Antimicrobial activity of some fungal isolates from Red Sea in Egypt

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Abstract. The study investigates the antimicrobial efficiency of fungi from the Red Sea in El-Quseir and Sharm El-Sheikh districts. The fungi's active metabolites were tested for their antibacterial activity against pathogenic germs. The fungi were grown on nutritional agar media and malt extract agar medium. The extracts of marine fungi were also investigated for their cell death potential, using lung carcinoma cells as a cell line. The results of our study demonstrated the strong antimicrobial activity of marine fungi towards both Gramme positive and Gramme negative microorganisms, particularly against *Serratia marcenscens* and *Salmonella*. The ethyl acetate extract from El-Quseir (a sand source) and Sharm El-Sheikh (a water source) demonstrated the highest inhibition zones, measuring 37 mm and 35 mm, respectively. The normal cell line (MRC-5) was subjected to cytotoxic effects that demonstrated antibacterial and anticancer properties, while also exerting non-significant toxicity on active concentrations. Comparing petroleum ether, chloroformic, and methanolic extracts to ethyl acetate extract, and our results showed that the latter had the lowest antibacterial activity. Against medically used lung cancer cell lines, marine fungi shown antitumor activity.

1 Introduction

Marine fungi are crucial for energy flow and nutrient recycling in marine environments because they regulate the natural substance's cycle that is dissolved. One living source of natural chemicals is coastal fungus. Therefore, it is indisputable that figuring out the actual extent of the Earth's mycobiome requires investigating the seafloor mycobiome, which includes discovering new habitats and substrates, particularly those that are inaccessible [17]. Over 90% of Earth's living biomass is found in its oceans and seas, where unicellular microorganisms that have evolved over evolutionary time scales and unique metabolic and genetic adaptations have resulted in an extraordinary diversity of secondary metabolites with unmatched structures. Earth is known for its highly erratic and unfriendly physico-chemical characteristics (high salinity, low temperature, restricted light availability, and high pressure) [1]. Research on marine fungi has been conducted ever since the discovery of the first marine species. Despite being common and plentiful, marine fungi have not gotten much attention.

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A wider range of fungal species may result from experimenting with different isolation techniques, lifestyles materials, incubation temperatures, and damp/moist chamber incubation conditions, even though seclusion into solely cultured cells is still the most reliable method for identifying and characterizing novel taxa. Seasonality and other environmental variations can also result in unique diversity. On the other hand, there is a chance that the dynamics of the food web and their structure will be altered by climate change in ways that are unexpected. It is well accepted that there is a global warming trend, and understanding how this is affecting marine fungus is essential [2]**.** At the moment, marine microorganisms constitute a useful source for the synthesis of ant pathogenic substances used in aquaculture. Many anti-aquatic pathogenic bacterial compounds originating from organisms found in the sea are described in the aforementioned work. The development of various antibiotic applications against aquatic bacterial infections in aquaculture will be facilitated by the availability of these compounds. As the main source of naturally occurring chemicals obtained from marine microorganisms, marine fungus are distinguished by their extensive genetic backgrounds, structural diversity, and high metabolite outputs. Approximately 60% of all novel compounds that are naturally produced by salt water microbes are made by coastal fungi; the most studied species are *Aspergillus* and *Penicillium* [3].

It has been demonstrated that salt water-derived fungi are unexplored reservoirs of cutting-edge coastal natural chemicals with potential applications in medicine. Fungi that originate from the sea face the same extreme environmental difficulties as their terrestrial cousins. They have therefore developed special metabolic pathways that allow them to create chemicals with remarkable biological activity and novel architectural forms [4]. According to [5]. High hydrostatic pressure, varying salinity, oligotrophy, low oxygen concentration, a moderate or elevated heat (such as hydrothermal craters), and absence of light are characteristics of the complex and severe ecosystem found in the deep sea. Fungi are the most varied and prevalent eukaryotes on the planet, and because they can thrive in any adverse environment, they are a significant resource for the development of novel medications. The greatest ecosystem on the globe is found in the maritime environment, which occupies over seventy percent of the planet's surface. It is characterized by a hostile range of physico-chemical characteristics, including a cold climate, little light, and a great deal of salt and severe pressure [6].

The migration of cancer cells is one measure of the aggressiveness and progression of malignancies, particularly high-risk neural crest tumour. Since there are presently no viable medication alternatives to stop the disease from spreading, new bioactive chemicals may be able to inhibit cancer cells from migrating. The fungus *Eurotium chevalieri* MUT 2316, which is a spongy endophyte, may produce secondary metabolites that impede the migration of human neuroblastoma SH-SY5Y cells. Due to the extreme isolation of SH-SY5Y cells, the curative properties of tetrahydroauroglaucin (TAG) and dihydroauroglaucin (DAG) were evaluated. Using an MTT test and cytofluorimetric assessment, it was demonstrated that neither of the drugs exhibited any cytotoxicity. Furthermore, using an injuries mending experiment, DAG was able to effectively suppress the fast transferring phenotype of SH-SY5Y cells, but TAG had no anti-migratory effect despite having structural similarities with DAG [7].

Cancer is the general word used to describe a set of diseases associated with abnormal control of cell division and homeostasis. There are currently over 100 distinct types of cancer known to exist. Cancer on a global scale is the biggest cause of mortality. The development of approved pharmaceutical medicines has benefited greatly from the use of natural products. Thus, there is an urgent need to investigate novel bioactive, innately occurring intermediates with lead potential. The fact that it is often known that underwater microbes are one of the most important and plentiful sources of natural commodities. Because they can adapt and

remain metabolically active in challenging environments, deep-water fungi are able to create a diverse range of second-generation mediators [4].

Naturally active mediators produced by salt water fungi are becoming an important organisms for the synthesis of medicinal lead compounds with antibacterial, anticancer, antiviral, and anti-neuritis effects because of their remarkable activity and comparatively low molecular weights. Because marine microorganisms create a variety of metabolites that are both structurally different and pharmacologically active, the pharmaceutical industry has shown a great lot of interest in them [14].

2 Material and methods

2.1 Location of specimens

Several samples were collected for this study in sterile bottles from the El Quseir and Sharm El Sheikh areas of the Red Sea at deep of 40 centimeters below the top of the sand as well as marine water. The samples were then transported to microbiological lab for the purpose of isolating fungi. Following sample collection, the sand samples were pulverized, dried, and sieved before being utilized to isolate the fungi.

2.2 Separation of salt water fungi

On malt agar medium plates, fungi were collected using the direct plating method and 0.5 g/L chloramphenicol as an antibiotic. Half gram of soil grains or 1 ml of salt water were added to the malt agar medium as soon as it dried. After that, the plates were grown for 7–15 days at 28±2°C. To identify, isolate, and preserve each fungal colony, they were moved to an unadulterated slant with the same media after the time of incubation. The slants were saved for additional examination at 4°C [9].

2.3 Inhibition of microbes

The pathogenic bacterial strains that were tested were the following: pathogenic Gramme negative bacteria (*Pseudomonas aeruginosa*, *Escherichia coli, Klebsiella, Enterobacter cloacae, Salmonella, Proteus vulgaris*, and *Serratia marcenscens*), and Gramme positive bacteria (*Staphylococcus aureus, MRSA, Staphylococcus epidermidis, Bacillus subtilis, Micrococcus, Enterococcus*, and *Streptococcus mutants*); Bacterial strains were cultivated on nutrient agar medium. The yeasts such as Candida albicans and Cryptococcus neoformans, as well as the pathogenic fungal strains Aspergillus niger, Aspergillus flavus, Aspergillus fumigatus, Penicillium marnefi, and Fusarium oxysporum, were cultured on malt extract agar medium (MEA) and used as test organisms.

2.4 Marine fungi cultivation for extraction of secondary metabolities

To produce second-generation metabolites, anhydrous medium called yeast extract sucrose (YES) was employed. A hundred milliliters of the medium was included in each of the 250 milliliters Erlenmeyer flasks. PH is lowered to 6.5±0.2. The medium was then autoclaved for fifteen minutes at 121 degrees Celsius. There were five gallons set out for every type of fungus. After adding one milliliter of suspended spores to one hundred milliliters of YES medium, the subjected fungus was cultivated at twenty five degrees Celsius for twenty-one

days. Whatman® No. 1 filter paper was used to filter 5L of broth for each fungus in order to separate the mycelia and culture filtrate. The culture filtrates were merged with petroleum ether in a separating funnel, annoyed briskly, and let to place for a minimum of seven hours in order to ensure total separation. After that, the top layer—also referred to as the petroleum ether layer—was divided. Methanol, chloroform, and ethyl acetate were the three unique solutions of solvents used to treat three different sections of the residual filtrate layer. In a separating funnel, the leftover filtrate was mixed with the same volume of either ethyl acetate, the solvent chloroform or methanol. Following the separation of the organic and water-soluble solvent phases, the solvent phases were dried with a rotary evaporator and kept cold until testing [9].

2.5 Assay of antimicrobial effectiveness

Using the agar-well diffusion method, the antibacterial activity of the fungal extracts against pathogenic bacterial and fungal strains was evaluated. The agar plates were prepared and an inoculum of log-phase bacteria and fungus was generated. The plates were then aseptically perforated using a cork borer (6 mm in diameter) to produce wells. Each sample's 100L analyzed extract was put in a different well. We used a well that was filled with solvent as a negative control. Two hours before the start of microbial growth, all plates were kept at 4±2°C on a graph to allow for chemical diffusion. The agar plates were incubated for 48 hours at 28±2°D and 24 hours at 37±2°the C, respectively, in order to study the growth of yeast, bacteria, and fungus. At the conclusion, the inoculation flasks were taken out of the incubation period. For the culture filtrates, different solvent extractions were carried out [9].

2.6 Cytotoxicity activity assay

Human lung malignancy cells used in this investigation were procured from Tissue Culture Unit. The cell lines have been preserved in RPMI 1640 media. Using a 75 cm3 culture Corning® flask, cancerous cell lines were cultivated for 48 hours at 37°C in a humidified water jacketed CO2 incubator (Shel Lab, Sheldon Manufacturing, which Inc. ®, USA). An inverted microscope (CKX41; Olympus, Japan) was used to examine the cultures in order to view the cell monolayer and ensure that there was no fungal or bacterial contamination. The cell monolayer was rinsed with five millilitres of Ca^{2+} and Mg^{2+}free phosphate buffer saline (PBS) in order to count the number of cells. Following that, 2.5 ml of a 0.53 mM trypsin/EDTA solution was added to the bottom of the culture flask, and it was incubated for 7 to 15 minutes. After removing the cells from the flask, after adding 6 millilitres of housekeeping medium, the trypsin's action was stopped. In the investigation, carcinoma cells were used to examine a chemical substance's cytotoxicity. Different test sample concentrations were added to the 96-well plates after the cells were seeded in order to dilute the cells. Subsequently, the cells were incubated on microtiter plates for 48 hours at 37°C. After incubation, the cells were aspirated and stained with crystal violet solution. The absorbance was determined following the addition of glacial acetic acid to the plates. The cytotoxic effect of each chemical was calculated, and the post-treatment survival curve of each cancer cell line was plotted. Graphpad Prism was used to calculate the 50% inhibitory concentration (IC_{50}) based on graphic plots of each cell's stimulus responsiveness profile [10]**.**

3 Results and discussion

3.1 Antimicrobial activity

Marine fungi were isolated, primarily identified and the percentage of its occurrence in plates were detected as follows: The colonies belonging to the genus *Aspergillus* representing 50% of colonies counted in Red sea samples. In contrary, *Penicillia* were representing 40% of colonies counted in Red sea samples. *Acremonium showed* less percentage 10% of colonies counted in Red sea samples, This indicated at figure (1), *Aspergillus* sp was *from* Sharm El-sheikh from sand source at table (1), *Penicilium* sp from El- Quseir from sand source at table (2), *Aspergillus sp* was from Sharm El- Sheikh from water source at table (3) and *Acremonium* sp was from El- Quseir from water source at table (4). Figures (2) showed the pure colonies of these marine isolates.

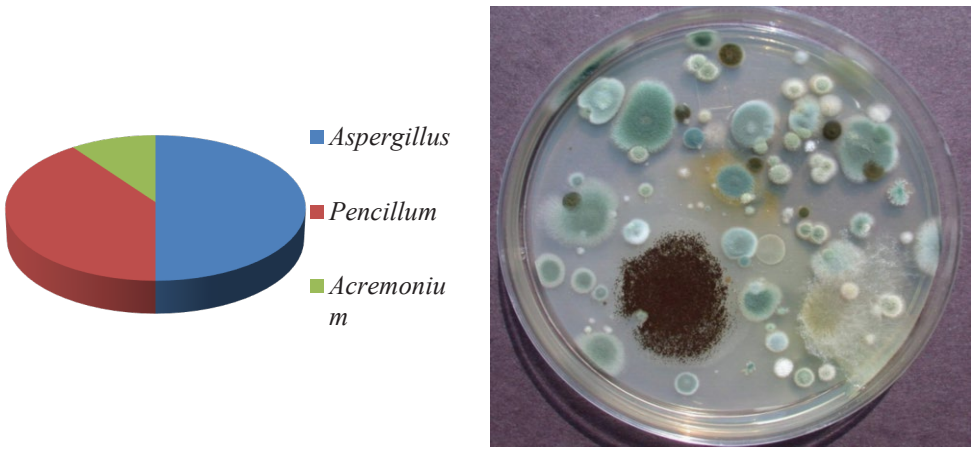

Fig. 1. The percentage of fungal isolates from Red sea.

Fig. 2. Pure colonies of Aspergillus sp , *Penicillium* sp and *Acremonium* sp, respectively.

The study examined the antimicrobial activities of naturally active mediators derived from *Aspergillus* sp isolated from Sharm El-Sheikh (sand source) and found that petroleum ether extract exhibited high antibacterial activity against *Pseudomonas aeruginosa, E.coli, Klebsiella, Enterobacter cloacae, Salmonella*, and *Proteus vulgaris* by inhibition zones of 12 mm, 27 mm, 15 mm, 26 mm, 11 mm and 9 mm, respectively, however it was inactive against *Serratia marcenscens* and all pathogenic fungi except for *Fusarium oxysporum* by inhibition zone 20 mm and certain yeasts except against *Cryptococcus neoformans*, but it was inactive against *Candida albicans*. With the exception of *Enterobacter cloacae* and *Serratia marcenscens*, ethyl ether extract demonstrated antibacterial activity against Gramm positive

bacteria (MRSA, *Bacillus subtilis*, and *Enterococcus*; inhibition zones 12 mm, 18 mm, and 17 mm, respectively). It also demonstrated antibacterial activity against Gramm negative bacteria, but no activity was observed against fungi or yeast, with the exception of *Fusarium oxysporum* (inhibition zone 20 mm) and *Cryptococcus neoformans*. Chloroformic extract had strong antimicrobial activity against *Enterococcus* by inhibition zone 25 mm in comparison to petroleum ether, ethyl acetate, and methanolic extract, whereas methanolic extract demonstrated stronger antibacterial activity against MRSA and *Micrococcus*. With the exception of *Serratia marcenscens*, ethanolic and chloroformic extracts showed antimicrobial action against all Gram-negative bacteria. However, they lacked antifungal properties and demonstrated antimicrobial activity against yeasts (*Cryptococcus neoformans* and *Candida albicans*). The antimicrobial activities of secondary metabolites derived from *Penicilium* sp from El-Quseir (sand source) revealed that, in comparison to petroleum ether, ethyl acetate, and chloroformic extracts, ethyl acetate extract exhibited higher antibacterial activity against *Staphylococcus aureus*, *Klebsiella*, and *Enterobacter* by inhibition zone 16 mm, 25 mm, and 25 mm, respectively. The maximum inhibition against *Serratia marcenscens* and *Salmonella* was proved by ethyl acetate extract, with inhibition zones measuring 35 mm and 37 mm, respectively. The antibacterial activity of petroleum ether, methanolic, and chloroformic extracts was shown against both Gramm positive and Gramm negative microorganisms. All extracts lacked antimicrobial efficacy against yeast and fungus, with the exception of *Fusarium oxysporum.* *Aspergillus* sp secondary metabolites from a water source in Sharm El-Sheikh were tested for antibacterial activity, and the results indicated that ethyl acetate and chloroformic extracts were effective against *Staphylococcus aureus* by inhibition zones of 16 mm and 7 mm, respectively. Each extract exhibited antibiotic action against *Salmonella, Enterobacter cloacae*, MRSA, *Cryptococcus, Klebsiella, Micrococcus*, and *Enterococcus*; however, no activity was observed against *Streptococcus mutant*, *Aspergillus niger*, or *Aspergillus flavus*. Ethyl acetate extract exhibits the strongest antibacterial action against *Serratia marcenscens* and *Salmonella*, with inhibition zones measuring 35 mm and 32 mm, respectively. The antimicrobial activity of secondary metabolites derived from *Acremonium* sp from El-Quseir (water source) demonstrated that ethyl acetate extract exhibited the highest antimicrobial activity against S. *aureus*, *Enterobacter cloacae, Salmonella*, and *Serratia marcenscens* by inhibition zones of 39 mm, 36 mm, 36 mm, and 30 mm, respectively. According to ethyl acetate extract exhibited antifungal action against Asp. *Fumigatus, Penicillium mornefi*, and *Fusarium oxysporum by* inhibitory zones of 14 mm, 18 mm, and 25 mm, respectively. With the exception of the chloroformic extract, all extracts exhibited antimicrobial action against Gramme positive, Gramme negative and fungal species, particularly against *Fusarium oxysporum*. However, no activity was observed against *Cryptococcus*, Asp. *flavus*, Asp. *niger*, and *Pseudomonas aeruginosa.*

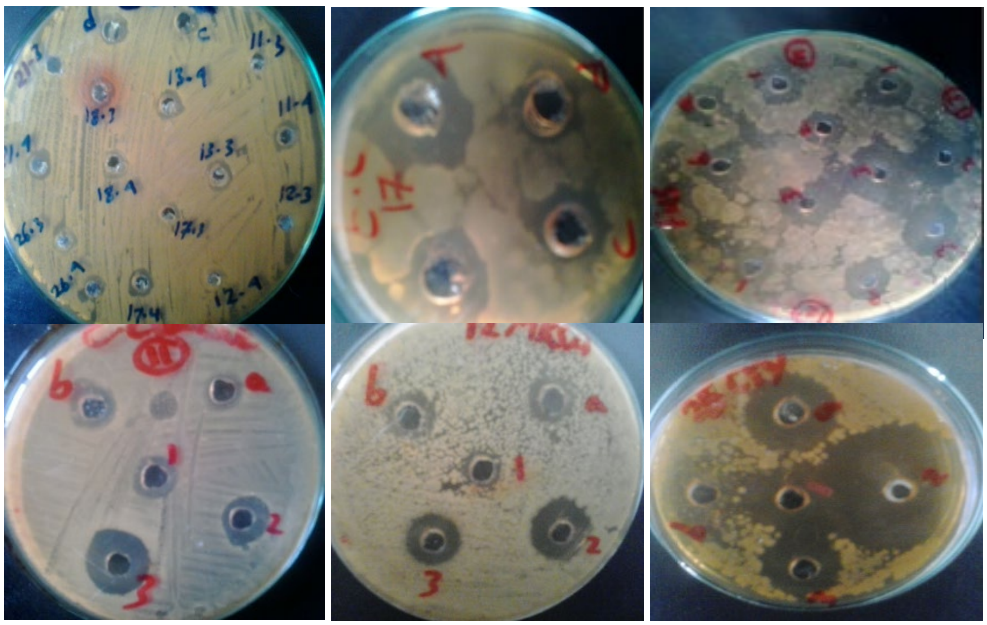

Fig. 3. Antipathogenic activity of the salt water fungi extracts against *Pseudomonas aeruginosa, E.coli, Klebsiella, Enterobacter cloacae, Salmonella*, and *Proteus vulgaris.*

Table 1. Antipathogenic action of naturally active mediators obtained from *Aspergillus* sp from Sharm El- sheikh (sand). The boundaries of inhibition (mm) are used to convey the findings.

Pathogen / Solvents		Extract of petroleum ether	Extract of ethyl acetate	Broth	Extract of methanol	Extract of chloroform
Gram positive bacteria	***Staph. aureus***					11
	MRSA	8	12	18	23	19
	Staphylococcus epidermidis					
	Streptococcus mutants			15	9	10
	Micrococcus			16	13	4
	Bacillus subtilis	7	18	8		
	Enterococcus	12	17	20	20	25
Gram negative bacteria	***Pseudomonas aeruginosa***	12	15		20	22
	Eschericia coli	27	16	25	6	15
	Klebsiella	15	12	8	9	10
	Enterobacter cloacae	26		33	12	2
	Salmonella	11	11	20	6	14
	Proteus vulgaris	9	33	25	4	2
	Serratia marcenscens					
Fungi	***Aspergillus niger***					
	Aspergillus flavus					
	Aspergillus fumigatus					
	Penicillium marnefi					

	Fusarium oxysporum	20	18	30	-	-
Yeast	***Cryptococcus neoformans***	7		10	12	14
	Candida albicans				1	2

Table 2. Antipathogenic action of naturally active mediators obtained from *Penicilium* sp from El-Quseir (sand). The boundaries of inhibition (mm) are used to convey the findings.

Pathogen \ **Solvent**		**Extract of petroleum ether**	**Extract of ethyl acetate**	**Broth**	**Extract of methanol**	**Extract of chloroform**
Gram Positive bacteria	*Staph. aureus*		16	17		
	MRSA	10	20	18	22	18
	Staphylococcus epidermidis	8				
	Streptococcus mutants	17				
Gram Negative bacteria	*Pseudomonas aeruginosa*			20	5	19
	Eschericia coli	7	7	9		
	Klebsiella	23	25	24	15	9
	Bacillus subtilis	17	22			
	Micrococcus	15	20			
	Enterobacter cloacae	15	25	26	12	15
	Salmonella	25	37	25	10	2
	Proteus vulgaris	13	22	24		
	Enterococcus	12	15	21	2	1
	Serratia marcenscens	27	35	36	1	1
Fungi	*Asperagilusniger*					
	Asperagilusflavus					
	Asperagilusfumigatus					
	Penicilliummornefi					
	Fusarium oxysporum	19	18	23		1
Yeast	*Cryptococcus*					
	Candida albicans				-	-

Table 3. Antipathogenic action of naturally active mediators obtained from *Aspergillus* sp from Sharm El- Sheikh (water). The boundaries of inhibition (mm) are used to convey the findings.

Pathogen \ **Solvent**		**Extract of petroleum ether**	**Extract of ethyl acetate**	**Broth**	**Extract of methanol**	**Extract of chloroform**
Gram Positive bacteria	*Staph. aureus*		16	29	-	7
	MRSA	22	16	14	11	8
	Staphylococcus epidermidis	13	15			
	Streptococcus mutants					
Gram	*Pseudomonas aeruginosa*			29	16	4
	Eschericia coli		13	15		
	Klebsiella	15	23	19	8	14
	Bacillus subtilis	13	12	8		

Negative bacteria	*Micrococcus*	9	9	10	6	11
	Enterobacter cloacae	13	15	23	14	16
	Salmonella	22	32	31	11	1
	Proteus vulgaris	15	13			
	Enterococcus	18	23	12	2	2
	Serratiamarcenscens	25	35	22	-	-
Fungi	*Asperagilusniger*					
	Asperagilusflavus					
	Asperagilusfumigatus			20	7	8
	Penicilliummornefi		12	14	1	-
	Fusariumoxysporum	29	18	11		
Yeast	*Cryptococcus*	17	16	16	12	15
	Candida albicans					1

Table 4. Antipathogenic action of naturally active mediators obtained from *Acremonium* sp from El-Quseir (water). The boundaries of inhibition (mm) are used to convey the findings.

Pathogen \ **Solvent**		**Extract of petroleum ether**	**Extract of ethyl acetate**	**Broth**	**Extract of methanol**	**Extract of chloroform**
Gram Positive bacteria	*Staph. aureus*	8	39	28		10
	MRSA	25	28	25	2	11
	Staphylococcus epidermidis	15	-	-	-	-
	Streptococcus mutants	15	7	-	-	-
Gram Negative bacteria	*Pseudomonas aeruginosa*	-	-	-	-	-
	Eschericia coli	7	13	8	-	-
	Klebsiella	22	25	24	11	6
	Bacillus subtilis	13	7	-	-	-
	Micrococcus	15	-	15	5	4
	Enterobacter cloacae	17	36	22	12	25
	Salmonella	16	35	18	11	-
	Proteus vulgaris	17	25	23	1	9
	Enterococcus	16	27	11	2	-
	Serratiamarcenscens	14	30	25	-	-
Fungi	*Asperagilusniger*	-	-	-	-	-
	Asperagilusflavus	-	-	-	-	-
	Asperagilusfumigatus	-	14	-	-	-
	Penicilliummornefi	-	18	-	-	-
	Fusariumoxysporum	17	25	26	7	-
Yeast	*Cryptococcus*	-	-	-	-	-
	Candida albicans	-	-	-	3	-

This result was in line with other recent research [11], which discovered that marine fungus test extracts exhibited antibacterial or antifungal activities in 38% to 59% of cases.

Moreover, around 70% of fungal strains exhibited antibacterial activity against bacteria. [12]**.** state that it is widely acknowledged that the red sea has a diverse range of microorganisms and special chemicals with therapeutic and pharmacological value. It has been shown that antibacterial effect works better against bacteria that are Gramme- than the bacteria known as Gramme positive [13]**.** Although the antimicrobial activity differed among the organisms, this finding showed antimicrobial action against bacteria, fungus, Gram positive, and Gram negative.These outcomes concurred with these outcomes. *Fusarium heterosporum* NC-477 growing on driftwood produced neomangicol B in 1998, the first indication of antibacterial chemicals from marine fungi (231). It is anticipated that 272 novel antipathogenic substances derived from salt water fungi would be identified by the end of 2019. With the exception of 2016 and 2017, more second-generation metabolites from marine fungi have been recovered since 2010 than have ever been documented. In that order, 193, 41, and 36 antibacterial chemicals were produced by China, other Asian countries, Europe, and the United States. Chinese scientists were responsible for more than 71% of the newly reported chemicals. Of the papers, over half, or 52%, were released in March. The amount of alcohol produced by youth March saw the release of antibacterial chemicals made from coastal fungus in respected publications. J. Antibiot: 11.4%, J. Natural Products: 13 percent, and J. Pharmaceuticals: 14 percent. Most of the new structures were published in the journals J. Nat. Prod. and Org. Lett. The majority of the novel antipathogenic compounds were produced by fungi isolated from soil, sponges, algae, and wetlands (22.4, 18.4, and 18.0 15.1%, accordingly) [25], [26] indicated that Compared to Gramme-positive bacteria, antibacterial capability was more efficient against Gramme-negative bacteria. Furthermore, the Red Sea is home to a diverse range of microbes and new chemicals that may have pharmacological and curative properties. The synthesis of new active metabolites complicates the assessment of novel drugs for medicinal applications. Throughout our research, *Candida albicans* displayed resistance. According to [27], extracts of O. *basilicum* leaves in methanol, acetone, and chloroform did not affect C. *albicans* 90028 and C. *crusei* ATCC 6258. This runs counter to the assertion made by [28] that O. *basilicum* aerial parts extracts in methanol and hexane exhibited antifungal activity against *Candida albicans*. [29] report that 35 different marine fungus strains were tested using fermentation broth and mycelia organic extracts at a concentration of 5 mg/mL for antibacterial activity. The six human pathogenic bacteria that were examined were B. *subtilise*, M. *luteus*, E. *coli*, P. *aeruginosa*, and S. *aureus*. The study's alcohol-based suspension of coastal fungus revealed that the pathogenic organisms had suffered severe damage.

3.2 Cytotoxicity activity

Aspergillus sp. ethyl acetate extract exhibits antitumor activity against the MRC-5 lung carcinoma cell line. The cell line's viability was 19.3% and its inhibition was 80.7% at a high dose of 2000 ug/ml, with an IC_{50} of 45.4 ± 2.4 µg/ml. As illustrated in Figures (4) and (5) as well as Table 5, the inhibition of lung cancer cell lines decreased with a drop in extract concentration.

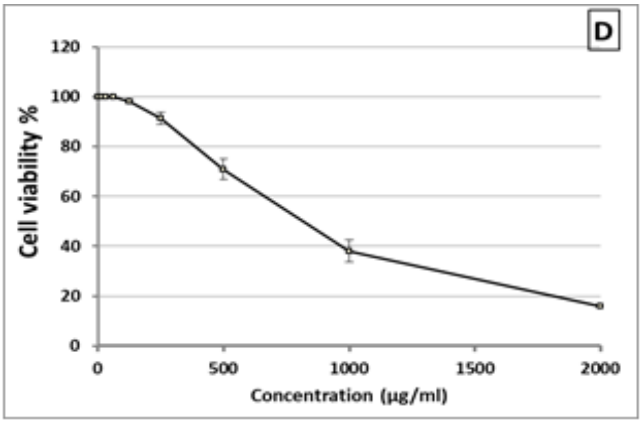

Fig. 4. Cytotoxicity of ethyl acetate extract of *Aspergillus* sp against lung carcinoma (MRC-5) cell line.

Table 5. Analysing Aspergillus sp. ethyl acetate extract's cytotoxicity against the MRC-5 lung cancer cell line.

Sample conc. (µg/ml)	Viability %	Inhibitory %	S.D. (±)
2000	19.3	80.7	0.73
1500	27.48	72.72	0.82
1000	38.93	61.07	1.79
500	71.33	28.67	2.42
250	90.28	9.27	3.97
0	100	0	

Inhibitory activity against lung carcinoma cells was detected under these experimental conditions with $IC_{50 = 45.4} \pm 2.4$ µg/ml.

Our findings concur with those of [30]. Scientists have discovered that a diverse range of microorganisms with antibacterial and cancer-fighting capabilities can be found in the Egyptian Sea's hard and soft reef systems. Furthermore, our findings concur with those of [31], who asserted that marine-derived fungi that live in symbiosis with salt-water organisms produce bioactive substances such as such as antibiotics, antioxidant-rich compounds, antitumors, anti-fungal agents owing to antiinsect properties, and acetylcholine ester formation inhibitors. *Penicillium sclerotiorum* M-22 fermentation products were utilised in a similar way to create penicilazaphilones B and C, two azaphilonidal derivatives. This fungus emerged from a decaying leaf sample that was taken on the west coast of Haikou, Hainan province, China. With IC_{50} values of 0.29, 0.44, and 0.06, 0.72 µM, respectively, cytotoxicity assays demonstrated penicilazaphilones B and C's selectivity against human gastric toxic cells SGC-7901 and melanoma cells B-16 [20].

Furthermore, the Red Sea is home to a diverse range of microbes and unique chemicals that may have pharmacological and therapeutic uses. The evaluation of novel compounds for therapeutic reasons is complicated by the synthesis of new active metabolites for anticancer uses [8].

Our results agree with [32] who showed that turkish marine drived fungi has strong anticancer activity also [33] discovered their rich genetic backgrounds, structural diversity, high metabolite outputs, and potent anticancer action, salt water fungi have emerged as the primary source of important naturally active compounds derived from marine microorganisms. About sixty percent of all marine microbial novel natural products are generated by marine fungus, with Aspergillus and Penicillium being the most investigated

taxa. [34] demonstrated that the seafloor fungal Aspergillus ochraceopetaliformis had significant deadly action versus the hepato malignancy cell line Hep-G2., with an IC_{50} value of 18.8 µg/ml. Deep-sea fungi include cytotoxic N-containing chemicals, such as penipalines, β-carbolines, and an analogue of carbaldehyde produced from indole. These compounds have demonstrated IC_{50} values as low as 20.44, demonstrating their efficacy against HCT-116 cell lines. Acremolin D, a novel acremolin-type alkaloid, was identified as A. sydowii MCCC 3A00324 after it emerged from deep sandy bottoms (2246 m) in the South Atlantic Ocean [24].

4 Conclusion

When it comes to delivering physiologically active metabolites that are secondary with excellent antibacterial properties towards Gramme positive and Gramme negative bacteria, fungi, and yeasts, underwater fungi are far more important than terrestrial fungi. The most effective solvent for important chemicals is ethyl acetate. They have also developed unique secondary pathways of metabolism. Additionally, marine fungi from El-Quseir and Sharm El-Sheikh have the best anticancer potential against lung cancer cell lines when compared to fungi from other Red Sea regions. Due to the previously described, it is possible to extract considerable additional substances from seaside fungi, especially Aspergillus sp. The unique antibacterial and anticancer qualities of these byproducts make them beneficial.

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