

IMPACT OF ENVIRONMENTAL CONDITIONS ON THE LIFE CYCLE OF EDITIONS OF BOOKS KEPT IN ARCHIVES

Natalia Onici

Technical University of Moldova, Bd. Stefan cel Mare, no. 168, Chisinau, Republic of Moldova

E-mail: nataliaonici@gmail.com

Abstract

A library is a collection of sources, resources, and services, and the structure in which it is housed; it is organized for use and maintained by a public body, an institution, or a private individual. In the more traditional sense, a library is a collection of books.

This paper presents studies about the importance of environmental conditions on the life cycle of editions of books kept in archives and libraries. Under which it was established that environmental conditions do not meet current standards, which led to the development of microorganisms on the surface both editions of books and libraries as reviewed. Manuscripts and printed books are the part of national and universal cultural heritage, along with other spiritual values that define spirituality of a nation.

Library policy scope has evolved and continues to develop within the meaning of complication because of a range of factors: social, economic, political, etc.. Governmental strategies and decisions of public authorities are deeply determined by convergence, globalization and cooperation undoubtedly lead to regrouping library institutions in various areas: computerization, trade, digitization, etc..

Keywords: editions of books, libraries, environmental conditions, restoration methods, factors of influence.

1. INTRODUCTION

Of the many attempts to define the concept of a library, through the state policy on libraries, according to Moldovan Law on Libraries (original) by Article 2 specifies that "The library is an organized collection, public or private, of publications and and non-publications what purchase, preserve and organize such collections to meet the needs of the beneficiaries of reading and information." In 2001 law changes this definition and gives to libraries legitimacy, the concept of "institutions of information, culture and education."

In librarian respect, this law is related more to statistical statements and the state of libraries - the poor situation, the lack of literature, marginalization of profession etc. The following development directions suggested to libraries provide:

- foundation of book collections for public libraries, which will include the most valuable artistic and scientific works of Romanian and universal culture and civilization;
- engagement of a wider population in self-directed learning and literacy based on the book in Romanian;

➤ providing children and youth with Romanian book as support in teaching and learning;

➤ influence editorial policy in Moldova and completion of public libraries with books in foreign languages.

Artistic and historical values of the library consolidate a number of features that distinguish them from other cultural assets. Thus, besides the patrimonial, aesthetic, artistic, documentary, historical and scientific functions, they fulfill the role of the spiritual universe, communication between the generations and perpetuation of knowledge of the nation enduring.

Elucidating the mechanism of degradation of various organic and mineral materials in the structure of objects of national heritage, explaining phenomena that occur over time between the systems involved in the process of destruction, removal, or decrease their activity is a fundamental problem of conservation - restoration.

Materials exposition in archives and libraries include the risk of damaging documents and can even lead to their loss if security measures are inadequate.

Librarians should be aware of the risks involved by exposure to unsuitable environmental conditions, unsafe methods of support or not safe enough conditions and should ensure the best possible safety conditions during exposure.

Ensure good storage of the editorial thesaurus requires study and knowledge of influence factors causing them. Studies in this regard [1, 5, 4] shows the structure of factors of influence:

- exogenous or endogenous factors (related to the nature of raw material and manufacturing conditions);
- external or exogenous factors (environmental influence).

Endogenous factors causing destruction of the cellulosic polymer during natural or artificial aging process, affecting various parts of the molecular structure (unhydroxilic functional groups) or macromolecular level (distortion of crystal lattice defects, abnormalities in the morphology of structural elements). These are the so called "weaknesses or points of least resistance" of the mass of cellulosic material which manifests as local internal tensions that lead to structural damage. These defects occur either in technological processes, or may pre-exist in the structure of cellulosic material in its natural state, when manifested as a form of preferential point of destructive attack, respectively point of least resistance where begins destruction.

Exogenous factors are divided into:

- determinants of manufacturing processes of books editions and archival documents - preparation for the printing, finishing, storage, transportation, distribution;
- environmental factors due to the edition release or document or book storage.

According to generation nature [1, 5] determinants were formed in:

- biological;
- physical;
- chemical.

Addressing the endogenous and exogenous factors allows us to customize them, so as to be presented below.

Sizing the influence factors will help to establish the impact of environmental conditions on the life cycle of editions of books kept in the archives, as that is the study objective of this work.

2. APPLICATIVE MATERIALS AND METHODS

The micro environmental values documents are stored influences significantly their life. Ambient conditions with reference to temperature, humidity, lighting and air pollution can damage organic materials comprising the documents in libraries, museums and archives.

One of the basic requirements of proper conservation of library documents is to ensure optimal atmospheric conditions, bearing in mind that any major change, particularly temperature and humidity should be avoided wherever possible. There should be no noticeable difference between day and night or between the environment in storage areas and reading rooms.

The temperature should remain between the values between $18 \pm 2^{\circ}\text{C}$ and relative humidity between 35-55%. Thermo-hygrographs will be install to be measured these variables and to keep them within acceptable limits [8, 9].

In this context it is necessary to measure the quantity of natural or artificial light "falls" on the book editions. The windows will be covered with curtains and fluorescent lamps with filters to reduce the amount of emitted UV radiation. Lighting reading rooms should be sufficient to create visual comfort of the user and to remain constant and the documents should not be exposed more than 50 lx illumination.

Since relative humidity is the most significant feature with the implications of the life cycle of books editions, originally study conducted to ascertain which is the level of its in storage environment, using suction psychrometers. Its operation is based on temperature dependence of the dry and wet thermometer on air humidity.

Later in several sterile Petri vats were distributed in advance fluidified culture media, meat broth and wort agar - agar (or agar sabureaud). After media solidification, Petri dishes are kept two days in the thermostat - to verify that the media are sterile.

In libraries, the air was examined at various points and at different heights, was distributed Petri dishes with nutrient media, such as at every point to find each broth agar Petri dish and another sabureaud. Then the Petri dishes were left uncovered 5 to 15 minutes, during which microorganisms in the air have settled on the surface of culture media.

After an appropriate incubation, the plates with broth - agar for bacteria, 2 days at 37°C, and the plates with sabureaud 5 days at 25°C, it has been established the number of colonies developed in the nutrient medium in a Petri dish.

3. RESULTS AND INTERPRETATIONS

Starting from the objective of the study with reference to the impact of environmental conditions on longevity of book editions in the study have been involved five libraries in Chisinau.

1. Library of Faculty of Technology and Management in Food Industry, Technical University of Moldova;
2. Library of Faculty of Light Industry, Technical University of Moldova;
3. National Library;
4. French Alliance Library;
5. Library of Antioch – Cantemir High School.

It is well known that paper sustainability is defined as "the degree to which the paper retains its original qualities in terms of continuous use."

Table 1. Results on environment conditions studied in the libraries in Chisinau

Nr.	Libraries included in the study	T, °C dry thermometer	T, °C wet thermometer	Relative air humidity, %
1	Library of Faculty of Technology and Management in Food Industry, Technical University of Moldova	19,2	19,4	86
2	Library of Faculty of Light Industry, Technical University of Moldova;	20,5	19,4	86
3	National Library	19,6	19,4	79
4	French Alliance Library	24,8	23,3	84
5	Library of Antioch – Cantemir High School	20,8	20,5	71

Following results were founded on, because one of the priority factors of influence on sustainability of the book editions are the environmental conditions, appeal their assessments. Results are listed in Table 1.

To ensure efficient storage conditions of books, archival documents it is recommended the following standard storage conditions (Table 2);

Table 2. Standard storage conditions recommended by the Central Intelligence Agency of RM

Media type	Temperature	Relative humidity
Paper, parchment	18 °C (±1 °C)	55 % (±5 %)
Monochrome Photos	12 °C (±1 °C)	35 % (±5 %)
Polychrome photos	5 °C (±1 °C)	35 % (±5 %)
Magnetic backing	18 °C (±1 °C)	40 % (±5 %)

As discussed relative humidity is very high, this leading not only to the destruction of book editions, but also to the library staff disease.

It is known fact that humidity over 60-70% causes low thermolysis so more with higher

temperature, thus negatively influenced thermoregulation. When air temperature is low, humidity is high, thermolysis increases, in this case heat is lost through radiation and convection.

It is known that warm air can hold much more moisture than cold air. When condensation occurs on the surface of an element air is saturated with water vapor temperature at that point.

At the time of condensation air relative humidity is 100%. Relative humidity is the amount of water vapor that air can hold at a given temperature.

If the air (which has 100% humidity) is heated, the relative humidity will decrease. This is because air will increase the capacity to retain moisture when heated [10].

To avoid condensation on the building elements that lead to corrosion or mould, humidity should be checked within the library. Moisture in the air can create a nuisance, such as generating condensate which can lead to mould spots on thermal bridges and can even affect the building structure. In Table 3 are specified types of mould and numbers of colonies of microorganisms found in libraries.

Depending on the temperature and ventilation, the amount of vapor can vary between 0 and 100%. Relative humidity largely defines our sense of comfort; the ideal percentage is between 45% and 65% [11].

Table 3. Types of microorganisms that were identified in the libraries involved in the study

Experiment place	Growing medium	Number of colonies NTG	Colony type	Features
Library of Faculty of Technology and Management in Food Industry, Technical University of Moldova	agar sabureaud	20	<ul style="list-style-type: none"> • Aspergillus; • Penicillium; • Bacillus. 	Aspergillus species are distinguished on the basis of microscopic characteristics of the colonial apparatus and crop characteristics of the colonies. Penicillium species are agents that can cause rotting mycotoxins.
Library of Faculty of Light Industry, Technical University of Moldova	agar sabureaud	3	Bacillus	Bacillus genus are ubiquitous bacteria, spores, gram positive, with cilia peritrichi, with or without capsule, aerobic, have a high resistance in the environment, found in soil, water, plants, food, drug. Physical and chemical factors resistant, survive several weeks in phenol-based disinfectants, temperature – 5°C up to 10 years, can be destroyed at boiling in about 10 minutes. Hazardous to readers' health.
National Library	agar sabureaud	3	Bacillus	
Library of Antioch – Cantemir High School	agar sabureaud	4	Bacillus	
French Alliance Library	geloză sabureaud	4	Staphylococcus	Genus Staphylococcus are gram positive, grows in soil arranged in irregular piles, aerobic, immobile, no spores. It is resistant to physical, chemical and biological factors. Resist in crop, in the fridge - a few months, resistant to interaction with solutions of alcohol, phenol - 2%, dangerous to the health of the reader.

4. CONCLUSIONS

The archives work environment encourages the appearance and development of microorganisms which need to survive and multiply a source of organic food and a high humidity environment.

Documents and books stored in archives are proper environments to mould and bacteria, cellulose providing the necessary food, and the porosity of materials (paper, cardboard, leather) favors retaining moisture for the development of these microorganisms.

Custom analysis of environmental factors means, that for rescue and further protection of editions of books and archival documents is necessary to fulfill environmental conditions, such as: climatic changes, the presence of corrosive gases in the atmosphere (pollutants) such as CO₂, SO₂, NO₂, Hal₂ (halogen), caused by industrial and urban activities, the influence of dust and microorganisms, especially fungi.

The environmental conditions of the libraries where the experiment was conducted on the objective of the study do not correspond to standards.

According to the results obtained, the humidity is higher than demand (35-55%), leading to lower life cycle editions of the book and possible diseases as well as of the staff and reader.

Also, due to high relative humidity of the air in the libraries, microorganisms in both air and surface of books editions will grow faster, leading to degradation of manuscripts and present danger to health.

As a mould hazardous to readers' health were detected species *Penicillium*, genus *Bacillus*, *Staphylococcus*.

To maintain environmental conditions will resort to the use of ventilation systems, permanent

cleaning shelves of dust and other impurities, cover windows with shutters - to not allow the passage of direct sunlight, use of bactericidal lamps, avoid locating plants in libraries.

5. REFERENCES

- [1] Dan, V., Kramer, C., Bahmir, G., Nicolau, A., Zara, M., „*Memorator pentru mucegaiuri*”, Editura EVRICA, Brăila, 1999.
- [2] Lazăr, V., – „*Microbiologie medicală*”- Ed. Universitatii Bucuresti -2001
- [3] Legea cu privire la bibliotecă nr. 286-XIII din 16.11.1994 // M.O. nr. 15 din 12.01.1995
- [4] La Conservation: *principes et realites*. Paris: Editions du Cercle de la Librairie, 1995.
- [5] Nicolau, A., „*Microbiologie generală. Factori care influențează dezvoltarea microorganismelor*”, Editura Academica, 2006.
- [6] Stoian, Victoria. „*Dimensiuni ale integrării: legislația de bibliotecă. Prezent și perspective*” // ABIR.- 2001.- nr. 1., p. 10 – 12
- [7] <http://www.lisr.ro/4-5-popescuau.pdf>
- [8] http://www.cepiem.ro/html/conditii_de_meniu.html
- [9] <http://www.referatele.com/referate/geografie/online4/Conceptul-de-meniu--Componentele-de-baza-ale-ediului-referatele-com.php>
- [10] http://www.isover.ro/controlul_umiditatii.php
- [11] <http://www.stopumiditatii.ro/despre-umiditate/>