

LICHEN FLORA OF THE FORTY YEARS OLD BOTANICAL GARDENS IN SZEGED

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The University Botanical Gardens in Szeged are, compared with time-honoured botanical gardens, a new establishment. Its settlement took place in 1922, about two km far from the town, in southeastern direction, on a territory of nearly 115 hectare (about 20 cadastral yoke).

The substrata which are suitable for the settlement of lichens have developed in the following fields: wall, tile, wooden constituents of buildings; stones of high mountains, middle mountains and rock groups; trunks of fir-trees, of trees of old and new arboreta; bark of ornamental and fully grown trees; the soil of the garden (Cf.: groundplan of the Botanical Gardens).

On these fields, differing from one another even from microclimatic point of view, the substrata of the occurring lichens are as follows:

1. *Limestone*
 - a) In groups of high mountains
 - b) In groups of mountains of medium height
 - c) In a rock-garden
2. *Artificial stones*
 - a) Ferro-concrete fence columns
 - b) Concrete and cement establishments, roof-tiles
 - c) Brick wall of buildings
3. *Soil*
 - a) Soil of garden paths
 - b) Disintegrated soil of lime content taking place on the surface of stones
4. *Timber*
 - a) Isolated timbers of buildings
 - b) Board material of pavilions
5. *Bark of trees*
 - a) Besides ways
 - b) At lake-shore
 - c) In different arboreta

It is obvious from the enumeration that the lichens of the botanical gardens are settled partly on a natural substratum, partly on an artificial one.

The epilithic lichen vegetation is poorer on natural limestones placed in more shaded groups than on artificial stones of open position, particularly on fence columns made of concrete. On natural limestones the association fragment of *Galoplacetum murorum* occurs with 13 species, two of them (*Lecanora albomarginata*, *Gandelariella vitellina*) take place among the character species, three (*Lecanora dispersa*, *Verrucaria calciseda* and *V. nigrescens*) among the order character, and one-one (*Galoplaca decipiens* and *Lecanora albescens*) among the alliance and association character species. The other six species are attendants in this association, resp., the *Caloplaca teicholyta* that grows rather on bricks, roof tiles, takes place as a differential species, and the *Physcia orbicularis* that is rather an epiphyton as a facultative epilith.

I examined the surface of all the 37 years old concrete columns surrounding the western rim of the gardens, making also coenologic investigations about those of them which had the richest lichen covering. On the basis of these it may be ascertained that there appear also here the *Caloplacetum murorum* association on the limestones, and even the *Caloplacetum citrinae* association. The latter is a highly nitrophilous and even urophilous lichen community, an association consisting of few members of synantropic, ruderal lichens, appearing first of all on the lower part of columns. The number of species of this association, as known from literature, is seven. Six of these appear on the fence columns of the botanical gardens, alone the *Caloplaca variabilis* missing and the *Physcia caesia* being substituted by the *Ph. vainioi* (= *Ph. caesiella*). The *Caloplaca citrina*, character species of the association, takes place with dominance 5 and constance V values, covering sometimes several square decimetres of stone surfaces.

The number of epilithic lichens is 14 species, resp. species variations altogether. From these there are worth mentioning the *Caloplaca (Gasparinia) pusilla*, occurring in this country as a rule on the dolomite, and the *Physcia vainioi*, a calciphilous lichen occurring rather on mountainous localities.

The number of *soil-dwelling* lichens is the lowest. From them only two *Collema* species ((*Collema crispum* and *C. tenax*) and a *Cladonia* species of short stature (*Cladonia coniocraea* f. *ceratodes*) are worth mentioning. The two former ones are jelly-like lichens of homoiomery thallus, the latter is a fruticose lichen found on a soil settled on the surface of a limestone rock.

From the *epixylic* lichens preferring the elaborated, dead wood the *Lecanora hageni* and *L. allophana* are small crustaceous species; the *Physcia orbicularis* and *Xanthoria parietina* are foliaceous lichens found in little number on the board material of buildings.

The most remarkable ones are the *epiphytic* lichens, settled on trunks of trees. They form the majority of lichens observed in the botanical gardens, appearing both on coniferous and deciduous trees. The basal and subleafage parts of trunks show the comparatively richest lichen vegetation, the number of species with higher dominance value is,

however, little. This statement concerns first of all the trunks near the lake *Nelumbo nucifera* and those of *Salix fragilis*, *Populus serotinus* and *Betula pendula* set on the lake-shore. The richest one of these is the lichen covering of *Salixes* consisting of 17 different species. The willow-trunks set around the lake have been examined for a longer time. 8—10 years after their planting I found on them a fragment of the crustaceous lichen association *Lecanoretum carpineae continentale*. This association was substituted later by the ass. *Physcietum ascendentis*. Today the trunks are covered by the sub-association *Parmelietoso Physcietum ascendentis*, with *Parmelia sulcata* and *P. physodes* like classe character species appearing in the greatest amount and with *Physcia ascendens* like the character species of the association. This association goes on developing in the direction of the association *Parmelietum caperatae* (Syn.: *Evernietum prunastris*), as demonstrated by the *Evernia* and *Ramalina* species occurring in it.

As the foliaceous lichens of radial growth which are lying on the bark appear on these trees in the greatest amount, they enabled us to carry out statistical measurements, namely to draw a conclusion from their present size concerning the speed of their growing. I have reckoned the mean diameter by measuring the thalli in the direction of their longest and shortest diameters, adding these data and dividing them by two. The mean diameter concerning the *Parmelia sulcata* thalli turned out to be 20 cm, that concerning the *Xanthoria parietina* thalli to be 10 cm, and that of *Parmelia physodes* thalli to be 4 cm. Knowing the age of trees and the starting time of the appearance of thalli, it may be stated that the *Parmelia sulcata* thalli have been growing about one cm for a year, the *Xanthoria parietina* thalli have shown around but a half of the growing energy of *Parmelia sulcata* thalli in the same time, and the least (1—2 mm or so) growing as been performed by the *Parmelia physodes* thalli.

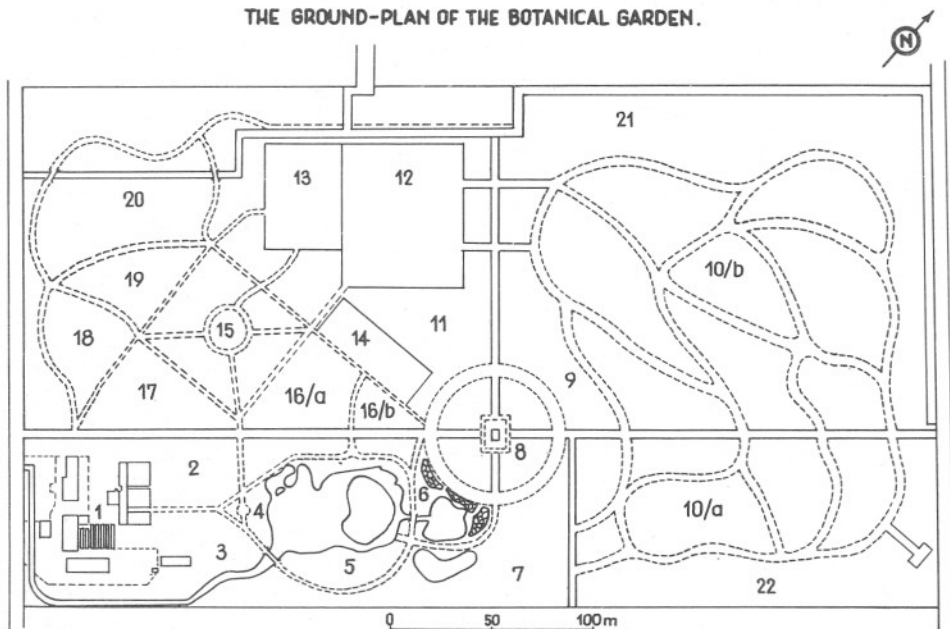
According to data of the enumeration at the end of my paper, in the botanical gardens in Szeged there are living, concerning the present status, forty epiphytic lichen species and species variations, occurring on the trunks of *Pinus sivestris*, *Pinus nigra*, *Betula pendula*, *Salix fragilis*, *Populus serotinus*, *P. italica*, *Fraxinus pennsylvanica*, *Juglans nigra*, *Prunus cerasifera*, *Quercus robur*, *Tilia cordata*, *Acer platanoides*, *Robinia pseudo-acacia*, *Fraxinus excelsior*, *Ulmus levis*, *Salix alba*, *Catalpa bignonioides*, *Taxodium distichum*, *Cotynus coggygria*.

The epiphyton lichens are associated on the trunks of *Salix fragilis*, *Betula pendula*, *Catalpa bignonioides*, *Populus serotinus* and *Fraxinus* in the *parmelietosum physodis* subassociation of the association *Physcietum ascendentis*, as a more hygrophytic association, and in the *xanthorietosum parietinae* subassociation of the same association as a more xerophytic association. Both associations are photophilous, they appear on open placed trunks which are exposed to the wind. Also the formation of lichen association of trunks at the lake-shore is determined by these factors. On the trunk surfaces of northern exposition of *Salixes* planted at the southern lake-shore, which are lying towards the lake, the relatively and at least intermittently higher vapour content of the air makes possible the development of a richer lichen covering.

The lichen flora of European botanical gardens is treated of in two monographs of florestal-coenological aspects. O. Almborn [1943] describes 61 lichen species from the one hundred years old botanical gardens of Lund, and G. Degelius [1961] has found 184 species in the botanical gardens in Göteborg. Both gardens are of older planttion, much older than those in Szeged, in northern territories which are more suitable for settling lichens.

In the forty years old botanical gardens in Szeged I enumerated 62 lichen taxons os 130 localities. Later this number will certainly be higher, and the University botanical gardens will become a region in the surroundings of Szeged which will bo of much value also from the point of view of the lichen flora.

THE GROUND-PLAN OF THE BOTANICAL GARDEN.



Enumeration of species

(The figures standing after the place of occurrence denote the areas shown on the ground-plan.)

Verrucaria calciseda DC. On limestone rock in the rockgarden. — (6.)

V. nigrescens Pers. At the same place and on roof tiles. — (1, 6.)

Leptorhaphis epidermidis (Ach.) Th. Fr. — On the bark of *Betula pendula*. — (5, 6, 9, 11.)

Arthonia punctiformis Ach. — On the bark of *Fraxinus excelsior* of smooth bark and of *Acer campestre*. — (10a, 10b.)

- A. radiata* (Pers.) Ach. var. *astroidea* Ach. — On the bark of *Acer campestris*. — (16—19.)
- Lecidea elaeochroma* Ach. — On the trunk of *Salix fragilis*, *Populus serotinus*, *Ulmus levis*. — (16, 19.)
- L. glomerulosa* (D.C.) Steud. — On the bark of *Salix fragilis* and *Ulmus levis*. — (4—5, 16, 19.)
- Cladonia coniocraea* (Flk.) Sandst. f. *ceratodes* (Flk.) And. — On a soil sedimented on the surface of limestone rocks. On the trunk of *Salix fragilis*. — (4, 6.)
- Biatorella* (*Sarcogyne*) *pruinosa* (S.m.) Mudd. — On the bark of *Salix fragilis*. — (5.)
- Lecanora albescens* (Hoffm.) Flk. — On limestone rock in the rock-garden and on concrete fence columns. (7, 8, 21, 22.)
- L. albomarginata* (Nyl.) Cromb. — At the same place. (5, 6, 8, 21.)
- L. allophana* (Ach.) Nyl. On trunks of *Populus serotinus*, *Prunus cerasifera* and *Salix fragilis*. — (17—20.)
- L. carpinea* (L.) Vain. — On trunks of *Acer platanoides*, *Fraxinus excelsior*, *Populus italica*, *Quercus robur*, *Robinia pseudacacia*, *Salix alba*, *S. fragilis*, *Tilia cordata*, *Ulmus levis*. — (4, 5, 10a, 10b, 17—21.)
- L. crenulata* (Dicks.) Hook. — On limestone rocks in the rock-garden. — (6, 8.)
- L. dispersa* (Pers.) Somm. — At the same place and on concrete fence columns. — (6, 7, 8, 21.)
- L. subfuscata* Magn. — On the trunk of *Ulmus levis*. — (17—20.)
- Lecania erysibe* (Ach.) Mudd. — On concrete fence columns. — (7, 21, 22.)
- Phlyctis argena* (Ach.) — On the trunk of *Fraxinus excelsior*, and *Metasequoia glyptostroboides*. — (15, 17—20.)
- Candelariella aurella* (Hoffm.) A. Zahlbr. — On limestone rock in the rock-garden and on concrete fence columns. (6, 7, 8, 21, 22.)
- Candelariella vitellina* (Ehrh.) Müll. — Arg. — On board surface of buildings. — (1, 2.)
- Parmelia acetabulum* (Neck.) Duby. — On the bark of *Populus serotinus*. (17—20.)
- P. caperata* (L.) Ach. — On trunks of *Catalpa bignonioides*, *Juglans nigra*, *Pinus nigra*, *P. silvestris*, *Salix fragilis* and *Ulmus levis*. — (5, 17—20.)
- var. *cylisphora* Ach. — On trunks of *Catalpa*, *Pinus nigra* and *Ulmus*. — (15, 17—20.)
- P. exasperatula* Nyl. — On trunks of *Populus alba*. — (5.)
- P. fuliginosa* (Fr.) Nyl. — On barks of *Betula pendula*, *Populus serotinus*, *Prunus cerasifera*, *Salix alba*. — (17—20.)
- P. glabra* (Schaer.) Nyl. — On the bark of *Salix alba*. — (17—20.)
- P. physodes* (L.) Aic'h. — On barks of *Catalpa bignonioides*, *Betula pendula*, *Prunus cerasifera* and *Taxodium distichum*. — (5, 17—20.)
- f. *labrosa* Ach. — On the bark of *Salix fragilis*. — (17—20.)
- P. sulcata* Tayl. — On barks of *Acer platanoides*, *Catalpa bignonioides*, *Cotinus coggygria*, *Fraxinus pennsylvanica*, *Juglans nigra*, *Populus alba*, *Prunus cerasifera*, *Salix alba*, *S. fragilis*, *Quercus robur*, *Tilia cordata*, *Ulmus levis*, *Pinus nigra*, *P. silvestris*, and on *Taxodium distichum*. — (5, 6, 17—20.)
- f. *coerulescens* A. Zahlbr. — On the bark of *Populus serotinus*. (5, 17—20.)
- f. *vonvoluta* (Grog.) Hillm. — On barks of *Populus serotinus* and *Ulmus levis*. — (4, 5, 17—20.)
- var. *rubescens* Roumeg. — On the bark of *Salix alba*. — (4, 5.)
- P. tiliacea* (Hoffm.) Ach. (= *P. scortea* Ach.) — On the trunk of *Populus serotinus*. — (17—20.)
- Evernia prunastri* (L.) Ach. — On trunks of *Betula pendula*, *Fraxinus pennsylvanica*, *Populus italica*, *P. serotinus* and *Salix fragilis*. — (4, 5, 7, 16b, 17—20.)
- var. *retusa* Ach. — On the bark of *Juglans nigra*. — (10a—10b.)
- Ramalina fraxinea* (L.) Ach. — On the trunk of *Salix fragilis*. — (4, 16a.)
- Caloplaca citrina* (Hoffm.) Th. Fr. — On concrete fence columns. — (7, 21, 22.)
- C. decipiens* (Arn.) Stein. — On limestone rocks and fence columns. — (7, 16b, 21, 22.)
- C. pusilla* Hedw. — On concrete fence columns. — (7, 21, 22.)
- C. teicholyta* (Ach.) Stein. — On limestone rocks and tiles. — (1, 6, 8.)
- Collema crispum* (Huds.) G. H. Web. — On a limestone rock in the arboretum. — (4, 5, 6.)

- C. tenax* (Sw.) Ach. — On the wet soil of ways and on the soil gathered on the surface of rocks. — (5, 6, 7, 17—20.)
- Xanthoria parietina* (L. Th. Fr. — On barks of *Populus alba*, *Robinia pseudacacia*, *Salix fragilis* and *Ulmus levis*. — (1, 7, 17—20.)
- var. *chlorina* (Chev.) Oliv. — On trunks of *Fraxinus pennsylvanica*, *Juglans nigra*, *Populus serotinus* and *Ulmus levis*. — (4, 7.)
- var. *polyphylla* Hillm. — On trunks of *Populus italica* and *P. serotina*. — (7, 17—20.)
- var. *virescens* (Wedd.) Sandst. On the trunk of *Populus italica*. — (22.)
- var. *vulgaris* Hillm. — On trunks of *Fraxinus excelsior* and *Populus italica*. — (17—20, 22.)
- Buellia punctiformis* (DC.) Mass. — On barks of *Pinus nigra* and *P. silvestris*. — (9, 11.)
- Rinodina pyrina* (Ach.) Arn. — On the trunk of *Populus alba*. — (4, 5, 10a.)
- Physcia aipolia* (Ach.) Hampe. — On trunks of *Fraxinus pennsylvanica* and *Salix fragilis*. — (4, 17—20.)
- Ph. ascendens* Bitt. — On trunks of *Betula pendula*, *Cotinus coggygria*, *Fraxinus excelsior*, *F. pennsylvanica*, *Populus alba*, *P. serotinus*, *Ulmus levis* and on concrete fence columns. — (4, 5, 17—20, 21, 22.)
- f. *anaptychioides* Nád v. — On the trunk of *Salix fragilis*. — (4.)
- f. *compacta* Nád v. — On the trunk of *Juglans nigra*. — (10a.)
- Ph. orbicularis* (Neck.) Du Rietz. — On limestone rocks, on trunks of *Populus alba* and *P. serotinus*, on tiles. — (4, 7, 17—20.)
- var. *viridula* Ach. — On trunks of *Populus italica* and *Ulmus levis*. — (4, 6, 7, 17—20.)
- Ph. pulverulenta* (Schreb.) Hampe. — On the bark of *Salix fragilis* and *Populus alba*. — (4, 5, 7, 17—20.)
- Ph. sciastra* (Ach.) Du Rietz. — On ferro-concrete fence columns, on limestone rocks in the rockgarden. — (6, 7, 21, 22.)
- Ph. stellaris* (L.) Hampe, var. *radiata* (Ach.) Nyl. — On the trunk of *Fraxinus pennsylvanica*. — (4, 5, 17—20.)
- var. *rosulata* (Ach.) Hue. — On trunks of *Fraxinus pennsylvanica* and *Salix fragilis*. — (4, 5, 17—20.)
- Ph. tenella* Bitt. — On ferro-concrete columns and on trunks of *Fraxinus pennsylvanica*, *Juglans nigra*, *Quercus robur*, *Populus alba*, *Salix alba* and *Ulmus levis*. — (7, 17—20, 21, 22.)
- Ph. tribacia* (Ach.) Nyl. — On the bark of *Populus italica*. — (1.)
- Ph. vainioi* Räs. — On ferro-concrete fence columns. — (1, 7, 21, 22.)

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