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ASPECTS REGARDING THE ATTACK OF SOME BIODETERIOGENS ON SOME CULT OBJECTS FROM ARGES COUNTY

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Abstract
Cultural heritage has a cultural significance, which refers to the aesthetic value of the heritage asset, the historical or social value of monuments for past, present or future generations. In conservation areas where there are open environment conditions, there are ecological producers (autotrophic bacteria, algae, lichens and higher plants). In terms of trophic relationships and the main food chain, the presence in the conservation environment of collections from archives, libraries and museums of excessive food resources for biodeteriogenic pests determines the possibility of the absence of producers, which is why most populations settled in the environment conservation of movable cultural heritage goods are consumers (egs insects) and destroyers (bacteria and fungi). In the present study, various fragments of cultural heritage goods taken from cemeteries, churches, for the purpose of analyzing biological patinas and establishing the etiopathogenic complex were subjected to analysis. Fungi of the genera Alternaria, Penicilium, Aspergillus, etc., various bryophytes, lichens and blue-green algae have been identified.

Keywords: fungi, *complex etiopathogenic*, lichens, algae

1. INTRODUCTION

The process of biodegradation of works of art and cultural heritage acquires an important aspect in practice, because as a whole there is a complex of physical, chemical and biological factors that work together depending on the microclimate in which they are located and can cause the appearance of different types of diseases serious. Nowadays there is more and more talk about the sustainable relationship between the doctor and the patient. This way of observation must become a basic principle in ensuring the health of heritage assets.

An essential condition to ensure adequate treatment is the correct establishment of the cause that triggers the disease. The risk factors that determined the respective disease, the mechanisms of pathogenesis must also be known. The biodeteriogenic agents that intervene in the biodegradation process belong to very different taxonomic groups (viruses, bacteria, fungi, protists, parasitic animals, etc.). These organisms use cultural heritage objects, inorganic and organic support, as nutritional support. Virtually all chemicals are subject to biodegradation reactions.

Krumbein (1979) believes that through their action biodeteriorating agents can cause different types of changes: biophysical, biochemical, chromatic. Dornieden et al. (1997) following investigations

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of several Greek, Israeli, Austrian and Crimean marble monuments and murals observed complex biopatinas which were later studied under the electron microscope.

2. MATERIALS AND METHODS

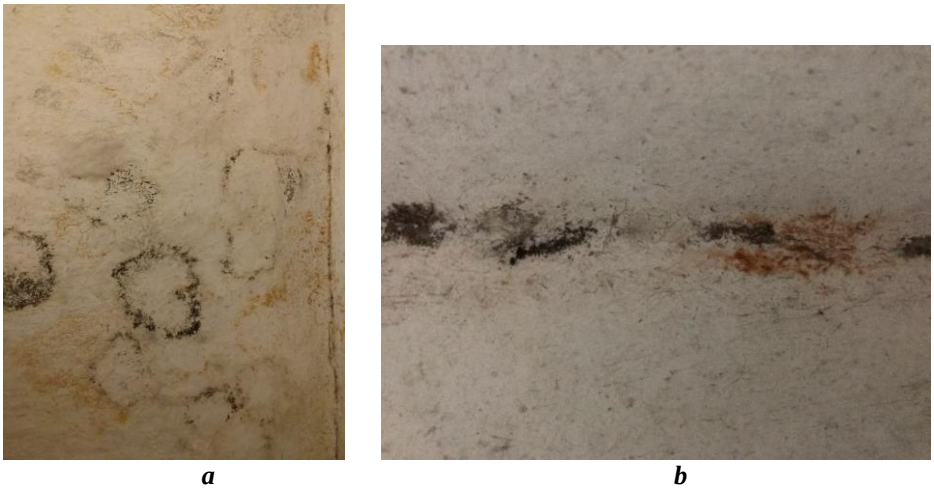
The analysis of the samples involved the following steps: identification of biodeterioration or biodegradation. Analyzing the visible part of the degradation phenomenology; sampling for analysis; isolation and purification of the causative germ; examination and identification; cultivation and confirmation of biodeteriogenic action; preserving the germ for further research and comparison.

Observation sheets were drawn up in which the changes occurring during the biodeterioration process, their intensity, and the type of biodeteriorating agent were specified. All results were correlated with the abiotic factors of the respective microclimate.

3. RESULTS AND DISCUSSIONS

In the present study, a comparative analysis of the different groups of biodeteriogens identified on different samples taken in the work, showed a significant share of fungi Tănase, 2001). Biodeteriogenic fungi often produce molds of different colors on sapwood, from blue to gray-black. The color is given by mycelial hyphae and asexual or sexual reproduction structures that develop especially on the surface of cellulose-rich substrates (fig. 1). The most common genera identified on the analyzed samples belong to the genera *Alternaria*, *Penicillium*, *Aspergillus*, *Fusarium*, *Cladosporium*, *Botrytis* (Tănase, 2006).

Merulius lacrymans, also called house sponge, in popular terms, belongs to the category of brown molds and is a saprophytic species procuring its food by degrading the already dead layer. It appears both on masonry and wood constructions. It can penetrate walls over 1.5 m thick and spreads up to 4.5 m in diameter (fig. 2).



a ***b***

Figure 1. Biodeteriogenic fungi on lithic substrates: a. Alternaria sp.; b. Aspergillus sp.

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Figure 2. Merulis lacrymans

Figure 3. Bioderms fungi - lichens

By the association of some fungi, bryophytes and lichens on different lithic substrates, plant bioderms are formed very frequently observed in our field trips (fig. 3). The most common species of mosses and lichens in these bioderms are: *Bryum intermedium, Caloplaca decipiens, Caloplaca aurantia, Lecanora dispersa, Lecanora hagenii, Lecanora crenulata* and *Lecanora umbrina*. Under the action of the acids secreted by these biodeteriogenic agents, the rocks crumble, the damage to various lithic art monuments being significant.

Figure 4. Bioderms green algae

Figure 5. Bioderms bryophytes-green algae

The mode of formation of the biological patina at the level of the lithic substrates analyzed is as follows: on this inorganic mineral substrate, phototrophic microorganisms are fixed, then chemotrophic (lithic and organic) microorganisms that form a biological film that interacts with the substrate. Minerals are assimilated in the nutrition process by phototrophs, subsequently heterotrophs are installed that continue the alteration process. The biofilm of variable thickness turns into plant bioderma, on which different species of lichens will settle. Through the corrosive action of lichen acids, the substrate is penetrated allowing the deep penetration of some endolithic

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species and the fixation of some mosses. The moisture factor is decisive, in this case, in accelerating the biodeterioration process of the lithic substrate (fig. 4,5,6,7,9).

Figure 6. Bioderms green algae - Aspergillus

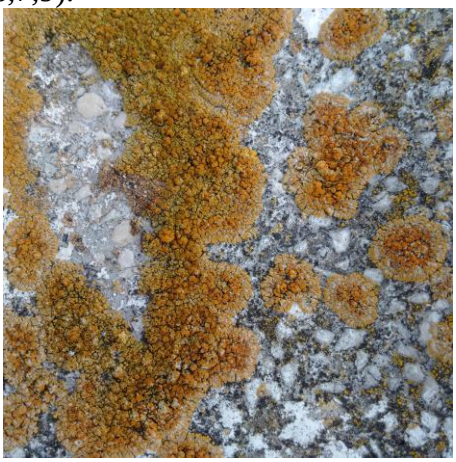

Figure 7. Xanthoria parietina

The cracks highlighted in the pictorial layers of the analyzed paintings are due to age. No cracks determined by biotic factors or early cracks determined by different physical or chemical phenomena that intervene in the drying process of the painting layer were highlighted. Salt migration and recrystallization occurs at different levels of the color layer causing its progressive exfoliation. The nature and porosity of the painting layer also favors faster or slower surface migration of soluble salts (fig. 8).

The first specialist in the conservation of works of art who dealt with the elucidation of the mechanism of the appearance of cracks was Sun (1999) and Knut Nicolaus (1999).

Figure 8. Bioderms green algae

Figure 9. Bioderms bryophytes on wood

On the surface of murals, the effect of algae is due to the secretion of organic acids (acetic, glycolic, lactic, oxalic, pyruvic and succinic acids) which have a corrosive effect (Oprea, 2006). Algae

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secrete, depending on the climatic conditions, large amounts of sugars and amino acids that facilitate the development of bacteria and some fungi. *Alternaria* and *Torula* species have been reported together with algae in the deteriogenic biofilm on the surface of murals or walls. Temperature is a limiting factor in the installation of certain species of algae on murals.
Research on the establishment of fungi on marble and stoneware has indicated that there are several stages in the growth and development of these colonies: prepenetration, which consists of the contact of the spores with the substrate, penetration, which consists of the germination of the spores and the mechanical penetration of the substrate by the mycelial hyphae, and postpenetration in which the newly formed mycelium develops in the gaps of the substrate (Sterflinger et al. 1997; Urzi et al. 1999).

4. CONCLUSIONS

The knowledge of the etiopathogenic complex in the present study represents a starting point for future visits and analyzes of various cultural heritage objects in Argeș.
The aggressiveness of dematiaceous fungi is a qualitative characteristic of the intensity of the attack on the wood, which is why it is recommended to apply treatments with specific fungicides.
The development of fungal colonies on different frescoes analyzed indicated a considerable percentage of species from the genera *Alternaria*, *Penicillium* and *Aspergillus*, the last two being involved in the occurrence of dangerous diseases in the human respiratory system. Species belonging to the genera *Alternaria*, *Cladosporium*, *Penicillium*, as well as non-fruiting mycelia were identified on the frescoes from the church of the Popăuți-Botoșani monastery (I. Ioniță, I. Muică, 2001). B. Hungarian (2004).
There is a correlation between the materials used in the execution of various heritage objects and the trophic preferences of biodeteriogenic agents. The diversity of the materials used in the original technique, to which the subsequent interventions are added, is also complemented by the atmospheric accumulations of an organic nature on the surface of the wall decorations, which add new sources of nutritional elements, increasing the speed of the process of installation and spread of biological pathogens.

5. ACKNOWLEDGEMENTS

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