THE 5TH CONFERENCE ON HARDWOOD RESEARCH AND UTILISATION IN EUROPE 2012

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Properties of trunk and briarwood of tree heath 
(*Erica arborea* L.) from island Rab

Slavko Govorčin¹, Tomislav Sinković¹, Tomislav Sedlar¹, Bogoslav Šefc², Iva Ištok²

¹,²Department for wood science, Faculty of Forestry, University of Zagreb, Croatia, 
govorcin@sumfak.hr, sinkovic@sumfak.hr, tsedlar@sumfak.hr, bsefc@sumfak.hr, 
iistok@sumfak.hr

**Key words:** Tree heath (*Erica arborea* L.), briarwood, trunk, physical properties, mechanical properties

**ABSTRACT**

Tree heath (*Erica arborea* L.) is an evergreen shrub that grows mainly in Mediterranean region. This species tends to grow in areas such as macchia shrub lands, dry evergreen scrublands, forest roadsides and forest outskirts which have a lot of light and sun though daytime. Tree heath is not a commercial timber species, it occurs as a result of forest roads and forest fireroads construction. This wood species is interesting because of its briarwood. Briarwood is tumour like outgrow that develops between root and trunk and it’s commonly used in making bowls of tobacco smoking pipes and knife handles. The trunk can also be used for variety of products because of its relatively good mechanical properties and nice colour and texture. Material for this study was taken from tree heath (*Erica arborea* L.) shrubs growing on island of Rab in Croatia. In this study density and dimensional stability of briarwood and trunk of tree heath were investigated. Also some mechanical properties of trunk such as bending strength and compression strength parallel to the grain were studied.

**AIM OF RESEARCH**

Knowing technological characteristics of wood is important postulate for rational usage of wood recourses. It is important to define anatomical, chemical, physical and mechanical properties of some wood species to determine its technological characteristics.

The aim of this research was to define some physical and mechanical properties of tree heath (*Erica arborea* L.) for further and more complete determination of its technological characteristics. Two different
parts of tree heath were studied. One was the trunk and the other was its root also known as briarwood. Briarwood was studied for its physical properties; density in absolutely dry condition, nominal density, and total volume shrinkage. Only total volume shrinkage was studied because briarwood has specific and complex structure and it is impossible to determent direction of grain on specimens. Trunk was studied for some of its physical and mechanical properties. The following physical properties of trunk were studied: density in absolutely dry condition, nominal density, total radial, tangential and volume shrinkage. Mechanical properties that were studied are ultimate compression strength parallel to the grain and ultimate bending strength.

MATERIAL AND METHODS OF RESEARCH

The tree heath (*Erica arborea* L.) is a shrub or small evergreen tree (Hirc, 1891) that grows mainly in Mediterranean region. These are particularly difficult conditions for most plants to grow in as the soil in the mountainous clime is often dry and rocky, but the hearty briar roots can work their way through the tiniest crevices or slowly break apart rock to reach the rare soil. It has a typical height of 1 to 4 meters, with some specimens reaching even 7 meters. This species tends to grow in areas such as macchia shrub lands, dry evergreen scrublands, forest roadsides and forest outskirts which have a lot of light and sun though daytime. It occurs as a result of forest roads and forest fire roads construction. The tree heath grows bright green needle-like leaves and each spring its greyish-white flowers bloom (Marčić, 1918), producing a delightful honey scent. Between the acidic and rocky soil it grows in and the long summer droughts it endures, this small trees root develops outgrow that is called briarwood.

*Figure 1 Macroscopic preview of briarwood and trunk wood: A – Briarwood, B – Trunk wood cross section, C – Trunk wood tangential section*
Briarwood (Tsoumis, 1988) is tumor like outgrow that develops between root and trunk and its commonly used in making bowls of tobacco smoking pipes, knife handles and it was used by blacksmiths for large wood heating power (Lasman, 1906). The use of briar as an ideal material to make bowls of pipes dates back to at least the 1850s. The bush must be at least 50 years old for the briar to grow to the necessary size, about the size of a football, weighing around 3 kg. Briarwood is a material that never alters. It is extremely hard and heat-resistant and in addition has a lovely grain that can give a sense of flames and never repeats itself. Each piece is unique.

The trunk of tree heath can also be used for variety of products because of its relatively good mechanical properties and interesting esthetic properties such as nice colour and texture.

Figure 2 Photomicrographs of briarwood and trunk wood: A – Briarwood (20×), B – Trunk wood cross section (4×) and C – Trunk wood tangential section (4×)

On Figure 1 macroscopic preview of briarwood and trunk is presented. Figure 2 presents photomicrographs of briarwood and trunk wood. On both figures the difference in normal structure of trunk wood in comparison to the irregular structure of briarwood is shown.

Material for this study was taken from three tree heath (Erica arborea L.) shrubs growing on island of Rab in Croatia. These shrubs were 20 to 30 years old and (horizontal) diameter of the tumors was about 30 to 50 cm. Total height of shrubs was about 5 to 6 meters. The shrubs were sampled for trunk and tumor as it’s shown in Figure 3 and specimens were prepared to study test or examine the physical and mechanical properties.
Figure 3 Briarwood and trunk wood (Erica arborea L.)

Physical properties of trunk and tumor were determined on sharp-edged samples dimensions 20×20×25 mm (R×T×L). Samples were then soaked in water during the period in which they exceeded water content higher than fiber saturation point. After attaining wanted water content, the samples were dried on temperature of 103±2ºC until they reached constant mass. As well, after attaining absolutely dry condition measurements were again completed and data were processed, all according to valid norms.

Ultimate compression strength parallel to the grain was determined on sharp-edged samples of trunk with dimensions 20×20×40 mm (R×T×L) according to the standard HRN ISO 3787:1999, and ultimate bending strength on samples with dimensions 20×20×300 mm (R×T×L) according to the standard HRN ISO 3133:1999.
RESULTS OF RESEARCH

Physical properties

Table 1 Statistical values of density in absolutely dry condition, nominal density and total, radial, tangential and volume shrinkage of tree heath trunk wood and briarwood.

<table>
<thead>
<tr>
<th></th>
<th>Tree heath (trunk wood)</th>
<th>Tree heath (briarwood)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ρ₀</td>
<td>ρᵧ</td>
</tr>
<tr>
<td>g/cm³</td>
<td>g/cm³</td>
<td>%</td>
</tr>
<tr>
<td>21</td>
<td>21</td>
<td>21</td>
</tr>
<tr>
<td>0.743</td>
<td>0.627</td>
<td>4.4</td>
</tr>
<tr>
<td>0.770</td>
<td>0.648</td>
<td>6.2</td>
</tr>
<tr>
<td>0.803</td>
<td>0.673</td>
<td>9.9</td>
</tr>
<tr>
<td>0.0191</td>
<td>0.0149</td>
<td>1.6109</td>
</tr>
<tr>
<td>0.0004</td>
<td>0.0002</td>
<td>2.595</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Key: ρ₀ - density in absolutely dry condition, ρᵧ - nominal density, βᵣ̄max - total radial shrinkage, βₜ̄max - total tangential shrinkage and βₐ̄max - total volume shrinkage

According to Table 1 mean values of researched physical properties of trunk wood are smaller in all segments then the ones of briarwood. Mean value of density in absolutely dry condition of briarwood is higher by 7.6 % then the same value of density in absolutely dry condition of trunk wood. Mean value of nominal density of briarwood is only by 2.7 % higher than the same value of trunk wood. Mean values of total volumetric shrinkage of briarwood is higher by 22.4 % then mean value of trunk wood.

Figure 4 Relation between total volumetric shrinkage and density in absolutely dry condition of briarwood
Figure 4 shows growth trend of total volumetric shrinkage in relation to the density in absolutely dry condition of briarwood. The same growth trend occurs at trunk wood (Figure 5) only with smaller correlation coefficient.

![Figure 4](image)

**Figure 5 Relation between total volumetric shrinkage and density in absolutely dry condition of trunk wood**

**Mechanical properties**

*Table 2 Statistical values of density at 12% water content, ultimate bending strength at 12% water content, ultimate compression strength parallel to the grain at 12% water content of tree heath trunk wood.*

<table>
<thead>
<tr>
<th>Tree heath (trunk wood)</th>
<th>( \sigma_{b12%} ) MPa</th>
<th>( \rho_{12%} ) g/cm(^3)</th>
<th>( \rho_{12%} ) g/cm(^3)</th>
<th>( \sigma_{c12%} ) MPa</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>18.8</td>
<td>0.863 MIN</td>
<td>0.864</td>
<td>54.9</td>
</tr>
<tr>
<td>49.1</td>
<td>49.1</td>
<td>0.920 AVE</td>
<td>0.951</td>
<td>58.9</td>
</tr>
<tr>
<td>110.2</td>
<td>110.2</td>
<td>1.004 MAX</td>
<td>1.002</td>
<td>61.8</td>
</tr>
<tr>
<td>29.304</td>
<td>29.304</td>
<td>0.0405 SD</td>
<td>0.0525</td>
<td>2.910</td>
</tr>
<tr>
<td>167.972</td>
<td>167.972</td>
<td>0.0010 VAR</td>
<td>0.0028</td>
<td>8.466</td>
</tr>
</tbody>
</table>

Key: \( \rho_{12\%} \) - density at 12% water content, \( \sigma_{b12\%} \) – ultimate bending strength at 12% water content, \( \sigma_{c12\%} \) – ultimate compression strength parallel to the grain at 12% water content

According to Table 2 mean value of ultimate bending strength at 12% water content of trunk wood is 49.1 MPa. Mean value of ultimate
compression strength parallel to the grain at 12% water content of trunk wood is 58.9 MPa.

Figure 6 shows that ultimate bending strength at 12% water content has a growth trend with the increase in density at 12% water content of trunk wood. Figure 7 shows that ultimate compression strength parallel to the grain at 12% water content and density at 12% water content of trunk wood.
grain at 12% water content also has growth trend with the increase in density at 12% water content.

CONCLUSIONS

Conducted study, measuring of samples and analysis of data that have been made on trunk of tree heath (*Erica arborea* L.) resulted in mean value of density in absolutely dry condition is 0.770 g/cm$^3$, and mean value of nominal density is 0.648 g/cm$^3$. Mean value of total radial shrinkage is 6.2 %, total tangential shrinkage is 10.0 %, and mean value of total volume shrinkage is 15.9 %. Mean value of ultimate compression strength parallel to the grain at 12% water content is 58.9 MPa and mean value of ultimate bending strength at 12% water content is 49.1 MPa. Mean value of density in absolutely dry condition of briarwood is 0.833 g/cm$^3$, and mean value of nominal density is 0.666 g/cm$^3$. Studied briarwood has mean value of total volume shrinkage of 15.9 %.

REFERENCES


2. HRN ISO 3787:1999 Određivanje čvrstoće na tlak paralelno s vlakancima.


