PRESERVATION STATE OF THE CONSTRUCTIONS WOOD AT CHURCHES FROM VRANCEA COUNTY

COJOCARIU ANA*, TĂNASE C.*, MITITIUC M. *

Abstract: The paper presents some aspects regarding the general process of deterioration and the presence of macromycetes as biodeterioration agents of constructions wood at the investigated historical monuments. The strong deteriorations of the wood observed at churches like „St. Nicholas” from Vrancioaia (dated 1778) and „Pious Paraschiva” from Valea Sarit (dated 1772), enforce the necessity for interventions for conservation and restoration on constructions to save all this remarkable architectural vestiges.

Key words: macromycetes, wooden churches, biodeterioration agents, Vrancea County.

Introduction

Wooden churches in Vrancea County are a true artistic heritage and a historical one as well, since they are the sole proofs of the wood civilization that have been preserved over centuries and which are enlisted in the unitary Romanian folk art fund. The wooden churches studied in Vrancea County, registered at the Minister of Culture and Cults as historical and architectural monuments by the National Institute of Historical Monuments, are subject to decay, as the wood is an organic material frequently attacked by bacteria, fungi, insects and other categories of biodegradable agents.

As far as the wooden churches in Vrancea County are concerned, the main concern was on highlighting the degradation caused by macromycetes to elements of construction, on evaluating the propagation and the force of the assault over essential elements of the constructions, on evaluating the influence the macromycetes have on the degree of wood decay and detection of the main categories of xylophagous fungi.

St. Nicholas’ wooden church in Vrancioaia has been selected as an example (dated 1778) – Photo 1. This church has been built on the basis of a plan with a single nave, the walls erected on a river stone foundation reaching a height of 80 cm outside the walls with the intention of protecting the wooden material used in the construction. The walls are made of wooden beams horizontally arranged ending with a “sparrow’s tail” technique. The belfry has been built in eight sides with windows having their brims marked by a rope carved in wood [6].

In the summer of 2003 the restoration process at the monument in Vrancioaia began, along with the retiling of the roof and the restoring of the foundation. The inner walls have been mortar scoured and the old plankets from the frontal parts have been removed and replaced with new ones.

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Material and Methods

In order to analyze the preservation state of the wood an initial reference material has been gathered, concerning the historical monuments in Vrancea County and the interventions undertaken for their restoration.

So as to emphasize the extent of the damage caused by macromycetes at the wooden churches selected for study, the affected parts of the construction, the specifics of the wood and the propagation area have been analyzed. The gathering of the sporocarps has been done following some periodical investigations concerning the wood used in the construction of the 17 wooden churches in Vrancea County territory.

The work records written for every sample collected from the wood used in the constructions comprise observations on the affected elements of the construction, the position of the sporocarps from the ground, ligneous essence, the wood’s degree of decay (hard wood, nearly hard wood, degraded wood, heavily degraded), the hydration of the wood (dry, nearly dry, moist, humid) etc. The species have been determined in the laboratory, based on the analysis of the morphological macroscopic and microscopic characteristics [1, 3, 4, 5].

Results and Discussions

Certain species identified among the macromycetes from the construction wood can be highlighted, as far as the frequency and the level of wood decay is concerned. These species belong to the Basidiomycota Phylum, being systematically comprised into 5 orders, 7 families and 7 genres (Table 1). The adopted classification system respects all the criteria from the Dictionary of Fungi, 9th Edition, CAB International, edited by Kirk et al. (2001, republished in 2004) [7, 8].

<table>
<thead>
<tr>
<th>Order</th>
<th>Family</th>
<th>Species</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dacrymycetales</td>
<td>Dacrymycetaceae</td>
<td>Dacrymyces stillatus Nees – Photo 3</td>
</tr>
<tr>
<td>Agaricales</td>
<td>Schizophyllaceae</td>
<td>Schizophyllum commune Fr.</td>
</tr>
<tr>
<td>Hymenochaetales</td>
<td>Hymenochaetaceae</td>
<td>Phellinus contigua (Pers.) Pat. – Photo 4</td>
</tr>
<tr>
<td>Schizoporaceae</td>
<td>Hyphodontia breviseta (P. Karst.) J. Erikss. – Photo 5</td>
<td></td>
</tr>
<tr>
<td>Polyporales</td>
<td>Gloeophyllaceae</td>
<td>Gloeophyllum sepiarium (Wulfen) P. Karst.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Gloeophyllum abietinum (Bull.) P. Karst. – Photo 6</td>
</tr>
<tr>
<td></td>
<td>Polyporaceae</td>
<td>Fibroporia vaillantii (DC.) Parmasto – Photo 7, 8, 9</td>
</tr>
<tr>
<td>Russulales</td>
<td>Stereaceae</td>
<td>Stereum hirsutum (Willd.) Pers.</td>
</tr>
</tbody>
</table>
The observations made on the elements of constructions have emphasized areas with reduced resistance of the used wooden material. As it is, the most damaged areas are those from the upper side of the constructions, damage caused by malfunctions at the general water drainage system at the level of the roof, itself strongly affected (Photo 2). In the lower side of the constructions have been identified macromycetes as well as degradable elements, both on the inside and the outside (Table 2). Overall, the damaged elements of the construction are represented by the area in which the water from the covers has infiltrated, the lateral fixed joining exposed to the action of environmental agents, the lower part of the lateral covers, the side stairs in the lower part.

Table 2 – The identified species of macromycetes and the affected construction’s elements

<table>
<thead>
<tr>
<th>Nr.</th>
<th>Identified species</th>
<th>Affected elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Dacrymyces stillatus Nees</td>
<td>joinery elements, wood floor, exterior walls, exterior staircase of verandah, clapboard, bed plate beam, belfry clapboards</td>
</tr>
<tr>
<td>2.</td>
<td>Gloeophyllum sepiarium (Wulfen) P. Karst.</td>
<td>concrete floor, exterior walls, verandah, bed plate beam, belfry clapboards, joinery elements, clapboard, wood floor</td>
</tr>
<tr>
<td>3.</td>
<td>Gloeophyllum abietinum (Bull.) P. Karst.</td>
<td>upper girders, joinery elements, wood floor, exterior walls, exterior pillars, bed plate beam</td>
</tr>
<tr>
<td>4.</td>
<td>Fibroporia vaillantii (DC.) Parmasto</td>
<td>upper girders, concrete floor, joinery elements, wood floor, exterior walls, interior clapboard, bed plate beam, belfry clapboards</td>
</tr>
<tr>
<td>5.</td>
<td>Stereum hirsutum (Willd.) Pers.</td>
<td>joinery elements, exterior walls, verandah, bed plate beam, covers</td>
</tr>
<tr>
<td>6.</td>
<td>Schizophyllum commune Fr.</td>
<td>upper girders, joinery elements, wood floor, exterior walls, exterior staircase, clapboard, bed plate beam, covers</td>
</tr>
<tr>
<td>7.</td>
<td>Phellinus contiguus (Pers.) Pat.</td>
<td>exterior walls, verandah, concrete floor</td>
</tr>
<tr>
<td>8.</td>
<td>Hyphodontia breviseta (P. Karst.) J. Erikss.</td>
<td>exterior walls, verandah, bed plate beam, belfry clapboards, joinery elements, belfry, wood floor</td>
</tr>
</tbody>
</table>

Most of the lignicolous species appear in the summer-autumn period, associated with the rise of humidity due to rainfall. The emergence of fungi developing on the wood of the construction, and in particular, of the species that appear on the inside as well, depends on the conditions provided by the microclimate and the characteristics of buildings’ construction and location. As it is, the deficient system of heating, infiltrations in the roof or the foundations are factors that encourage the eruption of the wood fungi on the elements of construction.

The species Dacrymyces stillatus appears quite frequently, usually on the exterior elements of construction, which are immediate subject to the atmospheric humidity. In contrast to that, species like Fibroporia vaillantii and Hyphodontia breviseta are more frequent for the inside elements. The latter are usually grouped on elements situated in the
upper third, where, due to specific conditions, there is no proper circulation of the air that would help eliminate the surplus of humidity in the wood.

On the whole, constant degradation of these monuments is caused by other groups of organisms as well. Owing to the absence of additional interventions in treatment, restoration and replacement, the wood from the structure of the cover has suffered serious damage that has lead even to the loss of material on extended areas. On the outside, the roof is heavily colonized with various species of lichens (Photo 10), an even well-marked phenomenon on the northern side of the monument. Accumulations of organic material at this level have resulted in the appearance of areas covered in moss, contributing to the general process of humification of the wooden material of the construction.

For basic elements, such as the bed plate beam, the advance of the fungi is usually associated with that of insects, having as a result a strong reduction of the wood’s resistance (Photo 11).

Conclusions

Conservation problems are translated in practice by identifying areas that have suffered modifications concerning the wooden material, owing to destructive action of physical factors as well as the settlement of a considerable number of organisms of the most various categories.

The identified agents of degradation are the macromycetes, which thrive on elements of construction such as: covers, exterior walls, bed plate beams, beams and fences, the wood floor, the concrete floor, dependencies represented by the stairs, church verandah, the surrounding fencing.

Heavy degradation of the wood, observed at the investigated churches, requires urgent measures of intervention on the constructions as well as restoration, with the purpose of saving these architectural vestiges of remarkable value.

BIBLIOGRAPHY

Photo 1 – Wooden Church Vrancioaia, Vrancea County

Photo 2 – Heavy degradations of the cover, Wooden Church Vrancioaia

Photo 3 – Dacrymyces stillatus Nees

Photo 4 – Phellinus contiguus (Pers.) Pat.

Photo 5 – Hyphodontia breviseta (P. Karst.) J. Erikss.

Photo 6 – Gloeophyllum abietinum (Bull.) P. Karst.
Photo 7 – *Fibroporia vaillantii* (DC.) Parmasto, sporocarp

Photo 8 – Detail on hymenium - *Fibroporia vaillantii* (25x)

Photo 9 – Aspect of wood degraded by *Fibroporia vaillantii*, brown rot

Photo 10 – Various species of lichens on the covers of the church

Photo 11 – Strong reduction of the wood’s resistance caused by insects