

THE MOLDOVA VEGETATION EXPOSITION FROM THE BOTANICAL GARDEN OF THE ACADEMY OF SCIENCES OF MOLDOVA

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Abstract: Construction phases of the Moldova Vegetation Exposition from the Botanical Garden of Chișinău are presented. Twelve forest micro-expositions, one steppe vegetation exposition, one grassland micro-exposition and an area of rare plants have been created during last 35 year on an area of 14 ha. The Moldova Vegetation Exposition includes 400 species of vascular plants.

Key words: gene pool mobilization, micro-exposition, forest vegetation, steppe, grassland.

Introduction

In accordance with the general construction plan of the Botanical Garden from Chișinău there has been assigned an area of 14 ha for the establishment of the Moldova Vegetation Exposition (**Fig. 1**). At the beginning the concept of the Moldova Vegetation Exposition has been created and then the draft project was made and the area was set up. As a concept to organize the Moldova Vegetation Exposition was to create areas (described next as *micro-expositions*) of forest plant communities, steppe vegetation, grassland vegetation and different types of forests that are representative for the Republic of Moldova. The first activities of planting have been started in 1972.

Throughout many years 20 thousands trees and 12 thousands shrubs have been planted. Also furrows with grass layers brought from forests have been placed into micro-expositions. There have been planted in micro-expositions 32 forest tree species, 18 forest shrub species and more than 350 grass species. More than five thousand trees have been removed during conservations works. As a result twelve forest micro-expositions, steppe exposition and grassland exposition have been created. Also there have been attempts to create aquatic and wetland micro-expositions. All created micro-expositions have been established according to fitocenotic structure principles by using methods from forestry and landscaping.

The Moldova Vegetation Exposition was created also for *ex situ conservation* of rare plant species from the Republic of Moldova. Also it is used in educational programs. Hence students from different universities and faculties such as biology, forestry and geography realize their practical lessons and projects.

Materials and methods

The Moldova Vegetation Exposition is situated at the eastern part of the Botanical Garden of Chișinău and is located on a slope with northeastern exposition, which is crossed by two valleys. Valleys with different expositions create certain varieties of relief, which give the possibility to establish different types of forests specific for the Republic of Moldova.

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It was conceived to establish main forest types such as: beech forests (*Fagus sylvatica*), sessile oak forests (*Quercus petraea*), pedunculate oak forests (*Quercus robur*), pubescent oak forests (*Quercus pubescens*), white poplar forests (*Populus alba*) and willow forests (*Salix alba*, *Salix fragilis*).

The trees and shrubs have been planted irregularly but with the endeavor that the composition would be more close to the structure of natural forests. Trees and shrubs have been transported from each type of natural forests and were planted in each type of micro-exposition. The grass layer has been made by transplanting furrows with grass layers (30x30 cm) brought from natural forests that have been placed in micro-expositions. Cleaning and conservation cuttings have been carried out each five years.

The steppe micro-exposition has been created by using next two methods: the method of furrows with grass layer and the second method by sowing seeds previously collected. The seeds of next species have been collected (*Stipa capitata*, *S. lesingiana*, *S. pulcherima*, *Festuca valesiaca* etc.) from the Bujac steppe. These methods have been also used to realize areas with grass vegetation in St. Petersburg (Tanfiliev, 1901), Moscow (Sorokina, 1960), Stavropol (Skripinski, 1973; Dudari, 1977; Dzăbov 1977), Doneţk (Ziman, Ivaşin, Ciuprina, 1975), Chişinău (Postolache, 1984, 2004). Works of creation the Moldova Vegetation Exposition commence in 1972 and continue in present time.

Results and discussions

Moldova forests and establishment of forests micro-expositions

The spontaneous forests in Moldova consist of broadleaved formations of Central Europe type. The main components in the forest formations are the pedunculate oak (*Quercus robur*), the sessile oak (*Quercus petraea*), the pubescent oak (*Quercus pubescens*) and the beech (*Fagus sylvatica*). Their spread on the territory of the Republic of Moldova depends on the hypsometric levels, on the exposition and the degree of slope inclination, on the soil and other conditions [1, 2, 3]. These and other factors determined the formation of different types of forests and associations.

The pedunculate oak is the principal species in the forest stands from the northern zone. Ninety percent of natural forests in the northern part of Moldova belong to the forest type "forest oak with cherry" (*Prunus avium*).

The Central Zone of the Republic of Moldova is a more compact forest massif and is comparable to the broadleaf forest of the central zone of Europe. The dominant tree species are *Fagus sylvatica*, *Quercus petraea* and *Quercus robur*. The favourable ecological conditions lead to the formation of highly productive forest stands. Hornbeam (*Carpinus betulus*) is abundant in forest stands.

The Southern Zone is the driest, and is characterized by oak at the higher elevations and by pedunculate oak mixed with blackthorn at lower elevations. Fluffy oak forests (*Quercus pubescens*) are found on south and south-western slopes at lower elevations.

The territory of the Botanical Garden allocated for the establishment of the Moldova Vegetation Exposition includes plateau and hills with different expositions, variety of soil types and hydrological conditions. The presence of a variety of conditions at the Botanical Garden permitted establishment of major types of forests that have been carried out by taking into considerations local conditions.

Beech micro-exposition

Beech forests (*Fagus sylvatica*) are spread only in northwestern part of Codrii Reserve from Central part of Moldova. Beech in Moldova is situated at the eastern border of the distribution area. Besides beech other tree species are scatter distributed such as: *Tilia cordata*, *T. tomentosa*, *Acer pseudoplatanus*, *Acer platanoides*. Hornbeam (*Carpinus betulus*) dominates the second tree layer in beech forests.

In order to establish **beech micro-exposition** an area of 0,54ha have been allocated, on a hill with northwestern exposition, 6-8 degrees slope inclination and with sandy-clay soil.

The area had been ploughed and prepared for planting works. There have been brought 1050 beech trees (3-4 years old) from Codrii Reserve and Sadova forest. Scattered accompanying forest species have been planted, during the period of 1976-1978, such as *Quercus petraea*, *Tilia tomentosa*, *Acer pseudoplatanus*, *Acer platanoides*. Also solitary exemplars of *Viburnum lantana*, *Swida sanguinea* and *Cornus mass* have been planted. Simultaneously with brought planted materials have been transported herb species such as *Polygonatum latifolia*, *Carex brevicollis*, *C. pilosa*, *Epipactis hebeborine* and *Allium ursinum*.

Nowadays in beech micro-exposition there could be identified next plant species *Anemonoides ranunculoides*, *Isopyrum thalictroides*, *Tulipa bibersteinana*, *Scopolia carniolica*, *Glechoma hirsuta*, *Hedera helix*, *Viola reichenbachiana*. Next tree species are present also: *Carpinus betulus*, *Acer platanoides*, *Acer pseudoplatanus*, *Quercus petraea*, *Tilia cordata*, *Fraxinus excelsior*, *Acer campestre*, *Morus nigra*, *Cerasus avium*, *Tilia tomentosa*. The cover degree of grassy layer constitutes 5%. Crown cover is 0,9 and beech trees reach 15 meters height.

Sessile oak micro-exposition

Sessile oak forests are dominant in the Central part of Moldova and are spread on an area of 56,5 thousands ha. In sessile oak forests are present next tree species: hornbeam (*Carpinus betulus*), white lime (*Tilia tomentosa*), ash tree (*Fraxinus excelsior*), cherry (*Cerasus avium*), sycamore (*Acer pseudoplatanus*), norway maple (*Acer platanoides*) and wild service tree (*Sorbus torminalis*).

Four different sessile oak micro-expositions have been created in the Botanical Garden of Chişinău: sessile oak with beech tree, sessile oak with smoke tree (*Cotinus coggygria*), sessile oak with lime and common ash (*Fraxinus excelsior*) and sessile oak with hornbeam.

The **sessile oak with beech tree micro-exposition** was established in 1975 on two slopes with different expositions. At the beginning only beech trees have been introduced and after next tree species have been planted: *Carpinus betulus*, *Fraxinus excelsior*, *Acer pseudoplatanus*, *Acer platanoides*, *Quercus petraea*, *Tilia tomentosa*, *T. cordata*, *Cerasus avium*, *Acer campestre*, *Malus sylvestris*, *Pyrus pyraster* and *Sorbus torminalis*.

Bush species such as *Swida sanguinea*, *Crataegus monogyna*, *Euonymus europaea*, *Euonymus verrucosa*, *Cornus mass* and *Viburnum lantana* have been planted in 1978.

Next plant species are present in sessile oak with beech tree micro-exposition: *Carex brevicollis*, *C. pilosa*, *Convalaria majalis*, *Scilla bifolia*, *Corydalis solida*, *Isopyrum thalictroides*, *Vinca minor*, *Viola ambigua*, *Geum urbanum*, *Chelidonium majus*, *Ballota nigra*, *Hedera helix*.

Pedunculate oak micro-exposition

The pedunculate oak is the principal species in the forest stands from northern zone. Ninety percent of natural forests in the northern part of Moldova belong to the forest

type “forest oak with cherry” (*Prunus avium*). Pedunculate oak with hornbeam forests type are spread in the central part of Moldova and pedunculate oak with fluffy oak forests type are situated in the southern part of Moldova.

The **micro-exposition of pedunculate oak with hornbeam** was established in 1972. At the beginning seedling of pedunculate oak of two years old have been planted and after in 1975 next forest tree species have been planted: *Tilia cordata*, *T. tomentosa*, *Fraxinus excelsior*, *Acer platanoides*, *Acer pseudoplatanus*, *Cerasus avium*, *Populus tremula*, *Acer campestre*, *Malus sylvestris*, *Pyrus pyraster* and also some bushy species have been introduced, such as *Swida sanguinea*, *Crataegus monogyna*, *Viburnum lantana*, *Euonymus verucosa*, *Ligustrum vulgare* and *Euonymus europaea*.

Currently in the micro-exposition of pedunculate oak with hornbeam are present 15 tree species, 11 bushy species and approximately 37 plant species, among which next species are typical for pedunculate oak with hornbeam forest type (*Quercus robur*, *Carpinus betulus*, *Tilia cordata*, *Acer campestre*, *Ficaria verna*, *Tulipa bibersteiniana*, *Carex brevicollis*, *C. pilosa*).

The **micro-exposition of pedunculate oak with cherry** was established in 1972 on an area of 1,1 ha and on a slope with northern exposition. Ground water is at the depth of 13m on the top of the slope and at the depth of 5m at the bottom of slope. Grey forest soil with different depth is present.

At the beginning *Cerasus avium*, *Rhamnus tinctoria*, *Frangula alnus* have been carried from northern part of Moldova and planted. During the period 1975-1982 next tree species and bushy species have been planted: *Acer platanoides*, *Acer pseudoplatanus*, *Acer campestre*, *Acer tataricum*, *Swida sanguinea*, *Crataegus monogyna*, *Viburnum lantana*.

At present time next vascular plant species are spread in the micro-exposition of pedunculate oak with cherry: *Pulmonaria mollis*, *Veratrum nigrum*, *Vinca minor*, *Lilium martagon*, *Fritilaria meleagroides*, *Poa nemoralis*, *Galium molugo*, *Cephalanthera longifolia*, *Dentaria bulbifera*, *Corydalis solida*, *Corydalis cava*, *Anemonoides ranunculoides*, *Anemonoides nemorosa*, *Galeobdolon luteum*, *Glechoma hirsuta*, *Arum orientale*, *Allium ursinum*, *Ranunculus auricomus*, *Gagea lutea*, *Adoxa moschatelina*, *Ficaria verna*, *Galium apparine*, *Galium odoratum*, *Nectaroscordum dioscoridis*, *Geranium phaeum*, *Stellaria holostea*, *Isopyrum thalictroides*, *Asarum europaeum*, *Polygonatum latifolium*, *Polygonatum multiflorum*, *Polystyichum aculeatum*, *Galanthus nivalis*, *Lunaria annua*.

As the result of carried work plantation, currently in the micro-exposition of pedunculate oak with cherry are present 9 forest tree species, 5 bushy species and 33 plant species, among which next species (*Quercus robur*, *Cerasus avium*, *Rhamnus tinctoria*, *Frangula alnus*, *Veratrum nigrum*, *Pulmonaria mollis*) are characteristic for pedunculate oak with cherry forest type. A remarkable oak tree of 30 years old reaches 20m height and 50cm in diameter. Oak trees produced seeds in the year 2000 and plantlets have been observed in 2001.

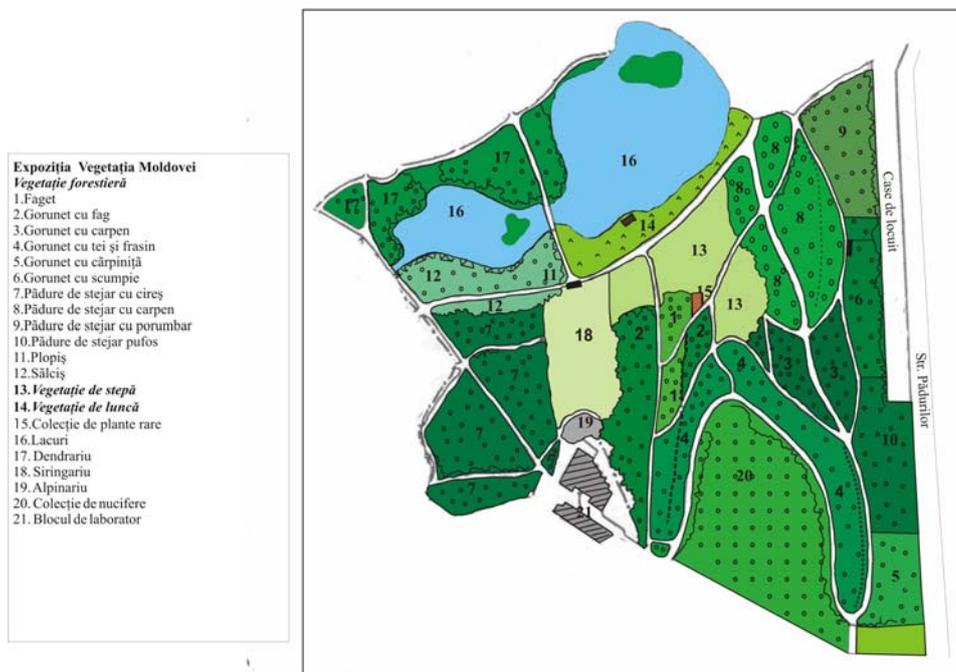


Fig. 1 Scheme of Moldova Vegetation Exposition

Conclusions

In the Botanical Garden from Chișinău has been established during last 35 years the “Moldova Vegetation Exposition” that includes 12 forest micro-expositions, steppe micro-exposition, grassland micro-exposition and a sector with rare plant species. 400 vascular plants species are the genofond of Moldova Vegetation Exposition.

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