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Comparison of general tree characteristics of less known oak species *Quercus dalechampii* Ten. and *Quercus polycarpa* Schur

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ABSTRACT: This study was designed to evaluate basic tree characteristics of *Quercus dalechampii* Ten. and *Quercus polycarpa* Schur and to find out differences between them. Total height, height of crown base and diameter at breast height were measured before tree felling. Cut stems were visually checked for heart rot on their basal parts. Diameters were measured on each stem in 1 meter long sections from the base to the point of life crown setting. Average values for both species were compared by *t*-test. The total height was proved to be statistically different; the height of crown base and diameter at breast height were quite similar for both species. *Q. dalechampii* Ten. was proved to be of larger stem diameter from the tree foot to the 3rd height meter; the diameter of *Q. polycarpa* Schur was superior from that height upwards. However, the most significant interspecies difference was found in a number of stems affected by wood-rot fungi as *Q. polycarpa* Schur turned out to be less resistant than *Q. dalechampii* Ten.

Keywords: *Quercus polycarpa* Schur; *Quercus dalechampii* Ten.; dry rot; stem characteristics

Quercus polycarpa Schur and *Quercus dalechampii* Ten. are two similar oak species which belong to the *Quercus petraea* species aggregate. They have been described by several authors as separate species (Schwarz 1936; Matyas 1971; Požgaj, Horváthová 1986; Dostál 1989; Koblížek 1990; Jovanovič 2000; Magic 1974, 2006).

Although they both occur over a large area of Europe, there is still only limited information on them in most parts of this area. The centre of distribution of both species is situated in south-eastern Europe, in particular in the Balkan Peninsula. The area of their distribution extends to the Czech Republic, where they are considered to occur on its northern margin. Although their presence in south-eastern Europe was known for a long time (Schwarz 1936; Gančev, Bondev 1966; Josipovič 1970; Matyas 1971; Cvjeticanin, Paunović 1988; Koblížek 1990; Cvjeticanin 1999; Jovanovič 2000), from Central Europe they were reported later (Magic 1974; Požgaj 1983, 1985; Dostál 1989), in the Czech Republic it has been since the 1980s (Požgaj, Horváthová 1986; Koblížek 1990; Úradníček, Maděra 2001; Kubát 2002).

Q. dalechampii is a tree up to 30 m high with markedly petiolate leaves; the lamina is elliptic or elliptic-lanceolate, largest in the bottom half with pointed lobes and elongated upper part (Koblížek 1990; Magic 2006). Tough-sided cupules are semi-globular with yellowish brown scales, which are coarse at least on the bottom part of the exterior. Ecological demands are similar to those of *Q. petraea*, however, it tends to occur more often on soils rich in calcium, it is more warm-requiring and stands dry sites better (Koblížek 1990; Úradníček, Maděra 2001; Magic 2006).

Q. polycarpa is a species that resembles *Q. dalechampii* in its general form. It is a tree up to 30 m high with markedly petiolate leaves; its lamina is elliptic or obovate, sinuous or shallowly lobate,

tough (Koblížek 1990; Magic 2006). Cupules are semi-globular with tough sides, with coarse scales on the whole exterior. The scales are widely ovate with pointed apex, pilose, bald on the back, reddish brown. In general, it is considered to be a dry-tolerant species which tends to grow both on poor acid and basic soils (Koblížek 1990; Úradníček, Maděra 2001; Magic 2006).

Although several species keys to both species exist (Magic 1974, 2006; Dostál 1989; Koblížek 1990; Požgaj 1998; Kubát 2002), their distinction is still considered to be difficult. Leaf characteristics are very variable (Chytrá 1995), so mature acorn cupules are usually needed for exact determination. However, a high number of cupules usually occurs only once in several years (Ostrolucká, Križo 1989), so they are often difficult to find. Even when they occur, they become ripe in the autumn, which is mostly the only time of the year when oak trees of these species can be reliably identified. Another problem is frequent introgressive hybridization within all species of the *Quercus petraea* aggregate (Koblížek, Úradníček 2000) which often causes that the key species characteristics are not well developed and cannot be clearly assigned to one species. The difficult identification and relatively high occurrence of hybridized individuals mean that in the Czech Republic both oak species are not usually distinguished from each other and from *Q. petraea* (Mattuschka) Liebl. and are simply described as *Quercus petraea sensu lato*.

Several studies on taxonomy and ecology of *Q. polycarpa* or *Q. dalechampii* have been published so far (Požgaj, Horváthová 1986; Cvjeticanin 1999; Požgaj 1999, 2001), however, only a few in the Czech Republic (Chytrá 1995; Matula 2004). The main goal of this study was to evaluate basic tree features which are important from the forestry aspects. I focused especially on stem characteristics in order to find out whether there were any differences in this respect. Besides the basic characteristics such as total height, height of live crown base and diameter at breast height I measured stem diameters minutely in order to describe differences in a general stem form.

Attention was also paid to wood decay as tree cutting allowed me to evaluate the presence of discoloured wood in stems of recently felled studied trees. The decay process in a living tree is a complex chain of environmentally influenced events driven by stress, competition and disturbance (Rayner, Boddy 1986). There are two basic groups of wood-inhabiting fungi. The first group is represented by saprotrophic fungi which utilize dead wood as a food base for growth and reproduction, the second one by those which attack the wood of standing living trees. Some fungi of the latter group can invade and kill living sapwood causing death to living trees (Dai et al. 2007), others live in the heartwood of living hosts, and these are commonly referred to as heart-rot fungi (Sinclair, Lyon 2005). The heart rot fungi are usually restricted to a non-living part of the tree, but they cause major volume losses of saw timber (Dai et al. 2007). In addition, trees infected by heart-rot fungi become weakened structurally (Terho et al. 2007) and are easily broken due to windthrow (Hennon 1995; Lewis, Lindgren 1999). However, decay fungi are important ecologically as they play an important role in gap formation and so facilitate an uneven-aged stand structure (Lewis, Lindgren 1999). Some oak species have been found susceptible to diseases caused by heart rot fungi which may be causal agents of their death (Swiecki, Bernhardt 1990; Fulé et al. 2002; Maloney et al. 2005). The most visible symptom is discoloration of heartwood, which means that attacked wood differs in colour intensity from normal wood (Przybyl 2007).

Both species, *Q. dalechampii* and *Q. polycarpa*, could be very perspective for forestry due to their ability to stand dry hot summers and cold winters as they do in south-eastern Europe. This feature may be important especially in future as global warming is likely to bring about significant changes in climate conditions of forest ecosystems all around Europe.

MATERIALS AND METHODS

The study was carried out in two forest stands situated close to the Hádecká planinka protected area. The forest stands were chosen due to natural occurrence of researched species *Q. dalechampii* and *Q. polycarpa*, which had been reported from there before (Matula 2004). In addition, both oaks species strongly dominated the studied forests stands. Moreover, a tree felling was under way there at that time due to which a part of research could be carried out on lying trees.

The forest stands were coppice converted into high stands on gentle slopes of south western aspect. The parent rock of the sites consisted of limestone; the soil was classified as rendzina. Within Zlatník's groups of geobiocene types (Buček, Lacina 1999) the sites belong to the *Ligustri – Querceta humilia superiora* group of geobiocene types (2 BD 2).

I estimated an approximate age of the forest between 100 and 110 years (by calculating the growth rings on cut trees). *Q. polycarpa* represented 49.0%,

Q. dalechampii 40.5%, *Q. petraea* (Mattuschka) Liebl. 3.0% and the hybrid *Q. barnovae* Georg. Et. Dobrescu (*Q. dalechampii* Ten. × *Q. polycarpa* Schur) 2.0% of tree species in the main storey. They were rarely accompanied by *Tilia cordata* P. Miller, *Sorbus torminalis* (L.) Crantz and *Acer campestre* L. The well-developed shrub layer was rich in species. Among others, *Cornus mas* L. and *Ligustrum vulgare* L. were the most frequent. *Carex pilosa* Scop., *Carex digitata* L., *Poa nemoralis* L., *Vincetoxicum hirundinaria* Med., *Galium sylvaticum* L., *Hepatica nobilis* Schreber, *Asarum europaeum* L., *Stellaria holostea* L. and *Origanum vulgare* L. were the most dominant species in the herb layer.

In total, 48 trees of *Q. polycarpa* and 48 trees of *Q. dalechampii* were measured. Only mature trees reaching the main storey of the forest canopy were used for measurements. Suppressed trees were excluded from the study. Other oak species represented by trees of *Q. petraea* and of the hybrid *Q. barnovae* were not taken into account.

Total height, diameter at breast height and height of crown base were measured on all studied trees. The height measurements were carried out with SILVA ClinoMaster (accuracy ± 0.25°), the diameter with diameter tape (accuracy 0.001 m). After tree felling, samples of leaves and cupules for species identification were easily taken away from upper insolated parts of crowns of the previously measured trees. After that, diameters at each 1 m of length of each stem were measured. The first diameter was measured at the length of 1 m from a tree foot, the second one at the length of 2 m, the third one at the length of 3 m etc. In the end, the same trees were examined for wood decay. Each trunk was visually checked in the part of the cut whether there was any discoloured wood or not. If there was, the tree was considered as affected by heart rot and classified as attacked.

Collected data were processed with statistical software Statistica 6.0. Means and standard deviations were calculated for each characteristic within each species. Normality of data distribution was tested by Shapiro-Wilk *W* test. Since the value *W* did not prove significant in any characteristics ($P > 0.05$ so the data were normally distributed), *t*-test for independent samples was carried out to evaluate statistical significance of differences between both species within each variable. For an interspecies comparison of numbers of attacked trees I carried out Cochrane *Q* test. In both tests the limit of statistical significance was set at $P < 0.05$.

RESULTS AND DISCUSSION

The average total height of *Q. dalechampii* was 19.3 m; the standard deviation was 0.64 m. The height of *Q. polycarpa* was 20.4 m on average; the value of standard deviation was 0.71 m (Fig. 1). *T*-test proved the difference to be statistically significant ($t = -3.9613$, $P < 0.0007$), however, it was not large (Table 1).

Table 1. Average values of height, height of crown base (HCB) and diameter at breast height ($d_{1.3}$) and their comparison. Statistically significant values are highlighted by bold letters

Characteristics	Average		Sd	
	dal	pol	dal	pol
Height (m)	**19.3**	**20.4**	**0.64**	**0.71**
HCB (m)	11.8	12.4	0.96	1.42
$d_{1.3}$ (cm)	33.4	32.3	2.24	1.56

Average difference in the height of crown base was similar to the values of total tree heights. The

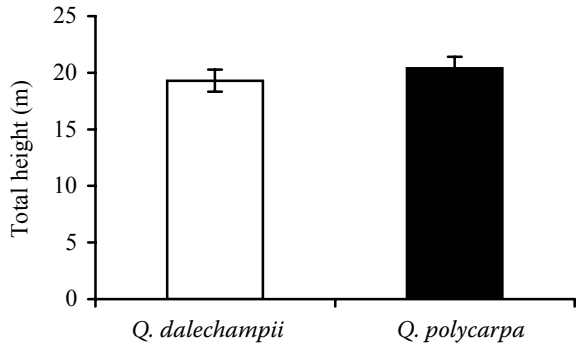

Fig. 1. Average total height of measured trees of both studied species

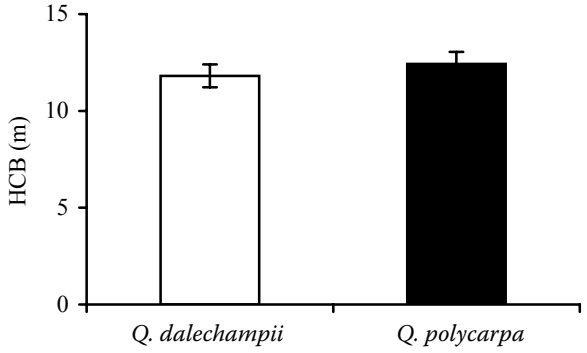

Fig. 2. Average height of the live crown base of both studied species

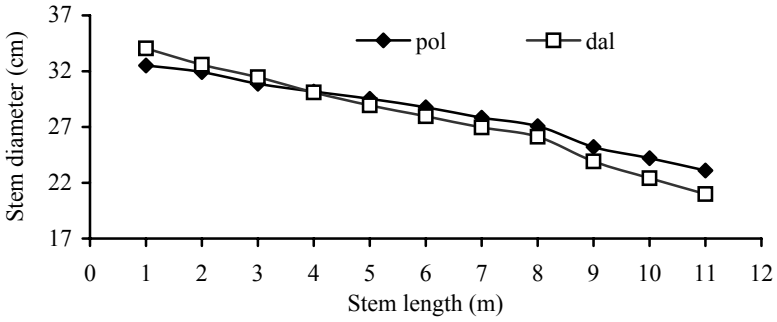

Fig. 3. Stem diameters related to the height of both species. The symbol pol stands for *Q. polycarpa* and dal for *Q. dalechampii*

average height of crown setting was 11.8 m for *Q. dalechampii* and 12.4 m for *Q. polycarpa*. Standard deviations were 0.96 m for *Q. dalechampii* and 1.42 m for *Q. polycarpa* (Fig. 2). Although there was a difference of 0.6 m on average, it turn out to be statistically insignificant (t = –1.2577, P = 0.2216) (Table 1).

Interesting results were obtained from measured diameters. Diameters at the breast height of both oak species did not prove statistically different. *Q. dalechampii* had an average diameter of 33.4 cm, which was only a little more than the breast-height diameter of *Q. polycarpa*, which was 32.3 cm on average (t = 1.3999, P = 0.1755) (Table 1). Nevertheless, when diameters of 1 meter stem sections were measured, it was found out that from the base to the crown base, diameters of the first, second and third section were greater for *Q. dalechampii* trees, whereas from the fourth meter upwards diameters of *Q. polycarpa* were superior to those of *Q. dalechampii* (Fig. 3). These differences even increased with an increasing height. When the difference was about 0.1 cm in the fourth meter section, it reached more than 2.0 cm in the 10th and 11th meters. However, statistically significant differences were found only in the first length meter (t = –2.7928, P = 0.0076) and in the last two sections (10th: t = 3.0331, P = 0.004; 11th: t = 3.2222, P = 0.0023) (Table 2).

A large interspecies difference was found in the number of stems affected by heart rot (Q = 21.00, P < 0.000005). Discoloured wood was found in 13 percent of *Q. dalechampii* individuals and the rest of them, 87 percent, did not show any signs of fungus infection. In contrast, 57 percent of *Q. polycarpa* trees had their stems affected by heart rot fungi and only 43 percent of them had no signs of discoloration (Fig. 4). *Fistulina hepatica* (Schaeff.) With. and *Inonotus* sp. were recognized as the most frequent fungi species which occurred in the trunks.

Average values of total height document that *Q. polycarpa* is slightly higher than *Q. dalechampii*. The height of the crown base of *Q. polycarpa* can also be considered higher. *Q. dalechampii* turned out to be of larger stem diameter at the height up to 3 m; the

Table 2. Average diameter of 1 m stem sections and their comparison. Statistically significant values are highlighted by bold letters

Height section	Average diameter (cm)		Sd		t	P
	pol	dal	pol	dal		
1	**32.5**	**34.0**	**1.38**	**2.32**	**–2.7928**	**0.0076**
2	31.9	32.5	1.83	2.17	–1.1403	0.2601
3	30.8	31.4	1.96	1.93	–1.0472	0.3005
4	30.1	30.1	1.06	1.56	0.1781	0.8595
5	29.5	28.9	0.87	1.74	1.4642	0.1500
6	28.7	27.9	1.91	1.60	1.5694	0.1234
7	27.8	26.9	1.97	2.50	1.3408	0.1866
8	27.0	26.1	1.72	2.48	1.5130	0.1371
9	25.2	23.9	2.04	2.48	1.9603	0.0560
10	**24.2**	**22.4**	**2.18**	**1.93**	**3.0331**	**0.0040**
11	**23.1**	**20.9**	**1.98**	**2.53**	**3.2222**	**0.0023**

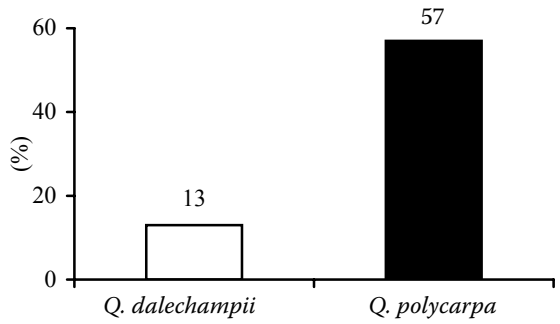

Fig. 4. Representation of trees affected by heart rot

diameter of *Q. polycarpa* is greater from the fourth meter upwards. All these findings show that the stem of *Q. polycarpa* is slightly longer and wider than that of *Q. dalechampii*. It indicates that its stems attain a slightly larger volume and thus a larger volume of wood. The values of the diameters of 1 meter stem sections also show that stems of *Q. dalechampii* taper off slightly more than *Q. polycarpa* stems which tend to be more full-boled.

In both species high numbers of trees affected by heart rot turned out to be a negative and important factor that significantly decreases the tree stability and wood quality of studied stands. A reason for this might be that these stands are coppices converted into high stands which tend to be more susceptible to decline-inducing factors are often related to oak decline (Thomas et al. 2002). Overaged oak trees in coppice forests have lower ability to conduct water, assimilate carbon and grow, which causes that these trees might be more susceptible to stress factors such as summer drought (Corcuera et al. 2005). Führer (1998) assumes that the combination of regional climate and local overaging factors may explain most variability in oak decline processes in forests of Central Europe. Oak decline has occurred in large areas of oak forests across Europe over the last several decades (Oleksyn, Przybyl 1987; Siwecki, Ufnalski 1998; Balci, Halmschlager 2003). Fungal diseases in combination with abiotic stress are considered to be among the main causal agents (Hansen, Delatour 1999; Jung et al. 2000; Thomas et al. 2002). However, there is a difference in resistance to wood-decay fungi between the studied oak species. Individuals of *Q. polycarpa* suffer from heart rot very much; the majority of them are affected so the amount of saw timber and its quality are considerably reduced. In addition, the heart rot of basal stem parts weakens their mechanical strength, which causes that windthrows and breakages occur significantly as described by several authors (Hennon 1995; Lewis, Lindgren 1999; Terho et al. 2007). On the contrary, the majority of *Q. dalechampii* stems are not affected by wood-decay fungi, which means that in general they are much less susceptible to mechanical damage and have the wood of comparatively better quality.

The results suggest that decay fungi play an important role in removing *Q. polycarpa* from the canopy of the studied sites. Therefore, if there were no influence of human activity, the oak composition of studied stands would probably change. At present, *Q. polycarpa* is the most common oak, however, its representation would decline due to its higher mortality rate while the representation of *Q. dalechampii* might remain unchanged or even increase. This should be taken into account in forest management as *Q. dalechampii* might also be more resistant to general oak decline. *Q. polycarpa* could probably be more resistant in different habitat conditions where it would be able to protect itself from fungal diseases. Due to its slightly better growth it might be an advantageous species. Preferring *Q. dalechampii* in thermophilic woods on limy soils can improve timber production with consequent positive economic effect as well as maintain ecological stability of oak stands without negative impact on ecological functions of such forests.

CONCLUSIONS

Q. dalechampii in comparison with *Q. polycarpa* was proved to be more suitable for growing in natural conditions of researched sites where it yields wood of better quality and its stands are more stable there. *Q. polycarpa* appears to be only slightly better growing but much less resistant to decay fungi.

All these findings show that both species differ and good knowledge of their properties can give us a possibility of benefiting from them in many ways. Especially nowadays when facing global warming both species might play an important role in forest ecosystems and might be commonly used in the forestry.

References

BALCI Y., HALMSCHLAGER E., 2003. Incidence of *Phytophthora* species in oak forests in Austria and their possible involvement in oak decline. Forest Pathology, *33*: 157–174.

BUČEK A., LACINA J., 1999. Geobiocenologie II. Brno, MZLU: 240.

CHYTRÁ M., 1995. Studie variability *Quercus petraea* agg. Brno, Masarykova univerzita : 65.

CORCUERA L., CAMARERO1 J.J., SISÓ S., GIL-PELEGRÍN E., 2005. Radial-growth and wood-anatomical changes in overaged *Quercus pyrenaica* coppice stands: functional responses in a new Mediterranean landscape. Trees – Structure and Function, *20*: 91–98.

CVJETICANIN R., 1999. Taksonomija i cenoekologija balkanskog hrasta kitnjaka (*Quercus dalechampii* Ten.) na serpentinama centralne i zapadne Srbije. Belgrade, Belgrade University: 310.

CVJETICANIN R., PAUNOVIĆ P., 1988. Prilog poznavanju hrastova Fruške Gore. Glasnik Šumarskog fakulteta, *70*: 59–66.

DAI Y.C., CUI B.K., YUAN H.S., LI B.D., 2007. Pathogenic wood-decaying fungi in China. Forest Pathology, *37*: 105–120.

DOSTÁL J., 1989. Nová květena ČSSR 1. Praha, Academia: 1563.

FULÉ P.Z., COVINGTON W.W., MOORE M.M., HEINLEIN T.A., WALTZ A.E.M., 2002. Natural variability in forests of the Grand Canyon, USA. Journal of Biogeography, *29*: 31–47.

FÜHRER E., 1998. Oak decline in Central Europe: a synopsis of hypotheses. In: McMANUS M.L., LIEBHOLD A.M. (eds), Proceedings: Population Dynamics, Impacts, and Integrated Management of Forest Defoliating Insects. USDA Forestry Service, General Technical Report NE-247: 7–24.

HANSEN E.M., DELATOUR C., 1999. *Phytophthora* species in oak forests of north-east France. Annals of Forest Science, *56*: 539–547.

HENNON P.E., 1995. Are heart rot fungi major factors of disturbance in gap-dynamic forests? Northwest Science, *69*: 284–293.

JOSIPOVIČ M., 1970. Flora SR Srbije. Beograd: 77–98.

JOVANOVIČ B., 2000. Dendrologija. Belgrade, Belgrade University: 567.

JUNG T., BLASCHKE H., OßWALD W., 2000. Involvement of soilborne *Phytophthora* species in Central European oak decline and the effect of site factors on the disease. Plant Pathology, *49*: 706–718.

KOBLÍŽEK J., 1990. *Quercus* L. In: HEJNÝ S., SLAVÍK B. (eds), Květena ČR 2. Praha, Academia: 21–35.

KOBLÍŽEK J., ÚRADNÍČEK L., 2000. Příspěvek k rozlišování a ekologii původních druhů rodu *Quercus* L. In: Rozlišování dubů a možnosti udržení druhové čistoty v lesních porostech. Roztoky u Křivoklátu, Česká lesnická společnost: 1–5.

KUBÁT K., 2002. Klíč ke květeně České republiky. Praha, Academia.

LEWIS K.J., LINDGREN B.S., 1999. *Picea glauca* × *engelmannii* and *Abies lasiocarpa* in sub-boreal forests of central British Columbia. Forest Ecology and Management, *123*: 135–143.

MAGIC D., 1974. Poznávame ďalšie druhy dubov v našich lesoch. Les, *30*: 244–252.

MAGIC D., 2006. *Quercus* L. In: GOLIÁŠOVÁ K., MICHÁLKOVÁ N. (eds), Flóra Slovenska V/3. Bratislava, Veda: 342.

MALONEY P.E., LYNCH S.C., KANE S.F., JENSEN C.E., RIZZO D.M., 2005. Establishment of an emerging generalist pathogen in redwood forest communities. Journal of Ecology, *93*: 899–905.

MATULA R., 2004. Comparison of stem characteristics of oak species *Q. dalechampii* Ten. and *Q. polycarpa* Schur. In: BUCHTA I. et al., Contemporary state and development trends of forests in cultural landscape. Brno, MZLU: 89–91.

MATYAS V., 1971. Short taxonomic review of the oaks of Hungary. Erdészeti Kutatàsok Budapest, *67*: 55–68.

OLEKSYN J., PRZYBYL K., 1987. Oak decline in the Soviet Union – scale and hypotheses. European Journal of Forest Pathology, *17*: 321–336.

OSTROLUCKÁ M., KRIŽO M., 1989. Biológia samčích reprodukčných orgánov druhov rodu *Quercus* L. Bratislava, Veda: 135.

POŽGAJ J., 1983. Duby našich lesov. Živa, *4*: 126–128.

POŽGAJ J., 1985. Poznávanie autochtónnych dubov Slovenska. Lesnícky časopis, *31*: 3–7.

POŽGAJ J., 1999. *Quercus polycarpa* Schur (polycarpic oak) in Slovakia. Folia Oecologica, *26*: 21–32.

POŽGAJ J., 2001. *Quercus dalechampii* Ten. in Slovakia. Folia Oecologica, *28*: 7–21.

POŽGAJ R., 1998. Identification of Slovak oaks by their bark. Acta Facultatis Xylologiae, *39*: 25–32.

POŽGAJ J., HORVÁTHOVÁ J., 1986. Variabilita a ekológia druhov rodu *Quercus* L. na Slovensku. Bratislava, Veda: 151.

PRZYBYL K., 2007. Fungi and minerals occurring in heartwood discolorations in *Quercus* robur trees. Acta Societatis Botanicorum Poloniae, *76*: 55–60.

RAYNER A.D.M., BODDY L., 1986. Population structure and the infection biology of wood-decay fungi in living trees. Advances in Plant Pathology, *5*: 119–160.

SCHWARZ O., 1936. Monographie der Eichen Europas und des Mittelmeergebietes. Dahlem bei Berlin: 1–160.

SINCLAIR W., LYON H.H., JOHNSON W.T., 1987. Diseases of Trees and Shrubs. Ithaca, Cornell University Press: 574.

SIWECKI R., UFNALSKI K., 1998. Review of oak stand decline with special reference to the role of drought in Poland. European Journal of Forest Pathology, *28*: 99–112.

SWIECKI J.T., BERNHARDT E., 1990. A delicate balance: Impacts of diseases and insects on the health of California oaks. Fremontia, *18*: 58–63.

TERHO M., HANTULA J., HALLAKSELA A.M., 2007. Occurrence and decay patterns of common wood-decay

fungi in hazardous trees felled in the Helsinki City. Forest Pathology, *37*: 420–432.

THOMAS F.M., BLANK R., HARTMANN G., 2002. Abiotic and biotic causes and their interaction as causes of oak decline in Central Europe. Forest Pathology, *32*: 277–307.

ÚRADNÍČEK L., MADĚRA P., 2001. Dřeviny České republiky. Písek, Matice lesnická: 333.

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Srovnání stromových charakteristik méně známých druhů dubu *Quercus dalechampii* Ten. a *Quercus polycarpa* Schur

ABSTRAKT: Studie se zabývá základními lesnickými charakteristikami dubů *Quercus dalechampii* Ten. a *Quercus polycarpa* Schur a rozdíly mezi nimi. Byla u nich měřena výčetní tloušťka, celková výška a výška nasazení koruny. Na pokácených kmenech bylo rovněž sledováno napadení dřevokaznými houbami. Zvláštní pozornost byla věnována vlastnostem kmene, kde byla měřena tloušťka kmene od báze po nasazení koruny po jednom metru. Z hodnocených vlastností se jako statisticky významné ukázaly rozdíly v celkové výšce; ve výčetní tloušťce a ve výšce nasazení koruny nebyl nalezen významný rozdíl. Ukázalo se, že *Q. dalechampii* má průměr větší od báze kmene do výšky 3 m, naopak od této výšky nahoru má kmen silnější *Q. polycarpa*. U *Q. dalechampii* bylo nalezeno výrazně méně jedinců napadených dřevokaznými houbami než u *Q. polycarpa*, což se ukázalo být jako významný rozdíl mezi oběma taxony.

Klíčová slova: dub žlutavý; dub mnohoplodý; hniloba kmene; charakteristiky kmene

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