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## Survey of Keratinophilic Fungi in the Tigris River in Baghdad

*Teeba Hashim Mohammad*

*Khalid Abdulrazak Habeb*

Department of Biology, College of Science for Women, University of Baghdad

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### Abstract:

The present study includes the isolation and identification of Keratinophilic fungi in fresh water samples collected from Tigris river in Baghdad, Iraq. Samples were collected from different districts of Baghdad (Al-Rustumia, Madina Al-Teb, Al-Azamia, Al-Kadimia, Al-Dorha and Al-Kanah). The water samples were examined for keratinophilic fungi by the plating method culturing and Hair Baiting Technique. A total number of 18 genera are recorded, in which the Tigris water indicates an impressive diversity of fungi.

A variety of fungal strains were isolated from river water, out of 814 fungal colonies, *Aspergillus terreus* (5.5%) was the most frequent species, followed by *Aspergillus niger* (5.2%) then *Rhizopus stolonifer* (3.3%). The results revealed that the highest number of fungal species are found in water surface near the margin (75%) followed by the fungi isolated from water surface in the middle of the river (25%), whereas the number of fungi in 50 cm depth from water surface near the margin and 50 cm depth from water surface in the middle of the river is 17.10% and 12.20% species respectively. The results suggest that the Tigris river is a potential transmission route of fungi and a healthily hazard mainly for the immune depressed individual.

**Key words:** Fresh Water, Keratinophilic Fungi, Tigris River, Baghdad

### Introduction:

Keratinophilic Fungi are widely distributed everywhere (soil, air, rivers, oceans etc) [1]. The opportunistic fungal infections can occur by exogenous and endogenous fungi [2]. The number of swimmers who attend rivers with a view to the courtyard or to fish is in the increase due to the rising temperatures and increased living requirements, in addition to the notes with increasing injury thus people fungal skin and use of chemical treatments, which in turn is increasing. On the other hand, the

keratinophilic fungi in river diversity is high enough for studying the fungal biodiversity; accordingly our efforts are increased for studying the potential ecological function of these fungi [3,4]. For the study of keratinophilic fungal species of the river, we have collected fungi from water to understand their fungal diversity [5]; in addition to studying the appearance and recurrence of fungal species in the Tigris River in Baghdad.

## Materials and Methods:

### I. Collected Samples

- Six different stations (Al-Rustumia ,Madina Al-Teb, Al-Azamia, Al-Kadimia, Al-Dorha and Al-Kanah) from the Tigris river are selected for water sample collection and for fungal diversity analysis. A total of 36 water samples are taken from the river of Baghdad City.
- The samples are collected from 4 places in each location as follow :-
  - A. Water surface near the margin
  - B. 50 cm depth from water surface near the margin
  - C. Water surface in the middle of the river .
  - D. 50 cm depth from water surface in the middle of the river .
- Due to the different distances between the sites of collection, water is stored in the refrigerator until the analysis is done [6].
- The presence of fungi is investigated in 36 water samples using the membrane filter technique. A volume of 1.5 liter of water is collected in dark bottles [7]. Ten ml of each sample is taken and filtered, in duplicate, through membrane filters with pores of 0.45  $\mu\text{m}$  size. The membranes are placed on sabourands dextrose agar (SDA) supplemented with chloramphenicol and Cycloheximide. The plates are incubated at 25°C for 4 weeks, and examined at frequent intervals, then transferred to a different media :
  - Sabouraud's Dextrose Agar (SDA)
  - Czapeck Dox agar(CZ)
  - Malt extract-agar(MEA)
  - Potato dextrose agar(PDA) , by type of fungi .

### II. Hair Baiting Technique

The hair bait technique is used to isolate keratinophilic fungi. For this purpose,

sterile petri dishes are half filled with the sterile soil and moistened with river water samples and baited with burying sterile human hair. These dishes are incubated at (25°C) and examined for fungal growth over a period of four weeks. After observing the growth under microscopes, it is cultured on Sabouraud's dextrose agar supplemented with chloramphenicol (50 mg/l) and cycloheximide (500mg/l). [8]

### III. The Percentage of Occurrence and Frequency

The percentage of occurrence and frequency is defined as follows [9]:

$$\% \text{ occurrence} = \frac{\text{No. of positive samples}}{\text{Total number of samples}} \times 100$$

$$\% \text{ frequency} = \frac{\text{No. of fungal isolated}}{\text{Total no. of isolates}} \times 100$$

### Results:

The results show that the highest populations of fungal genera and species are found in October, November, December, January, February, March, April and June. These periods represent months when the mud temperature are ranges between 10° C and 35° C .

**Identification:** Identifying the fungus is mainly done by using the taxonomic key, which depends on the diagnosis of fungal culture media through the exterior, background, color of culture on SDA, CZ, MEA and PDA media, personalized fungi after that by the optical microscope [10,11,12,13,14].

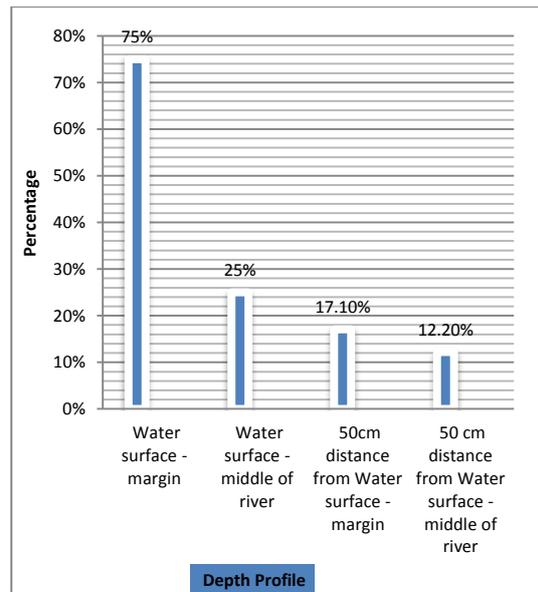
A total of 814 fungal colonies from 360 petri dishes are isolated and quantified to determine the frequency of occurrence and then identified. A total of 18 fungal genera are isolated, *Aspergillus* (10 species) is the most common genus and is represented always during the experimental period

followed by *Rhizopus* genus. The study is divided into three main groups: Zygomycotina, Anamorphic fungi and Mycelia sterile. It appears most often in the anamorphic groups its control fungal groups. It is also observed that the anamorphic group is the dominated fungal group. The fungal genera *Aspergillus Rhizopus*, *Fusarium*, *Trichophyton*, *Mycelia sterilia*, *Mucor*, *Cladosporium*, *Penicillium*, *Microsporium*, *Trichoderma*, *Ulocladium*, *Alternaria*, *Phoma*, *Scopulariopsis*, *Hypomyces*, *Phialophora*, *Chrysosporium* and *Exophiala* were observed during the survey period. (Table. 1).

**Table 1: Occurrence and Frequency of fungal genera in Tigris river isolated from (Al-Rustumia, Madina Al-Teb, Al-Azamia, Al-Kadimia, Al-Dorha and Al-Kanah).**

Fungal Genera	No. of isolated	Occurrence%	Frequency%
1- <i>Aspergillus</i>	38	24.2	27.5
2- <i>Rhizopus</i>	16	10.1	12.4
3- <i>Fusarium</i>	14	8.9	7.7
4- <i>Trichophyton</i>	12	7.6	5.2
5- <i>Mycelia sterilia</i>	12	7.6	3.9
6- <i>Mucor</i>	9	5.7	6
7- <i>Cladosporium</i>	8	5	4.7
8- <i>Penicillium</i>	7	4.4	8.1
9- <i>Microsporium</i>	7	4.4	3.3
10- <i>Trichoderma</i>	6	3.8	5.1
11- <i>Ulocladium</i>	6	3.8	3.1
12- <i>Alternaria</i>	6	3.8	2.5
13- <i>Phoma</i>	4	2.5	2.3
14- <i>Scopulariopsis</i>	4	2.5	1.2
15- <i>Hypomyces</i>	3	1.9	1.3
16- <i>Phialophora</i>	2	1.2	2
17- <i>Chrysosporium</i>	2	1.2	1.4
18- <i>Exophiala</i>	1	0.6	1.4

Three types of keratinophilic fungal species are common: *Aspergillus terreus* (5.5%) is the most frequent species with, *Aspergillus niger* (5.2%), followed by *Rhizopus stolonifer* (3.3%) frequency. The result also revealed found that the most occurrence involvement is observed for *Aspergillus terreus* (6.3%), followed by *Aspergillus niger* with a (5.7%), and *Mycelia sterilia* (4.9%). The water collected from the four sites of the Tigris River is heavily contaminated with microorganisms during all months. (Figure- 1).



**Fig.(1): Depth Profile of Keratinophilic Fungi.**

It is believed that the river which is an off- shoot of the Tigris river contains nutrient rich water bodies because the site is foully (polluted from diverse sources hence the presence of numerous contaminating micro-organisms) [15].

**Discussion:**

Fungi can grow everywhere, in different environmental conditions in all regions of the world. There is a relationship between the fungal concentration, PH of water, depth and oxygen; all these factors influence the fungal growth. Spores of *Aspergillus* and *Penicillium* are widely distributed in the world. According to previous reports, *Aspergillus* is the dominant genus in the tropical regions whereas the genus *Penicillium* is the dominant everywhere in the world [16]. *A. fumigatus* as air born fungus is ubiquitous .The fungi of water play an important role in the decomposition of organic matters such as dead stem and leaves[17].

The Hair Baiting Technique (HBT) method of keratinophilic fungi isolation is useful for the enumeration of spores [18] ,although there are different methods such as filtration, direct plating,

baiting for sampling fungi from water[19]. Future studies such as the effect of these fungi on the health are needed [20].

Generally, the qualitative and quantitative composition of keratinophilic fungi are important as a bio indicator of water pollution, because the growth of these types of fungi informs us about the risk of infection with potential of fungal pathogens [21].

### Conclusion:

A total of 18 fungal genera are isolated and identified from Tigris river. The study of biodiversity elucidates the relationships between organism and environment, and unravels the mechanisms of adaptation to extreme environmental condition. Rivers helps the mycologists to explore fungal diversity and exploit their ecological, medicinal and industrial potential.

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## مسح للفطريات المحبة للكراتين في نهر دجلة في مدينة بغداد

خالد عبد الرزاق حبيب

طبية هاشم محمد

قسم علوم الحياة، كلية العلوم للبنات، جامعة بغداد

### الخلاصة:

تضمنت هذه الدراسة عزل وتشخيص الفطريات المحبة للكراتين من المياه الجارية لنهر دجلة حيث جمعت العينات من مواقع مختلفة لمدينة بغداد\العراق (الرسومية، مدينة الطب، الاعظمية، الكاظمية، الدورة والقناة). استخدمت طريقة زرع الأطباق وتقنية الطعم بالشعرة لاختبار الفطريات المحبة للكراتين. تم تسجيل حوالي 18 جنس من الفطريات وهذا يشير إلى تنوع الفطريات الموجودة في مياه نهر دجلة. تم عزل وتشخيص 814 مزرعة فطرية شملت، *Aspergillus terrus* (5.5%) وهي أكثر الأنواع تكراراً أعقبها الفطر *Aspergillus niger* (5.2%) ثم الفطر *Rhizopus stolonifer* (3.3%). كما أظهرت النتائج أعداد هائلة من أنواع الفطريات في مياه السطح القريبة من الحافة (75%) مقارنة بالفطريات المعزولة من السطح في وسط النهر (25%)، كما وجد انخفاض أعداد الفطريات على عمق 50 سم من سطح النهر القريب من الحافة (17.10%)، والفطريات على عمق 50 سم من السطح وسط النهر (12.20%) نوع على التوالي. تشير النتائج إلى أن نهر دجلة ممكن أن يكون إحدى وسائل انتقال الفطريات وبذلك يمكن أن يشكل خطراً على الصحة سبباً في هبوط مناعة الأشخاص.

الكلمات المفتاحية: المياه الجارية، الفطريات المحبة للكراتين، نهر دجلة، مدينة بغداد.