

# Isolation and Diagnosis of Air Fungi inside the Buildings and Departments of the Technical Institute - Basrah Iraq

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**Abstract:** Importance of the research:

Aerobic fungi are a potential source of allergy, infection and poisoning for humans, animals and plants. Study and monitoring of aerobic fungi in indoor environments, especially those where people live or work, is essential for improving indoor air quality and preventing diseases caused by fungi. This research contributes to providing information on the diversity, distribution and impact of aerial fungi in the buildings and departments of the Technical Institute in Basra, an area characterized by a hot and humid climate. One of the goals of the research is to understand the fungal composition and the ability to spread present on the walls Surfaces and air inside buildings at the Basrah Technical Institute. The fungi were isolated from the air using the sedimentation method The method of study and from the walls using the surface swab formed the study material The types of finishing materials on wall surfaces were identified and used in the analysis. Seven types of air fungi were isolated in 6 different places at the Basra Technical Institute within the institute's buildings and departments. Two methods were used for isolation. The first was to expose the dishes to direct air inside the buildings, and the other method was to wipe the walls of the buildings with sterile wooden sticks, then plant them on media and incubate them at a

temperature 27 for filament fungi the and 37 for the growth of yeasts. After molecular diagnosis, 3 types of *Candida* species *tropicalis* clone A.A.Z.Z.N.N.6 and *Candida albicans* clone A.A.Z.Z.N.N.4 & *Candida parapsilosis* clone A.A.Z.Z.N.N.5 and 2 types of *Penicillium chrysogenum* & *Aspergillus niger* were obtained.

**Keywords:** *Candida* , fungi , air , walls , Institute , *Aspergillus* , *Penicillium*

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## Introduction

Fungi are a group of microorganisms that are ubiquitous and play an important role in the environment and public health. fungi can be harmful or beneficial depending on quantity ,type, and location(1). Aerobic fungi are those that reproduce and grow in the air and are transmitted by air currents. Some aerobic fungi can cause allergies, inflammation, or infection in plants, humans ,animals it is important to study and monitor aerobic fungi in different environments, especially those where people work. The departments and buildings of the Technical Institute in Basrah are examples of closed environments in which air conditioning devices are used to control humidity,temperature, humidity, and ventilation (2). increase the likelihood of aerobic fungi in indoor air and pose a health risk to visitors students, employees (3). Therefore, the goal of this research is to isolate and diagnose aerobic fungi inside the buildings and departments of the Technical Institute in Basra and evaluate their impact on health(4). samples of outdoor and indoor air were collected from several locations outside and inside the Technical Institute in Basrah using an air collection device. The samples were grown on a suitable medium and the fungi were cultured in specific conditions (5). Diagnosis is based on colony morphology, morphological characteristics, and molecular characteristics. (6). The results were compared between indoor and outdoor air and between different locations to assess the level of fungal contamination and its risks to health(7). Airborne fungi cause multiple breathing and inhalation problems. Also, the lack of an air filter causes fungi to accumulate. (8). The researchers hope that the results of this research will contribute to improving indoor air quality in the buildings and departments of the Technical Institute in Basrah and raise awareness of the concerned authorities about the necessity of taking preventive and remedial measures to reduce the impact of aerobic fungi on health.(9)

## Material & methods:

The experiment requires the following materials:

1. Sterial Petridishes: These are small dishes made of transparent glass material. They are used to cultivate and grow fungi.
2. Nutrient medium: You need a nutrient medium suitable for the growth of fungi. There are many cultivation media available on the market, such as SDA or (PDA) medium. This medium contains nutritional components that support fungal growth(10).
3. Air samples: You need to collect samples of the surrounding air using a suitable method such as media that collect air particles,

Equipment & instruments	Company / Country
Centrifuge	(DLAB /Ghain)
Sensitive balance	(Sartorius /Germany)
Electrophoreses	Clarivate /UK
Cabinet hood	(BioLAB/ Korea)
Water Distillatory	(GFL/ Germany)
Micropipettes (Different sizes)	(Eppendroff/ Germany)
Refrigerator	(Al Balsan / Turkey)
Tips (Different sizes)	(Jippo / Japan)
1.5 ml Eppendorf tubes	(Sigma-Aldrich /USA)
UV.transmission	Vilber Lourmat Sté /Farance
Vortex	Fisher Scientific/ USA
Thermostatic Incubator	Zxinstrument/Chain
Power Supply	Biorad/ <u>USA</u>
Applied Biosystems™ ProFlex™ PCR System	Fisher Scientific/ USA

Table (1) Instruments and material

**Methods :**

**DNA extraction :** DNA Extraction Mini Kit (Cat. No.: FAFYG 001) FavorPrep Fungi/ Yeast Genomic

**Preparation primers :**

To reach a final volume of 100 µL, place 10 µL of stock solution into 90 µL of free ddH<sub>2</sub>O.

Primer	Sequence	Primer sequence	T <sub>m</sub> (°C)	GC%	Size of Product (bp)
<i>ITS</i>	F=ITS1	5'- TCCGTAGGTGAACCTGCGG -3'	61.64	63.16	530 bp
	R=ITS4	5' TCCTCCGCTTATTGATATGC- 3'	55.09	45.00	

Table (3): The sequence of primers

Component	25 µL (Final volume)
Taq PCR PreMix	5µl
Forward primer	10 picomols/µl ( 1 µl )
Reverse primer	10 picomols/µl ( 1 µl )
DNA	1.5µl
Distill water	16.5 µl

Table (4): Reaction components of PCR

No.	Phase	T <sub>m</sub> (°C)	Time	No. of cycle
1-	Initial Denaturation	95°C	5 min	1 cycle
2-	Denaturation -2	95°C	Sec45	35 cycle
3-	Annealing	52°C	1 min	
4-	Extension-1	72°C	1 min	
5-	Extension -2	72°C	5 min.	1 cycle

Table (5): The optimum condition of detection

### Result:

20 samples taken from different area in the buildings and departments of the Basrah Technical Institute . the results showed the following diagram After diagnosing the samples in the microbiology laboratory, the following results were obtained:

Type of fungi	Bulding1	Bulding2	Bulding3	Bulding4	Bulding5	Bulding6
<i>Candida tropicalis</i> clone A.A.Z.Z.N.N.6	0	0	1	0	0	1
<i>Candida albicans</i> clone A.A.Z.Z.N.N.4	1	1	0	0	1	0
<i>Candida parapsilosis</i> clone A.A.Z.Z.N.N.5	0	0	0	0	1	1
<i>Penicillium chrysogenum</i>	1	1	0	1	0	1
<i>Aspergillus niger</i>	0	1	1	0	0	1

Table -6- showing the types of fungi that were diagnosed in the buildings and departments of the Basrah Technical Institute

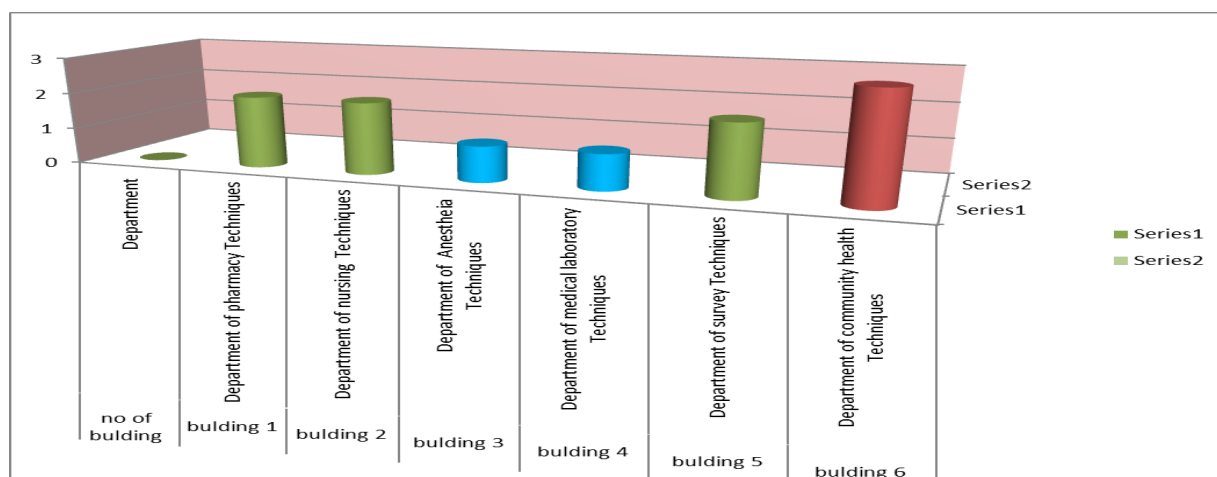


Table 8 shows the percentages of fungi present in the departments of the Technical Institute from which samples were taken randomly

### Discussion:

The results showed the presence of five types of fungi in the buildings of the Basra Technical Institute. The table presents data on the types of fungi detected across six different buildings, noting both species and specific clones where relevant. The buildings are labeled Building 1 through Building 6. The presence or absence of a particular fungal species (and clone) in each building is indicated by a 1 (present) or 0 (absent). Each building hosts a different combination of fungal species. Building 6 has the highest diversity, with all five types detected. *Candida albicans* and *Penicillium chrysogenum* are detected in more buildings compared to other species. *Penicillium chrysogenum* is found in four out of six buildings, making it the most widespread fungus in this dataset. *Candida tropicalis* and *Candida parapsilosis* each appear in two buildings only, suggesting more restricted occurrence. *Aspergillus niger* is absent in Buildings 1, 4, and 5 but present in Buildings 2, 3, and 6. The presence of *Candida* species (including specific clones) may indicate environments favorable for these opportunistic pathogens, often linked to human or moist indoor environments(11). *Penicillium* and *Aspergillus* genera are common environmental molds, with potential health and air quality implications, especially in enclosed spaces. Specific

clones of *Candida tropicalis*, *Candida albicans*, and *Candida parapsilosis* are identified, highlighting potential for genetic or epidemiological analysis regarding source or transmission patterns within or between buildings(12). It is noted that there is an increase in the spread of fungi in the aforementioned buildings, which requires attention to cleanliness and sterilization, wiping the surfaces of corridors, maintaining air purification, and not dealing with fungi that cause dangerous diseases inside these buildings(13). Maintaining clean air free of fungi that cause respiratory allergies in students and staff is very essential to creating a safe work environment. Irritation of the eyes, nose and throat. It usually appears as itchy or watery eyes, sore throat, or nasal congestion.(14).

Respiratory symptoms, including coughing, wheezing, sneezing, shortness of breath, and chest tightness.

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