

ACADÉMIE ROUMAINE

COMITÉ DE RÉDACTION

Rédacteur en chef :

NICHIFOR CEAPOIU, membre de l'Académie Roumaine

Rédacteur en chef adjoint :

NICOLAE SĂLĂGEANU, membre de l'Académie Roumaine

Membres :

dr. LUCIAN ATANASIU, maître de conférences; dr. NICOLAE BOSCAIU; dr. ing. N. CRISTEA; dr. TEODOR CHIFU; dr. DOINA IVAN, maître de conférences; dr. LEONTIN PETÉRFI; pr. dr. ION TARNAVSCHI; pr. dr. CONSTANTIN TOMA; pr. dr. GHEORGHE ZARNEA

Secrétaire de rédaction :

GEORGETA FABIAN-GALAN

La «Revue roumaine de biologie — Série de biologie végétale» paraît deux fois par an. Toute commande de l'étranger (fascicule ou abonnements) sera adressée à ROMPRESFILATELIA, Département d'exportation-importation (Presse), P. O. Box, 12—201, télex 10376 prsti r, București, Calea Griviței 64—66, Roumanie, ou à ses représentants à l'étranger.

Les manuscrits ainsi que toute correspondance seront envoyés à la rédaction et les livres et publications proposés en échange à INSTITUTUL DE ȘTIINȚE BIOLOGICE, 79651, București, Splaiul Independenței 296.

REVUE ROUMAINE DE BIOLOGIE
SÉRIE DE BIOLOGIE VÉGÉTALE

Calea Victoriei 125
R-79717, București, România
téléphone 50 76 80

EDITURA ACADEMIEI
ROMÂNE

Calea Victoriei 125
R-79717, București, România
téléphone 50 76 80

REVUE ROUMAINE DE BIOLOGIE

SÉRIE DE BIOLOGIE VÉGÉTALE

TOME 35

1990

N° 1

janvier—juin 1990

SOMMAIRE

IN MEMORIAM

Le Professeur Iuliu Morariu (1905—1989) 3

V. SANDA et A. POPESCU, L'étude des phytocénoses spécifiques des mauvaises herbes des plages, des sols salins maritimes et des dunes littorales de la Roumanie 7

AL. MANOLIU and VERA BONTEA, Chorology of the genus *Claviceps* Tulasne from the mycological flora of Romania 17

ANGHEL RICHÎTEANU, Uredinales from North Algeria 33

V. SLONOVSKI, DIDONA RĂDULESCU, VIORICA IACOB, D. MITITIU, ELENA PĂTRĂȘCANU, *Vicia sativa* L. subsp. *sativa* var. *platysperma* Barulina a dangerous weed for the lentil crop 45

NICOLAE DRAGOȘ, LEONTIN ȘTEFAN PÉTERFI, AURORA NEDELCU, VERONICA CRĂCIUN, Intracellular bacteria in euglenoid flagellates 51

ANCA ANTOHE, La variation des glucides dans les drageons de la vigne pendant la période de repos 55

KATALIN BARTÓK, ILDIKÓ MÓCSY, Studies upon lichen radioactivity 61

G. GHIORGHITĂ, CR. NICULIȚĂ, FL. FLORIA, S. V. BALINT, Influence of self-pollination and of the branching degree on some morpho-physiological indices in opium poppy (*Papaver somniferum* L.) 67

COMPTE RENDU 75

REV. ROUM. BIOL. — BIOL. VÉGÉT., TOME 35, N° 1, P. 1—76, BUCAREST, 1990

LE PROFESSEUR IULIU MORARIU (1905—1989)

Le 8 janvier 1989 est disparu le remarquable professeur et homme de science, Iuliu Morariu, éminent pédagogue qui a déployé une activité soutenue durant cinq décennies dans les sciences botaniques en s'y imposant grâce à sa rigueur, à son esprit analytique et à l'érudition de ses recherches. Il a été un professeur exemplaire, impressionnant par sa modestie et la solidité de ses connaissances. Ses qualités d'homme réunissaient les plus précieux aspects de l'intellectuel fortement implanté dans sa terre natale telles la bonté, la générosité, la sagesse et le patriotisme. Ce sont ces qualités qui l'ont imposé de bonne heure à ses contemporains et qui représentent également un don de l'éducation, de l'ascendance et surtout de l'espace biogéographique d'où il est issu. Il est né et a passé son enfance à Zagra, département de Bistrița-Năsăud, qui est, tout comme pour d'autres personnalités remarquables de notre culture nationale (George Cosbuc, Liviu Rebreanu, le botaniste Florian Poreius, etc.), un point de repère par suite de ses inestimables valences culturelles et historiques. C'est d'ici que provient la grande harmonie, la parfaite union de ses traits de caractère qui confèrent au professeur Iuliu Morariu une auréole de symbole : l'esprit scientifique, le calme de l'habitant de la Transylvanie, la profondeur et le sérieux de ses recherches, la modestie, l'honnêteté, la capacité d'analyse et de synthèse, le don de la quête tellement nécessaire au scientifique, letact pédagogique, le désir d'inspirer de grands sentiments, la confiance dans sa destinée, le travail ardu pour dépasser les limites de la connaissance et, surtout, l'aspiration assidue vers l'idéal, vers la beauté. Ses cheveux toujours blancs (moi, du moins, je ne les ai jamais vus autrement), les marques de l'âge profondément gravées sur son visage noble, illuminé d'un sourire plein de bonté et de chaleur, le regard tourné toujours vers l'intérieur, il faisait l'impression ineffaçable du professeur supérieur, exemplaire et éternel dont la vie se confond avec son métier. Un pareil professeur a contribué à l'éducation de centaines d'ingénieurs forestiers et de biologistes.

L'activité scientifique du professeur Iuliu Morariu a enrichi le patrimoine du pays de plus de 300 titres bibliographiques (articles, comptes rendus, notes scientifiques, études, monographies, cours universitaires, manuels, travaux de vulgarisation), dont certains d'un intérêt fondamental pour la flore du pays. C'est le cas de la « Monographie des chênes de Roumanie » (1942, 1948) et des « Contributions à la connaissance des ormes de Roumanie », élaborées en collaboration avec le professeur C. C. Georgescu ; viennent ensuite la « Botanique générale systématique » (1960, 1965, 1973) et les études ayant un caractère complexe (taxonomique, théorique, génétique, corologique, écologique) concernant des unités systématiques telles : *Centaurea*, *Cirsium*, *Hieracium*, *Detaria*, *Fraxinus ornus*,
REV. ROUM. BIOL.—BIOL. VÉGÉT., TOME 35, N° 1, P. 3—5, BUCAREST, 1990

Comandra elegans, *Centunculus minimus*, *Campanula*, *Viola*, *Thypha Iaxmanii*, *Hyacinthella*, *Quercus pedunculiflora*.

Nombreux phylotaxa sont neufs pour la flore de la Roumanie (*Amaranthus patulus*, *Ammania verticillata*, *Polycarpon tetraphyllum*, *Bidens vulgata*, *Cytospora taxifolia*, *Dipsacus strigosus*, *Saxifraga mutata*, *Achillea roseo-alba*, *Taraxacum fulvum*) et d'autres sont décrits pour la première fois, enrichissant le patrimoine scientifique botanique : (*Quercus x getica*, *Cirsium x vodicense*, *Amaranthus x dobrogensis*, *Sidownia x solitaria*, *Aspernia x carpatica* etc.).

L'expérience et la méticulosité scientifique ont été amplement utilisées lors de l'élaboration de la « Flore de la R. S. R. » à laquelle la contribution du Professeur Iuliu Morariu a été remarquable dès le premier volume, analysant des genres et familles des plus critiques (*Amaranthaceae*, *Bignemiaceae*, *Chenopodiaceae*, *Myrtaceae*, *Oleaceae*, *Onagraceae*; *Primulaceae*, *Pyrelaceae*, *Santalaceae*, *Valerianaceae*, *Adenostyles*, *Bellis*, *Campanula*, *Cytisanthus*, *Digitaria*, *Eupatorium*, *Genista*, *Medicago*, *Milium*, *Setaria*, *Solidago*, *Stipa*).

A part la phytotaxonomie, une importante direction dans son activité l'avait constitué celle écophytocénologique. Excepté les recherches ayant un caractère monographique régional (la flore des environs de Bucarest, les mauvaises herbes des rideaux forestiers, la végétation du littoral, la cénocologie de l'espèce *Quercus pedunculiflora*, la végétation des zones de Hărman, Măgura Codlei, Băile Perșani, Porțile de Fier, la Dépression Bârsei etc.), il a décrit au cours des années 1943–1977 environ 40 nouvelles associations végétales pour la Roumanie, les unes déjà entrées dans le circuit universel, telles : *Cardactum acanthoides Amarantho-Chenopodietum*, *Malvetum pussillae*, *Quercetum pedunculiflore*, *Polypaganetum monspolienoem*, *Onopordetum taurici*, *Elymetum sabulosus*, *Convolvietum lineatus*, *Sambucetum mograe*.

D'une importance particulière ont été aussi les travaux de sosologie, domaine dans lequel, du moins pendant la dernière partie de sa vie, il a mené une activité très intense, illustrée par la brochure intitulée « Ce qu'on doit protéger dans la nature du district de Brașov » (1966–1971), ainsi que par la participation avec des comptes rendus d'une haute tenue scientifique aux réunions et symposiums au sujet de la protection de la nature de Brașov, Bucarest, Sinaia, Cluj-Napoca, etc. D'ailleurs, à la suite de la reconnaissance de ses mérites de grande valeur, le Professeur Iuliu Morariu a été nommé président et, ensuite, membre d'honneur du Conseil districtuel pour la conservation des monuments naturels du district de Brașov.

Le deuxième aspect majeur de son activité a été celui didactique. Hormis le traité plus haut mentionné « Botanique générale et systématique », il a rédigé toute une série de botaniques et cours, très utiles tant pour les étudiants que pour les naturalistes, tels la « Botanique systématique » (1966, 1971), la « Botanique forestière » (1951), le « Cours de botanique de Brașov », le « Cours de phytopathologie de Cîmpulung Moldovenesc » (1950), « Notions de géobotanique » (1965), etc. Si l'on y ajoute la préoccupation toute particulière pour la pratique des étudiants, les nombreux et fructueux déplacements en terrain, l'adresse et l'esprit critique qu'il manifestait dans la préparation et l'utilisation des feuilles d'herbier nous aurons une image assez complète de celui qui fut le Professeur I. Morariu

tellement apprécié et respecté par les étudiants, par tous ses collègues. La sollicitation de lui devenir collaborateur dans l'élaboration de certaines études ou travaux scientifiques était une honneur et un signe de haute considération.

La personnalité complexe du Professeur I. Morariu ne peut être renfermée en quelques lignes de revue. Quelque grand que soit notre effort en essayant de signaler ses travaux et les œuvres de grande valeur, l'Homme est resté en dehors. C'était le produit de son époque, qui a vécu dans l'histoire en participant à son édification dans un domaine qui pourrait être considéré moins accessible au grand public, la botanique, mais tellement nécessaire pour la connaissance et la valorisation des ressources nationales. Il ne s'est pas borné aux objectifs stricts de la discipline qu'il a servie mais, au pas de son époque, il a essayé d'élargir ses confins en pénétrant résolument dans des domaines voisins, par exemple la physiologie, l'écologie, la phytogéographie, la protection du milieu, etc., qu'il a enrichis de travaux et d'idées d'avant-garde. De partout d'où il est allé, le long du périple de sa vie en tant que professeur à Cîmpulung Moldovenesc (1948–1953), professeur à la Faculté de Sylviculture de Brașov (1953–1970), professeur consultant aux Universités de Brașov et Bucarest (après 1970) et membre dans la Rédaction des Revues de Biologie de l'Académie Roumaine, il a amené un esprit novateur, de confiance et optimisme grâce auxquels il a contribué à l'édification d'une nouvelle ambiance de travail et de sérieux très fertile dans l'affirmation des jeunes talents.

C'est pourquoi le Professeur I. Morariu a bien des successeurs spirituels, toujours désireux de suivre son exemple et de lui rendre hommage de la sorte.

Les professeurs, les collègues, les enseignants de tous les degrés, ses collaborateurs les plus proches, ceux qui l'ont connu, les amis, les centaines d'ingénieurs forestiers qui ont été ses élèves, les nombreux biologistes qui l'ont connu et apprécié, présentent leur pieux hommage à celui qui a destiné toute sa vie au progrès des sciences botaniques en particulier, à la biologie en général, ainsi qu'à la conservation et protection de la nature de notre patrie.

C. Bândiu

L'ETUDE DES PHYTOCÉNOSES SPÉCIFIQUES DES MAUVAISES HERBES DES PLAGES, DES SOLS SALINS MARITIMES ET DES DUNES LITTORALES DE LA ROUMANIE

V. SANDA et A. POPESCU

Les conditions stationnaires d'ensemble ont déterminé une forte spécificité des phytocénoses psamophiles et halophiles de notre littoral maritime, reflétée dans 17 associations décrites, rencontrées seulement dans ce territoire, à savoir : *Cakiletea maritima*, *Crambetum maritima*, *As. Convolvulus persicus*, *Convolvulum lineatus*, *Scolymetum hispanici*, *Lactuco (talaricae)* — *Glaucietum flavae*, *Tournefortietum sibiricae*, *Salsolo-Euphorbietum paralias*, *Juncetum maritimo-acuti*, *Juncetum acuti*, *Juncetum maritimi*, *Caricetum extensae*, *Plantaginietum coronopi*, *Elymetum gigantei*, *Artemisietum arenariae*, *Secaletum silvestre* et *Agropyretum juncei*.

L'étude cénotaxonomique des groupements psamophiles du littoral de la mer Noire, en dépit de toutes limites et difficultés dues au manque de recherches phytocénologiques plus amples dans la région ponto-sarmatique, a quand même le don de mettre en évidence de nombreuses particularités floristiques d'un territoire qui présente un intérêt phytogéographique tout particulier.

La mise en évidence de la spécificité des cénotaxa arénicoles existants dans notre pays, des plus accentuées particularités de la structure de ces phytocénoses, joue un rôle déterminant dans l'établissement des liaisons singénétiques et chorologiques avec l'ensemble de la végétation de l'espace ponto-sarmatique.

Le présent travail porte sur les phytocénoses des mauvaises herbes des plages, des sols salins maritimes et des dunes littorales spécifiques de notre pays, végétation se développant sur des sables soumis sans interruption aux vents, à l'action des vagues de la mer et à la chaleur torride pendant l'été et détenant un rôle important dans l'action de fixer le substrat. Il traite d'un nombre de 22 associations groupées en 3 classes : *Cakiletea maritima* Tx. et Prsg. 50, *Juncetea maritimi* Br. — Bl. 31 et *Ammophiletea* Br. — Bl. et Tx. 43.

L'extrême fragilité biologique de ces milieux y impose avec nécessité la création de réserves naturelles où puissent être conservés d'importants éléments spécifiques de flore et suivie l'évolution des écosystèmes psamophiles.

La classe *Cakiletea maritima* Tx. et Prsg. 45 comprend la végétation des mauvaises herbes des plages et des bords de la mer, influencée beaucoup par l'homme à la suite des aménagements entrepris, mais soumise en même temps au principal facteur, c'est-à-dire l'action de lavage faite par les vagues de la mer.

Les espèces caractéristiques et de reconnaissance sont : *Cakile maritima*, *Polygonum maritimum*, *Atriplex hastata*, *Crambe maritima*, *Convolvulus persicus*, *Euphorbia peplis*, *Convolvulus lineatus*, *Scolymus hispanicus*, *Glaucium flavum*, *Atriplex littoralis*, *Tournefortia sibirica*, *Salsola ruthenica*.

CAKILETALIA MARITIMAE Tx. apud Oberd. 49

Cakilion maritimae Morariu 67

Comprend des associations des plages maritimes soumises aux vents, à la chaleur torride de l'été et aux vagues de la mer pendant les tempêtes violentes. Les espèces de reconnaissance pour l'ordre et l'alliance sont : *Cakile maritima*, *Crambe maritima*, *Convolvulus persicus*, *Convolvulus lineatus*.

Cakiletum friscum (Hacquette 27) Tx. 50

Pousse sur les sables non fixés du littoral, ventés, brûlés par le soleil de l'été ou lavés par les vagues de la mer au cours des tempêtes violentes. Nous avons rencontré les phytocénoses les plus représentatives aux environs de Capul Midia (11). Les phytocénoses sont en général pauvres en espèces reflétant les conditions précaires du milieu où elles se développent. Les espèces les plus fréquemment rencontrées sont : *Elymus sabulosus*, *Salsola soda*, *Atriplex hastata*, *Xanthium italicum*.

Crambetum maritimae (I. Șerbănescu 70) Popescu, Sanda, Doltu,

80. I. Morariu (4) présente sur la plage d'Eforie un relevé (p. 365) dont les dominantes sont *Crambe maritima* (AD=2) et *Eryngium maritima* (AD=1). I. Șerbănescu (18) décrit, à base de 4 relevés de Năvodari, l'association de *Crambe maritima*.

Nous l'avons notée sur la plage d'Eforie Nord (Vraja Mării). Dans la structure des ces phytocénoses participent certaines espèces caractéristiques des alliances *Scabiosion ucranicæ*, *Festucion vaginatae* et *Elymion gigantei*, parmi lesquelles les plus fréquentes sont : *Medicago falcata*, *Centaurea arenaria*, *Euphorbia sequevana*, *Agropyron junceum* et *Elymus sabulosus*.

La xérophilie accentuée de ces phytocénoses se reflète dans la présence de nombreuses espèces de *Festuco-Brometea* et *Festucion rupicolae*. Pareillement à l'association précédente, *Crambetum maritimae*, représente une phase de début de peuplement des sables maritimes.

As. *Convolvulus persicus* (Borza 31 n.n.) Burduja 68

L'association a été décrite dans la réserve de sables maritimes d'Agigea (1,18) où elle réalise des phytocénoses bien construites où ne manquent jamais : *Secale silvestre*, *Euphorbia sequevana*, *Medicago falcata*, *Alyssum borzeanum*, *Bromus tectorum*, etc.

L'alliance *Festucion rupicolae* est représenté par une série d'espèces xérophiles comme : *Xeranthemum annuum*, *Marrubium peregrinum*, *Salvia aethiopis*, *Anchusa officinalis*. Dans le Delta du Danube, à Sulina, *Convolvulus persicus* dresse des phytocénoses compactes dans lesquelles la plante végète et fructifie abondamment (16).

Convolvuletum lineatus Morariu (59 n.n.) 67 var. *psamohalofitica* Burduja et Horeanu 70

I. Morariu (5) signale en tant que nomen nudum (pp. 357—358) en spécifiant qu'elle s'installe sur les sables à végétation plus évoluée de

Năvodari, Cetatea Histria, Eforie et Agigea. En 1967 I. Morariu l'avait incluse parmi *Cakilion maritimae* en précisant qu'elle est installée sur les sables pacagés de Histria et Eforie Nord. C. Burduja et Cl. Horeanu (2) font l'analyse des phytocénoses de Histria et Traian qu'ils groupent dans la variante *psamohalofitica*.

Les groupements de *Convolvulus lineatus*, rudéralisés d'une manière accentuée, où *Cynodon* présente une participation significative caractérise les dunes aplaties et salines de Histria et Traian. La variante *psamohalofitica* Burduja et Horeanu 70 se caractérise par la présence de nombreuses espèces xérophiles de *Festuco-Brometea*, comme : *Cynodon dactylon*, *Plantago lanceolata*, *Medicago lupulina*, *Erodium cicutarium*, *Medicago falcata*, *Eryngium campestre*, etc., ainsi que de celles halophiles comme : *Puccinellia distans*, *Hordeum maritimum* ssp. *hystrix*, *Spergularia media*, *Lotus tenuis*, *Taraxacum bessarabicum*, *Artemisia maritima*, etc.

EUPHORBIETALIA PEPLIS Tx. 50

Euphorbion peplis Tx.50

Scolymetum hispanici I. Pop 69

L'association a été décrite par I. Pop (8) sur le littoral maritime des alentours de Vama Veche où elle occupe des surfaces appréciables. Association caractéristique des terrains arénicoles, méditerranéens, elle se distingue de l'association *Lolium perenne-Scolymus hispanicus* par le grand nombre d'espèces psamophiles (en proportion de plus de 50%) qui entrent dans la composition de ces phytocénoses.

Salsola ruthenica-*Xanthium strumarium* ass. Oberd. et Tx. 50

Pousse sur les sables faiblement salés du littoral maritime de Vama Veche (8) par groupes de dimensions variables, en réalisant un grand degré de recouvrement. C'est une association terrophyte pauvre en espèces, dominée par l'élément méditerranéen et cosmopolite dans lequel 50% des composantes des phytocénoses analysées sont des taxa arénicoles.

Lactuco(tataricae) — *Glaucietum flavae* Dihoru et Negrean 76

Association psamophile et xérophile (xéromésophile) ayant une grande étendue le long du littoral. Elle a été identifiée entre Portița et Perișor (3). Elle s'installe vers les sommets des dunes près de l'eau de la mer, ayant comme avant-poste les groupements compacts et de grande étendue de l'association *Salsolietum sodae*. Hormis les deux espèces caractéristiques on a noté encore : *Apera spica venti* ssp. *maritima*, *Salsola soda*, *Euphorbia peplis*, etc.

Antriplicion littoralis (Nordhagen 40 p.p.) Tx. 50

Tournefortietum sibiricae Popescu et Sanda 75

I. Morariu (4) (p. 365) signale à Constanța sur la plage de «Treia Papuci», sur des sables fins et salés, une bordure relativement dense de *Tournefortia sibirica*.

Tournefortia sibirica ainsi que *Cakile maritima* se développe sur les sables non fixés, dans un substrat peu évolué mais ayant une humidité constante. A part les espèces caractéristiques des sables non fixés, tels : *Salsola soda*, *Elymus sabulosus*, *Eryngium maritimum*, *Gypsophila perfoliata*, etc., on rencontre dans l'association d'autres espèces ayant une grande capacité de fixer les terrains, comme : *Aeluropus litoralis*, *Puccinellia limosa*, *Plantago maritima*, *Cynodon dactylon*, plantes qui contribuent essentiellement au processus de stabilisation et à la fertilisation des sables. Les phytocénoses les plus représentatives ont été décrites de Năvodari vers Capul Midia, là où l'influence anthropique est plus réduite.

Atriplicetum litoralis (Wi. Christ. 33) Tx. 37

Signalée par I. Șerbănescu (17) de Rușetu et Caragele jusqu'à Movi-la Săpată (Jud. Buzău), elle constitue des phytocénoses dans les salaisons faiblement chloruriques et sulphatiques ayant d'assez grandes exigences écologiques. Dans l'association on rencontre des espèces puissantes de salaison : *Suaeda maritima*, *Halimione verrucifera*, etc., mais y dominent celles de salinité faible ou moyenne, comme : *Puccinellia distans*, *Limonium gmelinii*, *Erysimum repandum*, *Bassia sedoides*, *Lepidium ruderales*, etc. On a rencontré aussi des étapes de transitions avec : *Puccinellia distans*, *Bassia sedoides*, *Polygonum aviculare*, *Helochloa alopecuroides* et *Agropyron repens*.

Salsolo-Euphorbietum paralias Pignatti 52

Association méditerranéenne, arénicole, pionnière, signalée chez nous par I. Pop (8) à Vama Veche. Dans sa composition prédominent les espèces xéromésophiles, modérément thermophiles. Les phytocénoses de notre littoral se distinguent de celles décrites par S. Pignatti (1952) du littoral sud-ouest du Liban par la dominance de l'espèce *Salsola kali* ssp. *ruthenica*, ce qui a déterminé I. Pop de séparer une nouvelle sous-association — *salsoletosum ruthenicae* I. Pop 85.

La classe *Juncetea maritimi* Br. — Bl. 31 réunit la végétation de salaisons maritimes qui caractérisent les sables salifères qui se trouvent dans un stade avancé de solification. Les espèces caractéristiques de la classe et pour l'ordre sont : *Juncus maritimus*, *J. acutus*, *Triglochin maritimus*, *Artemisia maritima*, *Carex extensa*, *Plantago maritima*, *Aster tripolium*, *Lotus tenuis*, *Plantago schwarzenbergiana*.

JUNCETALIA MARITIMI Br. — Bl. 31

Especies caractéristiques : *Lotus tenuis*, *Taraxacum bessarabicum*, *Juncus gerardi*.

Juncion maritimi Br. — Bl. 31

Especies caractéristiques : *Plantago cornuti*, *Triglochin maritimus*, *Aster pannonicus*.

Juncetum maritimo-acuti Horvatić 34 (Syn. : *Juncetum acuti-maritimi* Popescu et Sanda 72). L'association est fréquente dans les micro-

dépressions situées entre Mamaia et Năvodari (9, 10) végétant sur les sables mifixés ou fixés, au bord de la lisière de *Elaeagnus angustifolia*. Dans les phytocénoses de *Juncus acutus* et *Juncus maritimus* s'intrepénètrent des espèces arénicoles, plus xérophiles, comme : *Gypsophila perfoliata*, *Centaurea arenaria*, *Silene otites*, *Euphorbia seguierana*, *Bromus tectorum*, etc. et des mésophiles : *Carex distans*, *Festuca arundinacea*, *Teucrium scordium*, *Dacus guttatus* ssp. *zahariadi*, *Senecio vernalis*, *Samolus valerandi*, etc.

Juncetum acuti Popescu et Sanda 76

Décrite au Delta du Danube (12) où elle végète dans les microdépressions du schorre Caraorman, l'association pousse abondamment à Năvodari, entre le lac Năvodari et la mer Noire ainsi que tout au long du littoral, jusqu'à Mamaia. Dans l'association participent plusieurs espèces dans la plupart halophiles et facultativement halophiles. Sont présentes : *Suaeda maritima*, *Aeluropus litoralis*, *Spergularia marina*, *Agrostis pontica*, *Juncus gerardi*. L'association réalise un grand recouvrement de terrain (80—100 %) en fixant le substrat à l'aide des puissants rhizomes de l'espèce caractéristique.

Juncetum maritimi (Rübel 30) Pign. 53

Se développe sur des terrains ayant une humidité accentuée et un pourcentage plus élevé de salinité du territoire compris entre Năvodari et Mamaia (1, 18). Dans le Delta du Danube (12) elle occupe les microdépressions dont le substrat est riche en sels et l'humidité est élevée, en recouvrant de considérables surfaces à Sulina et surtout sur l'île de Sacalin. *Juncus maritimus* pousse très vigoureux et la grande densité des individus empêche l'installation d'autres espèces dans les respectives phytocénoses. Sont bien représentées les espèces halophiles : *Artemisia maritima*, *Puccinellia limosa*, *Salicornia europaea*, *Spergularia media*, *Plantago maritima*, *Limonium gmelini*.

Triglochineto(maritimae) — Asteretum(pannonici) (Soó 27) Topa 39

I. Șerbănescu (17) la cite dans Județul Dolj (Murta Dobrești—la forêt Glavacioc) et Județul Buzău (Caragele). L'association pousse sur les terrains ayant une salinité modérée et l'eau en excès ; c'est pourquoi les espèces vernaies n'ont de conditions d'installation que sur les petites hauteurs du terrain. Parmi les espèces halophiles, *Puccinellia limosa* a la présence la plus élevée après l'espèce dominante, *Aster tripolium*, formant de nombreux faciès qui indiquent la transition vers l'association *Puccinellietum limosae*.

Dans l'association sont décrites 3 sous-associations : *juncetosum gerardii* Topa 39, *scorzoneretosum parviflorae* Topa 39 et *plantaginetosum* Soó 47 (Syn. : *Triglochin maritimus-Plantago cornuti* Borza et Boșcaiu 65).

Taraxaco(bessarabici) — Caricetum(distantis) Sanda et al. 78 ; Popescu, Sanda, Doltu, 80 (Syn. : As. *Carex distans*—*Taraxacum bessarabicum* (Soó 30) Wendelbg. 43). Végète dans la Plaine du Bărăgan (Caragele, Rușetu) (17) sur les faibles salaisons, chloruriques, humides, riches en humus,

au moins dans l'horizon supérieur. Dans l'association dominent les espèces halophiles, mais y pénètrent aussi certaines mauvaises herbes qui indiquent l'utilisation intensive de l'association en tant que lieu de pâturage. E. Turenschi (19) décrit de Moldavie, trois faciès : avec *Puccinellia distans*, *Juncus gerardi* et *Aster tripolium* Turenschi 70.

Armerion maritimae Br.—Bl. et De L. 36

Groupe les prairies halophiles de petite taille dont les espèces caractéristiques sont : *Artemisia maritima*, *Carex extensa*, *Plantago coronopus* et, comme différentielle locale, *Merendera sobolifera* et *Agropyron litorale*.

Artemisietum maritimae (Wi. Christ. 27) Br.—Bl. et De L. 36

L'association est très fréquente sur les dunes fixées entre Năvodar et Capul Midia (11) ayant généralement une grande diffusion dans notre pays. Les plantes qui entrent dans la composition de l'association sont adaptées aux conditions de sécheresse, supportant un certain degré de salinité du sol. Le grand nombre des espèces qui se trouvent dans l'association montre que le substrat est évolué. Les espèces le plus fréquemment rencontrées sont : *Puccinellia limosa*, *Spergularia media*, *Gypsophila perfoliata*, *Astragalus virgatus*, *Medicago falcata* var. *romanica*, etc. Un cas tout spécial le constitue la présence des espèces *Merendera sobolifera* et *Agropyron litorale* (14) qui représentent des différentielles locales de cette association. E. Turenschi (19) signale de Moldova les faciès suivants : avec *Petrosimonia triandra*, *Limonium gmelinii*, *Aster tripolium*, *Puccinellia distans*, *Plantago schwarzenbergiana* Turenschi 70.

Caricetum extensae Br.—Bl. et De L. 36

Carex extensa est une espèce fréquemment répandue sur le cordon littoral entre Mamaia et Capul Midia (11) ; l'espèce entre aussi dans la composition d'autres phytocénoses qui occupent des surfaces étendues sur les sables humides et salés, là où le processus de solidification est avancé. Les espèces le plus fréquemment rencontrées dans l'association *Caricetum extensae* sont : *Juncus acutus*, *Aster tripolium*, *Artemisia maritima*, *Limonium gmelinii*, *Aeluropus littoralis*, *Puccinellia limosa*, etc.

Plantaginetum coronopi Tx. 37

Plantago coronopus était connue jusqu'à présent seulement dans le Delta du Danube à Sulina où elle végète abondamment sur les sables maritimes (12, 16). Elle pousse assez souvent de pair avec *Plantago maritima*, mais dans les microdépressions ayant un excédent d'humidité elle forme des associations bien définies. Parmi les espèces qu'on rencontre le plus souvent dans l'association, nous rappelons : *Juncus maritimus*, *Plantago maritima*, *Juncus gerardi*, *Samolus valerandi*, *Cerastium pulchellum*, *Puccinellia limosa*, etc.

Les phytocénoses de Sfintu Gheorghe (tableau 1) que nous avons identifiées près du phare, dans l'espace compris entre le village et le cimetière villageois, sont intercalées parmi celles de *Juncetum acuti*, végétant auprès de celles halophiles comme : *Salicornietum europaeae*, *Aeluropetum littoralis*, *Puccinellietum limosae* et *Obionetum pedunculatae*. A l'encontre

Tableau 1

Plantaginetum coronopi Tx. 37

Numéro du relevé	1	2	3	4	5	6	7	8	9	10	AD	K
Surface (m ²)	25	50	50	50	25	25	50	50	50	50		
Hauteur de la végétation (cm)	10	10	10	10	10	15	10	10	10	10		
Recouvrement (%)	80	75	65	70	75	75	70	80	75	80		

Armerion maritimae

<i>Plantago coronopus</i>	3-4	4	3-4	4	4-5	4	4-5	3	4	4	4	3-5	V
<i>Carex distans</i>	+	+	+	+	+	+	+	+	+	+	+	+	IV
<i>Artemisia maritima</i>	+	+	+	+	+	+	+	+	+	+	+	+	IV

Juncetea + *Juncetea maritimi*

<i>Juncus gerardi</i>	+	+	+	+	+	+	+	+	+	+	+	+	IV
<i>Juncus maritimus</i>	+	+	+	+	+	+	+	+	+	+	+	+	IV
<i>Juncus acutus</i>	+	+	+	+	+	+	+	+	+	+	+	+	III
<i>Taraxacum bessarabicum</i>	+	+	+	+	+	+	+	+	+	+	+	+	III
<i>Aster tripolium</i>	+	+	+	+	+	+	+	+	+	+	+	+	III
<i>Plantago maritima</i>	+	+	+	+	+	+	+	+	+	+	+	+	I

Puccinellio — *Salicornietea* + *Puccinellietalia*

<i>Limonium gmelinii</i>	+	+	+	+	+	+	+	+	+	+	+	+	II
<i>Halimione pedunculata</i>	+	+	+	+	+	+	+	+	+	+	+	+	III
<i>Puccinellia limosa</i>	+	+	+	+	+	+	+	+	+	+	+	+	IV
<i>Hymenolobus procumbens</i>	+	+	+	+	+	+	+	+	+	+	+	+	III
<i>Spergularia media</i>	+	+	+	+	+	+	+	+	+	+	+	+	IV
<i>Aeluropus littoralis</i>	+	+	+	+	+	+	+	+	+	+	+	+	II
<i>Chamomilla recutita</i>	+	+	+	+	+	+	+	+	+	+	+	+	II
<i>Bassia hirsuta</i>	+	+	+	+	+	+	+	+	+	+	+	+	I
<i>Suaeda maritima</i>	+	+	+	+	+	+	+	+	+	+	+	+	I
<i>Salicornia europaea</i>	+	+	+	+	+	+	+	+	+	+	+	+	III

Festuco — *Brometea*

<i>Cerastium semidecandrum</i>	+	+	+	+	+	+	+	+	+	+	+	+	III
<i>Bromus hordeaceus</i>	+	+	+	+	+	+	+	+	+	+	+	+	II
<i>Plantago lanceolata</i>	+	+	+	+	+	+	+	+	+	+	+	+	II
<i>Medicago falcata</i>	+	+	+	+	+	+	+	+	+	+	+	+	I
<i>Cynodon dactylon</i>	+	+	+	+	+	+	+	+	+	+	+	+	V

Bromion tectorum

<i>Gypsophila perfoliata</i>	+	+	+	+	+	+	+	+	+	+	+	+	I
------------------------------	---	---	---	---	---	---	---	---	---	---	---	---	---

Bidentetea

<i>Rumex maritimus</i>	+	+	+	+	+	+	+	+	+	+	+	+	III
------------------------	---	---	---	---	---	---	---	---	---	---	---	---	-----

Compagnes

<i>Daucus guttatus</i> ssp. zahariadi	+	+	+	+	+	+	+	+	+	+	+	+	II
<i>Myosotis arvensis</i>	+	+	+	+	+	+	+	+	+	+	+	+	II
<i>Atriplex rosea</i>	+	+	+	+	+	+	+	+	+	+	+	+	II
<i>Atriplex talarica</i>	+	+	+	+	+	+	+	+	+	+	+	+	II
<i>Sonchus arvensis</i>	+	+	+	+	+	+	+	+	+	+	+	+	II
<i>Trifolium fragiferum</i>	+	+	+	+	+	+	+	+	+	+	+	+	II
<i>Bolboschoenus maritimus</i>	+	+	+	+	+	+	+	+	+	+	+	+	II
<i>Capsella bursa-pastoris</i>	+	+	+	+	+	+	+	+	+	+	+	+	I

L'endroit et la date de la réalisation des relevés : 1—10, Sfintu Gheorghe, 10—11. V. 1989 ; Espèces dans un relevé : *Alyssum desertorum* (8), *Potentilla reptans* (10).

des phytocénoses de Sulina, celles de Sfintu Gheorghe se distinguent par l'abondance plus réduite de l'espèce *Plantago maritima*.

La classe *Ammophiletea* Br.—Bl. et Tx. 43 comprend la végétation des dunes littorales; elle est bien représentée dans notre pays sur l'entier cordon littoral. On rencontre les phytocénoses représentatives entre Mamaia et Năvodari et entre Eforie Nord et Eforie Sud.

ELYMETALIA ARENARIAE Br.—Bl. et Tx. 43

I. Morariu (4) décrit cette alliance régionale qui a un caractère pontique, la caractérisant par les suivantes espèces de haute taille: *Elymus arenarius*, *Centaurea arenaria*, *Artemisia arenaria* qui végètent sur les dunes littorales parmi lesquelles on rencontre des éléments hallophiles marins, de taille basse, tels: *Cakile maritima*, *Gypsophila perfoliata*, *Crambe maritima*, *Eryngium maritimum*, etc.

Elymetum gigantei Morariu 57

Cette association, ayant un aréal pontique, a été décrite par I. Morariu (4) à Eforie et à Mamaia complétée plus tard (5) d'un relevé réalisé dans la réserve d'Agigea. Elle s'étend (Evd. Pușcaru-Sorocanu, 1963) sur notre entier littoral maritime, signalée aussi dans le Delta du Danube (20) sur les schorries de Sărăturile, Letca, Caraorman. A l'aide des rhizomes puissants d'*Elymus sabulosus*, elle réussit de fixer en grande mesure les dunes de sables mouvantes. Les espèces de l'alliance *Elymion gigantei* le plus fréquemment rencontrées dans l'association sont: *Artemisia arenaria*, *Centaurea arenaria*, *Astradaucus littoralis*, *Cakile maritima*, *Gypsophila perfoliata*, *Crambe maritima*, *Eryngium maritimum*, *Secale silvestre* et *Agropyron junceum*. Il y a de nombreuses espèces de *Festucion vaginatae* qu'on rencontre dans l'association, par exemple: *Euphorbia seguierana*, *Plantago indica*, *Fumana procumbens*, *Helichrysum arenarium*, *Polygonum arenarium*, *Tragopogon floccosus*, *Astragalus virgatus*, etc. Etant une association pionnière, elle présente une importance particulière dans la stabilisation des dunes, ce qui est la première phase de constitution de végétation dans ces conditions extrêmement hostiles.

Artemisietum arenariae Popescu et Sanda 77

Tout comme *Elymus arenarius*, *Artemisia arenaria* présente une grande capacité de fixer le substrat et d'assurer l'abri nécessaire pour le développement des plantes moins résistantes. Dans les phytocénoses d'*Artemisia arenaria* de Mamaia (13) s'entrepénètrent les espèces arrénicoles et celles hallophiles-arrénicoles. Le grand nombre de plantes rudérales de l'association est le résultat de l'intervention intense de l'homme qui a modifié la végétation de la région. Les phytocénoses d'*Artemisia arenaria* étaient plus étendues sur le littoral entre Constanța et Năvodari; peu à peu, à la suite de l'élargissement et de l'aménagement des plages, elle ont été limitées. A présent, des phytocénoses représentatives de l'association ont été observées sur la plage comprise entre Eforie Nord et Eforie Sud, où elles forment une bande qui s'interpose entre *Elymetum gigantei* et les sables qui sont dans un stade avancé de friche, peuplés de *Cynodonetum dactyloni*, *Aperetum maritimae* et *Secaletum silvestre*.

Secaletum silvestre Popescu et Sanda 73 non Șerbănescu 70

Les relevés que nous avons publiés de Mamaia (10) et que nous avons attribués au commencement à l'association *Secaletum silvestre* Șerbănescu 70 constituent une nouvelle association, caractérisée par l'absence de l'espèce *Alyssum borzaeanum*.

Les phytocénoses du Delta du Danube (Letea, Caraorman, Sulina) (12) mettent en évidence la dominance des espèces arrénicoles dans l'association. Nous en rappelons: *Gypsophila perfoliata*, *Centaurea arenaria*, *Elymus sabulosus*, *Polygonum arenarium*, *Agrostis pontica*, *Apera maritima*, *Bromus tectorum*.

L'association de *Secale silvestre* décrite par I. Șerbănescu (18) d'Agigea est en réalité l'association *Secali silvestri-Alysssetum borzeani* (Borza 31 n.n.) Morariu 59.

Agropyro-Minuartion Tx. 45 apud Br.—Bl. et Tx. 52

Agropyretum juncei (Br.—Bl. et De L. 36) Tx. 52

L'association a été signalée par V. Popescu (15) sur les sables compris entre Corbu et Capul Midia. Elle végète sur des surfaces étendues sur la falaise située à environ 5 m au-dessus de la mer: *Agropyron junceum* a comme espèces accompagnantes: *Agropyron litorale*, *Teucrium polium*, *Cannabis ruderalis*, *Allium guttatum*, *Achillea setacea*, *Althaea officinalis*, *Marrubium peregrinum*, *Agropyron cristatum*, ssp. *pectinatum*, *Stipa capillata*, *Asperula setulosa*, *A. humifusa*, *Onosma arenarium*, *Silene densiflora* et *Nigella arvensis*.

BIBLIOGRAPHIE

1. Burduja C., Lucr. Ses. Șt. a Staț. de Cerc. marine „Prof. I. Borcea”, Agigea, (1966), Iași, 1968, 151—157.
2. Burduja C., Horeanu Cl., Analele Șt. ale Univ. „Al. I. Cuza”, Iași Sect. II. Biologie, 1970 (1): 181—184.
3. Dihoru Gh., Negrean G., Peuce Muz. Deltei Dunării, Tulcea, 1976, 5, 101—118.
4. Morariu I., Bul. Șt. Sect. de Biol. și Șt. Agric., Seria Bot., 1957, 9(4): 361—378.
5. Morariu I., St. Cerc. Biol. Seria Biol. veget., 1959, 11(4): 355—378.
6. Morariu I., Contrib. Bot. Cluj-Napoca, 1967, 233—246.
7. Pop I., Studia Univ. Babeș-Bolyai, Ser. Biol., 1969, 14(1): 9—19.
8. Pop I., Contrib. Bot. Cluj-Napoca, 1985, 131—139.
9. Popescu A., Sanda V., Rev. Roum. de Biol. Sér. Bot., 1972, 17(2): 99—111.
10. Popescu A., Sanda V., Rev. Roum. de Biol., 1975, 20(1): 7—17.
11. Popescu A., Sanda V., Șt. Cerc. Biol. Seria Bot., 1973, 25(2): 113—130.
12. Popescu A., Sanda V., Peuce Muz. Deltei Dunării, Tulcea, 1976, 5, 193—216.
13. Popescu A., Sanda V., St. Cerc. Biol. Seria Bot., 1977, 29(2): 161—167.
14. Popescu A., Sanda V., Muz. Șt. Nat. Băcău, Studii și Comunic., 1978(9—10): 317—342.
15. Popescu V., Inst. Ason. „Dr. P. Groza”. Notulae Horti Agrobot. Clujensis 1969, 77—80.
16. Sanda V., Popescu A., Șt. Cerc. Biol. Seria Bot., 1973, 25(5): 399—424.
17. Șerbănescu I., Com. Geol. Șt. tehnice și econom. Seria C. Pedol., Buc., 1965, (15): 1—149.
18. Șerbănescu I., St. tehnice și econom. Seria C. Pedol., in mem. N. C. Cernescu și M. Popovă, 1970(18), 365—400.
19. Turenschi E., Lucr. Șt. Inst. Agron.: „Ion Ionescu de la Brad”, Iași, 1970, 203—212.
20. Vasiliu V., Pop M., Floca F., Hidrobiologia, 1963, 4, 515—543.

Received July 17, 1989

Institut de Sciences biologiques, Bucarest, Splaiul
Independenței 296

CHOROLOGY OF THE GENUS *CLAVICEPS* TULASNE FROM THE MYCOLOGICAL FLORA OF ROMANIA *

AL. MANOLIU and VERA BONTEA

This paper presents the spread of *Claviceps* species in Romania, in the Universal Transverse Mercator System (UTM).

Claviceps purpurea, with the highest spread, parasitizes the most host-plants (84 species), 12 of these belonging to *Festuca* genus, followed in decreasing order by *Bromus* (9 species), *Poa* (7 species), *Elymus* (5 species), etc. *C. sesleriae* parasitizes 3 species, while *C. cynodontis* only one.

The host-species of *Claviceps* spp. are spread on the whole territory of Romania, beginning with the Black Sea seaside up to the mountainous zone, inclusively. The most host-species are hemicyptophytes, Eurasiatic, and from open sites.

The genus *Claviceps* belongs to the family *Clavicipitaceae*, which has been placed in the course of time under various orders. Thus, Nannfeldt (1932) located it in the order *Clavicipitales*, Miller (1949) in *Sphaeriales*, Luttrel (1951) in *Xylariales* (= *Sphaeriales* Miller), etc. Rogerson (1970) admits the order *Clavicipitales* Nannfeldt with a unique family *Clavicipitaceae* (Lindau) Earle, this classification being also adopted by us.

The species of the genus *Claviceps* have a wide spread in the world and exhibits a special economic significance, by damages induced to grain crops, grasslands and pastures, on the one hand, and by the fact that alkaloids of pharmaceutical use are extracted from their sclerotia, on the other hand. This fact determines the ever greater amplitude of research regarding the *Claviceps* genus and therefore we decided to establish its spread on the territory of Romania. To this end, we used bibliographical information, materials in mycological herbaria in this country, and our personal observations. The chorology of *Claviceps* genus has been expressed by maps in the Universal Transverse Mercator System (40, 41).

The lines of basic network in the UTM system in the map of Romania are drawn 100 km apart, the fundamental squares obtained being marked with 2 capital letters of the Latin alphabet. In its turn, every fundamental square is divided by vertical and horizontal lines 10 km apart, these squares being marked from left to right and from top to bottom with 00 up to 99 (Fig. 1, NK square, and Fig. 2). In this way, each station is represented by a code composed of 2 capital letters followed by 2 figures (e.g. Iași — NN 42).

The first *Claviceps* species — *Claviceps microcephala* (Wallr), Tul. — was recorded in Romania in 1893 on *Phleum pratense*, by Simonkai. Subsequently, other species, such as: *Claviceps wilsonii* Cke, *C. nigricans* Tul., *C. cynodontis* Langdon, *C. sesleriae* Stäger and *C. purpurea* (Fr.) Tul. were recorded. Following considerable research and by lack of sufficient criteria for separation the first 3 species were included in *C. pur-*

* The summary of this paper was sent to the Xth European Congress of Mycology, Tallinn, Estonian SSR, USSR, 20th—25th August, 1989.

purea (39). Consequently, this species exhibits the highest variability of stroma and sclerotia sizes and parasitizes the most host-species.

Until 1953 only 14 gramineous host-species were known (12, Ed. I). In the first survey on the *Claviceps* genus, issued in 1961 (64), 46 species and 14 varieties are indicated as hosts, these latter belonging to species *Triticum aestivum* L. and *T. durum* Desf. found in the Experimental farm at Cluj-Napoca.

In the present work 88 gramineous species are mentioned on the whole, 84 of which being parasitized by *C. purpurea*, 3 by *C. sesleriae* and one by *C. cynodontis*, and also one cyperaceous species*. At the same time the number of stations where are indicated the respective hosts increased considerably.

The highest number of host-plants attacked by *C. purpurea* belong to *Festuca* genus with 12 species, followed in decreasing order by *Bromus* with 9 species, *Poa* with 7, *Elymus* with 5, *Alopecurus*, *Hordeum*, *Koeleria*, *Deschampsia*, *Glyceria* and *Phleum* with 2 species each, and the remaining 24 genera with a single species each.

Claviceps purpurea is the species with the highest spread on the territory of this country, being recorded on some hosts in more than 30 stations (e.g. *Lolium perenne* in 39 stations, *Elymus repens* in 31, etc.). Rather high frequencies also show host-plants such as: *Festuca rubra* with 18 stations, *Dactylis glomerata* with 16, *Festuca pratensis* with 14, etc. Stations in which *Claviceps purpurea* was recorded are located under various phyto-geographical conditions, beginning with the seaside and the Danube Delta, up to the mountainous zone (Mountains of Rodna, Rarău, Ceahlău, Siriu, Iezer-Păpușa, Perșani, Bucegi, Făgăraș, Retezat, Cerna and Apuseni).

From the standpoint of biological forms, the host-plants are thus divided: 56 hemi-cryptophytes (66.66%), 17 therophytes (20.23%), 5 hemi-cryptophytes (geophytes) (5.95%), 2 therophytes (hemi-cryptophytes) (2.38%), 2 hemi-cryptophytes (chamephytes) (2.38%), 2 geophytes (2.38%).

When analysing the host-plants under the angle of phytogeographical elements, dominance of Eurasiatic species (38, representing 45.23%), followed in decreasing order by: European (13, i.e. 15.47%), circumpolar species (12, or 14.28%), mediterranean (8 or 9.52%), cosmopolitan (5 — 5.95%), Central European (4 — 4.76%), endemic (4 — 4.76%).

In relation with the biotope, most host-plants are from open sites (67 species, or 79.76%), then nemoral (14 species, or 16.66%) and aquatic (3 species or 3.57%).

The host-plants of the 3 *Claviceps* species follow, with coded localities:

ASCOMYCOTINA

PYRENOMYCETES

CLAVICIPITALES Nannfeldt, Nova Acta Regiae Soc.

Sci. Upsal. IV, 8 (2): 49, 1932

* Thanks are due to Mr. G. Negrean for his kindness in helping us in updating nomenclature of host-plants.

CLAVICIPITACEAE (Lindau) Earle in Mohr, Contr.

U.S. Natl. Herb. 6:170, 1901

CLAVICEPS L. — R. Tulasne, Ann. Sci. Nat. Bot.

20:43, 1853

Claviceps purpurea (Fr.) Tul., Ann. Sci. Nat. Bot. 20:43, 1853. (Fig. 1)

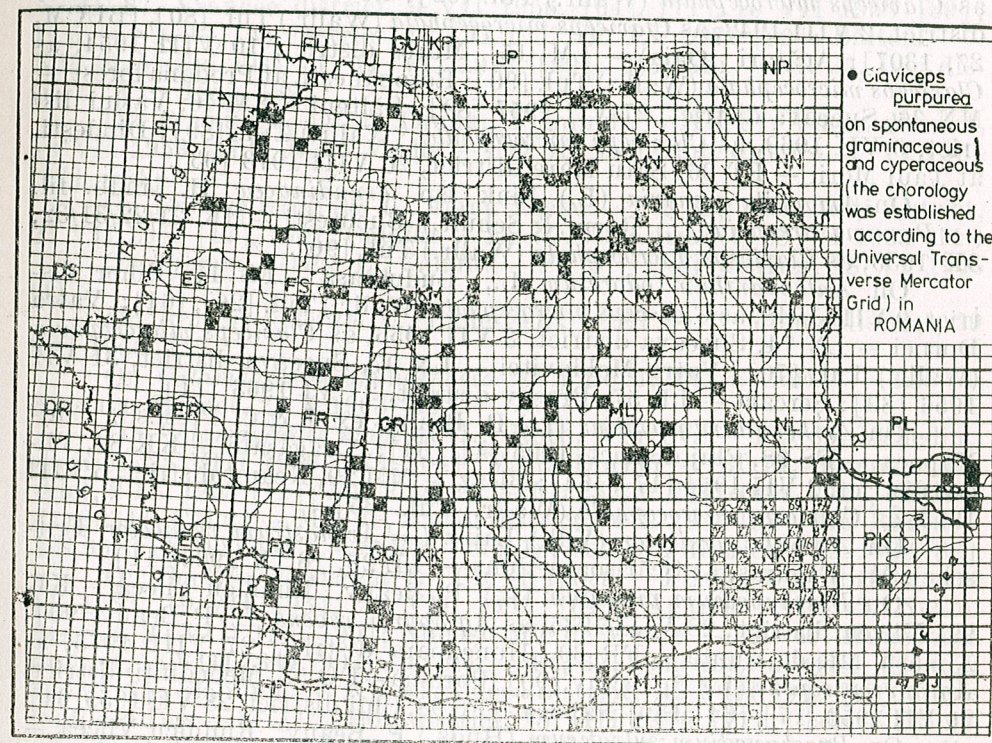


Fig. 1

On *Aegilops crassa* Boiss. (cult.), Cluj-Napoca — FS 98, Cluj district, 22 IX 1955 [27].

On *Aegilops speltoides* Tausch, Cluj apoca — FS 98, Cluj district, 22 IX 1955, as *Aegilops bicornis* Jaub.-Spach [27].

On *Aegilotrichum* sp., Iași — NN 42, I N district, 20 VII 1947 [89].

On *Agropyron cristatum* (L.) Gaertn. s.l., București — MK 21/22/31/32, 25 VI 1954 [17], [64]; Petrești-Năruja — ML 87, Vrancea district, 10 VII 1956 [71]; Ciala — ES 20/21, Arad district, 1957 [38]; Istria — PK 33, Constanța district, 14 VIII 1966 [11].

On *Agrostis capillaris* L. (= *Agrostis tenuis* Sibth.), Plopeni — MK 19, Prahova district, 24 VII 1971 [BUCM, 41, 2033]; Argintăria Lacul cel Mare and Lăcut) — ML 57, Buzău district [23].

On *Alopecurus aequalis* Sobol., Crovu — LK 84, Dîmbovița district, 31 X 1957, as *Claviceps microcephala* (Wallr.) Tul. [64], [76]; Din-

dești, at Valea Ierului — FT 06, Satu Mare district, 21 VIII 1973 [BUCM, 49, 2428], [63]; Piru Nou — FT 05, Satu Mare district, 25 VIII 1976 [63], [90].

On *Alopecurus geniculatus* L., Miercurea-Ciuc — MM 03, Harghita district, 6 IX 1960, as *Claviceps microcephala* (Wallr.) Tul. [31]; Toplița Mureșului — FR 59, Hunedoara district, 18 VII 1966 [11].

On *Alopecurus pratensis* L., Reci — ML 17, Covasna district, 1939, as *Claviceps microcephala* (Wallr.) Tul. [62]; Rovinari — FQ 77/87, Gorj district, 2 VIII 1942, as *Claviceps microcephala* (Wallr.) Tul. [80], [BUCM, 27, 1307]; Acățari (Oaia) — LM 15, Mureș district, 10 VIII 1954, as *Claviceps microcephala* (Wallr.) Tul. [90]; Rotopânești, at Prodana forest — MN 36, Suceava district, 27 VII 1957 [89]; Bălteni — NM 46, Vaslui district, 6 VII 1960, as *Claviceps microcephala* (Wallr.) Tul. [89]; Dindești, at Tăul Morii — FT 06, Satu Mare district, 20 VIII 1973 [63].

On *Amophila arenaria* (L.) Link ssp. *arundinacea* H. Lindb. fil. (= *Psamma arenaria* (L.) Roem. & Schult.), București — MK 21/22/31/32, 3X 1935, as *Claviceps microcephala* (Wallr.) Tul. [90].

On *Anthoxanthum odoratum* L., Budureasa — FS 17, Bihor district, 9 VIII 1948, as *Claviceps microcephala* (Wallr.) Tul. [26], [64]; Vatra Dornei — LN 74, Suceava district, 3 VII 1956, as *Claviceps microcephala* (Wallr.) Tul. [70]; Vatra Moldoviței — LN 97, Suceava district, 31 VII 1956 [89]; Șercaia — LL 57, Brașov district, 27 VI 1963 [11].

On *Arrhenatherum elatius* (L.) P. Beauv. ex J. & C. Presl.s.l., Cluj-Napoca — FS 98, Cluj district, 1905 [4], [64]; Drăgășani — KK 84, Vilcea district, 2 VII 1954 [17], [64]; Bicaz — MM 29, Neamț district, 5 VIII 1973, as *Claviceps microcephala* (Wallr.) Tul. [35].

On *Avenula versicolor* (Vill.) Lainz (= *Avenastrum versicolor* Fritsche), Mt. Făgăraș, at Scărișoara-Puha — LL 25, 16 IX 1966 [11].

On *Brachypodium pinnatum* (L.) P. Beauv., Rîmnicu Vilcea — KK 99, Vilcea district, 28 VIII 1935, as *Agropyron repens* (L.) P. Beauv. [90]; Almașu Mic de Munte — FR 69, Hunedoara district, 27 VIII 1975, as *Agropyron repens* (L.) P. Beauv. [90]; Poroina — FQ 52, Mehedinți district, 26 VII 1950 [17], [64]; Cluj-Napoca — FS 98, Cluj district, 28 VII 1955 [64].

On *Brachypodium sylvaticum* (Huds.) P. Beauv., Rîmnicu Vilcea — kk 99, Vilcea district, 22 VIII 1935 [64], [80], [BUCM, 27, 1302]; Rotopânești, at Prodana forest — MN 36, Suceava district, 26 VII 1957 [70], [89]; Moinești — MM 64, Bacău district, 10 X 1965 [11]; Sinaia-LL 82, Prahova district, 20 X 1968 [3]; Siriu-Băi (Berbeci village) — ML 43, Buzău district [23].

On *Briza media* L., Cluj-Napoca — FS 98, Cluj district, 23 VII 1955 [64]; Putna — LP 90, Suceava district, 18 VII 1956 [71]; Văratec — MN 42, Neamț district, 16 VII 1957 [71]; Cîmpu lui Neag — FR 51, Hunedoara district, 10 VII 1964 [11].

On *Bromus arvensis* L., Cluj-Napoca — FS 98, Cluj district, 1905 [4], [64]; Mircești — MN 81, Iași district, 8 XI 1971 [57].

On *Bromus benekenii* (Lange) Trimen (= *Bromus ramosus* Huds. ssp. *benekenii* (Lange) Sch. & Thell), Miercurea-Ciuc — MN 03, Harghita district, 15 IX 1964 [11].

On *Bromus commutatus* Schrad., Bălteni — NM 46, Vaslui district 11 VII 1957 [71].

On *Bromus hordeaceus* L. (= *Bromus mollis* L.), Almașu Mic de Munte — FR 69, Hunedoara district, 1947 [90]; Calafat — FP 57, Dolj district, 18 VI 1964 [11].

On *Bromus inermis* Leysser, Grajduri — NN 40, Iași district, 20 VII 1950 [73]; Podari — GQ 20, Dolj district, 18 VII 1954 [17], [64]; Stana — FT 60, Sălaj district, 2 VIII 1955 [64]; Rotopânești — MN 36, Suceava district, 20 VII 1956 [71], 26 VII 1957 [89]; Petrești-Năruja — ML 87, Vrancea district, 9 VII 1956 [64], [71], 10 VII 1958 [89]; Iași — NN 42, Iași district, 10 VII 1957, 30 IX 1972 [89]; Bălteni — NM 46, Vaslui district, 11 VII 1957 [89]; Roșcani — NN 25, Iași district, VII 1984 [89].

On *Bromus japonicus* Thunb., Flămînda — KK 87, Vilcea district, 12 VII 1953 [17]; Jiana Veche — FQ 31, Mehedinți district, 8 VI 1954 [17], [64].

On *Bromus secalinus* L., Jiana Veche — FQ 31, Mehedinți district, 21 VII 1953 [17], [64]; Calafat — FP 57, Dolj district, 18 VI 1965 [11].

On *Bromus sterilis* L., Calafat — FP 57, Dolj district, 18 VI 1965 [11].

On *Bromus tectorum* L., Băile Felix — ET 61/71, Bihor district, 29 VII 1966 [11].

On *Calamagrostis arundinacea* (L.) Roth, Vatra Dornei — LN 74, Suceava district, 25 X 1963 [11].

On *Calamagrostis epigeios* (L.) Roth, Corcova — FQ 65, Mehedinți district, 28 VIII 1956 [17], [64]; Vatra Dornei — LN 74, Suceava district, 2 IX 1963 [11]; Mt. Făgăraș — LL 25, 20 VIII 1969 [13], [BUCM 41, 2034]; Căiuți — MM 91, Bacău district, 4 X 1984 [88]; Mt. Rarău — LN 95, 3 IX 1988 [88]; — Solca — MN 18, Suceava district, 6 IX 1988 [88].

On *Dactylis glomerata* L., Cluj-Napoca — FS 98, Cluj district, 10 IX 1953, 19 VII 1954, 28 VII 1955 [64]; Agapia — MN 42, Neamț district, 20 VIII 1951 [90]; Almașu Mic de Munte — FR 69, Hunedoara district, 18 VIII 1944 [90]; Devesel — FQ 32, Mehedinți district, 16 VIII 1953 [17]; Flămînda — KK 87, Vilcea district, 12 VIII 1953 [17]; Coțofenii din Dos — GQ 02, Dolj district, 18 VIII 1954 [17]; Ciala — ES 20/21, Arad district, 1955 [38]; Vatra Moldoviței — LN 97, Suceava district, 19 VI 1956 [71]; Putna — LP 90, Suceava district, 29 VII 1960, 18 VII 1966 [89]; Iași — NN 42, Iași district, 10 VII 1957 [71], 30 IX 1972 [89]; Izvoru Muntelui — MM 29, Neamț district, 10 VII 1957 [89]; Dornîșoara — LN 53, Suceava district [11]; Frumoasa-Bosanci — MN 47, Suceava district, 17 VIII 1966 [48]; Plopeni — MK 19, Prahova district, 25 VIII 1971 [BUCM, 41, 2035]; Solca — MN 18, Suceava district, 6 IX 1988 [88]; Slătioara — MN 05, Suceava district, 7 IX 1988 [88].

On *Dasypyrum villosum* (L.) P. Candargy (= *Haynaldia villosa* (L.) Schur), Jiana Veche — FQ 31, Mehedinți district, 18 VI 1953, 27 VII 1953 [17], [64].

On *Deschampsia caespitosa* (L.) P. Beauv., Izvoru Muntelui — MM 29 Neamț district, 10 VIII 1957, as *Claviceps microcephala* (Wallr.) Tul. [71]; Plopeni — MK 19, Prahova district, 24 VIII 1971 [BUCM 41, 2036]; Horodnic de Jos — MP 00/10, Suceava district, 9 VI 1971, as *Claviceps microcephala* (Wallr.) Tul. [43]; Mt. Rarău — LN 95, 8 IX 1988 [88]; Mt. Căliman — LN 62, 9 IX 1988 [88].

On *Daschampsia flexuosa* (L.) Trin., Cluj-Napoca — FS 98, Cluj district, 1905 [4], [64].

On *Eleocharis palustris* (L.) Roem. & Schult. s.l., Băleni-Români — LK 96, Dîmbovița district, 25 IX 1957, as *Claviceps nigricans* Tul. [76]; Giurgiu — MJ 15/16, Ilfov district, 1 X 1967 [11]; Baia Mare — FT 98, Maramureș district, 28 IX 1972, as *Claviceps nigricans* Tul. [90]; Dindești — FT 06, Satu Mare, 31 VIII 1976, as *Claviceps nigricans* Tul. [63]; Carei, at Bobald — FT 08/18, Satu Mare district, 17 VIII 1977, as *Claviceps nigricans* Tul. [63]; Osoi — NN 61, Iași district, VII 1984 [89].

On *Eleocharis uniglumis* (Link) Schult., Mircești — MN 81, Iași district, 11 VII 1932, as *Claviceps nigricans* Tul. [57]; Jijila — NL 81/91, Tulcea district, 20 X 1966, as *Claviceps nigricans* Tul. [33]; Tinosu — MK 26, Prahova district, 4 VIII 1970, as *Claviceps nigricans* Tul. [BUCM, 41, 2031]; Baia Mare — FT 98, Maramureș district, 28 IX 1972, as *Claviceps nigricans* Tul. [BUCM, 45, 2213].

On *Elymus caninus* (L.) L. (= *Agropyron caninum* (L.) P. Beauv.), Cluj-Napoca — FS 98, Cluj district, 1905, as *Triticum caninum* L. [4], [64]; Almașu Mic de Munte — FR 69, Hunedoara district, 17 VIII 1945, as *Agropyron cristatum* (L.) Roem. & Schult. [90]; Curtea de Argeș — LL 10, Argeș district, 7 VII 1954 [17], [90]; Ocna Sibiului — KL 78, Sibiu district, 18 VIII 1954 [17], [64], [90]; Larga Jijia — NN 24, Iași district, 6 X 1961 [11]; Iași — NN 42, Iași district, 23 IX 1971 [56].

On *Elymus elongatus* [Host] Runemark s.l. (= *Agropyron elongatum* (Host) P. Beauv.), C.A. Rosetti — QL 01/02, Tulcea district, 14 VIII 1978 [BUCM, 60, 2969].

On *Elymus hispidus* (Opiz) Melderis s.l. (= *Agropyron intermedium* (Host) P. Beauv.), Jiana Veche — FQ 31, Mehedinți district, 3 VIII 1953 [17], [64]; Moinești, at Cornu — MM 64, Bacău district, 7 X 1965 [11]; Solca — MN 18, Suceava district, 6 IX 1988 [88].

On *Elymus hispidus* (Opiz) Melderis ssp. *barbulatus* (Schur) Melderis (= *Agropyron intermedium* (Host) P. Beauv. ssp. *trichophorum* (Link) Aschers & Graebn.), Cluj-Napoca FS 98, Cluj district, 1905 [4], [64].

On *Elymus repens* (L.) Gould s.l. (= *Agropyron repens* (L.) P. Beauv., *Elytrigia repens* (L.) Nevski, Beiuș — FS 06, Bihor district, 8 VIII 1948 [26], [64]; Grajduri — NN 40, Iași district, 20 VII 1950 [64], [73], [89]; Cornești — NN 31, Iași district, 13 VII 1951 [64], [73]; Craiova — GQ 20/21, Dolj district, 11 VI 1953 [17], [64]; Jiana Veche — FQ 31, Mehedinți district, 19 VI 1952 [17], [64]; Timna — FQ 53, Mehedinți district, 20 VII 1954 [17], [64]; Segarcea — GP 18, Dolj district, 26 VII 1954 [17], [64]; Piatra Olt — KK 81, Olt district, 26 VII 1954 [17], [64]; Curtea de Argeș — LL 10, Argeș district, 7 VII 1954 [90]; Bălteni — NM 46, Vaslui district, VII 1954, 12 VII 1957 [89]; Cluj-Napoca, at Hoia forest — FS 98, Cluj district, 28 VII 1955 [64], 22 IX 1955 [27]; Ciala — ES 20/21, Arad district, 1955 [38]; Petrești-Năruja — ML 87, Vrancea district, 10 VII 1956 [89]; Rotopănești, at Prodana forest — MN 36, Suceava district, 27 VII 1957 [89]; Iași — NN 42, Iași district, 10 VII 1957 [89]; Cîndești — MP 31, Botoșani district, 24 VIII 1962 [60]; Ișalnița — GQ 11, Dolj district, 24 VII 1963 [92]; Ponoare — Bosanci — MN 47, Suceava district, 1964 [47]; Frumoasa-Bosanci — MN 47, Suceava district, 1965

[49]; Moinești — MM 64, Bacău district, 2 X 1965 [17]; Dobrina — NM 65, Vaslui district, 16 VIII 1967 [59]; Cristești — MN 63, Iași district, 7 VIII 1971 [89]; Plopeni — MK 19, Prahova district, 12 IX 1971 [BUCM, 41, 2032]; Dindești, at Tăul Morii — FT 06, Satu Mare district, 20 VII 1973 [63]; Carei, at Bobald — FT 08/18, Satu Mare district, 17 VIII 1973 [63]; Sărățel — LN 01, Bistrița-Năsăud district, 1 IX 1980 [11]; Repedea — LP 00, Maramureș district, 31 VIII 1966 [11]; Roșcani — NN 25, Iași district, VII 1984 [89]; Iași — NN 42, Iași district, 10 IX 1985 [89]; Mărgineni forest — MM 79, Neamț district, 1972 [54]; Cheile Turzii — GS 06, Cluj district, 1975 [7].

On *Festuca altissima* All. (= *Festuca sylvatica* (Pollich) Vill. non Hudson), Grajduri — NN 40, Iași district, 20 VII 1950 [70].

On *Festuca arundinacea* Schreber s.l., Tîrgu Frumos — MN 92/NN 02, Iași district, 7 IX 1951, 1954 [64], [73]; Craiova — GQ 20/21, Dolj district, 6 IX 1953 [17], [64]; Coțofenii din Dos — GQ 02, Dolj district, 12 IX 1953 [17], [64]; Curtea de Argeș — LL 10, Argeș district, 7 VII 1954 [17], [64]; Acățari (Oaia) — LM 15, Mureș district, 10 VIII 1954 [17], [64]; Reghin — LM 28, Mureș district, 10 VIII 1965 [11]; Cheile Turzii — GS 06, Cluj district, VII 1966 [7].

On *Festuca drymeia* Mert. & Koch, Mt. Igniș — GT 09, 2 IX 1973 [BUCM, 45, 2214]; Argintăria (Lacul cel Mare and Lăcuț) — ML 57, Buzău district [23]; Mt. Zarandului, at Milova valley — ES 72, 27 IX 1974 [93] and Bîrzova — ES 73, 25 VII 1973 [93].

On *Festuca gigantea* (L.) Vill., Țibana — NN 20, Iași district, 10 IX 1949, 1954 [64], [80]; Bicaz — MM 29, Neamț district, 5 VIII 1973, as *Claviceps microcephala* (Wallr.) Tul. [35]; Mt. Zarandului, at Jernova valley — ES 83, 28 IX 1974 [93]; Scorțeni — MK 19, Prahova district, 11 IX 1979 [BUCM, 60, 2970]; Cacica — MN 17, Suceava district, 6 IX 1988 [88]; Rîșca — MN 44, Suceava district, 6 IX 1988 [88]; Bogata — KM 74, Mureș district [11].

On *Festuca heterophylla* Lam., Argintăria (Lacul cel Mare and Lăcuț) — ML 57, Buzău district, VIII 1958 [23]; Șuța Seacă — LK 76, Dîmbovița district, 16 VII 1961 [72]; Moinești, at Aluniș — MM 64, Bacău district, 5 X 1965 [11]; Vatra Dornei, at Dealul Rune — LN 74, Suceava district, 19 VIII 1980 [BUCM, 60, 2971].

On *Festuca nigrescens* Lam. s.l. (= *Festuca rubra* L. ssp. *commutata* Gaud.), Argintăria (Lacul cel Mare and Lăcuț) — ML 57, Buzău district, 31 VIII 1959 [23]; Mt. Bucegi, at Peștera — LL 73, 12 IX 1973, as *Festuca nigricans* Schur [90].

On *Festuca ovina* L. ssp. *sudetica* (Kitt.) Hay, Mt. Iezer-Păpușa — LL 44 [68].

On *Festuca picta* Kitt., Mt. Retezat, at Bucera — FR 42, 5 IX 1964 [11].

On *Festuca pratensis* Huds. s.l., Cluj-Napoca — FS 98, Cluj district, 1905, [4], [64] 15 IX 1973 [91]; Cluj-Napoca, at Mănăștur — FS 98, Cluj district, 10 IX 1953 [64], at Cetățuia, 27 VII 1955 [64], at Dîmbul Rotund, 24 VII 1955 [64]; Târcăia — FS 06, Bihor district, 6 VIII 1948 [17], [64]; Tîrgu-Frumos — MN 92/NN 02, Iași district, 1951 [70]; Timna — FQ 53, Mehedinți district, 9 VI 1954 [17]; Ciala — ES 20/21, Arad district, 1955 [38]; Hălăucești — MN 81, Iași district, 6 VII 1956 [89]; Văratec — MN 42, Neamț district, 18 VII 1957 [89]; Mt. Ceahlău — MN 20,

10 VIII 1957 [89]; Iași — NN 42, Iași district, 10 VII 1957 [89], 1972, as *Phalaris arundinacea* L. [89]; Rotopânești — MN 36, Suceava district, 26 VII 1957 [70]; Petroșani, at Buta — FR 83, Hunedoara district, 4 IX 1964 [11]; Mircești — MN 81, Iași district, 25 VII 1967 [57]; Dindești, at Tăul Morii — FT 06, Satu Mare district, 20 VIII 1973 [BUCM, 45, 2215]; Mt. Siriu, at Lunca Bradului — ML 33, 12 VIII 1973 [23], [90]; Cheile Turzii — GS 06, Cluj district, VII 1966 [7].

On *Festuca pseudovina* Hackel ex Wiesb., Cluj-Napoca — FS 98, Cluj district, 7 VI 1955 [64]; Calafat — FP 57, Dolj district, 18 VI 1964 [11].

On *Festuca rubra* L. s.l. Budureasa — FS 17, Bihor district, 9 VIII 1948 [26]; Curtea de Argeș — LL 10, Argeș district, 6 VII 1954 [17], [64]; Cluj-Napoca, at Valea Popii — FS 98, Cluj district, 9 VII 1955 [64]; Novaci — GR 00, Gorj district, 6 IX 1955 [17], [64]; Ciala — ES 20/21, Arad district, 1955 [38]; Putna — LP 90, Suceava district, 18 VII 1956 [89]; Cimpulung Moldovenesc — LN 96, Suceava district, 29 VII 1956 [89]; Vatra Moldoviței — LN 97, Suceava district, 31 VII 1956 [89]; Văratec, at Ciungi — MN 42, Neamț district, 11 VII 1957 [89]; Mt. Paring, at Rîncu — FR 92, 30 VIII 1960 [18]; Cîmpu lui Neag — FR 51, Hunedoara district, 3 IX 1964 [11]; Corneșul Mare — FR 92, 5 IX 1966 [92]; Mt. Iezer-Păpușa — LL 44, 13 VIII 1969 [68]; Mt. Ceahlău, at Ocolașul Mare — MN 20, 2 IX 1969 [14]; Sanislău — ET 97, Satu Mare district, 28 VIII 1973 [63]; Sfînta Ana Lake, at Poiana Ciomadului — MM 11, Harghita district, 1973 [87]; Argintăria (Lacul cel Mare and Lăcut) — ML 57, Buzău district [23]; Slătioara — MN 05, Suceava district, 7 IX 1988 [88]; Solca — MN 18, Suceava district, 7 IX 1988 [88].

On *Festuca rupicola* Heuffel s.l., Cluj-Napoca — FS 98, Cluj district, 27 VI 1955, as *Festuca sulcata* (Hack.) Nym. [64].

On *Glyceria fluitans* (L.) R. Br., Sălicea — FS 96, Cluj district, 17 VII 1939 [64]; Bicaz-Chei, at Valea Lapoșului — MM 18, Neamț district, as *Claviceps wilsonii* Cke., 3 IX 1953 [BUCM, 31, 1514] Iași — NN 42, Iași district, 19 VI 1960, as *Glyceria aquatica* J. & C. Presl. [89]; Foieni — FT 08, Satu-Mare district, 15 IX 1978 [63].

On *Glyceria plicata* (Fries) Fries, Urdari — FQ 86, Gorj district, 28 VIII 1955 [17], [64].

On *Helictotrichon pubescens* (Hudson) Pilger, Mt. Siriu, at Colții Bocîrnei — ML 33 [23].

On *Holcus lanatus* L., Cluj-Napoca — FS 98, Cluj district, 1905, as *Claviceps microcephala* (Wallr.) Tul. [4], [64]; Măneciu — ML 21, Prahova district, 7 IX 1930 [70], 17 IX 1934, as *Claviceps microcephala* (Wallr.) Tul. [84]; Galbina — FR 69, Hunedoara district, 18 IX 1948 [90]; Vatra Moldoviței — LN 97, Suceava district, 3 VII 1956, as *Claviceps microcephala* (Wallr.) Tul. [89]; Rotopânești, at Prodana forest — MN 36, Suceava district, 28 VII 1957, as *Claviceps microcephala* (Wallr.) Tul. [89]; Mt. Ceahlău — MN 20, 10 VII 1957, as *Claviceps microcephala* (Wallr.) Tul. [89]; Slănic Moldova — MM 51, Bacău district, 1 VIII 1958, as *Claviceps microcephala* (Wallr.) Tul. [89]; Argintăria (Lacul cel Mare and Lăcut) — ML 57, Buzău district, 31 VIII 1959 [23]; Mt. Buzău, at Harțag — ML 65, 8 IX 1961, as *Claviceps microcephala* (Wallr.) Tul. [5], [23]; Vatra Dornei, at Valea Țiganului — LN 74, Suceava district, 28 IX 1963

[11]; Dindești, at Tăul Morii — FT 06, Satu Mare district, 20 VIII 1973 [63]; Repedea — LP 00, Maramureș district, 31 VIII 1966 [11]; Borsec — NL 90, Harghita district, 26 VIII 1982 [90]; Cacica — MN 17, Suceava district, 6 IX 1988 [88];

On *Hordelymus europaeus* (L.) C. O. Harz, Lăpușna, at Dealul Crucii — LM 68, Mureș district, 14 IX 1967, as *Elymus europaeus* L. [11].

On *Hordeum distichon* L., Jiana Veche — FQ 31, Mehedinți district, 18 VI 1953 [17], [64].

On *Hordeum distichon* L. ssp. *nudus* (L.) Rothm., Cluj-Napoca — FS 98, Cluj district, 1905 [4], [64].

On *Hordeum murinum* L., Calafat — FP 57, Dolj district, 8 VI 1965 [11].

On *Hordeum vulgare* L., București — MK 21/22/31/32, 1942 [90]; Cluj-Napoca — FS 98, Cluj district, 1945 [64], [67]; Jiana Veche — FQ 31, Mehedinți district, 19 VI 1953 [17], [64].

On *Koeleria macrantha* (Ledeb.) Schult. (= *Koeleria gracilis* Pers. București — MK 21/22/31/32, 1940 [90]; Băile Felix — ET 61/71, Bihor district, 20 VII 1966 [11].

On *Koeleria pyramidata* (Lam.) P. Beauv., Calafat — FP 57, Dolj district, 18 VI 1965 [11].

On *Koeleria transsilvanica* Schur, Mt. Siriu, at Fundu Mrejei — ML 33 [23].

On *Leymus racemosus* (Lam.) Tzvelev (= *Elymus giganteus* Vahlssp. *sabulosus* (Bieb.) Tzvelev), Cluj-Napoca, (in Botanical Garden) — FS 98, Cluj district, 22 IX 1955, as *Elymus arenarius* L. [27], [64].

On *Lolium multiflorum* Lam., Cluj-Napoca — FS 98, Cluj district, 22 IX 1955 [27], [64]; Ciala — ES 20/21, Arad district, 1955 [38]; Craiova — GQ 20/21, Dolj district, 1 X 1956 [17], [64].

On *Lolium perenne* L., Arad — ES 20/21, Arad district, 1893 [64], [86]; Cluj-Napoca — FS 98, Cluj district, 1905 [4], [64], 15 VII 1955 [27], [64], 10 IX 1973 [91]; Codlea — LL 76, Brașov district, 16 VIII 1929 [90], 1935 [64], [83]; Almașu Mic de Munte — FR 69, Hunedoara district, 18 VIII 1945 [90]; Ezăreni — NN 32, Iași district, 5 VIII 1950 [73]; Piatra Neamț — MM 59, Neamț district, 30 VIII 1950 [73]; Medias — KM 91, Sibiu district, 1950 [64], [81]; Craiova — GQ 20/21, Dolj district, 2 VIII 1952, 25 VIII 1954 [17], [64]; Jiana Veche — FQ 31, Mehedinți district, 29 VII 1953 [17], [64]; Deveselu — KJ 98, Olt district, 29 VIII 1953 [17], [64]; Calafat — FP 57, Dolj district [17], [64]; Segarcea — GP 18, Dolj district, 26 VIII 1954 [17], [64]; Curtea de Argeș — LL 10, Argeș district, 6 VII 1954 [17], [64]; Tirgu Neamț — MN 52, Neamț district, 1954 [64], [73]; Acățari (Oaia) — LM 15, Mureș district, 18 VIII 1954 [17], [64]; Cuci — LM 84, Mureș district, 17 VIII 1954 [64]; Ciala — ES 20/21, Arad district, 1955 [38]; Focșani — NL 15/16, Vrancea district, 1955 [64]; Dolhasca — MN 75, Suceava district, 26 VII 1957 [89]; Iași — NN 42, Iași district, VII 1957 [89]; Văratec — MN 42, Neamț district, 16 VII 1957 [89]; Geoagiu — FR 78, Hunedoara district, 13 VII 1961 [89]; Dealu Mare — LM 15/16, Mureș district, 9 VIII 1965 [11]; Cheile Turzii — GS 06, Cluj district, VII 1966 [7]; Roșu — MK 12, Ilfov district, 9 VIII 1970 [BUCM, 41, 2037]; Mt. Buzău, at Harțag — ML 65, 8 IX 1961, as *Claviceps microcephala* (Wallr.) Tul. [5], [23];

Ghindăoani — MN 41, Neamț district, 17 IX 1970 [51]; Pingărcior — MM 39, Neamț district, 29 IX 1970 [50]; Tarcău — MM 39, Neamț district, 29 IX 1971 [55]; Voitineli — MP 00, Suceava district, 19 IX 1972, as *Claviceps microcephala* (Wallr.) Tul. [45], [46]; Cozia — KL 80, Vilcea district, 1976 [90]; Carei, at Bobald — FT 08/18, Satu Mare district, 17 VIII 1977 [62]; Foeni — FT 08, Satu Mare district, 15 IX 1978 [63]; Sărățel — LN 01, Bistrița-Năsăud, 1 IX 1980 [11]; Firiza — FT 98, Maramureș district, 29 VIII 1980 [11]; Domănești — FT 18, Satu Mare district, 29 VII 1983 [90]; Osoi — NN 61, Iași district, VII 1984, as *Claviceps microcephala* (Wallr.) Tul. [89]; Roșcani — NN 25, Iași district, VII 1984, as *Claviceps microcephala* (Wallr.) Tul. [89]; Solca — MN 18, Suceava district, 6 IX 1988 [88].

On *Lolium temulentum* L., Cluj-Napoca — FS 98, Cluj district, 1905 [4], [64]; Tirgu-Frumos — MN 92/NN 02, Iași district, 10 VII 1951 [73]; Iași — NN 42, Iași district, 10 VII 1957 [89]; Geoagiu — FR 78, Hunedoara district, 13 VII 1961 [89].

On *Melica ciliata* L., Cheile Turzii — GS 06, Cluj district, VII 1966 [7].

On *Milium effusum* L., Durău — MN 20, Neamț district, 6 VIII 1966, as *Claviceps microcephala* (Wallr.) Tul. [34].

On *Molinia coerulea* (L.) Moench s.l., Poiana Stampei — LN 54, Suceava district, 27 VIII 1954, as *Claviceps microcephala* (Wallr.) Tul. [BUCM, 35, 1714]; X 1969 [90]; Joseni — LM 87, Harghita district, 10 X 1954, as *Claviceps microcephala* (Wallr.) Tul. [91]; Miercurea-Ciuc — MM 03, Harghita district, as *Claviceps microcephala* (Wallr.) Tul. [31]; Mt. Siriu, at Valea Sadului — ML 33, 28 IX 1976, as *Claviceps microcephala* (Wallr.) Tul. [91].

On *Nardus stricta* L., mountain chalet Izvoare — FT 98, Maramureș district, 28 VIII 1974 [BUCM, 49, 2429].

On *Oreochloa disticha* (Wulf.) Link, Mt. Rodnei, at Pietrosul — LN 27, 17 IX 1974 [90].

On *Phalaris arundinacea* L. (= *Typhoides arundinacea* (L.) Moench, *Balclutha arundinacea* (L.) Dumort.), Sibiu — KK 77/87, Sibiu district, 15 VII 1895 [62]; Reci — ML 17, Covasna district, 1939 [62], [64]; Cluj-Napoca — FS 98, Cluj district, 12 IX 1933 [90]; Jidvei — KM 72, Alba district, 2 VIII 1933 [90]; Ciala — ES 20/21, Arad district, 1955 [38]; Tușnad — MM 11, Harghita district, 5 VIII 1956 [11]; Vlădeni — Mihăileni — MP 31, Botoșani district, 20 VIII 1962 [60]; Sinăuți-Mihăileni — MP 31, Botoșani district, 24 VII 1961, 27 VI 1966 [25], [61]; Mt. Perșani — LL 77, 1966 [42]; Mt. Perșani, at Armeniș — LL 77, 27 VII 1967, as *Koelleria gracilis* Pers. [42]; Iași — NN 42, Iași district, 30 IX 1972 [89]; Miercurea-Ciuc — MM 03, Harghita district, 25 VII 1972 [91]; Sărățura — FT 47, Satu Mare district, 11 VII 1986 [90]; Aciș — FT 36, Satu Mare district, 15 VII 1987 [90].

On *Phleum phleoides* (L.) Karst., Mircești — MN 81, Iași district, 11 VII 1972, as *Claviceps microcephala* (Wallr.) Tul. [57].

On *Phleum pratense* L. s.l., Arad — ES 20/21, Arad district, 1893, as *Claviceps microcephala* (Wallr.) Tul. [64], [86]; Cluj-Napoca — FS 98, Cluj district, 1905, as *Claviceps microcephala* (Wallr.) Tul. [4], [64]; Rovinari — FQ 77/87, Gorj district, 2 VIII 1942, as *Claviceps microcephala* (Wallr.) Tul. [64], [80], [BUCM, 27, 1306]; Jiana Veche — FQ 31, Meie-

dinți district, 2 VII 1953, as *Claviceps microcephala* (Wallr.) Tul. [17]; Frumoasa-Bosanci — MN 47, Suceava district, 2 VIII 1966, as *Claviceps microcephala* (Wallr.) Tul. [48]; Dindești — FT 06, Satu Mare district, 14 VIII 1974 [90].

On *Pholiurus pannonicus* (Host) Trin., Băile Felix — ET 61/71, Bihor district, 29 VII 1966 [11].

On *Phragmites australis* (Cav.) Trin. ex Steudel, Mogoșoaia — MK 23, Ilfov district, 29 IX 1967 [11]; Snagov — MK 35, Ilfov district, 29 IX 1967 [11]; Danube Delta, at South of Impuțita — QK 09, Tulcea district, 23 X 1980 [90] and Lopatina — PL 81, 23 X 1980 [90].

On *Poa annua* L., Mt. Paring, at Stina Mohoru — FR 92, 8 VIII 1956, as *Claviceps microcephala* (Wallr.) Tul. [18], [64] and at Rinca and Corneșul Mare — FR 92, 5 IX 1966 [BUCM, 41, 2038]; Ploștina, at Muchea Babei — ML 63, Buzău district, 7 IX 1959 [23], [90]; Mt. Iezer-Păpușa, at Găinațul Mare — LL 44, 10 VII 1967, as *Claviceps microcephala* (Wallr.) Tul. [68]; Mt. Rodnei — LN 27, 1974 [90].

On *Poa compressa* L., Mt. Siriu — ML 33, 8 IX 1973 [90].

On *Poa hybrida* Gaud., Toplița — LM 79, Harghita district, 18 VII 1966 [11].

On *Poa media* Schur, Mt. Ceahlău — MN 20, 10 VII 1957 [90].

On *Poa palustris* L., Argintăria (Lacul cel Mare and Lăcut) — ML 57, Buzău district, VII 1959 [23].

On *Poa pratensis* L., Cluj-Napoca — FS 98, Cluj district, 25 VI 1955, 17 VII 1955 [64]; Focșani — NL 15/16, Vrancea district, 1956 [81]; Sovata — LM 56, Mureș district, 20 VII 1966 [11]; Dorna Candrenilor — LN 84, Suceava district, 1980 [90].

On *Poa trivialis* L., Bratec — FS 29, Bihor district, 28 VII 1966 [11].

On *Secale cereale* L., in all the country.

On *Trisetum flavescens* (L.) P. Beauv. s. 1, Putna — LP 90, Suceava district, 18 VII 1956, as *Claviceps microcephala* (Wallr.) Tul. [71].

On *Triticum aestivum* L. (cult.), Cîmpia Turzii — GS 25, Cluj district 1933, 1934 [64], [67]; Lechința — KN 91, Bistrița-Năsăud district, 1936 [64], [67]; Budești — GT 29, Maramureș district, 1936 [64]; Medias KM 91, Sibiu district, 1936 [64], [67]; Sinmartin — KN 71, Cluj district, 1938 [64], [67]; Avram Iancu — FS 33, Alba district, 1938 [64], [67]; Ditrău — LM 88, Harghita district, 1938 [64], [67]; Chevezeșu Mare — ER 35, Timiș district, 1943 [64], [67]; Bălteni — NM 46, Vaslui district, 11 VII 1957 [70]; Jiana Veche — FQ 31, Mehedinți district [17], [64]; Cornești — FQ 78, Gorj district, 25 VI 1957 [17], [64].

On *Triticum aestivum* L. (cult.) var. *aureum* Link (= *Triticum aestivum* L. var. *albidum* Alef.), Cluj-Napoca — FS 98, Cluj district, 1954 [64].

On *Triticum aestivum* L. (cult.) var. *erythrospermum* Körn., Cluj-Napoca — FS 98, Cluj district, 1954, 1955 [64].

On *Triticum aestivum* L. (cult.) var. *gracum* Körn., Cluj-Napoca — FS 98, Cluj district, 1954 [64].

On *Triticum aestivum* L. (cult.) var. *lutescens* Alef., Cluj-Napoca, FS 98, Cluj district, 1954, 1955 [64]; Salatin — GT 21, Cluj district, 10 IV 1955 [64].

- On *Triticum durum* Desf., Cluj-Napoca — FS 98, Cluj district, 1954 [64].
- On *Triticum durum* Desf. var. *africanum* Körn., Cluj-Napoca — FS 98, Cluj district, 1954 [64].
- On *Triticum durum* Desf. var. *italicum* Körn., Cluj-Napoca — FS 98, Cluj district, 1954 [64].
- On *Triticum durum* Desf. var. *leucomelan* Körn., Cluj-Napoca — FS 98, Cluj district, 1954 [64].
- Triticum durum* Desf. var. *melanopus* Körn., Cluj-Napoca — FS 98, Cluj district, 1954 [64].
- Triticum durum* Desf. var. *valenciae* Körn., Cluj-Napoca — FS 98, Cluj district, 1954 [64].
- Claviceps cynodontis* Langdon, Univ. Queensl. Papers Dept. 3 (415): 34 — 40.1954 (fig. 2)

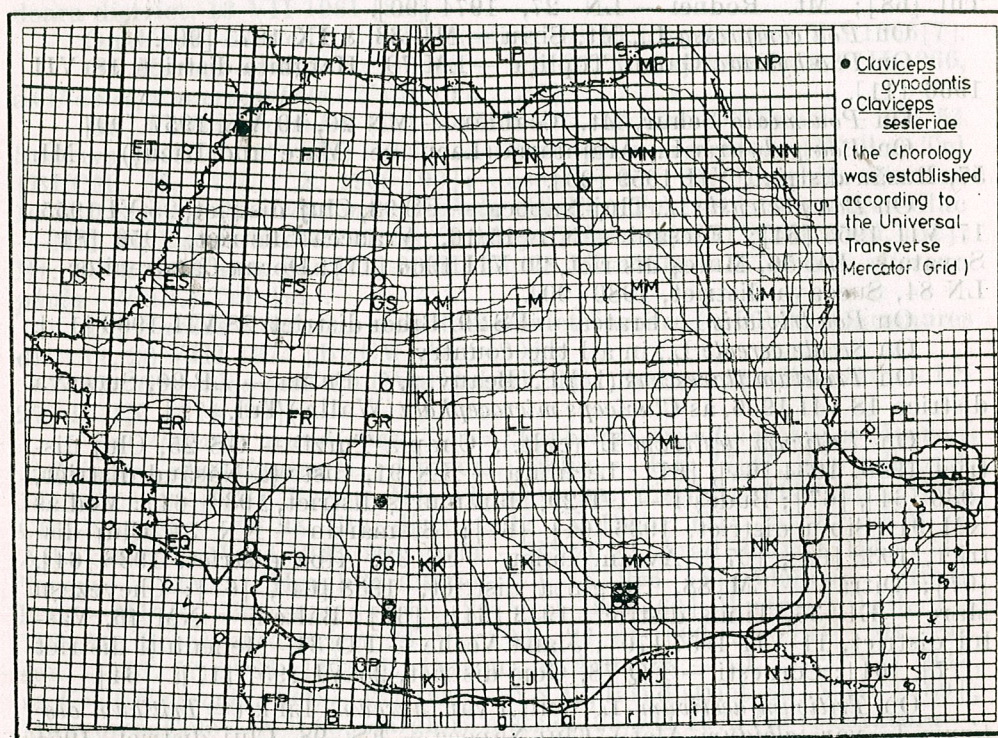


Fig. 2

- On *Cynodon dactylon* (L.) Pers., Craiova — GQ 20/21, Dolj district, 29 IX 1953 [17], 17 X 1964, as *Claviceps microcephala* (Wallr.) Tul. [92]; Negoiești — GQ 19, Gorj district, 21 IX 1953, as *Claviceps microcephala* (Walls) Tul. [17]; București — MK 21/22/31/32, 6 XI 1964, [BUCM, 36, 1754]; Pișcolt-Scărișoara Nouă — ET 97, Satu-Mare district, 3 IX 1978 [63].

Claviceps sesleriae Stäger, in Centralbl. für Bakter., II, 17 :784.1906 (fig.2)

- On *Sesleria bielzii* Schur, Mt. Bucegi, at Jepii Mici — LL 73, 20 VI 1946 [BUCM, 30, 1464], [64]; Mt. Rodnei, at Virful Laptelui — LN 27, 28 VII 1950 [64]; Mt. Cernei — FQ 15, 3 VII 1951 [17], [64]; Craiova — GQ 20/21, Dolj district, 3 VI 1953 [92]; Mt. Făgăraș, at Avrig — IL 25, 17 VIII 1954 [11]; Gârbova — GR 18, Alba district, 17 VIII 1954 [11]; București — MK 21/22/31/32, 17 IX 1973 [90].

On *Sesleria heuffleriana* Schur, Broșteni MN 03, Suceava district 29 VIII 1960 [70].

- On *Sesleria rigida* Heuff. ex Reichenb., Băile Herculane — FQ 17, Caraș-Severin district, 23 V 1923, as *Claviceps microcephala* (Wallr.) Tul. [64], [93]; Cheile Turzii — GS 06, Cluj district, 23 VI 1932, 26 V 1935 [7], [64], [70]; Mt. Apuseni, at Izbulul Ponorului — FS 65, 7 VII 1971 [9] and Cheile Runcului — FS 75, 26 VI 1962, VIII 1966, 1968 [6], [20], [70], [93].

REFERENCES

- Ainsworth G. C., Sparrow F. K., Sussman A. S., *The Fungi, An Advanced Treatise*, IV A, Academic Press, New York, San Francisco, London, 1973.
- Alexandri Al. V., MAIA, ASAS, ICPP, *Centr. mater. did. prop. agr.* București, 1977.
- Barbu Valeria, *Ocotirea naturii*, 16, 1, 1972, 57—61.
- Barna B., *Ujabb adatok az anyarozs ismeretéhez (Claviceps purpurea Tul.)* *Dale noi despre cunoașterea cornului secării (Claviceps purpurea Tul.)*, Doctoral thesis, Cluj, 1905, 1—25.
- Banescu Veronica, *St. cerc. biol., Seria Biol. veget.*, XV, 2, 1963, 175—202.
- Bechet Maria, *Studia Univ. Babeș-Bolyai Cluj, Seria Biologie*, 1, 1969, 21—28.
- Bechet Maria, *Contrib. bot., Univ. Babeș-Bolyai Cluj-Napoca*, 1975, 9—18.
- Bechet Maria, Crișan Aurelia, Szász Elisabeta, Csüros Margareta, *Contrib. bot., Univ. Babeș-Bolyai Cluj-Napoca*, 1978, 39—68.
- Bechet Maria, Moldovan I., *Contrib. bot., Univ. Babeș-Bolyai Cluj*, 1962, 71—80.
- Beldie Al., *Flora României, Determinator ilustrat al plantelor vasculare*, II, Ed. Academiei, București, 1979.
- Bojor O., *Herba Hungarica*, 7, 2—3, 1968, 137—114.
- Bontea Vera, *Ciuperci parazite și saprofite din România*, II, Edit. Academiei, București, 1986.
- Bontea Vera, Cîrțu D., Glodeanu C., *St. cerc. biol., Seria Biol. veget.*, 7, 3, 1975, 235—237.
- Bontea Vera, Manoliu Al., *St. cerc. biol., Seria Botanică*, 24, 6, 1972, 477—482.
- Borza Al., *Flora și vegetația Sebeșului*, Edit. Academiei, București, 1959, 55—62.
- Bubák Fr., *Beiblatt zu den Növénytani Közlemények*, VI, 4, 1907, 19—56.
- Comes I., *An. Luer. șt. Inst. agron. Craiova*, 1957, 331—338.
- Comes I., Ene Ileana, *Contribuții la cunoașterea microflorei (Chap. V)*, in *Pajiștile din masivul Paring și îmbunătățirea lor*, Edit. agrosilvică, 1962, 91—101.
- Comes I., Ene Ileana, *Bul. șt. Inst. agron. Craiova*, VII, Supplement, 1964, 151—168.
- Crișan Aurelia, Hodișan Viorica, *Contrib. bot., Univ. Babeș-Bolyai Cluj*, 1971, 45—54.
- Csüros S., Gherghely I., Pop S., *Contrib. bot., Univ. Babeș-Bolyai Cluj*, 1962, 131—150.
- Dennis R. W. G., *British Ascomycetes*, Verlag von J. Cranner, 1968.
- Dihoru Gh., *Învelișul vegetal din muntele Siriu*, Edit. Academiei, București, 1975, 17—19.
- Dobrescu C., Volcinski A., *Anal. șt., Univ. Iași (New Series), sec. II (St. nat.)*, VI, 1960, 223—224.
- Dobrescu C., Volcinski A., *Anal. șt., Univ. Iași (New Series) sec. II (St. nat.)*, VIII, 2, 1962, 279—284.
- Docea E., *Bul. șt. Acad. R. P. R., St. biol., geol., geogr.*, IV, 3, 1952, 505—517.
- Docea E., Negru Al., Bechet Maria, *St. cerc. biol., Acad. R.P.R., Filiala Cluj*, XII, 1, 1961, 47—59.

28. Eliade Eugenia, St. cerc. biol., Seria Biol. veget., **XIV**, 1, 1962, 429—458.
29. Eliade Eugenia, Anal. Univ. București, Seria Biol., **38**, 1963, 55—59.
30. Eliade Eugenia, Com. bot., SSNG, **III**, 1965, 177—190.
31. Eliade Eugenia, Bănescu Veronica, St. cerc. biol., Seria Biol. veget., **XV**, 2, 1963, 203—213.
32. Eliade Eugenia, Cristurean I., Anal. Univ. București, Seria Biol. veg., **XX**, 1971, 75—87.
33. Eliade Eugenia, Marin A., Anal. Univ. București, Seria St. nat., Biol. **XVII**, 1968, 223—226.
34. Eliade Eugenia, Zanoschi Val., Anal. Univ. București, Seria Biol. veget., **XIX**, 1970, 97—104.
35. Hatman M., Lazăr Al., Iacob Viorica, Lucr. șt. Inst. agron. "Ion Ionescu de la Brad" Iași, **I**, agro-hort., 1974, 15—16.
36. Hulea Ana (coordinator), Bul. prot. plant., 2—3, 1984, 19—121; 2—3, 1987, 17—114.
37. Hulea Ana, Paulian Fl., Comes I., Hatman M., Peiu M., Popov C., *Bolile și dăunătorii cerealelor*, Edit. Ceres, București, 1975.
38. Ioniță M., Lucr. ses. șt. Inst. agron. Timișoara (1957), 1958, 37.
39. Kovali E. Z., *Klavitsipitalingye griby SSSR*, Akad. Nauk Ukrainskoy SSR., Inst. Mikrobiologii i virusologhii im. D. K. Zabolotnogo, Kiev Naukova Dumka, 1984.
40. Lehrer A., *Codul biocartografic al principalelor localități din R. S. România*, Edit. Dacia, Cluj-Napoca, 1977.
41. Lehrer A., Lehrer Maria, Anal. șt. Univ. "Al. I. Cuza" Iași (New series), Sec. II, Biol., **XXIV**, 1978, 173—174.
42. Lungescu Elena, Bul. Inst. Politehnic Brașov, Seria B, Ec. forest., Bot., Silv., 1968, 49—58.
43. Manoliu Al., Lucr. șt. Volum omagial 1946—1975, ASAS, ICPP Fundulea, St. exp. agr Suceava, 1973, 317—326.
44. Manoliu Al., Anton Daniela, Rusan M., St. com. ocrot. nat. Suceava, 1977, 131—137.
45. Manoliu Al., Rusan M., Bol. da Soc. Broteriana, **XLVII** (2 sér.), 1973, 63—76.
46. Manoliu Al., Rusan M., Rev. roum. biol., Sér. Biol. végét., **22**, 1, 1977, 37—44.
47. Mititiuc M., Anal. șt. Univ. Iași (New series), sec. II (St. nat.) **XIII**, 1, 1964, 145—151.
48. Mititiuc M., Anal. șt. Univ. Iași (New series), sec. II, **XIV**, 2, 1968, 373—379.
49. Mititiuc M., St. com. ocrot. nat. Suceava, 1970, 169—187.
50. Mititiuc M., Lucr. Stațiunii „Stejarul”, Ecologie terestră și genetică, 1972—1973, 35—39.
51. Mititiuc M., St. com., Muz. șt. nat. Bacău, **6**, 1973, 107—110.
52. Mititiuc M., An. Muz. jud. Suceava, Fasc. St. nat., **VI**, 1980, 71—77.
53. Mititiuc M., Anal. șt. Univ. "Al. I. Cuza" Iași, Biol., **XXXII**, Supliment, 1986, 36—38.
54. Mititiuc M., Dascălescu D., St. com., Muz. șt. nat. Bacău, 1972, 29—34.
55. Mititiuc M., Dascălescu D., An. Muz. șt. nat. Piatra Neamț, Seria botanică-zoologie, **III**, 1977, 31—35.
56. Mititiuc M., Marin Elena, Anal. șt. Univ. Iași (New series), sec. II, **XVIII**, 2, 1972, 475—478.
57. Mititiuc M., Slonovschi V., Anal. șt. Univ. Iași (New series), sec. II, **XXI**, 1975, 98—100.
58. Mititiuc M., Stefan N., Anal. șt. Univ. "Al. I. Cuza" Iași, Biol. veget., **XXIX**, 1983, 35—38.
59. Mititiuc M., Vitalariu Gh., Com. șt. Univ. Iași, Inst. Pedag., 1939, 307—314.
60. Mititiuc M., Volcinski A., Anal. șt. Univ. Iași (New series), sec. II (St. nat.), **XI**, 1, 1965, 151—156.
61. Mititiuc M., Volcinski A., Anal. șt. Univ. Iași (New series), sec. II (St. nat.), **XIII**, 2, 1967, 275—279.
62. Moesz G., Emlékkönyv a Székely Nemzeti Museum ötvenés jubileumára. A Székely Nemzeti Museum Kiadása Sepsiszentgyörgy, 1939, 545—556.
63. Negrean G., St. com., Satu Mare, **V—VI**, 1981—1982, 577—595.
64. Nyárády A., Popescu V., Lucr. șt. Inst. agron. Cluj. **XVII**, 1961, 193—208.
65. Pop I., Probleme de biologie, 1963, 153—157.
66. Pop I., *Flora și vegetația Cîmpiei Crișurilor (interfluviul Crișul-Negru-Crișul Repede)*, Edit. Academiei, București, 1968, 59—67.
67. Rădulescu E., Anal. Fac. agr. Cluj, **XI**, 1945, 3—30.
68. Richișeanu A., Stancu R., Rev., muz., monum. Muzee, **5**, 1976, 57—63.
69. Rogerson C. T., Mycologia, **LXII**, 5, Sept.-Oct. 1970, 865—910.
70. Sandu-Ville C., *Ciupercei Pyrenomyces-Sphaeriales din România*, Edit. Academiei, București, 1971.
71. Sandu-Ville C., Lazăr Al., Hatman M., Lucr. șt. Inst. agron. Iași, 1959, 171—193.
72. Sandu-Ville C., Lazăr Al., Hatman M., St. cerc. șt. biol. șt. agr., Acad. R.P.R., Filiala Iași, **XIV**, 1, 1963, 7—22.
73. Sandu-Ville C., Rădulescu I., St. cerc. șt. biol. șt. agr., Acad. R.P.R., Filiala Iași, **V**, 3—4, 1954, 36—78.

74. Săvulescu Alice, (edited by), *Zonarca producției agricole din R.P.R.*, **II**, Edit. Academiei, București, 1957.
75. Săvulescu Alice, Hulea Ana, Bucur Elena, *Protecția plantelor în sprijinul zonării producției agricole în R.P.R.*, Edit. Academiei R.P.R., 1960.
76. Săvulescu Olga, Eliade Eugenia, *Omagiu lui Traian Săvulescu*, Edit. Academiei, București, 1959, 683—698.
77. Săvulescu Olga, Eliade Eugenia, Contrib. bot., Univ. Babeș-Bolyai Cluj, 1960, 77—83.
78. Săvulescu Tr., Anal. ICAR, **I**, 1930, 214—242.
79. Săvulescu Tr., Metode, îndrumări, rapoarte, anchete, **8**, ICAR, 1932.
80. Săvulescu Tr., Ann. Acad. Roum., Sec. Sci., Sér. III, Mém. 3, **XXIII**, 1948, 29—30.
81. Săvulescu Tr. (sub. red.), *Starea fitosanitară în România în anii 1932—1960*, ICAR, Metode, rapoarte, memorii, 1934—1963.
82. Săvulescu Tr., Sandu-Ville C., Bull. Soc. Mycol. France, Paris, **XLVI**, 3—4, 1930, 177—192.
83. Săvulescu Tr., Sandu-Ville C., Hedwigia, **75**, 3—4, 1935, 159—233.
84. Săvulescu Tr., Sandu-Ville C., Bull. Acad. Roum., Mém. Sci., Sér. III, **XV**, Mem. 17, 1940, 1—106.
85. Simonkai L., *Nagyvárának és vidékének növényvilága*, Budapest, 1890.
86. Simonkai L., Arad, **5**, 1893, 371—387.
87. Szász Elisabeta, János Viorica, Contrib. bot., Univ. Babeș-Bolyai, Cluj-Napoca, 1973, 74—84.
88. * * * *Herbarul Centrului de cercetări biologice Iași.*
89. * * * *Herbarium Mycologicum Moldavicum "C. Sandu-Ville" Iași.*
90. * * * *Herbarium Mycologicum Romanicum București (BUCM).*
91. * * * *Herbarium Phytopathologicum Transsilvanicum Cluj-Napoca.*
92. * * * *Schedae ad "Floram Olteniae exsiccatum", Centuria II și VI, Hortus Bot. Univ. Craiova*, 1965, 1967.
93. * * * *Schedae ad "Floram Romaniae exsiccatum" a Museo Botanico Universitatis Clusienensis editam*, Centuria XXIV—XXV, Muz. bot. Univ. Cluj, **XXIII**, 1—2, 1943, 1—66.

Received October 16, 1989

Biological Research Center Iași.

Str. 23 August 20A

6600 Iași-Romania

Research Institute of Plant Protection
București-Romania

UREDINALES FROM NORTH ALGERIA

ANGHEL RICHTEANU

The paper contains a list of 33 rust species, many of them deserving special attention because so far they have been reported from very few locations in Algeria or they were now collected from new host plants in this country. Notes on taxonomy and host problems are given for most species.

The rusts treated here were observed and collected during 1983—1985 by the author in North Algeria. The paper is based mainly on materials preserved in the Mycological Herbarium of the Institute of Biological Sciences, Bucharest (BUCM). The rest of collections as well as doublets of the material deposited in BUCM are found in the Botanical Department of the National Institute of High Education in Agronomy of Blida, Algeria.

The genera, species and the hosts under each species are arranged alphabetically.

Following usual practice, the various spore-forms in the rusts are indicated by the following symbols: 0 = spermogonia, I = aecidia or caeomata, II — uredo, III — teleuto.

The nomenclature of the fungi is according to Wilson & Henderson (1966), Jørstad (1958, 1962) and Braun (1982); that of the vascular plants follows Flora Europaea.

Acknowledgements. The author is indebted to Dr. Fatma Bounaga of the National Research Centre for Arid Zones in Algiers, and to Dr. Abdel Aziz Kedad of the National Institute of Agronomy, El Harrach, Algiers, for their valuable help and encouragements.

Coleosporium inulae Rabenh

On *Dittrichia viscosa* (L.) W. Greuter (syn. *Inula viscosa* (L.) Ait.), Blidean Atlas, Mt. Chréa, Haraza Hill, alt. c. 320 m, 5.X.1984, II + III, BUCM 108 925; distr. of Blida, commune of Souma, alt. c. 180 m, 15.XII.1984, II.

According to Jørstad (1958), the rust seems largely to follow this host, widespread in the Mediterraneans. Riofrio (1928) proved host alternation with *Pinus halepensis* Miller, but independence or host-alternation is probably general (Jørstad, 1958, 1962). In Algeria this rust is reported by Maire (1915) from Algiers, commune of El Harrach (formerly Maison Carrée). Then, Chevassut collected aecidia on the needles of *Pinus halepensis* from Bouinan, near Algiers, and uredo on *Inula viscosa* from Rovigo (actually Bougara) (Guyot & Chevassut, 1958).

Gymnosporangium clavariiforme (Pers.) DC

On *Crataegus monogyna* Jacq., distr. of Blida, at the wadi Mered near residential district Ben-Achour, alt. c. 210 m, 19.V.1984, 0 + I, BUCM 108 905.

Aecidiospores 23—31 × 21—27 μm, with 3.5—4.5 μm thick wall; the peridial cells are coarsely warted. In Algeria the chief alternate hosts

REV. ROUM. BIOL. — BIOL. VÉGÉT., TOME 35, N° 1, P. 33—44, BUCAREST, 1990

must be *Juniperus oxycedrus* L. and *J. phoenicea* L., two species of large occurrence in Tell Atlas.

Known on the same aecidial host from Bainem forest, near Algiers (Maire, 1915).

Guyot (1946 b) reported from North Africa *Aecidium oxycanthae* on *Crataegus oxyacantha*, collected by Ch. Chabrolin from Khanguet, 10.IV.1939, in a region where does not exist *Juniperus*, but where is of common occurrence *Tetractelis articulata* (Vahl) Masters (syn. *Callitris quadrivalvis*). However, it is not proved a genetical connection between these two hosts. Maire (1915) reported *Gymnosporangium gracile* Pat., collected by him near Batna (loco classico), 2.V.1912, on *Juniperus oxycedrus*. He stated that *G. gracile*, which among its aecidial hosts counts species of *Crataegus* is distinguished in having longer and narrower teleutospores than those of *G. clavariiforme*. In addition, in *G. gracile* the dikaryotic mycelium is systemic, producing witch brooms on the juniper. Without any motivation P. & H. Sydow (1915) included *G. gracile* in *G. clavariiforme*. In Jørstad's opinion (1962) *G. gracile* could be looked upon as a variety of *G. clavariiforme* too.

Gymnosporangium confusum Plowr

On *Crataegus monogyna* Jacq., distr. of Chlef, the valley of the wadi Djer, near Bou Medlaa, alt. c. 250 m, I.V. 1985, 0 + I, BUCM 108 904.

Aecidiospores $20 - 25 \times 19 - 23 \mu\text{m}$, smaller than those of *G. clavariiforme*; peridial cells with elongate, obliquely placed ridges, characteristic of this species. Maire (1920) identified frequently in North Africa *G. confusum* in its teleuto stage on *Juniperus phoenicea* L. and proved the host alternation with *Crataegus monogyna*.

Melampsora epitea Thum

On *Salix pedicellata* Desf., Blidean Atlas, Mt. Chréa, Haraza Hill, on the bed of a little wadi, alt. c. 400 m, 26.X.1984, II+III, BUCM 108 936.

Uredosori amphigenous, mostly hypophyllous; uredospores $16 - 20 \times 14 - 18 \mu\text{m}$ with $1.5 - 2.5 \mu\text{m}$ thick wall, heads of the uredo-paraphyses up to $20 \mu\text{m}$ broad, and with $1.5 - 6 \mu\text{m}$ thick wall. Teleutospores hypophyllous, few and small; teleutospores prismatic, rounded at both ends, wall up to $2 \mu\text{m}$, also at apex, $22 - 36 \times 7 - 17 \mu\text{m}$.

This rust, characterized by possessing subepidermal teleutospores which are not thickened above and have no distinguishable pore, corresponds to the collective species *M. epitea*, so commonly found on numerous species of *Salix* from the Arctic southward to the southern mountains of the N. hemisphere, and also in S. America. It is probable that in Algeria the rust can exist through the winter as mycelium in the stems and buds, and independent of the host-alternation. No rust appears to have been previously reported for *Salix pedicellata* Desf. in this country.

Melampsora euphorbiae (Schub.) Cast. var. *euphorbiae*

On *Euphorbia helioscopia* L., distr. of Blida, commune of Mefiah, in the park of the sanatorium, 31.III.1985, II, BUCM 108 930.

Uredospores $15 - 20 \times 13 - 18 \mu\text{m}$, wall more or less densely echinulate, without perceptible pores.

On *Euphorbia peplus* L., Blidean Atlas, Mt. Chréa, wadi Beni-Aza, alt. c. 350 m, 20.IV.1984, II + III, BUCM 108 929.

Spermogonia and aecidia were not observed. This host is very common in Tell Atlas and it is clearly generally followed by *M. euphorbiae*.

Melampsora populnea (Pers.) Karst. (syn. *M. pulcherrima* Maire)

On *Mercurialis annua* L., distr. of Blida, Blida, residential district Ben Achour, alt. c. 210 m, 11.IV.1984, 0 + I, BUCM 108 926; wadi Benzi Aza, alt. c. 220 m, 30.IV.1985, 0 + I, BUCM 108 894.

On *Populus alba* L., Algiers, commune of El Harrach, in the botanical garden of the National Agronomical Institute, alt. c. 20m, 24. XI. 1984, II + III, BUCM 108 927; distr. of Blida, residential district Ben Achour on wadi Beni Aza, alt. c. 220 m, 10.XIII.1984, II + III; Mt. Chréa, Quesia Hill, alt. c. 300 m, 30.XI.1984, II, 108 896.

As used here, *M. populnea* is a compound species including various morphologically very similar races, usually considered as species. According to Jørstad (1958), in this group it seems natural to place *M. pulcherrima* Maire, Bull. Soc. Hist. Nat. Afr. Nord., 7:139, 1915, a largely mediterranean rust which microscopically differs very little from the races having *Populus tremula* for chief diplot host.

As shown by Maire (1920, pp. XXI-XXII), this rust is alternating between *Populus alba* L. and *Mercurialis annua* L. and it seems to be of common occurrence on both hosts in Algeria.

Phragmidium rosae-sempervirentis Maire

On *Rosa sempervirens* L., Blidean Atlas, Mt. Chréa, Haraza Hill, alt. c. 350 m, 11.IV.1984, 0 + I, BUCM 108 934; Blida, residential district Ouled Yaich, on wadi Mered, alt. c. 170 m, 19.V.1984, 0 + I, BUCM 108 933; 22.V.1984, 0 + I, BUCM 108 935.

This opsis-form rust, described by Maire from Algeria and also reported from Morocco and Balears, seems to be a common species in North Africa, mainly in caecoma-stage. I examined many times the host in different places, particularly in the autumn, without finding the teleuto-stage which develops on branches.

Phragmidium violaceum (C. F. Schultz) Wint

On *Rubus ulmifolius* Shot. s.l. (syn.: *R. discolor* Whe. et Nees., *R. atlanticus* Pomel), Blidean Atlas, Chiffa's Gorges, Monkeys' Rivulet, alt. c. 450 m, 25.IX.1984, II, BUCM 108 931; distr. of Tipasa, Bérard Beach, alt. c. 3 m, 3.XI.1984, II + III, BUCM 108 932.

This rust is known for many species of the *Rubus* section *Eubatus* in whole Europe, West Asia, North and South Africa, and North America. *Rubus ulmifolius* is commonest species of brambleberry in Algeria and I found it commonly but, as a rule, not abundantly infected with *Phr. violaceum*. As I do not succeed in finding caecoma, the rust is probably able to maintain itself through uredo alone. However, Maire (1915) reported a caecoma-form of this species collected from Bouzaréa (Algiers).

***Puccinia allii* Rud. (syn.: *P. mixta* Fuck., *P. porri* (Sow.) Wint.)**

On *Allium* sp., Blidean Atlas, Mt. Chr  a, Bou-Tseldja Hill, alt. c. 450 m, 1.VI.1984, II + III, BUCM 108 912.

Uredospores $20-28 \times 18-21 \mu\text{m}$, wall $2-2.5 \mu\text{m}$ thick, very delicately echinulate. Teleutospores $40-65 (70) \times 16-22 \mu\text{m}$, wall smooth, up to $3-8 \mu\text{m}$ thick at the apex. Mesospores, as well as 3- or 4-celled teleutospores rather numerous.

The rust was collected by Maire on *Allium ampeloprasum* L. et *A. sphaerocephalum* L., II + III, at Maison Carr  e (act. El Harrach), Algiers (Maire, 1915, 1919) and on *A. vernale* Tineo at Cap Caxine near Algiers (Maire, 1915), and by Chevassut on *Allium chamaemoly* L., II, on Djebel Mouzaia near M  d  a (Guyot & Chevassut, 1958).

***Puccinia annularis* (Str.) Rohl. (syn. *P. chamaedryes* Ces.)**

On *Teucrium flavum* L., Blidean Atlas, Chiffa's Gorges, Monkeys' Rivulet, alt. c. 450 m, 25.IX.1984, III, BUCM 108 928.

This leptosporic rust was previously collected by Maire from the same place in 1912 and distributed by him in Myc. Bor. Afr., fasc. 2, no. 39, 1912 (Maire, 1915).

***Puccinia aristolochiae* (DC.) Wint.**

On *Aristolochia longa* L., distr. of Chlef, the valley of the wadi Djer near Bou Medfaa, alt. c. 250 m, 1.V.1985, II + III, BUCM 108 909; between Oued Djer and Bou Medfaa, alt. c. 230 m, 1.V.1985, II + III, BUCM 108 884.

Uredospores globoid to ellipsoid, yellowish-brown, $22-28 \times 20-26 \mu\text{m}$, wall delicately verruculose, c. $3 \mu\text{m}$ thick. Teleutospores ellipsoid, rounded at both ends, slightly constricted at the septum, chestnut-brown, $33-47 \times 20-27 \mu\text{m}$, wall smooth, up to $4 \mu\text{m}$ thick, pore of upper cell apical, of lower subequatorial or basal.

***Puccinia brachypodii* Otth var. *poae nemoralis* (Otth) Cumm. et H. C. Greene (syn.: *P. poae-nemoralis* Otth, *P. poae-sudeticae* J  rst.)**

On *Poa annua* L., distr. of Blida, Blida, residential district Ouled Ya  ch, alt. c. 190 m, 21.V.1984, II, BUCM 108 889.

The rust on *Poa annua* was collected for the first time in Africa from Boufarik and Baba Ali near Algiers by Chevassut in Febr. 1955 (Guyot & Chevassut, 1958). Here it appears to be scarce and in uredospore state only. In Africa this circumglobal rust is reported on *Poa* spp. from Algeria, Morocco, South Africa, and Uganda (Gjaerum, 1983).

***Puccinia calcitrapae* DC. (syn.: *P. carduorum* Jacky, *P. centaureae* DC., *P. cardui-pycnocephali* Syd., *P. bouinanensis* Guyot)**

On *Carduus tenuiflorus* Curtis (syn. *C. pycnocephalus* L. subsp. *tenuiflorus* (Curtis) Batt.), distr. of Blida, residential district "1st May", alt. c. 200 m, 22.V.1984, II + III, BUCM 108 886; Mt. Chr  a, Bou-Tseldja Hill, alt. c. 420 m, 1.VI.1984, II.

On *Centaurea sphaerocephala* L. s.l., distr. of Tipasa, commune of Bou Haroun, alt. c. 10 m, 23.XI.1984, II + III, BUCM 108 887.

On *Cheirolophus sempervirens* (L.) Pomel (syn. *Centaurea sempervirens* L.), Blidean Atlas, Chiffa's Gorges, Monkeys' Rivulet, alt. c. 350 m, 25.IX.1984, II + III, BUCM 108 888.

Puccinia calcitrapae is here regarded as containing a number of *formae speciales* occurring on various species of the tribe *Cynareae* of the family *Compositae*. They are characterised by "uredospores with thin echinulate walls with 3 equatorial pores and thin-walled, rounded, more or less verruculose teleutospores without apical thickening" (Wilson & Henderson, 1966).

It was previously reported as *P. cardui-pycnocephali* on *Carduus pycnocephalus* (Maire, 1915), and as *P. carduorum* on *Carduus macrocephalus* (Maire, 1919).

Puccinia bouinanensis Guyot, described on *Centaurea algeriensis* Coss. et Dur. from Bouinan near Algiers (Guyot et Chevassut, 1958) seems to belong to *P. calcitrapae* too. In the original material deposited in the Herbarium of the National Agronomical Institute, El Harrach, Algiers, I found the uredospores measuring $23-30 \times 22-27 \mu\text{m}$, and the teleutospores $22-36 \times 25-30 \mu\text{m}$.

***Puccinia coronata* Corda (syn.: *P. lolii* Niels, *P. coronifera* Kleb., *P. avena-cbarbatae* Gonz.)**

On *Avena sterilis* L., district of Blida, commune of Souma, alt. c. 180 m, 31.V.1984, II + III, BUCM 108 918; 6.V.1984, II + III; Mt. Chr  a, Bou-Tseldja Hill, alt. c. 500 m, 1.VI.1984, II + III.

On *Lamarckia aurea* (L.) Moench (syn. *Achyrodes aureum* (L.) Ktze), distr. of Blida, residential district "1st May", alt. c. 200 m, 22.V.1984, II + III; way of Souma, alt. c. 180 m, 31.V.1984, II + III, BUCM 108 919.

In Algeria the rust seems to be quite independent of the host-alternation with *Rhamnus*.

***Puccinia crepidicola* Syd.**

On *Crepis vesicaria* L., distr. of Blida, Blida way of Souma, alt. c. 180, m, 12.V.1984, II + III, BUCM 108 880.

Uredospores $19-28 \times 16-22 \mu\text{m}$, wall finely echinulate, $1.5-2.5 \mu\text{m}$ thick, with 2 equatorial pores. Teleutospores very variable, $29-43 \times 23-36 \mu\text{m}$, wall mostly $3-4 \mu\text{m}$ thick.

Maire (1915) reports this rust on *Crepis* (*Barkhausia*) *taraxacifolia* Thuill. from "Baba-Ali, plaine de la Mitidja".

***Puccinia echinopis* DC.**

On *Echinops spinosus* L., distr. of Blida, residential district Ouled Ya  ch on wadi Mered, alt. c. 180 m, 22.V.1984, II + III, BUCM 108 923.

***Puccinia galactitis* P. et H. Syd.**

On seedlings of *Galactites tomentosa* Moench (syn. *Lupsia galactites* (L.) O. Ktze), distr. of Blida, Blida on way of Souma, alt. c. 180 m, 15.VII.1984, III.

Previously reported by Maire (1915) from Algiers. According to J  rstad (1958, 1962), this rust belongs to the large compositous micro-

cyclic species *P. cnici-oleracei* Pers. : Desm. The host, which is a common weed in North Algeria, is apparently followed everywhere by this rust.

***Puccinia hieracii* Mart.** (syn. : *P. atlantica* Maire, *P. canariensis* Syd., *P. cichorii* Bell, *P. endiviae* Pass., *P. leontodontis* Jacky, *P. marquesii* Roll., *P. urospermi* Thüm.)

On *Hedipnois cretica* (L.) Dum.—Courset (*H. tubiformis* Ten.), distr. of Blida, Blida, residential district Ben Achour, alt. c. 200 m, 22.V.1984, II + III, BUCM 108 939.

On *Leontodon saxatilis* Lam. (syn. *L. nudicaulis* (L.) Banks), distr. of Blida, commune of Souma, alt. c. 130 m, 22.V.1984, II + III, BUCM, 108 940.

On *Leontodon* sp., commune of Souma, 6.VI.1984, II + III.

On *Leontodon tuberosus* L. (syn. *Thrinicia tuberosa* DC.), distr. of Blida, Blida, residential district Ben Achour, alt. c. 210 m, 22.V.1984, II + III, BUCM 108 938.

As here understood, *P. hieracii* Mart. is a collective species occurring on a large number of hosts, chiefly in the tribe *Cichorieae* of the *Compositae*. According to Wilson & Henderson (1966), *P. hieracii* closely resembles *P. calcitrapae*; the later is distinguished by the 3 equatorial uredospore pores. It is previously reported from Algeria on *Cichorium intybus* and *Lactuca scariola* as *P. cichorii* (Guyot & Chevassut, 1958), on *Seriola aetnensis* as *P. marquesii* (Maire, 1915), on *Leontodon tuberosus* (syn. *Thrinicia tuberosa*) as *P. canariensis* (Guyot & Chevassut, 1958), and on *Urospermum dalechampii* as *P. urospermi* (Maire, 1915; Guyot, 1946).

***Puccinia holeina* Eriks. ss. Henderson et Bennel, 1975** (syn. *P. hordei-murini* Buchw.)

On *Hordeum murinum* L., distr. of Blida, Blida, residential district Ouled Yaïch, alt. c. 190 m, 21.V.1984, II, BUCM 108 911.

Previously reported by Guyot & Chevassut (1958) as *P. hordei-murini* from Maison Carrée (act. El Harrach), Algiers.

***Puccinia magydaris* Pat. et Trab.**

On *Magydaris pastinacea* (Lam.) Paol. (syn. *M. tomentosa* (Desf.) Koch ex DC.), distr. of Blida, Blida, residential district Ben Achour, alt. c. 200 m, 22.V.1984, II + III, BUCM 108 924.

Uredospores obovate, $27-39 \times 23-32 \mu\text{m}$, epispore $3-4 \mu\text{m}$ at sides, at apex thickened to $6.5 \mu\text{m}$, coarsely echinulate especially at apex, germ-pores 3, approximately equatorial. Teleutospores rounded at both ends, $40-54 \times 23-37 \mu\text{m}$, spore wall irregularly undulate.

This hemiform species was originally described by Pattouillard (Bull. Soc. Mycol. France 13: 205, 1897), based on a specimen collected by Trabut from Algiers. The rust seems largely to follow this host in North Africa and Spain. In Algeria *P. magydaris* is a very common occurrence, especially on the plain of Mitidja (Maire, 1915; Guyot & Chevassut, 1958).

***Puccinia malvacearum* Bert. ex Mont.**

On *Lavatera cretica* L., distr. of Blida, Blida, residential district "1st May", alt. c. 200 m, 30 IV.1984, III, BUCM 108 876, residential district Ben Achour, alt. c. 220 m, 2.IV.1984, III, BUCM 108 878.

Reported from Algeria by Maire (1912) as collected from Algiers in February.

On *Lavatera* sp., distr. of Setif, Djemila on Roman ruins, 7.XII.1984, III, BUCM 108 877.

On *Malva nicaeensis* All., distr. of Tipasa, the valley of the wadi Hachem, Ben Khira Plains, E. of Cherchel, alt. c. 16 m, 12.V.1985, III, BUCM 108 879.

***Puccinia podospermi* DC.**

On *Scorzonera laciniata* L. (syn. *Podospermum laciniatum* (L.) DC.), distr. of Chlef, the valley of the wadi Djer near Medfaa, alt. c. 250 m, 1.V.1985, II + III, BUCM 108 907.

Uredospores globoid to ellipsoid, $22-30 \times 21-26 \mu\text{m}$, wall echinulate, $1.5-2 \mu\text{m}$ thick, with 2 germ-pores. Teleutospores ovoid or ellipsoid, rounded at both ends, $30-45 \times 24-32 \mu\text{m}$, wall c. $4 \mu\text{m}$ thick, verruculose, pore of upper cell near apex, of lower near base.

***Puccinia recondita* Rob. : ex Desm.** (syn. : *P. aegilopsis* Maire, *P. agropyri* Ell. et Ev., *P. madritensis* Maire, *P. rubigo-vera* Wint., [*P. symphyti-bromorum* F. Muel.])

On *Clematis cirrhosa* L., distr. of Blida, commune of Souma, in the recreation forest, alt. c. 130 m, 25.X.1984, 0 + I. distr. of Tipasa, commune of Bérard, Bérard Beach, alt. c. 3. m, 3.XI.1984, 0 + I; Blidean Atlas, Mt. Chréa, Quessia Hill, alt. c. 350 m, 30.XI.1984, BUCM 108 899.

On *Clematis flammula* L., Blidean Atlas, Mt. Chréa, Quessia Hill, alt. c. 350 m, 30.XI.1984, 0 + I, BUCM 108 903.

On *Cynoglossum* sp. (probably chiefly *C. pictum* Ait.), Blidean Atlas, Mt. Chréa, Quessia Hill, alt. 350 m, 30.XI.1984, 0 + I, BUCM 108 898.

On *Aegylops ovata* L., distr. of Blida, Blida, residential district of SONATRACH, alt. c. 200 m, 7.VI.1984, II + III, BUCM 108 890; distr. of Chlef, on the valley of the wadi Djer, near Bou Medfaa, alt. c. 250 m, 1.V.1985, II + III, BUCM 108 895.

On *Bromus lanceolatus* Roth, distr. of Blida, commune of Souma, alt. c. 180 m, 31.V.1984, II + III, BUCM 108 891; 6.V.1984, II + III.

On *Bromus madritensis* L., distr. of Blida, Blida, residential district Ouled Yaïch, alt. c. 200 m, 22.V.1984, II + III; commune of Souma, alt. c. 180 m, 31.V.1984, II + III, BUCM 108 893.

On *Bromus rigidus* Roth (syn. : *B. villosus* Forsk., *B. maximus* Desf.), Blidean Atlas, Mt. Chréa, Bou-Tseldja Hill, alt. c. 500 m, 1.VI.1984, II + III BUCM 108 892.

P. recondita is a very complex species including various morphologically very similar races or *formae speciales* which are mainly distinguishable only by reference to haplont or diplont host relations. Thus, according to Jørstad (1958), the above-mentioned rust on *Aegylops ovata*, corresponding to *P. aegilopsis* Maire, alternate with *Cynoglossum pictum* and *Echium italicum*, two acedial hosts very common in North Algeria, as

well as with other boraginaceous species, including *Anchusa*, *Lithospermum*, and *Solenanthus* (Maire, 1920; Dupias, 1971).

On species of *Bromus*, rusts of *Puccinia recondita* type (brown rusts or leaf rusts), were observed commonly in Algeria on *B. madritensis* and *B. rigidus*, and rarely on *B. lanceolatus*. Maire's observations indicate that in Telian Atlas *Clematis cirrhosa* serve as aecidial host for the rust corresponding to *Puccinia madritensis* Maire on *Bromus madritensis* and *B. rigidus* (Maire, 1920), but whether this host-alternation is obligate or not is unknown. This author described from Algeria on *Bromus madritensis* another brown rust, *P. bromi-rupestris* (syn. *P. bromina* f. sp. *bromi-rupestris* Guyot and Maire, 1939). Various species of *Thalictrum* and members of *Boraginaceae* occurring in Algeria may come into consideration too as possible aecidial hosts of the brown rusts on *Bromus* species.

Finally, the aecidia on *Clematis flammula* L. were indicated by Maire (1920) as a haploid phase of the brown rust *Puccinia agropyri* on *Agropyron repens* (L.) P. B. in Algeria.

***Puccinia schismi* Bub.** (syn.: *P. fragosoi* Bub., *P. koeleriae* Bagnis, *P. koeleriae* Politis, *P. laguri-chamaemoly* Maire)

On *Koeleria phleoides* (Vill.) Pers. (syn. *Lophochloa phleoides* (Vill.) Rehb.), distr. of Blida, Blida, residential district "1st May", alt. c. 200 m, 1.V.1984, III, BUCM 108 908.

Teleutospores $52-65 \times 19-23 \mu\text{m}$.

On *Lagurus ovatus* L., Blidean Atlas, Mt. Chr  a, Bou-Tseldja Hill, alt. c. 540 m, 1.VII.1984, II + III, BUCM 108 910.

Uredospores yellowish, $22-30 \times 21-27 \mu\text{m}$; teleutospores $51-60 \times 20-27 \mu\text{m}$ with apex thickened to $8 \mu\text{m}$.

The rust on *Lagurus ovatus* was described by Maire (1919) as *P. laguri-chamaemoly* from "coteaux T  lemly", Algiers. The uredospores measured $22-26 \times 18-23 \mu\text{m}$, and the teleutospores were $36-60 \times 18-22 \mu\text{m}$. Maire (1919, 1920) indicate that in Tell Atlas *Allium chamaemoly* L. serves as an aecidial host for this rust. In inoculation experiments with the *Lagurus* rust made by Guyot & Massenot (1953) and Dupias (1950) *Allium roseum* proved to be one of the aecidial hosts. Guyot (1939), Dupias (1950), and Guyot & Massenot (1953) established an alternation with *Allium* for the rust *P. fragosoi* on *Koeleria phleoides* too.

I follow Cummins (1956), J  rstad (1958, 1962) and Dupias (1971) in placing these two Mediterranean grass rusts which are known to be alternating with species of *Allium* in the compound species *P. schismi*.

***Puccinia smyrnii* Biv.-Bernh.** (syn. *P. smyrnii-olusatrum* Lindr.)

On *Smyrniolum olusatrum* L., distr. of Blida, Mt. Chr  a, alt. c. 1350 m, 10.I.1984, 0 + I + III, commune of Souma, alt. c. 180 m, 26.I.1984, 0 + I + III, BUCM 108 921; Blida, on wadi Beni Aza, alt. c. 220 m, 2.VI.1984, III, BUCM 108 902; commune of Meftah, in the park of the sanatorium, 31.III.1985, 0 + I + III, BUCM 108 922.

Sometimes all kinds of spores may be observed together from August to April.

***Puccinia tanacetii* DC.** (syn.: *P. absinthii* (Hedw. f.) DC., *P. artemisiella* P. et H. Syd.)

On *Artemisia arborescens* L., distr. of Tipasa, commune of B  rard, at the mouth of the wadi Oureit, alt. c. 3 m, 23.XI.1984, II + III.

Uredospores $27-34 \times 20-23 \mu\text{m}$, teleutospores $39-50 \times 23-26 \mu\text{m}$. As here understood, *P. tanacetii* is a compound species embracing several varieties, races or special forms occurring on *Artemisia* and *Chrysanthemum* which, in part, show slight morphological differences. In our collection the rust corresponds morphologically to *P. absinthii* (Hedw. f.) DC. (S  vulescu, 1953; Wilson & Henderson, 1966; Braun, 1982). In Algeria this species appears to be scarce on *Artemisia arborescens* as I only succeeded in finding it once.

***Tranzschelia discolor* (Fuck.) Tranz. et Litv.** (syn.: *Puccinia discolor* Fuck., *P. pruni-spinosae* Pers. f. *discolor* (Fuck.) E. Fisch., *Tranzschelia pruni-spinosae* (Pers.) Diet. var. *discolor* (Fuck.) Dunegan)

On *Amygdalus communis* L. (syn.: *Prunus communis* (L.) Arc. non Huds., *P. amygdalus* Batsch, *P. dulcis* (Mill.) D.A. Webb., *Amygdalus dulcis* (Mill.), Blidean Atlas, Mt. Chr  a, on the wadi Sidi El-Kebir, alt. c. 250 m, 20.X.1984, II + III, BUCM 108 881.

On *Armeniaca vulgaris* Lam. (syn. *Prunus armeniaca* L.), Blidean Atlas, Mt. Chr  a, Bou-Tseldja Hill, alt. c. 500 m, 23.X.1984, II + III, BUCM 108 883.

On *Prunus insititia* Jusl. (syn. *P. domestica* L. ssp. *insititia* (Jusl.) C.K. Schneid.), Blidean Atlas, Mt. Chr  a, Bou-Tseldja Hill, alt. c. 450 m, 23.X.1984, II + III, BUCM 108 882.

***Uromyces anthyllidis* Schroet.** (syn.: *U. baumlerianus* Bub., *U. guerk-eanus* P. Henn., *U. magnusii* Klc.)

On *Lotus ornithopodioides* L., Blidean Atlas, Mt. Chr  a, Bou-Tseldja Hill, alt. c. 500 m, 1.VI.1984, II + III, BUCM 108 901; distr. of Blida, commune of Souma, alt. c. 180 m, 24.IV.1985, II + III, 108 900.

Uredospores $22-30 \times 21-24 \mu\text{m}$, with $2-2.5 \mu\text{m}$ thick wall and 5-7 germ-pores. Teleutospores $20-25 \times 18-21 \mu\text{m}$, with $2-2.5 \mu\text{m}$ thick wall which is decidedly verrucose. In the collection from Souma the host plants were strongly injured, and the uredospores were infected with *Eudarlucacaricis* (Fr.) O. Erikss. (as anamorph).

On *Medicago polymorpha* L. (syn. *M. hispida* Gaertn.), Souma, alt. c. 180 m, 6.VI.1984, II, BUCM 108 937.

Uredospores $21-32 \times 20-25 \mu\text{m}$, with c. $2 \mu\text{m}$ thick wall and (4) 5-6(-8) germ-pores.

On *Melilotus infesta* Guss., distr. of Blida, commune of El Affroun, on the valley of the wadi Bou Roumi, alt. c. 200 m, 1.V.1985, II + III, BUCM 108 906.

Uredospores $22-25 \times 21-24 \mu\text{m}$. Teleutospores $20-24 \times 19-23 \mu\text{m}$.

U. anthyllidis may be considered a collective species and a considerable number of forms or races have been described on various genera of Leguminosae. This rust seems to be widespread on many hosts in Algeria

(Guyot, 1951). On *Medicago polymorpha* are known to house *U. anthyllidis* as well as *U. striatus*, but in the last species the spore-wall is given as 1.2–2 μ m thick, and the number of germ-pores as 3–4 (Jøstad, 1958, 1962; Braun, 1982).

Uromyces daetylidis Otth

On *Ranunculus macrophyllus* Desf., Blidean Atlas, Mt. Chréa, Quessia Hill, alt. c. 300 m, 30.XI.1984, O + I, BUCM 108 897.

On *Dactylis glomerata* L., Quessia Hill, alt. c. 350 m, 3.XI.1984, III, BUCM 108 917.

The teleutospores from November were on dead plants and they measured 22–31 $\times$ 14–20 μ m. This host-alternation has been observed by Maire (1920, p. XV) in Algerian Atlas where the two hosts are very common and grew intimately mixed.

Uromyces helichrysi Lagerh

On *Helichrysum rupestre* Rafin (syn.: *Helichrysum stoechas* (L.) DC. ssp. *rupestre* (Raf.) M., *H. fontanesii* Camb.), distr. of Chlef, the valley of the wadi Djer between Oued Djer and Bôu-Medfaa, alt. c. 230 m, 2.V. 1985, III, BUCM 108 885.

Teleutospores very variable, ovoid to subpyriform, rounded or subconical at the apex, brown, 26–32 $\times$ 22–27 μ m, wall smooth, thicker (up to 8 μ m) and darker at the apex, pedicels persistent, up to 90 μ m or more

Uromyces muscari (Duby) Graves (syn. *U. scillarum* (Grev. ex Berk.) Wint.)

On *Scilla autumnalis* L., Blidean Atlas, Mt. Chréa, Haraza Hill, alt. c. 250 m, 15. II. 1984, III, BUCM 108 913.

Teleutospores 19–27 $\times$ 16–20 μ m, wall smooth, c. 1.5 μ m thick.

Our collection agrees well with the description made by Săvulescu (1953) and by Wilson & Henderson (1966) for *U. muscari* (= *U. scillarum*), looked upon as a compound species that lives on many host species belonging to the liliaceous genera (incl. *Muscari*, *Scilla*, and *Urginea*).

This rust was previously reported from Algeria on *Muscari comosum* (Maire, 1915; Guyot, 1946, 1946a), *M. racemosum* (Guyot, 1946), *Scilla obtusifolia* (Juel, 1901), *S. peruviana* (Maire, 1915), and *Urginea maritima* (= *U. scilla*) (Maire, 1915; Guyot & Chevassut, 1958).

On *Scilla autumnalis* Hariot described from Algeria in 1913 the species *Uromyces scillinus* with teleutospores similar to those in *U. muscari*, but it seems to possess even an aecidial stage. According to Guyot (1951), these aecidia may represent a haploid phase of another heteroecious rust.

Uromyces salsolae Reich

On *Salsola kali* L., distr. of Tipasa, commune of Bérard, at the mouth of the wadi Ourcît, alt. c. 3 m, 23.XI.1984, III, BUCM 108 920.

Teleutospores 28–35 $\times$ 18–23 μ m, wall smooth, up to 7 μ m thick about the apical pore; pedicels very long and flexuous, persistent.

Jøstad (1958) treated this rust as belonging to the compound species *U. chenopodii* (Duby) Schroet., together with *U. salicorniae* de Bary, occurring on members of various chenopodiaceous genera.

Uromyces viciae-fabae (Pers.) Schroet. (syn.: *U. orobi* (Pers.) Lév., *U. fabae* de Bary ex Cooke)

On *Vicia faba* L., (cult.), distr. of Tipasa, the valley of the wadi Hachem, Ben Khira Plains, E. of Cherchel, alt. c. 16 m, 12.V.1985, BUCM 108 914, 108 915.

On *Vicia sativa* L., Blidean Atlas, Mt. Chréa, Haraza Hill, alt. c. 300 m, 7.VI.1984, II + III, BUCM 108 916.

Uredospores on *Vicia faba* 22–30 $\times$ 17–23 μ m, distantly echinulate, wall mostly 2–3 μ m, sometimes up to 4 μ m thick, with 3 or 4 germ-pores. Teleutospores on *V. sativa* 28–40 $\times$ 19–27 μ m, wall smooth, brown up 8–13 μ m thick at apex.

Apparently one of the most widely spread of the Uredinales on many leguminous species.

REFERENCES

1. Braun U., *Die Rostpilze (Uredinales) der Deutschen Demokratischen Republik*, Feddes Repertorium, **93**, (3–4): 213–331, 1982.
2. Chabrolin Ch., Guyot A. L., *Contribution à l'étude des Uredinées parasites de la flore tunisienne*, Uredineana, **1**, 3–26, 1938.
3. Cummins G. B., *Host index and morphological characterization of the grass rusts of the world*, Plant Disease Reporter, suppl. 237, 1956.
4. Dupias G., *Étude expérimentale d'Uredinées hétéroxènes* (Troisième note). Bull. Soc. Hist. Nat. Toulouse, **35**: 33–44, 1950.
5. Dupias G., *Essai sur la biogéographie des Uredinées. Son apport à la systématique*, Bull. Soc. Mycol. France, **87** (1–2): 129–412, 1971.
6. Gjaerum, H. B., *East African Rusts (Uredinales)*, mainly from Uganda. 1. On *Poaceae*, Mycotaxon, **18**: 209–234, 1983.
7. Guyot A. L., *Contribution à l'étude des Uredinées parasites de la flore algéro-tunisienne*, Uredineana, **2**, 46–49, 1946.
8. Guyot A. L., *Mycotheca uredineana* (fasc. 2), distribuée par A. L. Guyot, Uredineana, **2**: 153–155, 1946b.
9. Guyot A. L., *Les Uredinées*. II. *Uromyces*, Encyclopédie Mycologique, Lechevalier, Paris, 331 pp., 1951.
10. Guyot A. L., Chevassut G., *De quelques Uredinées d'Algérie*. 1. Uredineana, **5**: 385–400, 1959.
11. Guyot A. L., Maire R., *Sur une forme de Puccinia rubigo-vera (DC.) Winter, parasite des Bromes en Algérie*, Uredineana, **1**: 91–94, 1939.
12. Guyot A. L., Massenet M., *Études expérimentales sur les Uredinées hétéroiques réalisées du Laboratoire de Botanique de l'École Nationale d'Agriculture de Grignon (Seine-et-Oise) au cours des années 1949 à 1952*, Uredineana **4**: 281–354, 1953.
13. Jøstad I., *Uredinales of the Canary Islands*, Skrift. Norske Vid. Akad. Oslo, I. Math. Nat. Kl., **2**: 1–182, 1958.
14. Jøstad I., *Investigations on the Uredinales and other parasitic fungi in Mallorca and Menorca*, Skrift. Norske Vid. Akad. Oslo, I. Math. Nat. Kl., **2**: 1–73, 1962.
15. Juel H. O., *Contributions à la flore mycologique de l'Algérie et de la Tunisie*, Bull. Soc. Mycol. France, **17**: 257–273, 1901.
16. Maire R., *Schaedae ad Mycothecam Boreali-Africanum*, Séries 1 (fasc. 1–7), Bull. Soc. Hist. Nat. Afr. Nord, **6**, 1915.
17. Maire R., *Schaedae ad Mycothecam Boreali-Africanum*, Séries 2 (fasc. 8–9). Bull. Soc. Hist. Nat. Afr. Nord, **7**, 1916.
18. Maire R., *Schaedae ad Mycothecam Boreali-Africanum*, Séries 3 (fasc. 10–12). Bull. Soc. Hist. Nat. Afr. Nord, **8**, 1917.
19. Maire R., *Champignons nord-africains nouveau ou peu connus*, Bull. Soc. Hist. Nat. Afr. Nord, **8**: 134–200, 1917a.

20. Maire R., *Schaedae ad Mycothecam Boreali-Africanum*, Série 4 (fasc. 13—16), Bull. Soc. Hist. Nat. Afr. Nord, 10: 130—151, 1919.
21. Maire R., *Quelques Uredinales hétéroxènes de l'Afrique du Nord*, Bull. Soc. Bot. France, 61 (1914): XIV—XXIV, 1920.
22. Ozeda P., *Flora du Sahara*, 2nd ed., Paris, 1977.
23. Quezel P., Simonneau P., *Nouvelle flore de l'Algérie et des régions désertiques méridionales*, CNRS, Paris, 2 vol., 1962—1963.
24. Riofrio B. F., *Acerca de dos Uredinales heteroicos*, Bol. R. Soc. Espan. Hist. Nat. 23: 405—410, 1928.
25. Săvulescu Tr., *Monografia Uredinalelor II*, București, 1953.
26. Sydow P., Sydow H., *Monographia Uredinearum III*, Lipsiae, 1915.
27. Wilson M., Henderson D. M., *British Rust Fungi*, Cambridge, 1966.

Received November 3, 1989

Fruit Research Institute, Pitești — Mărăcineni
Department of Plant Protection, Romania

VICIA SATIVA L. SUBSP. SATIVA VAR. PLATYSPERMA BARULINA A DANGEROUS WEED FOR THE LENTIL CROP

V. SLONOVSKI, DIDONA RĂDULESCU, VIORICA IACOB, D. MITITIUC,
ELENA PĂTRĂȘCANU

In this paper we analysed thoroughly the taxon *Vicia sativa* L. var. *platysperma* Barulina, a dangerous weed for the lentil crop.

The analysis concerned the taxon morphology, palynology, biochemistry (of seeds), pests, phytopathogenous fungi. There are also given possibilities of identification of the weed in different vegetation stages to eliminate it easier from the lentil crops.

Vicia sativa L. ssp. *sativa* var. *platysperma* Barulina (called by the Romanian people "lintoi") is a dangerous weed for the lentil crops in Romania; that is why in force standards do not allow even one "lintoi" seed per lentil kilogram (STAS, 1-st class) or one seed at the most per lentil kilogram (STAS, 2-nd class) (M.A.I.A., 1974).

On account of this fact, and as it has an interesting (intergeneric) habitus, this taxon has waken up the interest of botanists for a long time.

The first to have called attention to it was A. F. Wiegmann who before 1881 (Rapaics 1919) considered it to be of a hybridogene origin (without trying an experimental interbreeding) on the basis of both the flattered seeds like the lentil ones (♂) and the vegetative organs similar to those of the *Vicia sativa* L. subsp. *sativa* (spring vetch) (♀). W. O. Focke, being accustomed to Wiegmann's works, put it in the xenic class a decision disputed by R. Rapaics on account of the fact that its descendants would have disappeared after the first generation (Rapaics, 1919). On the basis of A. F. Wiegmann's works, Ascherson and Graebner received the hybridogene origin of this taxon with reserve (Ascherson and Graebner 1906—1910), mentioning it with suspicion.

In Hungary, *Vicia sativa* subsp. *sativa* var. *platysperma* Barulina was identified by E. Legány (in 1908) at Magyaróvár (without noticing its segregation), and by Rapaics in 1918 at Debrecen in the lentil crops, too. As a result of a comparative study on *Vicia sativa* (spring vetch) and *Lens culinaris* (lentil), the latter concluded that *Vicia sativa* subsp. *sativa* var. *platysperma* is a hybrid of the two mentioned species, and called it *Vicialens leganyana* (Rapaics 1919). In 1960 as a result of interbreedings made under laboratory conditions between *Vicia sativa* ssp. *sativa*, *Lens culinaris*, *Vicia sativa* ssp. *sativa* var. *platysperma*, Mettin and Hanelt rejected the possibility of any hybridization between the two species; their theory was supported by some karyological research-works (Hollings and Stace 1974, Mettin and Hanelt 1964). On the basis of the above mentioned reasons, this taxon has been classified either as a variety (*V. sativa* L. var. *platysperma* Barab. — Topa and Nyárády 1957 —, *V. sativa* L. var. *platysperma* Barulina — Fedchenko 1948), an unimportant form of the *V. sativa* species situated between the *segetalis* and the *cordata* varieties (Topa and Nyárády 1957), or as a species (*Vicia lenssisperma*, *V. platysperma* (Ionescu-Sisești 1955). *Flora Europaea* has not taken it into account,

not mentioning it even (as a synonym (Ball, 1968). From the specialized literature we have had access to, we have learnt that this taxon can be found only in the lentil crops being known in Romania, The Republic of Hungary and the U.S.S.R. (Fedchenko 1948, Soó 1966, Topa and Nyárády 1957).

For a better knowledge of this taxon several investigations have been carried out, namely, biometrical measurements as compared to *V. sativa* subsp. *sativa* (both in populations and in the herbaristic material existing in Romania), the test of the origin (done by the author V. Slobovschi himself), biochemical analyses (Dr. Mihai Lazăr, The Institute of Medicine and Pharmacy of Iași), pollen analysis (Dr. Didona Rădulescu, The Centre of Biological Research, Bucharest), vegetal parasites (Dr. Viorica Iacob, The Agronomical Institute of Iași), animal parasites (Dr. Helena Pătrășcanu, The Agronomical Institute of Iași).

We consider it necessary to make a re-examination of the diagnosis for *Vicia sativa* due to the fact that in flowers, pods and leaflets we have not found out the variations mentioned in literature, even in the samples from the well-fertilized soils (at the fodder vetch — *V. sativa* L. cv. *Suceava* 54, the flowers, the pods and the leaflets are big, but the seeds are never lentiform, with prominent rootlet through the tegument, the hilum area being flattened like a saddle).

By analysing the obtained data, it comes out that *Vicia sativa* subsp. *sativa* var. *platysperma* is a stable and distinctive taxon which has not been given a higher systematic rank only because of the lack of a characteristic area (a fact evident both in the specialized literature and in the herbarium sheets in Romania).

The palynological analysis reveals small dissimilarities between these two taxons, specifying that in *V. sativa* subsp. *sativa* var. *platysperma*, the intervals between dimensions are smaller (fig. 1, Table 1).

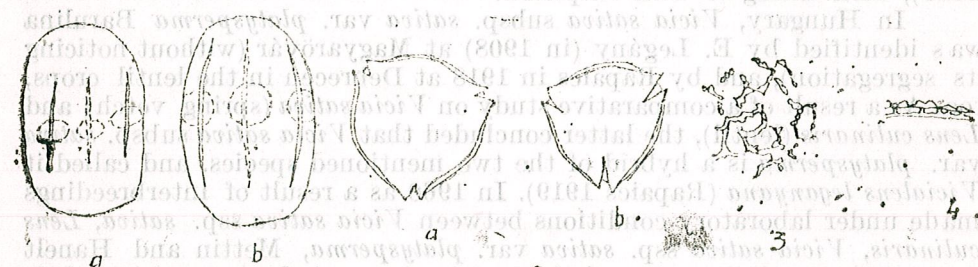


Fig. 1. — Shape, size and structure of pollen grains of *Vicia sativa* subsp. *sativa* and *V. sativa* subsp. *sativa* var. *platysperma*.
a. *V. sativa* subsp. *sativa* var. *platysperma*; b. *V. sativa* subsp. *sativa*.
1. pollen side view; 2. pollen polar view, exine outline and thickness (75 ×); 3. exine ornamentation (1900 ×); 4. optical section (1900 ×).

As a result of a three year's study on the collected seeds and on the plants obtained from these seeds, we have, noticed no segregation.

With regard to the biochemical analyses performed for the seeds of these two taxons, they pointed out to the existence of two substances in

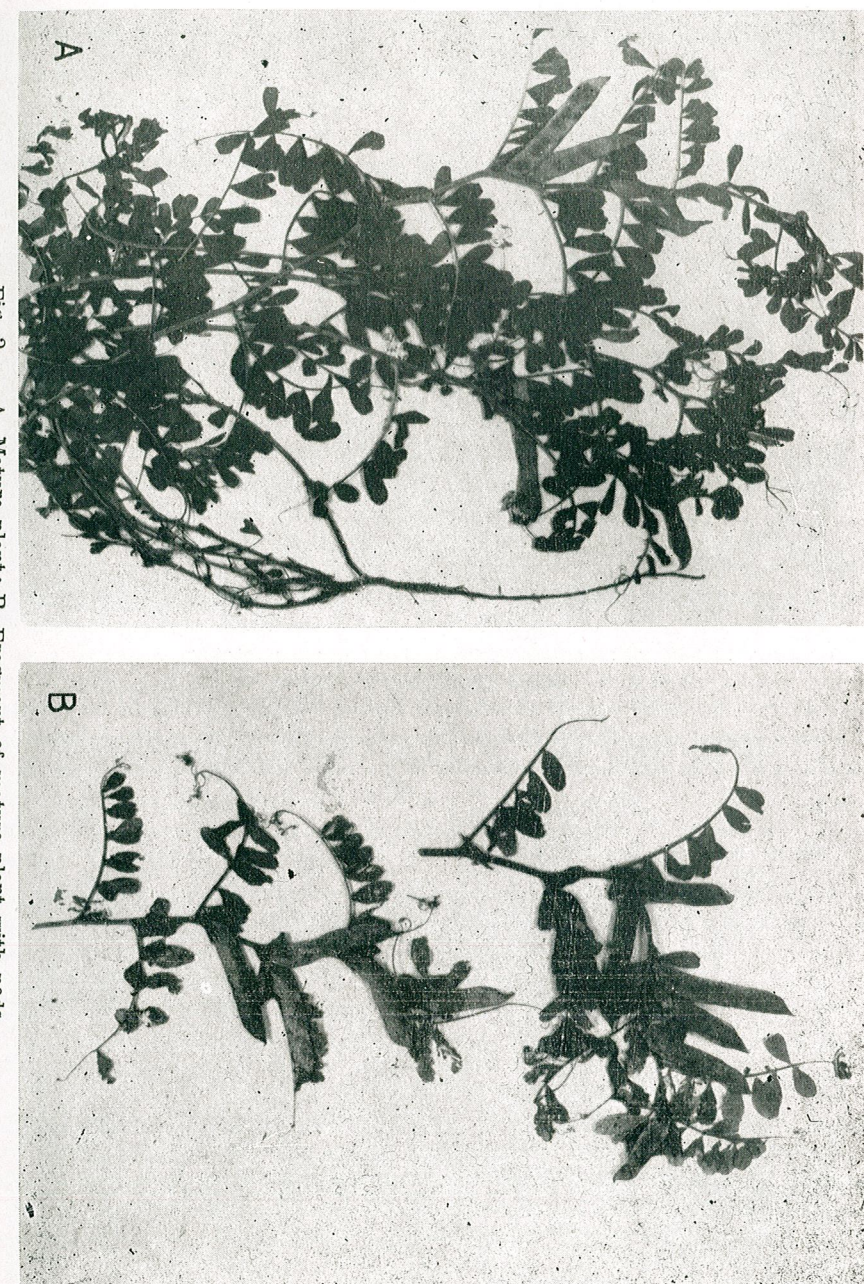


Fig. 2. — A. Mature plant; B. Fragment of mature plant with pods.

Table 1

Data concerning the analysis of pollen grains in *Vicia sativa* subsp. *sativa* and *V. sativa* subsp. *sativa* var. *platysperma*

Taxon	Sizes			Size	Shape	Optical section	Aperture	Orna- menta- tion
	P μ	E μ	Exine μ					
<i>V. sativa</i> subsp. <i>sativa</i> var. <i>platysperma</i>	29—30	(22)25—30	0.5—(1)	Average	Subprolate-prolate	Tegilate-baculate	3-colporate pollen long colps approx. 50% (elliptical—ora elliptical Reticuloid opening)	Reticululated
<i>V. sativa</i> subsp. <i>sativa</i>	32—40	22—30	0.5—(1)	Average	Subprolate-prolate	Tegilate-baculate	3-colporate pollen long colps approx. 65—75% elliptical or circular—ora (elliptical opening)	Reticuloid

V. sativa subsp. *sativa* var. *platysperma* Barulina which could not be found in *V. sativa* L. subs. *sativa*; for lack of a standard we have identified only the guanine (Lazăr. M. I. et al. — manuscript).

As for pests, a certain differentiation has been noticed. In the Podu Iloaiei surroundings (the country of Iași) two animal parasites have been identified, namely: *Apion vorax* Herbst. which consumes the immature seeds of these two taxons, and *Bruchus atomarius* L. whose adults appear when the seeds of *V. sativa* subsp. *sativa* reach maturity, even if the pods of the two taxons have been collected from the same parcel. As for vegetal parasites, *V. sativa* is parasited by *Uromyces viciae-fabae* (Pers.) Jorst; while *V. sativa* ssp. *sativa* var. *platysperma* Barulina by *Ascochyta viciae* Lib., *Vermicularia dematium* (Pers.) F.R. (on the stem) and *Uromyces viciae-fabae* (Pers.) Jorst (on the leaf).

From the morphological point of view, there are differences, sometimes quite striking ones between these two taxons, (Fig. 2, 3 and 4), (Table 2).

As *Vicia sativa* ssp. *sativa* var. *platysperma* depreciates a lentil meal since its seeds do not boil, the elimination of this taxon from the crop was intended. Elimination methods are manifold, some of them being difficult to apply. The separation of seeds by mechanical means does not bring about the expected results because of the lentiform shape of the seeds resembling the lentil ones (Fig. 5). The quartz lamp cannot be used except for obviating some uncertainties, because in order to make obvious the characteristic colour the tegument removal is required. Selection at the table of the "lintoi" seeds can be performed under the best conditions by persons who perfectly know the seeds, but the efficaciousness is much more reduced. That is why, we consider as the best method (at present) to pull up the plants of *Vicia sativa* var. *platysperma* in the field in all their stages of vegetation, since they distinguish quite clearly from the lentil ones, especially in the stages of plantlet and during the flowering period. Pulling up should be performed including the root or else the rest of the stem left regenerates, flowers and fructifies.

Fig. 4. — Plantlets.
a. *Vicia sativa* subsp. *sativa*; b. *Vicia sativa* subsp. *sativa* var. *platysperma*; c. *V. sativa* subsp. *sativa* var. *platysperma* "Suceava 54" the arrows indicate the narrow lanceolated leaflets of earlier leaves).

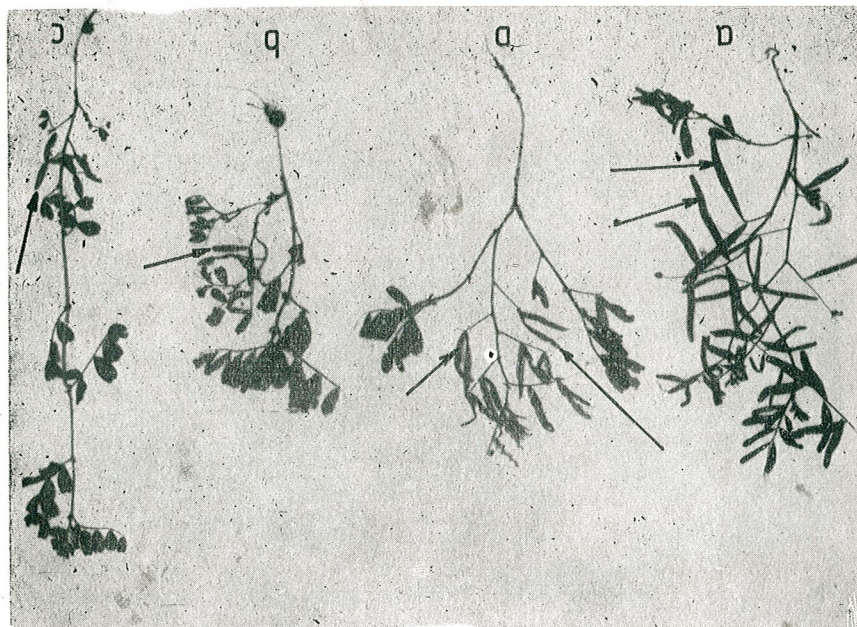


Fig. 3. — A. *Vicia sativa* subsp. *sativa* var. *platysperma* a. mature and immature pods; b. flowers; c. leaflets.
B. *Vicia sativa* subsp. *sativa* a. mature and immature pods; b. flowers; c. leaflets.

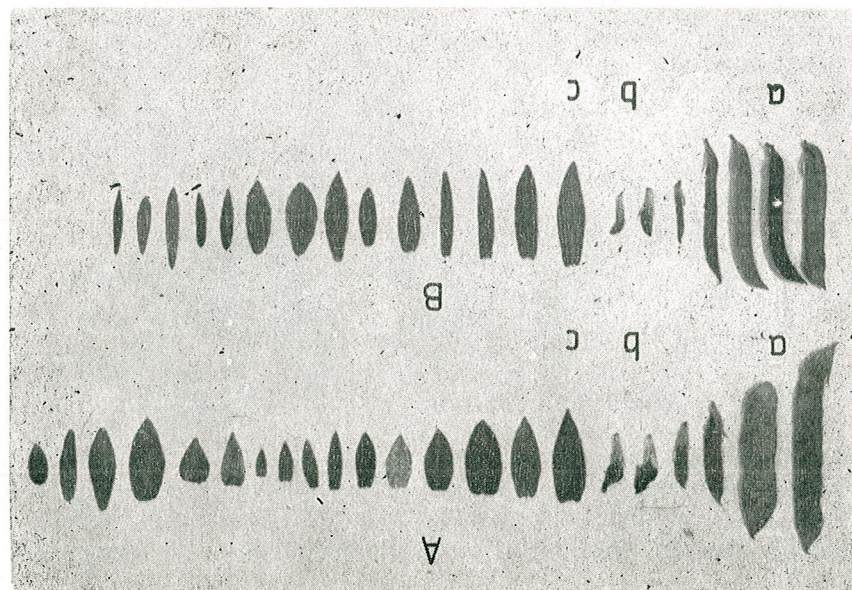


Table 2

Comparative table of the characteristics of the taxon *Vicia sativa* var. *platysperma* and *Vicia sativa* ssp. *sativa*

Plant organ	<i>Vicia sativa</i> sub sp. <i>sativa</i> var. <i>platysperma</i>	<i>Vicia sativa</i> ssp. <i>sativa</i>
Vegetation period	Annual	Annual
Plantlet	The first three leaflets have two narrow — lanceolated folioles, the petiole ending in a seta. The next two-three leaflets have four to six narrow — lanceolated folioles, but the seta is transformed into an unbranched tendril. The leaflets which keep on appearing have broad, obovated, oblong, emarginate and mucronate folioles; the rachis is prolonged by a tendril (Fig. 4, b, c).	All leaflets have narrow — lanceolated folioles. At the cv. "Suceav 54" the plantlet is similar to that of the <i>V. sativa</i> ssp. <i>sativa</i> var. <i>platysperma</i> (Fig. 4, a).
Stem	Vigorous, angulated, brached from the bottom, $\pm$ pilose, up to 1 m length.	Less vigorous, angulated, $\pm$ branched, $\pm$ pilose up to glabrescence 30–80 cm length
Leaf	The leaves ending in tribranched tendrils have six to eight pairs of obovated oblong-ovated broad-oblonged and narrow or broad-emarginate leaflets, with a mucro up to 2 mm and with a cuneated base. Seldom obtuse. The sizes of the leaflets range from (1) 22 to 27 (35) mm length and (4) 8 to 11 (13) mm width, with white wool on the lower face, sometimes on the upper face as well	Usually the lower leaves have no tendrils with obcordate leaflets. The upper leaves have tribranched tendrils with four to eight pairs of obovated, oblong, lanceolated, linear, obtuse or emarginate — mucronate leaflets.
Stipule	Four to eight toothed semisagittated stipules, 5–7 (10) mm length. The basal segment with violet, extrafloral nectarines. Starting from the top of the plant on a variable distance which goes as far as the middle of the plant the stipules are reduced to the final basal segment.	Four to eight toothed or incised semisagittated stipules, 5–7 mm length. The basal segment with extrafloral nectarines. The stipules are reduced to the final basal segment only on the top of the plant.
Flower	(1) 2 (3) flowers almost sessile (peduncle 1–3 mm), 17–23 mm length with glabrous and multicoloured petals. The standard lamina is broad-obovated, emarginate, with a small prolongation in emargination, red-violet longer than the claw which comes out of the calyx tube. The wings, shorter than the standard, are dark-violet. The pink keel is purple-stained at the top. The glabrous and filiform style is barbate under the stigma in the upper part.	Flowers almost sessile, single or in pairs, seldom more, 18–30 mm length (Ball 1968, Fedchenko 1948, Soó 1966, Topa and Nyárády 1957). In the studied samples the flowers length ranges between (8) 12 and 20 (25) mm.

Plant organ	<i>Vicia sativa</i> sub sp. <i>sativa</i> var. <i>platysperma</i>	<i>Vicia sativa</i> ssp. <i>sativa</i>
Vegetation period	Annual	Annual
Calyx	The calyx is slightly campanulate, 12–15 mm, length ciliated on veins, with unequal, erected, linear, lanceolated, ciliated teeth, separated by broad sinuses a bit longer than the tube. During the fructification period, the calyx is a little increased.	Tubular calyx. On the studied samples, the calyx, 7(9)–13(15) mm length, has linear lanceolated teeth, equal with or longer than the tube. In the studied samples their length is (7) 9–13 (15).
Pod	Elongated — linear, 4–8,5 cm length, (9)10(12) mm width compressed, finely-verrucous, finely-pubescent even at maturity; dark yellow, dark yellow-brown, brown-reddish, dark brown reddish. At the top it is $\pm$ straight. It splits up the calyx. On the outside it is slightly limited between the seeds, and on the inside a white material incompletely separates the seeds one from the other	Elongated linear, 4–8 cm length, 6–17(15) mm width (Ball 1968, Fedchenko 1948, Soó 1966, Topa and Nyárády 1957); in cross section it is slightly compressed or circular, finely-verrucous, at one end short pilosed, then glabrous black-brownish in colour. It splits up the calyx. In the studied samples, the length is 4–6 cm, the width 4–6 mm (seldom) 7.
Seed	There are six to twelve seeds in a pod. A seed is 5–7 mm in diameter, 2–3 mm thickness, with rounded edges. It is broad like a saddle in the hilum zone, with a prominent root perfectly visible through the testa. The hilum is long, broad, and obvious enough. The seed forms a turn at the connecting point between the root and the hilum. The strophiole appears like a dark point at small distance from the hilum	There are four to twelve seeds: in a pod, $\pm$ spherical, in 3.5–6.5 mm in diameter. The hilum is 1/6–1/5 from the seed circumference (Ball 1968, Fedchenko 1948, Soó 1966, Topa and Nyárády 1957). On the studied samples, the seeds are 3–5 mm in diameter. White at the cv. Suceava 54 they can be up to 7 mm in diameter.
Testa	It is wrinkled or smooth, mat greenish, yellowgreenish, blackish, mottled	It is smooth and shiny mat, brownish or black, mottled
Cotyledon	The cotyledons are pink, orange or light brown. Studied under the quartz lamp (after the testa has been removed), they are pink, orange or violet-shaded.	The cotyledons are pink, orange or light brown. Studied under the quartz lamp, they are pink, orange or violet-shaded

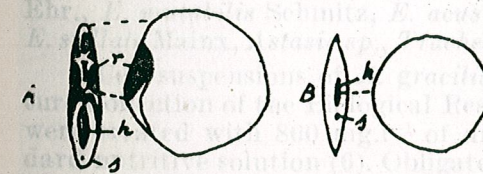


Fig. 5. — Seeds, front and side-view (magnified)
A. *Vicia sativa* subsp. *sativa* var. *platysperma*;
B. Lens culinaris: h, hilum; r, rootlet; s, strophiole



Fig. 6. — Mature stipules of *Vicia sativa* subsp. *sativa* var. *platysperma* (magnified).

CONCLUSIONS

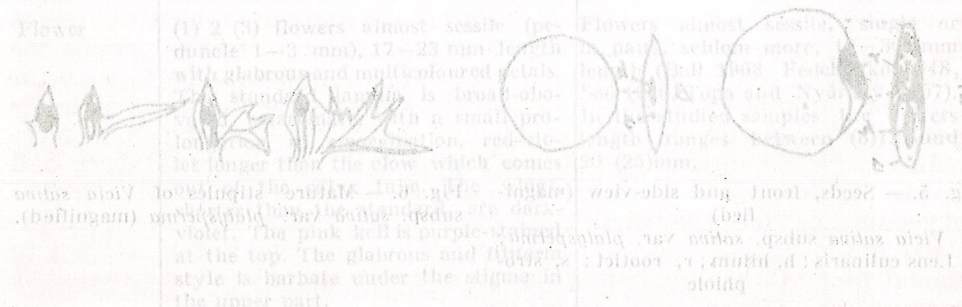
1. *Vicia sativa* L. subsp. *sativa* var. *platysperma* Barulina is a stable and well-individualized taxon, without a characteristic area.
2. From a genotypical point of view, this taxon is a mutant of the *Vicia sativa* species which could be kept among the lentil seeds because of its similar shape and developed according to Vavilov's Homologous Series.
3. The analysed taxon is dangerous weed for the lentil crop because it depreciates its quality.
4. The elimination of this weed from lentil can be accomplished by several methods, but the most reliable and economical one is to pull it up from the field in all its vegetation stages (before, during flowering and fructification and even in the stage of plantlet) as it is morphologically well differentiated both from the lentil (*Lens culinaris* Medik) and the spring vetch (*Vicia sativa* L. ssp. *sativa*).

Received November 3, 1989

The Agricultural Research Station,
Podu Iloaiei (Iasi)

REFERENCES

- Ascherson P., Graebner P., 1906—1910, Synopsis der Mitteleuropäischen Flora, 6, 2:1067
 Ball P. W., 1968, *Vicia* L. in Flora Europaea, 2 : 129—136, Cambridge.
 Fedchenko B.A., 1948, *Vicia* L. in Flora URSS, 13 : 460—463, Moscow, Leningrad.
 Hollings E., Stace C.A., 1974, Karyotype variation and evolution in the *Vicia sativa* L. aggregate, New Phytol., 73 : 195—208.
 Hollings E., Stace C.A., 1978, Morphological variation in the *Vicia sativa* L. aggregate, Watsonia, 12 : 1—14.
 Ionescu-Sisești Gh. 1955. *Buruienile și combaterea lor*. Edit. Agro-Silvică, București.
 Lazăr M.I. et al., Contribuții la studiul chimic al semințelor de linte, (in preparation).
 M.A.I.A., 1974, Semințele agricole pentru înșămânțare și consum. Colecție de standarde de stat și norme tehnice interne : 212—213.
 Mettin D., Hanelt P., 1964, Cytosystematische Untersuchungen in der Artengruppe um *Vicia sativa* L. 1., Kulturpflanze, 12 : 163—225.
 Rapaics, R., 1919. A lenesebűkköny *Vicia legányana* Rapaics et Lengyel. Magyar Botanikai Lapok, XVIII : 55—61, Budapest.
 Soó R., 1966, A Magyar flora és vegetáció, 2, Budapest.
 Topa E., Nyárády E. I., 1957, *Vicia* L. in Flora RPR, 5, 400—401, București.

INTRACELLULAR BACTERIA IN EUGLENOID
FLAGELLATESNICOLAE DRAGOȘ, LEONTIN ȘTEFAN PÉTERFI, AURORA NEDELCU,
VERONICA CRĂCIUN

The experiments have been carried out on the following euglenoid species : *E. gracilis*, *E. pisciformis*, *E. polymorpha*, *E. splendens*, *E. sanguinea*, *E. deses*, *E. mutabilis*, *E. acus*, *E. tristella*, *E. viridis*, *E. stellata*, *Astasia* sp., *Trachelomonas* sp. and *Phacus tortus*. Intracellular rod-shaped bacteria in the cytoplasm have readily been observed. The *E. mutabilis* and *E. deses* strains do not seem to contain them. In *E. polymorpha* bacteria were observed both in the cytoplasm and nucleoplasm.

Intracellular bacteria are seemingly uniform in size and ultrastructure. An electron transparent area is usually present between the surface of the prokaryote organism and the cytoplasm/nucleoplasm of the host cells. In some sections the nuclear envelope invaginations containing bacteria were observed. In *E. gracilis* cells treated with dihydrostreptomycin sulphate the bacterial cell wall is more sinuous, the prokaryote cell content more homogeneous and the electron transparent area is about 6—7 times wider. The nature of euglenoid cell — bacteria connection is discussed.

The intracellular occurrence (cytoplasm and nucleus) of bacteria has been first reported by G. F. Leedale (16), when studying the ultrastructure of euglenoid flagellates. Intracellular bacteria have also been identified not only in other euglenoid flagellates (13), but in species belonging to other groups as well : *Chlorophyceae* (2, 3, 4, 14, 15, 17, 28). *Prasinophyceae* (32), *Chrysophyceae* (1, 12, 27, 30). *Chloromonadophyceae* (11). *Dinophyceae* (8, 10, 26) and *Xanthophyceae* (21). Moreover, Wujek (21) reported them for *Pleurocapsa minor*, a prokaryote microorganism (cyanobacterium).

Our studies on the ultrastructure of euglenoid flagellates, some of which were published several years before (9, 22), have revealed the presence of intracellular bacteria in certain species belonging to the genera *Euglena*, *Trachelomonas*, *Phacus* and *Astasia*. The main results of this investigation are presented.

MATERIALS AND METHODS

The biological material examined ultrastructurally was sampled either from unialgal cultures on biphasic soil-water media (24) or from water bloom. Experiments have been carried out on a number of populations in the following species : *Euglena gracilis* Klebs., *E. pisciformis* Klebs., *E. polymorpha* Dang., *E. splendens* Dang., *E. sanguinea* Ehr., *E. deses* Ehr., *E. mutabilis* Schmitz, *E. acus* Ehr., *E. tristella* Chu, *E. viridis* Ehr., *E. stellata* Mainx, *Astasia* sp., *Trachelomonas* sp., *Phacus tortus* (Lemm.) Skv.

Cell suspensions of *E. gracilis* Klebs (strain 82 from the Algal Culture Collection of the Biological Research Centre in Cluj-Napoca — ACCB) were treated with 800 mg.l⁻¹ of dihydrostreptomycin sulphate in standard nutritive solution (6). Obligate phototrophy was achieved by the lack of any organic source of carbon. Samples were collected 48 hours and respectively 72 hours after treatment.

The cell pellets resulting from mild centrifugation were fixed in 2–6% glutaraldehyde for 1–2 hours, rinsed with phosphate buffer (PH) and postfixed with adequate amounts of osmium tetroxide (1–2%). The fixed cells were dehydrated in an acetone series and embedded in Westopal W (23). Sections were cut with an LKB Ultramicrotome and, after staining with lead citrate and uranyl acetate, were examined with a Tesla BS-613 or BS-500 transmission electron microscope.

RESULTS AND DISCUSSION

Intracellular rod-shaped bacteria were observed in most of the euglenoid species investigated (Figs. 1–5). Just two species, namely *E. mutabilis* and *E. deses*, do not seem to contain them. Bacteria most often occur within the euglenoid cytoplasm, outside the chloroplasts and mitochondria. In *E. polymorpha* bacteria were visible both in the cytoplasm and in the nucleoplasm (Fig. 5–7). Although bacteria were frequently observed close to the pellicular complex, seemingly no clear relationship can be established between this location and the way bacteria gain access to the euglenoid cell (Figs. 1, 4, 8).

The number of bacterial profiles in sections depends on the material. The most abundant occur in *E. polymorpha* and *E. gracilis* (several tens) (Fig. 7). Intracellular bacteria are seemingly uniform in size and ultrastructure. All euglenoid species have revealed bacteria about 0.3 μm wide and 0.7–0.8 μm long. The bacterial cell seems to be bounded by a double membrane wall (Fig. 5): their procaryote cytoplasm display typical ribosomes, markedly smaller than those in the euglenoid cytoplasm (Fig. 4). An electron dense nuclear material is mostly discernable in the central part of the profiles studied (Figs. 2, 4, 5, 7). Most sections also display bacterial cells undergoing binary division. An electron transparent area is usually found between the surface of the procaryote organism and the host cell cytoplasm, without any membranous structure (Fig. 5).

The intranuclear bacteria present in the nucleoplasm of *E. polymorpha* have no visible relationship with the chromatin and/or endosome (7). They exhibit the same ultrastructural features as the cytoplasmic ones. In certain sections the nuclear envelope reveals invaginations containing bacteria (Fig. 6). This location does not clearly account for the way bacteria might enter the nucleus.

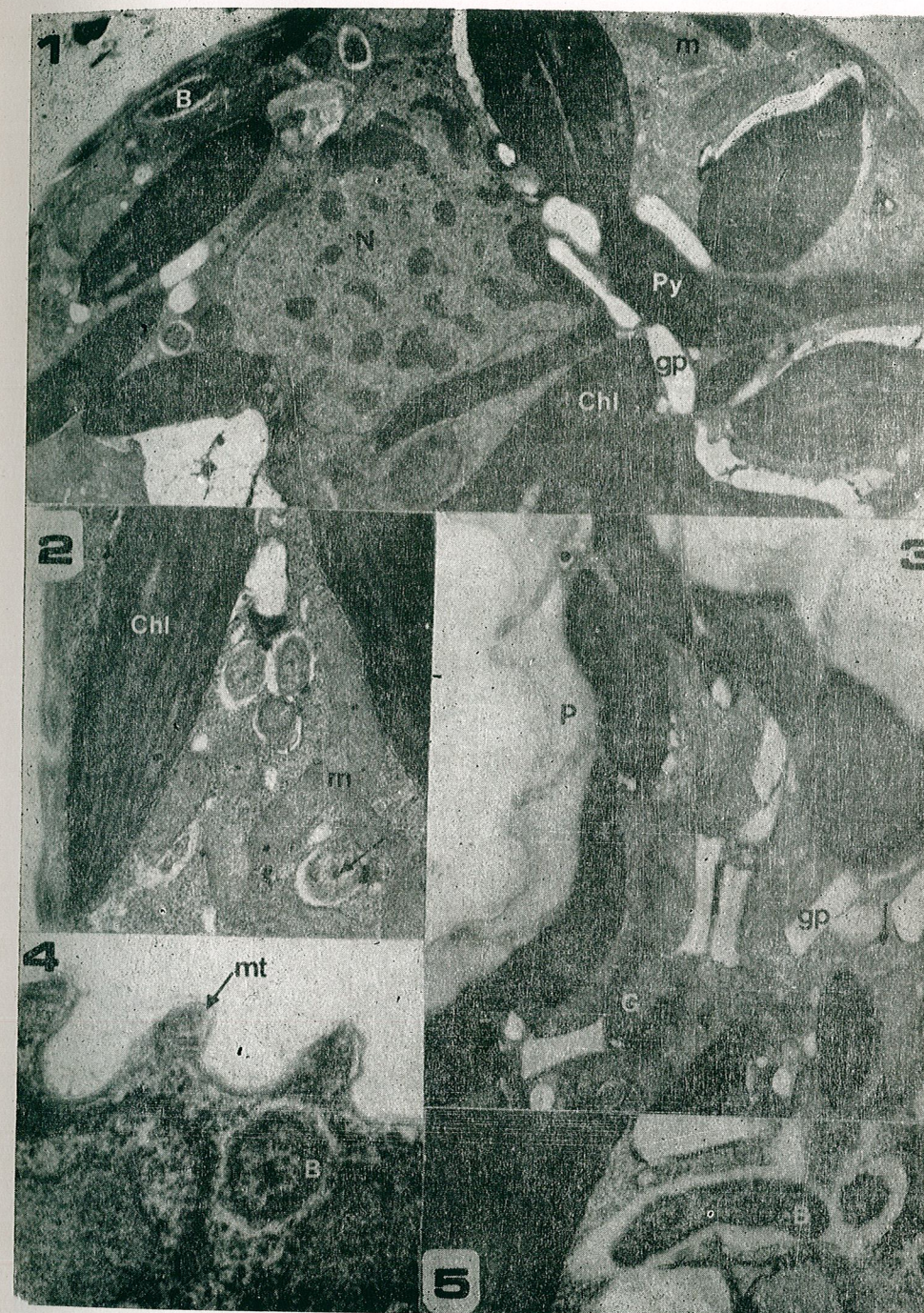
Fig. 1. — Part of *E. viridis* cell exhibiting the star-shaped pyrenoid surrounded by paramylon granules, nucleus, chloroplast ribbons, mitochondria and several rod-shaped bacterium profiles dispersed in the cytoplasm ($\times 9,500$).

Fig. 2. — Part of *E. acus* cell with three cross-sectioned bacteria. In their central part (arrow) an electron dense nuclear material can be observed ($\times 51,000$).

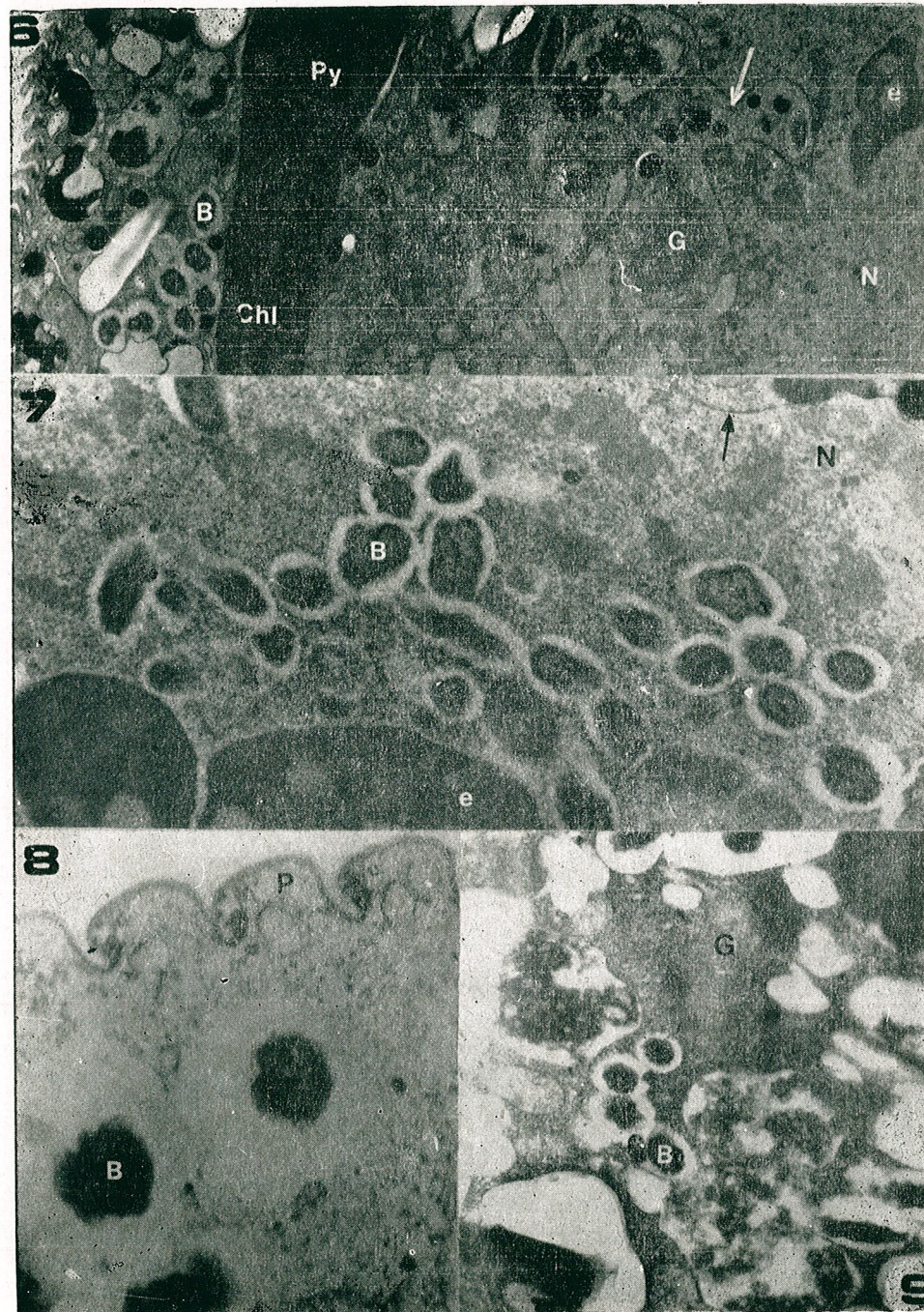
Fig. 3. — Several bacteria in the cytoplasm of a *Phacus tortus* cell (arrow) ($\times 29,000$).

Fig. 4. — A cross sectioned bacterium occurring close to the pellicular complex in *Astasia* sp. cell ($\times 57,400$).

Fig. 5. — Transversally and longitudinally sectioned bacterial cells in the cytoplasm of *E. polymorpha*. Note the electron transparent area between the bacterial profiles and the cytoplasm of the host cell ($\times 28,000$).



Abbreviations. B. — bacterium; Chl — chloroplast; e — endosome; G — Golgi body; gp — paramylon granules; m — mitochondria; mt — microtubules; N — nucleus; P — pellicle complex; Py — pyrenoid.



E. gracilis cells, when their suspensions have been treated with dihydrostreptomycin sulphate (800 mg.l^{-1}), are highly affected ultrastructurally, mainly at the level of chloroplasts (20). Their bacterial profiles, as frequent as those of untreated cells, are accordingly altered as concerns both ultrastructure and size (Figs. 8, 9). The cell wall becomes more sinuous, the cell content more homogenous, while the chromosome area is no longer clearly visible. The electron transparent area surrounding the bacteria is about 6–7 times wider.

Leedale (16) has reported the presence of intracellular bacteria in *E. spirogyra*, *Trachelomonas oblonga* var. *punctata* and *Strombomonas conspersa*. Certain strains of the first two species also contain endonuclear bacteria. He was aware of the wide distribution of bacteria in euglenoid cells, as further studies revealed (our paper reports them for 12 more species). Kies (13) has proved their presence *Colacium vesiculosum*. They are very frequent in *E. polymorpha* and *E. spirogyra*, nucleus included.

The origin of intracellular bacteria in euglenoid flagellates and their relationship to the host cell have not yet been demonstrated. Nevertheless, they may be undoubtedly assigned to the xenosomes (sensu Corliss) (5). So far, the bacterial attachment has not been found noxious to the host cell. On the other hand, this relationship is stable if not quite compulsory. In our experiment, *E. gracilis* strain 82 has preserved its intracellular bacteria for 10 years. This might suggest endosymbiosis. The advantages derived by the host cell remain obscure.

Leedale (16) has proved that intracellular bacteria do not fix nitrogen. Yet, it is well known that euglenoid flagellates are usually auxotrophs, their multiplication depending on exogenous vitamin B_{12} (4). Therefore, vitamin B_{12} synthesized by bacteria most probably provides an adaptive advantage preserved through selection.

The way bacteria gain entry to the host cell remains obscure, since the mature pellicle — with a complex structure — is unlikely to allow endocytosis. They more probably penetrate the reservoir or the vestigial cytostome, the latter being identified, unfortunately, only in a small number of species (29).

The high plasticity of primitive eukaryote cells facilitates the access of bacterial endosymbionts. This characteristic allows not only the natural penetration of bacteria but also the possibility of forced endosymbiosis. Such a forced endosymbiosis was achieved by the nitrogen-fixing bacterium *Azotobacter vinelandii* (aiming endocytobiosis) with fusible protoplasts as host cells (18, 19). Further investigation might pro-

Fig. 6. — Bacterial profiles apparently randomly distributed in *E. polymorpha* cell. An invagination of the nuclear envelope (arrow) containing a bacterium profile can be observed ($\times 11,300$).

Fig. 7. — Part of nuclear area of *E. polymorpha* cell showing numerous bacterial cells located in the nucleoplasm. Note the large, bacteria-free endosome; arrow shows nuclear envelope ($\times 26,000$).

Fig. 8–9. — Ultrastructural details of the bacterial profiles in *E. gracilis* cells treated with dihydrostreptomycin sulphate. Bacterial walls are more sinuous, the cell content more electron dense and homogeneous. The electron transparent area surrounding the bacterial cell is wider ($\times 83,000$; $22,600$).

vide control over endosymbioses, and this might open a new field for cell engineering which recently have designated "endocytobiotic engineering" (25).

REFERENCES

1. Belcher J. H., Nova Hedwigia, 1969, **18**, 257—270.
2. Burr F. A., West J. A., Phycologia, 1970, **9**, 17—37.
3. Colombo P. M., Phycologia, 1978, **17**, 148—151.
4. Cook J. R., in: *The Biology of Euglena*, 1968, Academic Press, New York and London, 244—314.
5. Corliss J. O., J. Protozool., 1985, **32**, 373—376.
6. Cramer M., Myers J., Arch. Mikrobiol., 1952, **17**, 384.
7. Dawes C. J., Lohr C. A., Rev. Algol., 1978, **13**, 309—314.
8. Dodge J. D., *The Fine Structure of Algal Cells*, 1973, Academic Press, London.
9. Dragoș N., Péterfi L. S., Crăciun C., Nova Hedwigia, 1979, **31**, 223—246.
10. Gold K., Pollinger U., J. Phycol., 1971, **7**, 264—265.
11. Heywood P., J. Phycol., 1978, **14**, 121—122.
12. Hibberd D. J., Brit. Phycol. J., 1971, **6**, 207—223.
13. Kies L., Mitt. Inst. Allg. Bot. Hamburg, 1980, **17**, 13—17.
14. Kochert G., Olsen L. W., Trans. Amer. Microsc. Soc., 1970, **89**, 465—478.
15. Lee W. S. B., Kochert G., J. Phycol., 1976, **12**, 194—197.
16. Leedale G. F., Österr. Bot. Z., 1969, **116**, 279—294.
17. Mishra A. K., Can. J. Bot., 1969, **47**, 1599—1603.
18. Nghia N. H., Gyurján I., Endocyt. C. Res., 1987, **4**, 131—141.
19. Nghia N. H., Gyurján I., Stefanovitz P., Paless Gy., Turtoczky I., Biochem. Physiol. Pflanzen., 1986, **18**, 347—357.
20. Nedeleu A., Dragoș N., Bercea V., Crăciun V., Stud. Cerc. Biol., in press.
21. Ott D. W., Cytobios., 1979, **24**, 185—194.
22. Péterfi L. S., Dragoș N., Crăciun C., Nova Hedwigia, 1979, **31**, 197—221.
23. Ploaie P. G., Petre Zoe, *Introducere în microscopia electronică cu aplicații la biologia celulară și moleculară*, 1979, Ed. Academiei, București.
24. Pringsheim E. G., J. Ecol., 1946, **33**, 193—204.
25. Rákósy-Tican L., Soran V., Dragoș N., Evoluție și adaptare, 1988, **3**, 31—37.
26. Silva E. S., Protistologica, 1978, **14**, 113—119.
27. Swale E. M. F., Brit. Phycol. J., 1969, **4**, 65—86.
28. Turner J. B., Friedmann E. I., J. Phycol., 1974, **10**, 125—134.
29. Willey R. L., Wibel R. G., Biosystems, 1985, **18**, 369—376.
30. Wujek D. E., Trans. Kansas Acad. Sci., 1978, **81**, 327—335.
31. Wujek D. E., Trans. Amer. Microsc. Soc., 1979, **98**, 139—141.
32. Wujek D. E., Gardiner W. E., Dawes C. J., Cryptogamie: Algologie, 1982, **3**, 121—127.

Received November 2, 1989

Biological Research Center,
3400 Cluj-Napoca, Str. Republicii nr. 48

LA VARIATION DES GLUCIDES DANS LES DRAGEONS DE LA VIGNE PENDANT LA PÉRIODE DE REPOS

ANCA ANTOHE

In the present paper the researches represent a continuation of the previous ones (1, 2, 3, 4) carried on in the north-east of Moldavia on *Vitis vinifera* types: Aligoté (type originated from France) and black Fetească (autochthonous type). During the profound vegetative rest in the branches and buds of *Vitis vinifera*, the quantity of glucides is smaller than that during the forced rest. Together with the preparation of the plant for the starting of vegetation, the quantity of glucides is changed. The Aligoté type has a greater quantity of glucides as an adaptation to the unfavourable conditions during winter.

Le rythme de développement d'une plante pérenne renferme différentes phases phénoménologiques qui constituent son cycle annuel.

Il y a deux caractéristiques essentielles de ce cycle: la période de croissance active et la période de repos.

Dans les zones tempérées, la périodicité thermique détermine le rythme végétatif des plantes pérennes qui comprend la phase de végétation active et la phase de repos.

Au cours de son évolution dans un climat modéré, la vigne a acquis la propriété de repos de ses activités physiologiques, ce qui la protège aussi d'un développement dans une période défavorable.

Après la chute des feuilles une série de transformations ont lieu dans les frageons et les bourgeons.

On a poursuivi la variation quantitative des glucides chez deux espèces de vigne: Aligoté (espèce originaire de France) et Fetească neagră (espèce indigène) dans la période de repos.

MATÉRIEL ET MÉTHODE

On a effectué l'étude dans la Station Expérimentale Hortiviticole Iași, dans des conditions d'expérimentation identiques à celles rappelées dans les travaux antérieurs (1, 2, 3, 4).

Pendant la période de repos, on a étudié les drageons d'un an de ces deux espèces. Les drageons ont été divisés en: base (comprenant les internœuds 1—4), milieu (internœuds 4—9) et sommet (internœuds 10—18).

On a analysé les internœuds divisés dans l'écorce avec le liber et séparément le bois. Les bourgeons ont été analysés avec leurs internœuds. La variation quantitative des glucides a été observée au cours des mois de décembre (repos profond), de février (repos forcé) et de mars (au début de la végétation).

Les glucides totaux (sucre directement réducteur, polyoses solubles dans l'eau et polyoses insolubles dans l'eau) ont été déterminés par la méthode titrimétrique Bertrand, modifiée par Iljin dans le sens de la micro-analyse.

REV. ROUM. BIOL. — BIOL. VÉGÉT., TOME 35, N° 1, P. 55 — 60, BUCAREST, 1990

RÉSULTATS ET DISCUSSIONS

Conformément aux figures 1 et 2, pour les deux espèces le repos profond se caractérise par l'absence des polyoses solubles dans l'eau.

Les polyoses insolubles se trouvent en grandes quantités par rapport au sucre directement réducteur.

A leur tour les réducteurs directs se trouvent dans une quantité plus réduite dans l'écorce de l'internœud que dans le bois de celui-ci ou dans les bourgeons.

Les polyoses insolubles dans l'eau prédominent sous forme de glucides dans tout les organes. Les quantités les plus importantes se trouvent dans le bois des internœuds, de même que dans les bourgeons avec leurs nœuds d'insertion. On a trouvé les mêmes résultats dans les travaux d'autres auteurs (6, 10).

Parmi les deux espèces, l'espèce Aligoté a plus de glucides que l'espèce Fetească neagră.

La position des internœuds le long des drageons des fruits présente une influence sur la dynamique des glucides, dans le sens que les internœuds et les bourgeons situés vers le milieu et au sommet du drageon se caractérisent par des quantités accrues de glucides, par rapport aux internœuds et aux bourgeons situés à la base du drageon.

L'organe qu'on vient d'analyser se distingue du point de vue de la quantité et de la qualité des glucides. Dans l'écorce et le liber, les glucides totaux se trouvent en quantités réduites par rapport au bois du même internœud et surtout par rapport aux bourgeons et à leurs nœuds.

Etant donné l'importance des glucides dans les conditions de basses températures, le fait que les bourgeons avec les plus grandes quantités de glucides se trouvent au milieu du drageon en reste un indice pour une bonne utilisation au printemps de l'année suivante. Les mêmes constatations ont été trouvées dans la littérature spécialisée (7, 8).

Pendant la période du repos forcé, on remarque l'apparition des polyoses solubles dans l'eau. Celles-ci apparaissent à la suite de la transformation de l'amidon dans des formes plus simples de glucides, qui ont le rôle de matériel énergétique ou pour réaliser différentes synthèses.

Les polyoses solubles dans l'eau se trouvent en quantités accrues, surtout dans le bois des internœuds et dans les bourgeons (surtout chez l'espèce Aligoté). Les glucides directement réducteurs augmentent pendant le repos forcé par rapport à leur quantité pendant le repos profond. Cette augmentation est plus évidente chez l'espèce Fetească neagră.

Les internœuds et les bourgeons qui se trouvent au milieu du drageon possèdent des quantités plus grandes de polyose directement réducteurs (spécialement les internœuds 7-9). Dans l'écorce et le liber des internœuds il y a moins de polyoses réducteurs que dans le bois de leurs nœuds.

Les polyoses insolubles dans l'eau pour les deux espèces se trouvent dans des quantités plus grandes que dans la période de repos profond.

Pour l'espèce Aligoté la quantité de polyoses insolubles dans l'eau est plus grande que pour l'espèce Fetească neagră.

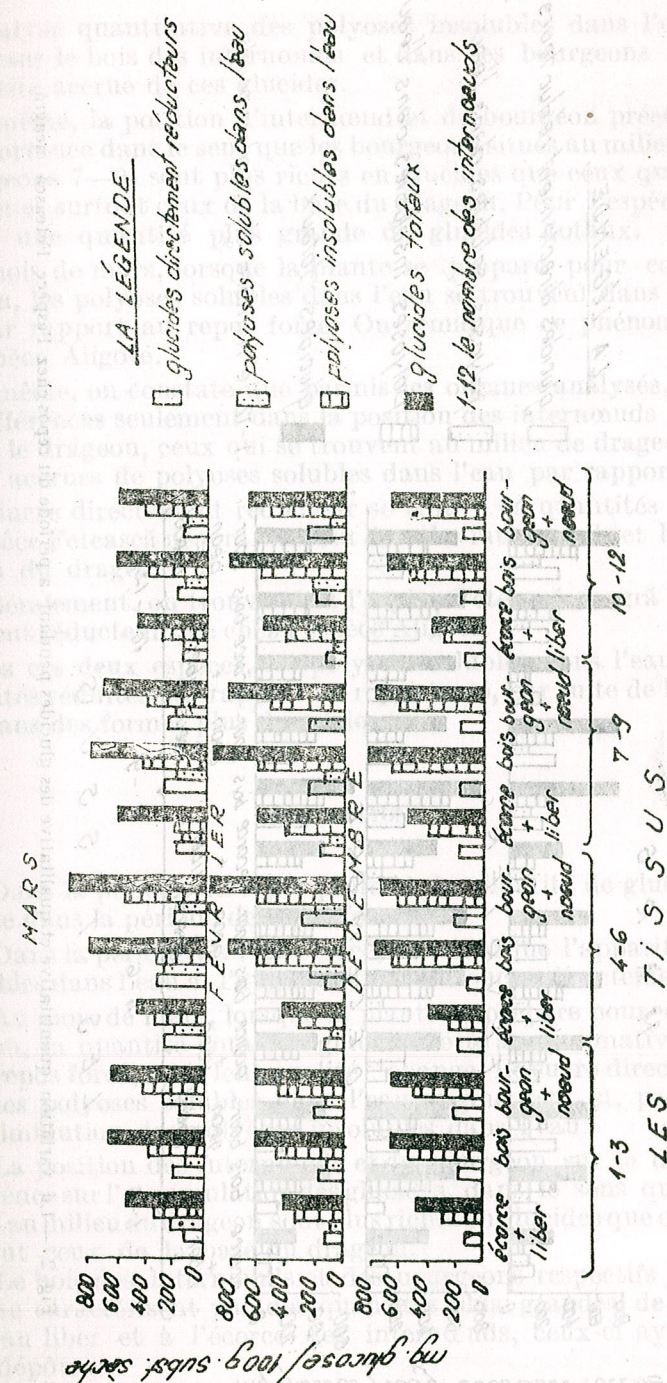


Fig. 1. — La variation quantitative et qualitative des glucides pendant la période du repos à l'espèce Aligoté.

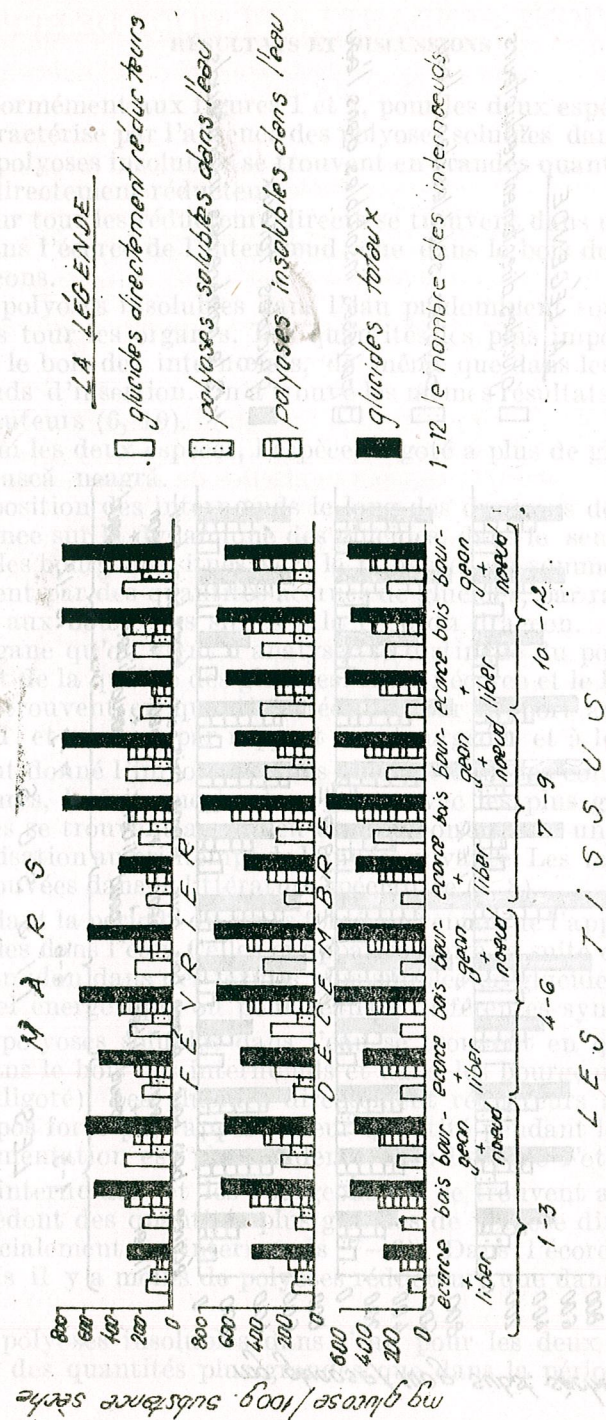


Fig. 2. — La variation quantitative et qualitative des glucides pendant la période du repos chez l'espèce Fetească neagră.

L'analyse quantitative des polyoses insolubles dans l'eau relève le fait que dans le bois des internœuds et dans les bourgeons se maintient une quantité accrue de ces glucides.

De même, la position d'internœud et de bourgeon présente une certaine importance dans le sens que les bourgeons situés au milieu du drageon (les bourgeons 7—9) sont plus riches en glucides que ceux qui se trouvent au sommet et surtout ceux de la base du drageon. Pour l'espèce Aligoté, on remarque une quantité plus grande de glucides totaux.

Au mois de mars, lorsque la plante se prépare pour commencer la végétation, les polyoses solubles dans l'eau se trouvent dans une quantité accrue par rapport au repos forcé. On remarque ce phénomène surtout chez l'espèce Aligoté.

De même, on constate que parmi les organes analysés, on ne saisit pas de différences seulement dans la position des internœuds et des bourgeons sur le drageon, ceux qui se trouvent au milieu de drageon ayant des quantités accrues de polyoses solubles dans l'eau par rapport aux autres.

Le sucre directement réducteur se trouve en quantités plus grandes chez l'espèce Fetească neagră, surtout dans les internœuds et les bourgeons du milieu du drageon.

Généralement, on trouve chez l'espèce Fetească neagră plus de sucre directement réducteur que chez l'espèce Aligoté.

Chez ces deux espèces, les polyoses solubles dans l'eau se trouvent en quantités réduites par rapport au repos forcé, par suite de leur transformation dans des formes plus dynamiques.

CONCLUSIONS

1. Dans la période du repos profond, la quantité de glucides est plus petite que dans la période de repos forcé.
2. Dans la période du repos forcé, on remarque l'apparition des polyoses solubles dans l'eau et l'augmentation du sucre directement réducteur.
3. Au mois de mars, lorsque la plante se prépare pour commencer la végétation, la quantité totale de glucides reste approximativement égale à celle du repos forcé, mais leur qualité change. Le sucre directement réducteur et les polyoses solubles dans l'eau augmentent et, parallèlement, a lieu la diminution des polyoses insolubles dans l'eau.
4. La position des internœuds et du bourgeon sur le drageon exerce une influence sur l'accumulation des glucides, dans le sens que ceux qui se trouvent au milieu du drageon sont plus riches en glucides que ceux du sommet et surtout ceux de la base du drageon.
5. Le bois des internœuds et des bourgeons respectifs sont des organes qui se caractérisent par des quantités plus grandes de glucides, par rapport au liber et à l'écorce des internœuds, ceux-ci ayant le rôle de tissu de dépôt.
6. L'espèce Aligoté a la plus grande quantité de glucides, comme accommodation aux conditions défavorables de l'hiver.

BIBLIOGRAPHIE

1. Antohe, Anca Lidia, Trav. du Muséum d'Hist. naturelle Gr. Antipa, 1984, XXV, 379.
2. Antohe, Anca Lidia, Rev. Roum. Biol. — Biol. végét., 1984, 28, 2, 77.
3. Antohe, Anca Lidia, Rev. Roum. Biol. — Biol. végét., 1984, 29, 2, 117.
4. Antohe, Anca Lidia, volume solennel 150 ans depuis la fondation du Musée d'Histoire naturelle, fondé en 1834, Iași, 1984.
5. Bernaz, Gh., Ann. Inst. vitic. et vinif., Valea Călugărească, 1975, 95.
6. Cojencanu, Natalia, Antohe, Anca Lidia, Travaux scientifiques Inst. Agronomique, 1971.
7. Dvornic, V., Pomohaci, N., Dvornic, Valentina Ilie, Maria, Travaux scientifiques Inst. Agronomique, Bucarest, 1966, 205.
8. Kondo, I. N., Cernomoret, Y. M., Document. Hortivitic., 1970, 11, 5, 39.
9. Kuzmin, A. I., Vinif. et Vitic., U.R. S. S., 1956, 1, 28.
10. Voica, N., Ann. Univ. Craiova, 1972, 111, vol. IV, 191.

Received December 14, 1988

Centre de recherches
biologiques, Iași,
Calca 23 August 20A

STUDIES UPON LICHEN RADIOACTIVITY

KATALIN BARTÓK *, ILDIKÓ MÓCSY **

The concentration of ^{134}Cs and ^{137}Cs has been studied in the lichens sampled from the Apuseni, Retezat, Rodna and Harghita Mountains, between 1975 and 1988. As a result of the nuclear accident which took place at Chernobyl (USSR), the ^{137}Cs concentration has increased 18 times approximately. It has been proved the existence of some species which have a greater accumulating capacity, being therefore considered radioactive pollution bioindicators.

Some of lichens' characteristics, such as: large surface compared to their biomass, lack of cuticle, ability to bound positive ions, extreme longevity and a low growth rate, turn these inferior plants into accurate bioindicators of atmospheric pollution (1, 10).

Together with the nuclear techniques, the radioactive pollution is also to be found. The radioactive substances which are discharged as a result of the nuclear explosions or accidents — in the shape of atmospheric depositions — pollute the soil, the vegetation, the surface waters, etc.

The intensive programme of nuclear explosions between 1950 and 1963 led to a considerable pollution of the environment with artificial radionuclides, which considerably diminished after the conventions signed in 1963, according to which the nuclear explosions were to be performed underground. As the electric power is provided in 24 countries of the world by the nuclear power plants, the defections which may appear during their functioning could represent another source of pollution.

In consequence of the nuclear accident which took place at Chernobyl (USSR), on April 26, 1986, a great quantity of radioactive substances has been discharged. Among the artificial radionuclides responsible of long standing contamination, the most important are the ^{134}Cs and ^{137}Cs isotopes of cesium (7,8).

During the last 20 years a growing attention has been paid to the study of radionuclide restraint by lichens, especially in the Scandinavian countries, knowing that lichens are playing a leading part in the radionuclide transfer, in the ecological chain: — atmospheric depositions — lichens — reindeer — man (4, 9, 11).

The aim of this paper is the determination of ^{134}Cs and ^{137}Cs content in different species and families of lichens, sampled in certain mountainous regions, before and after the nuclear accident of Chernobyl (period between 1975—1988).

MATERIAL AND METHODS

Lichen sampling has been accomplished:

- in the Apuseni Mountains (Vlădeasa Massif) in two points: the spruce fir forest from *Preluca Rabului* and the mixed beech and spruce fir forest from the *Răcad Valley*, about 1200—1450 m altitude;
- in the Retezat Mountains from the spruce fir forests both from the crystalline part and the limestone one (between 1300 and 1600 m altitude);

REV. ROUM. BIOL. — BIOL. VÉGÉT., TOME 35, N° 1, P. 61—65, Bucarest, 1990

— the sample range has been enriched with lichens collected from the mixed beech and spruce fir forest of *Rebra Valley* (the Rodna Mountains), about 1100 m altitude — and, from the spruce fir forest of *Mădărași* — the Harghita Mountains — about 1200 m altitude.

The sampling period included 2 phases: the first one before the nuclear reactor's accident, between 1975 and the 1st of May 1986, and the second one after the 6th of May 1986 up to July 1988.

The sampled lichens have been dried at ambiental temperature, then at 105°C.

Their radionuclide content has been determined by the gamma-spectrometric method with NaI(Tl) detector coupled to a multichannel analyser of Packard type. The results are expressed in Bq.g⁻¹ dry substance.

RESULTS AND DISCUSSION

Our results concerning the above mentioned radionuclides indicate that there are differences between species and families of lichens, as well as between years and sides of sampling.

The investigations refer to two epiphyte families: *Parmeliaceae* and *Usneaceae*, as well as to two terricolous genera: *Cladonia* and *Peltigera*.

The values of ¹³⁷Cs determined in 1975 in the *Vlădeasa Massif* (Table 1) were very low (between 3.4 and 5.7 Bq.g⁻¹ dry substance), significant differences being noticed between the lichen families. As ¹³⁷Cs has a radio-

Table 1
¹³⁷Cs content depending on lichens family, sites and collecting time

Sampling site	Sampling period	Specific radioactivity (Bq.g ⁻¹ dry weight)		
		Life — forms		Terricolous lichens
		Epiphytic lichens		
		Fam. Parmeliaceae	Fam. Usneaceae	g. Cladonia + Peltigera
Apuseni Mountains	1975 V — 1986 V 1986 V — 1987 VII	5.7±0.7 118 ±9	3.4±0.4 46 ±18	4.9±0.7 131 ±27
Retezat Mountains	1983 VII 1986 X	3.5±0.6 53 ±14	<3 33 ±9	3.2±0.4 63 ±19
Rodna Mountains	1975 V — 1986 V 1986 VII	— 16 ±4	— 18 ±3	— 20 ±6
Harghita Mountains	1975 V — 1986 V 1988 VII	— 11±2	— 8 ±2	— —

active half-life of 30.2 years, and the content of this radionuclide is due to the nuclear fusions between 1950 and 1963, in the *Retezat Mountains*, where lichen sampling took place in 1983, much lower amounts of ¹³⁷Cs

(3—3.5 Bq.g⁻¹ dry substance) were determined, with no significant differences between the lichen families.

After the Chernobyl accident, the ¹³⁷Cs content has greatly increased: on the species belonging to *Parmeliaceae* family the deposit became 21 times greater; on *Usneaceae* family 14 times greater, on the terricolous genera 27 times greater than in 1975, in the *Vlădeasa Massif*.

A similar situation was to be found in the *Retezat Mountains*: on the *Parmeliaceae* family the amount was 15 times greater, on the *Usneaceae* 11 times greater, and on the terricolous lichens about 20 times more ¹³⁷Cs than in the previously mentioned period.

The lowest values have been registered in the case of the *Usneaceae* family, which could be due to the filamentous-cylindric aspect of the thallus and its position which allow an easy leaking of rainy polluted water.

The highest ¹³⁷Cs content has been registered on the terricolous lichens (g. *Cladonia*, g. *Peltigera*) due both to the large contact surface, and to the rain which washed the radionuclides from the leaves of the trees, concerning them at the level of soil. It is positively assumed that the concentration level of the terricolous lichens also depends on some local factors such as tree density, thick canopy cover, slope exposition, season, etc.

Table 2 presents ¹³⁴Cs and ¹³⁷Cs content in 11 lichen species from the *Vlădeasa Massif* (*Răcadului Valley*, October 1986 and *Preluca Rabului*, October 1987), as well as from the *Retezat chalc district* (October, 1986).

Table 2
¹³⁴Cs and ¹³⁷Cs content of different lichen species from the Apuseni and Retezat Mountains after the Chernobyl accident

Family	Lichen species	Specific radioactivity (Bq.g ⁻¹ dry weight)					
		Apuseni Mountains		Retezat Mountains			
		Răcad Valley 1986 IX	Preluca Rabului 1987 X	Chalc district 1986 X			
		¹³⁴ Cs	¹³⁷ Cs	¹³⁴ Cs	¹³⁷ Cs	¹³⁴ Cs	¹³⁷ Cs
Parmeliaceae	<i>Parmelia furfuracea</i>	64	142	35	105	21	43
	<i>Parmelia physodes</i>	95	211	29	88	36	70
	<i>Parmelia tiliacea</i>	54	119	36	110	—	—
	<i>Centraria glauca</i>	—	—	29	87	31	67
	<i>Cetraria pinastri</i>	—	—	27	81	14	32
	AVERAGE	71±17	157±48	31±4	94±13	26±10	53±18
Usneaceae	<i>Usnea hirta</i>	15	34	6	18	} 12 *	
	<i>Usnea florida</i>	—	—	—	—		
	<i>Evernia prunatri</i>	31	69	14	43	—	—
	<i>Ramalina calicaris</i>	—	—	—	—	19	41
	AVERAGE	23±11	52±25	10±5	31±17	16±5	34±11
Cladoniaceae	<i>Cladonia coniocraea</i>	63	141	32	95	21	44
	<i>Cladonia fimbriata</i>	90	199	—	—	14	30
	<i>Cladonia furcata</i>	62	137	36	109	—	—
Peltigeraceae	<i>Peltigera canina</i>	—	—	34	102	—	—
	AVERAGE	72±16	159±35	34±2	102±7	18±5	37±10

* — Value obtained from species *Usnea hirta*, *Usnea florida*, *Usnea longissima* *Usnea articulata*.

After the accident which took place in Chernobyl, a great quantity of ^{134}Cs has been detected in all the previously mentioned cases (^{134}Cs has a radioactive half-life of 2.2 years). We can notice in the *Vlădeasa Massif* differences between the observed species (minimum at *Usnea hirta*, maximum at *Parmelia* and *Peltigera*, 3–4 times higher than at *Usnea*), as well as the fact that all the lichen species sampled in the *Răcădu lui Valley* show a pronounced radionuclide accumulation than the species from *Preluca Rabului*. This proves that the radioactive pollution has been much more intense in this valley. We assume that the plus of wet depositions is due partly to the local weather conditions and partly to the fact that during the critical period the leaves of the trees were not sufficiently developed, and thus, they could not play the part of a protective screen.

Knowing the fact that the ratio of $^{134}\text{Cs}/^{137}\text{Cs}$ activity in the moment of the accident was equal with 0.5, and taking into account their half-life times, it has been calculated to be 0.45 during the month of September 1986, and 0.32 during the month of October 1987, respectively. The radionuclide values from lichens sampled in the *Preluca Rabului* have been calculated again according to the values above mentioned.

Differences between the analysed lichen species have been registered in the *limestone Retezat* too (highest value at *Parmelia physodes*, lowest value at g. *Usnea*), the radionuclide accumulations being moderate in the terricolous lichens, probably due to the sampling side and the forest density.

Enlarging our research area, in the second sampling period to other massifs, the *Rodna Mountains*, and the *Harghita Mountains* (Table 1), a maximum contamination has been registered in the *Apuseni Mountains* lower values have been recorded in the *Retezat Mountains*, much lower ones in the *Rodna Mountains*, and the lowest values in the *Harghita Mountains*.

These values are closely connected to the radioactive cloud's change of place, to the rainfalls of the period, and are similar to those obtained by Galeriu D. (2), when estimating the cesium depositions in Romania, in May 1986. Galeriu's estimations also explain the unequal depositions by the weather conditions as well as by the characteristics of the relief.

The research carried on in Finland (6), 10–12 days after the accident which took place at Chernobyl, had in view the determination of the overall level of radiations; it has also been determined that lichens showed maximum registered values (231 Bq), compared to 16–41 Bq in the coniferous tree leaves, and 0–2 Bq in the deciduous tree leaves. This had been previously proved by some other authors (3), who underlined the fact that, generally speaking, lichens deposit radionuclides 4 times more than superior plants.

CONCLUSIONS

The ^{137}Cs concentration in the lichens studied after the 1st of May 1986 is about 18 times greater than that determined in the same places before the accident.

The different accumulation of cesium depending on the lichen species proves the sensitivity of some species to radioactive pollution. On this basis the proportions of local contamination can be reconstituted.

The contamination degree of lichens with artificial radionuclides is influenced by weather conditions, type of vegetation, relief.

The results which have been obtained are justifying the continuation of the studies concerning lichens, and are widening the research area concerning other artificial radionuclides and ecosystems.

REFERENCES

1. Bartók Katalin, *Impactul chimic-societate*, red. Marțian Cotrău, Iași, 1985, 69–73.
2. Galeriu D., *Progrese în fizică*, Constanța, 1988, 611–613.
3. Galun M., Garty J., Ronen R., *Webbia*, 1984, **38**, 371–383.
4. Holleran D. F., Luick J. R., Whicker F. W., *Health Physics*, 1971, **21**, 657–666.
5. Mattson Sören L. J., *Health Physics*, 1975, **28**, 233–248.
6. Mikkola K., Albrecht A., *Notulae Entomologicae*, 1986, **66**, 153–157.
7. Salo A., *I.A.E.A. Bulletin*, 1986, **28**, 3, 28–32.
8. * *Chernobyl Reactor Accident WHO Report of a Consultation 6 May 1986*.
9. Taylor H. W., Hutchinson-Benson E., Svoboda J., *Can. J. Bot.*, 1985, **63**, 792–796.
10. Trass M., *Fol. Crypt. Estonica*, 1978, **3**, 14–22.
11. Wayne C. Hanson, *Health Physics*, 1982, **42**, 433–447.

Received July 3, 1989

* Center of Biological Researches,

3400 Cluj-Napoca, str. Republicii, no. 48

** Public Health and Medical Research Institute

3400 Cluj-Napoca, str. Pasteur no. 6

MATERIAL AND METHOD

With the first experiments on opium poppy (6) we investigated the effect of self-pollination on the morphine level of capsules. In 1988 we especially the effects of the pollination modality on the major biological parameters of poppy capsules. In this respect we performed genetic measurements and biochemical analyses on 200 free-pollinated and 100 self-pollinated capsules from an experimental field at Cluj-Napoca (Romania). The biological material was a result of a selection over 3 years of a population treated (3 generations) with nitrogen.

at sublimation degree of lichens with artificial radiation is influenced by weather conditions. The results which have been obtained are justifying the conclusion of the studies concerning lichens and are showing the necessity of carrying out artificial radiation and recontamination studies that all the lichen species sampled in the Rodna Valley show a pronounced radioactive accumulation than the species from *Prutca* and *Rebulet*. This proves that the radioactive pollution is more intense in this valley. We assume that the plus of wet depositions is due partly to the local weather conditions and partly to the fact that the lichen species are more sensitive to the radioactive pollution than the species from *Prutca* and *Rebulet*. The values of the trees were not as high as the values of the lichens.

Knowing that the plus of wet depositions is due partly to the local weather conditions and partly to the fact that the lichen species are more sensitive to the radioactive pollution than the species from *Prutca* and *Rebulet*, it has been necessary to carry out artificial radiation and recontamination studies that all the lichen species sampled in the Rodna Valley show a pronounced radioactive accumulation than the species from *Prutca* and *Rebulet*. This proves that the radioactive pollution is more intense in this valley.

Differences between the analysed lichen species have been observed in the ^{137}Cs concentration. The highest value was recorded for *Parvocetraria* and the lowest for *Cladonia*. The values of the lichens are closely connected to the radioactive cloud's passage of place, to the rainfalls of the period, and are similar to those obtained by Galeriu D. (2), when estimating the cesium depositions in Romania, in 1986. Galeriu's estimations also explain the unequal depositions by the weather conditions as well as by the characteristics of the relief.

The research carried on in Finland (6), 10–12 days after the accident which took place at Chernobyl, had in view the determination of the ^{137}Cs all level of radiations; it has also been determined that lichens showed maximum registered values (231 Bq), compared to 16–41 Bq in deciduous tree leaves, and 0–2 Bq in the deciduous tree bark. This had been previously proved by some other authors (3), who underlined the fact that, generally speaking, lichens deposit radioactivity 4 times more than other plants.

CONCLUSIONS

The ^{137}Cs concentration in the lichens studied after the 1st of May 1986 is about 18 times greater than that determined in the same plants before the accident.

The different accumulation of cesium depending on the lichen species proves the sensitivity of some species to radioactive pollution. On this basis the proportions of local contamination can be reconstructed.

INFLUENCE OF SELF-POLLINATION AND OF THE BRANCHING DEGREE ON SOME MORPHO-PHYSIOLOGICAL INDICES IN OPIUM POPPY (*PAPAVER SOMNIFERUM* L.)

G. GHIORGHITĂ, CR. NICULIȚĂ, S. V. BALINT

The self-pollination of *Papaver somniferum* plants caused the diminishing of capsule dimensions, of the shell and seed mass per capsule and of the morphine content in the capsule. The greatest reduction was registered by the capsule seed quantity.

The increase of the plant branching generally caused a higher capsule seed and morphine yield per individual. It was not found any positive correlation between the number of branches/individual and the morphine level in the capsules.

Along with the isolation from mutagen treated populations of some poppy lines with higher productivity, we also tried to know some aspects of poppy biology. We were especially concerned with the influence of the pollination modality on some of the capsule morpho-physiological parameters, with special reference to their morphine content. As Heltmann and Silva (1978) showed, poppy pollination must have an impact on the seed yield. The fact was ascertained by Kálmán-Pál et al. (1987) who reported that self-pollination reduces the seed mass per capsule.

Another aspect we were interested in was the effect of the branching degree of the poppy plants on the shell, seed and morphine output per individual. The poppy branching degree is a cultivar characteristic (thus, a genetic one), but is also dependent on the interrelation genotype-environment. Our multiannual observations showed that water and nutrient supply over the period from the rosette stage up to the flourishing one and the distance between the plants decisively influence the branching degree. The relation existing between the distance and the number of branches of a plant had already been noticed in 1916 by Ranninger (apud Tétényi and Földesi, 1970). On the other hand, the capsule, seed and morphine yield/ha seems to depend on the number of branches/plant. Thus, Földesi et al. (1987) reached the conclusion that the morphine content depended up to 42% on the plant mass, up to 32% on the number of capsules and up to 18% on the alkaloid level of the capsule and Deneva (1975) showed that with her poppy hybrids the morphine content increased with the number of capsules.

MATERIAL AND METHOD

With the first experiments on opium poppy (6) we investigated the effect of self-pollination on the morphine level of capsules. In 1988 we tested especially the effects of the pollination modality on the major morpho-physiological parameters of poppy capsules. In this respect we performed biometric measurements and biochemical analyses on 295 free-pollinated and 169 self-pollinated capsules from an experimental field at Cindești (Vrancea). The biological material was a result of a selection over 5 years in a population treated (3 generations) with mutagens.

We analysed: the length and width of the capsule, the number of stigmatic rays, the seed and shell mass, the morphine content, of mature capsules. The data were computed with a "Junior" computer and the results are given in Table 1. We also studied the correlations between the pairs of analysed variables, trying both the simple linear correlations and the relations that could be linearized. The study specially aimed at the relation between the capsule morphine content (also depending on the pollination modality) and the other investigated parameters. Some of the values obtained by the correlation test are given in Table 2.

As to the influence of the branching degree on the production capacity of plants, the first informations were obtained in 1987 when, from a poppy population (of the same origin) cultivated at Piatra Neamț, we assayed the above mentioned indices at individuals with 6, 7 and 12 branches. The morphine content per individual was also determined. In 1988 we continued these investigations on two poppy forms (which may be considered as autumn forms) from a field at Cindești (Vrancea). One of the forms was of the same origin as the poppy discussed previously, the other was a mutant, that appeared on the experimental field, characterized by: high branching degree, flowers with pink petals and violet spot, smaller capsules and brown seeds. Both forms were self-sown proving to be cold resistant. Out of the first variant we investigated individuals with 2, 3 and 4 branches and out of the mutant form — individuals with 5, 8 and 17. The results are listed in Table 3.

RESULTS AND DISCUSSIONS

The investigated parameters (even the capsule dimensions) are more or less negatively influenced by self-pollination as Table 1 shows. If the differences between two categories of capsules (free-pollinated and self-pollinated) are not too great regarding capsule length and width, number of stigmatic rays and morphine content, the self-pollination determined a significant decrease of the shell mass per capsule ($\bar{x} = 2.59$ g compared to 3.27 g for the free-pollinated capsules) and a drastic decrease of the seed quantity ($\bar{x} = 1.75$ g and 5.06 g respectively). Referring to the seed quantity the variability already raised — amplified itself even more, from $s\% = 26.60$ (free-pollination) to $s\% = 66.23$ (self-pollination). The increase of the capsule sterility as an effect of self-pollination has already been observed in previous investigations (4, 6, 7), but that in 1988 was extremely pronounced. It is possible that the agro-meteorological conditions favoured the phenomenon. Our supposition starts from the fact that we found a more marked variability of the analysed indices, as compared to previous years, especially of the physiological features (shell and seed mass, morphine level), (Table 1).

The morphine content of capsules presents a great variability depending not only on pollination but also, in the same area, on the field and even more, in the same field, on the sowing time. Here are the statistical values of

the morphine content of two variants of plants with the same origin grown at Cindești at a distance of about 500 m, sown on an interval of a week:

Lot A		Lot B	
Free-pollination	Self-pollination	Free-pollination	Self-pollination
$\bar{x} = 0.44\%$ $s\% = 20.45$	$\bar{x} = 0.42\%$ $s\% = 23.81$	$\bar{x} = 0.56\%$ $s\% = 14.28$	$\bar{x} = 0.52\%$ $s\% = 13.46$

The differences of the attained morphine level — on the two fields — are obvious. The effect of self-pollination is also evident: the variability of the character is greater on lot A than on lot B although the biological material was of the same nature. Here we can ascribe only the time interval mentioned and the different field exposures. The results are arguments for the assertions of Bernáth (1, 2) which refer to some environment factors (especially light and temperature) on the poppy alkaloid yield.

For the poppy selecting activity it would be of great importance to discover some macroscopic criteria to facilitate the identification of forms with high productivity, with special reference to the morphine yield/ha.

Table 1

The values of some morpho-physiological indices in free- and self-pollinated capsules of opium poppy

The index	Free pollination			Self-pollination		
	$\bar{x}$	$\pm s\bar{x}$	$s\%$	$\bar{x}$	$\pm s\bar{x}$	$s\%$
Length (mm)	51.69	0.39	13.20	50.52	0.54	14.13
Width (mm)	43.46	0.29	11.45	38.73	0.34	11.34
Stigmatic rays (nr)	14.68	0.38	10.55	14.44	0.12	10.86
Shell mass/capsule (g)	3.27	0.05	27.49	2.59	0.05	26.11
Seed mass/capsule (g)	5.06	0.08	26.60	1.75	0.10	66.23
Morphine (%d. m.)	0.47	0.006	23.04	0.44	0.008	24.66

In this respect, we tried to establish the possible positive correlations between the morphine content and the other parameters analysed in the case of the 295 free-pollinated and the 169 self-pollinated capsules. The data distribution was close to the gaussian one. A simple linear dependence between the analysed pairs of characters was observed, the highest values of the correlation coefficient being registered by the following features: capsule width depending on the shell mass/capsule ($R = 0.802$), capsule width depending on the seed mass/capsule ($R = 0.630$), shell mass/capsule depending on the seed quantity/capsule ($R = 0.624$). Thus, our previous observations are ascertained, (8).

We studied the morphine content of the mature capsules depending on the other parameters and highlighted rather low values of the corre-

lation coefficients — under 0.40. In this situation we try to identify nonlinear dependences of different forms. Table 3 presents the correlation coefficient matrix for a function of the form: $y(x) = a_0 + a_1x + a_2x^2 + \dots + a_nx^n$ in free and self-pollination conditions. A slight increase in the correlation coefficients is noticed as compared to using simple correlation functions.

In case of the correlation functions:

$$y(x_1, x_2, \dots, x_n) = a_0 + a_1x_1 + a_2x_2 + \dots + a_nx_n + a_{n+1} + a_{n+2}x_2^2 \dots \dots a_{2n}x_n^2 \dots$$

we noticed an increase of the correlation coefficients with the number of variables introduced. Thus, for example, for the simple linear dependence of the morphine content related to the number of stigmatic rays, the correlation coefficients have values of 0.167 (free-pollinated capsules) and 0.195 (self-pollinated ones), and depending on the seed quantity per capsule, the same analytical dependence reveals values of 0.201 and 0.054 respectively. Testing the square form dependence for the correlations among the same features we obtain coefficients with higher values, of 0.193 and 0.294 in the first case, and of 0.255 and 0.145 in the second, respectively. Considering the square dependence of the morphine content related to the two parameters (number of stigmatic rays and seed mass per capsule), a new increase in the correlation coefficients was noticed — 0.365 (for free-pollinated capsules) and 0.391 (for self-pollinated ones).

The tests with correlation functions of a higher degree (linear dependences also comprising third degree terms) showed a new increase in the correlation coefficients.

On the other hand, the binary graphical representations of the variables studied proved a wide dispersion of the values, even in the cases in which the correlation coefficients had relatively high values. This shows (otherwise, a known fact) that the correlation coefficient alone is not sufficient to statistically characterize the dependence between the two values.

As to the influence of the poppy plant branching degree on the indices investigated, Table 2 shows an important variability of the character — even at the level of the individual — depending on the capsule investigated. Thus, to give only one example, the individual with 6 branches from Piatra Neamț had, at harvesting time, capsules with shell mass oscillating between 1.5 and 2.6 g, seed quantity between 2.0 and 5.0 g, and morphine content between 0.36 and 0.67 % d.m. Such variations registered even at the level of the individual prove the difficulty of obtaining a poppy cultivar with stable shell, seed and morphine yield/ha. The increase of the branching degree seems to have a negative impact on the capsule dimensions.

In the Piatra Neamț experiment a higher branching did not correspond to a higher capsule, seed and morphine yield per plant, the individual with 12 branches having lower values of these indices than the one with 7 branches (Table 3). The Cindești experiment showed a more pronounced feature variability of the mutant form. Both investigated forms had raised quantities of shells, seeds and morphine per plant along with the increase of the branching degree. Although there seems to be a positive correlation of these parameters, the yield addition of a valuable genotype

with a good branching may be assured only in the case this does not need a lowering of the plant density on the surface unity.

From the data of Table 2 we cannot identify a clear relation between the number of branches per plant and the morphine level attained by the capsules, a relation that would have been of great importance for selection activity.

Table 2

The matrix of correlation coefficients (R). $Y = a_0 + a_1x + a_2x^2 + a_3.1/x$

2.1. Free pollination

The variables	R ₁	R ₂	R ₃	R ₄	R ₅	R ₆
1. Capsule length	1.0000	0.3035	0.4410	0.2603	0.2837	0.1117
2. Capsule width	—	1.0000	0.5429	0.8275	0.6595	0.2062
3. Stigmatic rays	—	—	1.0000	0.4085	0.4298	0.1928
4. Shell mass/capsule	—	—	—	—	0.6619	0.3358
5. Seed mass/capsule	—	—	—	—	1.0000	0.2547
6. Morphine content	—	—	—	—	—	1.0000

2.2. Self-pollination

The variables	R ₁	R ₂	R ₃	R ₄	R ₅	R ₆
1. Capsule length	1.0000	0.2292	0.4911	0.2785	0.1801	0.1529
2. Capsule width	—	1.0000	0.3933	0.6936	0.2117	0.2532
3. Stigmatic rays	—	—	1.0000	0.2285	0.0516	0.2941
4. Shell mass/capsule	—	—	—	1.0000	0.0565	0.2917
5. Seed mass/capsule	—	—	—	—	1.0000	0.1450
6. Morphine content	—	—	—	—	—	1.0000

Our investigations on poppy over the last years had as a major aim the melioration of the morphine content of the capsules. The data of this paper show that the morphine content does not only depend on the field used, but also on the sowing moment on the same field and, even more, on the analysed capsule of an individual. Thus, the plants from the field A (Cindești) had a much lower morphine level than the plants from the field B. Yet, on the same field A, the autumn individuals (on which we tested the branching effect) had a higher average morphine content in the capsules. It is true that the two forms these individuals belong to represented other genotypes, but only this aspect does not explain the clear but registered difference as the various capsules of these individuals had different values of the morphine content. What would the explanation of this situation be? ! Of course, the impact of the genotype is essential, but the conditions of its manifestation are not less important. And these conditions could not be identical as the seeds of the 3 experiments were cultivated at different moments (on field A on April 8th, 1988; on field B on April, 15th, 1988 and the autumn variants were self-sown in summer 1987).

Several investigations on opium poppy (1), (2), (14), (15), performed even in controlled conditions (phytotron), clearly proved the influence of some meteorological factors along the diverse poppy phenophases and that of light and temperature — from the flowering stage to maturation.

Table 3

Values of some morpho-physiological parameters in opium poppy individuals with different branching

Individual	Branches (Nr.)	Capsule length (mm)	Capsule width (mm)	Shell mass (g)	Seed mass (g)	Morphine content % s.u.	Morphine quantity/plant (g)
PIATRA NEAMȚ 1987							
1	6	35-45	31-46	1.5-2.6	2.0-5.0	0.36-0.67	0.0670
		37.7	42.9	13.7	22.6	0.48	
2	7	43-57	35-43	1.8-2.7	3.1-5.2	0.41-0.67	0.0805
		54.1	39.7	16.9	30.3	0.48	
3	12	36-46	21-37	0.6-1.7	1.0-3.3	0.24-0.45	0.0525
		40.7	29.6	14.7	27.9	0.33	

I CÎNDEȘTI — VRANCEA 1988

4	2	53-54	42-44	3.4-4.0	5.0-5.1	0.81-1.04	0.0681
		53.5	43.0	7.4	10.1	0.92	
5	3	57-60	40-43	3.4-3.8	2.6-5.1	0.62-0.73	0.0741
		58.3	41.3	10.9	12.4	0.68	
6	4	53-64	36-43	2.1-4.0	1.5-5.5	0.55-0.67	0.0781
		59.2	40.2	12.8	14.6	0.61	

II CÎNDEȘTI — VRANCEA 1988

7	5	39-49	26-38	1.0-2.1	2.0-4.5	0.58-0.64	0.0500
		45.0	32.8	8.2	15.5	0.61	
8	8	35-50	22-35	0.7-2.0	1.1-4.6	0.51-1.11	0.0750
		44.5	30.6	12.5	24.5	0.60	
9	17	33-51	21-36	0.6-2.1	1.0-4.5	0.72-1.69	0.2047
		42.3	28.5	22.5	43.8	0.91	

tion — on the alkaloid content and spectrum. The individuals whose branching influence we tested had the highest morphine level not only because they belonged to more valuable genotypes, but also because they attained maturation much earlier and might probably had better conditions to express their genetic potential. The same for the plants from fields A and B that had — due to their delayed sowing — different conditions along the diverse phenophases.

When we analysed the morphine content of the individuals with different branching degree, we noticed that not the first capsule on the plant had the greatest morphine content but one of the last in their maturation sequence. The flower buds of an individual develop and flourish successively and the capsules mature in the same order. Some physiological processes, like alkaloid accumulation in capsule, take place in different agro-meteorological conditions, and due to the physiological ageing of the leaves, the latest capsules have a forced maturation. It seems that these capsules accumulate the highest morphine quantities. Thus, some older observations are indirectly confirmed (14), (16). Hotin (1972) shows that the highest capsule and seed production is attained when poppy is harvested with 75% central capsules and 15-20% lateral capsules having brownish seeds, a moment that also coincides with the maximum levels of morphine in capsules and oil in seeds. Consequently, the morphine content differences between poppy lots, cultivated with the same biological material, but on different fields, or on the same field but in different moments, as much as the morphine variations registered in the capsules belonging to the same individual, are the result of the influence of specific agro-meteorological conditions along plant growth and development.

CONCLUSIONS

1. The self-pollination of *Papaver somniferum* plants caused the diminishing of the capsule dimensions, of the number of stigmatic rays, of the seed and shell mass per capsule and of the morphine level on it. The greatest reduction was registered by the capsule seed quantity.

2. Our investigations did not find high linear correlations between the morphine content and the other parameters of the capsule. Even in case of high correlation coefficients (among some indices), the dispersion degree of the values was very high.

3. An increased number of branches per plant generally provided a higher capsule, seed and morphine yield per individual. Yet we did not find any positive correlation between the number of branches and the morphine level in the capsules.

4. The high morphine content variability, manifested even in the same individual at the level of its diverse capsules, is due to the specific agro-meteorological conditions in which the capsules developed and matured.

Acknowledgements. The authors thank Mrs. Elena Munteanu for technical assistance and to prof. J. Fr. Gille for the English version of this paper.

REFERENCES

1. Bernáth J., Herba Hung., 1986, **25**, 2, 43—75.
2. Bernáth J., Herba Hung., 1987, **26**, 2—3, 49—66.
3. Deneva T., Genet. Sel., 1975, **8**, 6, 419—423.
4. Floria Fl., Gille E., Plinzeru G., St. cercet. Biol. — Biol. veget., 1986, **38**, 1, 68—77.
5. Földesi D., Bernáth J., Kádár I., Herba Hung., 1987, **26**, 2—3, 113—120.
6. Ghiorghiță I. G., Gille V. E., Tóth T. E., Sava R. I., Rev. roum. Biochim., 1983, **20**, 3, 161—168.
7. Ghiorghiță I. G., Gille V. E., Rosu R., Rev. roum. Biochim., 1984, **21**, 4, 279—286.
8. Ghiorghiță I. G., Gille V. E., Paun E., Tóth T. E., Rev. Roum. Biol. — Biol. Végét., 1986, **31**, 1, 41—49.
9. Ghiorghiță I. G., Gille V. E., Tóth T. E., Onisei T., Amariei D., Lucr. Stat. „Stejarul”, Biol. veget. exp. și genetică, 1987, **10**, 67—74.
10. Gille V. E., Ghiorghiță I. G., Plinzeru G., Rev. roum. Biol. — Biol. Végét., 1985, **30**, 1, 73—78.
11. Gille V. E., Ghiorghiță I. G., Onisei T., St. cercet. Biochim., 1986, **29**, 1, 46—51.
12. Gille E., Ghiorghiță G., Tóth E., Amariei D., Onisei T., Lucr. Stat. „Stejarul”, Biol. veget. exp. și genetică, 1987, **10**, 75—82.
13. Heltmann H., Silva F., Herba Hung., 1978, **17**, 2, 55—60.
14. Hotin A., Progress in the field of plant drugs, Poznan, 1972, 196—199.
15. Kálmán-Pál A., Bernáth J., Tétényi P., Herba Hung., 1987, **26**, 2—3, 75—91.
16. Nash M. J., Stored. Prod. Res., 1980, **16**, 133—141.
17. Tétényi P., Földesi D., Acta Agron. Scient. Hung., 1970, **19**, 1—2, 147—160.

Received September 11, 1989

“Stejarul” Research Station,

Alexandru cel Bun nr. 6

5600 Piatra Neamț, Romania

MIHAELA PAUCĂ-COMĂNESCU (edited by), *Făgetele din România — cercetări ecologice* (Beech forests from Romania — ecological researches), Ed. Academiei Române, București, 1989, 262 p., 16 figs., 185 tables

The book has been welcome as it presents the results of some assiduous and competent researches accomplished by a gifted and rather complex professional team. This ecological study of beech forests is approached with a clear outline of an ecosystemal thinking vegetal ecology and other similar researches on: oak, spruce, fir, forests, pastures. The necessity of an ecological study of beech forests in Romania was called both for the preponderant surfaces in our forest fund and for their economic and ecological functions. The book is well structured in 3 large chapters which reflect both the research methodology and the systemic thinking by which the main problems have been approached.

Chapter one, *General considerations upon beech forests in Romania*, presents the origin of beech forests on the territory of Romania, their natural conditions, their functional and landscape characters as well as the main characteristics that concern: soils, climate, ecological coordinates. Although the beech forests in Romania represent one third of all the forest surface, the optimum of the forests is represented by the resorts with good humidity and trophicity as well as those with an annual average temperature of 5.2—7.5° C. This chapter also presents the local and regional organization taking into account the floristic composition and resort conditions. The individuality of beech forests in Romania and the sindynamical as well as sinecological relationships are in this respect emphasized by the floristic structure and composition. However, the apparent phytocenotic regional diversity defines the Romanian landscape particularities as well as the floristic ecological unity of Carpathian beech forests. The authors briefly present the types of forests and ecosystems. They give new principles and criteria of outlining the types of forest ecosystems, especially those formed of beech.

In the second chapter, *Complex researches in constituted beech ecosystems*, the results of systematic researches made on types of forest ecosystem are minutely presented analysing thoroughly the main components: primary producers, consumers and decomposers, the litter and the soil. All these complex activities have been approached by the help of a competent team formed by botanists, zoologists, pedologists, silviculturists. It is worth mentioning that the research took place on the main geographical and pedoclimatic areas presenting in the end a scientific material well ordered and constantly containing the main elements and processes of the forestry ecosystem: the biotope elements belonging to the biocenosis (primary producers including the accumulation of biomass, energetic stock, the metabolic activity indicators) as well as the consumers and decomposers (macroconsumers, the invertebrate fauna from the canopy, mobile invertebrates on the soil — epigaion — soil invertebrates, the decomposing activity indicators). A correlation between all these studied components is clearly made, stressing constantly both the most significant elements of the ecosystem and the part played by the edaphic and bioclimatic determinism.

In the third chapter, *The structure and function of beech forests as ecosystems*, the relation between the structure and function for each main component of the type of ecosystem is interestingly approached: primary producers (the trees and herbs strata), consumers and decomposers (macroconsumers, canopy consumers (only invertebrates), consumers and decomposers from epigaion as well as these in the soil). The authors confer a very important role to the primary production process and to the decomposing one, most varied and interesting from one type of ecosystem to another.

The volume ends with interesting subjects accurately presented concerning the ecological functions of beech forests: the hydrologic, antierosive, climatic modelling ones, etc.

Finally, the volume presents an ensemble of ecological problems partially solved concerning our beech forests as well as new aspects that are to be thoroughly studied in the next future relying on the experience and the conclusions drawn, most useful both in the actual management of beech forests and in the future actions of reconstruction and ecological construction of these forests on natural beech forests areas. The book is of interest not only for the colleagues working in the field, but also for hydrologists, climatologists, hydroenergeticians, economists.

N. Roman

REFERENCES

- MIHAELA, PAUL, COMANESCU (1979) *Forest ecology in Romania*. (Bucuresti: Editura Stiintifica si Literara). 1980, 322 p., 10 fig., 185 tables.
- The book has been written by a team of authors who are active in the field of forest ecology in Romania. It is a comprehensive work that covers the main aspects of forest ecology, from the general principles to the specific details of the different types of forests. The book is written in a clear and concise style, making it accessible to a wide range of readers. It is a valuable reference work for anyone interested in forest ecology in Romania.
- Finally, the volume presents an ensemble of ecological problems partially solved concerning our beech forests as well as new aspects that are to be thoroughly studied in the next future. The conclusions drawn, most useful both in the actual management of beech forests and in the future actions of reconstruction and ecological conservation of these forests on natural beech forest areas. The book is of interest not only for the colleagues working in the field, but also for hydrologists, climatologists, hydrogeologists, economists.
- The volume ends with interesting subjects accurately presented concerning the ecological functions of beech forests: the hydrological, antierosive, climatic modelling ones, etc.
- For the third chapter, The structure and function of beech forests as ecosystems, the relation between the structure and function for each main component of the type of ecosystem is interestingly approached: primary producers (the trees and herbs strata), consumers and decomposers (macroconsumers, canopy consumers (only invertebrates), consumers and decomposers (invertebrates, soil invertebrates, the decomposing activity, indicators) from epiphytes as well as those in the soil). The authors confer a very important role to the primary production process and to the decomposing one, most varied and interesting from one type of ecosystem to another.

N. 1. 1980

REV. ROM. BIOL. - BICH. VEGET., TOME 25, No. 1, P. 35, BUCURESTI, 1980

AVIS AUX AUTEURS

La «Revue roumaine de biologie — Série de biologie végétale» publie des articles originaux d'un haut niveau scientifique, de tous les domaines de la biologie végétale: morphologie, systématique, géobotanique, physiologie, écologie, génétique, microbiologie, phytopathologie. Les sommaires des revues sont complétés par d'autres rubriques, comme: 1. La vie scientifique, qui traite des manifestations scientifiques du domaine de la biologie: symposiums, conférences, etc.; 2. Comptes rendus des livres de spécialité parus en Roumanie. Les auteurs sont priés d'envoyer leurs articles, notes et comptes rendus dactylographiés en deux exemplaires. Les tableaux et l'explication des figures seront dactylographiés sur pages séparées et les diagrammes seront exécutés à l'encre de Chine noire, sur papier calque.

Les tableaux et les illustrations seront numérotés par des chiffres arabes. La répétition des mêmes données dans le texte, dans les tableaux ou dans les graphiques sera évitée.

Les références bibliographiques, citées par ordre alphabétique, comporteront le nom de l'auteur, l'initiale du prénom, le titre de la revue, abrégé conformément aux usances internationales, l'année, le tome, le numéro, la page. Les travaux seront accompagnés d'un court résumé de maximum 10 lignes, en anglais. Les textes des travaux ne doivent pas dépasser 7 pages dactylographiés (y compris les tableaux, la bibliographie et l'explication des figures). La responsabilité concernant le contenu des articles revient exclusivement aux auteurs.

PRINTED IN ROMANIA