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FLORISTIC AND PHYTOCOENOTIC BIODIVERSITY OF PROTECTED AREA NEMȚENI (R. MOLDOVA)

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Abstract: Protected area Nemţeni is situated in the bottom-grassland of the river Prut have the area of 20,9 ha and, attributed to the ecosystems which consist of *Salix alba*, *Populus alba*, *Quercus robur*. The investigations done during 2003-2006 periods had the target of study the floristic and phytocoenotic composition, elaborate optimal measures of biosafety and sustainable use. 168 species of vascular plant, classified in 46 fam. and 129 gen. were identified. 9 species of rare plants being on high endangered level were determined. Floristic composition from the biologic, ecologic, geographic, economic, cariologic point of view was analyzed. Vegetal community of 5 associations were attributed to *Salicetum albae-fragilis* Issler 1926; *Populetum albae-Fraxinosum bessarabicum* Borza 1937; *Pruno spinosae-Crataegetum* Soó 1931; *Trifolio repenti-Lolietum* Krippelova 1967; *Lolio-Plantaginetum majoris* (Linkola 1921) Berger 1930.

Key words: biodiversity, protected area, rare species.

Introduction

Protected area Nemţeni represents a value forestry sector extended on the area of 20,9 ha is included in the category of natural forestry reserve. Some literature data about flora and vegetation of forestry reserve Nemţeni is unknown. The target of revealing the floristic biodiversity, elaborating optimal measures and performing scientific investigations during the 2003-2006 periods was achieved.

Material and method

Protected area Nemţeni represents a forestry formation, distinguished by bi-stratified arboretum of *Populus alba*, *Salix alba*, *Quercus robur*, is classified at the category of poplar, willow, oak system extended on the river grassland [7, 8]. In the Forestry Unit Oneşti, the forestry type Lunca, parcel 24, sub-parcel B and D, managed under Forestry Enterprise Hânceşti is emplaced [6]. From the physical and geographical point of view protected area Nemţeni is situated on the bottomland of the river Prut (Republic Moldova), between the villages Bălăureşti (north), Ovileni (south) and Nemţeni (east), the coordinates are 46°49'38" north latitude and 28°6'3" east longitude (Fig. 1).

As a coenotaxonomic unit flora and vegetation's protected area Nemţeni during the 2003-2006 periods were studied. Floristic investigations using the itinerary method over all vegetation season were performed. For describing vegetal communities phytocoenologic descriptions according Central-European Phytocoenology School were used [1, 2, 4, 5].

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Meantime, for geobotanical description, were revealed and delimited the surfaces, which have following dimensions: forestry vegetation 2500 s. m., shrubs 100 s. m., grasslands 100 s. m. Geobotanical descriptions in the form-type were registered. General information referring to each geobotanical description, it means: locality, description data, geographical situation, characteristic station conditions (relief, soil, etc.) was registered. The height and diameter of the phytorepresentatives, also existent stratification in phytocoenosis, general cover, and each cover's layer were registered too. All of the species, indicated in the control surface, according J. Braun-Blanquet phytocoenotic index of abundance-dominance (AD) were noted [2].

Results and discussions

Arboretum diversity

In protected area Nemțeni natural, fundamental and mixed arboretum of poplar (*Populus alba*), willow (*Salix alba*), 70 years old oak (*Quercus robur*) of average productivity, growing on alluvial typical soils between 15-20 m altitude were evidenced. In arboretum an island surface formed by oak, parcel 29, sub-parcel B, varying between 200-250 years old was detected. In arboretum, on the second floor, the species of elm (*Ulmus laevis*), hedge (*Acer campestre*) and pear (*Pyrus pyraster*) were revealed.

Floristic diversity

As a result of floristic investigations in protected area Nemțeni 168 species of vascular plants were identified and registered.

Arboretum numbers 10 trees species: *Acer campestre*, *A. negundo*, *A. tataricum*, *Populus alba*, *P. nigra*, *Pyrus pyraster*, *Quercus robur*, *Salix alba*, *S. triandra*, *Ulmus laevis* and, 2 liana species: *Humulus lupulus*, *Vitis sylvestris*.

Fruticant (bushy) layer is well expressed and is represented by 11 trees species: *Corylus avellana*, *Cornus mas*, *Crataegus monogyna*, *Euonymus europaea*, *E. verrucosa*, *Prunus spinosa*, *Rosa canina*, *Swida sanguinea*, *Sambucus nigra*, *Viburnum lantana*, *V. opulus*.

Herbaceous cover is represented by 145 species of vascular plants: *Aegopodium podagraria*, *Agrimonia eupatoria*, *Agrostis stolonifera*, *Ajuga reptans*, *Althaea offiinalis*, *Anchusa ochroleuca*, *Anemone ranunculoides*, *Angelica sylvestris*, *Anthriscus sylvestris*, *Arctium lappa*, *A. tomentosum*, *Arenaria serpyllifolia*, *Aristolochia clematites*, *Artemisia annua*, *A. vulgaris*, *Asarum europaeum*, *Asparagus officinalis*, *A. tenuifolius*, *Atriplex rosea*, *A. tatarica*, *Ballota nigra*, *Brachyopodium sylvaticum*, *Brassica nigra*, *Bromus hordeaceus*, *Bromus sterilis*, *Calamagrostis canascens*, *Campanula persicifolia*, *C. trachelium*, *Capsella bursa-pastoris*, *Cardamine impatiens*, *Cardaria draba*, *Carduus acanthoides*, *C. nutans*, *Carex hirta*, *Cerastium holosteoides*, *Cerinthe minor*, *Chelidonium majus*, *Chenopodium album*, *C. urbicum*, *Cichorium inthybus*, *Cirsium arvense*, *Conium maculatum*, *Consolida regalis*, *Convollaria majalis*, *Convolvulus arvensis*, *Corydalis cava*, *C. solida*, *Crepis foetida*, *Cynoglossum officinale*, *Dactylis glomerata*, *Datura stramonium*, *Daucus carota*, *Descurania sophia*, *Dipsacus laciniatus*, *Epipactis helleborine*, *E. palustris*, *Equisetum arvense*, *Erysimum virgatum*, *Euphorbia helioscopia*, *E. villosa*, *Filipendula ulmaria*, *Fragaria vesca*, *Fumaria schleicheri*, *Gagea lutea*, *G. pusilla*, *Galanthus nivalis*, *Galeopsis speciosa*, *Galium aparine*, *G. boreale*, *G. odoratum*, *Geum urbanum*, *Glaucium corniculatum*, *Glechoma hederacea*, *G. hirsuta*, *Hordeum murinum*, *Isopyrum thalicroides*, *Iva xanthiifolia*, *Lamium maculatum*, *L. purpureum*, *Lapsana communis*, *Lapulla squarosa*, *Lathraea squamaria*, *Lathyrus niger*, *L. sylvestris*, *Leonurus*

cardiaca, *Linaria vulgaris*, *Lolium perenne, Lotus corniculatus*, *Lycopus europaeus*, *Lygustrum vulgare*, *Lysimachia nummularia*, *L. vulgaris*, *Malva pusilla*, *Matricaria discoidea*, *M. perforata*, *Melilotus officinalis*, *Mercurialis perennis*, *Orobanche cernua*, *Paris quadrifolia*, *Phlomis pungens*, *Physalis alkekengi*, *Plantago major*, *Poa angustifolia*, *P. annua*, *P. nemoralis*, *Polygonatum multiflorum*, *Polygonum aviculare*, *P. dumetorum*, *P. hydropiper*, *P. lapathifolium*, *Potentilla anserina*, *P. reptans*, *P. supina*, *Prunella vulgaris*, *Pulmonaria officinalis*, *Ranunculus ficaria*, *Rorippa austriaca*, *Rubus caesius*, *Sambucus ebulus*, *Saponaria officinalis*, *Scilla bifolia*, *Scutellaria altissima*, *Silene alba*, *Sisymbrium altissimum*, *S. loeselii*, *S. officinale*, *S. strictissimum*, *Sonchus arvensis*, *Stachys sylvatica*, *Stellaria holostea*, *Symphytum officinale*, *Taraxacum officinale*, *Torilis arvensis*, *Tragopogon dubius*, *Trifolium hybridum*, *T. pratense*, *T. repens*, *Tussilago farfara*, *Urtica dioica*, *Verbena officinalis*, *Veronica chamaedrys*, *Vicia angustifolia*, *V. cracca*, *Viola elatior*, *V. reichenbachiana*, *Xanthium italicum*, *X. spinosum*.

Taxonomic Analysis revealed the plant species of the protected area Nemțeni, which were attributed to 129 genuses and 46 families. During the study 8 most representative genus, it means: *Polygonum*, *Sisymbrium* (4 sp.), *Acer*, *Galium*, *Euphorbia*, *Poa*, *Potentilla*, *Trifolium* where each genus is represented by 3 species were identified. Other genuses by 1-2 species constituting 85% from the flora of above-mentioned protected area are represented. The families which include the most species are: *Asteraceae* (19 sp.), *Lamiaceae* (13 sp.), *Brassicaceae* (11 sp.), *Poaceae* (10 sp.). Families which possess less than 10 species constitute 70% from the floristic fund of the protected area Nemțeni (**Fig. 2**).

Analysis of Bioform of flora's protected area Nemțeni create the possibility of evidencing the numerical value of the hemicryptophyte (37%), terophytes (32%), phanerophytes (15%) and geophytes (14%), other categories registered less percentage (**Fig. 3**).

Analysis of Geoelements. From the geographical point of view, in flora of protected area Nemțeni predominate north elements – 82%, from which euriasiatic – 54% and european – 16% geoelements were evidenced, regarding to another floristic elements its forms an inconsiderable part (**Fig. 4**).

Analysis of Ecologic Index. Concerning the exigencies to the soil humidity in flora of protected area Nemțeni the species manifested different percentage: mesophytes – 50%, xeromesophytes – 36%, mesohygrophytes – 13%. Referring to the air temperature attitude in the ecological spectrum of flora's protected area Nemțeni the species remarked following percentage: micromesotherm – 68%, moderate-thermophyle – 18%, euriterm – 15%. According to the soil reaction here predominate the species slightly acid-neutrophyle (37%), euryionic (36%) and acid-neutrophyle (31%) (**Fig. 5**).

Economical Analysis of Flora Inventory from protected area Nemțeni, conform the modality and possibility of using the considerable value of medicinal (52%), ornamental (34%), melliferous (36%), alimentary (26%), industrial (24%) were revealed. For appreciating anthropeic influence in the zone where is emplaced protected area Nemțeni, as a studying subject, the altitudinal index **Ka** was calculated (Pop et Drăgulescu, 1983) [4], the value of which varies into 51-90% that denotes the anthropeic impact in zone (**Fig. 6**).

Caryologic Analysis points out a considerable participation of 35% polyploid and diploid-polyploid species into the constitution of floristic gene pool (fund) of protected area Nemțeni, the diploids registering 29%. Diploid index (DI) is 0,8 that indicates on the pioneer and instable character of vegetal formations of above-mentioned area, reflecting completely station conditions of the grassland (**Fig. 7**).

Rare plants species. In flora of protected area Nemțeni 9 rare plants species, representing 5, 2% of floristic fund of named area, with following classification according UICN was revealed (**Fig. 1**).

Endangered (EN) – 5 species: *Asparagus officinalis*, *Epipactis palustris*, *Vitis sylvestris*, *Paris quadrifolia*.

Vulnerable (VU) – 1 species: *Galanthus nivalis*.

Lower risk (LR) – 3 species: *Astragalus pseudoscaber*, *Epipactis helleborine*, *Viburnum opulus*.

Phytocoenotic diversity: In the protected area Nemțeni limits 3 types of vegetation were revealed: forestry, pratal, ruderal, including 5 vegetal associations, 4 classes, 4 orders, and 4 alliances.

Conspectus of vegetal associations*:*

Forestry vegetation

QUERCO-FAGETEA Br.-Bl. et Vlieger 1937
PRUNETALIA Tx. 1952
Prunion spinosae Soó 1931
1. *Pruno spinosae-Crataegetum* Soó 1931
II. SLICETEA PURPUREAE Moor 1958
SALICETALIA PURPUREAE Moor 1958
Salicion albae Tx. 1955
2. *Salicetum albae-fragilis* Issler 1926
3. *Populetum albae-fraxinosum bessarabicum* Borza 1937

Vegetation of mesophyle grassland

III.MOLINIO-ARRHENATHERETEA Tx. 1937
ARRHENATHERETALIA Pawl. 1928
Cynosurion Tx. 1947
4. *Trifolio repenti-Lolietum* Krippelova 1967

Synantropic vegetation

VI. PLANTAGINETEA MAJORIS Tx. et Prsg. 1950
PLANTAGINETALIA Tx. 1950
Lolio-Plantaginion Siss. 1969
5. *Lolio-Plantaginetum majoris* (Linkola 1921) Berger. 1930

Natural and anthropeic impact

In the past, protected area Nemțeni frequently was flood. Such natural impact had a decisive character in the development of all vital processes in above-mentioned protected area. Concomitantly, the constructions, in 1975, of Costești-Stînca artificially dam upstream the protected area, the hydrologic regime of the river was regularized and, in such manner being stopped the inundations. Dam's construction unfavorable influenced reducing surfaces occupied with aquatic and paludal vegetation. Ecosystem's vulnerability in such conditions favored the installing of adventives and ruderal species in the protected area's phytocoenosis.

Biodiversity conservation

Protected area Nemţeni is a representative forestry area, with willow and poplar, characteristic for the grassland's forests river Prut. According to floristic composition of protected area Nemţeni it is a valuable forest which includes a gene pool (fund) constituted from 168 vascular plant, from which 10 trees, 11 shrub, 2 liana and, 145 herbaceous plant species. 9 rare species was registered, 3 of which are included in Red Book of Republic Moldova [3]. Protected area Nemţeni, in February 25, 1998, conform the Decision of R. Moldova Parliament, nr. 1539, received the Statute of Natural Forestry Reserve (Annex 4) [9].

Conclusions

- Protected area Nemţeni represents an area (20,9 ha) of valuable forestry. Floristic gene fund includes 168 species of vascular plants, from which 10 trees species, 11 shrub species, 2 liana species and, 145 herbaceous plants species, appertaining to 129 genus and, 46 families.
- Nine species of rare plants were registered, three of which are included in Red Book of Republic Moldova. Five vegetal associations were revealed: *Salicetum albae-fragilis* Issler 1926; *Populetum albae-Fraxinosum bessarabicum* Borza 1937; *Pruno spinosae-Crataegetum* Soó 1931; *Trifolio repenti-Lolietum* Krippelova 1967; *Lolio-Plantaginetum majoris* (Linkola 1921) Berger 1930.
- For optimizing the biodiversity conservation and sustainable use it is necessary performing works on ecological reconstruction, with the target of ameliorating the composition and structures of vegetal community.

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Fig. 1 – Map of protected area Nemțeni

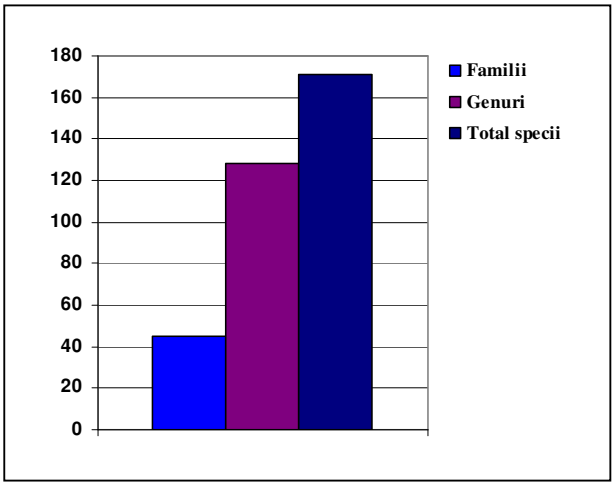

Fig. 2. Taxonomic analysis of flora's protected area Nemțeni

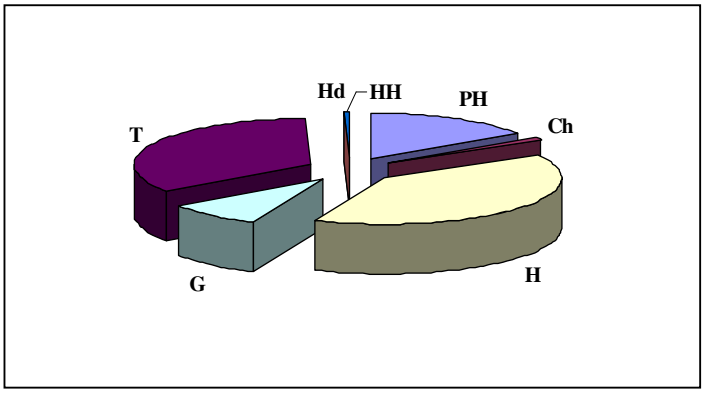

Fig. 3. Analysis of bioform of flora's protected area Nemțeni

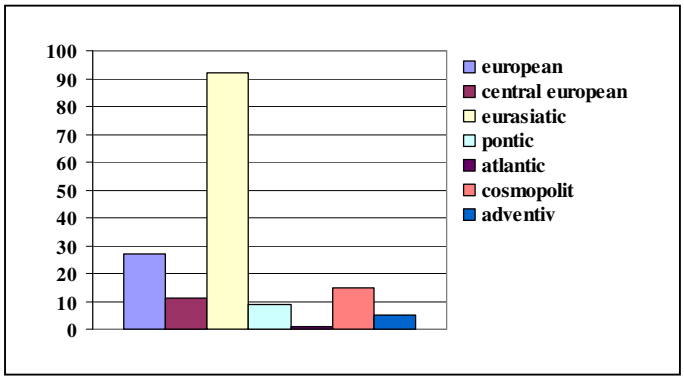

Fig. 4. Geoelement analysis of flora's protected area Nemțeni

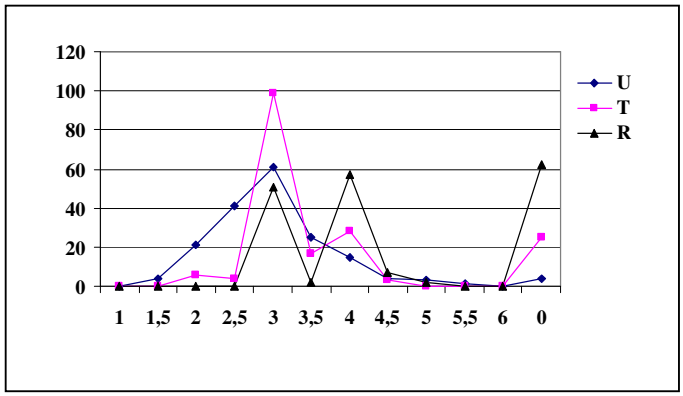

Fig. 5. Ecological index's analysis of flora's protected area Nemțeni

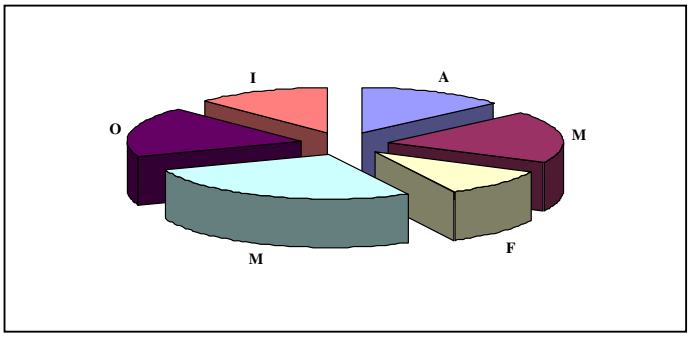

Fig. 6. Economical analysis of flora's protected area Nemțeni

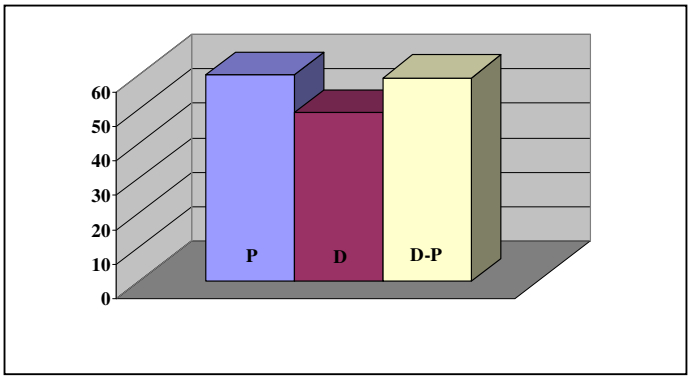

Fig. 7. Caryological analysis of flora's protected area Nemțeni