Opportunistic fungi isolated from the libraries of a higher education institution in Petrolina/PE

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1 INTRODUCTION

Fungi are beings that are unicellular as yeasts or pluricellular as filamentous fungi, they are heterotrophic eukaryotic where they are ali mented by absorption of nutrients from organic matter; they have sexual and asexual forms of reproduction varying according to the spores or conidia produced. There are many physical elements that affect the growth of fungi, humidity is an important factor in the growth of fungi, because they prefer an environment with a high rate of humidity (SOUSA; PANTOJA; NUNES, 2016).

Factors such as the number of individuals per area, human activities, equipment, temperature, relative humidity, ventilation, location and structure of the building and design, contribute to the growth and proliferation of microorganisms in the indoor environment. This high humidity and poor ventilation propitiate the degradation of materials, which constitutes another factor of indoor air pollution and is considered an important risk factor for the occupants' health (CAMPOS et al., 2017).

Books accumulate microorganisms, which during handling can be inhaled, which can be alleviated by proper ventilation and with correct cleaning and sanitization measures (TASSA; BRAGA; MOTTER, 2018).

The monitoring to identify the levels of air quality in artificially conditioned environments is determined according to Resolution RE No. 9 of January 16, 2003, ANVISA, which defines technical reference standards for cleaning and maintenance of air conditioning systems, quality and monitoring of indoor air. The goal is to ensure the health and safety of individuals who frequent public and collective places with air-conditioned environments, expressing as maximum recommendable value - VMR, for acceptable microbiological contamination should be $\leq$750 CFU/m³ of fungi, for the ratio I/E $\leq$ 1.5, where I is the amount of fungi in the indoor environment and E is the amount of fungi in the outdoor environment (BRASIL, 2003).

2 OBJECTIVE

To evaluate the microbiological quality of the air present in the libraries of higher education institutions.

3 METHODOLOGY

The study was conducted in the library of one of the Federal Universities in the city of Petrolina-PE, the chosen environment is artificially acclimatized, the number of plates used took into account the size of the environment and an average distance between one plate and another of 8.5 m. The libraries located in Petrolina-PE, have an area of approximately 2,148.60 m² of built area, during the collection the standard methods of ANVISA were employed, a total of 30 Petri dishes were used.

The samples were collected using the passive sedimentation technique on solid culture medium using Petri plates containing the culture media Sabouraud Dextrose Agar (ASD) (FLORES; ONOFRE, 2010) plus tetracycline at a concentration of 50 mg/L. The plates were exposed in strategic locations, placed at a distance of up to 1.5 m from the floor and away from the walls, and remained open for 15 minutes. After the exposure time had elapsed, the plates were properly labeled, packaged and transported to the Microbiology Laboratory of the center campus of the Universidade Federal do Vale do São Francisco, where they were incubated at room temperature and observed daily for a period of seven days.

After growth of the fungal cultures, a quantitative analysis was performed by counting the number of CFU of the colonies present in the respective culture media, and differentiating between filamentous and yeastlike fungi.

To obtain pure samples for further processing, the predominant colonies, grown in the Petri dish cultures, were seeded in test tubes with BDA (Potato Dextrose Agar) medium and incubated at room temperature (28 ± 2 ºC) for growth, After the growth was verified the analysis of the macroscopic aspects was done for identification and later the microscopic analysis, where it was mounted slides with fragments of the colonies, increased of a drop of the dye for visualization in the microscope and later identification based on specific literature (SILVA et al., 2021).

4 DEVELOPMENT

The samples collected in the library received the correct packaging, after being taken to the Microbiology Laboratory of the center campus of the Universidade Federal do Vale do São Francisco, where they remained under observation for a period of 4 to 7 days, as mentioned in the methodology. After the growth of the colonies, the number of colonies that grew in the Petri dishes was counted, according to their quadrant; each quadrant received a numbering to facilitate the identification process of the dishes. To purify the samples a fungal fragment was inoculated into a test tube with BDA (Potato

Dextrose Agar) medium and incubated at room temperature (28 ± 2 ºC) for 3 to 4 days for growth. After growth, a fragment of the fungal colony was extracted and slides were mounted for microscopic analysis in order to identify the fungal genera collected in the indoor air.

The microorganisms obtained in this study are commonly isolated in indoor environments with artificial air conditioning, and are possible pathogenic agents in employees and users who may or may not be immunosuppressed, such as the filamentous fungi *Aspergillus sp.*, *Bipolaris sp.*, *Cladosporium sp.* and *Penicillium sp*. that were found in the internal environment of the library.

Table with the results of the number of colony forming units (CFU):

Genres	UFC	CFU%
Aspergillus sp.	**9**	**33,33%**
Bipolaris sp.	**1**	**3,70%**
Cladosporium sp.	**7**	**25,92%**
Penicillium sp.	**3**	**11,11%**
Unidentified	**7**	**25,92%**
Total	**27**	**99,98%**

The sedimentation air sampling calculation will use the equation described by Friberg et al. (1999).

$$\text{No. CFU/m3} = \frac{\text{No. CFU on plate X 1 (SAR)}}{\text{Petri dish area (m}^2\text{) 23}}$$

Table with the result of the sample calculation:

Local	UFC	CFU/m³	I/E
Lobby	**3**	**21,7**	**0,1**
Bookshelves	**5**	**36,2**	**0,2**
Cubicle Room 1	**4**	**29,0**	**0,1**
Mezzanine	**4**	**29,0**	**0,1**
Reception	**10**	**72,5**	**0,3**
Cubicle Room 2	**2**	**14,5**	**0,1**
Group Room	**0**	**0,0**	**0,0**
Drinking fountain	**0**	**0,0**	**0,0**
Sofa	**0**	**0,0**	**0,0**
Ramp	**0**	**0,0**	**0,0**
Management	**0**	**0,0**	**0,0**
Total Internal	**28**		
External 1	**33**		
External 2	**22**		
External 3	**40**		
External 4	**22**		
Total External	**117**		
External Average	**29,25**	**212,0**	

5 CONCLUDING REMARKS

The results obtained were useful to evaluate the conditions of the common use environment in the library of the Federal University. These analyses are extremely important, since anemophilic fungi have the ability to cause respiratory problems. The results showed that the air quality is within the standards required by ANVISA, but with the presence of some fungal genera, among them the *Aspergillus sp.* that present pathogenic and toxigenic species.

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