UNIVERSITATEA DIN CLUJ-NAPOCA
GRĂDINA BOTANICĂ
CONTRIBUȚII BOTANICE, CLUJ-NAPOCA, 1989

THE FLORA OF THE "FÎNAȚELE CLUJULUI" RESERVATION

ARIERIA VICOL

Our aim was to study the evolution of the diversity of plants from the reservation within a period of 40 years. For this, we made up lists with the species found by us in 1984 and by E. Ghișa in 1944. Afterwards, an ecological analysis of both the new and absent species in 1984 compared to 1944, using the method of ecological bioindicators, was undertaken. In the reservation 39 new species appeared and only 21 disappeared, a fact that indicates a pressure upon the stability of the flora. Most of the new species are specific to forests, reflecting the influence of the potential conditions in the reservation. Therefore, the pressure comes mostly from the inside.

1. Generalities.

From the hayfields situated in the northern part of the city Cluj-Napoca (Fig. 1) and used by the natives, two plots were declared botanical reservation in 1932: „La Țigle" and „La Crai". Within the reservation the relief is broken, this being the very reason why people avoided it and why many rare species managed to survive here. Both in the reservation and in the surrounding hayfields and pastures, the present-day flora and vegetation are secondary with respect to the flora and vegetation of the forests cut a long time ago. Still, the natural potential greatly manifests itself, the phenomenon of spontaneous reafforestation being obvious and extended in the reservation. The forest sets itself up again, unless man acts to stop it.

2. The natural frame.

The highest altitude in the reservation is 542 m ("Glimeia"), while the lowest one is not below 500 m (at S—SE from the Eastern Hillock). The main geomorphological formations follow the E—W direction (Fig. 2).

The reservation is situated upon a basis consisting of marine deposits (the Sarmatic Sea) and especially of mild grit stones, conglomerates, gravels, all covered by more recent formations such as: marls, clays and fine sands. This basis was made up in the sarmatian, when it also suffered the orogenic movements that account for the general morphology of the region. Further on, the relief of the reservation was modelled by earth slidings and by the erosive effect of water and air. Special attention should be payed to the formations of the "Glimeic" type, characteristic to the wave-like earth slidings (specific to the geomorphological landscape of the Transylvanian Basin).

Concerning the climate, a name like "The Warm Valley" (close to the reservation) is the first climatic characterization which belongs to the local population. The annual average temperature of the whole region is +8.5 °C, July being the warmest month (with the medium temperature above 20 °C) and January the coldest one (the medium temperature being −4.1 °C). The annual average precipitations are of about 600 mm. The greatest amount of rain falls in spring and summer. The annual me-

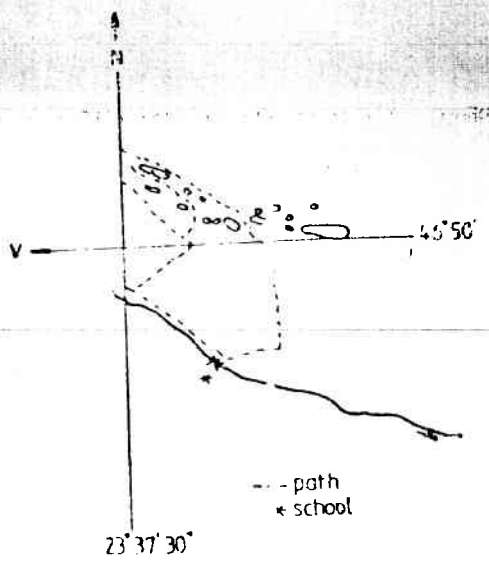

Fig. 1. The geographical situation of the "Finațele Clujului" reservation and the roads leading to it, from the houses in "Valea Finațelor" (the Hayfield Valley).

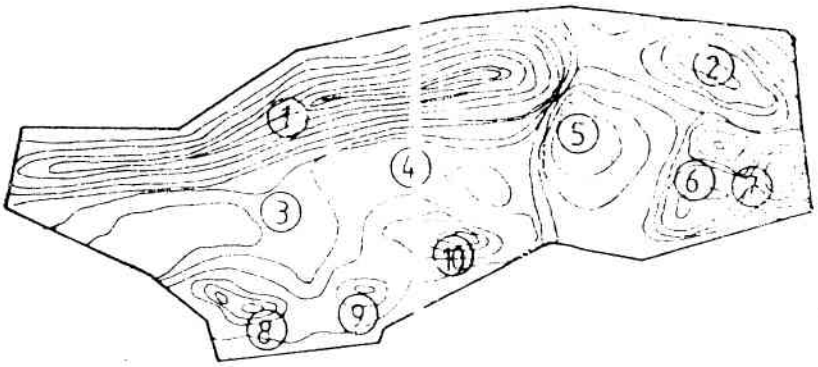

Fig. 2. The "Finațele Clujului" reservation with the geomorphological formations as named by E. Ghișa in 1944: 1. "Glimeia" (a small hill, reaching 5 2 m in height); 2. "Piscurile Gemene", The Twin Peaks; 3. "Iajiștea", The Pasture; 4. "Tarnița", The Saddle; 5. "Rovina", The Pit; 6. "Movila", The Hillock; 7. "Straja", The Guard; 8. "Colina Vestică", The Western Hillock; 9. "Colina Medie", The Middle Hillock; 10. "Colina Estică", The Eastern Hillock.

dium relative humidity of the air is about 80%. The special microclim te study (E. Ghișa, 1944, p. 40 -45) of the reservation reveals sor very special microclimate conditions here: a very high insolation, a mu higher temperature (the annual average reaches +14.5°C), the precipit tions, although not below 500 mm a year run quickly down the abru and generally barren slopes. In spite of the fact that the general clim is a forest one, the topoclimate and the microclimate favoured the i tallation and preservation in time o a more thermophile vegetation.

The reservation is situated inside a region of leached chernozem, the erosion led to a strong degradation, especially on the slopes, the

becoming poor in humus, with neutral or alcaline pH and a short profile. In low and relatively plane places ("Tarnița", the Pasture, "Rovina") the soil is deeper, contains 5—6% humus and has a slightly acid pH.

From the phytogeographical point of view, the reservation belongs to the Holarctic Flower Empire, the Eurosiberian Region, the Central-European Province (or the East Carpathian Province, the Province of Dacian Carpathians), the Transylvanian Plateau Division, the Transylvanian Plane (Depression) District (after Al. Borza, 1960—1965) According to H. Meusel et al. (1965) the reservation is affiliated to: the Holarctic Flower Empire, the Temperate Zone, the Middle-European Region, the Carpathian Subregion, the Transylvanian Province.

3. Aim and method.

The first aim we tried to achieve was to prove the evolution of the diversity of the flora from the reservation within a period of 40 years. In order to achieve it, we reinventoried the flora of the reservation and compared our lists of species with the lists provided by E. Ghișa, in 1944. This enabled us to make up new lists, with the species we could no more find and with the new species found in 1984. We also worked out a systematic synopsis with all the species after first having up-dated the nomenclature. In order to appreciate the evolution of the flora, we analysed phytocoenologically and ecologically the missing, as well as the new species found in 1984 compared to those found in 1944, using the method of the vegetal bioindicators (after H. Ellenberg, 1974).

4. General considerations upon the flora.

a) *The statistic analysis of the taxons.* What is remarkable, is the fact that on a territory of only 2.3 ha, with an extension in altitude of less than 50 m, we can find 474 cormophytic species. If we compare this number with the average of 800 species/km² in Central Europe, we find that the reservation has an extremely high diversity of plants. The 474 species (including those absent or new within 40 years) belong to: 274 genera, 66 families, 36 orders.

b) The analysis from the point of view of the altitude, the vegetation strata and the bioforms. The best represented are the plants from the plain stratum (85 . 45%), while the plants from the forests and forest clearings represent 17.72% (E. Ghișa, 1944, p. 57—59).

The distribution of the flora regarding the bioforms is the following: hemicryptophytes 66.5%, terophytes 13.9%, geophytes 11,5%, phanerophytes 4%, chamaephytes 3.8%, hydrophytes 0.67%.

The relations between these groups of plants from the reservation reflect the clearing of the forest and the setting of the herbaceous secondary vegetation. We must outline the fact that in the present process of spontaneous reafforestation, one must expect an increase in the number of plants characteristic to forest and forest clearings. Even up to now, as we can see from the analysis of the phytocoenotic affiliation of the new species in the reservation the increase concerns these very groups of plants.

c) *The phytogeographical analysis.* The percentage of the phytogeographical elements in the reservation is the following (after E. Ghişa, 1944, p. 66):

Eurasian	24.54%
Eurosiberian—North American	14.77%
Eurosiberian	3.86%
European (including Central-European)	17.72%
Pontic	9.54%
Ponto-Mediterranean	7.95%
Mediterranean-Submediterranean	10.22%
Circumpolar	3.4%
South-East European (Dacian-Balkan)	3.4%
Cosmopolitan	2.72%
Sarmatian	0.68%
American	0.45%
Illiric and endemic	less than 1%

The high percentage (27.71%) of the generally thermophyle elements (Pontic, Mediterranean, Submediterranean) reflects the particular situation in the reservation. This situation is also underlined by the remarkable presence of the Dacian, Balkan, Illiric and endemic elements (4%).

d) *The ecological analysis of the dynamics of the flora.* Submitted to an ecological analysis, the two lists of species (the absent and the new ones in the reservation after 40 years) reflect quite different ecological demands (see fig. 3).

A) The list with the missing species:

Aristolochia clematitis L.
Lychnis flos-cuculi L.
Sanguisorba minor SCOP.
Eryngium planum L.
Centaurium erythrea RAFN ssp. erythrea
Cynoglossum officinale L.
Euphrasia stricta D. WOLFF
Carlina acaulis L.
Carduus acanthoides L.
Scorzonera humilis L.
Alisma plantago-aquatica L.
Butomus umbellatus L.
Zannichellia palustris L.
Sclerochloa dura (L.) BEAUV.
Cynosurus cristatus L.
Hordeum murinum L.
Holcus lanatus L.
Setaria pumila (POIRET) SCHULTES
Dichanthium ischaemum L.
Lemna trisulca L.
Typha latifolia L.

B) The list with the new species

Dryopteris filix-mas (L.) SCHOTT
Juglans regia L.
Ulmus glabra HUDSON
Urtica dioica L.
Parietaria officinalis L.
Chenopodium bonus-henricus L.
Anemone nemorosa L.
Clematis vitalba L.
Adonis aestivalis L.

Ranunculus sceleratus L.
Berberis vulgaris L.
Fumaria officinalis L.
Fragaria vesca L.
Geum urbanum L.
Potentilla thuringiaca BERNH.
Prunus domestica L.
Prunus cerasus L.
Vicia silvatica L.
Acer campestre L.
Rhamnus saxatilis JACQ. ssp. tinctorius (WALDST. et KIT.) NYMAN
Frangula alnus MILLER
Viola odorata L.
Viola alba L.
Viola reichenbachiana JORDAN
Circaea lutetiana L.
Bifora radians BIEB.
Aegopodium podagraria L.
Trinia glauca (L.) DUMORT.
Lysimachia vulgaris L.
Prunella laciniata L.
Sambucus nigra L.
Helianthus annuus L.
Arctium lappa L.
Mycelis muralis (L.) DUMORT.
Lapsana communis L.
Allium sphaerocephalum L.
Maianthemum bifolium (L.) F.W. SCHMIDT
Polygonatum multiflorum (L.) ALL.
Alopecurus geniculatus L.

Fig. 3 shows that the missing species in the reservation are, generally speaking, more xerothermic, while the new species are more mezothermic. It also indicates the demand for less or greater humidity, respectively. These observations led us to the conclusion that in the reservation occurred a process of increasing the humidity level and, at the same time, one of a slight cooling, both processes having an unfavourable influence upon the xerothermic species and favouring the mesothermic ones. Taking into account both this situation and the general phenomenon of spontaneous reafforestation, we can assume that the reafforestation itself generated the higher humidity and the slight cooling in the reserved space.

5. Conclusions.

In the reservation we found a high plant diversity. We also noted that upon the background consisting of Eurasiatic-Siberian-Circumpolar species (about 64%) a high percentage (about 30%) of elements characteristic to some warmer regions has been superposed.

The great participation of the forest elements (18%) on the predominant background of the plain stratum elements (about 86%), allowed us to recognize the wooded past of the region and the subsequent extension of the herbaceous, secondary vegetation.

The fact that there were more new species (39) than missing ones (21) indicated a pressure upon the stability of the flora in the reserva-

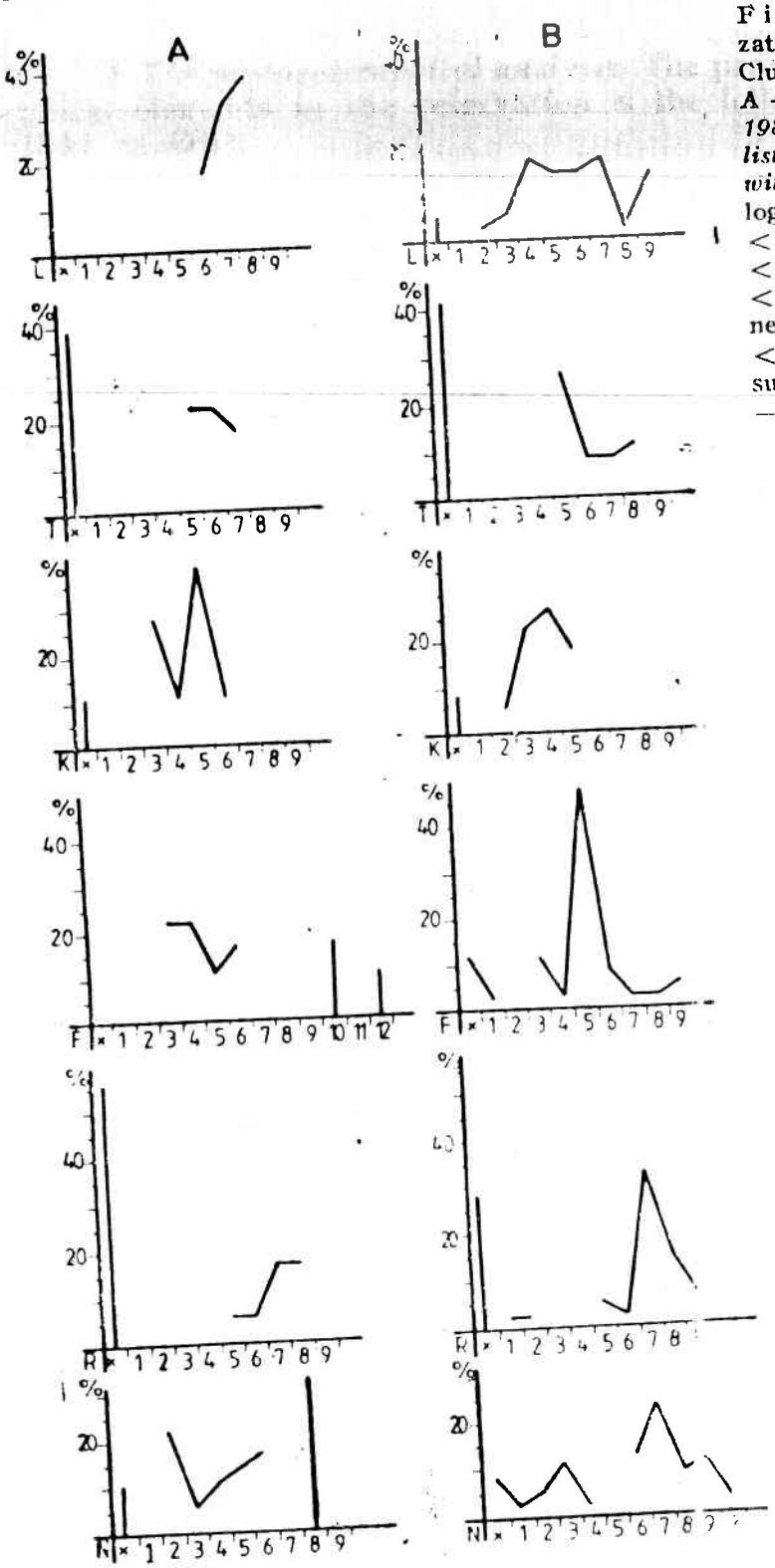

Fig. 3. The ecological characterization of the flora of the "Finațele Clujului" reservation, based on: A — *the list of the absent species in 1984 with respect to 1944*; B — *the list of the new species found in 1984 with respect to 1944*; × — high ecological tolerance, — low insolation < L_5 < high insolation, — cold < T_5 < hot, — oceanic climate < K_5 < continental climate, — dryness < T_5 < humidity, — acid pH < R_5 < alcaline pH, — low nutrient supply < N < high nutrient supply, — (after H. Ellenberg, 1974).

tion (stability being reflected by an as great as possible constancy of the list of species in time). The great number of elements specific to forests (19 species out of the total of 39 new ones) showed the great influence of the potential conditions of the reservation. Therefore, the pressure came mostly from the inside.

REFERENCES

1. Borza, Al., Boşcaiu, N., *Introducere în studiul covorului vegetal*. Ed. Acad. R.S.R., Bucureşti, 1965.
2. Ellenberg, H., *Zeigerwerte der Gefässpflanzen Mitteleuropas*. Göttingen, 1974.
3. Ghişa, E., *Rezervaţia botanică dela Cluj. Contribuţiuni la studiul florei şi vegetaţiei Basinului Ardelean*. Bul. Com. Monum. Nat. din România, Cluj, 1944, 37—177.
4. Meusel, H., Jäger, E., Weinert, E., *Vergleichende Chorologie der Zentraleuropäischen Flora*. Jena, 1965.
5. Nemeş, M., Csapó, I., In: Nemeş, M., şi colab., Contribuţii la studiul răspîndirii şi clasificării solurilor din raionul Cluj. Studii şi Cercet. Agron., Cluj, X, 1959, 13—47.
6. Pop, I., *Ocrotirea naturii în R. S. România*. Univ. Cluj, 1982.
7. Raţiu, O., *Fitocenologie şi vegetaţia R. S. România*. Univ. Cluj, 1982.
8. Sanda, V., Popescu, A., Dolta, M. I., Doniţă, N., *Caracterizarea ecologică şi fitocenologică a speciilor spontane din flora României*. Studii şi Comunic., Şt. Nat., Sibiu, 10, 1983, Suppl.
9. Spârchez, Z., *Harta formaţiunilor forestiere a raionului Cluj*. În: Nemeş, M. şi colab., Contribuţii la studiul răspîndirii şi clasificării solurilor din raionul Cluj. Studii şi Cercet. Agron., Cluj, X, 1959, 13—47.
10. Velea, C., *Harta vegetaţiei ierboase a raionului Cluj*. În: Nemeş, M. şi colab., Contribuţii la studiul răspîndirii şi clasificării solurilor din raionul Cluj, Studii şi Cercet. Agron., Cluj, X, 1959, 13—47.
11. Zsigó, E., Vicol, A., *Caracterizarea ecologică a rezervaţiei ştiinţifice „Finaţele Clujului" (jud. Cluj)*. A II-a Conf. de ecologie, 11—14 sept. 1984, Sibiu.
12. *Flora Europaea I—V*. University Press, Cambridge, 1964—1987.
13. *Flora R. S. România I—XIII*. Ed. Acad. R.S.R., Bucureşti, 1952—1976.
14. *Publicaţia nr. 9757/1974 a Cons. Pop. al Jud. Cluj*. Comisia pentru protecţia mediului înconjurător. Cluj, 1974.
15. Vicol A. *Aspecte de floră şi vegetaţie din rezervaţia „Fînaţele Clujului"* (Lucrare de diplomă). Univ. din Cluj-Napoca, 1985

FLORA REZERVAŢIEI „FÎNAŢELE CLUJULUI"

(Rezumat)

Rezervaţia „Finaţele Clujului" a fost declarată ca atare în 1932. Primul studiu amănunţit a fost realizat de E. Ghişa în 1944. Scopul nostru a fost să studiem evoluţia diversităţii plantelor din rezervaţie, în 40 de ani, comparînd situaţia găsită de noi, în 1984, cu cea găsită de E. Ghişa în 1944. Pentru a-l atinge, am reinventariat flora rezervaţiei şi am comparat lista noastră de specii cu lista elaborată de E. Ghişa în 1944, ceea ce ne-a dat posibilitatea să alcătuim noi liste, una cuprinzînd speciile în minus în rezervaţie (negăsite de noi, dar citate de Ghişa) şi cealaltă cuprinzînd speciile în plus în rezervaţie (găsite de noi şi necitate de Ghişa). De asemenea, am elaborat un conspect sistematic cu toate speciile, procedînd în prealabil la reactualizarea nomenclaturii. În vederea aprecierii dinamicii florei, am procedat la analiza fitocenologică şi ecologică a speciilor lipsă şi a celor noi faţă de situaţia de acum 40 de ani, folosind metoda bioindicatorilor vegetali (după H. Ellenberg, 1974). Am constatat că, în general, speciile lipsă sînt mai xerotherme, necesită mai puţină umiditate, iar speciile noi sînt specii mai mezoterme, de umiditate mai mare.

Deci în rezervaţie a avut loc un proces de creştere a umidităţii şi de răcire. Ţinînd cont de această situaţie şi de fenomenul spontan de reîmpădurire observat, putem presupune că reîmpădurirea este cea care a antrenat modificarea microclimei rezervaţiei. Numărul mare de elemente specifice pădurilor (19 din cele 39 noi specii) indică marea influenţă a condiţiilor potenţiale din rezervaţie, care exercită o presiune asupra stabilităţii florei de aici.