Fraxinus angustifolia	+	-	-	-	-	-	-	-	-	-	-	I
Aegopodium podagraria	-	-	-	+	-	-	-	-	+	-	-	I
Circaea lutetiana	+	-	-	-	-	-	-	-	-	-	-	I
Sambucus nigra	+	-	-	-	-	-	-	+	-	-	-	I
Ulmus minor	+	-	-	-	-	-	-	+	-	-	-	I
Ulmus minor juv.	-	-	-	-	+	-	-	-	-	-	-	I
Glechoma hederacea	-	-	-	-	-	-	+	-	-	+	-	I
Cruciata glabra	+	+	-	-	-	-	-	-	-	-	-	I
Carex remota	+	-	-	-	-	-	-	-	-	-	-	I
Fagetalia												
Geranium robertianum	+	+	-	+	+	2	-	-	+	+	-	IV
Asarum europaeum	+	-	-	+	-	-	+	-	1	1	-	III
Sanicula europaea	-	+	-	-	-	-	+	+	+	2	-	III
Acer platanoides	+	-	-	-	-	-	+	+	-	+	-	II

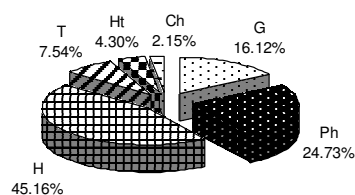
Acer platanoides juv.	-	-	-	-	-	-	1	1	-	+	-	II
Chaerophyllum temulum	+	+	-	+	-	-	-	+	-	-	-	II
Galium odoratum	-	-	+	+	+	-	+	-	+	1	1	II
Lamium galeobdolon	+	-	-	-	+	-	+	-	-	-	-	II
Lapsana communis	+	+	+	-	-	-	-	-	-	-	-	II
Salvia glutinosa	-	-	-	-	-	-	+	-	+	+	-	II
Allium ursinum												
ssp. ucrainicum	+	-	-	+	1	+	-	-	-	-	-	II
Euphorbia amygdaloides	-	-	+	-	+	-	-	-	+	-	-	II
Campanula rapunculoides	+	+	-	-	-	-	-	-	-	-	-	I
Carex sylvatica	-	-	-	-	-	-	-	+	-	-	-	I
Dentaria bulbifera	-	-	-	-	+	+	-	-	-	-	-	I
Pulmonaria obscura	-	-	-	-	-	-	+	-	-	-	-	I
Stachys sylvatica	+	-	-	-	-	-	-	-	-	-	-	I
Luzula luzuloides	-	-	-	-	-	-	-	-	-	+	-	I
Rubus hirtus	-	-	-	-	-	-	-	1	-	-	-	I
<i>Quercus-Fagetea</i>												
Quercus robur	1	1	2	2	2	3	1	+	1	1	1	V
Quercus robur juv.	-	-	+	+	+	-	+	-	+	-	-	III
Acer campestre	1	+	+	+	+	+	+	-	+	+	+	V
Acer campestre juv.	-	-	-	+	1	+	-	-	+	-	-	II
Viola reichenbachiana	+	+	+	-	+	+	1	+	+	-	-	IV
Evonymus verrucosus	+	-	1	-	-	-	-	+	+	-	+	III
Crataegus monogyna	+	-	1	-	-	-	-	+	+	-	+	III
Melica uniflora	1	2	-	-	+	-	+	-	+	+	-	III
Fraxinus excelsior	1	+	-	-	-	-	-	1	+	-	+	III
Fraxinus excelsior juv.	-	-	-	-	-	-	-	+	-	-	-	I
Geum urbanum	+	+	-	-	+	-	+	1	-	+	-	III
Mycelis muralis	+	+	+	-	-	-	-	-	-	-	-	II
Moehringia trinervia	+	+	-	-	-	2	-	-	-	-	-	II
Ranunculus ficaria	-	-	-	1	1	+	-	-	-	-	-	II
Brachypodium												
sylvaticum	-	-	-	-	-	-	-	-	2	-	-	I
Evonymus europaeus	+	-	-	-	-	-	-	-	-	-	-	I
Ulmus procera	+	-	-	-	-	-	-	-	-	-	-	I
Clematis vitalba	+	-	-	-	-	-	-	-	-	-	-	I
Poa nemoralis	-	+	-	-	-	-	-	-	-	-	-	I
Dryopteris filix-mas	-	+	-	-	-	-	-	-	-	-	-	I
Rosa canina	-	-	-	-	-	-	-	-	-	-	+	I
Viola odorata	-	-	-	-	-	-	+	-	-	-	-	I
Viola alba	-	-	-	-	-	-	-	-	-	+	-	I
Ranunculus auricomus	+	-	-	-	-	-	-	-	-	-	-	I
Lathyrus niger	+	-	-	-	-	-	-	-	-	-	-	I
Polygonatum latifolium	-	-	-	-	-	-	-	-	2	-	-	I
Anemone ranunculoides	-	-	-	-	-	-	-	-	-	-	+	I
Platanthera bifolia	-	-	-	-	-	-	+	-	-	-	-	I
Anemone nemorosa	-	-	-	-	-	-	-	-	-	-	+	I
<i>Quercetea pubescentis</i>												
Fragaria vesca	-	-	-	1	1	+	-	-	-	-	-	II
Polygonatum odoratum	-	-	-	-	-	-	+	+	-	-	+	II
Cornus sanguinea	+	-	-	-	-	-	-	-	-	-	+	I
Clinopodium vulgare	-	+	-	-	-	-	-	-	-	-	-	I
Agrimonia eupatoria	+	+	-	-	-	-	-	-	-	-	-	I
Acer tataricum	-	-	-	-	-	-	-	-	+	-	-	I
Cornus mas	-	-	1	-	-	-	-	-	-	-	-	I
Prunus spinosa	-	-	-	-	-	-	-	-	-	-	+	I
Viola hirta	+	+	-	-	-	-	-	-	-	-	-	I
<i>Companion</i>												
Galium aparine	+	+	-	-	-	+	+	-	-	-	-	II
Lysimachia nummularia	+	+	-	-	-	-	-	-	+	-	-	II

Ajuga reptans	+	-	-	+	+	-	-	-	-	-	-	II
Veronica chamaedrys	-	+	-	-	+	-	-	-	-	-	+	II
Taraxacum officinale	-	+	-	-	+	+	-	-	-	-	-	II
Capsella bursa-pastoris	-	-	-	-	-	-	-	-	-	-	+	I
Acinos arvensis	-	-	-	-	-	-	-	+	-	-	-	I
Arctium tomentosum	-	-	+	-	-	-	-	-	-	-	-	I
Hypericum perforatum	+	+	-	-	-	-	-	-	-	-	-	I
Prunella vulgaris	+	-	-	-	-	-	-	-	-	-	-	I
Parietaria officinalis	+	+	-	-	-	-	-	-	-	-	-	I
Leonurus cardiaca ssp. villosus	+	-	-	-	-	-	-	-	-	-	-	I
Polygonum convolvulus	-	+	-	-	-	-	-	-	-	-	-	I

Place and date of the releves:

1,2. dl. Movila, 11.06.2003; 3. dl. Prisăcii, 07.2001; 4-6,11. pd. Buda, 6.05.2002; 7,8. Poiana cu Cetate, 08.2001; 9. dl. Vărbăriei, 23.08.2003; 10. Bârnova, 09.2002

Fig.1. The bioforms spectrum



Ph - phanerophytes, G -geophytes
H-hemicryptophytes, T- therophytes
Ht -hemitherophytes, Ch -chamephytes

Fig.2. The phytogeographical spectrum

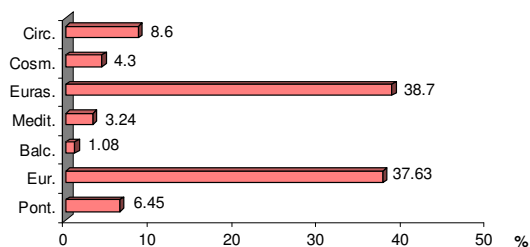
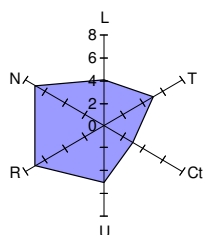


Fig.3. The ecological indices spectrum



L-light, T-temperature, Ct-continentality,
U-humidity, R-pH, N- soil trophicity, based on
mineral nitrogen contents

Table 2
Biomass (Kg/ha) and productivity (Kg/ha/year) of arborescent layer

Species	Density (trees/ha)	Average diameter (cm)	Biomass (kg/ha)									Productivity (Kg/ha/year)
			Trunks	Branches					Leaves	Total		
				Total	5	4	3	2			1	
dl. Movila - Tăcuta												
Quercus robur	69	35.08	43700	13837.94	599.15	3397.56	5298.85	3802.24	740.14	745.2	58283.14	1720
Carpinus betulus	200	29.58	98056.92	31602.65	2109	6445.8	10720.71	9961.62	2365.52	1663.45	131323.02	3410
Tilia tomentosa	123	29.18	43085.8	14537.72	369.54	3781.11	5256.17	4696.42	434.07	442.5	58066.03	2410
Fraxinus excelsior	57	29.85	31304.8	11676.74	597.48	3676.26	3728.54	3382.18	292.28	279.58	43261.12	1596
Cerasus avium	60	27.86	18366.56	6190.22	-	1460.39	2409.85	2149.23	170.75	176.08	24732.86	466
Acer campestre	33	25.38	8823.95	2683.43	-	65.46	1305.29	1137.76	174.92	153.63	11661.01	378
Total	542	29.86	243338.03	80528.7	3675.58	18826.58	28719.41	25129.45	4177.68	3460.44	327327.18	9980
Focșeasca												
Quercus robur	350	24.96	102058.92	32855.06	956.36	6518.97	13083.99	10132.19	2163.55	2041.18	136955.16	4620
Carpinus betulus	150	23.11	44875.96	42601.33	-	2683.36	32854.88	6115.12	947.97	759.9	88237.19	2897
Tilia tomentosa	165	18.92	24247.64	8298.17	-	436.45	2567.53	4952.72	341.47	390.97	32936.78	2215
Cerasus avium	30	24.93	7474.65	2520.57	-	441.33	957.47	1047.89	73.88	82.32	10077.53	278
Acer campestre	40	23.11	8501.96	2579.99	-	88.76	1098.54	1197.54	195.15	169.21	11251.16	464
Total	735	23.25	187159.13	88855.12	956.36	10168.87	50562.41	23445.46	3722.02	3443.58	279457.82	10474
pd. Buda												
Quercus robur	355	29.73	142557.15	43178.64	-	4761.69	20324.69	15637.6	2454.66	2363.55	188099.34	5530
Carpinus betulus	250	19.07	25717.35	18751.96	-	394.32	8734.50	8599.08	1024.06	757.89	45227.2	3260

Cerasus avium	60	28.64	19301.64	6550.56	-	1588.56	2554.2	2232.48	175.32	179.4	26031.6	582
Acer campestre	105	10.00	2871	798	-	-	-	675	123	111	3780	370
Ulmus minor	20	19.07	2914.55	767.3	-	-	260.95	450.07	56.28	51.51	3733.36	220
Total	790	24.40	193361.69	70046.46	-	6744.57	31874.34	27594.23	3833.32	3463.35	266871.5	10006
Bárnova												
Quercus robur	132	45.46	171612.77	55913.25	5144.61	20024.07	16772.74	11192.43	2779.4	2917.4	230443.42	6452
Carpinus betulus	320	28.91	168077.51	56722.28	2284.71	10755.31	21279.18	18767.48	3635.6	2738.84	227538.63	3920
Tilia tomentosa	80	20.57	13736.03	4710.73	-	589.11	1559.72	2386.59	175.31	194.37	18641.13	620
Cerasus avium	8	22	1585.2	530.2	-	46.8	196.8	268.4	18.2	20.6	2136.00	57
Acer campestre	72	18.18	8966.92	2318.91	-	-	680	1454.54	184.37	168.47	11454.30	370
Total	612	31.34	363978.43	120195.37	7429.32	31415.29	40488.44	34069.44	6792.88	6039.68	490213.48	11419
Average of the association	670	25.08	246959.32	89906.41	3015.31	16788.82	37911.15	27559.64	4631.47	4101.76	340967.47	10470
%			72.44	26.36	0.88	4.93	11.12	8.08	1.35	1.20	100.00	

FOREST VEGETATION IN THE TECUCI PLAIN (GALAȚI COUNTY)

OPREA A. *

Summary: In this paper, the forest vegetation in the Tecuci Plain (Galați County) is presented. There have been identified nine vegetal associations, framed out in four Classes, five Orders, and seven Alliances of vegetation. Thus, the forest vegetation is installed along the rivers, on the sand dunes, or on the hills in that region. Every association, in this paper, is accompanied by: a diagnosis, a live form's spectrum, a fitogeographical spectrum, and a phytosociological table. Also, there are cross-references to the most significantly papers, in relation to this vegetation of the Tecuci Plain.

Key Words: forest, vegetation, sand dunes, Tecuci Plain, Romania

Tecuci Plain represents the North-East part of the great Romanian Plain. In this area, a surface over 13.500 ha is covered by stabilized sands, or parts of them are taken by winds, being so-called „wandering sand dunes”. Besides the wandering dune vegetation, on these, it is also installed a forest vegetation, especially along the water courses which are passing through the Tecuci Plain, namely: **Siret** river and **Bârlad** river. Our searches, made during 1992 and 1998, have identified, on plotting areas, nine forest associations. Among of these, three are disposed along the minor riverbeds (see the next associations: Ass. *Salicetum albae-fragilis*, Ass. *Populetum x canadensis*, and Ass. *Calamagrostio-Tamaricetum ramosissimae*); other three vegetal associations are installed on the flats of the same rivers, namely: Ass. *Ulmeto-Fraxinetum pallisae*, Ass. *Fraxino pallisae-Quercetum pedunculiflorae*, and Ass. *Quercetum pedunculiflorae*. Other two forest associations are installed on the slopes of the hills in the Tecuci Plain, namely: Ass. *Lathyro collini-Quercetum pubescentis*, and Ass. *Pruno spinosae-Crataegetum*. A great part of the Tecuci Plain, and especially those parts having wandering sands, have been planted with acacia trees. Under the canopy of these trees, during the times, there was established a herbaceous layer, and together with the acacia trees, one could frame these phytocoenoses under the name: Ass. *Bromo sterilis-Robinetum pseudacaciae*. Thus, every association in this paper is accompanied by: a diagnosis, a live form's spectrum, a fitogeographical spectrum, and a phytosociological table. The nomenclature of the vascular plant species follow the “Flora Europaea” (1964-1980) [8], and the nomenclature of the vegetation follow L. Mucina, 1997 [5] and Gh. Coldea, 1997 [9].

The coenotaxonomical outline of the forest vegetation in the Tecuci Plain:

- I. SALICETEA PURPUREAE Moor 1958
 - SALICETALIA PURPUREAE Moor 1958
 - SALICION ALBAE Soó 1930
 - 1. *Salicetum albae-fragilis* Issler 1926
 - 2. *Populetum x canadensis* I. Lupu 1979

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- TAMARICETALIA Borza et Boşcaiu 1963 n.n. emend. Popescu et Sanda 1992
 ARTEMISIO SCOPARIAE-TAMARICION RAMOSISSIMAE Simon et Dihoru
 (1962) 1963
3. *Calamagrostio-Tamaricetum ramosissimae* Simon et Dihoru (1962) 1963
- II. QUERCO-FAGETEA Br.-Bl. et Vlieger in Vlieger 1937
 FAGETALIA SYLVATICAЕ Pawlowski, Sokolowski et Wallisch 1928
 ALNION INCANAE Pawlowski, Sokolowski et Wallisch 1928 (=ALNO-PADION
 Br.-Bl. et Tx. 1943 emend. Mill. et Görs 1958)
4. *Ulmeto-Fraxinetum pallisae* (Borza 1966) Sanda 1970
 5. *Fraxino pallisae-Quercetum pedunculiflorae* A. Oprea 1997
- III. QUERCETEA PUBESCENTIS Doing-Kraft ex Scamoni et Passarge 1959
 QUERCETALIA PUBESCENTI-PETRAEAE Klika 1933
 QUERCION PUBESCENTI-SESSILIFLOREAE Br.-Bl. 1932
6. *Lathyro collini-Quercetum pubescentis* Klika 1932 emend. Jákucs 1960
 QUERCION PEDUNCULIFLOREAE Popescu, Sanda, Doltu 1979
7. *Quercetum pedunculiflorae* Borza 1937
 ROBINION PSEUDACACIAE M. Csűrös-Káptalan 1968
8. *Bromo sterilis-Robinetum pseudacaciae* Pocs 1954
 - *brometosum sterilis* Mititelu et al. 1973; Horeanu 1975
 - *anthriscetosum* Magyar 1937 (=facies cu *Anthriscus trichosperma* Dobr. et al. 1969)
 - *urtico-ballotosum* Mititelu et al. 1968 (= facies cu *Ballota nigra* Dobr. et al. 1969)
 - *chelidonietosum* Toth 1958
 - *secalietosum* Pócs 1954
 - *cannabinetosum* Mititelu et al. 1968
- IV. RHAMNO-PRUNETEA Rivas Goday et Borja 1961
 PRUNETALIA Tx. 1952
 PRUNION FRUTICOSAE Tx. 1952 (=PRUNION SPINOSAE Soó 1940)
9. *Pruno spinosae-Crataegetum* (Soo 27) Hueck 31

Description of the vegetal associations

1. Ass. *Salicetum albae-fragilis* Issler 26

This is a meso-hygrophilous vegetal association, including stable phytocoenoses, installed on alluvial soils, and floating alluvial soils. This vegetal association have a great importance, being so-called riverside coppice, with poplars and willows stands (framed in the third class of cropping power). In the past, this association had had a great importance along the rivers, but nowadays this one is replaced by the plantation of Canadian Poplar. The trees are in two-layer strata, achieving 60-70% coverage of the soil. The herbaceous stratum cover the soil up to 50%. The shrub layer is missing in this association.

Live form's spectrum: H=36 (47%); Ph=12 (16%); T=10 (13%); H (G)=4 (5%), others=19%;
 Fitogeographical spectrum: Euras=35 (46%); Eur=11 (15%); Cosm=7 (10%); Circ=6 (8%);
 Euras (submedit)=4 (5%); Adv=3 (4%); others=12%. Table No. 1 (Rel. No. 1-5).

Table No. 1

Surface of relevé, m ²	400	400	400	400	400	K
Coverage of trees, %	60	65	60	65	60	
Height of trees, m	8-10	8-10	8-10	8-10	8-10	
Diameter of trees, cm	15-20	15-20	25-30	20-25	25-30	
Coverage of regeneration layer, %	1	1	1	1	1	
Coverage of grass layer, %	15	15	10	15	15	
No. of relevé	1	2	3	4	5	
Salix alba	3	3	3	3	3	V
Salix alba juv.	+	-	-	+	-	II
Salix fragilis	2	2	2	1	1	II
<i>Salicion albae</i>						
Populus alba	1	1	1	+	1	V
Populus alba juv.	-	+	+	-	+	III
Populus nigra	+	1	+	2	1	V
Populus nigra juv.	-	-	+	-	-	I
<i>Salicetalia et Salicetea</i>						
<i>purpureae</i>						
Lysimachia mummularia	+	+	-	+	+	III
Urtica dioica	+	-	-	+	+	III
Rubus caesius var. arvalis	-	-	+	+	-	II
Saponaria officinalis	-	-	+	-	-	II
Humulus lupulus	-	+	+	-	-	II
Oenothera biennis	+	-	-	-	+	II
Aristolochia clematitis	-	-	+	+	+	II
Physalis alkekengi	+	-	-	-	-	II
<i>Agrostion stoloniferae</i>						
Lolium perenne	+	+	+	+	+	V
Poa angustifolia	+	+	+	+	+	V
Agrostis stolonifera	+	+	+	-	+	V
Elymus repens ssp. repens	+	+	+	-	+	IV
Carex hirta	-	-	+	-	-	I
<i>Quercio-Fagetea</i>						
Populus tremula	-	+	-	+	1	I
Populus tremula juv.	-	-	-	1	-	I
Pyrus pyraeaster	-	-	-	+	+	I
Rhamnus cathartica	-	-	-	-	-	I
Rhamnus cathartica juv.	-	+	-	-	-	I
Sambucus nigra	+	-	-	-	-	I
Sambucus nigra juv.	-	-	-	-	+	I
Prunus spinosa	+	-	-	-	-	I
Prunus spinosa juv.	+	-	-	-	-	I
Polygonatum odoratum	-	-	-	-	+	I
Prunella vulgaris	+	-	-	-	-	I
Torilis japonica	-	-	-	+	-	I
<i>Aliae</i>						
Ballota nigra	+	+	-	-	+	III
Taraxacum officinale	+	+	-	-	+	III
Erigeron annuus	+	-	-	+	+	III
Euphorbia cyparissias	+	+	-	-	+	III
Potentilla reptans	+	+	-	-	+	III
Ulmus minor	+	+	-	-	-	II
Polygonum hydropiper	+	-	-	-	+	II
Rorippa amphibia	-	-	+	+	-	II
Fraxinus angustifolia	+	-	-	-	+	II
Bidens tripartita	+	+	-	-	-	II
Calamagrostis epigejos	+	-	-	+	-	II
Artemisia absinthium	-	-	+	+	-	II
Polygonum lapathifolium	+	-	-	-	+	II

Daucus carota	+	-	+	-	-	II
Tussilago farfara	-	-	+	+	-	II
Scirpus maritimus	+	-	-	+	-	II
Inula britannica	-	-	+	-	+	II
Silene latifolia ssp. alba	+	-	-	-	-	I
Solanum dulcamara	-	-	+	-	-	I
Fallopia convolvulus	+	-	-	-	-	I
Potentilla argentea	-	-	-	-	+	I
Arctium tomentosum	-	+	-	-	-	I
Fragaria vesca	-	-	-	-	+	I
Agrimonia eupatoria	+	-	-	-	-	I
Echium vulgare	-	-	+	-	-	I
Artemisia annua	-	-	-	+	-	I
Leonurus cardiaca	-	-	-	-	+	I
Verbascum phlomoides	-	-	-	+	-	I
Veronica anagallis-aquatica	+	-	-	-	-	I
Tanacetum corymbosum	-	-	-	+	-	I
Trifolium repens	-	1	-	-	-	I
Geranium pusillum	-	-	-	1	-	I
Stellaria nemorum	+	-	-	-	-	I
Hypericum perforatum	-	-	+	-	-	I
Bellis perennis	-	-	-	-	+	I
Equisetum ramosissimum	-	-	-	+	-	I
Rumex crispus	-	-	-	-	+	I
Sambucus ebulus	-	+	-	-	-	I
Ranunculus repens	+	-	-	-	-	I

Data and place of the relevés: Siret riverbed at 1: Cosmești-20 Jul. 1994; 2-3: Ivești-8 Aug. 1995; 4-5: Tudor Vladimirescu-27 Jul. 1993

2. Ass. *Populetum x canadensis* I. Lupu 79

This is a vegetal association edified by the Black Canadian Poplar. The phytocoenoses are met along the Siret river banks, on plane areas. The surfaces of these plantations are not so large, and one can remark that these plantations have replaced those associations edified by the poplars and willows trees in the near past on the Tecuci Plain. The soils are alluvials. The plantations have been made with some cultivars of Canadian Poplars (*Populus x canadensis*), by some of the clones, which are suitable for the climate and soils of Romania. These clones, largely used in these plantations, are the next ones: '*Serotina*', '*Regenerata*', '*Robusta*', '*Marilandica*' [3]. These plantations with Canadian Poplars have a strong artificial feature, and a medium-term existence (being exploited at over 25 years old). As concerning the succession of the vegetation, one can see that in the clearings, are going to be installed those phytocoenoses of the previous vegetal association.

An interesting feature of the coenotaxons of the *Salicetea* class, is the herbaceous stratum, which are edified most of the time, by the weeds from *Chenopodietea*, *Plantaginetea*, and *Artemisietea* classes.

Live form's spectrum: H=49 (50%); T=17 (17%); Ph=10 (10%); others=23%.
Fitogeographical spectrum: Euras=35 (36%); Eur=11 (11%); Cosm=9 (9%); Euras. cont=8 (8%); Circ=7 (7%); Adv=7 (7%); others=22%. Table No. 2 (Rel. No. 1-5).

Table No. 2

Surface of relevé, m ²	400	400	400	400	400	
Coverage of trees, %	70	75	70	65	90	
Coverage of shrubs, %	2	1	2	1	1	
Coverage of grass layer, %	25	20	25	20	20	K
Diameter of trees, cm	20	25	25	30	25	
Coverage of regeneration layer, %	1	1	1	1	1	
No. of relevé	1	2	3	4	5	
Populus x canadensis	4	4	4	4	5	V
<i>Salicion albae</i>						
Salix alba	+	1	+	-	-	II
Salix alba juv.	+	-	+	-	-	II
Salix fragilis	+	+	1	-	-	II
Salix fragilis juv.	+	-	-	-	-	I
Populus alba	1	-	+	-	+	II
Populus alba juv.	-	-	-	-	+	I
<i>Salicetalia et Salicetea purpureae</i>						
Lysimachia nummularia	-	+	1	-	+	III
Glechoma hederacea	+	-	+	+	-	III
Rubus caesius var. arvalis	+	-	-	+	-	II
Solanum dulcamara	-	-	+	+	-	II
Clematis vitalba	-	-	+	+	+	II
Aristolochia clematitis	+	-	-	-	+	II
Morus alba	-	-	+	+	-	II
Eupatorium cannabinum	+	+	-	-	-	II
Oenothera biennis	+	-	+	-	-	II
Lithospermum officinale	-	-	+	-	+	II
<i>Prunetalia</i>						
Prunus spinosa	-	-	+	-	+	II
Prunus spinosa juv.	-	-	+	-	-	I
Crataegus monogyna	+	-	+	-	-	II
Crataegus monogyna juv.	+	-	-	-	-	I
Ligustrum vulgare	-	+	-	-	-	I
Ligustrum vulgare juv.	-	+	-	-	-	I
<i>Quercu-Fagetea</i>						
Glechoma hirsuta	+	-	+	+	-	III
Geum urbanum	+	+	-	-	+	III
<i>Molinietalia et Molinio-Arrhenatheretea</i>						
Agrostis stolonifera	+	+	+	+	+	V
Prunella vulgaris	-	+	+	-	+	III
Stellaria graminea	+	+	-	-	+	III
Taraxacum officinale	+	+	+	-	-	III
Poa angustifolia	-	+	-	+	-	II
Dactylis glomerata	+	-	-	+	-	II
Vicia cracca	+	-	-	+	-	II
Bellis perennis	+	-	-	+	-	II
Lathyrus pratensis	-	-	-	+	-	I
Ajuga reptans	-	-	-	-	+	I
Lolium perenne	-	-	-	+	-	I
<i>Festuco-Brometea</i>						
Euphorbia cyparissias	+	+	-	-	+	III
Arenaria serpyllifolia	+	-	-	+	-	II
Rumex acetosella	-	-	+	+	-	II
Trifolium ochroleucon	+	-	-	+	-	II
Plantago media	-	-	-	+	-	I
Anchusa barrelieri	-	-	+	-	-	I
Potentilla recta	-	-	-	-	+	I
Allium rotundum	-	+	-	-	-	I
Vicia sativa	+	-	-	-	-	I
Trifolium campestre	-	+	-	-	-	I
<i>Chenopodietea</i>						
Conyza canadensis	+	+	+	+	+	V
Stellaria media	-	-	-	+	+	III

Convolvulus arvensis	+	-	+	+	-	II
Cirsium arvense	-	-	+	-	-	II
Reseda lutea	+	-	+	+	-	II
Cynoglossum officinale	+	-	-	+	-	II
Crepis tectorum	-	-	-	+	-	I
Hyoscyamus niger	-	-	-	-	+	I
Veronica persica	+	-	-	-	-	I
Rorippa sylvestris ssp. kernerii	-	-	-	-	+	I
Salvia verticillata	-	-	-	+	-	I
Lepidium campestre	+	-	-	-	-	I
Malva sylvestris	-	+	-	-	-	I
Stachys palustris	-	-	+	-	-	I
<i>Secalietea</i>						
Fallopia convolvulus	+	+	-	-	-	II
Raphanus raphanistrum ssp. raphanistrum	-	-	+	-	+	II
Veronica arvensis	+	-	-	-	-	I
Lathyrus tuberosus	-	-	-	+	-	I
<i>Plantaginietalia et Plantaginietea</i>						
Rorippa sylvestris ssp. sylvestris	+	+	+	-	-	III
Ranunculus repens	+	+	-	+	-	III
Rorippa austriaca	-	-	+	+	+	III
Potentilla anserina	+	-	+	-	-	II
Plantago major	-	+	+	-	-	II
Mentha longifolia	+	-	-	+	-	II
Carex hirta	+	-	+	-	-	II
Verbena officinalis	-	-	+	-	+	II
Polygonum aviculare	-	-	-	-	+	I
<i>Artemisietea</i>						
Conium maculatum	+	+	-	+	-	III
Artemisia absinthium	+	-	-	-	+	II
Galium aparine	+	-	+	-	-	II
Leonurus cardiaca ssp. villosus	-	-	+	-	+	II
Chelidonium majus	-	-	+	+	-	II
Hypericum perforatum	+	+	-	-	-	II
Arctium tomentosum	+	-	-	-	+	II
Sambucus ebulus	-	-	+	+	-	II
Stachys germanica	+	+	-	-	-	II
Artemisia vulgaris	-	-	+	-	+	II
Erigeron annuus	+	+	-	-	-	II
Alliaria petiolata	-	-	+	-	+	II
Cirsium vulgare	+	-	-	+	-	II
Vicia sepium	-	-	+	+	-	II
Viola hirta	-	+	-	-	+	II
Dipsacus laciniatus	+	-	-	-	+	II
Trifolium pannonicum	+	+	-	-	-	II
Tussilago farfara	+	-	+	-	-	II
Ballota nigra	-	+	-	-	-	I
Chaerophyllum temulum	-	-	-	+	-	I
Bunias orientalis	-	+	-	-	-	I
<i>Phragmitetia</i>						
Carex vulpina	+	-	-	-	-	I
Phragmites australis	-	+	-	-	-	I
<i>Sedo-Scleranthetia</i>						
Acinos arvensis	+	-	-	-	-	I
Hieracium pilosella	-	-	-	-	+	I
<i>Origanetalia</i>						
Lysimachia punctata	-	-	-	-	+	I
Vincetoxicum hirundinaria	-	-	+	-	-	I

Data and place of the relevés: Siret riverbed: 1-2: Cosmești-20 Aug. 1994; 3-4: Movileni-22 Aug. 1994; 5: Tudor Vladimirescu-15 Jul. 1995

3. Ass. *Calamagrostio-Tamaricetum ramosissimae* Simon et Dihoru (1962) 1963

This vegetal association have been identified along the Siret river, on the alluviums of the inferior terraces, on large surfaces. The characteristic and dominant species is *Tamarix ramosissima*, whose coverage is between 50-75%, being accompanied by a herbaceous stratum well developed, most of the species being mesophilous, installed between the shrubs of *Tamarix ramosissima*. This lignaceous species play a pioneer part on the alluvial soils, being a stabilizer of the sands, and thus preparing the soil to install other forest vegetation along the rivers in that region.

Live form's spectrum: H=31 (52%); T=16 (26%); Ph=4 (7%); Ch (H)=2 (3%); others=12%.

Fitogeographical spectrum: Euras=26 (43%); Cosm=7 (11%); Adv=5 (8%); Circ=5 (8%); Euras. cont=4 (7%); others=23%. Table No. 3 (Rel. No. 1-6).

Table No. 3

Surface of relevé, m ²	400	400	400	400	400	400	
Coverage of vegetation, %	50	55	55	55	75	60	
Coverage of regeneration layer, %	1	1	1	1	1	1	K
No. of relevé	1	2	3	4	5	6	
<i>Tamarix ramosissima</i>	3	3	3	3	4	3	V
<i>Tamarix ramosissima</i> juv.	+	+	+	+	+	+	V
<i>Calamagrostis epigejos</i>	+	+	+	+	-	+	V
<i>Tamaricion, Tamaricetalia et Salicetea</i>							
<i>purpureae</i>							
<i>Oenothera biennis</i>	+	-	1	+	-	+	III
<i>Urtica dioica</i>	-	-	+	1	+	+	III
<i>Salix fragilis</i>	-	+	-	-	-	-	I
<i>Populus alba</i>	+	-	-	-	-	-	I
<i>Populus alba</i> juv.	-	-	-	-	+	-	I
<i>Agrostion stoloniferae</i>							
<i>Agrostis stolonifera</i>	+	+	+	+	+	1	V
<i>Poa angustifolia</i>	+	1	+	+	1	+	V
<i>Rorippa sylvestris</i> ssp. <i>sylvestris</i>	+	-	+	+	-	-	III
<i>Trifolium repens</i>	+	-	-	-	-	1	I
<i>Taraxacum officinale</i>	-	+	-	-	-	-	I
<i>Trifolium fragiferum</i>	-	-	-	-	-	+	I
<i>Elymus repens</i>	-	-	-	-	+	-	I
<i>Lolio-Plantaginietum</i>							
<i>Lolium perenne</i>	-	+	-	+	+	-	III
<i>Plantago major</i>	+	-	+	-	+	+	III
<i>Panico-Setarion</i>							
<i>Setaria lutescens</i>	+	-	-	+	-	+	III
<i>Echinochloa crus-galli</i>	+	+	+	-	-	+	III
<i>Aliae</i>							
<i>Agrimonia eupatoria</i>	-	-	+	+	-	+	III
<i>Tanacetum vulgare</i>	+	+	-	+	+	-	III
<i>Conyza canadensis</i>	-	-	+	+	+	-	III
<i>Artemisia absinthium</i>	+	-	-	+	-	+	III
<i>Verbena officinalis</i>	-	+	+	-	+	-	III
<i>Cichorium intybus</i>	+	-	+	-	+	+	III
<i>Artemisia austriaca</i>	+	+	+	-	-	+	III
<i>Plantago lanceolata</i>	+	+	-	+	+	-	III
<i>Tussilago farfara</i>	+	-	-	+	-	+	III
<i>Potentilla argentea</i>	+	-	-	+	-	+	III
<i>Mentha pulegium</i>	-	+	-	+	-	-	II
<i>Bromus commutatus</i>	+	-	+	-	-	-	II
<i>Ranunculus repens</i>	+	-	-	-	+	-	II
<i>Achillea collina</i>	-	-	+	+	-	-	II

Achillea setacea	+	-	+	+	-	-	II
Salvia nemorosa	-	-	+	-	-	-	I
Atriplex hastata	-	-	-	+	-	-	I
Chenopodium urbicum	-	+	-	-	-	-	I
Rorippa austriaca	-	-	-	-	+	-	I
Potentilla supina	-	-	-	-	-	+	I
Centaurea biebersteinii	-	-	+	-	-	-	I
Alopecurus geniculatus	+	-	-	-	-	-	I
Althaea officinalis	-	-	-	+	-	-	I
Xanthium riparium	-	-	-	-	-	+	I
Anagallis arvensis	-	+	-	-	-	-	I
Chenopodium glaucum	-	-	-	-	+	-	I
Rubus caesius var. arvalis	-	-	+	-	-	-	I
Cynodon dactylon	+	-	-	-	-	-	I
Lotus corniculatus	-	-	-	+	-	-	I
Juncus gerardi	-	-	-	-	-	+	I
Prunella vulgaris	-	-	+	-	-	-	I
Rorippa austriaca	+	-	-	-	-	-	I
Medicago lupulina	-	-	-	+	-	-	I
Equisetum arvense	-	+	-	-	-	-	I

Date and places of relevées: river meadows of Siret: 1-3: Cosmești-18 Aug., 1994; 4-6: Furcenii Noi-20 Aug., 1994

4. Ass. *Ulmeto-Fraxinetum pallisae* (Borza 1966) Sanda 1970

This vegetal association has been identified by Al. Borza [2], for the first time in the Romanian Plain, during his searches over the forest vegetation at the Southern of the Bucharest, but missing the herbaceous layer from his relevées, under the name *Ulmeto-Fraxinetum holotrichae*. Later, V. Sanda, change the name of this association as. *Ulmeto-Fraxinetum pallisae*, following his searches over the forests **Frasinu** and **Spătaru** (Buzău county) [7]. This vegetal association is installed in those numerous microdepressions in the forest of Torcești and Balta, along the Bârlad river. Also, the phreatric layer is situated quite shallow. Soils are alluvials, clay-alluvials, or even colluvials. In the first 30 cm depth, the soil has a low degree of salt. Thus, there are conditions for keeping numerous hygro-halophilous vascular plants. The tree layer is dominated by *Fraxinus pallisae* and *Ulmus minor*, having a maximum degree of K; besides these two species, other species are: *Fraxinus angustifolia*, *Quercus robur*, *Ulmus minor*, *Acer tataricum* and so forth, but having a low degree of K (I-II). The shrub layer has a low coverage degree, but the herbaceous layer is well represented, here and there.

The phytocoenoses of this association, identified in the forest of Balta Academiei (Munteni commune), represents the northest locality identified in Romania, until now [243], but having a wider spread in the Southern part of the Romanian Plane.

Live form's spectrum: H=49 (59%); Ph=10 (11%); T=9 (10%); others=20%.
Fitogeographical spectrum: Euras=32 (36%); Eur=14 (16%); Euras. cont=10 (11%); Circ=6 (7%); Cosm=5 (6%); others=24%. Table No. 4 (Rel. No. 1-5).

Table No. 4

Surface of relevé, m ²	400	400	400	400	400	
Coverage of trees, %	70	75	70	75	70	
Height of trees, m	12-14	15-17	15-16	15-17	12-14	
Diameter of trees, cm	15-25	15-30	15-25	20-35	15-25	K
Coverage of shrubs, %	2	1	1	2	1	
Coverage of grass layer, %	30	20	20	20	15	
Coverage of regeneration layer, %	2	2	3	2	2	
No. of relevé	1	2	3	4	5	
Fraxinus pallisae	4	4	4	4	4	V
Fraxinus pallisae juv.	+	+	+	+	+	V
Fraxinus angustifolia	+	1	+	1	+	V
Fraxinus angustifolia juv.	+	-	+	+	-	III
Ulmus minor	1	1	1	1	1	V
Ulmus minor juv.	+	-	-	+	-	II
<i>Alno-Padion</i>						
Lysimachia nummularia	+	+	+	-	+	IV
Poa nemoralis	+	-	+	-	-	II
Glechoma hederacea	-	+	-	-	+	II
Gladiolus imbricatus	-	-	+	+	-	II
Symphytum officinale	+	-	-	+	-	II
Valeriana officinalis	-	-	+	-	+	II
Cruciata glabra	+	-	+	-	-	II
Rubus caesius var. arvalis	+	-	-	-	+	II
<i>Fagetalia sylvaticae et Quercus-Fagetea</i>						
Cardamine impatiens	1	1	+	1	+	V
Pyrus pyraister	+	+	-	-	+	III
Pyrus pyraister juv.	-	+	-	-	+	II
Geum urbanum	-	+	+	-	+	III
Rorippa sylvestris ssp. sylvestris	+	-	+	-	+	III
Galium rubioides	+	-	-	+	+	III
Ranunculus ficaria ssp. bulbifer	+	-	+	+	-	III
Alliaria petiolata	-	-	+	+	+	III
Ornithogalum boucheanum	+	+	-	+	-	III
Hypericum hirsutum	-	+	+	-	+	III
Quercus robur	+	-	-	-	+	II
Quercus robur juv.	-	+	-	+	-	II
Trifolium medium	-	+	-	-	+	II
Asparagus tenuifolius	+	-	-	+	-	II
Convallaria majalis	-	-	+	-	+	II
Dianthus armeria	+	-	-	+	-	II
Fragaria viridis	-	-	-	+	+	II
Polygonatum latifolium	+	-	-	-	+	II
Scrophularia nodosa	-	-	+	+	-	II
Viola reichenbachiana	+	-	+	-	-	II
Carex divulsa	+	-	-	-	+	II
Galium odoratum	+	-	+	-	-	II
Acer tataricum	-	-	+	-	-	I
Lapsana communis	-	-	-	+	-	I
Mercurialis perennis	-	-	-	+	-	I
<i>Quercetia pubescenti-petraeae</i>						
Crataegus monogyna	+	-	-	+	+	III
Crataegus monogyna juv.	-	+	-	-	+	II
Vincetoxicum hircundinaria	-	-	+	+	-	II
Aristolochia clematitis	-	+	-	+	-	II
Veronica chamaedrys	-	+	-	+	-	II
Galanthus elwesii	+	-	-	+	-	II
Prunus spinosa	+	+	+	+	-	IV
Prunus spinosa juv.	+	-	+	-	+	III

<i>Molinio-Arrhenatheretea</i>						
Poa pratensis ssp. angustifolia	+	-	+	-	+	III
Serratula tinctoria	+	-	+	-	+	III
Stachys officinalis	+	+	+	-	-	III
Veronica serpyllifolia	+	-	-	+	-	II
Dactylis glomerata	-	+	+	-	-	II
Colchicum autumnale	+	-	+	-	-	II
Poa silvicola	+	+	-	-	-	II
Ranunculus acris ssp. acris	+	-	-	-	+	II
Calamagrostis epigejos	-	-	+	-	+	II
Agrostis stolonifera	-	+	+	-	-	II
Lathyrus pratensis	+	-	-	-	+	II
Ranunculus auricomus	-	-	+	+	-	II
Scutellaria hastifolia	+	-	-	-	-	I
Poa trivialis	-	-	+	-	-	I
Serratula wolffii	+	-	-	-	-	I
Ajuga reptans	+	-	-	-	-	I
Alopecurus arundinaceus	+	-	-	-	-	I
<i>Festuco-Brometea</i>						
Galium aparine	-	+	+	-	+	III
Cardaria draba	+	-	-	+	+	III
Stellaria media	+	-	-	+	+	III
Plantago media	+	-	+	-	-	II
Lythrum salicaria	+	-	-	-	+	II
Carex vulpina	+	-	-	+	-	II
Trifolium repens	-	-	+	-	+	II
Poa bulbosa	-	+	-	-	+	II
Geranium pusillum	+	-	-	+	-	II
Potentilla recta	+	-	-	+	-	II
Capsella bursa-pastoris	-	+	-	+	-	II
Lamium purpureum	-	-	+	-	+	II
Urtica dioica	+	-	-	+	-	II
Fallopia convolvulus	-	+	-	+	-	II
Anthriscus cerefolium ssp. trichosperma	-	+	-	-	+	II
Arctium lappa	-	-	+	-	+	II
Linaria vulgaris	-	+	-	-	+	II
Torilis arvensis	+	-	+	-	-	II
Taraxacum officinale	+	-	-	-	-	I
Prunella vulgaris	+	-	-	-	-	I
Carex acutiformis	-	+	-	-	-	I
Silene latifolia ssp. alba	+	-	-	-	-	I
Melilotus officinalis	-	-	+	-	-	I
Ranunculus repens	-	+	-	-	-	I
Sium latifolium	+	-	-	-	-	I
Vicia tetrasperma	+	-	-	-	-	I
Carduus acanthoides	-	-	+	-	-	I
Achillea setacea	-	+	-	-	-	I
Cynoglossum officinale	-	-	+	-	-	I
Galium humifusum	+	-	-	-	-	I
Artemisia austriaca	-	-	+	-	-	I
Populus canescens	+	-	-	-	-	I
Artemisia vulgaris	+	-	-	-	-	I
Asperugo procumbens	-	+	-	-	-	I

Data and place of the relevés: Bârlad riverbed: 1-3: forest Balta-Munteni, 20 Jun., 1996; 4-5: forest Torcești-Umbrărești, 15 Jul., 1996

5. Ass. *Fraxino pallisae-Quercetum pedunculiflorae* A. Oprea 1997

Some phytocoenoses of this vegetal association have been identified on large surfaces in the forests: Balta Academiei (Munteni), and Torcești (Umbrărești), on full plain fields or even

on small depressions [6]. The association is installed on well drained soils, flooded in the springs, but wet-dried in the summer time. The soils are the next: phreatic-wet chernozems, phreatic-wet carbonated chernozems, leached phreatic-wet chernozems, alluvial and alluvial gleyed soils, on sandy or cleyed substratum. The coverage of the trees vary between 65-70%; the coverage of shrubs is around 5%, and the herbaceous stratum vary between 30 to 40%. Live form's spectrum: H=53.38%; Ph=22.03%; G=8.47%; others=16.12%. Fitogeographical spectrum: Euras.=38.1%; Eur.=13.5%; Euras. cont.=7.62%; Circ.=7.62%; Eur. centr.=5.93%; others=27.23%. Table No. 5 (Rel. No. 1-10).

Table No. 5

Coverage of trees, %	70	70	65	65	65	60	65	65	75	70	
Height of trees, m	20-22	20	18-20	20	22	22	20	22	18-20	20	
Diameter of trees, cm	25-50	30-50	30-45	50	25-70	30-60	25-50	30-50	30-70	25-50	
Coverage of shrubs, %	5	5	4	3	4	5	5	4	5	3	
Coverage of regeneration layer, %	1	1	1	1	1	1	1	1	1	1	K
Coverage of grass layer, %	30	30	35	35	35	30	35	40	40	35	
Surface of relevé, m ²	400	400	400	400	400	400	400	400	400	400	
No. of relevé	1	2	3	4	5	6	7	8	9	10	
Fraxinus pallisae	+	1	1	2	2	1	1	+	1	+	V
Fraxinus pallisae juv.	+	+	+	-	+	-	+	-	+	+	IV
Fraxinus angustifolia	2	2	1	1	+	1	1	+	+	1	V
Fraxinus angustifolia juv.	+	+	+	+	-	1	1	+	+	1	V
Quercus pedunculiflora	3	3	3	3	3	3	3	3	3	3	V
Quercus pedunculiflora juv.	+	-	-	+	+	+	-	-	+	-	III
<i>Alno-Padion</i>											
Serratula tinctoria	+	1	-	-	-	+	-	-	+	+	III
Galium aparine	-	-	+	+	-	1	-	+	-	+	III
Lysimachia nummularia	+	1	-	1	+	-	-	+	-	+	III
Cruciata laevipes	-	-	+	+	-	+	+	-	-	+	III
Glechoma hederacea	+	-	1	+	1	-	+	+	-	-	III
Brachypodium sylvaticum	-	+	+	+	-	+	-	-	+	-	II
Populus alba	+	+	-	-	-	+	-	-	-	-	II
Rubus caesius	+	-	+	-	-	-	+	-	-	+	II
Rumex sanguineus	-	-	+	+	-	-	-	+	-	+	II
Viburnum opulus	+	+	-	-	-	+	-	-	+	-	II
Viburnum opulus juv.	+	-	+	-	-	-	-	-	-	-	I
Ranunculus repens	-	+	-	-	+	-	-	-	+	+	II
Symphytum officinale	+	-	-	-	+	-	-	-	-	-	I
Ranunculus acris ssp. acris	+	-	-	-	+	-	-	-	-	-	I
Lamium maculatum	-	-	-	-	1	+	-	-	-	-	I
Frangula alnus	+	-	-	-	-	-	-	-	+	-	I
Malus sylvestris	+	-	-	-	-	1	-	-	-	-	I
Gladiolus imbricatus	+	-	-	+	-	-	-	-	-	-	I
<i>Quercetea</i>											
<i>pubescenti-petraeae</i>											
Acer tataricum	+	-	-	+	+	+	+	-	+	-	III
Acer tataricum juv.	-	+	-	+	-	-	-	-	+	-	II
Polygonatum odoratum	+	+	-	+	-	+	-	-	+	-	III
Buglossoides											
purpureoerulea	1	+	-	-	+	+	-	-	-	+	II
Calamintha sylvatica	+	-	+	-	-	+	-	-	-	-	II
Prunus spinosa	+	+	-	-	+	-	-	+	+	-	II
Poa nemoralis	-	+	-	+	-	+	-	+	-	-	II
Vincetoxicum hirundinaria	+	-	+	-	+	+	-	-	+	-	II
Genista tinctoria	-	-	-	+	+	-	-	+	-	-	II

Lathyrus niger	+	-	-	-	-	+	-	-	-	-	II
Polygonatum latifolium	+	-	-	-	+	+	+	-	-	-	II
Asparagus officinalis	+	-	+	+	-	-	-	-	-	-	II
Aristolochia clematitis	+	+	-	-	1	1	-	+	-	-	II
Lychnis coronaria	-	-	+	-	-	-	+	-	-	-	I
Sorbus torminalis	-	+	+	-	-	-	-	-	-	-	I
Rosa gallica	-	-	+	-	-	+	-	-	-	-	I
Cornus mas	1	1	-	-	-	+	-	-	-	-	I
<i>Quercus-Fagetea</i>											
Crataegus monogyna	+	-	+	-	+	-	+	+	-	-	III
Crataegus monogyna juv.	-	-	+	-	+	-	-	-	+	-	II
Pyrus pyraeaster	-	+	+	-	-	+	-	-	-	-	II
Geum urbanum	-	-	+	+	+	1	-	+	-	-	II
Cornus sanguinea	+	+	-	-	-	+	-	-	+	-	II
Rosa canina	-	-	+	-	+	-	-	-	-	+	II
Prunella vulgaris	+	-	-	1	-	+	-	-	+	-	II
Trifolium medium	-	+	-	-	+	-	-	-	+	+	II
Populus tremula	+	-	+	+	-	+	+	-	-	-	II
Rhamnus cathartica	-	-	+	-	-	+	-	+	-	-	II
Euonymus europaeus	+	+	-	-	+	-	-	-	+	-	II
Euonymus europaeus juv.	+	-	-	+	-	-	-	+	-	-	II
Ranunculus auricomus	-	-	+	-	+	-	-	+	+	-	II
Asparagus tenuifolius	+	+	-	+	-	-	+	-	-	-	II
Veronica longifolia	+	+	-	-	-	-	+	-	-	-	II
Scrophularia nodosa	-	+	-	-	+	-	-	-	+	-	II
Carex divulsa	+	-	-	-	+	+	+	-	-	-	II
Acer campestre	+	-	+	-	-	-	+	-	-	-	II
Acer campestre juv.	+	-	-	-	-	-	-	-	-	-	I
Convallaria majalis	-	+	+	-	-	-	+	-	+	-	II
Ulmus minor	+	-	-	+	-	1	+	-	-	+	II
Carex spicata	+	-	+	-	-	-	-	-	-	+	II
Ligustrum vulgare	-	+	+	-	-	+	+	-	-	-	II
Ligustrum vulgare juv.	+	+	-	-	+	-	+	-	-	+	III
Leucojum vernum	+	-	-	-	-	-	-	-	-	-	I
Veronica spicata	+	-	-	+	-	-	-	-	-	-	I
Carex sylvatica	-	+	-	-	+	-	-	-	-	-	I
Ranunculus cassubicus	+	-	-	-	+	-	-	-	-	+	I
Dianthus armeria	+	-	-	-	-	-	-	-	-	-	I
Myosotis scorpioides	-	-	+	-	-	-	-	-	-	-	I
Carpinus betulus	1	1	-	-	-	-	-	-	-	-	I
Carpinus betulus juv.	+	+	-	-	-	-	-	-	-	-	I
Glechoma hirsuta	+	-	1	+	+	-	-	-	-	-	I
Pulmonaria officinalis	-	+	+	-	-	-	-	-	-	-	I
Anemone ranunculoides	+	-	+	+	-	-	-	-	-	+	I
Astragalus glycyphyllos	-	-	-	-	-	+	-	-	-	-	I
Ranunculus ficaria ssp. bulbifer	+	-	-	+	-	-	-	-	-	-	I
Fragaria vesca	-	-	+	-	+	+	-	-	-	-	I
Viola reichenbachiana	+	-	+	-	-	+	-	-	-	-	I
<i>Phragmitetea</i>											
Cardamine impatiens	+	+	+	+	-	+	-	-	+	+	III
Sium latifolium	+	+	-	+	-	-	-	+	-	-	III
Lythrum salicaria	+	+	-	-	-	-	+	-	-	-	II
Lysimachia vulgaris	+	-	-	-	-	-	+	-	+	-	II
Eupatorium cannabinum	-	-	+	+	-	-	+	-	-	-	II
Carex vulpina	-	+	-	-	+	-	-	-	-	-	II
Agrostis stolonifera	+	1	+	+	-	+	+	+	-	-	II

Stachys palustris	-	+	-	-	-	-	-	-	+	-	I
Carex hirta	-	+	-	-	-	+	-	-	+	-	I
Rorippa sylvestris ssp. sylvestris	+	-	-	+	+	-	-	-	-	-	I
<i>Molinio-Arrhenatheretea</i>											
Dactylis glomerata	+	-	-	+	+	-	-	-	-	-	II
Thalictrum lucidum	+	-	+	-	-	+	-	-	-	+	II
Valeriana officinalis	+	+	-	-	-	-	-	+	-	-	II
Ajuga reptans	-	-	+	+	-	+	-	-	-	+	II
Calamagrostis epigejos	+	-	-	-	-	-	+	-	+	-	II
Lychnis flos-cuculi	+	+	-	-	-	-	+	-	-	-	II
Cichorium intybus	-	+	-	+	-	-	+	-	-	+	II
Stachys officinalis	+	-	-	+	-	-	+	-	-	-	II
Colchicum autumnale	+	-	+	-	-	-	+	-	-	+	II
Trifolium repens	+	-	1	-	-	-	-	+	-	+	II
Plantago media	+	-	-	+	-	-	-	-	-	-	I
Galium mollugo	+	-	+	-	-	-	-	-	-	-	I
Potentilla reptans	+	-	-	-	-	+	-	-	-	-	I
Poa angustifolia	-	-	+	-	+	+	-	-	-	-	I
Lathyrus pratensis	-	-	+	+	-	-	-	-	-	-	I
Heracleum sphondylium	+	-	-	-	+	-	-	-	-	-	I
Daucus carota	+	-	-	+	-	-	-	-	-	-	I
Clinopodium vulgare	+	-	-	-	-	+	+	-	-	-	I
Poa silvicola	-	-	+	-	-	+	-	-	-	-	I
Stellaria graminea	+	-	-	+	-	-	-	-	-	-	I
Vicia cracca	+	-	-	+	-	-	+	-	-	-	I
Taraxacum officinale	+	-	-	-	-	-	-	-	+	-	I
<i>Aliae</i>											
Anthriscus cerefolium ssp. trichosperma	+	+	-	-	+	+	-	+	-	-	II
Hypericum perforatum	+	-	-	-	-	-	+	-	-	-	I
Veronica chamaedrys	-	+	-	-	+	-	-	-	-	+	I
Althaea officinalis	+	-	+	-	-	-	-	-	-	-	I
Artemisia absinthium	-	-	-	-	-	+	-	+	-	-	I
Dipsacus fullonum	-	-	-	+	-	-	-	+	-	-	I
Fallonium convolvulus	+	-	-	+	-	-	-	-	-	-	I
Filipendula vulgaris	+	-	-	-	-	-	-	-	-	-	I
Galega officinalis	-	+	-	-	-	-	-	-	-	-	I
Lamium purpureum	+	-	-	-	+	-	-	-	+	-	I
Ornithogalum boucheanum	+	+	-	-	-	-	-	-	-	-	I

Data and place of the relevés: Bârlad riverbed: 1-5: forest Balta Academiei (Berheci-Munteni)-12 Sept., 1996; 6-10: forest Torcești (Umbrărești)-14 Sept. 1996.

6. Ass. *Lathyro collini-Quercetum pubescentis* Klika 1932 emend. Jákucs 1960

The phytocoenoses of this association occupy small areas in the Tecuci Plain, making forests with large clearings, on plaine lands or on the slopes of the hills. Soils are leached chernozems, made on loess or sands, having 3.5-8% humus in A layer, and a pH of 6-6.9. The phytocoenoses are three stratified. The stratum of the trees is low closed, and all the trees have a slow rithm of growing, wry stems and branches, with stems up to 5 or 6 m high; also, the natural regeneration of the trees is weak, from the stubs only. *Quercus pubescens* is the dominant species; other species, sporadically met, are: *Quercus virgiliana*, *Q. dalechampii*, *Q. pedunculiflora*, *Pyrus pyraster*, *Acer tataricum*...The shrub tree is weak represented. The herbaceous layer cover between 15 and 20%, being edyified by those species immigrating here from the steppe meadows surrounding the forests.

Live form's spectrum: H=38 (60%); Ph=11 (17%); T=4 (6%); others=17%. Fitogeographical spectrum: Euras=19 (30%); Euras. cont=10 (15%); Eur=8 (12%); Pont-medit=4 (6%); Circ=4 (6%); others=31%. Table No. 6 (Rel. No. 1-5)

Table No. 6

Surface of relevé, m ²	400	400	400	400	400	
Coverage of trees, %	50	65	65	70	65	
Height of trees, m	5-6	5-6	6-7	5-6	5-6	
Diameter of trees, cm	10-18	15-20	8-15	8-18	10-18	K
Coverage of shrubs, %	3	10	5	3	3	
Coverage of grass layer, %	20	15	15	20	20	
Coverage of regeneration layer, %	1	1	1	1	1	
No. of relevé	1	2	3	4	5	
<i>Quercus pubescens</i>	3	4	4	4	4	V
<i>Lathyrus pannonicus</i> ssp. <i>collinus</i>	+	-	-	+	+	II
<i>Quercion pubescenti-petraeae</i>						
<i>Dictamnus albus</i>	+	-	-	+	+	III
<i>Acer tataricum</i>	1	-	-	+	+	II
<i>Acer tataricum</i> juv.	+	+	+	+	+	V
<i>Inula hirta</i>	-	-	+	+	+	I
<i>Vicia cassubica</i>	+	-	-	-	+	I
<i>Quercetalia pubescenti-petraeae</i>						
<i>Viola hirta</i>	+	+	+	+	1	V
<i>Fragaria viridis</i>	+	+	+	+	-	IV
<i>Thalictrum aquilegifolium</i>	+	-	-	+	+	III
<i>Hypericum hirsutum</i>	+	-	+	+	+	III
<i>Quercus pedunculiflora</i>	+	-	-	-	+	II
<i>Quercetea pubescenti-petraeae</i>						
<i>Carex praecox</i>	+	+	+	+	-	IV
<i>Vinca herbacea</i>	+	+	+	+	-	IV
<i>Asparagus tenuifolius</i>	+	+	+	+	+	IV
<i>Poa angustifolia</i>	+	+	-	+	+	IV
<i>Teucrium chamaedrys</i>	+	-	-	+	+	III
<i>Cynanchum vincetoxicum</i>	+	-	-	+	+	III
<i>Agrimonia eupatoria</i>	-	-	+	+	-	II
<i>Trifolium alpestre</i>	+	-	-	+	-	II
<i>Carex divulsa</i>	-	+	-	+	-	II
<i>Stachys officinalis</i>	+	-	+	-	-	II
<i>Clinopodium vulgare</i>	-	-	-	+	+	II
<i>Veronica chamaedrys</i>	-	-	-	+	-	I
<i>Buglossoides purpureoerulea</i>	+	-	-	-	+	I
<i>Astragalus glycyphyllos</i>	+	-	-	-	-	I
<i>Brachypodium pinnatum</i>	-	-	-	+	-	I
<i>Cornus mas</i>	-	1	+	+	+	I
<i>Cornus mas</i> juv.	+	-	-	+	-	II
<i>Quercus dalechampii</i>	-	-	+	-	-	I
<i>Quercus virgiliana</i>	-	+	-	+	-	I
<i>Orno-Cotinetalia</i>						
<i>Ajuga laxmanni</i>	+	-	+	-	-	II
<i>Hypericum perforatum</i>	+	-	-	+	-	II
<i>Prunetalia et Prunion spinosae</i>						
<i>Rhamnus cathartica</i>	+	+	+	+	+	IV
<i>Rhamnus cathartica</i> juv.	+	-	+	-	-	II
<i>Crataegus monogyna</i>	+	+	+	+	+	IV
<i>Crataegus monogyna</i> juv.	-	+	+	-	-	II
<i>Prunus spinosa</i> ssp. <i>dasyphylla</i>	+	+	+	+	-	IV
<i>Prunus spinosa</i> ssp. <i>dasyphylla</i> juv.	+	-	-	-	+	II
<i>Rosa canina</i>	+	+	+	+	+	III

Rosa canina juv.	+	+	-	-	+	III
Origanum vulgare	-	-	-	+	+	II
<i>Quercus-Fagetea</i>						
Glechoma hederacea	+	+	-	+	+	III
Geum urbanum	+	-	-	+	-	II
Brachypodium silvaticum	-	+	+	-	-	II
Carex spicata	+	-	-	-	+	II
Polygonatum latifolium	-	-	-	+	-	I
Campanula persicifolia	+	-	-	-	-	I
Sedum maximum	-	-	-	+	-	I
Tanacetum corymbosum	-	+	-	-	-	I
<i>Festuco-Brometea, Festucetalia valesiacae et Festuco-Stipion</i>						
Filipendula vulgaris	+	+	+	+	+	V
Galium verum	+	+	+	+	+	V
Potentilla patula	+	-	-	+	+	III
Coronilla varia	+	-	-	+	+	III
Festuca valesiaca	+	-	+	-	+	II
Potentilla argentea	+	-	-	+	-	II
Artemisia austriaca	+	-	-	+	-	II
Plantago lanceolata	-	+	-	+	-	II
Eryngium campestre	+	-	-	-	+	II
Euphorbia nicaeensis	-	-	+	-	+	II
Medicago falcata	-	-	-	+	+	II
Dichanthium ischaemum	-	-	+	-	+	II
<i>Aliae</i>						
Galium aparine	-	-	+	+	+	III
Dactylis glomerata	-	+	+	+	+	III
Achillea setacea	+	-	-	+	+	III
Fallopia convolvulus	+	-	-	+	-	II
Ballota nigra	-	+	1	+	+	I
Vicia sativa	+	-	+	-	-	I
Trifolium campestre	-	+	-	+	-	I
Pyrus pyraeaster	+	+	-	+	-	I

Data and place of the relevés: 1-3: forest Pârlești-Valea Mărlui, 19 Aug., 1996; 4-5: forest Durasca-Barcea, 27 Jun., 1996

7. Ass. *Quercetum pedunculiflorae* Borza 1937

This association has been described by Al. Borza (1937), between Prut and Nistru rivers [1]. The author, show that the grey oak make up small forests, and, rarely forests having large surfaces (for. ex. the forest of Manzâr). Those phytocoenoses described by I. Morariu as *Quercetum pedunculiflorae typicum* and *Q. p. geticum* can be also ascribed at the association *Quercetum pedunculiflorae* Borza 1937 [4]. The association of grey oak represent nowadays only traces of the forest-steppe, which characterised the Tecuci Plain vegetation in the past. Today, the grey oak make up only a few forests, having small areas, situated on the Siret-Bârlad interfluvium only. *Quercus pedunculiflora* is a tree claiming more humidity, growing well on the wet soils, but survive also, on the near dry soils. In the tree stratum there are met sometimes the species *Quercus pubescens*. The shrub layer is well developed, being edified by: *Crataegus monogyna*, *Cornus sanguinea*, *Acer tataricum*, *Prunus spinosa*, *Rhamnus cathartica*, *Ligustrum vulgare*, *Acer campestre*, *Euonymus europaeus*, *Sambucus nigra*... The most frequent herbaceous species are the next: *Geum urbanum*, *Silene vulgaris*, *Vincetoxicum hirundinaria*, *Asparagus tenuifolius*, *Buglossoides purpureoerulea*, *Carex spicata*, *Astragalus glycyphyllos*, *Polygonatum latifolium*, *Viola hirta*, *Vinca herbacea*, *Ballota nigra*... Those kind of forests are generally cleared, and the clearings are penetrated by the species belonging to the Class *Festuco-Brometea*, Order *Festucetalia valesiacae*, like the next ones: *Poa angustifolia*,

Filipendula vulgaris, *Festuca valesiaca*, *Carex praecox*... By the presence of the weeds in those forests (for instance, *Cannabis ruderalis*, *Urtica dioica*, *Ballota nigra*, *Sambucus ebulus*...), one can observe a beginning of a ruderal succession of the herbaceous layer. More, the intensive grazing process in some of the forests (the forests of Nemțeanca, Arhipoia, Țepu and so forth), clearings, recurrent mowings of the herbs, lead to a strong ruderal evolution of those forests, and there, in the herbaceous layer are dominating the next species: *Urtica dioica*, *Ballota nigra*, *Leonurus cardiaca* ssp. *villosus*, *Conyza canadensis*, *Arctium minus*, *Cannabis ruderalis* and so forth. In these forests, the characteristic species, *Quercus pedunculiflora*, is regenerating also from the stubs only, due to the recurrent cutting down of the trees; thus the strength of the stands is weak, and the juvenil trees is missing almost totally.

Live form's spectrum: H=50 (54%); Ph=20 (22%); T=7 (7%); G=6 (6%); others=11%.
 Fitogeographical spectrum: Euras=19 (21%); Euras. cont=15 (17%); Eur=12 (14%); Eur. centr (submedit)=7 (7%); Pont-medit=6 (6%); Circ=6 (6%); others=29%. Table No. 7 (Rel. No. 1-6).

Table No. 7

Surface of relevé, m ²	400	400	400	400	400	400	
Coverage of trees, %	75	75	60	75	60	60	
Height of trees, m	18-22	18-22	18-20	18-20	18-20	18	
Diameter of trees, cm	30-50	35-55	30-40	35-40	25-50	30-50	K
Coverage of shrubs, %	3	3	5	3	5	5	
Coverage of grass layer, %	25	30	30	5	35	30	
Coverage of regeneration layer, %	1	1	1	1	1	1	
No. of relevé	1	2	3	4	5	6	
<i>Quercus pedunculiflora</i>	4	4	3	4	3	3	V
<i>Quercus pedunculiflora</i> juv.	+	+	+	+	+	+	V
<i>Quercion pubescenti-petraeae</i>							
<i>Acer tataricum</i>	+	-	-	+	+	-	III
<i>Acer tataricum</i> juv.	+	+	-	+	-	+	III
<i>Primula veris</i>	+	+	-	-	+	+	III
<i>Dictamnus albus</i>	-	-	-	+	-	-	I
<i>Lathyrus niger</i>	-	-	+	-	-	-	I
<i>Iris graminea</i>	+	-	-	-	-	-	I
<i>Pulmonaria mollis</i> ssp. <i>molissima</i>	-	-	+	-	-	-	I
<i>Inula hirta</i>	+	-	-	-	-	-	I
<i>Quercetalia pubescenti-petraeae</i>							
<i>Fragaria viridis</i>	+	-	-	+	-	+	III
<i>Viola hirta</i>	-	+	+	-	-	+	III
<i>Viola suavis</i>	-	-	-	-	+	-	I
<i>Thalictrum aquilegifolium</i>	+	-	-	-	-	-	I
<i>Quercetalia pubescenti-petraeae</i>							
<i>Vincetoxicum hirundinaria</i>	+	+	-	+	+	+	V
<i>Buglossoides purpureoerulea</i>	+	-	-	+	+	+	IV
<i>Veronica chamaedrys</i>	-	+	-	-	+	+	III
<i>Carex divulsa</i>	-	+	+	-	+	-	III
<i>Vinca herbacea</i>	-	+	+	-	-	+	III
<i>Asparagus tenuifolius</i>	-	-	-	+	+	-	II
<i>Acer campestre</i>	+	+	-	-	-	-	II
<i>Ligustrum vulgare</i>	+	-	-	+	-	-	II
<i>Ligustrum vulgare</i> juv.	+	+	+	-	-	+	III
<i>Agrimonia eupatoria</i>	-	+	+	-	-	-	II
<i>Clinopodium vulgare</i>	+	-	-	+	-	-	II
<i>Quercus pubescens</i>	+	-	-	-	-	-	I
<i>Quercus robur</i>	-	-	+	-	-	-	I
<i>Brachypodium pinnatum</i>	-	-	-	-	+	-	I

Galium mollugo	-	+	-	-	-	-	I
Digitalis lanata	-	-	-	+	-	-	I
Cornus mas	-	-	+	-	-	-	I
Pyrus pyraeaster	-	-	-	+	-	-	I
Matricaria perforata	+	-	-	-	-	-	I
Tilia tomentosa	-	-	+	-	-	-	I
Teucrium chamaedrys	-	-	-	-	-	+	I
Polygonatum odoratum	-	-	-	-	+	-	I
Quercus x venusta	-	-	-	+	-	-	I
<i>Orno-Cotinetalia et Orno-Cotinion</i>							
Clematis recta	-	+	-	-	-	-	I
Asperula tenella	+	-	-	-	-	-	I
Trifolium montanum	-	-	-	-	+	-	I
Asparagus verticillatus	+	-	-	-	-	-	I
Coronilla varia	-	+	-	-	-	-	I
Cytisus austriacus	-	+	-	-	-	-	I
Campanula bononiensis	-	-	-	+	-	-	I
Campanula macrostachya	-	-	-	-	+	-	I
<i>Quercus-Fagetia</i>							
Geum urbanum	+	+	+	-	+	+	V
Euonymus europaeus	+	-	-	+	+	-	III
Euonymus europaeus juv.	+	-	-	+	-	+	III
Polygonatum latifolium	-	+	-	+	+	-	III
Lapsana communis	+	-	-	+	-	-	II
Viola odorata	+	+	-	-	-	-	II
Brachypodium silvaticum	-	-	-	+	+	-	II
Glechoma hirsuta	-	+	+	-	-	-	II
Asperula cynanchica	-	-	-	-	+	-	I
Geranium robertianum	-	+	-	-	-	-	I
Allium scorodoprasum	-	-	-	+	-	-	I
Viola alba	-	-	+	-	-	-	I
Genista tinctoria	+	-	-	-	-	-	I
Campanula persicifolia	-	-	-	-	+	-	I
Thalictrum minus	-	-	-	+	-	-	I
Centaureum erythraea	-	-	-	-	-	+	I
Festuca valesiaca	+	-	-	-	-	-	I
Mycelis muralis	-	+	-	-	-	-	I
Ajuga genevensis	-	-	-	-	+	-	I
Sedum maximum	+	-	-	-	-	-	I
Melica uniflora	-	+	-	-	-	-	I
Tanacetum corymbosum	-	-	+	-	-	-	I
Poa nemoralis	+	-	-	-	-	-	I
Scrophularia nodosa	-	-	-	-	+	-	I
Fallopia dumetorum	-	-	-	-	-	+	I
Phleum phleoides	-	-	+	-	-	-	I
Origanum vulgare	-	+	-	-	-	-	I
Scabiosa ochroleuca	-	-	-	+	-	-	I
Asparagus tenuifolius	-	-	-	-	+	-	I
Potentilla recta	-	+	-	-	-	-	I
Galium verum	-	-	-	-	+	-	I
Linaria genistifolia	-	-	-	+	-	-	I
Dianthus pseudarmeria	+	-	-	-	-	-	I
Moehringia trinervia	-	-	+	-	-	-	I
Veronica spicata	-	-	-	-	+	-	I
<i>Carpinion betuli</i>							
Prunus avium	-	+	+	-	-	+	III
Galium schultesii	-	-	+	-	-	-	I
<i>Fagetalia et Fagion sylvaticae</i>							
Euphorbia amygdaloides	+	-	-	-	-	-	I
Mercurialis ovata	-	-	+	-	-	-	I
Veronica officinalis	-	+	-	-	-	-	I

<i>Prunetalia et Prunion spinosae</i>							
Prunus spinosa ssp. dasyphylla	+	+	+	-	+	-	III
Crataegus monogyna	+	-	+	-	+	-	III
Crataegus monogyna juv.	+	-	+	+	+	+	V
Rhamnus cathartica	-	+	-	+	-	-	II
Rhamnus cathartica juv.	-	+	-	-	-	+	II
Rosa canina	-	-	+	+	-	-	II
Sambucus nigra	+	-	+	-	-	-	II
Sambucus nigra juv.	-	-	+	-	-	+	II
Cornus sanguinea	-	+	-	+	-	-	II
<i>Aliae</i>							
Urtica dioica	+	+	1	1	+	+	V
Cannabis ruderalis	1	+	+	1	+	+	V
Ballota nigra	+	+	+	+	+	+	V
Leonurus cardiaca ssp. villosus	+	+	+	+	1	1	V
Conyza canadensis	1	+	+	1	+	+	V
Arctium minus	+	+	1	+	+	+	V
Astragalus glycyphyllos	+	+	-	+	-	+	IV
Stachys officinalis	+	+	-	-	+	-	III
Dactylis glomerata	+	-	-	+	-	+	III
Galium aparine	-	+	+	-	+	-	III
Carex spicata	-	+	-	-	+	+	III
Elymus repens ssp. repens	+	-	-	-	-	+	II
Poa angustifolia	-	-	+	-	-	+	II
Fallopia convolvulus	-	-	+	+	-	-	II
Hypericum perforatum	+	-	-	-	-	+	II
Arctium tomentosum	+	-	-	-	-	-	II
Inula britannica	-	+	-	-	-	-	I
Agrostis stolonifera	-	-	-	+	-	-	I
Medicago lupulina	-	-	-	-	+	-	I
Galeopsis pubescens	+	-	-	-	-	-	I
Aristolochia clematitis	-	+	-	-	-	-	I
Achillea nobilis ssp. neilreichii	-	-	-	+	-	-	I
Artemisia absinthium	-	-	+	-	-	-	I
Lysimachia nummularia	-	-	-	-	-	+	I
Ajuga reptans	-	-	-	-	+	-	I
Artemisia austriaca	+	-	-	-	-	-	I
Lolium perenne	-	-	-	-	-	+	I
Melica ciliata	-	+	-	-	-	-	I
Bromus sterilis	-	-	-	+	-	-	I
Rubus caesius	-	-	+	-	-	-	I
Prunella vulgaris	-	-	-	-	+	-	I
Plantago media	+	-	-	-	-	-	I
Arctium lappa	-	-	-	-	-	+	I
Lavatera thuringiaca	-	-	+	-	-	-	I
Stachys sylvatica	+	-	-	-	-	-	I
Althaea cannabina	-	-	-	-	+	-	I
Chaerophyllum temulum	+	-	-	-	-	-	I
Festuca valesiaca	-	-	-	+	-	-	I
Ulmus minor	-	-	+	-	-	-	I
Euphorbia cyparissias	-	-	-	-	+	-	I
Artemisia vulgaris	-	+	-	-	-	-	I
Knautia arvensis	-	-	-	-	+	-	I
Potentilla recta	-	-	-	-	-	+	I
Veronica austriaca	+	-	-	-	-	-	I

Data and place of the relevés: 1: forest Nemțeanca-Furcenii Noi, 12 Jun., 1993; 2: forest Țepu-7 Jul., 1994; 3: forest Balta-Academiei, Munteni, 16 Aug., 1995; 4: forest Hanu Conachi-20 Jul., 1992; 5: forest Șerbănești-21 Jul., 1992; 6: forest Durasca-20 May, 1996

8. Ass. *Bromo sterilis-Robinetum pseudacaciae* Pocs 1954

Beginning with the years '20 of the last century, in Tecuci Plain, has started a copious process of planting the huge areas of „wandering sand dunes” with various lignaceous species, especially acacia trees; thus, nowadays, a great part of the sand dunes are stabilized. The trees of acacia are exploited at an age of 20-30 years old. Generally speaking, those cleared surfaces resulted after the cutting down the trees, are allowed to regenerate itself. Thus, the primary plantations of acacia, together with the numerous herbaceous species under the stands, make up phytocoenoses which can be allotted to the Ass. *Bromo sterilis-Robinetum pseudacaciae* Pocs 1954.

This association is a thermophilous one, as someone can find a lot of vascular plants from Class *Quercetea pubescenti-petraeae*. The coverage of the herbaceous stratum reach at 40-65%. There is well known that the acacia plantations are characterised by a very heterogenous flora, as: *Galium aparine*, *Rubus caesius*, *Ballota nigra*, *Bromus sterilis*, *Alliaria petiolata*, *Urtica dioica*, *Leonurus cardiaca*, *Physalis alkekengi*... Some of the species have higher AD indices on the fields, so there can be pointed out different infracoenotaxons, as following:

-*brometosum sterilis* Mititelu et al. 1973, Horeanu 1975 (with *Bromus sterilis*);

-*anthriscetosum* Magyar 1937 (=facies *anthriscetosum trichospermae* Dobrescu et al. 1969)
(with *Anthriscus trichosperma* ssp. *cerefolium*)

-*urtico-ballotetosum* Mititelu et al. 1968 (= facies *ballotetosum nigrae* Dobrescu et al. 1969)
(with *Urtica dioica* și *Ballota nigra*)

-*chelidonietosum* Toth 1958 (with *Chelidonium majus*)

-*secalietosum* Pócs 1954 (with *Secale silvestre*)

-*cannabietosum* Mititelu et al. 1968 (with *Cannabis ruderalis*)

-there is signaled out a facies with *Poa angustifolia* I. Lupu 1980.

In the Tecuci Plain, those acacia plantations, are in a pretty good stage of growing, now. But, here and there, these acacia plantations have replaced in the past the natural forest vegetation made by *Quercus pubescens* and *Q. pedunculiflora*. Thus, the floristical richness is impoverished in comparison with the wild flora from the sand dunes.

Live form's spectrum: H=25 (38%); T=20 (31%); Ph=8 (12%); others=19%.
Fitogeographical spectrum: Euras=22 (33%); Eur=11 (17%); Cosm=6 (9%); Circ=6 (9%);
Euras. cont=5 (8%); Adv=4 (6%); others=18%. Table No. 8 (Rel. No. 1-5).

Table No. 8

Surface of relevé, m ²	400	400	400	400	400	
Coverage of trees, %	65	50	65	65	65	
Height of trees, m	8-10	10	8-10	10-12	9-11	K
Diameter of trees, cm	20-25	20-25	20-25	20-25	20-25	
Coverage of shrubs, %	3	2	11	2	2	
Coverage of grass layer, %	35	50	50	55	50	
Coverage of regeneration layer, %	2	3	3	2	3	
No. of relevé	1	2	3	4	5	
<i>Robinia pseudacacia</i>	4	3	4	4	4	V
<i>Robinia pseudacacia</i> juv.	+	+	+	+	+	V
<i>Bromus sterilis</i>	2	+	+	+	+	V
<i>Anthriscus cerefolium</i> ssp. <i>trichosperma</i>	+	+	2	+	+	V
<i>Urtica dioica</i>	+	2	+	+	+	V
<i>Ballota nigra</i>	+	2	+	+	+	V
<i>Conium maculatum</i>	+	+	+	+	+	V
<i>Cannabis ruderalis</i>	+	+	+	3	+	V
<i>Chelidonium majus</i>	+	+	+	+	3	V
<i>Secale silvestre</i>	+	+	2	+	+	V

<i>Robinion pseudacaciae</i>						
Morus alba	-	+	-	+	-	II
Gleditsia triacanthos	+	-	-	-	-	I
Acer negundo juv.	+	-	-	+	-	I
<i>Prunetalia et Prunion spinosae</i>						
Geum urbanum	+	+	-	+	+	IV
Sambucus nigra	+	-	+	+	+	IV
Euonymus europaeus	+	+	-	+	-	III
Euonymus europaeus juv.	+	-	+	+	-	II
Crataegus monogyna	+	-	-	+	-	II
Crataegus monogyna juv.	+	+	-	-	+	III
Rosa canina	-	-	+	+	-	II
Origanum vulgare	-	+	-	-	+	II
<i>Quercetea pubescenti-petraeae</i>						
Clinopodium vulgare	+	+	-	+	-	III
Silene latifolia ssp. alba	+	-	+	+	-	III
Pyrus pyraeaster	+	+	-	+	-	III
Campanula macrostachya	+	-	-	+	-	II
Lithospermum officinale	-	+	-	-	+	II
Fallopia dumetorum	+	+	-	-	-	II
Arctium lappa	+	-	-	+	-	II
Saponaria officinalis	-	-	+	-	+	II
Achillea setacea	+	+	-	-	-	II
<i>Chenopodietea</i>						
Stellaria media	+	+	-	+	+	IV
Chenopodium album	+	-	+	+	-	III
Geranium pusillum	+	-	+	+	-	III
Fumaria schleicheri	-	-	+	+	+	III
Convolvulus arvensis	-	+	-	-	+	II
Solanum nigrum	-	+	+	-	-	II
Senecio vernalis	+	-	+	-	-	II
Capsella bursa-pastoris	+	-	-	-	+	II
Sonchus arvensis	-	+	+	-	-	II
<i>Sisymbrium et Sisymbrietalia</i>						
Conyza canadensis	+	-	-	+	+	III
Sisymbrium officinale	-	+	+	-	-	II
Bromus tectorum	-	+	+	-	-	II
Polygonum aviculare	+	-	-	+	-	II
<i>Festuco-Brometea</i>						
Potentilla argentea	-	+	+	-	-	II
Galium humifusum	+	-	-	+	-	II
Poa angustifolia	+	-	-	+	-	II
Muscari racemosum	+	-	-	+	-	II
Euphorbia cyparissias	-	+	+	-	-	II
Berteroa incana	+	-	+	-	-	II
Poa compressa	-	+	-	-	+	II
Medicago lupulina	-	-	+	-	+	II
<i>Aliae</i>						
Alliaria petiolata	+	+	-	+	+	IV
Cirsium arvense	-	+	+	-	-	II
Artemisia absintium	+	-	-	+	-	II
Taraxacum officinale	-	+	-	+	-	II
Thlaspi perfoliatum	-	-	+	-	-	I
Torilis arvensis	-	+	-	-	-	I
Setaria viridis	+	-	-	-	-	I
Veronica arvensis	-	-	+	-	-	I
Agrostis stolonifera	-	-	-	+	-	I
Arctium minus	-	-	-	-	+	I
Veronica polita	-	+	-	-	-	I
Elymus repens ssp. repens	+	-	-	-	-	I

Myosotis arvensis	-	-	+	-	-	I
Althaea cannabina	-	+	-	-	-	I

Data and place of the relevés: 1: forest Hanu Conachi, 12 Jun., 1992; 2: forest Liești, 20 Jun., 1993; 3: forest Durasca-Barcea, 3 Jul., 1993; 4: forest Pârlești-Valea Mărului, 18 Aug., 1994; 5: forest Barcea-Barcea, 3 Jul., 1993

9. Ass. *Pruno spinosae-Crataegetum* (Soó 1927) Hueck 1931

Phytocoenoses of this vegetal association are spreaded in the clearings of the forests, on the skirts of the forests, or on the place of the former forests, on plane fields or on the slopes of the hills, usually on the East or South-East exposures.

The characteristic and dominant species of this association, *Prunus spinosa* ssp. *dasyphylla*, and *Crataegus monogyna*, make up medium coverage indices (up to 50% to 60%), on surfaces between 500 m² to 1000 m². The first one of the characteristic species, is a constant one in all the phytocoenoses, while the second one, are met sporadically only. The herbaceous layer is relatively well developed, edified by various species, immigrated here from other vegetal associations. Among these species, the next ones are more frequently: *Ballota nigra*, *Galium aparine*, *Poa angustifolia*, *Elymus repens* ssp. *repens*, *Calamagrostis epigejos*...The economical importance of this association is in their pioneer's role in the vegetation succession towards the installation of the forests; besides, on those slopes quite declined, these phytocoenoses have a stabilizer role and against the soil erosion.

Live form's spectrum: H=29 (58%); Ph=6 (12%); T=4 (8%); others=22%. Fitogeographical spectrum: Euras=19 (38%); Eur=7 (14%); Euras. cont=5 (10%); Circ=4 (8%); others=30%. Table No. 9 (Rel. No. 1-5).

Table No. 9

Surface of relevé, m ²	200	200	200	200	200	
Coverage of vegetation, %	75	75	75	70	70	K
No. of relevé	1	2	3	4	5	
<i>Prunus spinosa</i> ssp. <i>dasyphylla</i>	4	4	4	4	4	V
<i>Crataegus monogyna</i>	+	+	+	+	+	V
<i>Prunion spinosae et Prunetalia</i>						
<i>Cornus sanguinea</i>	+	+	-	-	+	III
<i>Origanum vulgare</i>	+	-	+	+	-	III
<i>Rosa canina</i>	+	+	-	-	+	III
<i>Potentilla argentea</i>	-	+	-	+	-	II
<i>Euonymus europaeus</i>	-	+	-	-	-	I
<i>Aristolochia clematitis</i>	-	-	+	-	-	I
<i>Veronica chamaedrys</i>	-	-	-	+	-	I
<i>Humulus lupulus</i>	+	-	-	-	-	I
<i>Quercetea pubescenti-petraeae</i>						
<i>Geum urbanum</i>	-	+	+	-	-	II
<i>Clinopodium vulgare</i>	+	-	-	-	+	II
<i>Acer tataricum</i>	+	-	-	+	-	II
<i>Tanacetum corymbosum</i>	-	+	-	-	-	I
<i>Festuco-Brometea</i>						
<i>Poa angustifolia</i>	-	+	+	+	-	III
<i>Salvia nemorosa</i>	+	-	+	+	-	III
<i>Daucus carota</i>	+	+	-	-	+	III
<i>Gagea arvensis</i>	+	-	-	+	-	II
<i>Calamagrostis epigejos</i>	-	+	-	-	+	II
<i>Eryngium campestre</i>	-	+	+	-	-	II
<i>Salvia verticillata</i>	-	-	-	+	-	I

Viola hirta	+	-	-	-	-	I
Euphorbia cyparissias	-	-	-	-	+	I
Erysimum diffusum	-	+	-	-	-	I
Verbascum phoeniceum	-	-	+	-	-	I
<i>Aliae</i>						
Ballota nigra	+	+	-	+	+	IV
Hypericum perforatum	-	+	+	-	+	III
Fragaria viridis	-	+	-	+	-	II
Artemisia absinthium	+	-	+	-	-	II
Phlomis herba-venti ssp. pungens	+	-	-	-	+	II
Lamium purpureum	-	+	+	-	-	II
Anemone ranunculoides	-	-	+	+	-	II
Stachys officinalis	-	+	-	+	-	II
Cichorium intybus	+	-	+	-	-	II
Stachys recta	+	-	-	+	-	II
Agrimonia eupatoria	+	-	-	-	+	II
Glechoma hederacea	-	-	+	-	-	I
Physalis alkekengi	-	+	-	-	-	I
Vicia cracca	-	-	+	-	-	I
Achillea setacea	+	-	-	-	-	I
Tanacetum vulgare	-	-	-	-	+	I
Conium maculatum	-	-	+	-	-	I
Erigeron annuus	-	-	-	+	-	I
Matriacria perforata	+	-	-	-	-	I
Prunella vulgaris	-	+	-	-	-	I
Torilis arvensis	-	-	-	+	-	I

Data and place of the relevés: 1-2: forest Balta Academiei-Munteni, 7 Aug., 1994; 3-4: forest Țepu-Țepu de Sus, 15 Jul. 1993; 5: forest Pârlești-Valea Mărului, 19 Aug., 1995

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CONTRIBUTIONS TO THE STUDY OF THE VASCULAR FLORA FROM THE MOLDOVIȚA RIVER'S AREA (SUCEAVA COUNTY)

MÂNZU C.*

Resumé: As a result of the studies made in the Moldovița River's area between 2000 and 2003, we identified 624 species of vascular plants.

Key words: vascular flora, Moldovița river's area

Introduction

Being the limit between Obcina Mare and Obcina Ferdeului, with an average height of 814 meters, Moldovița River's area is situated at the N-E extremity of the central – European province, which determines a continental – moderate – temperate climate, with some influences from the eastern continental climate and the boreal climate from the North. By its position, Moldovița River's area belongs to the south eastern subdistrict of Bucovina's "Obcine", characterised by higher temperatures and thermal amplitude and lower precipitation [1].

Regarding the vascular flora, the investigated area has been relatively poorly researched, some mentions appearing in papers which offer a general view on the Bucovina's "Obcine" and Suceava county [6, 7, 8, 9, 13, 14], or in papers with an phytocoenological character [5, 10, 11].

Material and method

This floristic epitome is the result of a field-research made between 2000-2003, correlated with notes from the speciality literature.

The epitome contains species identified by us and not quoted before, and also species that have been quoted and confirmed in our field-research. For the taxon's identification were used papers having the following authors: Flora R. P. R. – R. S. R. (1952-1976) [15], Beldie Al. (1977, 1979) [2], Ciocârlan V. (1988-1990, 2000) [3, 4], Sârbu I. and colaborators (2001) [12]. In this epitome, the species are depicted in the botanical family's systematic order, while within the families was used the alphabetical order. The used classification system is the one adopted by Ciocârlan V. [4]. For each species is specified the area within it was found, the locality's name being coded as following: 1 – Argel; 2 – Ciumârna; 3 – Ciumârna ("La Palmă"); 4 – Deia; 5 – Deia; 6 – Demăcușa; 7 – Dragoș; 8 – Frumosu; 9 – Hoghia Mare; 10 – Hoghia Mică; 11 – lunca Moldoviței; 12 – Moldovița – Rașca; 13 – Moldovița; 14 – Paltin; 15 – Adânc rivulet; 16 – Lunguleț rivulet; 17 – Mic rivulet (Demăcușa); 18 – Petac rivulet (Demăcușa); 19 – Turculeț rivulet (Argel); 20 – Valcan rivulet; 21 – Poiana Calului (Ciumârna); 22 – Rașca; 23 – Rașca – Argel; 24 – Săcriș; 25 – Seredna; 26 – Strâmtura; 27 – Strâmtura – Vama;

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28 – “Trei Movile”; 29 – Ciumârna rivulet; 30 – Vama; 31 – Vatra Moldoviței; 32 – Vatra Moldoviței – Ciumârna; 33 – Vatra Moldoviței – Paltin

Results and discussions

Fam. *Lycopodiaceae*: *Lycopodium annotinum* L.: 15, 21; *Lycopodium clavatum* L.: 6; *Lycopodium selago* L.: 32; Fam. *Equisetaceae*: *Equisetum arvense* L.: 8, 11, 6, 5, 19, 4, 20, 3, 2, 22, 14, 7; *Equisetum fluviatile* L.: 17; *Equisetum hyemale* L.: 31, 8; *Equisetum palustre* L.: 2, 15, 16; *Equisetum ramosissimum* Desf.: 17; *Equisetum sylvaticum* L.: 1, 5, 19, 15, 16, 17, 18, 22; *Equisetum telmateia* Ehrh.: 5, 4, 20, 7; Fam. *Ophioglossaceae*: *Botrychium lunaria* (L.) Swartz: 9; Fam. *Polypodiaceae* s. str.: *Polypodium vulgare* L.: 4, 31, 15; Fam. *Dennstaedtiaceae*: *Pteridium aquilinum* (L.) Kuhn: 18; 2, 15, 11, 21, 22, 8, 25; Fam. *Aspleniaceae*: *Asplenium trichomanes* L. ssp. *trichomanes*: 4; *Athyrium distentifolium* Tausch ex Opiz: 20; *Athyrium filix-femina* (L.) Roth: 1, 19, 15, 16, 4, 20, 17, 2, 18, 8, 7, 10; *Cystopteris fragilis* (L.) Bernh.: 15, 18; *Cystopteris montana* (L.) Desv.: 16, 6, 19, 15, 21, 4, 20; *Dryopteris carthusiana* (Vill.) H. P. Fuchs: 16, 14, 7, 20, 8; *Dryopteris dilatata* (Hoffm.) A. Gray: 16, 8, 7; *Dryopteris filix-mas* (L.) Schott: 19, 15, 16, 4, 20, 17, 18, 8, 7; *Gymnocarpium dryopteris* (L.) Newman: 1, 6, 19, 15, 4, 18, 8, 32; *Gymnocarpium robertianum* (Hoffm.) Newman: 15, 16, 21, 20; *Matteuccia struthiopteris* (L.) Tod.: 7, 19, 16, 4, 11, 8; *Phegopteris connectilis* (Michx.) Watt.: 4, 1, 6, 15, 16, 20, 17, 18; *Polystichum braunii* (Sprenger) Fée: 15; *Polystichum setiferum* (Forsk.) Woytar: 15, 16; Fam. *Pinaceae* (*Abietaceae*): *Abies alba* Miller: 19, 15, 16, 21, 4, 20, 17, 8, 7; *Picea abies* (L.) Karsten: 19, 16, 21, 4, 20, 17, 18, 8, 7; *Pinus sylvestris* L.: 15; Fam. *Cupressaceae*: *Juniperus communis* L. var. *communis*: 3, 31; Fam. *Aristolochiaceae*: *Asarum europaeum* L.: 4; Fam. *Ranunculaceae*: *Aconitum degeneri* Gayer: 4; *Aconitum firmum* Reichenb. ssp. *hians* (Reichenb.) Gayer: 7; *Aconitum moldavicum* Hacq.: 1, 19, 16, 32; *Aconitum variegatum* L.: 7; *Actaea spicata* L.: 19, 15, 16, 17, 7, 32; *Aquilegia vulgaris* L.: 8; *Caltha palustris* L.: 6, 4, 27, 19, 15, 16, 20, 17, 7; *Isopyrum thalictroides* L.: 15; *Trollius europaeus* L. ssp. *europaeus*: 1, 4, 8, 2, 14, 19, 11, 3; *Anemone nemorosa* L. ssp. *nemorosa*: 4, 5, 8, 15, 16, 7; *Anemone ranunculoides* L.: 4; *Clematis alpina* (L.) Miller: 7, 17; *Clematis vitalba* L.: 7; *Ranunculus acris* L. ssp. *acris*: 6, 11, 8, 7, 2, 19, 4, 20, 32, 22, 14, 9, 10, 25; *Ranunculus carpaticus* Herich: 7, 4, 8, 15, 16; *Ranunculus cassubicus* L.: 4; *Ranunculus fallax* (Wimmer et Grab.) Sloboda: 4; *Ranunculus ficaria* L.: 4; *Ranunculus flammula* L.: 32; *Ranunculus polyanthemoides* L. ssp. *polyanthemoides* (Boreau) Ahlfvengren: 6, 13, 1, 7, 3, 2, 18; *Ranunculus repens* L.: 16, 8, 11, 2, 7, 19, 4, 20, 17, 32, 6, 9, 25; *Ranunculus sardous* Crantz: 11; *Ranunculus sceleratus* L.: 30, 4; *Ranunculus serpens* Schrank ssp. *nemorensis* (DC.) G. Lopez: 13; *Thalictrum aquilegifolium* L.: 7, 19, 16; *Thalictrum minus* L. ssp. *minus*: 8; Fam. *Fumariaceae*: *Corydalis cava* (L.) Schweigg. et Koerte: 4; *Corydalis solida* (L.) Clairv.: 4; Fam. *Ulmaceae*: *Ulmus glabra* Hudson: 16; Fam. *Cannabaceae* (*Cannabinaceae*): *Humulus lupulus* L.: 30, 32; Fam. *Urticaceae*: *Urtica dioica* L. ssp. *dioica*: 15, 16, 2, 4, 20, 17, 18, 7, 10, 25; Fam. *Fagaceae*: *Fagus sylvatica* L. ssp. *sylvatica*: 19, 15, 16, 4, 20, 18, 8, 7, 32; Fam. *Betulaceae*: *Alnus incana* (L.) Moench: 2, 4, 16, 20, 11, 17, 7; *Betula pendula* Roth: 15, 21; Fam. *Corylaceae*: *Carpinus betulus* L.: 30; *Corylus avellana* L.: 19, 15, 16, 20, 18, 8, 7, 31; Fam. *Caryophyllaceae*: *Arenaria serpyllifolia* L.: 20; *Cerastium arvense* L. ssp. *arvense*: 22; *Cerastium dubium* (Bast.) Guépin: 6; *Cerastium fontanum* Baumg. ssp. *fontanum*: 4, 20, 17, 2, 32, 11, 13, 6, 9, 10, 25; *Cerastium glomeratum* Thuill.: 30; *Cerastium holosteoides* Fries. ampl. Hyl.: 7, 11, 18; *Cerastium semidecandrum* L.: 11; *Cerastium sylvaticum* Waldst. et Kit.: 15, 4; *Dianthus barbatus* L. ssp. *compactus* (Kit.) Heuffel: 1; *Dianthus deltoideus* L.: 2, 9, 10, 25; *Dianthus superbus* L.: 14, 32; *Lychnis flos-cuculi* L.: 1, 2, 19, 16; *Lychnis viscaria* (L.) ssp. *viscaria*: 32; *Moehringia muscosa* L.: 6, 15; *Sagina procumbens* L.: 15, 17; *Saponaria officinalis* L.: 19, 20; *Scleranthus annuus* L. ssp. *annuus*: 31; *Scleranthus uncinatus* Schur: 6; *Silene alba* (Miller) E. H. L. Krause: 15, 16, 32; *Silene dioica* (L.) Clairv.: 4, 15, 16, 8; *Silene nutans* L. ssp. *nutans*: 6, 13, 22, 8; *Silene viscosa* (L.) Pers.: 2; *Stellaria graminea* L.: 13, 8, 19, 6, 22, 14, 9, 10, 25; *Stellaria holostea* L.: 7, 5, 2, 4; *Stellaria media* (L.) Vill.: 7, 20, 17; *Stellaria nemorum* L.: 7, 4, 15, 16, 20, 17, 8; *Stellaria uliginosa* Murray: 4; Fam. *Chenopodiaceae*: *Chenopodium album* L. var. *album*: 7, 2, 17; *Chenopodium polyspermum* L.: 7; *Chenopodium strictum* Roth: 7; Fam. *Polygonaceae*: *Polygonum aviculare* L.: 4, 7; *Polygonum bistorta* L.: 7, 19; *Polygonum convolvulus* L.: 31; *Polygonum dumetorum* L.: 7; *Polygonum hydropiper* L.: 7, 2, 4, 20, 17; *Polygonum lapathifolium* L. ssp. *incanum* (F. W. Schmidt) Schübler et Martens: 7, 4, 17, ssp. *lapathifolium*: 7; *Polygonum minus* Huds.: 31; *Polygonum mite* Schrank: 7; *Rumex acetosa* L.: 7, 11, 13, 8, 17, 2; *Rumex acetosella* L. ssp. *acetoselloides* (Balansa) den Nijs: 13, 1, 16, 22, 32; *Rumex alpestris* Jacq.: 10; *Rumex alpinus* L.: 9, 10, 25; *Rumex conglomeratus* Murray: 20; *Rumex crispus* L.: 19, 16, 4, 20, 17, 6, 8; *Rumex obtusifolius* L. ssp. *obtusifolius*: 7, 4, 17, 22, ssp. *sylvestris* Čelak.: 17, 2, 7, 4; Fam. *Grossulariaceae*: *Ribes uva-crispa* L. ssp. *uva-crispa*: 7, 19, 15, 16, 17; ssp. *grossularia* (L.) Reichenb.: 8, 4; Fam. *Crassulaceae*: *Sedum maximum* (L.) Hoffm.: 32; Fam. *Saxifragaceae*: *Chrysosplenium alternifolium* L.: 4, 15; *Parnassia palustris* L.: 2, 17, 3, 18, 28; Fam. *Rosaceae*: *Agrimonia eupatoria* L. ssp. *grandis* (Andrz.) Bornm.: 14; *Alchemilla glaucescens* Wallr.: 9, 10, 25; *Alchemilla monticola* Opiz: 6; *Alchemilla subcrenata* Buser: 28; *Alchemilla vulgaris* L. emend. Fröhner: 6, 11, 13, 8, 19, 15, 20, 4, 17, 3, 2, 18, 7; *Alchemilla xanthochlora* Rothm.: 6, 32; *Aruncus dioicus* (Walter) Fernald: 32; *Filipendula ulmaria* (L.) Maxim. var. *denudata* (J. et C.

Presl.) Maxim: 19, 16, 4, 17, 2, 8, 7; *Filipendula vulgaris* Moench: 8, 11, 3, 2; *Fragaria vesca* L.: 8, 7, 4, 15, 16, 11, 20, 17, 18; *Fragaria viridis* Weston ssp. *viridis*: 19, 21, 4, 20, 8, 7; *Geum allepicum* Jacq.: 15, 17; *Geum montanum* L.: 19, 20; *Geum rivale* L.: 7, 19, 16, 17; *Geum urbanum* L.: 8, 15, 16, 4, 17, 7; *Potentilla anserina* L.: 11, 7, 2, 20, 32; *Potentilla arenaria* Borkh. ssp. *arenaria*: 11, 4; *Potentilla aurea* L.: 21, 20, 9, 10, 25; *Potentilla erecta* (L.) Rausch.: 6, 1, 8, 7, 21, 20, 3, 2, 32, 18, 22, 14, 9, 10, 25; *Potentilla recta* L. ssp. *recta*: 13; *Potentilla reptans* L.: 11, 7, 19, 4, 20; *Potentilla ternata* C. Koch: 9, 10, 25; *Rosa canina* L. s.l.: 13, 5, 20, 2, 15, 7; *Rosa pendulina* L.: 7, 19, 15, 16, 18; *Rubus caesius* L.: 11, 7; *Rubus hirtus* Waldst. et Kit. ssp. *hirtus*: 15, 16, 17, 18, 8, 7, 32, 28; *Rubus idaeus* L.: 19, 15, 16, 4, 20, 17, 2, 8, 7, 32; *Sanguisorba officinalis* L.: 8, 31; *Spiraea chamaedryfolia* L.: 7, 8, 19, 15, 16, 11, 17, 2; *Sorbus aucuparia* L. ssp. *aucuparia*: 4, 7, 19, 15, 16, 21, 20, 18, 8; Fam. *Fabaceae* (*Leguminosae*): *Anthyllis vulneraria* L. ssp. *vulneraria*: 8, 16, 3, 2, 14, 8; *Astragalus glycyphyllos* L.: 7; *Coronilla varia* L.: 8; *Genista tinctoria* L. ssp. *tinctoria*: 8, 14, 9, 25; *Genistella sagittalis* (L.) Gams: 10; *Lathyrus hallersteinii* Baumg.: 17; *Lathyrus pratensis* L.: 6, 8, 4, 20, 17, 3; *Lathyrus tuberosus* L.: 30; *Lathyrus vernus* (L.) Bernh.: 5; *Lotus corniculatus* L.: 6, 11, 13, 1, 8, 19, 3, 2, 32, 18, 22, 14, 7, 9, 10, 25; *Medicago lupulina* L.: 11, 30, 8, 2, 3, 18, 22, 14, 9, 10, 25; *Medicago minima* (L.) L.: 11, 20; *Onobrychis vicifolia* Scop.: 8; *Ononis arvensis* L. ssp. *arvensis*: 2, 1, 6, 18, 14; *Trifolium alpestre* L.: 1, 3, 2, 22, 14, 8, 10, 25; *Trifolium aureum* Pollich: 22; *Trifolium campestre* Schreber: 11, 4, 6, 22; *Trifolium hybridum* L. ssp. *hybridum*: 22; *Trifolium medium* L. ssp. *medium*: 2, 6; *Trifolium montanum* L.: 13, 8, 1, 3, 2, 18, 22, 14, 24; *Trifolium ochroleucon* Hudson: 3, 2, 18, 14; *Trifolium pannonicum* Jacq.: 13, 1, 8, 2, 19, 3, 18, 22, 14; *Trifolium pratense* L. ssp. *pratense*: 6, 11, 4, 8, 19, 20, 17, 3, 2, 18, 22, 7, 9, 10, 25; *Trifolium repens* L. ssp. *repens*: 6, 11, 13, 4, 1, 30, 19, 2, 20, 17, 32, 18, 22, 7, 9, 10, 25; *Trifolium spadiceum* L.: 16; *Vicia cracca* L.: 8, 19, 11, 3, 4; *Vicia sativa* L. ssp. *sativa*: 19, 7, 8; *Vicia sepium* L.: 8; *Vicia sylvatica* L.: 20; Fam. *Lythraceae*: *Lythrum salicaria* L.: 8, 7, 22; Fam. *Onagraceae*: *Chamaerion angustifolium* (L.) Holub: 16, 17, 7; *Chamaerion dodonaei* (Vill.) Holub: 11; *Circaea alpina* L.: 16, 8, 19, 15, 20, 7; *Circaea lutetiana* L.: 15, 4, 18, 8; *Circaea x intermedia* Ehrh.: 15; *Epilobium collinum* C. C. Gmelin: 2, 4; *Epilobium hirsutum* L.: 16, 4, 20, 17, 6, 8; *Epilobium montanum* L.: 19, 15, 16, 4, 20, 17, 18, 8, 7; *Epilobium palustre* L.: 4, 20, 17; *Epilobium parviflorum* Schreber: 7; Fam. *Thymelaeaceae*: *Daphne mezereum* L.: 7, 16, 20, 18, 8, 32; Fam. *Cornaceae*: *Cornus mas* L.: 4; *Cornus sanguinea* L.: 30; Fam. *Santalaceae*: *Thesium alpinum* L.: 4; Fam. *Celastraceae*: *Evonymus verrucosus* Scop.: 5; Fam. *Euphorbiaceae*: *Euphorbia amygdaloides* L.: 5, 7, 15, 16, 4, 20, 18, 8; *Euphorbia carniolica* Jacq.: 1, 19, 16, 17; *Euphorbia cyparissias* L.: 30; *Euphorbia platyphyllos* L.: 19; *Mercurialis perennis* L.: 7, 19, 15, 16, 20, 18; Fam. *Rhamnaceae*: *Frangula alnus* Miller: 7; Fam. *Aceraceae*: *Acer pseudoplatanus* L.: 19, 16, 4, 20, 17, 8, 7; Fam. *Oxalidaceae*: *Oxalis acetosella* L.: 4, 5, 19, 15, 16, 21, 20, 17, 18, 8, 7; Fam. *Geraniaceae*: *Geranium palustre* L.: 8, 32; *Geranium phaeum* L.: 7, 16; *Geranium pratense* L.: 8, 31; *Geranium robertianum* L.: 19, 15, 16, 4, 20, 17, 18, 8, 7; *Geranium sanguineum* L.: 8; Fam. *Balsaminaceae*: *Impatiens noli-tangere* L.: 2, 15, 16, 4, 20, 17, 18, 7; Fam. *Linaceae*: *Linum austriacum* L.: 8; *Linum catharticum* L. ssp. *catharticum*: 13, 1, 8, 19, 3, 22, 14, 10; Fam. *Polygalaceae*: *Polygala amara* L. ssp. *amara*: 5, 3, 2, 14; *Polygala vulgaris* L. ssp. *vulgaris*: 1, 8, 11, 3, 18, 22, 9, 10, 25, 32; Fam. *Apiaceae* (*Umbelliferae*): *Astrantia major* L. ssp. *major*: 8, 32, 14, 4, 3, 2, 7; *Eryngium campestre* L.: 19, 31; *Eryngium planum* L.: 8; *Sanicula europaea* L.: 7, 16, 15, 20, 17; *Aegopodium podagraria* L.: 19, 15, 16, 4, 20, 17, 7; *Angelica sylvestris* L. ssp. *montana* (Brot.) Arcangeli: 19, 4, 22, 14, 8, 7; *Anthriscus sylvestris* (L.) Hoffm.: 4, 19, 16, 7; *Carum carvi* L.: 6, 11, 2, 8, 1, 7, 19, 18, 22; *Chaerophyllum aromaticum* L.: 8, 4, 17, 2, 18, 9; *Chaerophyllum aureum* L.: 7, 8; *Chaerophyllum bulbosum* L. ssp. *bulbosum*: 4; *Chaerophyllum hirsutum* L.: 19, 15, 16, 4, 20, 17, 18; *Chaerophyllum temulum* L.: 4, 7; *Conium maculatum* L.: 7; *Daucus carota* L. ssp. *carota*: 1, 4; *Heracleum sphondylium* L. ssp. *sphondylium*: 6, 8, 3, 2, 14, 7; *Laserpitium latifolium* L.: 4; *Peucedanum oreoselinum* (L.) Moench: 13, 22; *Pimpinella major* (L.) Hudson ssp. *major*: 14; *Pimpinella saxifraga* L. ssp. *saxifraga*: 13, 11, 2, 1, 20, 3, 18, 22, 14; *Torilis arvensis* (Hudson) Link ssp. *arvensis*: 4, 7; Fam. *Hypericaceae*: *Hypericum hirsutum* L.: 7; *Hypericum maculatum* Crantz ssp. *maculatum*: 6, 1, 8, 19, 15, 16, 4, 17, 3, 2, 18, 22, 14, 7, 10, 9, 25; *Hypericum perforatum* L.: 20, 9, 10; Fam. *Tiliaceae*: *Tilia cordata* Miller: 20; Fam. *Malvaceae*: *Malva pusilla* Sm.: 30; *Malva sylvestris* L. ssp. *sylvestris*: 30, 8; Fam. *Violaceae*: *Viola canina* L. ssp. *ruppii* (All.) Schübler et Martens: 7, 5, 22, 8, 9, 25; *Viola declinata* Waldst. et Kit.: 9, 10, 25; *Viola hirta* L.: 11, 7; *Viola mirabilis* L.: 18; *Viola odorata* L.: 24, 8, 5; *Viola reichenbachiana* Jordan ex Boreau: 6, 7, 1; 16, 2, 13, 15, 20, 17; *Viola tricolor* L. ssp. *tricolor*: 1, 2, 22, 8; Fam. *Tamaricaceae*: *Myricaria germanica* (L.) Desv.: 11, 14, 4, 22, 20; Fam. *Brassicaceae* (*Cruciferae*): *Alliaria petiolata* (Bieb.) Cavara et Grande: 30; *Barbarea vulgaris* R. Br. ssp. *vulgaris*: 7; *Bunias orientalis* L.: 8, 1, 4, 32; *Capsella bursa-pastoris* (L.) Medik.: 17; *Cardamine amara* L. ssp. *amara*: 7; *Cardamine flexuosa* With. in Stokes: 7, 15; *Cardamine hirsuta* L.: 4; *Cardamine impatiens* L.: 4, 16; *Cardaminopsis arenosa* (L.) Hayek: 16; *Cardaminopsis halleri* (L.) Hayek ssp. *halleri*: 16, 9; *Cardaria draba* (L.) Desv.: 30; *Dentaria bulbifera* L.: 15; *Dentaria glandulosa* Waldst. et Kit.: 19, 15, 16, 8; *Diplotaxis muralis* (L.) DC.: 33; *Lepidium ruderales* L. (păduchermită): 26; *Rorippa sylvestris* (L.) Besser ssp. *sylvestris*: 7; *Sinapis arvensis* L.: 7; *Sisymbrium officinale* (L.) Scop: 7; *Thlaspi arvense* L.: 30; *Thlaspi perfoliatum* L.: 30; Fam. *Salicaceae*: *Populus tremula* L.: 15, 21; *Salix alba* L. ssp. *alba*: 7; *Salix aurita* L.: 4; *Salix caprea* L.: 7, 5, 19, 15, 4, 17; *Salix cinerea* L.: 7; *Salix elaeagnos* Scop.: 7, 11; *Salix fragilis* L.: 7, 1, 16; *Salix purpurea* L. ssp. *purpurea*: 4, 20, 11, 7; *Salix silesiaca* Willd.: 16, 17, 8; *Salix viminalis* L.: 20; Fam. *Ericaceae*: *Calluna vulgaris* (L.) Hull: 21; *Vaccinium myrtillus* L.: 5, 8, 6, 15, 21, 10, 25; *Vaccinium vitis-idaea* L.: 6, 21, 10, 25; Fam. *Pyrolaceae*:

Moneses uniflora (L.) A. Gray: 28, 31; Fam. *Monotropaceae*: *Monotropa hypopitys* L.: 4; Fam. *Primulaceae*: *Lysimachia nummularia* L.: 4, 20, 11, 17, 7; *Lysimachia punctata* L.: 30; *Lysimachia vulgaris* L.: 7, 15; *Primula elatior* (L.) L. ssp. *leucophylla* (Pax) H. Harrison ex W. W. Sm. et Fletcher: 5; *Trientalis europaea* L.: 21; Fam. *Gentianaceae*: *Centaurium erythraea* Rafin. ssp. *erythraea*: 14; *Gentiana acaulis* L.: 9, 10, 25; *Gentiana asclepiadea* L.: 8, 7, 15, 4, 17, 14, 32; *Gentiana cruciata* L.: 15; *Gentianella austriaca* (A. et J. Kerner) Holub: 2, 14, 3; Fam. *Asclepiadaceae*: *Vincetoxicum hirsundinaria* Medikus ssp. *hirsundinaria*: 30; Fam. *Oleaceae*: *Fraxinus excelsior* L.: 32; Fam. *Solanaceae*: *Atropa belladonna* L.: 6; *Hyoscyamus niger* L.: 26; *Solanum dulcamara* L.: 20, 12; Fam. *Convolvulaceae*: *Calystegia sepium* (L.) R. Br.: 7; *Convolvulus arvensis* L.: 11, 7; Fam. *Cuscutaceae*: *Cuscuta epithymum* (L.) Nath.: 1; Fam. *Boraginaceae*: *Cynoglossum officinale* L.: 7; *Echium vulgare* L.: 8, 31; *Myosotis arvensis* Hill. ssp. *arvensis*: 22, 8; *Myosotis nemorosa* Besser: 7; *Myosotis scorpioides* L.: 6, 19, 16, 20, 17, 2; *Myosotis sylvatica* Ehrh. ex Hoffm.: 7, 4, 15, 16, 20, 17; *Pulmonaria mollis* Wulfen ex Homem ssp. *mollissima* (A. Kerner) Nyman: 4, 7; *Pulmonaria officinalis* L.: 7, 4, 19, 15, 20; *Pulmonaria rubra* Schott: 15, 16, 17, 18, 8, 7; *Symphytum cordatum* Waldst. et Kit.: 7, 4, 5, 19, 15, 16, 17; *Symphytum tuberosum* L. ssp. *tuberosum*: 8; Fam. *Verbenaceae*: *Verbena officinalis* L.: 30; Fam. *Lamiaceae*: *Ajuga genevensis* L.: 30; *Ajuga reptans* L.: 7, 19, 15, 20, 18; *Ballota nigra* L. ssp. *nigra*: 31; *Clinopodium vulgare* L.: 15; *Galeopsis speciosa* Miller: 15, 16, 4, 20, 17, 2, 8, 7; *Galeopsis tetrahit* L.: 14, 4, 2, 7; *Glechoma hederacea* L.: 16, 4, 20, 7; *Glechoma hirsuta* Waldst. et Kit.: 19, 15, 18, 8, 7; *Lamium amplexicaule* L.: 30; *Lamium galeobdolon* (L.) L. ssp. *galeobdolon*: 7, 15, 20; *Lamium maculatum* L. ssp. *maculatum*: 15, 16, 4, 17, 2, 7; *Lamium purpureum* L.: 7; *Leonurus cardiaca* L. ssp. *villosus* (Desf. ex Sprengel): 30; *Lycopus europaeus* L.: 2, 7, 20; *Mentha arvensis* L. ssp. *arvensis*: 7; *Mentha longifolia* (L.) Hudson: 8, 11, 2, 7, 15, 16, 4, 20, 31; *Mentha pulegium* L.: 2; *Mentha x piperita* L.: 2; *Mentha x verticillata* L.: 7; *Nepeta nuda* L.: 8; *Origanum vulgare* L.: 8; *Prunella grandiflora* (L.) Scholler: 8, 14; *Prunella vulgaris* L.: 6, 11, 13, 4, 8, 14, 2, 19, 15, 16, 20, 17, 3, 32, 18, 22, 7, 9, 10, 25; *Salvia glutinosa* L.: 32; 19, 15, 16, 4, 20, 17, 2, 18, 8, 7; *Salvia nemorosa* L. ssp. *nemorosa*: 30; *Salvia pratensis* L. ssp. *pratensis*: 8; *Salvia verticillata* L.: 8, 7; *Stachys germanica* L.: 6; *Stachys officinalis* (L.) Trev.: 13, 8, 1, 3, 2, 6, 18, 22, 14; *Stachys sylvatica* L.: 19, 15, 16, 4; *Teucrium chamaedrys* L.: 30; *Thymus pannonicus* All. ssp. *pannonicus*: 30; *Thymus pulegioides* L. ssp. *pulegioides*: 14, 7, 19, 1, 11, 21, 20, 3, 2, 32, 13, 18, 22, 8, 9, 10, 25; Fam. *Callitricheaceae*: *Callitriche cophocarpa* Seudner: 1, 19, 16, 20; *Callitriche palustris* L.: 1, 2; Fam. *Plantaginaceae*: *Plantago lanceolata* L.: 11, 1, 8, 30, 19, 4, 20, 3, 2, 32, 6, 18, 22, 7, 9, 10, 25; *Plantago major* L. ssp. *major*: 16, 2, 4, 20, 17, 32, 11, 6, 7; *Plantago media* L.: 11, 13, 8, 14, 19, 20, 3, 2, 32, 6, 18, 22, 7, 9, 10, 25; Fam. *Scrophulariaceae*: *Chaenorrhinum minus* (L.) Lange ssp. *minus*: 32; *Digitalis grandiflora* Miller: 8; *Euphrasia officinalis* L. ssp. *pratensis* Schübler et Martens: 6, 11, 1, 8, 2, 20, 3, 32, 18, 22, 14; *Euphrasia stricta* D. Wolff ex J. F. Lehm ssp. *stricta*: 6, 9, 10, 25; *Lathraea squamaria* L.: 5; *Linaria vulgaris* Miller: 30; *Melampyrum arvense* L.: 7; *Melampyrum bihariense* A. Kerner: 7; *Rhinanthus alectorolophus* (Scop.) Pollich: 7; *Rhinanthus angustifolius* C. C. Gmelin ssp. *angustifolius*: 22, 14, 8; *Rhinanthus minor* L.: 6, 13, 1, 8, 7, 19, 3, 2, 18, 22, 14; *Scrophularia nodosa* L.: 15, 16, 11; *Scrophularia scopoli* Hoppe: 2, 23; *Verbascum chaixii* Vill. ssp. *austriacum* (Schott) Hayek: 2, 8; *Verbascum nigrum* L. ssp. *nigrum*: 8, 32; *Verbascum phlomoides* L.: 8, 1; *Veronica anagallis-aquatica* L.: 7, 2; *Veronica arvensis* L.: 7; *Veronica beccabunga* L.: 4; 16, 7, 19, 20, 17; *Veronica chamaedrys* L. ssp. *chamaedrys*: 7, 15, 9, 10, 25; *Veronica montana* Jusl.: 16, 15; *Veronica officinalis* L.: 8, 7, 19, 15, 4, 20, 9, 10, 25; *Veronica serpyllifolia* L. ssp. *serpyllifolia*: 11, 32; *Veronica urticifolia* Jacq.: 19, 15, 7, 28; Fam. *Campanulaceae*: *Campanula abietina* Griseb.: 4, 20, 7, 9, 10, 25; *Campanula glomerata* L. ssp. *glomerata*: 1, 8, 2, 19, 3; *Campanula patula* L.: 11, 1, 8, 7, 19, 17, 18; *Campanula persicifolia* L.: 19, 15, 8; *Campanula rapunculoides* L.: 7, 4, 11, 8; *Campanula rotundifolia* L. ssp. *rotundifolia*: 15; *Campanula serrata* (Kit.) Hendrych: 1, 19, 3, 2, 13, 6, 18, 22, 14, 8, 9, 10, 25; *Campanula sibirica* L. ssp. *sibirica*: 7; *Campanula trachelium* L.: 16, 4, 7; *Phyteuma orbiculare* L.: 16; *Phyteuma tetramerum* Schur: 16; Fam. *Rubiaceae*: *Cruciata glabra* (L.) Ehrend: 13, 7, 5, 19, 1, 20, 3, 6, 22, 14, 8; *Cruciata laevipes* Opiz: 18; *Galium aparine* L.: 7; *Galium mollugo* L.: 7; *Galium odoratum* (L.) Scop.: 7, 19, 15, 16, 4, 20, 18, 8; *Galium palustre* L. ssp. *palustre*: 8, 6, 2, 19, 15, 16, 17; *Galium schultesii* Vest: 1, 16, 4, 8, 7; *Galium uliginosum* L.: 8; *Galium verum* L.: 13, 8, 2, 19, 3, 18, 14, 7; Fam. *Caprifoliaceae*: *Lonicera nigra* L.: 7, 16, 1, 20, 17; *Lonicera xylosteum* L.: 7, 4, 8, 2, 18; *Sambucus ebulus* L.: 30, 7; *Sambucus nigra* L.: 7; *Sambucus racemosa* L.: 4, 5, 8, 7, 2; *Viburnum opulus* L.: 7, 14; Fam. *Valerianaceae*: *Valeriana montana* L.: 4, 20; *Valeriana simplicifolia* (Reichenb.) Kabath: 5; *Valeriana tripteris* L.: 7, 5, 17; Fam. *Dipsacaceae*: *Dipsacus fulonum* L.: 31; *Dipsacus laciniatus* L.: 30; *Knautia arvensis* (L.) Coulter ssp. *arvensis*: 13, 8, 11, 3, 6, 7; *Scabiosa ochroleuca* L.: 8; *Succisa pratensis* Moench: 18, 14; Fam. *Asteraceae* (*Compositae*): *Achillea collina* J. Becker: 13; *Achillea distans* Waldst. et Kit. ex Willd ssp. *distans*: 10, 25, 8; *Achillea millefolium* L. ssp. *millefolium*: 13, 8, 11, 19, 1, 2, 20, 3, 32, 6, 22, 7, 9, 10, 25, 28; *Achillea stricta* (Koch) Schleicher ex Gremli: 31; *Antennaria dioica* (L.) Gaertner: 22, 8, 9, 10, 25; *Arnica montana* L.: 3, 9, 10, 25; *Artemisia abrotanum* L.: 7; *Artemisia absinthium* L.: 30; *Artemisia vulgaris* L.: 27, 4; *Bellis perennis* L.: 4, 11, 14, 19, 16, 20, 17, 32, 6, 7; *Bidens cernua* L.: 2; *Bidens tripartita* L.: 7, 16, 4, 20; *Carduus acanthoides* L.: 9; *Carduus crispus* L. ssp. *crispus*: 7; *Carduus personatus* (L.) Jacq. ssp. *personatus*: 8; *Carlina acaulis* L. ssp. *acaulis*: 1, 8, 31, 19, 2, 13, 22, 14, 9, 10, 25; *Carlina vulgaris* L.: 11; *Centaurea jacea* L.: 8, 6, 19, 4, 17, 3, 2, 11, 22, 14, 7; *Centaurea melancolathia* Borbás: 1; *Centaurea phrygia* L.: 1, 19, 3, 2, 11, 6, 18, 22, 14, 8; *Cirsium arvense* (L.) Scop.: 11, 22, 4, 20, 12, 17, 32, 7; *Cirsium erisithales* (Jacq.) Scop.: 19, 2, 8; *Cirsium furiens* Griseb.

et Schenk: 19; *Cirsium oleraceum* (L.) Scop.: 19, 16, 4, 17, 2, 8, 7; *Cirsium palustre* (L.) Scop.: 16, 17, 6, 7; *Cirsium rivulare* (Jacq.) All.: 1, 8, 7, 19, 15, 4; *Cirsium vulgare* (Savi) Ten.: 11, 4, 20, 17, 32, 7, 10, 25; *Cirsium waldsteinii* Rouy: 1, 4, 17; *Conyza canadensis* (L.) Cronq.: 11, 20; *Doronicum austriacum* Jacq.: 1, 19, 15; *Erigeron annuus* (L.) Pers. ssp. *annuus*: 11, 13; *Galinsoga ciliata* (Rafin.) Blake: 7, 20; *Galinsoga parviflora* Cav.: 7; *Gnaphalium sylvaticum* L.: 6, 15, 21, 4, 17, 32; *Homogyne alpina* (L.) Cass.: 21, 4, 20, 17, 10, 25; *Inula britannica* L.: 2; *Inula ensifolia* L.: 27; *Inula helenium* L.: 2; *Inula hirta* L.: 30; *Leucanthemum vulgare* Lam. ssp. *vulgare*: 11, 6, 1, 8, 14, 19, 3, 2, 18, 22, 9, 10, 25; *Leucanthemum waldsteinii* (Schultz Bip.) Pouzar: 7, 1, 19, 15, 16, 17, 8; *Matricaria discoidea* DC.: 2; *Matricaria recutita* L.: 31; *Onopordum acanthium* L.: 7, 30; *Petasites albus* (L.) Gaertner: 15, 16, 17, 2; *Petasites hybridus* (L.) P. Gaertner, B. Meyer et Scherb.: 22, 16, 4, 17, 2, 7; *Petasites kablikianus* Tausch: 19, 4, 8; *Senecio jacobea* L. ssp. *jacobea*: 8; *Senecio ovatus* (P. Gaertner, B. Meyer et Scherb.) Willd.: 8, 16, 19, 15, 18, 7; *Senecio paludosus* L.: 4; *Senecio vernalis* Waldst. et Kit.: 7; *Senecio vulgaris* L.: 30, 7; *Solidago virgaurea* L. ssp. *virgaurea*: 8, 7, 10, 25; *Tanacetum corymbosum* (L.) Schultz Bip. ssp. *corymbosum*: 3, 2, 14; *Tanacetum vulgare* L.: 30, 8, 31; *Telekia speciosa* (Schreber) Baumg.: 19, 15, 16, 4, 17, 2, 7, 8; *Tussilago farfara* L.: 11, 5, 19, 15, 4, 20, 17, 3, 2, 7; *Cicerbita alpina* (L.) Wallr.: 1; *Cichorium intybus* L. ssp. *intybus*: 30, 8; *Crepis biennis* L.: 13, 8, 3, 2, 6, 22, 14; *Crepis paludosa* (L.) Moench: 1, 19; *Hieracium aurantiacum* L. ssp. *aurantiacum*: 6, 1, 8, 7, 19, 15, 9, 10, 25; *Hieracium lactucella* Wallr.: 7, 9, 10; *Hieracium murorum* L.: 1, 8; *Hieracium pilosella* L.: 8, 11, 7, 1, 21, 20, 2, 32, 22, 9, 10, 25; *Hieracium prenanthoides* Vill.: 7; *Hieracium transsylvanicum* Heuffel: 14, 1, 19, 15, 16, 21, 4, 20, 8, 7; *Hieracium umbellatum* L.: 14, 9, 10, 25; *Hypochoeris radicata* L.: 11, 13, 8, 19, 1, 20, 3, 6, 22, 14; *Hypochoeris uniflora* Vill.: 14, 9, 10; *Lapsana communis* L. ssp. *communis*: 19, 15, 16, 18, 7; *Leontodon autumnalis* L. ssp. *autumnalis*: 13, 11, 20, 3, 9, 10, 25; *Mycelis muralis* (L.) Dumort.: 19, 15, 16, 4, 20, 18, 8, 7; *Scorzonera rosea* Waldst. et Kit.: 9, 10, 25; *Sonchus arvensis* L. ssp. *arvensis*: 7; *Sonchus oleraceus* L.: 7; *Taraxacum officinale* Weber et Wiggers: 6, 11, 2, 20, 32, 7, 9, 25; *Tragopogon pratensis* L. ssp. *orientalis* (L.) Celak: 8; Fam. *Alismataceae*: *Alisma plantago-aquatica* L.: 16, 22; Fam. *Potamogetonaceae*: *Potamogeton natans* L.: 4; Fam. *Trilliaceae*: *Paris quadrifolia* L.: 7, 15, 5, 19, 16, 4, 18, 8; Fam. *Liliaceae*: *Veratrum album* L. ssp. *album*: 25, 32; *Colchicum autumnale* L.: 6, 8, 14, 32; *Gagea lutea* (L.) Ker-Gawl.: 4; *Lilium martagon* L.: 2; *Scilla bifolia* L. ssp. *bifolia*: 32; *Maianthemum bifolium* (L.) F. W. Schmidt: 31, 19, 15, 16, 21, 4, 20, 18, 8, 7; *Polygonatum latifolium* (Jacq.) Desf.: 5; *Polygonatum verticillatum* (L.) All.: 19, 15, 16, 17, 2, 18; *Streptopus amplexifolius* (L.) DC.: 15; Fam. *Amaryllidaceae*: *Galanthus nivalis* L.: 3, 32; Fam. *Iridaceae*: *Crocus vernus* (L.) Hill: 32, 3, 4; *Gladiolus imbricatus* L.: 2, 19, 1, 3, 14; Fam. *Orchidaceae*: *Anacamptis pyramidalis* (L.) L. C. M. Richard: 8; *Coeloglossum viride* (L.) Hartman: 9, 6; *Dactylorhiza maculata* (L.) Soó ssp. *schurii* (Klinge) Soó: 7; *Epipactis helleborine* (L.) Crantz: 8, 15, 18; *Goodyera repens* (L.) R. Br.: 15; *Gymnadenia conopsea* (L.) R. Br. ssp. *conopsea*: 1, 8, 19, 3, 2; *Listera ovata* (L.) R. Br.: 15, 18; *Neottia nidus-avis* (L.) L. C. M. Richard: 4; *Platanthera bifolia* (L.) L. C. M. Richard: 31, 15, 3; Fam. *Juncaceae*: *Juncus articulatus* L.: 6, 19, 16, 4, 20, 17, 32; *Juncus bufonius* L.: 15, 22, 20, 17, 2; *Juncus conglomeratus* L.: 17; *Juncus effusus* L.: 8, 6, 19, 16, 4, 20, 17, 2, 32, 7, 9, 10, 25; *Juncus inflexus* L.: 19, 15, 2, 4, 20, 17; *Juncus tenuis* Willd.: 19, 20, 2, 32; *Luzula campestris* (L.) DC.: 14, 7, 3, 18, 9, 10, 25; *Luzula luzuloides* (Lam.) Dandy et Wilmott ssp. *luzuloides*: 8, 6, 19, 15, 16, 21, 4, 20, 17, 10, 25; *Luzula pallescens* Swartz: 30; *Luzula pilosa* (L.) Willd.: 4; *Luzula sylvatica* (Hudson) Gaudin: 19, 15, 4, 17(6), 18, 7; Fam. *Cyperaceae*: *Blysmus compressus* (L.) Panzer ex Link: 19; *Eleocharis palustris* (L.) Roemer et Schultes: 6, 19, 16, 4, 17, 8; *Eriophorum angustifolium* Honck.: 7; *Eriophorum latifolium* Hoppe: 7, 6, 15; *Schoenoplectus lacustris* (L.) Palla: 16; *Scirpus sylvaticus* L.: 8, 6, 7, 19, 16, 4, 17, 2; *Carex acuta* L. ssp. *acuta*: 4; *Carex curta* Good.: 7, 16, 19; *Carex digitata* L.: 15; *Carex echinata* Murray: 6; *Carex flacca* Schreber ssp. *flacca*: 4; *Carex flava* L.: 1, 4, 20, 32; *Carex hirta* L.: 4, 20; *Carex lepidocarpa* Tausch: 7; *Carex montana* L.: 11; *Carex nigra* (L.) Reichenb. ssp. *nigra*: 8; *Carex ovalis* Good.: 6, 2, 1, 19, 32, 9, 10, 25; *Carex paniculata* L.: 16; *Carex pendula* Hudson: 17, 7; *Carex remota* L.: 16, 15, 4, 7; *Carex rostrata* Stokes var. *rostrata*: 1, 19; *Carex spicata* Hudson: 19; *Carex sylvatica* Hudson: 7, 19, 15, 16, 4, 17, 18; *Carex vesicaria* L.: 19; *Carex vulpina* L.: 19; Fam. *Poaceae* (Gramineae): *Briza media* L.: 13, 1, 8, 2, 19, 3, 6, 18, 22, 14, 9, 10, 25; *Cynosurus cristatus* L.: 6, 11, 1, 8, 19, 17, 3, 2, 32, 18, 22, 14, 9, 10, 25; *Dactylis glomerata* L. var. *glomerata*: 6, 13, 8, 15, 19, 4, 11, 17, 3, 2, 14, 7; *Dactylis polygama* Horvátovszky: 15; *Festuca altissima* All.: 15, 16; *Festuca arundinacea* Schreber ssp. *arundinacea*: 4; *Festuca drymeja* Mert. et Koch: 15; *Festuca gigantea* (L.) Vill.: 15, 4, 8, 7; *Festuca nigrescens* Lam.: 9, 10, 25; *Festuca ovina* L. ssp. *ovina*: 31, 23; *Festuca pratensis* Hudson ssp. *pratensis*: 8, 19, 17, 3, 2, 6, 9, 25; *Festuca rubra* L. ssp. *rubra*: 6, 11, 13, 1, 8, 19, 21, 20, 3, 2, 32, 18, 22, 14, 9, 10, 25; *Festuca valesiaca* Schleicher ex Gaudin: 14, 22; *Lolium perenne* L.: 11, 4, 20, 17, 32, 6, 7; *Poa annua* L.: 4, 20, 17, 11, 7; *Poa nemoralis* L.: 19, 15, 4, 7; *Poa palustris* L.: 19, 4, 17, 8; *Poa pratensis* L.: 6, 11, 20, 17, 2, 7; *Poa supina* Schrader: 9; *Poa sylvicola* Guss.: 19, 8; *Poa trivialis* L.: 19, 16, 4; *Melica picta* C. Koch: 7; *Melica uniflora* Retz.: 19; *Glyceria fluitans* (L.) R. Br. ssp. *fluitans*: 19, 16; *Glyceria maxima* (Hartman) Holmberg: 2; *Glyceria nemoralis* (Uechtr.) Uechtr. et Koernicke: 8; *Glyceria notata* Chevall.: 19, 15, 16, 4, 20; *Bromus commutatus* Schrader: 30; *Bromus hordeaceus* L.: 6; *Bromus tectorum* L.: 15; *Brachypodium pinnatum* (L.) Beauv. ssp. *pinnatum*: 8, 17; *Brachypodium sylvaticum* (Hudson) Beauv.: 15, 18, 8, 7; *Agrostis capillaris* L. ssp. *capillaris*: 6, 11, 13, 1, 8, 2, 19, 21, 20, 17, 3, 32, 18, 22, 14, 9, 10, 25; *Agrostis stolonifera* L. ssp. *stolonifera*: 11, 19, 16, 2, 4, 5, 20, 17, 32, 7, 8; *Alopecurus aequalis* Sobol.: 20; *Alopecurus geniculatus* L.: 1; *Anthoxanthum odoratum* L.: 6, 11, 1, 19, 3, 2, 32, 18, 22, 14, 9, 10, 25; *Arrhenatherum elatius*

(L.) Beauv. ex. J. et C. Presl ssp. *elatus*: 3, 2, 14; *Avenula pratensis* (L.) Dumort.: 3, 14; *Calamagrostis arundinacea* (L.) Roth: 8, 31, 7, 19, 17, 2, 14; *Calamagrostis pseudophragmites* (Haller fil.) Koeler: 20; *Calamagrostis varia* (Schrader) Host: 21; *Calamagrostis villosa* (Chaix) J. F. Gmelin: 19, 15, 7; *Deschampsia caespitosa* (L.) Beauv. ssp. *caespitosa*: 6, 19, 16, 4, 17, 2, 7, 9, 10, 25; *Deschampsia flexuosa* (L.) Trin.: 6, 21, 4; *Elymus caninus* (L.) L. ssp. *caninus*: 15, 17; *Elymus repens* (L.) Gould: 19, 4, 6, 7; *Helictotrichon decorum* (Janka) Hernard: 2; *Holcus lanatus* L.: 6, 11, 8, 4, 17, 3, 2, 32, 18, 22, 14, 7; *Hordelymus europaeus* (L.) C. O. Harz: 15, 16, 18, 7; *Phleum alpinum* L.: 14; *Phleum montanum* C. Koch: 10; *Phleum pratense* L.: 13, 4, 1, 8, 19, 16, 3, 2, 6, 18, 22, 14; *Trisetum flavescens* (L.) Beauv. ssp. *flavescens*: 21, 11, 3, 14; *Danthonia decumbens* (L.) DC.: 8, 21, 18, 22, 9, 10, 25; *Molinia caerulea* (L.) Moench ssp. *caerulea* var. *caerulea*: 8, 3, 14, 32; *Nardus stricta* L.: 6, 21, 2, 9, 10, 25; *Echinochloa crus-galli* (L.) Beauv.: 7; *Setaria pumila* (Poiret) Schultes: 7, 31; Fam. *Typhaceae*: *Typha latifolia* L.: 16; *Typha shuttleworthii* Koch et Sonder: 16, 8, 4; Fam. *Lemnaceae*: *Lemna minor* L.: 2, 22, 19, 16.

Conclusions

As a result of the floristical research done between 2000-2003 in the territory of the Moldovița River's area, were identified 624 species and 121 subspecies, among 104 typical subspecies and 17 atypical subspecies, included in 81 botanical families.

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NEW DATA ON THE PRESENCE OF THE CLASS *PHRAGMITI-MAGNOCARICETEA* KLIKA IN KLIKA ET NOVAC 1941 FROM THE ORIENTAL CARPATHIANS

ZAMFIRESCU OANA*

Abstract: The paper presents two plant associations of the class *Phragmiti-Magnocaricetea* Klika in Klika et Novac 1941: the association *Glycerietum plicatae* Kluczinsky 1928 of order *Nasturtio-Glyceritalia* Pignatti 1953, alliance *Glycerio-Sparganioni* Br.-Bl. et Sissing in Boer 1942, and the association *Carici-Menyanthetum* Soó 1955 of order *Magnocaricetalia* Pignotti 1953, alliance *Magnocaricion elatae* (Balatova-Tulakova 1963) Oberd. et al. 1967. The tables of phytosociological relevés, chorology, the ecology and the characteristic and accessory species were presented, and the analysis of bioforms, floristic elements and ecological indices was carried out for each association.

Keywords: paludal vegetation, bioforms, floristic elements, ecological indices

Introduction

The studied area is 140 km² and is located on the left slope of Izvoru Muntelui-Bicaz reservoir, which is a part of the Stânișoara Mountains.

Material and Method

The vegetation study of the natural ecosystems from the left side of Izvoru Muntelui-Bicaz reservoir was carried out according to the method of the Zürich-Montpellier school, formulated by J. Braun-Blanquet in collaboration with J. Pavillard.

The names of the associations were chosen according to the Phytosociological Nomenclature Code (J. J. Barkmon, J. Moraveç and S. Ranschert, 1986).

The description of the associations, based on characteristic, dominant and discriminant species, allowed the construction of the phytosociological tables, in agreement with the methodology formulated by Al. Borza and N. Boșcaiu (1965).

For the classification of the association we used general papers about Romanian vegetation together with the papers of G. Grabherr, L. Mucina and T. Ellmauer (1993).

Results and Discussions

1. Association *Glycerietum plicatae* Kluczynski 1928

The plant communities with *Glyceria plicata* appear along mountain streams or in small depressions filled with rainwater. They occur on soils that are rich in nutrients, on calcareous substrata from the mountainous level (500 – 1100m-altitude) of the Oriental and the Occidental Carpathians.

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Together with *Glyceria plicata*, which has 70 – 80% coverage, occur many other species that are characteristic of the alliance *Glycerio-Sparganion* and the order *Nasturtio-Glycerietalia*, which are both superior syntaxa to the association (Tab. 1).

Although this association is not widespread, we identified it for the first time in the studied area, from the deposits of the Buhalnița and Hangu streams (Tab. 1).

Table 1. Ass. *Glycerietum plicatae* Kulczynski 1928

Relevee No.	1	2	3	4	5	K
Altitude (m)	755	758	760	790	795	
Coverage (%)	90	90	90	100	95	
Area (m ²)	25	10	10	25	10	
No. of species	7	8	5	8	9	
Characteristic species						
<i>Glyceria plicata</i>	5	5	5	5	5	V
<i>Glycerio-Sparganion</i>						
<i>Veronica beccabunga</i>	-	+	-	+	+	III
<i>Nasturtio-Glycerietalia</i>						
<i>Epilobium hirsutum</i>	+	-	-	+	-	II
<i>Myosotis scorpioides</i>	-	+	-	-	+	II
<i>Mentha longifolia</i>	-	-	+	-	-	I
<i>Phragmitetalia</i>						
<i>Lycopus europaeus</i>	+	+	-	-	+	III
<i>Phragmiti-Magnocaricetea</i>						
<i>Equisetum palustre</i>	-	+	+	+	+	IV
<i>Galium palustre</i>	+	+	+	-	+	IV
<i>Molinio-Arrhenatheretea</i>						
<i>Juncus effusus</i>	+	+	-	+	-	III
<i>Ranunculus repens</i>	-	-	+	+	+	III
Companion species						
<i>Tussilago farfara</i>	+	+	-	+	+	IV
<i>Carex remota</i>	+	-	-	+	+	III

Rel. 1, 2, 3 –Piciorul Vânăț forest road (Buhalnița), 21-07-2000, 4, 5 – Hangu, 19-07-2002.

The bioform analyses (Fig. 1) clearly revealed the dominance of hemicryptophytes (66,67%) followed by geophytes and helohydathytes (16,67% each).

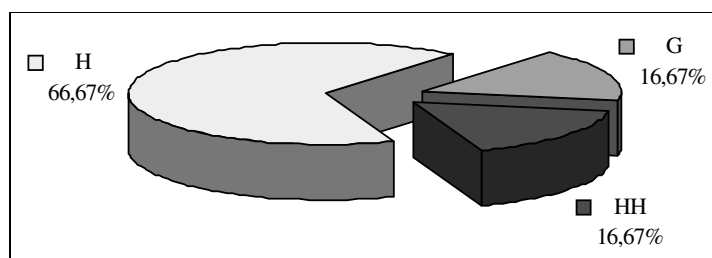


Figure 1. Bioform spectrum of Ass. *Glycerietum plicatae* Kulczynski 1928
(H – hemicryptophytes, HH – helohydathytes, G - geophytes)

The floristic element analysis (Fig. 2) showed that among the 12 species, the Eurasian ones dominate with 50%, followed by circumpolar and worldwide ones with 33,33% and 16,67%, respectively.

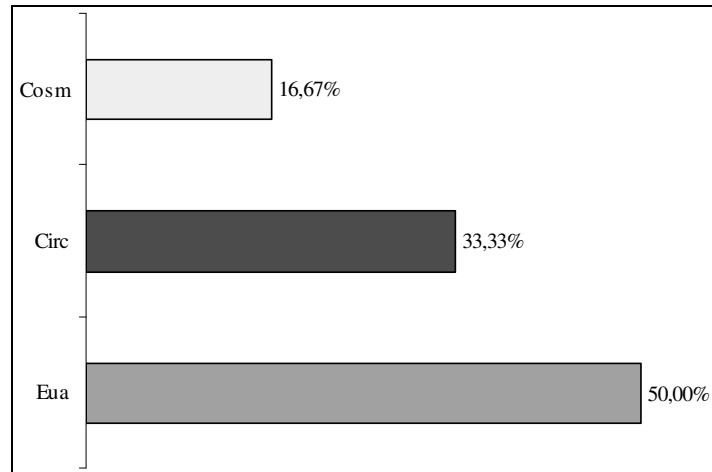


Figure 2. Floristic elements spectrum of Ass. *Glycerietum plicatae* Kulczynski 1928 (Eua – Eurasian; Circ – Circumpolar; Cosm – worldwide)

The analysis of the ecological indices (Fig. 3) showed that the association is dominated by hygrophytes and mesohygrophytes with 41,67%, by microthermophilous species with 91,67% and by neutrophilous species 41,67%.

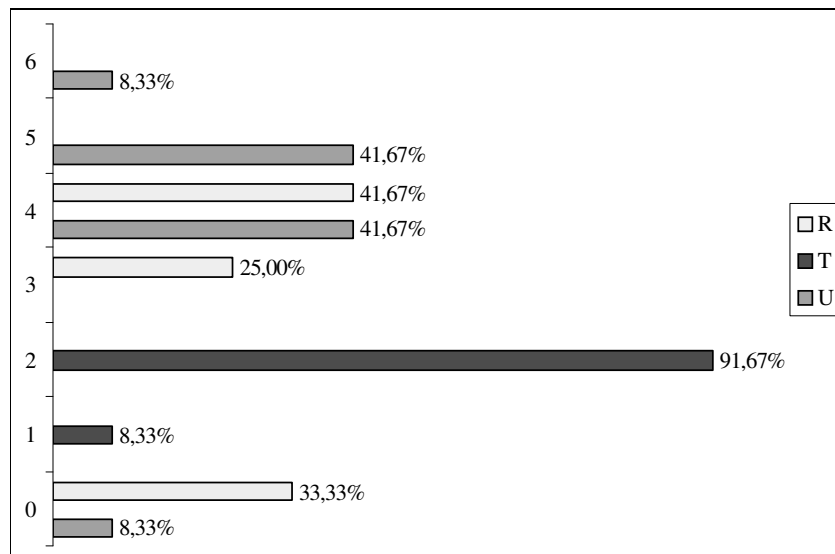


Figure 3. Ecological indices spectrum of Ass. *Glycerietum plicatae* Kulczynski 1928 (U – soil moisture; T – temperature; R – soil reaction)

2. Association *Carici-Menyanthetum* Soó 1955

The plant communities of this association were identified in many mountainous drainage basins and depressions from the Rodnei Mountains. They occur in shallow ponds and lakes. The characteristic species – *Carex pseudocyperus* and *Menyanthes trifoliata* – and the presence of hygro-hydrophilous species outline the strong hydrophilic characteristic of the association. After ponds dry out and peat develops the plant communities from these locations are replaced with peat bog ones that belong to the order *Caricetalia nigrae* (Rațiu 1972, Gergely and Rațiu 19873). This fact seems to endorse the classification of the observed plant communities in the suborder *Caricetosum flavae*.

This association has not been acknowledged before from the studied area or from any other parts of the Neamț District.

Table 2. Ass. *Carici-Menyanthetum* - *caricetosum flavae* subas. nova

Relevee No.	1	2	3	4	5	6	K
Altitude (m)	610	610	610	610	610	610	
Coverage (%)	50	50	25	25	25	50	
Area (m ²)	100	100	95	95	95	80	
No. of species	14	13	13	13	12	11	
Characteristic species							
<i>Menyanthes trifoliata</i>	4	4	3	4	4	2	V
Subassociation differential species							
<i>Carex flava</i>	+	+	+	+	+	+	V
Magnocaricion și Magnocaricetalia							
<i>Galium palustre</i>	+	+	+	+	+	+	V
<i>Lysimachia vulgaris</i>	+	+	+	+	+	-	V
<i>Carex vesicaria</i>	+	+	+	-	-	+	IV
<i>Lathyrus pratensis</i>	-	-	+	-	+	-	II
<i>Myosotis caespitosa</i>	-	+	-	+	-	-	II
<i>Lythrum salicaria</i>	+	-	-	-	-	-	I
Phragmitetalia							
<i>Lycopus europaeus</i>	+	-	-	-	-	-	I
Nasturtio-Glycerietalia							
<i>Epilobium hirsutum</i>	+	+	+	+	+	+	V
<i>Mentha longifolia</i>	+	+	+	+	+	+	V
Phragmiti-Magnocaricetea							
<i>Typha latifolia</i>	+	+	+	+	1	+	V
<i>Scirpus sylvaticus</i>	+	+	+	+	+	+	V
<i>Alisma plantago-aquatica</i>	-	-	+	+	-	+	III
<i>Rumex palustris</i>	-	+	-	-	-	-	I
<i>Polygonum amphibium</i>	-	-	-	+	-	-	I
Lemnetea							
<i>Lemna minor</i>	2	+	+	-	-	-	III
Companion species							
<i>Salix cinerea</i>	+	5	5	4	5	3	V
<i>Juncus effusus</i>	+	-	-	-	+	+	III
<i>Calamagrostis epigeios</i>	-	-	-	+	+	-	II

Rel. 1, 2, 3, 4, 5, 6 – Ruginești (Mormântului Valley), 19-07-2000

The bioform analysis (Fig. 4) showed that among the component species of the association, hemicryptophytes were dominant with 55%, followed by helohydatophytes with 20%, and geophytes and therophytes, each with 10%.

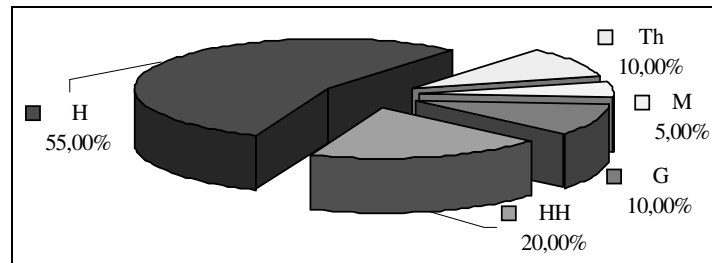


Figure 4. Bioform spectrum of Ass. *Carici-Menyanthetum - caricetosum flavae* subas. nova (H – hemicryptophytes, HH – helohydatophytes, G – geophytes Th – therophytes, M – mesophanerophytes)

The floristic element analysis (Fig. 5) indicated the dominance of Eurasian species with 40%, followed by circumpolar and worldwide species, each with 30%

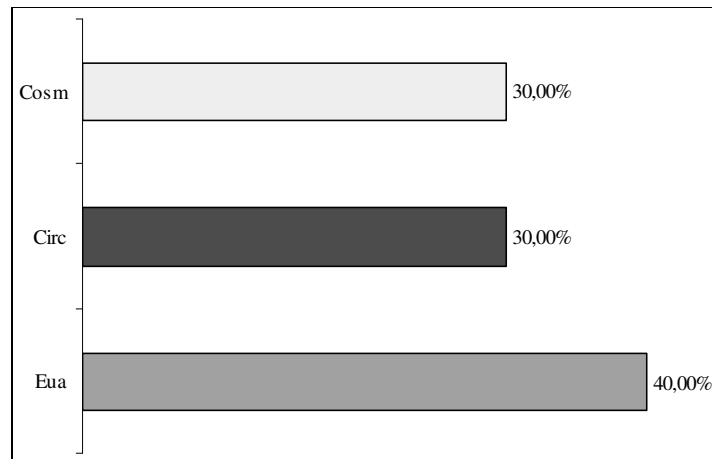


Figure 5. Floristic elements spectrum of Ass. *Carici-Menyanthetum - caricetosum flavae* subas. nova (Eua – Eurasian; Circ – Circumpolar; Cosm – worldwide)

The analysis of the ecological indices (Fig. 6) outlines the dominance of mesohygrophytes and hydrophytes with 40%, of mesothermophilous species with 70%, and, concerning the soil reaction, the dominance of the euryionic species with 60%.

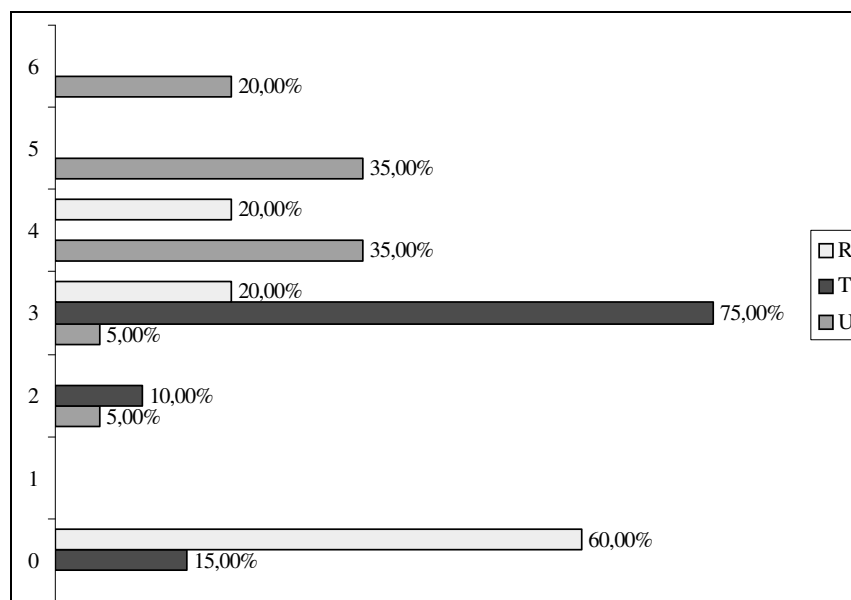


Figure 6. Ecological indices spectrum of Ass. *Carici-Menyanthetum - caricetosum flavae* subas. nova (U – soil moisture; T – temperature; R – soil reaction)

Conclusions

1. The study demonstrates that the identified plant communities belong to the associations *Glycerietum plicatae* Kluczinsky 1928 and *Carici-Menyanthetum* Soó 1955.
2. Hemicryptophytes, Eurasian species, hygrophytes and mesohygrophytes dominate the plant communities of both associations.
3. Regarding temperature and soil reaction figures, plant communities of the association *Glycerietum plicatae* Kluczinsky 1928 are dominated by microthermophilous and neutrophilous species, while plant communities of the association *Carici-Menyanthetum* Soó 1955 are dominated by mesothermophilous and euryionic species, respectively.

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**SOME ANATOMICAL ASPECTS CONCERNING GLANDULAR
AND NONGLANDULAR TRICHOMES PRESENTS ON
PEPEROMIA SPECIES CULTIVATED
OF BOTANICAL GARDEN OF IASI**

CAMELIA IFRIM*

Summary: The present paper is focused on glandular and non-glandular trichomes of eight taxa from *Peperomia* genus. We point out the histo-anatomical features for each taxons by using MO and MEB methods.

Key Words: histo-anatomy, MO, MEB, glandular and non-glandular trichomes, *Peperomia*

Introduction

The studies of *Piperaceae* family members are very interesting especially because of their systematic position. The anatomical aspects found in the literature are referring only to a few *Peperomia* species and is focused on lamina features [1, 2, 6] and rarely point out the characteristics of glandular trichomes [5]. In our country there are few morpho-anatomical observations upon the species belonging to this family [3, 7].

Material and method

The vegetal material is represented by the leaves and the stems of seven taxa who belongs to *Piperaceae* familiy: *Peperomia clusiifolia* (Jacq.) Hook., *P. clusiifolia* (Jacq.) Hook. 'Variegata', *P. obtusifolia* (L.) A. Dietr., *P. obtusifolia* (L.) A. Dietr. 'Variegata', *P. orba* Bunting 'Astrid', *P. serpens* (Sw.) Loud., *P. serpens serpens* (Sw.) Loud. 'Variegata', and *P. verticillata* (L.) A. Dietr., cultivated in the greenhouses of the Botanical Garden of Iasi. The fixing and processing of the material was done according to the usual protocol of the Vegetal Morphology and Anatomy Laboratory belonging to the Biology Department of University "Al.I. Cuza" of Iasi.

The sections were made transversal at the middle level of the stem, petiole and lamina. As well as were made superficial sections at the leaf level. The obtained permanent preparations were analyzed and drawn at MC₁ optic microscope and photographed at the Novex optic microscope.

Micromorphological surface aspects of the stems and leaves was analyzed and photographed at the scanning electronic microscope (MEB) [8] with according to the usual procedure of the Electronic Microscopy Laboratory belonging to the Biology Department the University "Al. I. Cuza" of Iasi.

* Botanical Garden "Anastasiu Fătu" Iași

Results

The morpho-anatomical synthesis, especially these signed by Metcalfe and Chalk [4], mention first of all the presence of glandular trichomes to the majority of members belonging to this family. It is a few information about the trichome structure.

For the studied species by us we have noticed the presence of both trichomes types: glandular and non-glandular, these are more frequently than the non-glandular ones. and in most of cases have a unicellular gland.

Among the most frequently met **glandular trichomes** we can mention the three cells trichomes, with the basis between the epidermical cells, an unstalked cell and the unicellular gland. This apical cells can be sac-like (in most cases) or spatula-like (sometime, in cases of *Peperomia serpens* taxa). The glandular trichomes are present on the aerial vegetative organs at all analyzed species, (less *P. verticillata*): at the level of leaf petiole (fig. **B**) and lamina (on both epidermis), but less numerous at the stem level (fig. **A**). These trichomes are disposed in a special way; they can be found among the epidermical cells, in genuine depressions, and the gland does not exceed the epidermis cells level (fig. **C**). At *Peperomia serpens* and its variegated leaves sort (fig. **D**) this glandular trichomes may have the unicellular gland at the same level with the epidermical cells or may be exceed.

At *P. verticillata*, on the stem (fig. **F**) and on the leaf, were observed glandular trichomes with the stalk and the head above the epidermis cells level.

The **nonglandular trichomes** have a slightly different structure. In general they are multicellular, uniseriate or even unicellular.

The multicellular, uniseriate non-glandular trichomes were met at the stem and leaf of *P. verticillata* (fig. **G, H, I**), the leaf of *P. orba* 'Astrid' (fig. **J**) and on the leaf of *P. serpens* (fig. **K, L**). This last species has non-glandular trichomes disposed only in the lower epidermis and it was not observed at their variegated leaves sort. In the last case we can mention that basal cell which is slightly exceeded the epidermical cells, an aspect easily to detect by SEM. At *P. verticillata* we can mention an abundance of pluricellular non-glandular trichomes which are offering the characteristical macroscopical aspect.

The unicellular non-glandular trichomes with pointed tip and thickened wall were noticed on the petiole of *P. clusiifolia* (fig.) and its variegated leaves sort. It was found, as well as, at the taxons of *P. clusiifolia*, *P. obtusifolia* and their variegated leaves sort (fig. **M**), on the lamina level and mainly on the midrib. This trichomes have the thickened walls and narrow lumina.

Conclusions

The aspects presented above bring new information about the trichomes types present at the members of *Piperaceae* family.

The mentioned anatomical data can be used as diagnosis characters in taxonomy.

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Explanation of the plates

Plate I. Glandular and non-glandular trichomes:

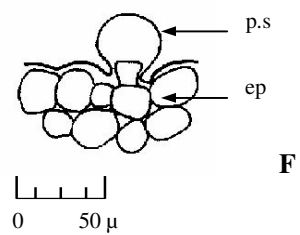
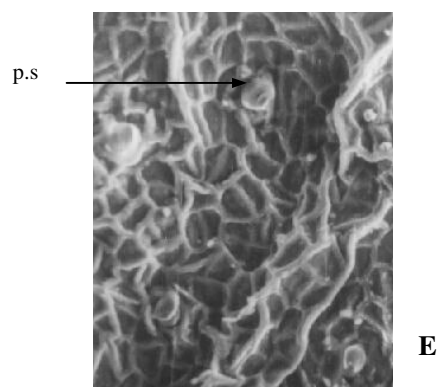
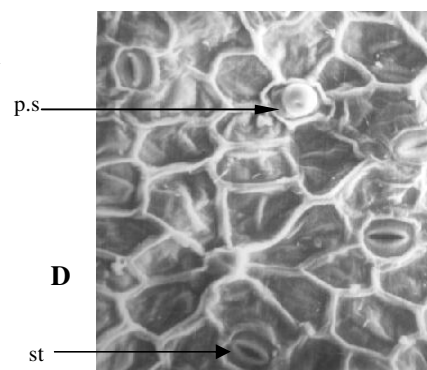
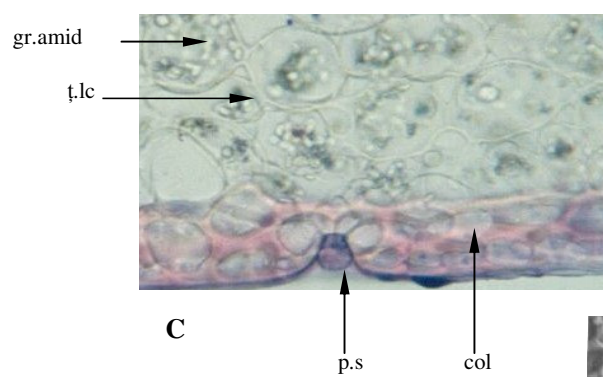
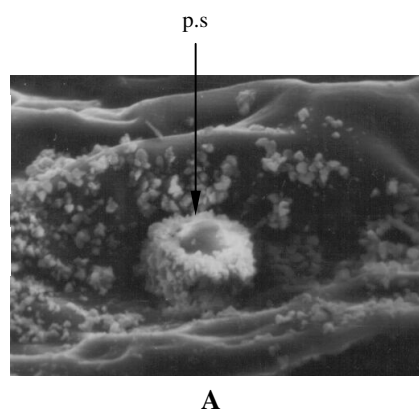
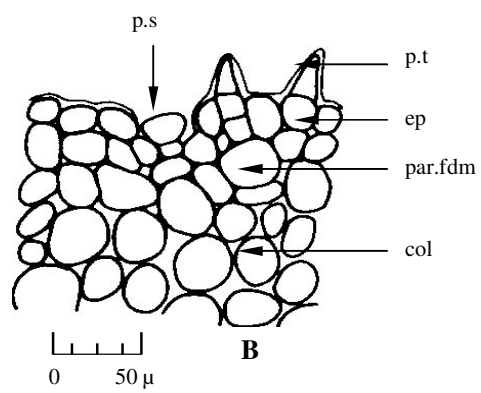
A - *Peperomia serpens*, stem, micromorphological surface view (SEM, x 390); **B** - *Peperomia clusiifolia*, leaf, detail of petiole; **C** - *Peperomia clusiifolia*, leaf, detail of mesophyll; **D** - *Peperomia serpens*, leaf, micromorphological surface view (SEM, x 360); **E** - *Peperomia clusiifolia*, leaf, micromorphological surface view (SEM, x 520); **F** - *Peperomia verticillata*, stem, detail of epidermis.

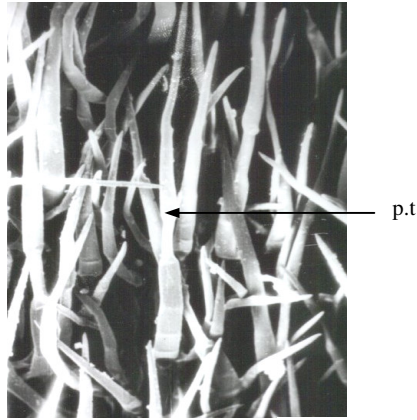
Plate II. Trichomes:

G - *Peperomia verticillata*, stem, micromorphological view (SEM, x 400); **H** - *Peperomia verticillata*, stem, detail of epidermis; **I** - *Peperomia verticillata*, leaf, detail of epidermis; **J** - *Peperomia orba* 'Astrid', leaf, micromorphological view (SEM, x 350); **K** - *Peperomia serpens*, leaf, detail of low epidermis; **L** - *Peperomia serpens*, leaf, micromorphological surface view (SEM, x 700); **M** - *Peperomia obtusifolia* leaf, detail of upper epidermis

Abbreviations

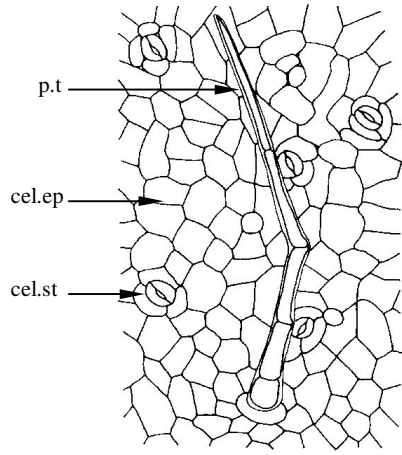
cel.ep - epidermal cells; **cel.st** - stomatal cells; **cut** - cuticle; **ep** - epidermis; **ep.s** - upper epidermis; **par.clz** - cellulosic parenchyma; **par.fdm** - fundamental parenchyma; **Ț.lc** - spongy parenchyma; **Ț.psd** - palisade parenchyma.



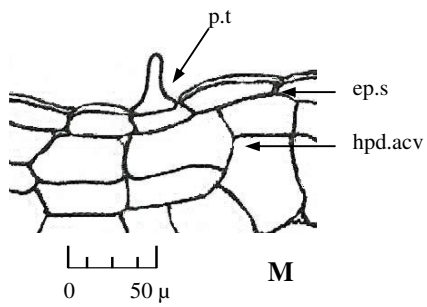


G

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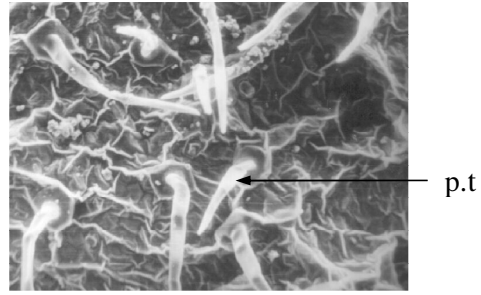


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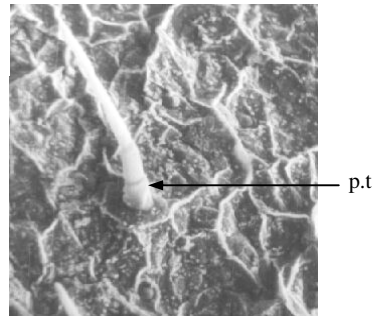
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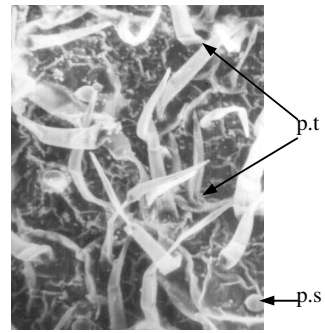


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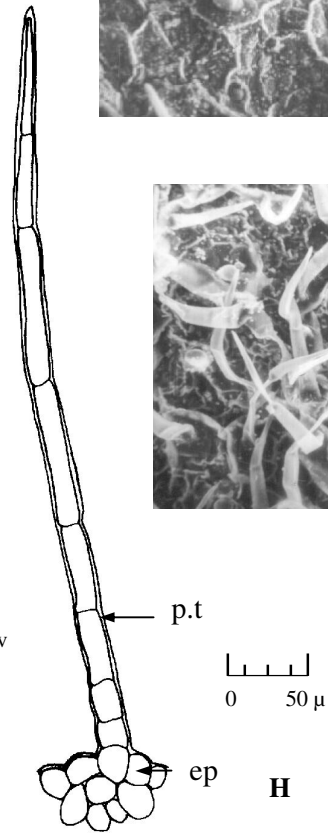
L



p.t



I



H

0 50 μ

SOME HISTO-ANATOMICAL ASPECTS CONCERNING THE LEAF STRUCTURE OF *BASELLA ALBA* AND *BASELLA RUBRA*

GABRIELA BUSUIOC *, CAMELIA IFRIM **

Abstract: We analyze the histo-anatomical peculiarities leaf of two *Basella* species cultivated in the Botanical Garden of Iași (Romania). The aim of the papers is to identifying their leaf characteristics which is typically for *Basellaceae* family and the differences between this two species who was observed on the studied material.

Key words: Leaf histo-anatomy, *Basella* sp.

Introduction

The studied taxa are rather fleshy, twining plants and belongs to a small tropical family - *Basellaceae*. The fleshy, mucilaginous leaves of *Basella* species have been used locally (Africa, China, etc.) as vegetables or for medicinal purposes.

The anatomical data are fewer [1, 2, 4] and is focused especially on other *Basellaceae* species.

Material and method

The vegetal material is represented by the leaves of two taxa: *Basella alba* L. and *Basella rubra* L. [5]. Both the taxa were cultivated in the greenhouses of the Botanical Garden of Iași.

The fixing and processing of the material was done according to the usual protocol of the Vegetal Morphology and Anatomy Laboratory belonging to the Biology Department of the University "Al. I. Cuza" of Iași.

The sections were made transversal at the middle level of the root, of the stem and of the leaves. As well as there were made superficial sections at the leaf level [3]. The obtained permanent preparations were analyzed and photographed at the Novex optical microscope.

Results

Basella alba L.

The petiole (Figures A-C). The outline of the transverse section is incompletely circular, with plane adaxial surface and with two small lateral-adaxial ribs.

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The epidermis has isodiametrical cells with several sizes, all of them with an external wall slightly thickened than the others. Here and there we can notice the cruciferous type stomata.

The fundamental parenchyma is cellulose and of a meiotic type, some cells contain simple crystals or, more often, the calcium oxalate druses.

In the fundamental parenchyma there is a big vascular bundle; its outline is following the petiole outline. A few parenchymatous-cellulose rays traverse this vascular bundle, an argument in the favour of the assertion that we are talking about a composed vascular bundle. The phloem has the sieve tubes and companion cells; the xylem has irregular scattered vessels and separated by the cellulose parenchyma cells. At the phloem outskirts there is a thin belt of angular collenchyma.

The lamina (Figures **D-H**). The epidermis in surface view. The upper epidermis is composed by polygonal cells with straight lateral walls. The lower epidermis has irregular cells with wavy lateral wall (the rare wavy, but with a big amplitude).

The cruciferous type stomata, are presented in both epidermis, thus the lamina is amphistomatous. By transparency we can observe simple crystals of calcium oxalate.

In transverse section the midrib is less prominent at the lower side of the lamina. The midrib comprises a small vascular bundle without mechanical elements at the phloem pole.

Both epidermis have slightly tangential elongated cells, with thin walls; here and there we can notice stomata. The mesophyll is homogenous, is composed of isodiametrical cells, polygonal-rounded, with intercellular spaces among them. Some cells of the hypodermic adaxial layer are slightly perpendicular on the epidermis remembering the palisade cells. The lamina has a bifacial isofacial structure, some cells of the mesophyll contain druses or simple crystals of calcium oxalate.

Basella rubra L. (Figures I-M).

This taxon has just a few differences. The outline of transverse section of the petiole is semicircular with two obvious lateral wings and an adaxial depression. The vascular area is represented by seven bundles who contain collenchyma layers in phloem position.

The lamina has a mesophyll which seems to be differentiated, the 2-3 subepidermal layers are composed by the palisade-like cells.

Conclusions

In this paper we note the histo-anatomical aspects which can be useful for the taxonomical diagnosis.

The differences between these two taxa are smaller and are obvious at the structure of the vascular bundles and the mesophyll.

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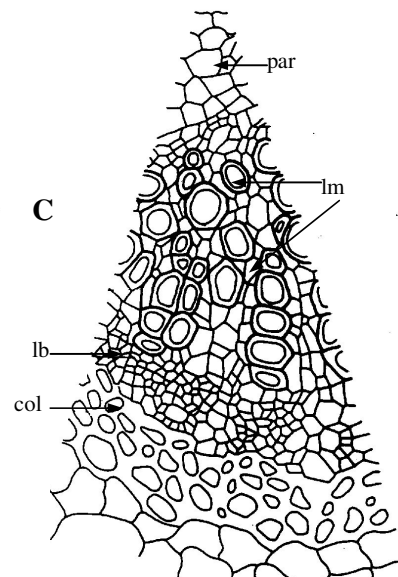
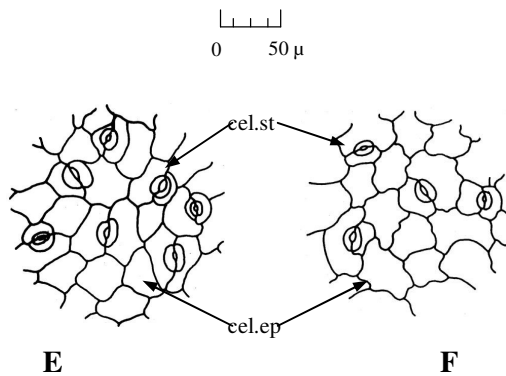
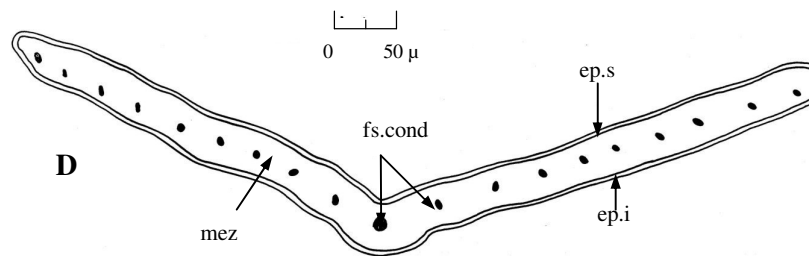
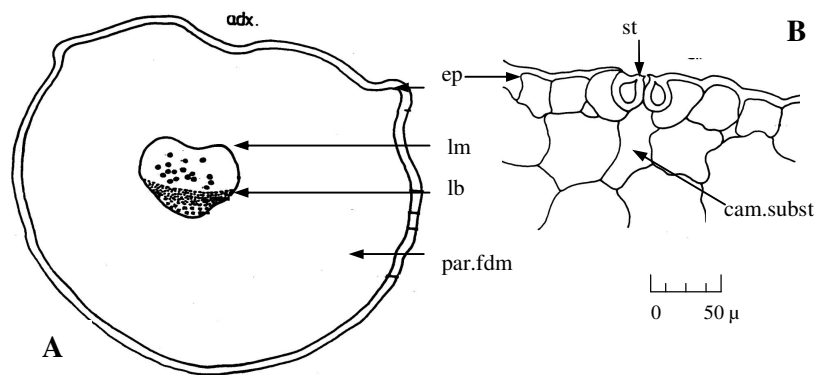
Explanation of the figures

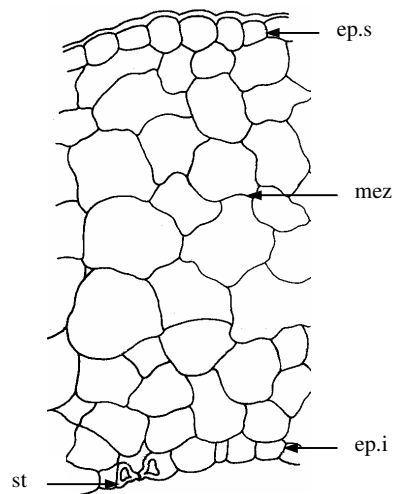
Basella alba L. – The structure of the petiole (**A**, **B**, **C**) and the leaf lamina (**D**, **E**, **F**, **G**, **H**). **A** - diagram of the petiole; **B** - detail of the stomate; **C** - detail of the vascular bundle; **D** - diagram of the lamina; **E** - the lower epidermis; **F** - the upper epidermis; **G** - detail of the mesophyll; **H** - detail of the midvein.

Basella rubra L. – The structure of the petiole (**I**, **K**, **L**) and the leaf lamina (**M**). **I** - diagram of the petiole; **K** - detail of the collenchyma; **L** - detail of the minor vein; **M** - detail of the mesophyll.

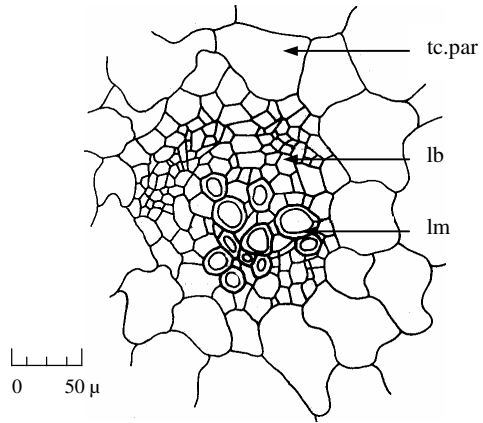
Abbreviations

cam.subst - substomatal chamber; **cel.ep** - epidermal cells; **cel.st** - stomatal cells; **col** - collenchyma; **ep** - epidermis; **ep.i** - lower epidermis; **ep.s** - upper epidermis; **fs.cond** - vascular bundle; **lb** - phloem; **lm** - xylem; **mez** - mesophyll; **par.fdm** - fundamental parenchyma; **tc.par** - parenchymatous sheat; **Ț.lc** - spongy parenchyma; **Ț.psd** - palisade parenchyma.

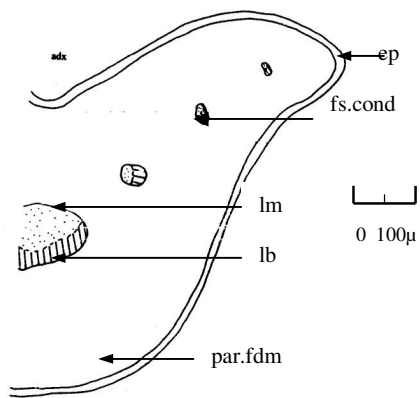




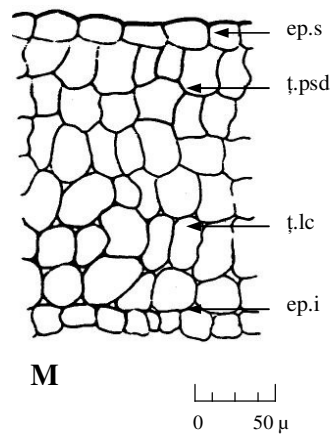
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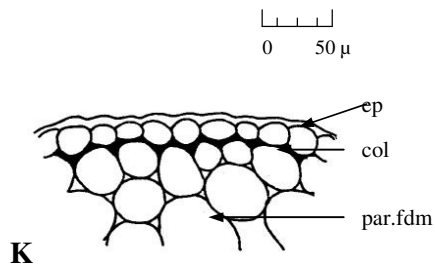
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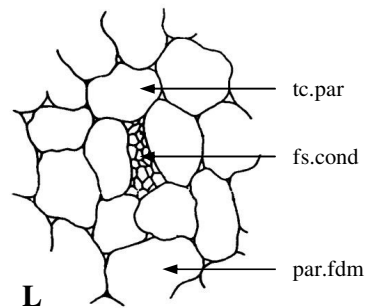
I



M



K



L

„A. FĂTU” BOTANICAL GARDEN IASSY – THE GREENHOUSE –

GEORGETA TEODORESCU*

Summary: In Iassy, „A. Fătu” Botanical garden’s Greenhouse complex (20 buildings with a total area of 3800 sq.m) hosts a remarkable fund of exotic plants (2700 taxa), native especially in subtropical, tropical and ecuatorial areas, on every continent. This paper presents some of the plant collections grown in this space. It comes out that, by number, diversity and value (scientific/decorative) of the taxa, many collections – azaleas and camelias, carnivorous plant, palm trees, bromelias, orchids, cicads, crotons, ficuses – have a unicum value in the country.

Key words: exotic plants, greenhouse, collections

It can be said that since 1970 the notion of „nature’s preservation” had become more and more pressing. Since then, more actions were undertaken in order to know and preserve „ex situ” the spontaneous flora; concomitantly logistic were structured, specific for the administration of these plants.

Thus, among the priority objectives of the world’s botanical gardens are: „ex situ” conservation activities, concerning species that have become rare; scientific activities (observations of spontaneous vegetal species and correlating this knowledge in renaturalization activities); educational activities (in making known the biodiversity and the need to protect it; to mould the respect towards nature; to efficiently intervene about all public categories).

Constituted in a scientific network, the AGBR (The Association of the Botanical Gardens in Romania) is committed in aligning the country’s botanical gardens to the european standards regarding the mission, structure and management of these institutions. Included in this association, the Botanical Garden of Iassy constitutes a valuable „nursery” of specialists and ensures their involvement in enforcing the strategies of biodiversity’s conservation.

„A. Fătu” Botanical Garden from Iassy, has an important role in enforcing the world and european strategies concerning biodiversity conservation.

The Botanical Garden’s involvement in this action is done „ex situ” – a traditional activity, by gathering collections of rare, endemic or endangered species, creating a seed bank etc. – and „in situ” by participating to regional and national projects of habitat protection. At the same time the Botanical garden is developing as a environment educational center in order to be capable to inform about the vegetable legacy and the possibilities to protect it. Thus, the need to orientate the scientific research, the information or education towards biodiversity conservation proves to be an priority objective.

For a botanical garden is a duty towards the public to increase it’s knowledge about the living world, to try and answer rigorously the questions about plant diversity, ecology, lasting administration of natural resources and other topical interests.

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As a representative unit on a national scale, „A. Fătu” Botanical Garden from Iassy, has – since it’s foundation – as a priority objective „ex situ” conservation activities concerning species that have become rare, endangered or are endemic to Romania and other geographical locations. These could serve in future repopulation of new biotopes, that would have to be created; the obtained experience, concerning the behaviour „in captivity” of these species, would be an important trump in these attempts. In this activity, the Botanical gardens have, with no doubt, the most efficient means; they also have the necessary scientific knowledge and experience to cultivate a wide range of exotic and native taxa.

The Greenhouse Department constitutes a valuable and permanent exhibit for different categories of visitors because of the abundance of the exposed vegetal material, the types of informing and presentation. Besides the magnificent decor offered, the Greenhouses represent true schools of tropical botanics by the diversity of the cultivated species; also, here can be found many spontaneous species – obtained by international seed exchange. All these exotic plants are classified, described and participate at the place’s esthetics depending on the represented climate.

Principal objective, of scientific, didactic and recreational interest (of our institution), the Greenhouses Department (20 greenhouses blocks – 3800 m²) lodges a remarkable stock of exotic plants (300 taxa) native especially in subtropical, tropical and equatorial areas, on every continent; the plant distribution respects well established criteria (phytogeographical, taxonomical, utilitarian) offering a wide range of informations.

Without exhausting a theme that is so vast, we present the general problems of the Greenhouses Department, making an inventory of the exotic plants collection, cultivated in this space.

Carnivorous plants (insectivorous):

These plants have captured the attention of many biologists since the late XVIII – th century (Roth, 1782), the literature about their type of feeding, gradually growing richer. In 1875, Ch. Darwin describes a series of carnivorous plants highlighting the leaf’s structure, the tentacle and foliar lobe’s movement, the structure of the secretory glands, making a series of experiments concerning the carnivorous plant’s feeding process. They represent an interesting biological group, having some unsuspected adaptive metamorphosis, regarding exclusively the leaf, determined by their mixed nourishment. The number of known carnivorous plants species is estimated around 535, most of them belonging to the dycotyledonous. These are autotrophic plants, living – generally – on mediums that are poor in nutritive substances therefore they have to complete their nitrogenous nourishment of mineral origin, with the organic one resulted by decomposing the substances found in the structure of the animal organisms, especially insects. They have distinct biological adaptation and special features, resulted mostly after the metamorphosis of the leaves in order to attract, capture and digest small animals.

The carnivorous plants from the Botanical garden’s collection (12 taxa) exhibit adequate modalities to the mentioned purpose.

Species from the *Drosera* genera (*D. communis*, *D. aliciae*, *D. capensis*, *D. spathulata*) retain the prey with glandular hairs (glandular tentacles), that are mobile and sticky.

Pinguicula (*P. nemorensis*, *P. esseriana*) and *Dionaea muscipula* (fly trap, Venus trap; scattered in peaty swamps in South Carolina) have traps resulted from leaf modification.

Species from the *Saracenia* genera (*S. flava*, *S. purpurea*;; from the North America’s peat bogs), *Cephaelotus follicularis* (australian species), the tropical epiphyte

Nepenthes (*N. x mixta*) have leaves transformed in urns (cornets, „pails”) in which insects enter and are digested.

Also, *Utricularia vulgaris* (bladder wort), indigenous aquatic plant, has small traps.

Through the abundance and diversity of the taxa included, this collection is representative for our greenhouses; it constituted the subject of scientific papers, licence thesis, mass-media presentations, thematic exhibitions.

Azaleas and Camellias

Among numerous exotic plants collections, the azaleas and camellias collection is especially appreciated. Sheltered in the fifth greenhouse, it constituted itself – along the years – a real „reserve” of unique plants (35 azaleas cultivars and 15 camellias cultivars). These are valuable decorative plants, especially at flowering time (through the flower number and morphological and colour variety) and form a representative collection, the largest of this type in the country. For more than 20 years, at flowering time (January – March) an exhibition is organized. The azalea's shrubs (presented in pots or tubs) are medium sized (maximum height is 2 m) and have persistent leaves; the flowers generally have a large variety of forms: they are simple or involute, single or grouped, the corolla can have wavy or fringed margins and a rich and variable chromatic – bright red (*Ambrosiana*, *Adventsglocke*, *Europa*, *Flacăra*), brick-coloured (*Robert van Oost*), purplish-blue shades (*Enzette Kisse*, *Hexe*, *Kiss – Bier*, *Concinnum*), purplish-blue with wavy white margins (*De Waale's Favorite*), pink (*Vaervaeneana rosea*), pink streaked with white (*Eri*), pure white (*Pax*, *Petrick Alba*).

The 12 cultivars of *Camellia japonica* (shrubby or tree appearance, coriaceous, shiny, persistent leaves,) are noticed at flowering time because of the large flowers, simple or involute, heaving waxy petals, variable coloured (white, red, pink, streaked or pure).

The bromelias collection

The plants from the **Bromeliaceae** family that are sheltered in our greenhouses constitute an abundant collection (100 taxa). It includes both terrestrial species – pine-apple (*Ananas comosus*) cultivated in tropical areas, well-known for its fruit's taste, sweet and flavoured (the fruit is compound, globular, the inflorescence's axis participating at its formation) – and epiphytic species (most of them). These plants originate in the Amazonian basin. In these plants, special adaptations allow the fast absorption of the water from the atmosphere (rain, dew): scaly hairs, with complex morphology, located on the leaves or stem. Also called „urn plants”, the species of *Aechmea*, *Billbergia*, *Guzmania*, *Noregelia*, *Nidularium* and *Vriesea* genera are grassy plants, usually stemless; they have leathery, stiff leaves, often with prickly tips or margins, forming a rosette or some kind of cornet, in the middle of which the inflorescence grows. The Spanish moss (*Tillandsia usneoides* – rootless plant, with long thread-like stems) is suspended by its base and pour down in an impressive, gray cascade (approx. 1 m in length); other species (*Tillandsia cyanea*) are noticed through their flattened inflorescences.

Spectacular plants, many bromelias are cultivated for their unique flowers/inflorescences, other for their persistent leaves, intensely coloured.

Orchids collection

The orchids have now access almost everywhere in the world, from Greenland to Sahara, from the seashore to the mountain tip. They are adapted to the different mediums and climates. The **Orchidaceae** family is one of the richest in the plant's world; from the 30000 existing species, most of them originate in the warmer regions of the world – the tropical regions of Africa and Asia.

In our greenhouses are found more than 50 species and hybrids; among the terrestrial species we possess: *Calanthe vestita*, *Vanda sp.*, *Paphiopedilum sp.* and cultivars (*P. barbatum*, *P. insigne*) with large, solitary flowers, on the flower stem, *Cymbidium* cultivars (the boat orchid) are often used as cut flowers.

Most of the orchids are epiphytic (they develop on other plants, used as support, without being parasited; the mineral substances are taken from the so-called „suspended soil”, resulted from decomposition of leaves and organic matters that accumulated between roots or on thicker branches of the host-plant): *Lycaste aromatica* (from Mexico, Nicaragua; grows in tropical forests, 2000 m altitude), *Coelogyne cristata* (from Himalaya, 1600-2000 m altitude), *Laelia pumila*, *Stanhopea insignis*, *S. hernandezii*.

Orchid's aerial roots – having root cover – are special adaptations for fast absorption of water during rains; many orchids also deposit the water in foliar bulbs (the inferior internode of the tuberascended aerial stem): *Coelogyne cristata*, *Dendrochilum cobbiaeum* etc.

The most impressive part in an orchid is the flower, attractive especially by size, colour and scent. At flowering time, the orchids from our collection are an attraction point. Like the bromelias, the orchids are rare, exacting plants, that can be cultivated only in special conditions; they are impressive because of their decorative appearance, diversity and way of life.

Tropical plants collection

These plants are remarkable both by flowers and leaves.

The exotic **Araceae** collection (approx. 70 taxa): decorative by flowers (*Anthurium* – flamingo flower, and its 10 cultivars represent an attractive point; its inflorescence is very attractive by its form and bright color: pink – ‘Guatemala’, white – ‘Lena’, red – ‘Grig’; species and cultivars of *Spathiphyllum*, *Zantedeschia*), attractive by shape and leaves coloration (species from the following genera: *Anthurium*, *Amorphophallus*, *Dieffenbachia*, *Aglaonema*, *Caladium*, *Syngonium*) or by habitus (*Philodendron*, *Monstera* and *Xanthosoma* species).

The **Marantaceae** family representatives collection, includes taxa from *Calathea*, *Ctenanthe*, *Maranta*, *Stromanthe* and *Thalia* genera. They form an important group among the hot greenhouse plants. These are grassy plants, perennial, that stand out both by habitus and foliage decorativeness, attributes that ensure them certain privileges in cultivation activities.

From the **Calathea** genera – spread in the tropical America – we mention: *Calathea makoyana* the leaf's upper side is olive-green, marked with reddish/green oval spots, along the midrib; the underside has the same pattern but on red) decorative species by its color pattern and association. *C. bachemiana*, *C. lancifolia*, *C. lietzei* are species remarked both by leaf's background color (olive-green, silver-green or metallic-green) and shape, color and arrangement of the spots. *C. ornata* has a cultivar – ‘Roseo-lineata’ (with pink stripes).

From the **Marantha** genera, *M. leuconeura* (‘Karchoveana’ and ‘Fascinator’ cultivars) and *M. bicolor* species are remarked by their large leaves, colored in different shades and velvety appearance. These are exacting plants, demanding special conditions (high temperature, shady places and high air humidity) that recommend them for greenhouse cultivation. The Botanical garden collection, gathered along the years, includes 20 taxa, and constituted a subject for some known scientific papers; it is also habitual presence in flower exhibitions.

Crotons collection

Under this name – crotons (*Codiaeum variegatum* var. *pictum*) - are included a large number of cultivars, used as indoor plants; they originate in Asia and Malaysia.

Crotons are small shrubs (70 cm high), having persistent leaves, with different sizes and shapes. They are decorative both by their habitus and – especially – leaves polychromy (red, purple, pink, orange, yellow), with different combinations (stripes, spots, dots) varying with age. All the cultivars are heat loving (20⁰-22⁰ C) and exacting towards the air and soil humidity.

Among the 25 cultivars from our collections, we mention: *Gold finger*, *Phillippe*, *Geduldig*, *Mrs. Iceton*, *Excellent*, *Aureo-punctatum* (*Pictum*), *Goldstar*, *Petra*, *Gold Moon*, *Norma*, *Corckscrew* etc. It is the most abundant cultivar collection in the country, known and appreciated by specialists. It is also habitual in plant exhibitions.

The *Acalypha* (**Euphorbiaceae**) cultivars and species collection: *A. hispida* owns it's attractiveness to the distinct appearance and the inflorescence's purplish – red coloring.

The leaves of some cultivars (, *Godseffiana* ', , *Miltoniana* ' and , *Musaica* ') of *A. wilkesiana* species, have characteristic markings.

Fern collection

Includes both exotic and indigenous taxa (aprox. 55) belonging to the **Polypodiatae** and **Lycopodiatae** classes; these are grassy, perennial plants, decorative by leaves (= fronds); some have creeping (*Sellaginella* turfing species) or vertical stems (stiff stem, up to 50 cm high and a terminal leaves rosette – *Blechnum brasiliense*), underground rhizome (*Pteris*, *Davallia*, *Polypodium*) or aerial (tree-ferns – *Cyathea*).

The ferns from the Botanical garden collection have leaves with a large variety of shapes: from simple, with undivided margins (*Asplenium nidus*) to those that are very complexe, many times divided (*Nephrolepis exaltata*).

Pteris cretica (with it's numerous cultivars), *Blechnum occidentale*, *Adiantum capillus-veneris* – are valuable decorative plants, especially by their fronds (with variable shape and size).

Collection of plants from Musaceae family

The taxa from this family attract attention by special qualities: banana tree (species and cultivars of *Musa* genera) exhibit an elegant tuft of leaves at the end of their slender stem; paradise-bird flower (*Strelitzia reginae*) is unequaled in it's beauty and inflorescence persistance; species of *Musa*, *Strelitzia* and *Heliconia* stand out by habitus and unusual inflorescences.

Palm tree collection

Areaceae family is very numerous, wide spread but limited to tropical and subtropical areas. The palm trees collection (aprox. 55 taxa) includes known species – *Phoenix dactylifera*, *Chamaerops humilis*, *Hornea forsteriana*, *Sabal blakburnia*, *Trachycarpus fortunei*, *Washingtonia filifera* – but also many rarities (species from the genera: *Archontophoenix*, *Arecastrum*, *Brahea*, *Butia*, *Caryota*, *Chamaedorea*, *Chrysalidocarpus*, *Latania*, *Dictyosperma*, *Syagrus*). Highly decorative, the palm trees are imposing among the exotic plants because of their elegant leaves and particular habitus.

Collection of plants decorative by leaves's colouring and shape (includes species and cultivars from *Begonia*, *Dracaena*, *Cordyline*, *Pilea* and *Peperomia* genera); these have been presented in scientific paper, flower exhibitions, mass-media.

Collection of species and cultivars of Ficus genera

Abundantly represented in the Greenhouse Complex (24 species, 13 cultivars), the ficuses collection (**Moraceae** family) has an important place in the scientific research of

our collective. Native to the tropical and subtropical region, the *Ficus* genera has a significant representative in plant's world. All the species have milky sap (latex) and are large trees or shrubs, from which some are climbing. The leaves have variable size, are leathery (coriaceous), undivided or lobed, decorative. The flowers are inclosed in the receptacle; the fruits (sicones) are characteristic, sometime edible (*Ficus carica*). The aerial adventitious roots, produced along the stems of many species, are also visually interesting.

Succulents collection

Is one of the most abundant collections (grouped in 2 greenhouse compartments); it includes species from families like **Cactaceae, Aizoaceae, Crassulaceae, Euphorbiaceae, Agavaceae, Asteraceae, Asclepiadaceae** etc.

The cactuses are the best known group from the succulent plant category. They are native to America, from where they were spreaded in Europa and Africa. Mexico is considered to be the richest area in cactuses. These are plants well adapted to the conditions of the dry desert, having some vegetative organs modifications. Characteristic for them is the transformation of their leaves in thorns/spines; the green stem takes over the chlorophyllian assimilation function; a reduced transpiration allows them to resist extended periods of drought. They are cultivated as ornamental because of their variety of shapes and the beauty and tenderness. Some species (from genera like *Lobivia, Astrophytum, Rebutia, Gymnocalicium, Echinocereus, Echinopsis, Mammillaria*) stand out by their shape geometry, the disposition and insertion of spines particularities, the coloring and tenderness of their flowers.

This collection includes (also) species and cultivars from genera like: *Agave, Crassula, Ceropegia, Euphorbia, Alöe, Kalanchoe, Gasteria, Hawortia, Lithops, Sansevieria, Senecio, Stapelia* (aprox. 1200 taxa) etc.

Useful plants collection: includes tropical and subtropical plants (aprox. 120 taxa) having different uses: food, medicine, aromatic and other uses (resiniferous, colouring, textile, precious wood etc.).

Gymnospermous collection: includes representatives from families like: *Cycadaceae, Pinaceae, Cupressaceae* and *Taxodiaceae*. Primitive forms of present phanerogams (important for knowing the evolution of seed-plants), the representatives of *Cycas, Ceratozamia, Zamia, Encephalartos, Stangeria* genera, constitutes an exceptional collection (by habitus, age etc.). Having a disjunctive spreading in the southern hemisphere, the families *Araucariaceae* and *Podocarpaceae* include valuable representatives (the *Araucaria* and *Podocarpus* genera).

In our collection many of the cultivated gymnospermous stand out by their habitus and foliage variety; they have also constituted the subject of some scientific papers, degree papers, mass-media presentations and exhibitions.

Citrics collection

The cultivated species belong to three genera: *Fortunella, Poncirus* and *Citrus*. The *Citrus* genera is the best represented; in our collection can be found many cultivars of *Citrus limon* (lemon tree), *C. sinensis* (orange tree), *C. reticulata* (mandarin tree), *C. paradisi* (grape tree), *C. maxima* (pumelo tree) etc. These plants are native to the tropical and subtropical areas of Asia, their cultivation being an old tradition. The taxa cultivated in the collection have multiple qualities.

The collection of plants with peculiar esthetic qualities

This collection includes: exotic plants with controlled growth (lianas, climbing and vobule plants controled in order to cover variable shapes – cercles, columns, twisted roots etc.); grafted cactuses, that stand out by shape and colour (of the graft and the stock);

coniferous and deciduous taxa can be trimmed and controlled to take different shapes (topiary); wooden exotic plants with knited or trimmed stems/branches.

Numerous other exotic plants collections, cultivated in the Iassy Botanical garden's Greenhouses, include valuable taxa, representative for specific phytogeographic areas, inclusively plants with esthetic/decorative qualities: mediteranean plants; plants from Australia and New Zealand; plants from the northern and southern regions of Asia.

Along the years we considered necessary a scientific aproach of the incomplete cleared up aspects regarding the taxonomy, growing conditions (including finding out optimal culture parameters, like the category and quality of the soil), to experiment new multiplication proceedings, observing biological/esthetic/utilitary qualities of some taxa having scientific/ornamental importance (including rare/endangered taxa). The research that we have made materialized in a large number of scientific papers, licence paper, master's degree.

Many of the exotic plants collections, existing in the greenhouses of Iassy's Botanical Garden – by the number and value of the cultivated taxa – have a value of unica in Romania: azaleas and camellias, carnivorous plants, palm trees, lianas and epiphites, succulents etc. Our involvement in making and maintaining these collections has contributed to a national acknowledgement of this activity.

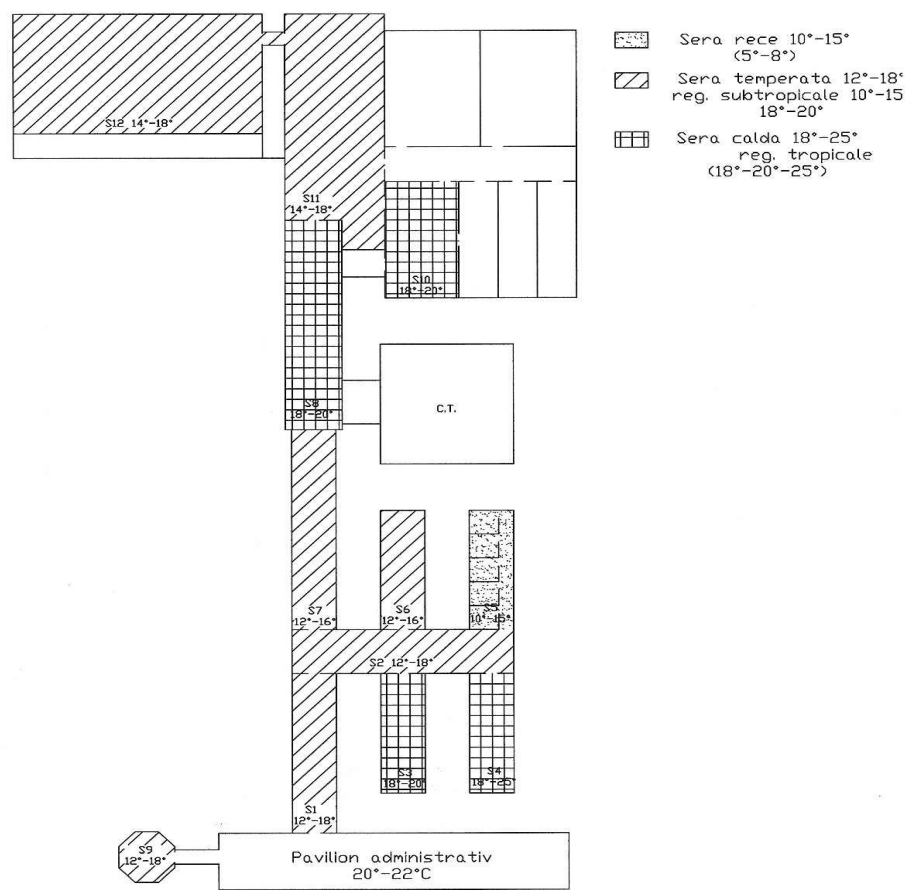
The Botanical Garden's Greenhouses, by the multitude of the exhibited collections, have a remarcable role in making the public senzitive in understanding the diversity of the plant's world and the need to protect it, in educating the respect for the nature and the important role of the plants in our life. The Botanical gardens have the role to put the plant in it's place, in the living systems and to make understood the importance of a good environment management.

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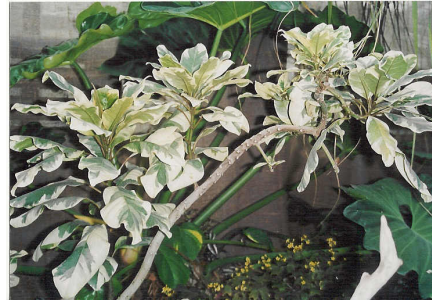
SCHIȚA COMPLEXULUI DE SERE



SchiȚa Complexului de Sere



Lithops karasmontana var. *karasmontana*



Heimerliodendron brunonianum 'Variegata'



Magnolia grandiflora



Fuchsia x hybrida 'Nymphe'



Drosera spathulata Labill



Maxillaria tenuifolia

SPECIES WITH IMMUNOSTIMULANT ACTIVITY CULTIVATED IN THE “USEFUL PLANTS” DEPARTMENT OF THE BOTANICAL GARDENS FROM IAȘI

VIOLETA TĂNĂSESCU*, OANA GACEA**

Abstract: The present paper presents a new group of plants, from the “Useful Plants” sub-section, less known for its immunostimulant proprieties, but which are used in the composition of some modern drugs (neutraceuticals).

Out of the total number of twenty-three species, belonging to fourteen families, two are trees, two are shrubs, seven are annual plants and twelve are perennial.

The medicinal and toxic plants are listed in the alphabetical order of their Latin names, along with the family, vegetal material, the harvesting time, the geographic distribution and the therapeutic activity.

The immunostimulant plants represent a valuable material for scientific researcher or the studying process because of its known origins.

Key words: medicinal plants, immunostimulants, the “Useful plants” sub-section, the Botanical Gardens from Iași.

Introduction

Today it is known that many urinary tract infections, pulmonary diseases, heart deficiencies, endocrine and digestive diseases are connected with immunodeficiency which lead to a weak resistance of the body to infections. [9]

Due to this aspect, the research activity was centered on the isolation and the identification of different substances, which would have an influence upon the immune response by stimulating the immune reaction – immunostimulant agents.

Lately the interest of researchers has grown toward the plant-kingdom as a possible source for new immunostimulants. This is why starting with 1980 the majority of substances that have been tested as immunostimulants are extracted from plants. [2,4,9]

Starting with the role of “Useful Plants” sub-section into proving the importance of the plants and its utility in our daily life, since 2003 we thought necessary to improve this department with new plants which through their pharmacological activity would be appropriate for modern research.

The reason of the inauguration of the immunostimulants group is double: on one hand the visitors interest for medicinal plants that are used due to its components in modern medicine; on the other hand it was our wish to group the medicinal species in the same group with the toxic ones, according to the therapeutic activity.

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We wanted to show that the term “medicinal plant” is influenced by history (it depends on the therapy evolvement), some of the herbs used in the past are no longer used today and vice-versa, and the term of “toxic/toxicity” is dependant on the administration dosage.

Results and discussion

The “Medicinal Plants” sub-section is placed within the “Useful Plants” department (1.5 ha), on the central platform of the Botanical gardens. Today includes twenty-three groups of plants which are divided according to its therapeutical effect on the human body unlike the classical Botanical Gardens where the plants are grouped according to the used part of the plant.

By adding a new group of plants - the immunostimulants (less known under this aspect – Plate I), we intend to bring information for those that are interested: students, Ph.D. students, proffessors, doctors, pharmacists, professionals in this field or even to the public.

The immunostimulant plants group includes twenty-three species, belonging to fourteen families: *Aristolochiaceae* – one taxon, *Asteraceae* – seven taxons, *Araliaceae* – one taxon, *Lorantaceae* – one taxon, *Malvaceae* – two taxons, *Droseraceae* – one taxon, *Plantaginaceae* – one taxon, *Cupressaceae* – one taxon, *Fabaceae* – three taxons, *Poaceae* – one taxon, *Phytolaccaceae* – one taxon, *Urticaceae* – one taxon, *Tiliaceae* – one taxon, *Myrtaceae* – one taxon.

Out of all species two are trees, two are shrubs, seven are annual plants and twelve are perennial. All species are grown outside, except three species grown in cold green-house conditions: *Drosera rotundifolia* L., *Myrtus communis* L., *Panax ginseng* C.A. Meyer.

In the Table I are listed, in the alphabetical order of their Latin names, the medicinal and toxic plants which through the active compounds contributes to the growth of the defence capacity of the body. The information is completed by dates concerning the family, vegetal material, the harvesting time, the geographic distribution and the therapeutic activity.

The propagation of all taxons has been done through seeds that were obtained from internal and international (*Drosera rotundifolia*, *Echinacea purpurea*, *Myrtus communis*, *Panax ginseng*) exchange. In March and April all the seeds have been sown directly on the ground layer, except the followings: *Drosera rotundifolia*, *Echinacea purpurea*, *Myrtus communis*, *Panax ginseng*, *Thuja occidentalis*, that were first sown in flower pots and only after that its were taken outside, at the ground layer (*Thuja occidentalis*), or transferred to cold green-house conditions (the other three species already mentioned above).

Beside the species used a long time for its different medicinal proprieties (Table I), we introduced new plants in the group (*Aristolochia clematidis*, *Arnica montana*, *Echinacea purpurea*, *Gossypium hirsutum*, *Carthamus tinctorius*, *Eupatorium cannabinum*, *Phytolacca americana*, *Myrtus communis*, *Drosera rotundifolia*) of which the immunostimulant proprieties have been proven lately. This is exactly why some of its have not ben listed as medicinal in the books of systematic – botany.

We accomplished also a classification of the species (Table I) in medicinal (Med.) and toxic (Tox.).

Even though the allocated area for each group is very small, the plants (the outdoors ones) are distributed on small dimensions layers, and they are permanently kept under observation in order to establish the necessary growth conditions depending on the annual variation of environment factors.

The labels for the toxic taxons are written in red and the labels for the typical medicinal plants in black.

As we already stated, the collected information from this new group of the “Medicinal Plants” sub-section are used by specialists as well as the public. The present taxons represent a valuable material for research (Ph.D. students from faculties like Biology, Pharmacy, Veterinary Medicine) because its known origins.

This new group tries to respond, at least in part, to the request of the public regarding the new medicines/drugs found on the market and which contain plant extracts; in the nature this plants are wild, subspontaneous or cultivated (Table I).

Conclusions

1. The “Medicinal Plants” sub-section includes twenty-four groups of plants, divided by the therapeutical activity; the last group contains species with immunostimulant proprieties.
2. The group of immunostimulant plants is formed of twenty-three taxons which belong to fourteen families, out of which two are trees, two are shrubs, seven are annual plants and twelve are perennial.
3. In the Table I are listed the toxic and medicinal plants in alphabetical order, the family, the vegetable material/the harvested part of the plant, the therapeutical activity and the growth area.
4. The plants have been obtained from seeds that were received from internal and international exchange; some are grown indoors and some outdoors. In the nature this plants are wild, subspontaneous or cultivated.
5. Our aim is the cognition, at least in part, of those plants with immunostimulant proprieties which lie at the basis of the modern phytopreparates.

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**SPECIES WITH IMMUNOSTIMULANT ACTIVITY CULTIVATED IN
THE “USEFUL PLANTS” DEPARTAMENT OF THE BOTANICAL GARDENS FROM IAȘI**

Nr. crt.	Taxons	Family	Vegetal material/harvest time	The Activity	Geographic distribution
1.	Althaea officinalis L. Perennial Med. wild / cultivated	Malvaceae	Althaeae radix (III-IV) (IX-XI)	Stimulent of phagocytosis, stimulent of immunoglobulins synthesis	Europe, North Africa; adv. în Amer. de N.
2.	Aristolochia clematitis L. Perennial Tox. wild	Aristolochiaceae	Aristolochiae rhizoma (IV) herba (V-VI) semen	Stimulent of phagocytosis	Medit.
3.	Arnica montana L. Perennial Tox. wild / cultivated	Asteraceae	Arnicae flos (VI-VIII)	Stimulent of phagocytosis	Eur.
4.	Calendula officinalis L. Annual Med. cultivated/ subspontaneous	Asteraceae	Calendulae flos (VI-VIII)	Stimulent of phagocytosis	Medit.
5.	Carthamus tinctorius L. annual Med. cultivated/ subspontaneous	Asteraceae	Carthami flos (VII-IX) semen	Stimulent of phagocytosis	Asia - West
6.	Drosera rotundifolia L. perennial Med. wild	Droseraceae	Droserae herba (V-VIII)	Stimulent of phagocytosis, stimulent of the proliferation of the T cells, stimulent of nonspecific immune mechanism	Euras., Am. de N.
7.	Echinacea purpurea (L.) Mnch. perennial Med. cultivated	Asteraceae	Echinaceae radix (III), (IX-X) herba (VII-VIII)	Stimulent of phagocytosis	Am. de N.
8.	Eupatorium cannabinum L. perennial Tox. wild	Asteraceae	Eupatorii herba (VII-IX)	Immunostimulant (Pharmacetutical industry)	Euras., Afr. de N.

9.	Glicine max (L.) Merr. (G. hispida (Moench) Maxim, Soja hispida Moench) annual Med. cultivated	Fabaceae	semen (IX-X)	Immunostimulant through lectins	As. de E.
10.	Glycyrrhiza glabra L. perennial Med. wild, subspontaneous and cultivated	Fabaceae	Glycyrrhizae radix sau Liquiritae radix (IX-XI) (II-VI)	Immunostimulant through lectins	Euras.-medit.
11.	Gossypium hirsutum L. annual Tox. cultivated	Malvaceae	Gossypii radix cortex (IX-XI)	Stimulent of interferon secretion	Peru
12.	Matricaria recutita L. (M. chamomilla) annual Med. wild/ cultivated	Asteraceae	Chamomillae flos (V-VIII)	Stimulent of phagocytosis	Euras.
13.	Myrtus communis L. shrub Med. cultivated	Myrtaceae	Myrti semen Folium (VI-IX)	Seed extract is cytostatic	Medit.
14.	Panax ginseng C. A. Meyer shrub Med. cultivated	Araliaceae	Ginseng radix (following seven years in cultivation)	Stimulent of protein synthesis, at the bone marrow level	Far East
15.	Phaseolus vulgaris L. annual Med. cultivated	Fabaceae	Phaseoli fructus sine seminibus (IX-X)	Immunostimulant through lectins	Venez., NV Argentinei
16.	Phytolacca americana L. perennial Tox. cultivated/ subspontaneous	Phytolaccaceae	Phytolacca radix herba semen (IX-XI)	Immunostimulant through lectins	Am. de N

17.	Plantago major L. Pătlagină mare Med. perennial wild	Plantaginaceae	Plantaginis majoris semen folium (V-X)	Stimulent of serumal complement, activarea macrofagelor	Euras.
18.	Solidago virgaurea L. Med. perennial wild	Asteraceae	Solidaginis herba et summitates (VII-IX)	Imuno-induced antitumoral effect	Euras., Am. de N
19.	Thuja occidentalis L. Tox. tree cultivated	Cupressaceae	Thujae summitates (all year long)	Stimulent of phagocytosis and of the proliferation of the T cells	Am. de N
20.	Tilia cordata Mill. Med. tree wild	Tiliaceae	Tiliae flores (VI-VII)	Immunostimulant through lectins	Eur.
21.	Triticum aestivum L. (T. sativum Lam., T. vulgare Vill.) Med. annual cultivated	Poaceae	Triticii semen (VII-VIII)	Immunostimulant through lectins	Large area
22.	Urtica dioica L. Med. perennial wild	Urticaceae	Urticae majoris herba radix (V-IX)	Immunostimulant through lectins	Cosm.
23.	Viscum album L. Tox. shrub wild	Loranthaceae	Visci albi stipes (I-III) (X-XII)	Unknown immunostimulant mecanism	Eur.

- Med. = medicinal; - Tox.= toxic.



Imunostimulant medicinal plants



Calendula officinalis L.



Plantago major L.



Phytolacca americana L.



Eupatorium cannabinum L.



Aristolochia clematitis L.

“D. BRANDZA” BOTANICAL GARDEN NURSERY FROM BUCHAREST PRESENT AND FUTURE REFERENCES

MITACHE M.*

Abstract: As the continuous demography registered during the last decades of the last century increases, the population on the Earth reached alarming levels due to the increasing needs of the population in continuous increase on the one hand and on the other hand, due to the human intervention in larger areas of the Earth. This continuously increased ominous anthropic influence, that attracts also the limitation of the planetary resources of all kinds, conducted during the last years to the unanimous recognition of the fact that the plants have the status of vital element within the world natural heritage, being a main element for maintaining the life on Earth and representing at the same time an essential resource for the future, for the planet existence (Convention on Biological Variety, 1992; The Declaration from Grand Canaria on World Program for Plants Preservation, 2000).

Key words: nursery, trees, wooden plants, lianas, bushes.

In the context of the above-mentioned ideas, the role that the botanical gardens play at present increased significantly, and the range of the developed activities diversified. Thus, a current botanical garden, regardless its type, has to play a key role in the activities of plant species identification and monitoring (inventory, mapping, monographs, database, rapid evaluation of phyto-variety), *in situ* preservation (protected areas, the management of plant populations, the biotope rehabilitation), *ex situ* preservation of their diversity (seeds culture, collection of rare and threaten with extinction plants, multiplied “in vitro” within the reproduction programs), research and environment education (systematic, anatomy, techniques of *in situ* and *ex situ* preservation, the management of the vegetal natural resources, environment legislation), information sharing, technical and scientific cooperation, etc.

Traditionally, the botanical gardens involved mostly in the *ex situ* preservation activities, based especially on the creation and maintenance of the collections of living plants and of the herbariums. The *ex situ* preservation involves a larger range of directions:

- the achievement of some special collections of living plants including rare or threaten plants, collections useful in researches of genetic variability, of reproduction and ecological biology;
- the establishment of some collection of native plants of economic importance (pharmaceutical, food, textile);
- using the species from the collections of living plants in the repopulation programs;
- the establishment of seeds cultures and tissues;
- the development of techniques and laboratories of cells and tissues cultures;
- the identification and promotion of the educational values of these aspects;
- joining the *in situ* and *ex situ* preservation activities.

The role of “framework” within the structure of the most botanical gardens is ensured by the wooden plants (trees, bushes, lianas).

* Botanical Garden “D. Brandza”, University of Bucharest

The trees occupy, in general, the largest land surface from the total surface of a botanical garden. The same situation is in “D. Brandza” Botanical Garden from Bucharest.

“D. Brandza” Botanical Garden Nursery was designed initially only as a reserve of wooden species and functioned for many years only for ensuring the young vegetal material, necessary for replacing the old trees and the trees existent in the garden and for creating again various sectors in the open space of the garden.

Due to the major changes in the global policy during the last years regarding the biovariety and the preservation of the biovariety, this sector of the Botanical Garden has to integrate into the present new tendencies.

In this regard, the role of the Nursery increased in the general context of the Botanical Garden, and the activities developed in this sector enhanced significantly.

First of all, having in view the need to develop the micro-production as partial self-financing base of the Botanical Garden, at present the nursery is under rearrangement. Thus, closed, protected spaces for the reproduction of the valuable species of wooden plants are under arrangement and large spaces were allotted and arranged for the reproduction of some species of trees and bushes (*Paulownia tomentosa* (Thunb.) Steud., *Albizia julibrissin* Durazz., *Tilia platyphyllos* Scop., *Gleditschia triacanthos* L., *Hibiscus syriacus* L., *Callicarpa bodinieri* Levl. var. *giraldii* Rehd., *Buxus sempervirens* L., *Euonymus europaea* L., *Spartium juncem* L. etc.) destined to the utilization through commercialization.

Besides this new role, which refers to the economic and financial aspect, “D. Brandza” Botanical Garden Nursery has another role, very important too, and this role is to involve directly in the repopulation programs, by the means of the collections of young plants, which are existent here.

The nursery will involve actively in the research programs by participating in the near future in developing a project of “in vitro” reproduction of some valuable wooden species. In this regard, a renovation and a corresponding reuse of the cold greenhouse related to the sector is foreseen.

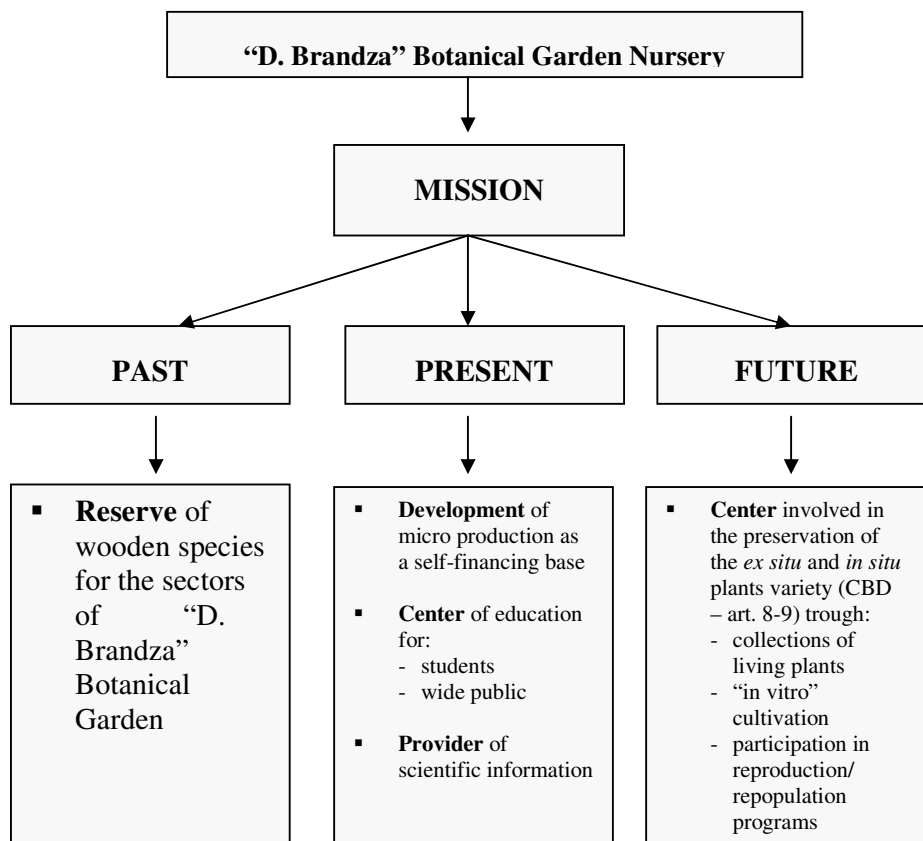
Another new mission of “D. Brandza” Botanical Garden is that of active involvement in education and information programs.

The nursery sector, with all its specialists is involved in the students training, providing them, during the summer practice period, the opportunity to gain new and correct scientific and practical knowledge on the way of reproduction, development and cultivation of various species of existent wooden plants.

The promotion of the botanical gardens as training centres for the specialists in horticulture (dendrology) is based, in general, on at least two significant arguments: the need to apply correctly the garden practices in maintaining the collection and the need to know and promote the horticulture (dendrology) as science and art.

At the same time, the dissemination of the information referring to the decorative plants (in our case wooden species) and the standards of their cultivation, support on the one hand their botanical value and on the other hand represent an additional stage in the environment education.

In order to support the above mentioned activities, an informative material (a leaflet) is under printing. The leaflet contains the description and certain specific features for the development and cultivation of some of the most important wooden species cultivated in “D. Brandza” Botanical Garden. In the future we want to continue this series of informative materials addressed to the wide public.



The major objective of “D. Brandza” Botanical Garden Nursery, as a component of this institution, is to respect and to integrate harmoniously into the European concept of botanical garden and into the new current background regarding the mission of the botanical gardens for the human society.

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“D. Brandza” Botanical Garden Nursery
List of trees, brushes and lianas

1. *Acer negundo* L.
2. *Aesculus carnea* Hayne
3. *Aesculus hippocastanum* L.
4. *Aesculus octandra* Marsh.
5. *Ailanthus altissima* (Mill.) Swingl.
6. *Albizia julibrissin* Durazz.
7. *Amelanchier ovalis* Med.
8. *Amorpha fruticosa* L.
9. *Ampelopsis aconitifolia* Bge.
10. *Berberis julianae* C.K. Schneid.
11. *Berberis vulgaris* L.
12. *Betula verrucosa* Ehrh.
13. *Buddleia japonica* Hemsl.
14. *Buxus sempervirens* L.
15. *Callicarpa bodinieri* Levl. var. *giraldii* Rehd.
16. *Calycanthus occidentalis* Hook. & Arn.
17. *Campsis radicans* (L.) Seem.
18. *Catalpa bignonioides* Walt.
19. *Cercis siliquastrum* L.
20. *Clematis jackmani* Th. Moore var. “Bagatelle”
21. *Clematis tangutica* (Maxim) Korsh.
22. *Clerodendron bungei* Steud.
23. *Cotoneaster horizontalis* Dene.
24. *Deutzia scabra* Thunb.
25. *Euonymus europaea* L.
26. *Euonymus fortunei* (Turcz.) Hand. – Mazz.
27. *Ficus carica* L.
28. *Forsythia intermedia* Zbl.
29. *Forsythia viridissima* Lindl.
30. *Fraxinus excelsior* L. var. “pendula”
31. *Ginkgo biloba* L.
32. *Gleditschia triacanthos* L.
33. *Gymnocladus dioica* (L.) K. Koch.
34. *Hedera helix* L.
35. *Hibiscus syriacus* L.
36. *Hibiscus moscheutos* L.
37. *Juniperus horizontalis* Mnch.
38. *Kerria japonica* (L.) DC.
39. *Koelreuteria paniculata* Laxm.
40. *Lagerstroemia indica* L.
41. *Lavandula officinalis* Chaix.
42. *Ligustrum vulgare* L.
43. *Liriodendron tulipifera* L.
44. *Lonicera brownii* (Rgl.) Corr.
45. *Lonicera caprifolium* L.
46. *Lonicera pileata* Oliv.
47. *Lonicera tangutica* Maxim.
48. *Magnolia kobus* DC.
49. *Magnolia soulangeana* Lindl.
50. *Mahonia aquifolium* (Pursh) Nutt.
51. *Morus alba* L. var. “pendula”
52. *Parthenocissus quinquefolia* (L.) Planch.
53. *Parthenocissus tricuspidata* (S. & Z.) Planch.
54. *Paulownia tomentosa* (Thunb.) Steud.
55. *Periploca graeca* L.
56. *Philadelphus coronarius* L.
57. *Platanus acerifolia* Willd.
58. *Polygonum baldschuanicum* Rgl.
59. *Populus alba* L.
60. *Prunus mahaleb* L.
61. *Prunus serrulata* Lindl.
62. *Prunus triloba* Lindl.
63. *Ptelea trifoliata* L.
64. *Pyracantha coccinea* Roem.
65. *Quercus borealis* Michx. f.
66. *Rhus typhina* L.
67. *Salvia officinalis* L.
68. *Sophora japonica* L.
69. *Spartium junceum* L.
70. *Spiraea bumalda* Burv.
71. *Spiraea salicifolia* L.
72. *Spiraea vanhouttei* (Briot) Zbl.
73. *Syringa vulgaris* L.
74. *Tamarix ramosissima* Ldb.
75. *Taxodium distichum* (L.) Rich
76. *Thuja orientalis* L.
77. *Tilia platyphyllos* Scop.
78. *Ulmus montana* Stokes. var. “pendula”
79. *Viburnum carlesii* Hemsl.
80. *Viburnum rhytidophyllum* Hemsl.
81. *Vinca major* L.
82. *Vinca minor* L.
83. *Wisteria sinensis* (Sims.) Sweet.
84. *Zizyphus jujuba* Mill.



Calycanthus occidentalis Hook. & Arn.



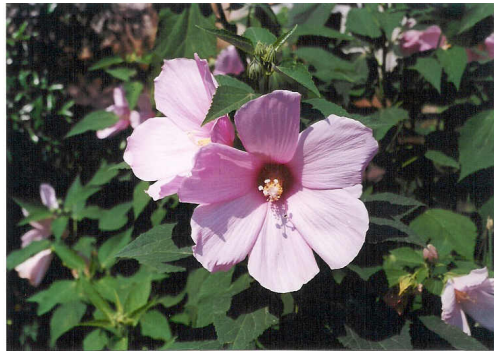
Campsis radicans (L.) Seem.



Clematis tangutica (Maxim) Korsh.



Hibiscus moscheutos L.



Hibiscus moscheutos L.



Hibiscus syriacus L.



Magnolia soulangeana Lindl.



Wisteria sinensis (Sims.) Sweet.



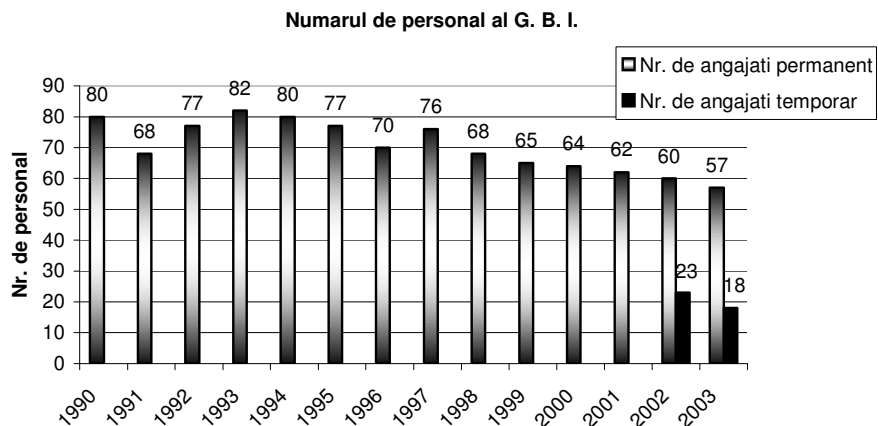
Prunus triloba Lindl.

GRĂDINA BOTANICĂ A UNIVERSITĂȚII „AL. I. CUZA” IAȘI

RAPORT DE ACTIVITATE ÎN PERIOADA 2000–2003

I. CADRUL GENERAL:

Suprafața actuală a Grădinii Botanice este de 99,8 hectare, fiind cea mai mare din România (prin comparație, Grădina Botanică din Cluj-Napoca are 14 hectare, iar cea din București 17,5 hectare). Este membru fondator al Asociației Grădinilor Botanice din România, afiliată la Asociația Internațională a Grădinilor Botanice.



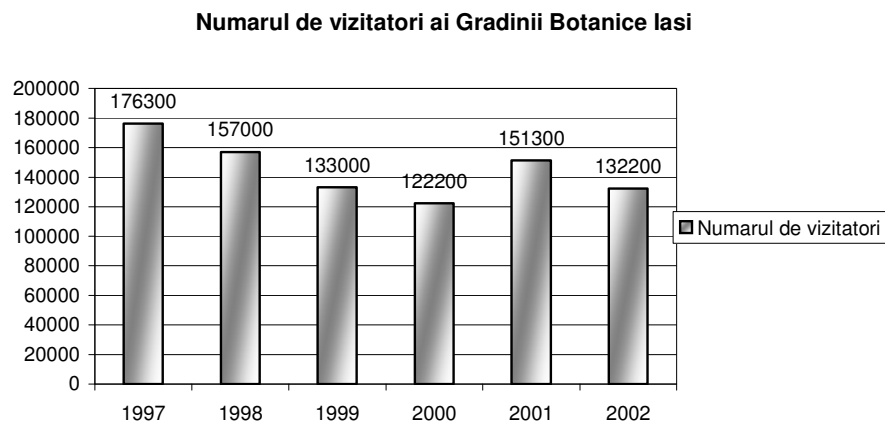
În comparație, Grădina Botanică din București are 72 de angajați, iar cea din Cluj-Napoca are 40 de angajați cu contract pe termen nelimitat de muncă și 15 angajați pe perioadă determinată).

Fondul de plante existent în colecțiile celor 12 sectoare de activitate ale Grădinii Botanice Iași se ridică la cca 8000 de taxoni (Cluj-Napoca: cca 10.000, București: cca 5000).

II. REALIZĂRI ALE GRĂDINII BOTANICE IAȘI ÎN PERIOADA 2000-2003:

Numărul de specii de plante introduse în colecțiile Grădinii Botanice Iași după anul 2000: în jur de 382.

Numărul de vizitatori ai Grădinii Botanice Iași (exprimat prin numărul de bilete vândute/an):



Evoluția cheltuielilor:

2000: 3.459.109.693 lei (din care: 465.124.692 lei = 13% din veniturile proprii ale Grădinii Botanice, 409.994.718 lei = 12% din veniturile proprii ale Universității și 2.583.990.283 lei = 75% din credite bugetare)

2001: 4.565.231.676,74 lei (din care: 1.297.879.721,74 lei din veniturile proprii ale Grădinii Botanice, 832.688.672 lei din veniturile proprii ale Universității și 2.434.663.283 lei din credite bugetare)

2002: 6.728.476.528 lei (din care: 272.656.923 din activități economice, 941.804.411 lei din veniturile proprii ale Grădinii Botanice, 1.167.223.223 lei din veniturile proprii ale Universității și 4.346.543.971 lei din credite bugetare)

Evoluția veniturilor (vânzări de broșuri, pliante, vederi, materiale dendro-floricole etc.):

1999: 441.655.681 lei (din care venituri din activități autofinanțate = 423.782.470 lei și 18.073.211 lei din sponsorizări)

2000: 676.713.801 lei (din care venituri din activități autofinanțate = 651.699.414, gratuități = 2.941.176 lei și 22.073.211 lei din sponsorizări)

2001: 958.187.254 lei (din care: 92,73% reprezintă venituri din vânzare de bilete, pliante și vederi, 7,09% vânzare produse și 0,18% din taxe, deșeuri și imputații)

2002: 1.720.973.001 lei (din care: 62,15% reprezintă venituri din activitatea economică, 36,98% credite bugetare și 0,88% venituri proprii)

III: PRESTĂRI DE SERVICII ALE PERSONALULUI GRĂDINII BOTANICE IAȘI CĂTRE UNIVERSITATEA „AL. I. CUZA” IAȘI:

- Deratizări și dezinsecții efectuate în spațiile universității (cămine studențești, cantină, facultăți);
- Furnizare de aranjamente florale la: rectoratul universității, decanate ale diverselor facultăți, cu ocazia manifestărilor științifice naționale sau internaționale desfășurate în cadrul universității;
- Depozitarea și manipularea materialelor casate de la universitate (în 2002 s-au adus și manipulat tone, iar în 2003 tone);
- Sprijinirea stațiunii de la Ezăreni cu personal de la grădina botanică la cosit și pescuit;
- S-au prestat diferite activități de plantări și întreținere spații verzi la Muzeul de Istorie Naturală, Stațiunea „Ion Borcea” de la Agigea și Observatorul Astronomic;
- S-au reparat unele mijloace de transport ale Universității în atelierele grădinii botanice;
- Personalul grădinii botanice participă anual la practica studenților facultății de biologie la Potoci și Agigea.

IV. FUNCȚIA INSTRUCTIV-EDUCATIVĂ A GRĂDINII BOTANICE:

- Aproape toate vizitele oficiale sosite în municipiul Iași la diferite întreprinderi și instituții au prins în program și vizitarea grădinii botanice ca emblemă culturală a orașului (în anul 2000 au vizitat grădina botanică 47 de delegații, în 2001 – 114, în 2002 – 129, în 2003 – 143);
- Primirea diferitelor delegații străine și din țară care vin la universitate și alte instituții de învățământ superior din Iași, precum și a vizitelor oficiale ale primăriei Municipiului Iași dar și alte delegații străine care au legături cu agenții economici din Iași;
- Asigură desfășurarea practicii studenților Universității noastre, în special de la facultățile de biologie și geografie, precum și de la alte instituții de învățământ superior din Iași (agronomie, farmacie, arhitectură etc);
- Se primesc vizitele delegațiilor studenților sosiți în Iași cu prilejul diferitelor manifestări naționale;
- În cadrul grădinii botanice se desfășoară o parte din activitățile practice și de educație ecologică elevii tuturor liceelor, școlilor generale din Iași și celelalte județe ale Moldovei.

V. FUNCȚIA DE POPULARIZARE ȘI EDUCAȚIE ECOLOGICĂ A GRĂDINII BOTANICE:

Grădina Botanică este o expoziție permanent deschisă publicului dar în mod special sunt organizate 3 expoziții de sezon:

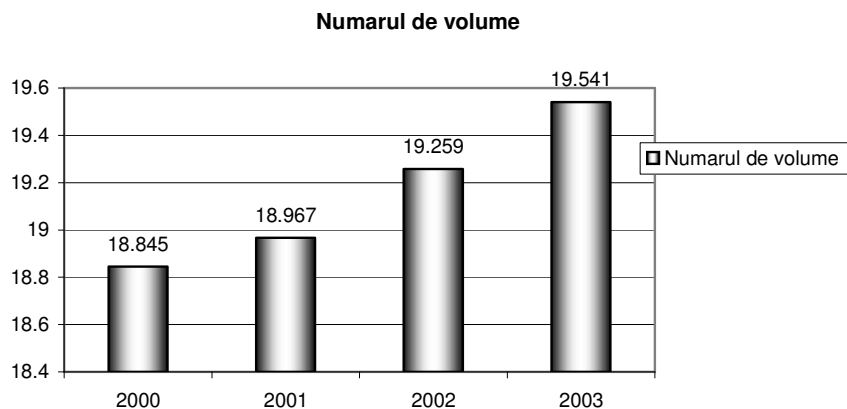
1. Expoziție de trandafiri în luna iunie a fiecărui an;
2. Expoziție de azalee și camelii în lunile ianuarie-martie a fiecărui an;
3. Expoziția „Flori de toamnă” în luna octombrie a fiecărui an, care a ajuns la a 27-a ediție în 2003 și a devenit deja o tradiție în spectrul cultural al orașului Iași, și nu numai;

4. Participări la diverse expoziții cu standuri în diferite orașe din Moldova (Piatra Neamț, Galați, Tg. Neamț, Suceava etc.)
5. S-a realizat transmiterea on-line, pentru prima dată în România, a expoziției „Flori de toamnă” 2002.
6. S-a realizat o pagină web de prezentare a Grădinii Botanice la adresa: <http://botanica.uaic.ro>, în colaborare cu elevii Liceului de Informatică Iași.
7. Este în curs de realizare un CD-ROM de prezentare a Grădinii Botanice în colaborare cu centrul de Consultanță pentru Întreprinderile Mici și Mijlocii Iași.

VI. FUNCȚIA ȘTIINȚIFICĂ ÎN CADRUL GRĂDINII BOTANICE:

- Participări la manifestări științifice interne (Iași, București, Arad, Craiova, Cluj-Napoca) și internaționale, cu finanțare integral externă (Chișinău, Görlitz, Budapesta, Viena, Porquerolles, Bruxelles, Stockholm, Bratislava etc.).
- Organizare și participare a cercetătorilor grădinii botanice la simpozioanele anuale de micologie și sesiunile anuale ale Catedrei de Biologie Vegetală a Facultății de Biologie.
- Colaborări la realizarea unor proiecte de cercetare științifică în cadrul Uniunii Europene:
 1. Inventarierea Pajiștilor Seminaturale din România
 2. Inventarierea Macrofitelor Acvatice din Dunăre
 3. Importanțe Aree de Conservare a Plantelor din România
 4. Studiul Biodiversității din Rezervația Biosferei Delta Dunării
- Colaborări nemijlocite în unele proiecte pan-Europene:
 1. Atlas Florae Europaeae
 2. Flora Europaea
- Colaborare la realizarea unor granturi de cercetare ale Grădinii Botanice și Catedrei de Biologie vegetală a Facultății de Biologie Iași.
- Publicații:
 1. Buletinul Grădinii Botanice Iași, cu apariție anuală (a ajuns la tomul nr. 11/2003).
Este trimis la schimb în țară și străinătate la 33 instituții de profil. În urma schimbului s-au obținut următoarele publicații: 547 cărți și 431 periodice (în perioada 2000-2003).
 2. Catalogul de semințe al Grădinii Botanice Iași: se editează anual în scopul realizării schimbului de material dendro-ornamental cu alte instituții similare din întreaga lume (cu alte cca. 500 grădini botanice, parcuri și arboretumuri)
 3. Cărți publicate de cercetătorii Grădinii Botanice: 8 (ex. „Flora Lemnoasă a României”, „Mușcatele”, „Crizantemele”, „Begoniile”, „Plante rare și ocrotite din România”, „Determinatorul Ilustrat al Plantelor Vasculare din Estul României” etc.)

Biblioteca:



Ierbarul: număr de coli înregistrate: 46.841, în lucru: cca 1000 coli.

În cadrul Grădinii Botanice Iași se editează „Flora Exsiccata a Moldovei și Dobrogei”, până în prezent apărând Centuriile I-VIII, fiind în lucru Centuria a IX^a.

VII. PROBLEME ale Grădinii Botanice:

Revendicări terenuri: în momentul de față există peste 15 procese pe rol ale grădinii botanice cu diferite persoane care revendică teren pe actualul teritoriu al instituției

VIII. PERSPECTIVE:

5. Realizarea unei sere acvariu
6. Realizarea unei săli de conferințe pentru susținerea unor teme de educație ecologică
7. Realizarea unei surse proprii de aprovizionare cu apă din izvoarele existente pe teritoriul grădinii botanice
8. Realizarea unei noi sere pentru producerea florilor și legumelor de către Universitate.

M. Mititiuc, A. Oprea

RECENZII

**Sorin Geacu, Colinele Covurluiului –
Editura Univers enciclopedic, București, 2002, 338 p.**

Cartea publicată de dl. Sorin Geacu abordează, într-o formă nouă, studiul complex de evaluare a potențialului geoecologic într-o regiune puternic afectată de activitățile antropice care au dus la modificarea peisajului natural și diminuarea treptată, dar continuă, a capacității productive la activitățile economice de bază și în consecință alterarea calității vieții în regiune.

Studiul este structurat în trei părți: I – *Probleme generale*; II – *Analiza componentelor peisajului geografic*; III – *Modificarea antropică a peisajului geografic, ocrotirea naturii, regionarea peisagistică*. Toate cele trei capitole formează un tot unitar prin corelațiile evidențiate cu autoritatea unui cercetător consacrat.

În partea I a lucrării este descrisă așezarea geografică, limitele și denumirea regiunii și istoricul cercetărilor, începând de la Dimitrie Cantemir până în zilele noastre.

În partea a II-a a cărții sunt analizate complex și meticulos componentele peisajului geografic: geologia, relieful, potențialul climatic și hidric, comunitățile biologice și solurile ca expresie a interacțiunii dintre potențialul ecologic și comunitățile biologice.

Partea a III-a reprezintă o sinteză critică a modificărilor antropice a peisajului geografic, ocrotirea naturii și regionarea peisagistică.

Lucrarea în întregime se bazează pe o documentare minuțioasă din arhive și sinteze de specialitate, iar datele prezentate sunt reale și credibile, ceea ce face ca ele să poată fi utilizate în lucrări de amenajare a teritoriului și managementul durabil al resurselor.

Modul de expunere este clar, inteligibil și arată că autorul are o solidă pregătire ecogeografică, stăpânește cu siguranță metodologia de lucru pe teren și în laborator, are o capacitate de analiză și sinteză remarcabilă, toate dublate de o legătură sentimentală cu locurile de origine ale autorului.

Pe lângă datele valoroase inserate în paginile cărții, autorul se remarcă prin interpretarea acestora în mod original, urmate de concluzii solid argumentate pe bază de literatură și observații proprii.

Lucrarea publicată de dl. Sorin Geacu reprezintă un model de analiză complexă ecogeografică a unei unități geomorfologice distincte și pe lângă importanța științifică ea poate fi utilizată în planurile manageriale privind dezvoltarea durabilă a regiunii.

Considerăm că această carte este utilă unui cerc larg de specialiști care lucrează în amenajarea teritoriului, agricultură, silvicultură, administrație publică și învățământ, fapt ce ne face să o recomandăm cu toată responsabilitatea tuturor celor interesați.

**Prof. Univ. Dr. Mihai Mititiuc, Dr. I. Sârbu
Universitatea „Al. I. Cuza” Iași**

**OMAGIU
LA ÎMPLINIREA VÂRSTEI DE 70 DE ANI ADUS
BOTANISTULUI DR. ION SÂRBU**

Omagem astăzi pe distinsul domn Ion Sârbu, la cei 70 de ani împliniți de curând. Este cert faptul că dvs. îl cunoașteți într-o măsură mult mai mare decât noi, cei din generația de mijloc sau mai tânără. L-am cunoscut într-o zi de început de toamnă din îndepărtatul an 1990-început de ev nou pentru mulți dintre noi, ca și pentru societatea românească. Atunci am efectuat, împreună cu dumnealui prima mea deplasare pe teren, în Delta Dunării-pe traseul Tulcea-Sulina-Sfiștofca-C. A. Rosetti. Așa am luat cunoștință cu cel ce urma să-mi devină un adevărat mentor și model de profesionalism științific în activitatea mea la Grădina Botanică. În anii ulteriori am făcut numeroase deplasări pe teren cu dumnealui, deplasări în care pe lângă scopurile propuse inițial, am efectuat nenumărate identificări de plante, am purtat multe discuții pe teme botanice, am colectat semințe pentru catalog ori plante pentru Herbarul Grădinii Botanice ori pentru *Flora Exsiccata Moldaviae et Dobrogeae*.

Ceea ce doresc să exprim cu toată gratitudinea acum este că dânsului îi datorez primele reușite personale în folosirea determinatoarelor pentru plantele superioare, întâile recunoașteri de plante pe teren ajutându-ne cu lupa geologică, iconografia lui Rothmaler ori determinatoarele lui Beldie. Tot dânsului îi datorez și introducerea mea în complexa și dificila știință a fitocenologiei și vegetației României, mai cu seamă că împreună cu dumnealui am învățat să efectuez întâia oară releveuri pe teren. Nu într-o mai mică măsură mulțumesc aici și domnului prof. N. Ștefan pentru multele aplicații de teren făcute împreună, de la care am învățat la fel de mult.

Cred că nu pot exprima în cuvinte destul de convingătoare cât de mult a însemnat și înseamnă pentru mine personal ca și pentru noi, generația mai tânără de botaniști ieșeni, felul său calm și cald de a vorbi, amabilitatea și competența cu care ne sprijină de fiecare dată când îi solicităm vreun sfat ori o indicație bibliografică, o lucrare științifică, o hartă ori deslușirea tainelor vreunui munte din țara noastră și multe altele.

Eu am convingerea că, prin ceea ce face, domnul Dr. Ion Sârbu este și va fi un model de conduită umană, morală și intelectuală, model demn de urmat pentru toți tinerii botaniști din Iași, dar nu numai.

Pentru tot ce faceți pentru botanica românească, cât și pentru sprijinul acordat fiecăruia dintre noi, eu vreau să vă mulțumesc din suflet, atât în nume personal cât și al colegilor din grădina noastră botanică.

La mulți ani, domnule Ion Sârbu!

Biol. Dr. Adrian Oprea

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Proiecte:

- Proiect internațional PIN-MATRA: “National Grassland Inventory Project Romania”, The Royal Dutch Society of Nature (Contract No: OO.B.21/2000). Proiect coordonat local de Conf. Dr. Anca Sârbu (Univ. din București) (Supervisor Dr. Peter Veen, Olanda)
- “Studii biocenologice și de monitoring în ariile protejate din județele Moldovei” (Grant Nr. 44/1998-2001, Cod 77): Finanțator Ministerul Educației Naționale, România
- “Introducerea, acomodarea și urmărirea naturalizării în Grădina Botanică Iași a unor plante rare și ocrotite din flora României” (Tema 35252/Cod CNCSIS 77): Finanțator Ministerul Educației Naționale, România
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- “Flora și vegetația României, ocrotirea florei, instituțiile implicate în conservarea naturii, parcuri și rezervații naționale și naturale” (colaborare la situ-l www.plant-talk.org; Corespondent: Dr. Hugh Syngé (National Tropical Botanical Garden, USA);
- Colaborare la proiectul științific “Euro+Med PlantBase” (baza de date pe internet a opereii „Flora Europaea”); coordonator Dr. Stephen L. Jury, Euro+Med PlantBase Secretariat, Centre for Plant Diversity & Systematics, School of Plant Sciences, The University of Reading, Marea Britanie.
- “Identificarea arborilor-monumente istorice din municipiul Iași” (Proiect Eco-Monument, coordonat local de Asociația „Eurodemos” Iași și având finanțare dublă (Primăria Mun. Iași/CIDA Canada), sub auspiciile „Agendei Locale 21” (AL21)
- “Identificarea unor arii naturale spre a fi protejate în Jud. Iași”, Proiect coordonat local de Biol. Dr. Grigore Davideanu, Muz. de Istorie Naturală Iași, Univ. “Al. I. Cuza” Iași și finanțat de Fundația pentru parteneriat, Miercurea-Ciuc prin intermediul Societății de ecologie “AquaTerra”, Filiala Iași
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- Proiect internațional IECB-MIDDC: “Macrophytes, River Corridor, Land Use, Habitats, a multifunctional study in the Danube catchment based on a GIS approach”; Institute of Ecology and Conservation Biology, University of Vienna (Contract no. 45.512/2001). Proiect coordonat local de Conf. Dr. Anca Sârbu (Univ. din București) (Supervisor Prof. Dr. Georg Janauer, Univ. din Viena)
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- “Evaluarea capacității conservative a ariilor protejate de interes local din Județele Galați, Iași, Vaslui și Vrancea”: Inst. de Biol. al. Acad. Române
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- Se oferă consultanță științifică și tehnică în realizarea unor lucrări de doctorat, masterat, licență, de grad didactic etc
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- Colaborare permanentă cu mass-media locală și națională
- Participare la diverse expoziții florale în Iași și alte orașe din țară.

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