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# Pribeta grove (Pribeta-Chapel) – a locality with a highly diversified mixture of Slovak original oaks

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**Abstract**

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We studied the unique oak grove in the locality Pribeta Grove (Pribeta-Calvary, or Pribeta-Chapel), consisting of a number of Middle European oak species. The trees have a high variability, with the basic section *Dascia* Ky. and considerable impact of the section *Roburoides* Schwz. The oldest exemplars are 500 years in age. Similar mixtures of oak trees in Slovakia are very rare, therefore the importance of the locality is indisputable and the call for protection is well reasoned.

**Keywords**

*Quercus*, taxa, Pribeta-Chapel locality, Slovak territory

## Introduction

Occurrence of old and precious tree populations in intensively exploited agricultural land is almost a surprise at present. The locality Pribeta Grove has been resisting untouched by impact of the two world wars and a range of social disturbances. It is a very nice locality, the name of which, however has not been chosen yet from the Pribeta grove, Pribeta-Chapel (Požgaj and Horváthová, 1986), and Pribeta-Calvary (Pribeta-Kalvária). The age of the oldest oak exemplars is about 500 years, the diameter of the thickest tree is 3.67 m and the highest one has 22 m in height. The total area of the studied locality is 2.4 ha. The territory is in the ownership of the Catholic Church, it is fenced and locked at the moment.

## The site conditions

The studied locality – Pribeta Grove Protected Area is situated in South Slovakia between the towns Nové Zámky and Štúrovo, in the cadastral territory of the Pribeta village, parcel number 4,149. By its geomorphology, this locality belongs to the region Podunajská lowland, unit Podunajská upland, division Hronská upland, subdivision Vojnická upland, part Strekovské terrace. The territory of Pribeta village is 127–222 m

asl. The studied locality is situated on a flat hill, with a slightly concave ridge and an inclination of 5–10°, in a young tectonic depression filled with sandy dunes covered with Quaternary Aeolian sediments – loess and loess loam. The parent rock material is loess loam. The bordered eastern part of the protected area is adjacent to vineyards, the western one is borderer with the motor way Pribeta – Komárno. The aim of declaration of this area protected was to preserve 69 exemplars of old oak trees (TA Nitra, 2002).

The territory is situated in the warm climatic region, subregion $A_1$ – warm dry, with moderate winters and high number of sunny hours (Syrový, 1958). It is the warmest subregion of Slovakia. The average annual temperature in years 1901–1950 reached 9.6 °C, total precipitation 570 mm, snow cover was shorter than 40 days and the average number of summer days was more than 70. The data about winds, recorded by the Hydrometeorological station in Hurbanovo are in Fig. 1. As it is shown in the figure, the most frequent winds are northwest and south. Calm represents only 6% (Stuchlík and Šoltís, 1958). The uniformity of the climate (Fig. 2) is well demonstrated by the Walter´s climagram (Walter et al., 1975). According to the diagram, no severe dry period has been recorded for the studied locality, not even in the summer months.

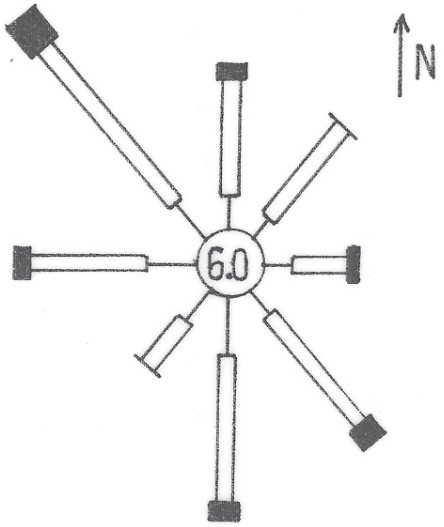


Fig. 1. The mean frequency of wind directions and intensity in the years 1901–1950 (data adopted from the meteorogical station Hurbanovo)

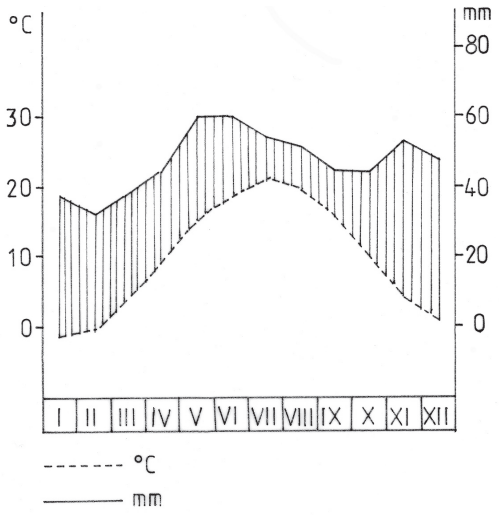


Fig. 2. Walters climagram showing the mean weather conditions in the meteorogical station Hurbanovo in the years 1901–1950

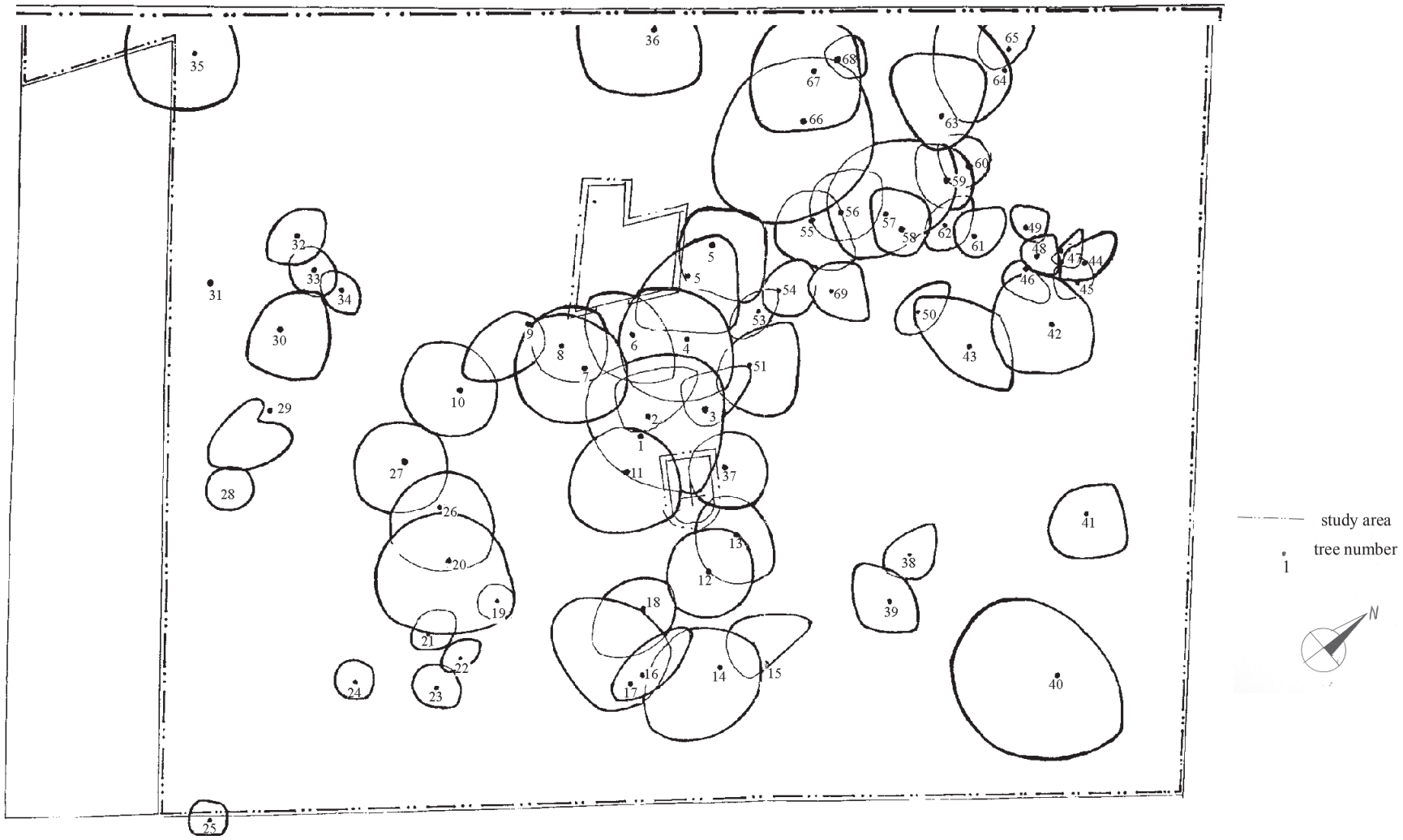


Fig. 3. The oak trees in the Protected Area Pribeta Grove – occurrence map

## Methods

Spatial arrangement of the studied oak exemplars (Fig. 3) has been mapped by means of geodetic measurements. Basic dendrometry was carried out on all mature oaks. The DBH values ($d_{1.3}$) were measured by a tape and the tree height by an altimeter Suunto OY with 1 m accuracy. The crown shape and distribution in four cardinal directions (E – East, S – South, W – West, N – North) were obtained by measuring crown projection with an accuracy of 1 m. All oak exemplars were photographed with emphasis on the stem habitus, state of leaves and small branches with fruits. There was also sampled material with developing fruits and the fruits alone. The tree health state was evaluated according to assessment of state of foliage and amount of dead branches (five point scale according to Heško, 1985; précised by Požgaj, 2000), and the sanitary index was calculated according to Požgaj (1987). Apart from this, there were recorded apparent stem hollows and presence and abundance of the semiparasitic *Loranthus europaeus* Jacq. The abundance of *Loranthus europaeus* was evaluated with the following three-point scale: 0 (absence), less than 5 (few), over 5 (many) pest individuals on the tree. The taxonomy was determined visually.

## Results and discussion

The Protected Area Pribeta Grove (Pribeta-Chapel) consists of 69 oak trees 60–70 years in age, comprising, however, a few 500 year old. The variability of this oak population is considerable, despite of the fact that the population is the original one. The oak trees at the site mostly belong to the sections *Dascia* Ky. (dominant), *Roburoides* Schwz. and *Robur* Rchb. The fourth section *Eucerris* Oerst., abundantly present in the south Slovakia by the single species (*Quercus cerris* L.), is missing here. Most individuals belong to the *Dascia section*, especially the typical species *Q. virgiliana* Ten. (11.76%) and *Q. pubescens* Willd. (10.29%); this is, however, significantly influenced by the *Roburoides* section. The influence of the least has not been observed in two trees only, *Q. robur* L. and *Q. dalechampii* Ten. Most individuals are not affected to such extent (Fig. 4). The *Dascia* section has dominant effect on the character of leaf surface, leaf stalk and leaf edge, and this is also true for the surface structure of young sprouts and the youngest branches, sprout colouration, and the shape of lenticels and buds. The significant effects of the roburoides section can be observed on several trees on their leaves: shape, lobes, coloration, lateral veins alignment and on acorn clusters. At the same time (several individuals of *Q. dalechampii* and two cases in the *Robur section* – *Q. robur* and *Q. pedunculiflora* C. Koch), it is rather problematic to distinguish between the sections *Dascie* and *Roburoides* because of effect of *Q. polycarpa* Schur (Požgaj and Horváthová, 1986 clasiified this individual as *Quercus polycarpa* Schur, var. *polycarpa* Máty, 1971, f. *polycarpa* Máty, 1971, sf. *polycarpa* Máty, 1971). Besides, there are some significant cross-connections between the species in the *Dascia* section, mainly between *Q. virgiliana* and *Q. pubescens*, and, to a lower extent, between *Q. pubescens* and *Q. frainetto* Ten. Especially interesting is the bark form which, except young individuals *Q. virgiliana* and *Q. pubescens*, does not comply with the *Dascia* section. Acorn cupules are mostly flat, most of them having thickened base, and in some cases also with thickened papillae (scurf with thickened papillae on the cupule base has *Q. dalechampii*, flat scurf with flattened apexes has *Q. pubescens*, Schwarz, 1936). The scurf apexes of some individuals were slightly flattened, some of them somewhat abristle. Significantly abristle and feathery scurf on cupule edge is typical for *Q. frainetto* Ten. of *Dascia* section (Schwarz, 1936). The scurf thickness around the cupule was not recorded. The acorn cupules were found wider and narrower, mostly deeper. During the material collection (August 2005), almost all oak trees were in their mast years. The acorns occurred individually or in clusters, mostly without stalks, some of them, however, had spindle 5 cm long – and not only in the case of *Q. robur*.

Most of the oak trees at the site have high $d_{1,3}$ values (perimeter bigger than 3.5 m). They are not very tall (the average height of all trees is 12.8 m, the highest – tree number 40 is 22 m high and the lowest one, number 28, is 5.5 m high), the crown projection is fairly large (Table 1), with average values: E 4.41 m; S 4.68 m; W 4.51 m; N 4.50 m, representing an almost regular tree crown. It seems that there is nothing extremely affecting the crown shape. The habit of the individual trees reveals that the trees have been growing without any restrictions during their whole existence, in most cases as solitaires. It is interesting that *Q. virgiliana* is mostly present as younger individuals.

The evaluation of health state with a five-level scale based on the leaf surface appearance resulted in a sanitary index of 2.09 (Table 2), well corresponding to the tree age. Due to high abundance of *Loranthus europaeus* (mistletoe) some individuals have perished. As for the mistletoe occurrence, we classified the trees in three categories. The category of severely damaged trees represented 19.10% of the population, 8.85% trees were in the category of damaged trees and without damage was 72.05% of the population. Higher $d_{1.3}$ values were observed for damaged oaks than for healthy ones (healthy 1.73 m, damaged 2.60 m and severely damaged 2.33 m). It is interesting that the thickest tree ($d_{1.3}$ = 3.67 m) has not been attacked yet by mistletoe. Several trunkbreaks were recorded.

In some trees, mainly *Q. virgiliana*, 70% leaves were found damaged by *Lymantria dispar* L. Some trees have hollows in the trunk; some are attacked by decay fungi with distinct sporulation on the trunk surface. We suppose that the evident cuts into crowns represented sanitary interventions. Due to the mistletoe, some oaks have damaged apex (irreversible pathological feature). The pathogen occurs also on fairly young individuals.

Table 1. Diameter ($d_{1.3}$), height, crown projection, taxonomical classification and health condition of oaks in the Protected Area Pribeta Grove (Pribeta-Chapel)

| Tree number | Diameter (m) | North | South | West | East | Height (m) | Health condition | *Quercus** |
|---|---|---|---|---|---|---|---|---|
| 1 | 2.8 | 11 | 5 | 10 | 8 | 17 | 2– | pub × |
| 2 | 1.75 | 8 | 3 | 1 | 5 | 13 | 2 | pub |
| 3 | 1.8 | 7 | 2 | 7 | 4 | 13.5 | 2 | vir × |
| 4 | 2.3 | 5 | 8 | 7 | 6 | 17 | 2 | vir × |
| 5 | 2.23 | 7 | 8 | 8 | 3 | 17 | 2– | pub × |
| 6 | 1.95 | 4 | 6 | 7 | 7 | 13 | 2 | pub × dal |
| 7 | 2.71 | 5 | 7 | 6 | 8 | 21 | 2– | vir × |
| 8 | 2 | 7 | 3 | 6 | 1 | 15 | 1– | pub × dal |
| 9 | 3.4 | 1.5 | 9 | 4 | 2 | 15 | 2– | pub × |
| 10 | 2.3 | 5 | 6 | 5 | 7 | 16.5 | 3 | pub × pol |
| 11 | 2.8 | 5 | 8 | 7 | 5 | 19 | 2– | pub × dal |
| 12 | 2.65 | 6 | 5 | 5 | 5 | 17.5 | 2 | pub × fra |
| 13 | 1.9 | 3 | 5 | 6 | 5 | 13.5 | 1– | vir × |
| 14 | 3.2 | 5 | 10 | 5 | 6 | 17 | 2 | pub × |
| 15 | 2.1 | 3 | 2 | 0 | 6 | 7.5 | 3– | pub |
| 16 | 2.8 | 8 | 3.5 | 2 | 2.5 | 19 | 1– | pub × dal |
| 17 | 2.65 | 6 | 4 | 2 | 12 | 16.5 | 1– | pub × |
| 18 | 2.3 | 4 | 7.5 | 4 | 3.5 | 9.5 | 2– | pub × |
| 19 | 0.65 | 2 | 2 | 2 | 2.5 | 10.5 | 1 | pub |
| 20 | 2.72 | 6 | 9 | 9 | 6 | 18.5 | 2 | pub × fra |
| 21 | 1.28 | 4 | 2 | 2 | 2 | 11 | 1 | pub |
| 22 | 0.55 | 3 | 2 | 1 | 2 | 9 | 1– | pub × |
| 23 | 0.73 | 3 | 2 | 3 | 3 | 7.5 | 1 | pub × pol |
| 24 | 0.59 | 2.5 | 2 | 2 | 3 | 7 | 1 | pub × |
| 25 | 1.1 | 2.5 | 2 | 2 | 3 | 7 | 1 | pub |
| 26 | 2.7 | 5 | 7 | 8 | 4 | 18 | 2– | pub × |
| 27 | 2.19 | 5 | 6 | 6 | 5 | 15 | 2– | pub × pol |
| 28 | 0.87 | 2 | 3 | 3 | 2 | 5.5 | 3– | pub |
| 29 | 3.06 | –2 | 9 | 4 | 1 | 12.5 | 4 | pub × |
| 30 | 3 | 6 | 5 | 7 | 3 | 15 | 3– | pub × |
| 31 | 2.1 | dry | | | | 8 | 5 | |
| 32 | 0.92 | 4 | 4 | 3 | 3 | 7 | 1 | fra × pub |
| 33 | 0.66 | 2.5 | 2.5 | 3 | 3 | 7 | 1– | vir × |
| 34 | 1.31 | 2 | 2 | 3 | 3 | 6 | 1 | pub × vir × rob |
| 35 | 3.67 | 5 | 8 | 6 | 9 | 6.5 | 2 | pub × pol |
| 36 | 2.93 | 5 | 9 | 8 | 9 | 12.5 | 1– | pol × pub |
| 37 | 1.63 | 4.5 | 5 | 6 | 4 | 14 | 2 | pub × |
| 38 | 1.58 | 4 | 3 | 3 | 2 | 9 | 1– | dal |

Table 1. Continued

| Tree number | Diameter (m) | North | South | West | East | Height (m) | Health condition | *Quercus** |
|---|---|---|---|---|---|---|---|---|
| 39 | 2.94 | 3 | 4 | 4 | 6 | 11 | 2 | pub × pol |
| 40 | 3.57 | 7 | 12 | 10 | 12 | 22 | 2 | vir × |
| 41 | 1.25 | 4 | 5 | 6 | 3 | 15 | 1 | vir |
| 42 | 3.22 | 5 | 7 | 6 | 7 | 13 | 3 | pub × fra |
| 43 | 2.53 | 5 | 3 | 7 | 8 | 14.5 | 2 | pub × |
| 44 | 0.8/0.79 | 5 | 3 | 2 | 2 | 10 | 1– | vir × |
| 45 | 0.9 | 2 | 3 | 3 | 1 | 10 | 1– | pub |
| 46 | 0.73 | 0 | 3 | 5 | 1 | 10 | 1 | vir |
| 47 | 0.9 | 4 | 1 | 3 | 0 | 10 | 1 | vir × |
| 48 | 0.81 | 3 | 1 | 3 | 2 | 10 | 1 | vir × |
| 49 | 0.66 | 3 | 1 | 3 | 2 | 10 | 1 | pub × pol |
| 50 | 0.65 | 5 | 2.5 | 2 | 2 | 7.5 | 1 | rob |
| 51 | 2 | 7 | 5 | 7 | 3 | 13 | 2– | vir × |
| 52 | 2.29 | 6 | 5 | 6 | 6 | 14.5 | 2 | pub × |
| 53 | 2.16 | 3 | 4 | 1 | 2 | 13 | 4 | pub × |
| 54 | 1.03 | 5 | 2 | 3.5 | 2 | 14 | 2 | pub × |
| 55 | 2.44 | 3 | 5 | 7 | 3 | 13.5 | 3 | pub × pol × fra |
| 56 | 1.84 | 6 | 4 | 4 | 4 | 14.5 | 1– | vir |
| 57 | 2.34 | 11 | 6 | 4 | 7 | 16 | 2 | vir |
| 58 | 2.06 | 4 | 3 | 3 | 5 | 16.5 | 4 | vir × |
| 59 | 0.6 | 3 | 4 | 3 | 5 | 11 | 1– | vir × |
| 60 | 0.82 | 3 | 3 | 2 | 4.5 | 10 | 1 | vir |
| 61 | 0.88 | 4.5 | 2 | 3 | 3 | 11 | 2 | vir |
| 62 | 0.93 | 5 | 3 | 2 | 3 | 11 | 2 | vir |
| 63 | 2.55 | 7 | 4 | 3.5 | 8 | 15 | 3 | vir × |
| 64 | 2.2 | 1 | 8 | 5 | 9 | 12 | 2– | pub × pol |
| 65 | 1.88 | 4 | 3 | 1 | 4 | 10 | 2– | vir |
| 66 | 3.12 | 8 | 13 | 9 | 8 | 14.5 | 1– | pub × |
| 67 | 2.32 | 6 | 9 | 8 | 7 | 16.5 | 2 | pub × ped |
| 68 | 2.05 | 3 | 1 | 3 | 2 | 8 | 3– | pub × pol |
| 69 | 1.8 | 4 | 2 | 5 | 3 | 15 | 3 | vir × pol |

*Taxonomical units: fra – *Quercus frainetto*, dal – *Q. dalechampii*, ped – *Q. pedunculiflora*, pol – *Q. polycarp*a, pub – *Q. pubescens*, vir – *Q. virgiliana*, rob – *Q. robur*

The composition of herbal layer does not reflect a natural constitution, but an artificial one.

Mowing is performed at both regularly and occassionally and treading occurs too. In ruderal parts dominates *Urtica dioica* L. and *Galium aparine* L., in presence of the protected *Adonis vernalis* L. and several rare species as *Salvia austriaca* Jacq., *Verbascum phoeniceum* L., *Ranunculus nemorosum* DC., *Geranium lucidum* L. etc.

Except of oaks there are present alien species, mainly the invasive *Robinia pseudoacac*ia L., *Ailanthus altissima* (Mill.) Swingle, and *Gleditsia triacanthos* L. There are also original species as *Tilia cordata* Mill., *Acer campestre* L., *A. pseudoplatanus* L., *Prunus spinosa* L., *Rosa canina* L., *Sambucus nigra* L., *Crataegus monogyna* Jacq. etc. The tree density is higher in the south-eastern and middle part of the analysed area.

Table 2. Health index in oaks in the Protected Area Pribeta Grove (Pribeta-Chapel) assessed based on their foliage density in August 2005

| Health category | Number of trees | Percentage |
|---|---|---|
| 1 | 13 | 18.90 |
| 1.5 | 13 | 18.90 |
| 2 | 19 | 27.50 |
| 2.5 | 11 | 15.90 |
| 3 | 5 | 7.25 |
| 3.5 | 4 | 5.80 |
| 4 | 3 | 4.35 |
| 4.5 | 0 | 0 |
| 5 | 1 | 1.40 |
| Total | 69 | 100 |

Health index: 2.09

The bushy part occurring in the most frequently visited part of the area is destroyed by people. The mature and old oak trees are grown without any restrictions. The major part of the protected area is in ownership by the Catholic Church (pilgrimage), and except of the herbal composition, the natural regeneration and recovery is hampered systematically. This is true mainly for the area around the chapel and 14 Calvary stations. In such a way, only in case of the mature oaks we can speak about a real conservation.

The leaf surface and branching are typical for the *Dascia* section. Most trees have their bark deeply segmented, with long narrow strips, which suggests about the effect of species belonging to another section.

From the oak composition we can conclude about the presence of allochtonous elements. Surely, *Q. robur* is ecologically alien here; similarly the presence of one tree of *Q. dalechampii* provokes doubts about its originality.

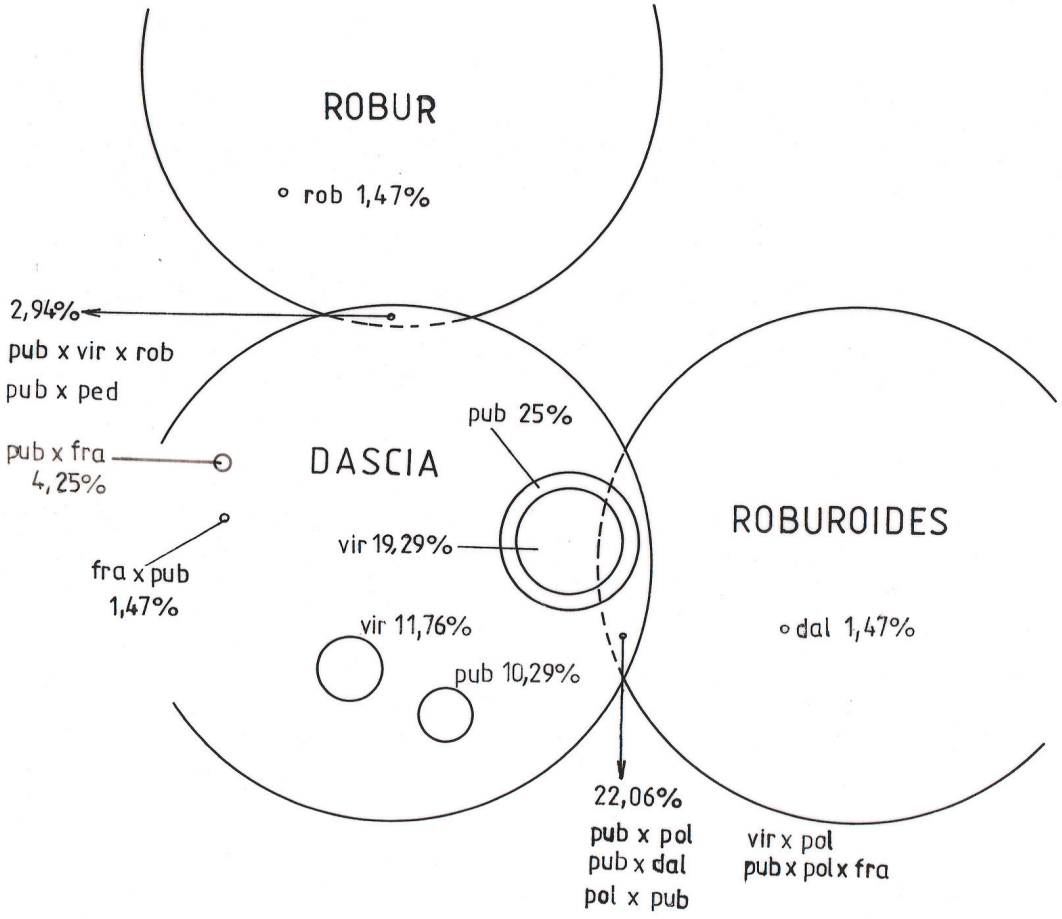


Fig. 4. Graphical representation of taxonomic affiliation of oaks in the Protected Area Pribeta Grove

The high variability of oak population consisting of untypical individuals allows us to hypothesise about an artificial population. This idea is supported by several factors. First – the site conditions are not favourable for certain oak trees. Second – the Calvary complex is situated at the centre of the studied area. The chapel was built in 1762 (Reško and Gellérthegy, 2003). According to the references, the hermits were living in this area more than 300 years ago. The pilgrim site was subjected to a reconstruction in 1909. It seems that most oaks have its origin in this time period of time, only few of them are 500 years old.

Table 1 gives a list of all the examined trees ordered corresponding to the diagram in Fig. 3 with their $d_{1.3}$ values, height, crown projection (four cardinal directions), health state evaluated visually and taxonomic classification.

## Conclusions

We studied the mixture of 69 oak trees growing in the Protected Area Pribeta grove (Pribeta-Chapel). We classified the trees to the system, sampled their vegetative and generative material, recorded basic morphologic features, dendrometric variables and health status. We observed occurrence of several pure exemplars of *Q. virgiliana* Ten. and *Q. pubescens* Willd., one *Q. robur* L., and one *Q. dalechampii* Ten. Most trees represented intermediate forms within the *Dascia* Ky. section (*Q. pubescens* × *Q. virgiliana*, *Q. pubescens* × *Q. frainetto*) and transitions forms between the sections *Dascia* and *Roburoides* Schwz.

Dominant was the effect of *Q. polycarpa* Schur (*Q. pubescens* × *Q. polycarpa*); less strong was the effect of *Q. dalechampii* Ten.(*Q. pubescens* × *Q. dalechampii*), in one case also the effect of *Robur* Rchb. section (*Q. pubescens* × *Q. robur*). Our supposition that the oak population at the site is not original is well reasoned. Historical references report about building the chapel in 1762 near the existing hermit cottage; subjected in 1909 to reconstruction. These facts suggest that adjustment of the species composition at the site was very probable. Moreover, the habitus of several trees reveals that these trees have never been embedded into a connected canopy – natural for this type of community, and the densest part has been used by the Catholic church (hermits, chapel, pilgrimage) since the very beginning.

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# Pestrá zmes pôvodných dubov Slovenska na lokalite Pribetský háj (Pribeta-Kaplnka)


## Súhrn

V Chránenom areáli Pribetský háj (Pribeta-Kaplnka) sa sledovalo 69 existujúcich dubov. Stanovila sa ich systematická príslušnosť, odobrali sa herbárové položky, zaznamenali sa základné morfologické znaky, taxačné veličiny a zdravotný stav. Bolo tam zaznamenaných viacero čistých jedincov *Quercus virgiliana* Ten. a *Q. pubescens* Willd. a po jednom jedinci *Q. robur* L. a *Q. dalechampii* Ten. Prevažná väčšina jedincov duba predstavovala prechodné formy v rámci sekcie *Dascia* Ky. (*Q. pubescens* × *Q. virgiliana*, *Q. pubescens* × *Q. frainetto*) a prechodné formy medzi sekciou *Dascia* a sekciou *Roburoides* Schwz. Hlavne sa tam prejavil vplyv *Q. polycarpa* Schur (*Q. pubescens* × *Q. polycarpa*), menej *Q. dalechampii* Ten. (*Q. pubescens* × *Q. dalechampii*). V jednom prípade sa zaznamenal aj vplyv sekcie Robur Rchb. (*Q. pubescens* × *Q. robur*). Populáciu dubov pokladáme za nepôvodnú. Tomuto názoru napomáhajú aj historické pramene, podľa ktorých tam existujúca kaplnka bola postavená v roku 1762 neďaleko už existujúcej pustovne, ktorá bola upravovaná ešte aj v roku 1909. Tieto okolnosti dávajú veľký predpoklad k upravovaniu drevinovej skladby.



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