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THE OCCURRENCE OF *QUERCUS CERRIS* IN COVASNA COUNTY

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Abstract: *The aim of this study is to describe the site and vegetation conditions of the populations of Turkey oak (Quercus cerris L.) discovered in the southeastern Transylvania, in order to find indices of species origin. Four sites, isolated from each other, were mapped and characterized through phytosociological releves. The isolation from the known area of Turkey oak and some practices in oak regeneration suggest the artificial origin of the species. Hence, the naturalness could be inferred from the floristic composition and coincidence of sites. The results are important for the knowledge of species ecology and vegetation description of the area.*

Key words: *Quercus cerris, chorology, phytosociology.*

1. Introduction

The Turkey oak (*Quercus cerris* L.) is a submediterranean-mediteranean species, growing in areas with warm climate and long vegetation season. Its distribution in Romania covers mostly the west and south regions, with a significant penetration inside the Carpathian arch on the western side of Transylvanian Plateau [8], [12] (Figure 1). The intolerance of the continental climate determines a scattered distribution on East and Southeast of the country. The species is able to form pure stands or admixed with other oaks, forming phytocenoses of the following associations: *Lychno coronariae - Quercetum cerris, Quercetum frainetto-cerris, Cytiso nigricantis - Quercetum cerris, Potentillo micranthae - Quercetum petraeae-cerris, Quercetum petraeae-cerris, Querco cerris - Carpinetum betuli, Quercetum robori-cerris* [8], [10].

Due to its frequent yield of acorns and sprouts, the Turkey oak is able to take the place of other species on dry-mesic sites.

In the whole area of Braşov depression, to which Covasna county belongs, grow naturally only two species of oak - sessile oak (*Quercus petraea* s.l., including the three subspecies *Q.p. petraea, Q.p. polycarpa* and *Q.p. dalechampii*) and common oak (*Quercus robur*) [3], [4], [6], [12], 13]. The presence of *Quercus pedunculiflora* near Sânpetru village, Braşov county [10], needs to be confirmed, as long as morphological separation from *Q. robur* is not clear and therefore its taxonomic position is still disputed [2]. Outside the basin of Braşov depression, on the west side of Perşani Mountains *Quercus pubescens* also grows, in a small and isolated population [13]. Thus, considering the current state, our aim is to describe the identified populations of *Quercus cerris* in the Southeastern side of Transylvania, with

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respect to distribution, site conditions, population parameters and species composition. The main question that arises regards the naturalness of these populations, considering the distance from the continuous range of this species and the climate conditions of the studied area.

2. Material and Methods

The data were collected during the researches on the oak forests from the upper basin of Olt river (between the spring and Racoş), when most of such forests were investigated from a floristic and phytosociological point of view. The sites with *Quercus cerris* were analysed minutely in order to identify the size of population and its dimensional structure. Four releves, with a surface of 400 m^2, were made in the phytocenoses with Turkey oak, using the Braun-Blanquet method. The term "population" was used here not in its strict sense, but to indicate the group of individuals on different sites.

The mean annual values for temperature and precipitations, recorded at the meteorological station of Sfântu-Gheorghe are: 7.5 ˚C and 550 mm [7].

The names of the vascular species follow Ciocârlan [1]. For vertical structure of the phytocoenoses the following abbreviations were used: E3 - tree layer, E2 - shrub layer, E1 - herb layer, E0 - moss layer.

3. Results

In the studied area, *Quercus cerris* was identified in four independent sites (Figure 1), noted with A, B, C and D: two in Bodoc Mountains, one in Baraolt Mountains and one in the south of Harghita Mountains. Along with the sites location, the population parameters are indicated below.

The first population identified (site A) is located between Biborţeni and Băţanii Mici villages (Covasna county), at 46°06'34" N, 25°40'21" E; altitude 590-610 m, exposition SE, inclination of the slope 5-10°. The geologic substrate is volcanic sediments. Five trees were identified, with the diameter at breast high (*dbh*) of 45-47 cm. They are relatively close to each other, on less than 200 m between the farthest pair. In the year of observation (2007), only two seedlings were recorded, in spite of the relatively large number of cupules on the ground. The stand is dominated by *Quercus robur*, and the total number of species in the phytocenoses is quite high - 74.

E3 (70%): *Quercus robur* 4, *Quercus petraea* 2, *Quercus cerris* +
E2 (2%): *Fagus sylvatica* +, *Crataegus monogyna* +
E1 (75%): *Lysimachia nummularia* 2, *Agrostis tenuis* 2, *Stachys officinalis* 2, *Potentilla alba* 2, *Ajuga reptans* 2, *Carex montana* 2, *Fragaria vesca* 2, *Melampyrum bihariense* 2, *Serratula tinctoria* 1, *Festuca rubra* 1, *Lysimachia vulgaris* 1, *Peucedanum carvifolia* 1, *Poa angustifolia* 1, *Dactylis polygama* 1, *Cruciata glabra* 1, *Viola reichenbachiana* 1, *Vicia sepium* 1, *Trifolium medium* 1, *Clinopodium vulgare* 1, *Chamaecytisus hirsutus* 1, *Euphorbia amygdaloides* 1, *Quercus petraea* 1, *Veronica chamaedrys* 1, *Galium schultesii* 1, *Filipendula vulgaris* 1, *Lotus corniculatus* +, *Corylus avellana* +, *Rosa gallica* +, *Sedum maximum* +, *Fagus sylvatica* +, *Frangula alnus* +, *Campanula rapunculoides* +, *Pulmonaria mollis* +, *Succisa pratensis* +, *Stellaria graminea* +, *Valeriana wallrothii* +, *Campanula patula* +, *Achillea millefolium* +, *Centaurea indurata* +, *Crepis sp.* +, *Genista tinctoria* +, *Ranunculus auricomus* +, *Pimpinella saxifraga* +, *Vincetoxicum hirundinaria* +, *Clematis recta* +, *Symphytum tuberosum* +, *Melittis melissophyllum* +, *Pyrus pyraster* +, *Sanicula europaea* +, *Euphorbia cyparissias* +, *Pulmonaria officinalis* +, *Agrimonia eupatoria* +, *Hieracium sabaudum* +, *Brachypodium sylvaticum* +, *Lathyrus niger* +, *Campanula persicifolia* +, *Cephalanthera longifolia* +, *Avenula adsurgens* +, *Ranunculus polyanthemos* +, *Lapsana communis* +, *Malus*

sylvestris +, Hieracium lachenalii +, Veronica officinalis +, Geum urbanum +, Hieracium umbellatum +, Galium pseudaristatum +, Salvia glutinosa +, Tilia cordata +, Fraxinus excelsior +, Mycelis muralis +
E0 (1%): *Mnium sp. +*

Site B is located toward the north of Araci village (Covasna county), at 45°49'52" N, 25°39'45" E; altitude 570-580 m, exposition SE, inclination of the slope 5-10°. The geologic substrate is flysh. On an area of near two hectares, there are 31 trees with *dbh* of 24-57 cm. More than 50 seedlings were recorded, as the stand has a low canopy cover (less than 0.4 in some points) due to silvicultural cuttings. The number of vascular species is 47.

E3: *Quercus robur* 3, *Quercus cerris* 2, *Carpinus betulus* 1, *Fagus sylvatica +, Quercus petraea +*
E2: *Ligustrum vulgare* 2, *Crataegus monogyna* 1, *Viburnum opulus +, Prunus spinosa +, Acer campestre +, Lonicera xylosteum +, Rhamnus saxatilis +, Cornus sanguinea +, Corylus avellana +, Viburnum lantana +, Frangula alnus +*
E1: *Carex digitata* 1, *Ajuga reptans* 1, *Carex montana* 1, *Fragaria vesca* 1, *Brachypodium sylvaticum* 1, *Clinopodium vulgare* 1, *Veronica officinalis* 1, *Calamagrostis epigeios +, Crocus banaticus +, Festuca sp. +, Viola hirta +, Viola mirabilis +, Verbascum chaixii +, Campanula sibirica +, Melica nutans +, Fragaria viridis +, Cruciata glabra +, Astragalus glycyphyllos +, Sanicula europaea +, Euphorbia cyparissias +, Pulmonaria officinalis +, Festuca drymeja +, Lathyrus niger +, Coronilla varia +, Chamaecytisus hirsutus +, Rubus sp. +, Veronica chamaedrys +, Salvia glutinosa +, Mycelis muralis +, Hypericum perforatum +, Daphne mezereum +*

Site C is located toward the east of Olteni village (Covasna County), at 45°58'25" N, 25°52'14" E, at altitude of 740 m, exposition S, and inclination of the slope 15°. Here only one tree of Turkey oak was identified, with *dbh* = 21 cm, and no seedlings. The hosting phytocenoses is dominated by sessile oak and includes 56 vascular species.

E3 (70%): *Quercus petraea* 4, *Quercus cerris +, Sorbus torminalis +, Carpinus betulus +*
E2 (10%): *Carpinus betulus* 1, *Crataegus monogyna* 1, *Pyrus pyraster +, Acer campestre +*
E1 (50%): *Carex michelii* 2, *Allium oleraceum* 2, *Carex divulsa* 2, *Sedum maximum* 1, *Poa nemoralis* 1, *Stellaria holostea* 1, *Campanula rapunculoides* 1, *Fragaria vesca* 1, *Cruciata glabra* 1, *Symphytum tuberosum* 1, *Carpinus betulus* 1, *Luzula luzuloides* 1, *Euphorbia amygdaloides* 1, *Quercus petraea* 1, *Veronica chamaedrys* 1, *Galium schultesii* 1, *Stachys officinalis +, Tanacetum corymbosum +, Ferulago sylvatica +, Bromus ramosus +, Valeriana wallrothii +, Ajuga reptans +, Carex montana +, Ranunculus auricomus +, Lilium martagon +, Galium aparine +, Viola reichenbachiana +, Iris graminea +, Melittis melissophyllum +, Astragalus glycyphyllos +, Euphorbia cyparissias +, Vincetoxicum hirundinaria +, Pulmonaria officinalis +, Vicia sepium +, Hieracium sabaudum +, Lathyrus niger +, Peucedanum oreoselinum +, Campanula persicifolia +, Trifolium medium +, Clinopodium vulgare +, Polygonatum odoratum +, Rosa gallica +, Festuca heterophylla +, Achillea distans +, Moehringia trinervia +, Hieracium umbellatum +, Neottia nidus-avis +, Rosa canina +, Dactylis polygama +, Melampyrum bihariense +, Lathyrus vernus +*

Site D is located toward the east of Zoltan village (Covasna County), at 45°55'05" N 25°53'57" E, on the altitude of 810-820, exposition S-SV, inclination of the slope 5-10°. On an area of 1 ha there are 47 trees with *dbh* between 5 and 37 cm (Figure 2). In this case, measurements with the Pressler borer shows that trees with *dbh* 5 and 37 respectively have almost the same age. Thus, it seems that the Turkey oak has a high tolerance to competition (for light, water and nutrients). Few seedlings

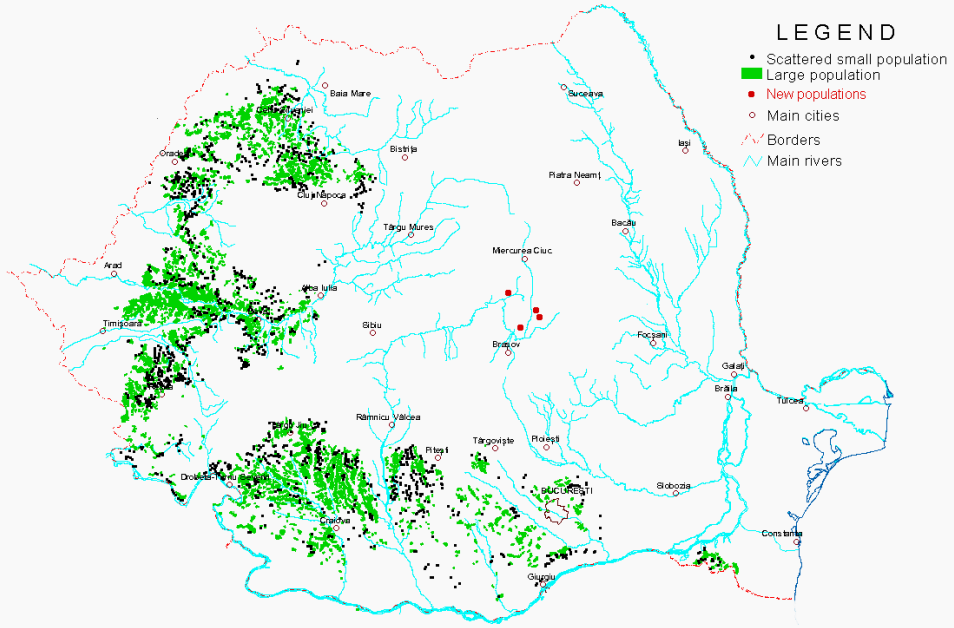

Fig. 1. *The distribution of Quercus cerris in Covasna county (red dots), comparing with its area in Romania* (*green areas and black dots - map printed by Forest Research and Management Institute, Bucharest*)

and some sprouts were recorded. The forest is dominated by sessile oak, but the releve was made on the place where Turkey oak prevails. The floristic composition, with 64 species shows a peculiar combination of acidophytes (*Vaccinium myrtillus, V. vitis-idaea, Luzula luzuloides, Genista tinctoria*) and xerophytes (*Potentilla alba, Carex montana, Poa angustifolia, Lathyrus niger, Trifolium aplestre*). The most noticeable is

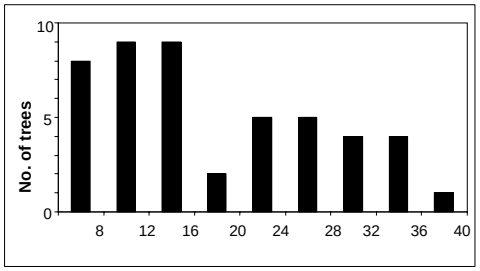

Fig. 2. *The structure on diameter classes of the Quercus cerris population in Bodoc Mountains* (*site D*)

the occurrence here of *Potentilla micrantha*, a subtermophilous taxon rare in the studied area.

E3 (60%): *Quercus cerris* 3, *Quercus petraea* 2
E2 (2%): *Fagus sylvatica* +
E1 (65%): *Luzula luzuloides* 2, *Pteridium aquilinum* 2, *Vaccinium myrtillus* 2, *Poa angustifolia* 1, *Symphytum tuberosum* 1, *Trifolium medium* 1, *Carex montana* 1, *Achillea distans* 1, *Quercus petraea* 1, *Melampyrum bihariense* 1, *Fragaria vesca* 1, *Cruciata glabra* 1, *Maianthemum bifolium* 1, *Hieracium murorum* 1, *Avenula praeusta* 1, *Thesium linophyllon* +, *Astrantia major* +, *Viola reichenbachiana* +, *Pulmonaria mollis* +, *Melittis melissophyllum* +, *Carpinus betulus* +, *Vicia sepium* +, *Hieracium sabaudum* +, *Lathyrus niger* +, *Peucedanum oreoselinum* +, *Campanula persicifolia* +, *Potentilla alba* +, *Clinopodium vulgare* +, *Serratula tinctoria* +, *Chamaecytisus hirsutus* +, *Quercus cerris* +, *Euphorbia amygdaloides* +, *Malus sylvestris* +, *Festuca heterophylla* +, *Valeriana wallrothii* +, *Hieracium lachenalii* +, *Veronica officinalis* +,

Trifolium alpestre +, Hieracium umbellatum +, Solidago virgaurea +, Veronica chamaedrys +, Rosa canina +, Galium schultesii +, Festuca rubra +, Lathyrus vernus +, Ajuga reptans +, Geranium sanguineum +, Hierochloe australis +, Anemone nemorosa +, Potentilla micrantha +, Genista tinctoria +, Hypericum montanum +, Populus tremula +, Potentilla erecta +, Iris ruthenica +, Juniperus communis +, Viola canina +, Lychnis viscaria +, Hieracium caespitosum +, Ranunculus auricomus +, Vaccinium vitis-idaea +, Hypericum perforatum +, Daphne mezereum +
E0 (2%): *Polytrichum formosum* 1

In almost all cases, the large trees have frost wounds. Sometimes dead branches could be seen in the canopy.

4. Discussions

Each studied population of *Quercus cerris* has a narrow distribution, the trees being concentrated on a relatively small area. The sites have the potential of the extrazonal conditions for Turkey oak. This statement could be sustained by the relict occurrence in the upper basin of Olt river of other subtermophilous species: *Potentilla micrantha, Silene viridiflora, Aremonia agrimonoides*, *Piptatherum virescens, Sedum cepaea Galium pseudaristatum* etc. [5], [11]. Besides, the area of site C is the only place where *Lithospermum purpureocaeruleum* grows in Bodoc Mountains (anyway, this xerophyte is known only from three sites in the area of Braşov depression). Not far from site B grows *Dictamnus albus*, another relict xerophilous species of the studied area. For the other two sites, the favorability for Turkey oak could be indicated by the phytosociological traits. The vegetation composition and site conditions resemble those of the subcontinental association *Potentillo albae-Quercetum petraeae* Libbert 1933, which is related with *Quercetum petraeae-cerris* Soó 1963. In some regions of Europe, these two syntaxa are hard to be separated [9].

In spite of the absence of evidence in the forest management documents or the testimony of local foresters, the unnatural origin of *Quercus cerris* should not be rejected. The introduction of the species could happen or not by the will of foresters. Since the acorn production of *Q. robur and Q. petraea*, the natural oaks in the area have a long periodicity, it was possible to use acorns from other region to regenerate some of the oak forests from Covasna County. It is also known that Turkey oak is preferred to be cultivated in the areas with a high interest for wildlife management.

5. Conclusions

The occurrence of *Quercus cerris* in Covasna County, away from the area of the species, brings important information for phytogeography and species ecology. At this point, its naturalness is not proved, even if there are some ecological convergences to sustain this hypothesis.

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