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THE FLORISTIC RICHNESS OF BUDA AND RÂIOSU MOUNTAINS, FĂGĂRAŞ MASSIF

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Abstract. The present study deals with the floristic richness of Râiosu and Buda Mountains, Făgăraş Massif. Many endemics and relicts of these vegetal groups confirm the oldness of the vegetation of these calcareous mountains; they survived to the extreme catatherme of the glaciations, because of the thermal characteristics of the calcareous substrate. During the glacial periods, Râiosu and Buda Peaks, that are higher than 2,300 m–2,400 m, functioned as an important ”nunatak”, which enabled the preservation of this rich flora (endemics and relicts).

Keywords: glacial relief, climate oscillations, relicts, calciphile, Făgăraş.

Rezumat. Bogăţia floristică a munţilor Râiosu şi Buda, masivul Făgăraş. Lucrarea prezintă bogăţia floristică a munţilor Râiosu şi Buda, din masivul Făgăraş. Mulţimea endemitelor şi a relictelor vegetale confirmă vechimea vegetaţiei acestor munţi calcaroşi; ele au supravieţuit catatermelor glaciaţiunilor datorită caracteristicilor termice ale substratului calcaros. Faptul că Vârfurile Râiosu şi Buda sunt situate la peste 2.300-2.400 m altitudine a făcut ca aceşti munţi să funcţioneze în perioadele glaciare ca un important „nunatak” care a ajutat la păstrarea acestei flore bogate în endemite şi relicte.

Cuvinte cheie: relief glaciar, oscilaţii climatice, relicte, calcifile, Făgăraş.

INTRODUCTION

The Făgăraş Mountains preserves the most representative glacial landforms of the Southern Carpathians. The unique features of the landscape of the Romanian Carpathians are mainly induced by the extension of the glacial and periglacial relief and by the highest values of the relief intensity within the entire country. This is why, Emm. de Martonne (1907) called the Southern Carpathians the ”Transylvanian Alps”. As a consequence of their past the Făgăraş Mountains have a lot of glacial traces: cirques, lakes (mountain lakes) and glacial valleys. The northern slopes characterized by a strong declivity, limited the development of the glacier length, while in the South the gentle and large valleys permitted the formation of some (valley) glaciers that are over 7 km long having a sinuous aspect and ramifications, which derive from the suspended tributary valleys (PIŞOTA, 1968).

The glacial cirques, locally called ”bucket” have different aspects and complexity. The valleys Capra and Buda are the most extended; they are formed by "complexes of glacial valleys", but the most spectacular valleys can be found on the western side of Buda – Râiosu – Muşeteica Peak. Some of the valleys have small lakes and glacial cirques that were occupied in the past by the tongues of the glaciers.

The altitude of 2,000-2,200 meters where they are situated indicate the fact that they were formed in a most recent glacial era that corresponds to Würm period (VAN CAMPO, 1969).

The glacial cut blade like indents appeared at the intersection of the glacial valleys and cirques, being accentuated by the past periglacial phenomena or by the actual crionival ones. They are common in the relief of the main crest of the southern slope Buda – Râiosu - Muşeteica. The studied mountains are situated in the northern side of Argeş County; they are a part of the southern slope of the Făgăraş Mountains.

Buda Mountain (2,431 m) is situated in the North of Buda Lake, a glacial lake situated at 2,055 m altitude. The lake has a surface of about 0.86 ha, it is triangular, and its maximum depth is 2.2 m (PIŞOTA, 1971). The Buda Valley has its origins in Buda cirque; it flows southwards and crosses a limestone area forming Gegiu Gorges, with hardly accessible walls. The valley of the Buda Stream is 18 km long and it flows in to Vidraru Lake. It has many tributaries including the Râiosu Stream.

The other studied mountain is Râiosu (2,395 m), which is a continuation of the Buda Mountain together with which it forms an almost continuous peak, as long as they are separated only by a little "saddle" called "Poliţa lui Vodă" or ”Vodă`s road”. This mountain has the shape of a huge pyramid and it presents all the features of a calcareous mountain with abrupt walls and detritus; the dolomite calcareous intercalation is well developed in sericite schists.

Râiosu Lake has a 0.15 ha surface and it depends on the rainy periods (PIŞOTA, 1971). It is situated at the southern side of the massif, East of Buda – Râiosu – Muşeteica summit, at 2,180 m altitude, in the glacial cirque dominated by Muşeteica Peak at West and by Râiosu Peak at East. This is probably the most spectacular landscape from the Făgăraş Mountains. The lake is strongly clogged because the rocks are desegregated and then transported by the masses of snow and ice. In the summer, it is frequently covered by iced snow. As there is no marked path, the access to the lake is very difficult (STANCU, 2005).

MATERIALS AND METHODS

If in the Pleistocene the characters of the climate justified the term periglacial on the territory of Romania, nowadays the region evolves under a crionival modelling regime at altitudes above the timberline. The crionival processes and the forms resulted presently are connected with the much more intense and extended manifestation from the Pleistocene; some of them continue their evolution, while others stopped, but they may be reactivated mainly due to the characteristics of the climate, as well as to the anthropogenic action.

The alpine level of the Făgăraş Mountains is characterized by the though climate conditions: the average temperatures of the cold months are -8°C and even -11°C, while the average number of winter days is 120-160. There are 220-250 frozen days yearly. The biggest thermal differences are registered in the transition months: April-May and October-November. Record values of the atmospheric rainfalls are registered in the western part of the massif (over 1,300 mm) while on the eastern side the value is 1,200 mm. Over a half of them are solid rainfalls. The average number of days with snow layer is over 200. The strong wind blowing from West could frequently reach 120 km/h.

The longitudinal orientation of the main alpine summit leads to great thermal differences between the shady northern slopes and the sunny ones, where the nebulosity is higher. The Făgăraş Mountains are considered to be the greatest clouds maker of our country. Beside the clouds coming together with the winds from the Atlantic, from the polar seas or from the Mediterranean Basin, the Făgăraş Mountains forms their own clouds. Some of them appear as a consequence of a stronger warming of the air from the southern slope by comparison with the northern one.

The crionival relief is the direct result of the diurnal thermal oscillations, with maximum efficiency in the aforementioned seasons of transition, but mainly in the spring (FLOREA, 1998). The fact that these mountains are entirely crystalline in their structure (but displaying a great petrographic diversity with intercalations of crystalline limestones and marbles) with cracks that permit water circulation, justifies the variety and the frequency of these forms.

RESULTS AND DISCUSSION

Buda (2,431 m) - Râiosu (2,395 m) - Mușeteica (2,448 m) is the only southern summit that displays the aspect of a ridge surrounded by pyramidal peaks. The presence of the crystalline limestone and dolomites, which led to the appearance of various forms (such as needles, sharp crests, towers, short abrupt sectors) explains the crenellated character of this summit with numerous elements of ruiniform calcareous relief. The limestones from the Râiosu and Buda Mountains shelter a series of vegetal calciphile associations which, despite the localization of these mountains, are representative for the Romanian Carpathians.

Many endemics and relicts of these vegetal groups confirm the oldness of the vegetation of this calcareous massif; they survived to the extreme catatherme of the glaciations, because of the thermal characteristics of the calcareous substrate. The absence of a glacial phenomenology from the calcareous massif shows that Râiosu and Buda, which exceed 2,300 m – 2,400 m, in the glacial periods, functioned as an important "nunatak" contributing to the preservation of this rich flora (endemics and relicts) (BĂNĂRESCU & BOȘCAIU, 1973). The oldness of this flora is also confirmed by the reduced capacity of phytocoenotic competition, a fact which conditioned the surviving in groups situated on rocks or on mobile and semi fixed detritus (petrophille).

The flora of these two mountains includes a great variety of phyto-geographical elements determined by the altitude variations (600 – 2,431 m). The Eurasian elements are dominant within this researched territory, followed by the European, Circumpolar, and Central European ones; the Carpathian endemics and the Carpathian-Balkan elements and the Alps-Carpathian elements represent 18% of this mountains flora (BELDIE, 1967).

On the other hand, a clear relationship between the altitude and the frequency of the calciphile species exists. But many of these species could be also found frequently on some basic rocks, especially gabbros. The Mesozoic limestone enclave of the Râiosu Mountain leads to some general conclusions regarding the floral-genetic role of the calciphile elements (BOȘCAIU, 1975).

In MERXMÜLER (1952) opinion, disjunctions between the calciphile species that can be found these days in the northern and southern parts of the Alps, appeared towards the end of the Tertiary age, when there still where large areas of limestone which, these kinds of plants used to grow on an unbroken area. As a result, the calcareous layer that was in contact with the vegetation could play a bigger part than it does today, in the migration of the calciphile plants. The erosion of the different limestone areas has been directed to isolate through crumble of the calciphile plants` area.

According to Malyschev's explanations (1965), the calciphily developed in the context of the drying of the climate because it ensures the compensation of a deficit of humidity during the periods of drought. As a result, the calciphily played an important role during the times of widen climatic changes that coincided with the formation of the complexes high level of the mountain flora. As a consequence of widen climatic tolerance, the calciphily encourages the migration of diverse vegetal populations across big distances, which supports the floral changes between distant mountains. So, it was favoured the extension of the cryophilic species in regions where the climate was dry. At the same time, the optional calciphily of some cryophilic species, became obligatory in the regions with a humid climate, where they can be found only in a calcareous layer.

According to Malyshev, many species the area of which has far-away disjunction are calciphile species. In its turn, the frequency of the calciphile areas seems to be correlated to the allophone elements of the flora. In Malyschev's opinion, in the native floral complexes, the calciphile species are less numerous than the allochthonous ones. Thus, calciphily favoured the floristic exchanges between the floras of several massifs of the alpine system and the arctic flora. The calciphile plants could migrate on long distances under the conditions of a climate that grows arid or cold in catathermes periods.

Taking these into account, it is accountable that the calciphile plants of the Făgăraş Mountains have polygenetic origins, coming from different phytogeographic areas and their migration happened in different phyto historic ages. Despite the huge phytogeographic interest, the chorological origin of these plants stands relative, as we do not always know the whole data concerning a certain area of all these species.

The Carpathian-Balkan species are very frequent both on the meadows from the alpine space and on the calcareous rocks from the forests (NEGREAN & OLTEAN, 1989). They highlight the floral-genetic connections between the flora of this East-Carpathian space and that of the Balkan Mountains, which existed in the Tertiary. Representative species: *Carduus kerneri* ssp. *kerneri, Campanula patula* ssp. *abietina, C. transsilvanica, Alyssum repens, Erysimum witmannii, Rhododendron myrtifolium, Poa media, Sesleria rigida, Ranunculus crenatus, Potentilla aurea* ssp. *chrysocraspeda, Saxifraga luteo-viridis, Veronica baumgartenii, Viola declinata, V. dacica* etc.

The taxa *Aconitum toxicum* highlights the link with the Balkan-Illyrian flora.

The existence of floral historical interferences with Anatolia and Caucasus in the past is attested by the presence of the following taxa: *Bruckenthalia spiculifolia, Plantago gentianoides, Telekia speciosa, Carex nigra* ssp. *dacica.*

A series of western and south-western and even Oriental-continental elements were found in this area of research: *Taraxacum nigricans, Scrophularia scopolii, Isatis tinctoria* ssp. *praecox.*

The results of the floristic analysis confirms the fact that this territory belongs to the Holarctic region, Eurosiberian sub region, Central-European domain, Eastern-Charpatian (Dacian) province, the Southern Carpathian circumscription, the Făgăraş Mountains district (BORZA & BOŞCAIU, 1965).

The impact of the anthropogenic - zoogenous pressure leads to the endangering and even to the extinction of some species or plants communities. Thus, although some species are still not in danger on a large scale, e.g. the national territory, they could be jeopardized in individual counties. These extinctions already represent an alarm because the extinction of some species in a county is followed by its extinction on the entire national territory (BOŞCAIU et al., 1994).

CONCLUSIONS

According to the phytogeographic information we have nowadays, we propose the following chorological classification of the calciphile plants from the Râiosu and Buda Mountains (CIOCÂRLAN, 2000; DIHORU & PÂRVU, 1987; OPREA, 2005).

Boreo-Circumpolar: *Adoxa moschatellina* L., *Artemisia vulgaris* L., *Asplenium scolopendrium* L., *A. ramosum* L., *Campanula rotundifolia* L., *Carex pallescens* L., *C. sylvatica* HUDSON, *Cerastium arvense* L. ssp. *arvense, Circaea alpina* L., *Chrysosplenium alternifolium* L., *Clinopodium vulgare* L., *Coeloglossum viride* (L.) HARTMAN, *Eriophorum latifolium* HOPPE, *Equisetum hiemale* L., *E. pratense* EHRH., *Galium aparine* L., *Geum aleppicum* JACQ., *G. rivale* L., *Gnaphalium sylvaticum* L., *Gymnocarpium robertianum* (HOFFM.) NEWMAN, *Hepatica nobilis* SCHREBER, *Juniperus communis* L., *Koeleria macrantha* (LEDEB) SCHULTES, *Milium effusum* L., *Moneses uniflora* (L.) A. GRAY., *Parnassia palustris* L., *Polypodium vulgare* L., *Polystichum braunii* (SPENNER) FÉE, *P. lonchitis* (L) ROTH, *Pyrola minor* L., *Rubus idaeus* L., *Sagina procumbens* L., *Selaginella selaginoides* (L.) LINK, *Spergularia rubra* (L.) J. et C. PRESL, *Stellaria uliginosa* MURRAY, *Viola biflora* L.

Arctic-Alpine-Circumpolar: *Aster alpinus* L., *Athyrium distentifolium* TAUSCH ex OPIZ, *Bartsia alpina* L., *Carex atrata* L., *Cerastium cerastoides* (L.) BRITTON, *Cystopteris montana* (LAM.) DESV., *Erigeron uniflorus* L., *Kobresia myosuroides* (VILL.) FIORI, *Lloydia serotina* (L.) REICHENB., *Loiseleuria procumbens* (L.) DESV., *Myosotis alpestris* F. W. SCHMID, *Pedicularis verticillata* L., *Potentilla crantzii* (CRANTZ) BECK ex FRITSCH, *Polygonum viviparum* L., *Rhodiola rosea* L., *Salix alpina* SCOP., *Saxifraga hieracifolia* WALDST. & KIT., *Saussurea alpina* (L.) DC., *Silene acaulis* (L.) JACQ.

Alpine-Circumpolar: *Anemone narcissiflora* L., *Carex pyrenaica* WAHLBG., *Dryas octopetala* L., *Hedysarum hedysaroides* (L.) SCHINZ et THELL., *Myosotis alpestris* F. W. SCHMIDT, *Polygonum viviparum* L., *Salix reticulata* L., *Saxifraga oppositifolia* L.

Alpine-Arctic: *Arabis alpina* L., *Ligusticum mutellinoides* (CRANTZ) VILL., *Nigritella nigra* (L.) REICHENB., *Pedicularis oederi* VAHL., *Saxifraga aizoides* L., *S. androsacea* L., *S. paniculata* MILL., *Pinguicula alpina* L.

Alpine-Altaic: *Astragalus australis* (L.) LAM., *Gentiana verna* L. ssp. *verna*, *Leontopodium alpinum* CASS., *Poa supina* SCHRAD., *Saxifraga moschata* WULFEN.

Alpine-Central-European: *Astragalus alpinus* L., *A. australis* (L.) LAM., *Bellardiochloa violacea* (BELLARDI) CHIOV., *Biscutella laevigata* L., *Bupleurum falcatum* L. *ssp. cernuum* (TEN.) ARCANGELI, *Carex sempervirens* VILL., *Cerastium alpinum* L., *Cerinthe glabra* MILLER, *Epilobium alpestre* (JACQ.) KROCKER, *Euphrasia salisburgensis* FUNCK., *Helianthemum alpestre* (JACQ.) D.C., *H. nummularium* (L.) MILLER ssp. *grandiflorum* (SCOP.) SCHINZ. & THELL., *Hieracium aurantiacum* L., *H. villosum* JACQ., *Kernera saxatilis* (L.) REICHENB., *Linaria alpina* (L.) MILLER, *Primula halleri* J.F. GMELIN, *Pritzelago alpina* (L) O. KUNTZE ssp. *brevicaulis* (SPRENGEL) GREUTER et BURDET, *Ranunculus alpestris* L., *R. oreophilus* BIEB., *Rumex scutatus* L., *Salix retusa* L. ssp. *kitaibeliana* WILLD., *Saxifraga retusa* GOUAN, *S. stellaris* L., *Sedum alpestre* VILL., *S. atratum* L., *Silene pusilla* WALDST. & KIT., *Solidago* *virgaurea* L. ssp. *minuta* (L.) ARCANGELI, *Thesium alpinum* L., *Trifolium badium* SCHREB., *Valeriana montana* L., *Veronica aphylla* L.

Alpine-Carpathian: *Acinos alpinus* (L.) MOENCH ssp. *alpinus*, *Aconitum tauricum* WULFEN, *Androsace lactea* L., *A. villosa* L. ssp. *arachnoidea* (SCOTT., NYM. et KOTSCH.) NYM., *Armeria alpina* WILLD., *Campanula alpina* JACQ., *Centaurea nervosa* WILLD., *Dianthus glacialis* HAENKE ssp. *glacialis*, *Draba kotschyi* STUR, *Festuca versicolor* TAUSCH, *Galium anysophyllum* VILL., *Gentiana brachyphylla* VILL., *G. utriculosa* L., *Helianthemum alpestre* (JACQ) D.C, *Nigritella rubra* (WETTST.) K. RICHTER, *Oxytropis halleri* BUNGE ex KOCH, *Polygala alpestris* REICHENB., *Pulsatilla alba* REICHENB., *Scabiosa lucida* VILL., *Senecio carniolicus* WILLD., *Viola alpina* JACQ.

Alpine-Carpathian-Balkan: *Achillea stricta* (KOCH) SCH., *Aconitum degenii* GAYER, *Alyssum repens* BAUMG. ssp. *repens*, *Alnus viridis* (CHAIX) D.C., *Arabis allionii* D.C., *Crepis conyzifolia* (GOUAN) A. KERN., *Dianthus barbatus* L. ssp. *compactus* KIT., *Doronicum columnae* TEN., *Gentianella lutescens* (VALEN.) J. HOLUB, *Laserpitium krapfii* CRANTZ., *Ligusticum mutellina* (L.) CR., *Phyteuma confusum* A. KERNER, *Ranunculus crenatus* WALDST.& KIT., *Senecio subalpinus* KOCH, *Tanacetum corymbosum* (L.) SCHULTZ BIP. ssp. *subcorimbosum* (SCHUR) PAWL., *Trifolium pallescens* SCHREB.

Balkan-Carpathian (incl. Dacian): *Aconitum toxicum* RCHB., *Alyssum repens* BAUMG. ssp. *transsilvanicum* (SCHUR) NYM., *Asperula capitata* KIT. ex SCHULTES, *Bellardiochloa variegata* (LAM.) KERGUELEN, *Bromus barcensis* SIMONKAI, *Bupleurum diversifolium* ROCH., *Centaurea atropurpurea* WALDST. et KIT., *C. kotschyana* HEUFFEL, *Cirsium candelabrum* GRISEB., *Dianthus petraeus* WALDST. et KIT, *Draba lasiocarpa* ROCHEL, *Galium kitaibelianum* SCHULTES et SCHULTES, *Geranium sylvaticum* L. ssp. *caeruleatum* (SCHUR) D. A. WEB., *Gypsophila petraea* (BAUMG.) REICHENB., *Helleborus purpurascens* WALDST. et KIT., *Lathyrus hallersteinii* BAUMG., *Linum extraaxilare* KIT., *Poa cenisia* ALL. ssp. *contracta* NYAR., *Plantago gentianoides* SIBTH. et SM., *Pulmonaria rubra* SCHOTT, *Ranunculus pseudomontanus* SCHUR, *Saxifraga carpatica* RCHB., *S. corymbosa* BIOSS., *S. pedemontana* ALL. ssp. *cymosa* ENGLER, *S. rotundifolia* L. ssp. *heucherifolia* (GRIS. et SCHENNK) CIOCÂRLAN, *Sempervivum marmoreum* GRISEB., *Senecio pappopus* (RCHB.) LESS., *Sesleria bielzii* SCHUR, *S. rigida* HEUFF. ssp. *haynaldiana* SCHUR, *Silene lerchenfeldiana* BAUMG., *Symphyandra wanneri* (ROCHEL) HEUFFEL, *Thymus balcanus* BORB., *Veronica baumgartenii* ROEMER et SCHULTES.

Balkan-Dacian-Pannonic: *Chamaecytisus hirsutus* (L.) LINK. ssp. *leucotrichus* (SCHUR) LÖVE et. LÖVE.

Carpathian (incl. End): *Achillea schurii* SCHUR, *Aconitum moldavicum* HACQ., *Aquilegia transsylvanica* SCHUR, *Athamantha turbith* (L.) BROT. ssp. *hungarica* (BORBAS) TUTIN, *Campanula carpatica* JACQ., *C. transsilvanica* SCHUR, *Cardaminopsis neglecta* (SCHULTES) HAYEK, *Centaurea pinnatifida* SCHUR, *Cerastium arvense* L. ssp. *lerchenfeldianum* (SCHUR) ASCHERSON et GRAEBNER, *C. transsilvanicum* SCHUR, *Chrysosplenium alpinum* SCHUR, *Dentaria glandulosa* W. et K., *Dianthus glacialis* HAENKE ssp. *gelidus* (SCHOTT, NYM. et KOTSCHY) NYM., *D. henteri* HEUFFEL ex GRISEB., *D. petraeus* WALDST. et KIT. ssp. *petraeus*, *D. spiculifolius* SCHUR, *D. tenuifolius* SCHUR, *Erysimum witmanni* ZAWADSKI ssp. *transsilvanicum* (SCHUR) P. W. BALL, *E. wittmannii* ZAM. ssp. *witmannii, Eritrichium nanum* (L.) SCHRADER ssp. *jankae* (SIMK.) JAV., *Festuca rupicola* HEUFFEL ssp. *saxatilis* (SCHUR) RAUSCHERT, *Genista tinctoria* L. ssp. *oligosperma* (ANDRAE) PROD., *Helictotrichon decorum* (JANKA.) HENRARD, *Hepatica transsilvanica* FUSS, *Hesperis moniliformis* SCHUR, *Leucanthemum waldsteini* (SCHULTZ BIP.) POUZAR, *Onobrychis montana* D. C., ssp. *transsilvanica* (SIMONKAI) JAV., *Origanum vulgare* L. var. *barcense* SIMK., *Oxytropis carpatica* UECHTR., *Papaver alpinum* L. ssp. *corona-sancti-stephani* (ZAPAL.) BORZA, *Phyteuma tetramerum* SCHUR, *Poa granitica* BR.-BL. ssp. *disparilis* (NYAR.) NYAR., *Ranunculus carpaticus* HERBICH, *Symphytum cordatum* WALDST. et KIT., *Thymus comosus* HEUFFEL, *T. pulcherimus* SCHUR.

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REFFERENCES

BĂNĂRESCU P. & BOŞCAIU N. 1973. *Biogeografie. Perspectivă genetică şi istorică*. Edit. Ştiinţifică. Bucureşti. 302 pp.

BELDIE AL. 1967. *Endemismele şi elementele dacice din flora Carpaţilor româneşti*. Comunicări de botanică la a V-a Consfătuire de geobotanică. Bucureşti: 113-120.

BORZA AL. & BOŞCAIU N. 1965. *Introducere în studiul covorului vegetal*. Edit. Academiei Române. Bucureşti. 340 pp.

BOŞCAIU N. 1975. *Problemele conservării vegetaţiei alpine şi subalpine.* Ocrotirea Naturii Bucureşti. **19**(1): 17-21.

BOŞCAIU N., COLDEA GH., HOREANU CL. 1994. *Lista roşie a plantelor vasculare dispărute, periclitate, vulnerabile şi rare din România.* Ocrotirea naturii şi a mediului înconjurător. **38**(1): 45-56.

CIOCÂRLAN V. 2000. *Flora ilustrată a României. Pteridophyta et Spermatophyta.* Ediţia a doua revăzută şi adăugită. Edit. Ceres. Bucureşti. 1139 pp.

DIHORU G. & PÂRVU C. 1987. *Plante endemice în flora României*. Edit. Ceres. Bucureşti. 180 pp.

FLOREA M. 1998. *Munţii Făgăraşului. Studiu geomorfologic.* Edit. Foton. Braşov. 114 pp.

MALYSCHEV L. I. 1965. *Flora alpina Montium Sajanensium Orientalium Nauka.* Moscova-Leningrad. 367 pp (In Russian).

MERXMÜLLER H. 1952. *Untersuchungen zur Sippenglicderung und Arealbildung in den Alpen.* München. 105 pp.

NEGREAN G. & OLTEAN M. 1989. *Endemite şi zone endemo-conservatoare din Carpaţii S-E.* Ocrotirea naturii şi a mediului înconjurător. **33**(1): 15-25.

OPREA A. 2005. *Lista critică a plantelor vasculare din România.* Edit. Universităţii. “Al. I. Cuza”. Iaşi. 668 pp.

PIŞOTA I. 1968. *Lacurile glaciare din Munţii Rodnei.* Analele Universităţii Bucureşti. (Şt. nat.) Geologie-Geografie. **12**(2): 113-124.

PIŞOTA I. 1971. *Lacurile glaciare din Carpaţii Meridionali*. Studiu hidrologic. Edit. Academiei. Bucureşti. 162 pp.

STANCU DANIELA ILEANA. 2005. *Flora şi vegetaţia Munţilor Râiosu şi Buda, masivul Făgăraş.* Edit. Universităţii din Piteşti. 226 pp.

VAN CAMPO M. 1969. *Végétation würmienne en France. Donnéss bibliographiques. Hypothése.* Etudes francaise sur le quaternare présentées á l`occasion du VIII-e Congrés International de l`INQUA. Paris: 1-8.

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