

THE ORIGIN OF THE CALCIPHILE FLORA FROM THE ROMANIAN CARPATHIANS

DANIELA ILEANA STANCU

NICOLAE BOȘCAIU

Rezumat

Originea florei calcifile din Carpații Românești

Este o prezentare a rolului jucat de calcifilie de-a lungul timpului, în special a marilor schimbări climatice care au coincis cu formarea înaltelor nivele complexe ale florei montane.

Ca o concluzie, plantele calcifile din Carpații Românești au origini poligenetice, venind din diferite arii fitogeografice și emigrarea lor s-a produs în diferite ere fitoistorice.

The high frequency of the calciphile species has recently been emphasized by the botanical studies. Many petrophytes from all the levels of vegetation in the mountains, from the mountainous level to the alpine level, can easily be found only on the calcareous layer. There is also a great number of orophytes whose calciphilie is optional. Thus, the appearance of calcareous rocks, on small areas, is followed by the trait of a distinct flora.

On the other part, there is an evidently relationship between the growing of the altitude and the frequency of the calciphile species. But many calciphile species can frequently be found on alkaline rocks, especially the gabbroic ones.

On H. MERXMULLER (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.

Relying on the statistic analysis of the flora from the mountains in the Oriental Sayan, L. M. MALYSHEV (1965) established some important considerations about the florogenetic role of the calciphilie. According to Malyshev's explanations, the calciphilie has been developed in conditions of climate's drying, because the calciphilie provide for compensation of the deficit of humidity during dryness periods.

As a result, the calciphilie played an important role during the times of widen climatic changes that coincided with the formation of the complexes high level of the mountains flora. As a consequence of the widen climatic tolerance, the calciphilie encourage the migration of divers vegetal

populations across big distances, which supporting the floral changes between distant mountains. So, was favored the extension of the calciphile species in regions where the climate is dryness. At the same time, the optional calciphilie of some calciphile species, became obligatory in the regions with a humid climate, where they can be found only on a calcareous layer. Also, calciphile species can be found in eutrophic or even mezotrophic peat-bogs, but the species that are specific to these peat-bogs could frequently be found on limestones too: *Parnassia palustris*, *Pedicularis verticillata*, *Pinguicula vulgaris*, *Primula farinosa*, *Swertia perennis*. On the same way, fontinal higrophytes such as *Saxifraga aizoides*, *Silene pusilla* and *Viola biflora* can often be found on arid limestone. On its turn, *Saxifraga mutata* ssp. *mutata* (which is alpine vicariant of the Carpathian endemism *Saxifraga mutata* ssp. *demisa*) survived in Romania till today only in the eutrophic peat-bog from the Braşov depression.

Yet, there are some exceptions: thus, the obligatory calciphile species from the northern areas such as *Helianthemum nummularium*, could become optional or indifferently, in the southern areas.

Finding that the calciphilie is more important for the alpine flora than for the mountainous level, leads to the conclusion that this flora has formed in a moister climate than the alpine level's flora (L. MALYSHEV 1965).

According to Malyshev, many species whose area have far-away disjunction, are calciphile species. In his turn, the frequency of the calciphile areas seems to be correlate to the alohtone elements of the flora. On Malyshev opinion in the native floral complexes, the calciphile species are less numerous than the alohton ones. Thus, calciphilie favored the floristic exchanges between the floras of several massifs of the alpine system and the arctic flora.

The calciphile flora from the Romanian Carpathians seems to have a two-folded origin, coming from the tertiary oro-mediterranean flora, as well as from the northern massifs of holarctic flora. But, a great number of nemoral hemiorophyte which are considered as having appeared in the ancient Miocene flora, are calciphobe (*Syringa josikaea*, *Veronica bachofenii*) or indifferent at the calcareous layer (*Aconitum moldavicum*) or, at least, they could eventually be calciphile (*Hepatica transsilvanica*).

The calciphile plants could migrate on long distances under the conditions of a climate that grows arid or cold in catathermes ages.

Malyshev's statistics showed that in the Orient Sayan, the calciphilie of the arctic-alpine plants are 30% while the alpine ones only 24%. These percentages are similar to those of the Romanian Carpathians flora have polygenetic origins, coming from different fitogeographic areas and their emigration happened in different fitohistoric ages. Despite the huge fitogeographic interest, the corologic belonging of this plants stands relative, as we do not always know the whole data concerning a certain area of all these species.

At the same time, according to the fitogeographic information we have today, we support the following corological classification of the calciphile plants of the Romanian Carpathians flora.

Boreo-Circumpolar

Saxifraga hirculus L., $2n = 32$

Arctic-Alpine-Circumpola

Androsace chaejasme Wulfen, $2n = 20$

Astragalus frigidus (L.) A. Gray, $2n = 16$

Cystopteris montana (Lam.) Desv., $2n = 168$

Rhodiola rosea L., $2n = 22$

Saxifraga adscendens L., $2n = 22$

Saxifraga cernua L., $2n = 52, 54$

Saxifraga hieraciifolia Waldst. & Kit., $2n = \dots$

Saussurea alpina (L.) DC., $2n = 52, 54$

Silene acaulis (L.) Jacq., $2n = 24$

Alpine-Circumpolar

Anemone narcissiflora L., $2n = 14, 16$

Draba fladnizensis Wulfen, $2n = 16$

Dryas octopetala L., $2n = 18, 36$

Hedysarum hedysaroides (L.) Sch. et Thell., $2n = 14$

Myosotis alpestris F. W. Schmidt, $2n = 24, 48, 72$

Oxytropis campestris (L.) DC., $2n = \dots$

Polygonum viviparum L., $2n = 82-86, 100$

Salix reticulata L., $2n = 38$

Saxifraga oppositifolia L., $2n = 26$

Alpico-Arctic

Arabis alpina L., $2n = 16, 32$

Euphrasia salisburgensis Funck, $2n = 44$

Nigritella nigra (L.) Reichenb., $2n = 64$

Saxifraga aizoides L., $2n = 26$

Saxifraga androsacea L., $2n = 16$

Saxifraga paniculata Miller, $2n = 28$

Alpico-Altaic-Arctic

Astragalus alpinus L., 2n = 16, 32
Astragalus penduliflorus Lam., 2n = 16
Carex capillaris L., 2n = 54
Pinguicula alpina L., 2n = 32

Alpico-Altaic

Aster alpinus L., 2n = 18, 36
Leontopodium alpinum Cass., 2n = 52
Saussurea discolor (Willd.) DC., 2n = 26
Saxifraga moscata Wulfen, 2n = 22, 52

Alpico-Centro-European

Androsace lactea L., 2n = 76
Armeria alpina (DC.) Willd., 2n = ...
Astragalus australis (L.) Lam., 2n = 32, 48
Bupleurum falcatum L. ssp. *cernum* (Ten.) Archangeli 2n = ...
Bupleurum ranunculoides L., 2n = 42
Carex brachystachys Schrank, 2n = 40
Cerinth glabra Miller, 2n = ...
Draba aizoides L., 2n = 16
Galium anisophyllum Vill., 2n = 22-80, 110
Gentiana clusii Perr. & Song., 2n = ...
Gentiana lutea L., 2n = 40
Helianthemum alpestre (Jacq.) DC., 2n = 22
Helianthemum nummularium (L.) Miller ssp. *grandiflorum* (Scop.) Schinz. & Thell., 2n = ...
Kernera saxatilis (L.) Reichenb., 2n = 16, 32
Linaria alpina (L.) Miller, 2n = 12
Oxytropis pyrenaica Godron & Gren., 2n = 16
Oxytropis halleri Bunge, 2n = 32
Ranunculus thora L., 2n = ...
Rumex scutatus L., 2n = 40
Salix retusa L., 2n = 76, 114
Scabiosa lucida Vill., 2n = 16
Silene pusilla Waldst. & Kit., 2n = 24
Valeriana montana L., 2n = 32

Alpico-Carpathian

Androsace obtusifolia All., $2n = \dots$
Eritrichium nanum (L.) Schrader ssp. *nanum*, $2n = \dots$
Nigritella rubra (Wettst.) K. Richter, $2n = 34$
Polygala alpestris Reichenbach, $2n = 34$
Saxifraga mutata L. ssp. *mutata*, $2n = 28$
Viola alpina Jacq., $2n = 22$

Alpico- Carpathian- Balcanic

Asplenium lepidum C. Presl., $2n = 144$
Biscutella laevigata L., $2n = 18, 36$
Cerastium eriophorum Kit., $2n = 36$
Daphne blagayana Freyer, $2n = 18$
Doronicum columnae Ten., $2n = \dots$
Genista radiata (L.) Scop., $2n = \dots$
Geranium macrorrhizum L., $2n = 46, 87, 93$
Peltaria alliacea Jacq., $2n = 14, 28$
Trisetum alpestre (Host.) Beauv., $2n = \dots$

Balcano-Carpathian (incl. Dacian)

Alyssum repens (Reut.) Jav., $2n = 16$
Arabis praecurrens Waldst. & Kit., $2n = \dots$
Asperula capitata Kit., $2n = 22$
Bupleurum diversifolium Roch., $2n = \dots$
Carduus kernerii Simonkai, $2n = \dots$
Delphinium fissum Waldst. & Kit., $2n = \dots$
Draba lasiocarpa Rochel, $2n = \dots$
Erysimum comatum Pancici, $2n = \dots$
Erysimum witmanni Zawadski ssp. *transsilvanicum* (Schur) P.W. Ball, $2n = \dots$
Ferulago silvatica (Besser) Reichenb., $2n = \dots$
Gypsophila petraea (Baumg.) Reichenb., $2n = \dots$
Lilium carniolicum Bernh. ssp. *jancae* (A. Kern.) Asch. & Graebn., $2n = \dots$
Moehringia pendula (Waldst. & Kit.) Fenzl., $2n = \dots$
Peucedanum longifolium Waldst. & Kit., $2n = \dots$
Seseli gracile Waldst. & Kit., $2n = \dots$
Seseli rigidum Waldst. & Kit., $2n = \dots$

Sesleria heuffleriana Schur, 2n = ...

Sesleria rigida Heuffel, 2n = ...

Balcano-Dacian-Panonic:

Ferula sadleriana Ledeb., 2n = ...

Silene flavescent Waldst. & Kit., 2n = ...

Illyric:

Onobrychis alba (Waldst. & Kit.) Desv., 2n = ...

Moesiac:

Campanula crassipes Heuffel, 2n = 34

Ferula heuffeli Griseb., 2n = ...

Festuca xanthina Roem. & Schultes, 2n = ...

Minuartia graminifolia (Ard.) Jav., 2n = ...

Primula auricula L. ssp. *serratifolia* (Roch.) Jav., 2n = ...

Scutellaria vellenovskyi Rech., 2n = ...

Sesleria filifolia Hoppe, 2n = ...

Silene saxifraga L., 2n = 24

Carpathian (incl. Dacian)

Athamantha turbith (L.) Brot. ssp. *hungarica* (Borbas) Tutin, 2n = ...

Campanula carpatica Jacq., 2n = 34

Dianthus callizonus Schott & Kotschy, 2n = 30

Eritrichium nanum (L.) Schrader ssp. *jankae* (Simk.) Jav., 2n = ...

Hesperis moniliformis Schur, 2n = ...

Hesperis nivea Baumg., 2n = ...

Hesperis oblongifolia Schur, 2n = ...

Linum uninerve (Rochel) Jav., 2n = ...

Onobrychis transsilvanica Simk., 2n = 14

Oxytropis carpatica Uechtr., 2n = ...

Papaver corona-sancti-stephani Zapal, 2n = ...

Primula wulfeniana Schott ssp. *baumgarteniana* (Degen & Moesz) Ludi, 2n = 66

Salix kitaibeliana Willd, 2n = 76

Saxifraga mutata L. ssp. *demissa* (Schot & Kotschy) D.A. Webb., 2n = ...

Trisetum fuscum (Kit. ex Schultes) Schultes in Roemer & Schultes, 2n = ...

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Daniela Ileana Stancu
The Museum of Pitești County
44, Armand Călinescu Street
Romania
Nicolae Boșcaiu
Romanian Academy
Cluj-Napoca, 9, Gheorghe Bîlașcu Street
Romania