Sumer Journal for Pure Science (ISSN: 2790-7031)
2nd International Scientific Conference on Pure and Medical Sciences/University of Sumer 2024

Evaluation of Magnesium Oxide Nanoparticles Toxicity against Stachybotrys Chartarum from Indoor Buildings in Medicine and Science Colleges University of Sumer

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Abstract

Stachybotrys chartarum has been shown to be more common than other fungi, and C. herbarum has been found to be more noticeable than other fungi isolated from indoor buildings. According to HPLC data, the retention duration or primary peak in verrucarol the record occurred at 5.6 minutes while a filter extract of S. chartarum from (4.5-6.5) minutes which identifies with toxin verrucarol produced located in the same area. PCR which proves to be useful for identification of Stachybotrys spp. MgO nanoparticles in this study proved efficiency in the inhibition fungus of 100% and the concentration of toxin reduction.

Keywords: Magnesium Oxide; Nanoparticle; Fungi isolation; Stachybotrys chartarum; Indoor buildings.

تقييم كفاءة جسيمات أكسيد المغنسيوم النانوية ضد الفطر *Stachybotrys Chartarum* في ترميم المباني في كليات الطب والعلوم جامعة سومر

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الخلاصة

أظهرت النتائج أن *Stachybotrys Chartarum* أكثر شـــيوعًا من الفطريات الأخرى المعزولة من المباني الداخلية. وفقا لبيانات HPLC، فإن مدة الاحتفاظ أو الذروة الأولية في verrucarol حدثت عند 5.6 دقيقة، في حين أن مســتخلص مرشــح *S.chartarum* من (4.5-6.5) دقيقة والذي يتطابق مع مادة verrucarol الســامة المنتجة الموجودة في نفس المنطقة. PCR الذي أثبت أنه مفيد للتعرف على *Stachybotrys spp*. أثبتت جزيئات أكســيد الماغنسيوم النانوية في هذه الدراسة كفاءتها في تثبيط الفطريات بنسبة 100% وتركيز تقليل السم.

الكلمات المفتاحية: أكسيد المغنيسيوم؛ الجسيمات النانوية؛عزل الفطريات ستاشيبوتريس شارتاروم؛ المباني الداخلية.

1. Introduction

Fungal development inside wet or water-damaged buildings is a growing threat all over the world. with negative consequences for both residents and buildings. Air sampling alone in moldy buildings does not reveal the richness of fungus species growing on parts of the building. metabolites, these molds have often been created to produce on water-destroyed cellulose materials, such as roof, paper over, sheet-rock and wall sheet, in housing and profitable constructions [1].

Many fungi can produce a huge number of secondary metabolites, some of which offer a significant health risk to humans. These poisonous secondary metabolites are known as mycotoxins. are expelled into the environment. As a result, two routes for mycotoxins to become airborne are feasible. The study challenge associated with this fungus appears to be underappreciated, and there is still a requirement to precisely define the true hazards posed by S. chartarum and phylogenetically related species. There are many diseases associated with existence of indoor fungi invasion which is frequently inhabited as the origin of disease [2]. The purpose of this study was to determine the diversity of fungus growing on wet or water-damaged buildings and their controllability.

2. Materials and Methods

2.1 Fungi Samples Collected Indoors

The assay was carried out at several sites in Al-Rafa city, Nasiriyah, Iraq. Samples were taken from different parts of the buildings belonging to the Science and Medicine College at Sumer University.The samples were collected from multiple parts of each facility that contained old and neglected areas such as bathrooms, refrigerators, and walls.

2.2 Fungi Isolation and Identification

Culture media were made and placed on petri dishes, while sterilized filter sheets and wheat straw medium (WSM) were employed to capture the fungus Stachybotrys chartarum. In addition to that, gypsum media was placed in an area encompassed by this study. Dishes and traps were randomly put in four various places as a four-repeated sample for each location.

Later on, Petri dishes were opened in each place for 5 minutes, While the traps, such as gypsum, were put in a container with water to keep them moist and left for a period of one month. These petri dishes were also opened in refrigerators for 5 minutes while colonies of fungi were scraped from inside refrigerators with sharp tools. Following that, these petri dishes were incubated at 25 ± 2 °C for three days before being tested. The following types of media was used in this study: A-Wheat Straw Medium (WSM).

This medium was made from 40 g of electrically ground wheat straw that was then soaked in 500 mlof distilled water for 24 hours. The mixture was then placed in a flask and boiled for 15-20 minutes. After boiling, the liquid was filtered through a clean piece of gauze in another flask to get the extraction (1). The volume is then increased to 1 L of distilled water. The medium was then sterilized by autoclave after 17 $g.L^{-1}$ of agar was added. The broth was made in the same medium but without the addition of agar. This medium was used to help Stachybotrys chartarum grow faster.

2.3 Base Sequences

The base sequences
5′GTTGCTTCGGCGGGAAC3′,
5′TTTGCGTTTGCCACTCAGAG3′,5′ACCTATCGTTGCTTCGGCG3′,and5′GCGTTTGCCACTCA GAGAATACT3′.

3. Results and Discussion

3.1 Fungi Isolated from Inside Buildings

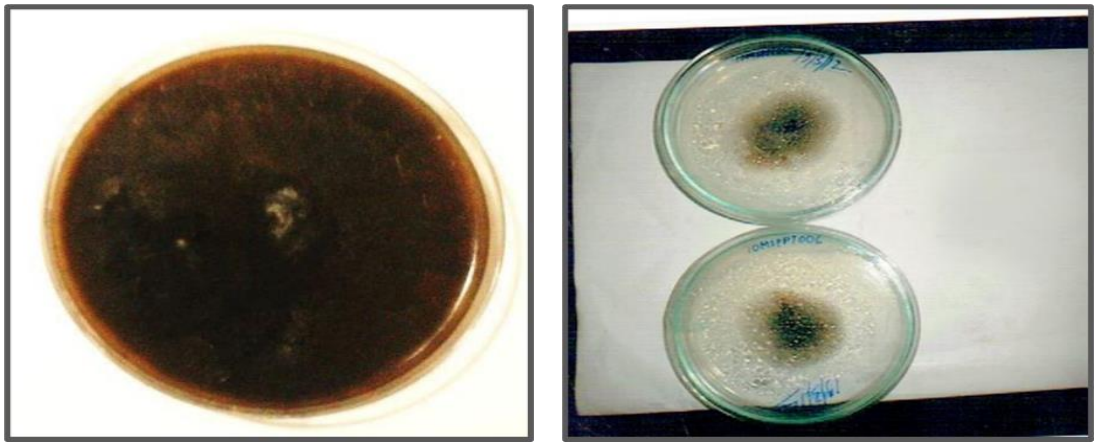
Stachybotrys chartarum and Stachybotrys echinate have been isolated. It was discovered that *S. chartarum* was more common than other species, accounting for around 63% of the total. Aspergillus fumigatus 30%, *Penicillium sp*, *Cladosporium sp* 6% than Alternaria sp 1%. The first species is more obvious than other fungi, reach 77% on potato dextrose agar, which is its preferred medium. This outcome is consistent with [3]. The result of the current study in agreement with [4], who mention that
28.08 % of total 381 isolates of the genus Aspergillus Alternaria alternata, the amount of nitrogen andthe type of nitrogen source have an impact on the synthesis of alternariol and other secondarymetabolites [5].

(a) **(b)**

Figure -1 (a) and (b). Show the damp indoor building signs which are contaminated by a moldy odor in some places. with a dark spot in the ceiling, wallpaper, archives and bathrooms.

3.2 Diagnosis of Stachybotrys chartarum

After 14 days of incubation, Stachybotrys chartarum looks as black colonies on wheat straw agar medium at 25 ± 2 ^{0}C. Light Microscope inspection of C. herbarum hypha that are septate and brown in colour Figure2A. Conidiophores are brown and often septate, with just the apical section branching. Conidia are spherical to oval in form, 1 to 4 celled, and formed in chains with a noticeable dark scar at the point of connection Figure2B.



(a) **(b)**

Figure -2 (a) Colony of *Alternaria sp* Fungus Growing on the Wheat Straw Medium, **(b)** *Stachybotrys chartarum* appears as black colonies on wheat straw aga

3.3 MgO Nanoparticles

The impact of MgO nanoparticles on growth inhibition is given in Table 1, which reveals that MgO nanoparticles have a high efficiency to inhibit Stachybotrys chartarum growth at a concentration of 0.3 ppm MgO 96%.

Table 1- MgO nanoparticles on the growth inhibition Stachybotrys chartarum.

No.	Treatments	Concentration	Inhibition
1	Control	-	0
2	MgO	0.1	85.6
3	MgO	0.2	95.4
4	MgO	o.3	100.0

3.4 HPLC Study

A high-performance liquid chromatography (HPLC) investigation indicates that S. chartarum yields macrocyclic trichothecenes. The period of retention or major peak of standard verrucarol toxin was found to be 5.6 minutes while a filter extract of S. chartarum from (4.5-6.5) minutes which identifies with toxin verrucarol produced located in the same area. The obtained filter extract of S. chartarum is producedas shown in Figure 3; these results established the existence of verrucarol toxin in the samples under research [6].

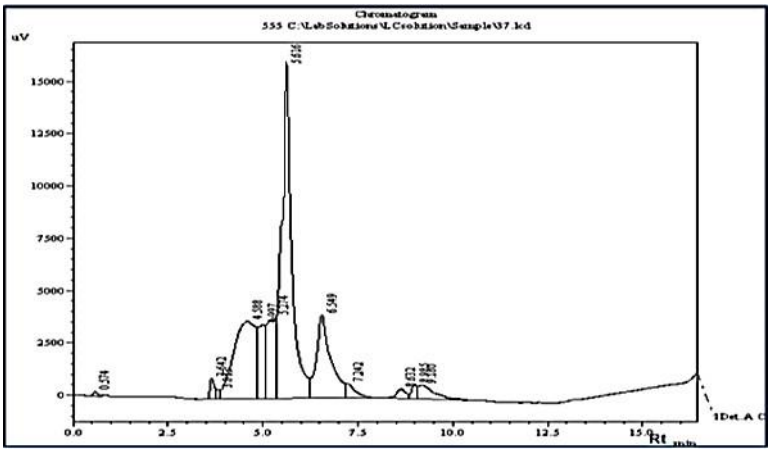


Figure -3 Refers to the main peak and HPLC chromatographic analysis of the standard verrucaroltoxin

3.5 Molecular Identification

The main objective of this research is on the genetic identification of two common indoor fungus genera: Stachybotrys and Chaetomium. A specific primer pair was used to amplify the 600 bp fungal DNA PCR products.

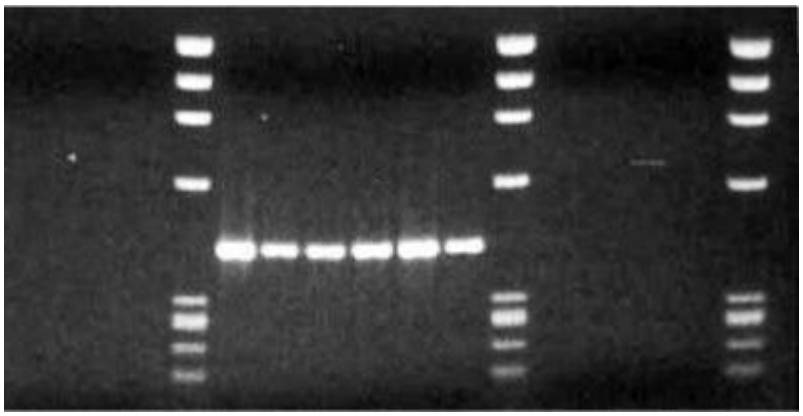


Figure -4 Show that amplified the fungal DNA.

4. Conclusion

The development of growth *S. chartarum* was increased in different times [7] whereas others growth isindependent of the time of year. Penicillium spp. concentration increase in the raining months [8].

S. chartarum has shown more frequency than other fungi and *C.herbarum* has been found more visiblethan other fungi which are isolated from indoor buildings. *S.chartarum*, exposure to houses gave a lot of pollution and is responsible for health special effects on people in agricultural and industrial environment. Sticholysin caused breaking the red blood cells [9]. Using silver nanoparticles as adding substance with painting materials to improve coating process for the inhibition and preventing the growth of fungi. Coating formulation containing MgO NPs will limit the growth of *stachybotrys sp* on surfac.

5. Acknowledgments

The authors would like to thank Dr. adil Al-zurgany for his unlimited support and Dr. Souad Abdul Jabbar chief manager of microbiology department for her insightful suggestions regarding samples analysis and other anonymous reviewers for their careful reading of the manuscript. This research was supported by the Colleges of Medicine and College of Science/ University of Sumer.

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