ISOLATION OF SOIL FUNGI FROM MINHLA AREA, MAGWAY REGION AND SCREENING ON THE ANTIMICROBIAL ACTIVITY FROM SOIL FUNGI

Myint Thu[1], Ye Myint Aung[2], Zar Zar Yin[3]

Abstract

Three different soil samples were collected from Minhla Area, Magway Region during July 2018. A total of 15 fungal strains were isolated by serial dilution method from these soil samples. These strains were cultured on Blaskeslee's Malt Extract Agar (BMEA Medium), Czapek-Dox Agar (CZA Medium), Malt Extract Agar (MEA Medium), Dichloran Rose Bengal-Chloramphenicol Agar (DRBC Medium), Glucose Ammonium Nitrate Agar (GAN Medium) and Potato Dextrose Agar (PDA Medium). Pure colonies were preserved on slant culture containing PDA Medium. Among all of media, BMEA medium and PDA medium are better for isolation of soil fungi than other media. In the colony morphology, the isolated fungi were small, medium and large in size. The margin of isolated fungi were entire, undulate, and the elevation of isolated fungi were raised, convex, flat. In the form, isolated fungi were circular, irregular and filamentous. Moreover, physicochemical properties of soil from different locations of Minhla Area were analyzed. Furthermore, all fungal strains were tested by eight test organisms for the antimicrobial activity. Especially, the isolated fungi YY- 6, 11, 14 and 15 showed the antimicrobial activity against all test organisms. Among them, YY-6 showed the highest antimicrobial activity (32.82 mm and 31.47 mm) on *Candida albicans* and *Escherichia coli*, respectively.

Keywords: Soil fungi, serial dilution method, physicochemical properties, antimicrobial activity

Introduction

Soils are very complex, having numerous constituents performing different functions mainly due to the activity of soil organisms (Ullah *et al.,* 2017). The soil quality is determining by microbial composition and functioning changes during decomposition of organic matter, recycling of nutrients and biological control (Stefanis *et al*., 2013).

The microorganisms plays significant role in soil ecosystem. Fungi are very vital for the soil ecosystem since they play a key role in different essential processes including elemental release by mineralization and organic matter decomposition (Christensen, 1989). Moreover, the fungi are responsible for the decomposition of organic compounds and their activity contributes in the bio-deterioration and biodegradation of toxic substances in the soil (Rangaswami and Bagyaraj, 1998).

Fungi among other soil microorganisms are important in both of the formation and stabilization of soil aggregates. Fungi produce many antibiotics, having antibacterial and antifungal activity, which are widely used as drugs over the world especially the penicillin, cephalosporin and fusidic acid (Dobashi *et al.,* 1998). The recent decades are characterized by the novel discoveries of microorganisms capable of producing compounds, as a potential source of new antibiotics (Ullah *et al.,* 2017). Due to the importance of fungi, this research aimed to obtain the fungal species that could be isolated from soil. Fungi are not only beautiful but play a

[1] Assistant Lecturer, Department of Chemistry, Pathein University
[2] Dr, Professor and Head, Department of Chemistry, Pathein University
[3] Dr, Associate Professor, Department of Botany, Pathein University

significant role in the daily life of human beings besides their utilization in industry, agriculture, medicine, food industry, textiles, bioremediation, natural cycling, as biofertilizers and many other ways. Fungal biotechnology has become an integral part of the human welfare (Karthikeyan *et al.*, 2014). The aim of the present work is to analyze physicochemical properties of soil from Minhla Area, to study the cultural characteristics of isolated soil fungi on six different culture media and to determine the preliminary antimicrobial activity of isolated fungi.

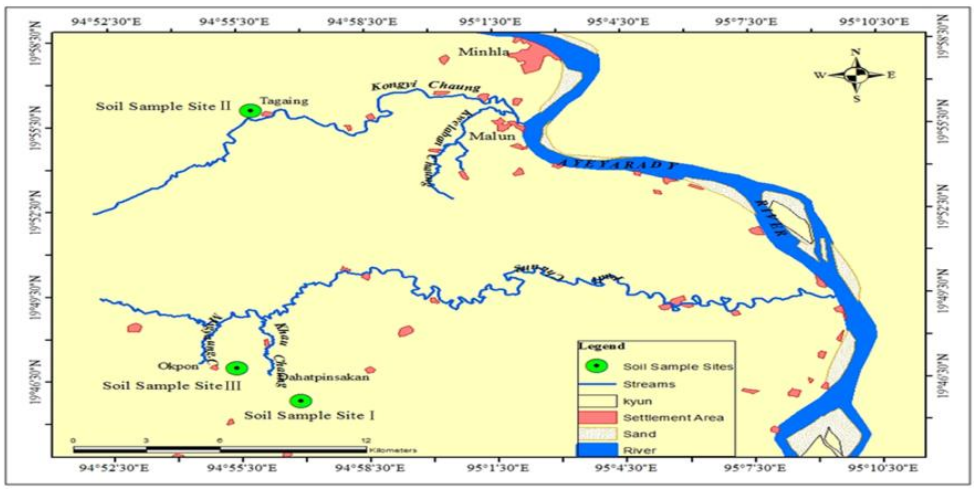
Materials and Methods

Collection of Soil Samples

The soil samples that collected from three different places (Table 1 and Figure 1) were utilized for the isolation of microorganisms especially fungi. The soil type as its some physicochemical properties was analyzed by Department of Agriculture (Land Use), Insein Township, Yangon Region.

Table 1 Collected Soil Samples from Three Different Places of Minhla Area

Sample No.	Place	Soil type	pH	Location
1	Dahatpin Village	Clay Loam	7.23	N 19º 46' 57.588" E 094˚ 55' 23.721"
2	Tagaing Village	Sandy Clay Loam	8.38	N 19º 56' 03.911" E 094˚ 55' 49.429"
3	Dahatpin Village	Clay	7.24	N 19º 45' 46.891" E 094˚ 56' 52.518"



Source: Department of Geography, Pathein University

Figure 1 Map of soil collection (Minhla Area)

Isolation of Fungi from Soil Sample by Serial Dilution Method

Soil samples (1 g each) were introduced into a conical flask containing 99 mL of distilled water. The flask was then shaken for about 30 min in order to make the soil particles free from each other. This solution was then serial diluted from 10^{-3} to10^{-7} dilution in separate test tubes and 0.5 mL each of the above dilution was separately transferred into sterile petridishes under aseptic condition. The sterilized culture medium in conical flask was cooled down to about 45ºC and separately poured into each of the petridish containing the respective soil dilutions. The inoculated plates were moved clock-wise and anticlock-wise direction as to make uniform distribution of the fungi inoculums. When the agar was solidified, the inoculated plates were inverted and incubated at room temperature for 3-6 days. Isolated pure fungi were preserved into slant culture containing PDA medium for further experimentations (Dubey and Maheshwari, 2002).

Inoculation Method

The working benches in the laboratory were thoroughly swapped methylated sprit soaked in cotton wool, and also a burning blue flame was allowed to sterile the surrounding air before the inoculation proper. The conical flasks were corked tightly with cotton wool and the petri were fully autoclaved (Ania *et al.,* 2011).

Lacto Phenol Cotton Blue Teased Mount (LPCB-TM)

Staining of the Soil Fungi

Fungal morphology were studied macroscopically by observing colony features (Colour and Texture) and microscopically by staining with lacto phenol cotton blue and observed under microscope for the conidia, conidiophores and arrangement of spores. Firstly, one drop of Lacto phenol Cotton Blue was placed on the slide. By using a sterile needle, a tiny piece of the colony was transferred into the lacto phenol Cotton Blue on the slide and fungal colony was carefully teased into very tiny pieces preparation using sterile needles. The prepared slide was covered with a cover slip. Finally, fungal spores were observed under microscope using 10×and 40× objective lens. Lacto phenol Cotton Blue is a stain used for making semipermanent microscopic preparation of fungi. Phenol kills any organism. Lactic acid preserves fungal structures, and acts as a clearing agent. Cotton blue stains the chitin and cellulose of the fungal cell wall intensely blue. Glycerol prevents drying (Larone, 1995).

Screening of Effective Soil Fungi by Agar Well Diffusion Method

The isolated fungi were grown on PDA medium at room temperature for 5 days. Isolated strains were tested by agar well diffusion method for the preliminary antimicrobial activities. Cork borer was used to make the wells (8 mm in diameter) in the autoclaved basal antimicrobial test-medium. Wells impregnated with 3-6 days old culture fermented broth (20 µL) were incubated at room temperature for 24-28 h. After 24-28 h of incubation, the clear zones were measured. Therefore, the diameter of clear zones had been observed as potent activity as shown by respective strain. Clear zones surrounding the wells indicated the presence of antimicrobial activities which inhibit the growth of the test organisms selectively. In this study eight pathogenic microorganisms (Table 2) were utilized for antimicrobial activity (Collins, 1965).

Table 2 Eight Kinds of Test Organisms Used for Antimicrobial Activity (NITE, PRD and UY)

Test No.	Test Organisms	Diseases
1	*Escherichia coli* AHU5436	Diarrhoea, abdominal pain
2	*Bacillus subtilis* IFO 90571	Fever
3	*Bacillus pumilus*IFO 90571	Wound and burn infection
4	*Candida albicans* NITE 09542	Candidasis, skin disease
5	*Pseudomonas fluorescens* IFO94307	Septicemia
6	*Staphylococcus aureus* AHU8465	Boil and food poisoning
7	*Agrobacterium tumefaciens* NITE 09678	Crown gall disease
8	*Malassezia furfur* UY	Dandruff, Seborrhoeic dermatitis

NITE = National Institute of Technology Evaluation
PRD = Pharmaceutical Research Development
UY = University of Yangon

Results and Discussion

Physicochemical Properties of Soil Samples

In present study, soil samples were collected from 0-15 cm depth after removing the surface soil for the isolation of fungi. The results obtained from this study has shown to be similar with the research conducted by Tangjang *et al*., 2009 where they found out that there was greater amounts of bacterial and fungal populations in the top soil (0-10 cm) if compared to that of other depths. This might be due to the higher organics contents found in the top soil where humus is abundantly presence, especially for the forest floor that is often covered by wilted leaves that tend to decompose.

Physicochemical analysis of three different soils from Minhla area revealed moisture and organic contents. The colour of soil samples was pale red and red with variation in pH (7.23-8.38). Most soil microorganisms and plants prefer a near-neutral pH range of 6 to 7 because the availability of most soil nutrients is best in this pH range (Atlas and Bartha, 1998). Neutral to alkaline soils provided favorable conditions for the growth of fungi (Rashmi, 2005). The temperature of soil environments of Minhla area at the time of this investigation (rainy season) revealed that the soil environment of this Township had temperature range between 30˚C to 35˚C. Moita *et al*., 2005 reported that temperature between 27 to 34˚C and pH 6.0 favoured cell growth. The soil moisture measured at each Dahatpin village and Tagaing village were (3.53-6.16%), organic carbon (0.66 - 1.06 %), organic nitrogen (0.11- 0.15 %), humus (1.14-1.83 %) respectively. Soil moisture is essential for soil microorganisms, without some water; there is no microbial activity (Sylvia *et al.*, 2005).

The soil physical factors as moisture content, texture and structure, which affect soil aeration, have a profound influence on fungal activity (Griffin, 1963). Organic matter in an ecosystem is frequently the limiting factor for growth of heterotrophic microorganism, nitrogen is required for protein formation, in addition to being required for protein synthesis, ammonium or nitrite is oxidized by some microorganisms for generating energy (Atlas and Bartha, 1998).These results are shown in Table 3.

Isolation of Fungi

In the investigation of fungi, 15 fungi were obtained and seven fungi were isolated from soil sample 1, one fungus from soil sample 2, and seven fungi from soil sample 3. The isolated fungi were designated as YY-1 to YY-15**.** These results are shown in Table 3.

Table 3 Some Physicochemical Properties of the Isolated Soil Fungi

Sample No.	Place	Texture	pH	T(˚C)	Moisture (%)	Organic carbon (%)	Organic Nitrogen (%)	Humus (%)	Isolated Fungi
1	Dahatpin Village	CL	7.23	30	4.98	1.06	0.15	1.83	YY-1,2,3,4,5, 6,7
2	Tagaing Village	SCL	8.38	35	3.53	0.92	0.11	1.59	YY-8
3	Dahatpin Village	C	7.24	30	6.16	0.66	0.11	1.14	YY-9,10, 11,12,13,14,15

*__CL__-clay loam **SCL**- sandy clay loam **C**- clay

Colony Morphology of the Isolated Soil Fungi

In the present study, 15 fungal strains were isolated from three different samples collected from Minhla area. The fungi have been isolated by using soil serial dilution method and six culture media. The surface colour of isolated fungi YY-1 to YY-15 were white, gray, pale yellow, pale green, yellow, pale red, black, pinky white, and their reverse colour were cream, pale yellow, pale brown, white, gray, red, deep yellow and yellow. In the colony morphology, the isolated fungi were small, medium and large in size. The margin of isolated fungi were entire, undulate, and the elevation of isolated fungi were raised, convex, flat and the form of isolated fungi were circular, irregular and filamentous. Tin Tin Hla (2017) reported that a total of 35 fungi were isolated from seven different soil samples and their colony color were red, green, gray, white, yellow, brown, pink and black. In this study, six culture media were used and isolated fungi were better growth on BMEA medium and PDA medium than other culture media. Ando *et al.* (2004) reported that many fungi grow robustly on BMEA medium. Agrios, (1988) described that PDA is general medium most widely used in the isolation of fungi, having a complete nutritional basis and this is probably the reason why colony development was faster with respect to other media. Earlier work reported maximum growth of fungi, potato Dextrose was most favourable (Maheshwari *et al*., 2000). These results are shown in Table 4.

Table 4 Colony Morphology of the Isolated Soil fungi

Strain No.	Surface color	Reverse color	Form	Elevation	Margin	Size of colony
YY-1	Pale yellow	Pale yellow	Circular	Flat	Undulate	Small
YY-2	White	Cream	Circular	Raised	Entire	Large
YY-3	White	Pale yellow	Circular	Flat	Entire	Large
YY-4	White	Cream	Circular	Raised	Entire	Large
YY-5	Gray in the center White in the edge	Cream	Filamentous	Convex	Entire	Large
YY-6	White	Pale yellow	Irregular	Flat	Undulate	Medium
YY-7	White	Pale yellow	Circular	Flat	Entire	Large

Strain No.	Surface color	Reverse color	Form	Elevation	Margin	Size of colony
YY-8	White	Pale yellow	Circular	Flat	Entire	Large
YY-9	Pale green	Yellow	Circular	Convex	Entire	Large
YY-10	White	White	Circular	Flat	Entire	Large
YY-11	Green in the center White in the edge	Cream	Circular	Raise	Entire	Large
YY-12	White	White	Circular	Flat	Entire	Large
YY-13	Pale green	Yellow	Circular	Flat	Entire	Medium
YY-14	Yellow	Pale yellow	Circular	Raised	Entire	Medium
YY-15	Gray in the center White in the edge	Cream	Circular	Raised	Entire	Large

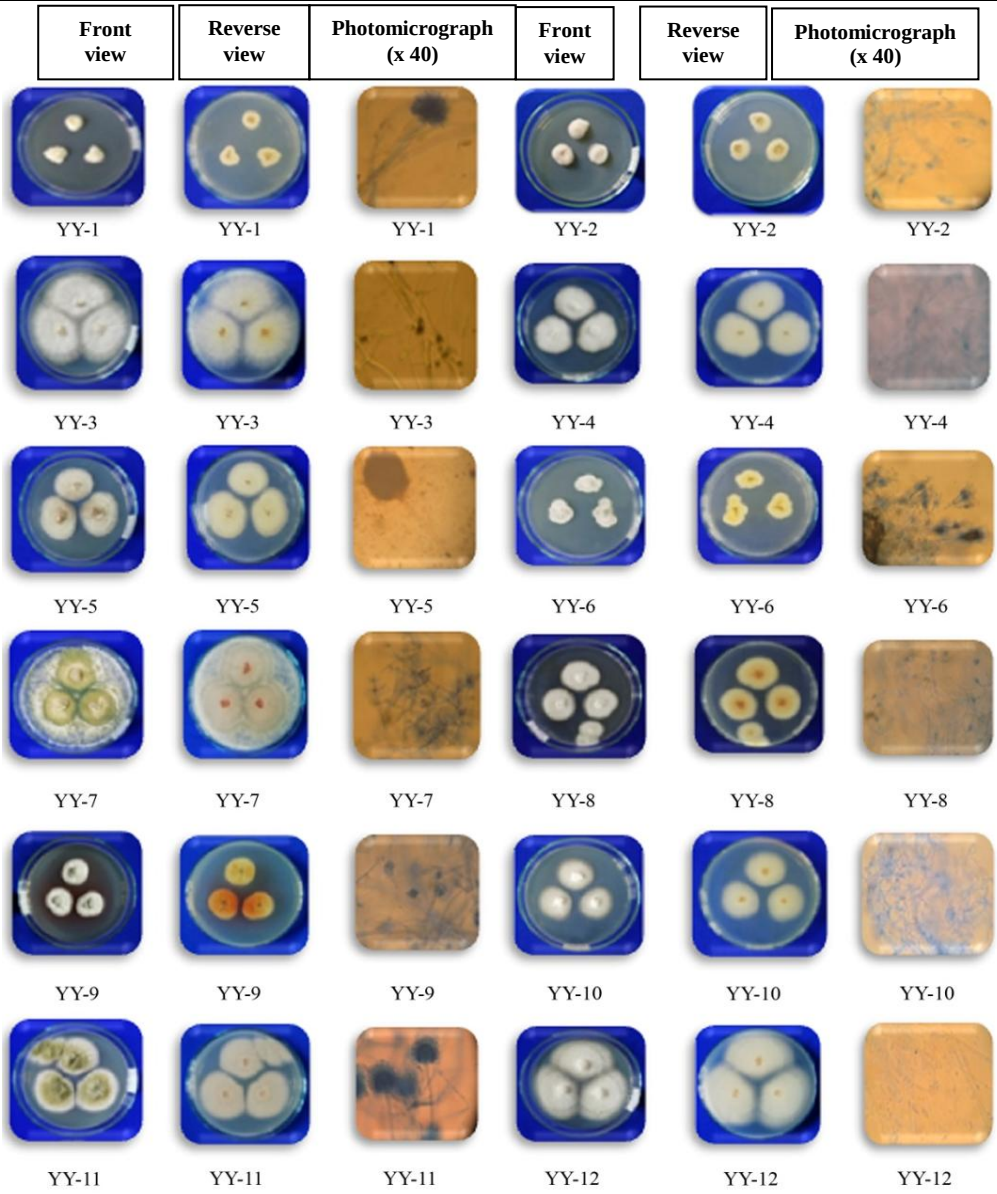


Figure 2 Morphologies of the isolated soil fungi on BMEA medium

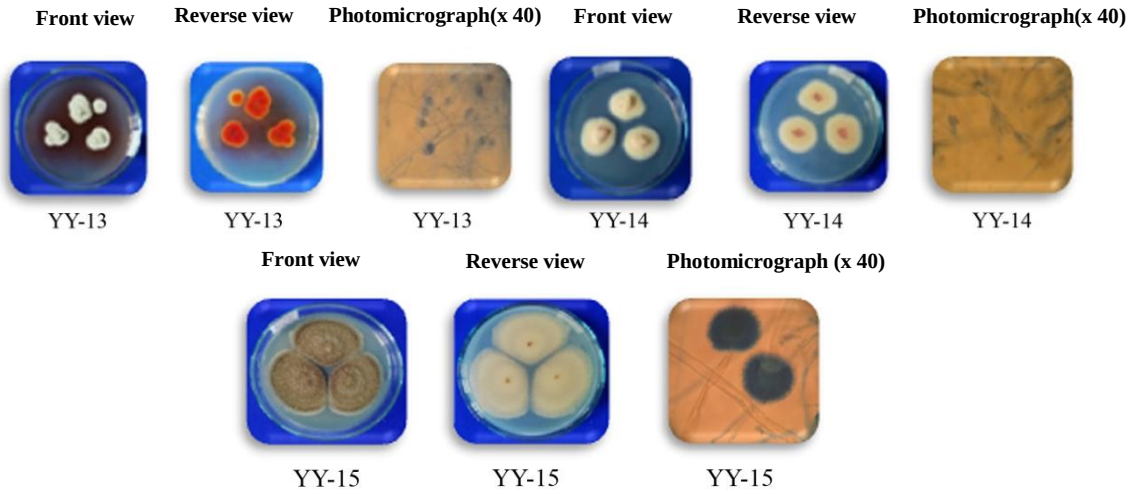


Figure 3 Morphologies of the isolated soil fungi on BMEA medium

Antimicrobial Activities of the Isolated Fungal Strains

All fungal strains were tested by eight test organisms for preliminary study of antimicrobial activities. Among them, four strains showed different level of antimicrobial activity. Especially, YY-6 and 11 showed the antimicrobial activity against all test organisms.

Among them, YY-6 showed the highest antimicrobial activity (32.82 mm and 31.47 mm) on *C. albicans* and *E. coli* respectively. Moreover, YY-6 showed the highest antifungal activity (31.90 mm) on *M. furfur*. According to Dulmage and Rivas 1978, soil microorganisms have continually been screened for their useful biological active metabolites, such as antibiotic since long ago. Brooks, 2001reported that antibiotics are classified as broad-spectrum antibiotics when they have the ability to affect a wide range of gram-positive and gram-negative bacteria while antibiotic that only effective towards certain group of bacteria are known as narrow spectrum antibiotics. Therefore, YY-6 strain was broad-spectrum antibiotics. These results are shown in Tables 5-12 and Figures 4-11.

Table 5 Antibacterial Activities of the Isolated Fungal Strains against *E. coli*

Isolated Fungi	Fermentation period (Days) and Inhibitory Zone (mm)							
	3 -days	4-days	5-days	6-days	7-days	8-days	9-days	10-days
YY-1	-	-	-	-	-	-	-	-
YY-2	-	-	-	+	+	12.81	20.28	-
YY-3	-	-	-	12.35	13.46	18.82	12.14	12.35
YY-4	-	-	-	+	+	+	14.21	-
YY-5	-	13.23	14.33	14.48	12.38	12.37	11.70	+
YY-6	19.73	24.05	27.04	30.99	31.47	31.03	27.08	24.21
YY-7	-	-	+	+	+	12.55	15.28	15.82
YY-8	-	-	+	+	+	+	+	-
YY-9	-	-	-	+	+	+	+	-
YY-10	-	-	-	+	+	+	+	-
YY-11	13.54	15.71	16.24	16.40	20.58	20.04	19.30	16.97
YY-12	-	-	-	11.99	12.84	12.22	+	-
YY-13	11.60	16.26	15.14	15.11	13.30	11.91	10.62	-
YY-14	17.24	16.56	15.57	15.55	15.29	15.19	12.48	12.34
YY-15	13.34	15.02	15.16	16.53	15.46	15.30	14.05	13.32

(+) present (-) No activity Agar well =8mm

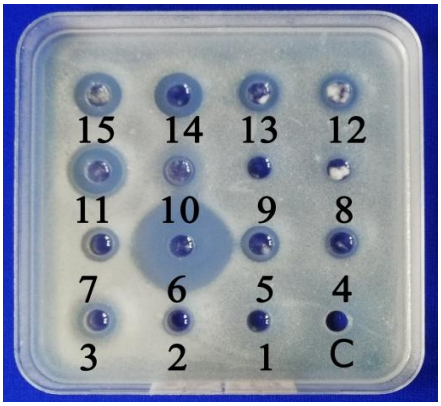


Figure 4 Antibacterial activity of the isolated fungal strains against *E. coli*

Table 6 Antibacterial Activity of the Isolated Fungal Strains against *B. subtilis*

Isolated Fungi	Fermentation period (Days) and Inhibitory Zone (mm)							
	3 - days	4- days	5- days	6- days	7- days	8- days	9- days	10- days
YY-1	-	-	+	13.55	+	+	-	-
YY-2	-	-	12.62	16.91	15.93	15.81	15.73	-
YY-3	-	-	+	14.54	15.29	15.21	13.52	-
YY-4	-	12.16	12.28	15.17	17.60	13.40	12.98	-
YY-5	-	-	+	14.04	12.50	12.24	+	-
YY-6	-	-	+	13.70	14.42	+	+	-
YY-7	-	-	+	+	+	+	-	-
YY-8	-	-	+	13.51	+	+	+	-
YY-9	-	-	+	13.53	+	+	+	-
YY-10	-	-	+	13.91	+	+	+	-
YY-11	-	-	+	17.26	13.81	+	+	-
YY-12	-	-	+	16.55	17.44	15.62	15.20	-
YY-13	-	-	+	12.95	13.99	13.29	+	-
YY-14	-	11.27	12.02	13.45	14.33	13.70	+	-
YY-15	-	12.25	12.70	13.71	15.24	14.46	+	+

(+) present (-) No activity Agar well =8mm

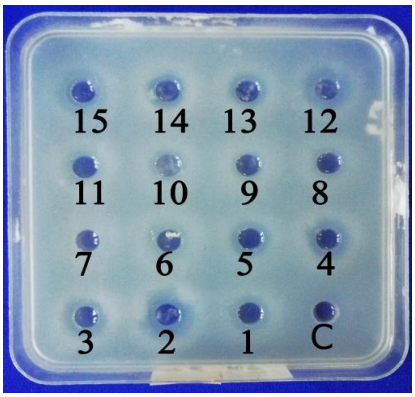


Figure 5 Antibacterial activity of the isolated fungal strains against *B. subtilis*

Table 7 Antibacterial Activity of the Isolated Fungal Strains against *B. pumilus*

Isolated Fungi	Fermentation period (Days) and Inhibitory Zone (mm)							
	3 -days	**4-days**	**5-days**	**6-days**	**7-days**	**8-days**	**9-days**	**10-days**
YY-1	-	-	-	-	-	-	-	-
YY-2	-	-	+	10.68	13.50	11.96	11.53	-
YY-3	17.56	12.38	+	+	-	-	-	-
YY-4	-	12.22	11.84	+	+	-	-	-
YY-5	-	-	12.48	13.94	12.81	10.95	-	-
YY-6	+	25.69	29.60	29.71	30.25	29.69	25.40	22.06
YY-7	14.63	14.01	11.56	+	-	-	-	-
YY-8	-	-	-	-	-	-	-	-
YY-9	-	-	-	-	-	-	-	-
YY-10	-	-	-	-	+	+	-	-
YY-11	-	-	15.18	18.49	18.80	19.60	17.82	14.44
YY-12	-	-	-	12.38	13.43	12.58	+	+
YY-13	-	-	-	11.20	11.82	12.16	14.13	10.58
YY-14	11.35	12.10	12.77	16.03	14.92	13.45	13.18	12.83
YY-15	11.87	13.53	15.44	16.75	16.81	14.51	12.88	12.21

(+) present (-) No activity Agar well =8mm

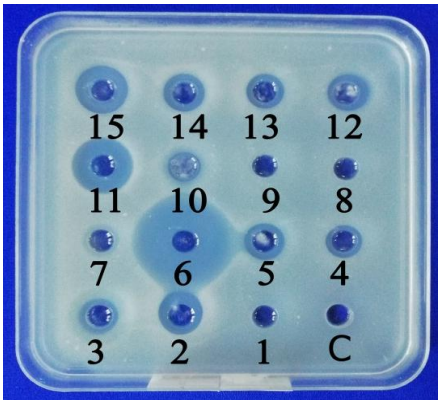


Figure 6 Antibacterial activity of the isolated fungal strains against *B. pumilus*

Table 8 Antifungal Activity of the Isolated Fungal Strain against *C. albicans*

Isolated Fungi	Fermentation period (Days) and Inhibitory Zone (mm)							
	3 -days	4-days	5-days	6-days	7-days	8-days	9-days	10-days
YY-1	-	-	-	-	-	-	-	-
YY-2	-	-	-	11.04	11.73	12.86	11.86	-
YY-3	-	16.15	20.99	18.76	15.94	15.58	14.31	-
YY-4	-	+	11.65	11.89	11.87	11.75	+	-
YY-5	-	+	13.10	13.72	14.02	13.37	12.19	12.01
YY-6	-	20.79	22.49	29.40	30.03	32.82	28.75	21.64
YY-7	-	-	-	-	-	-	-	-
YY-8	-	-	-	-	-	-	-	-
YY-9	-	-	-	-	-	-	-	-
YY-10	-	-	-	13.92	10.96	-	-	-
YY-11	-	18.19	19.36	20.57	16.73	16.23	15.72	+
YY-12	-	-	-	12.05	13.25	12.74	+	-
YY-13	-	11.59	12.16	14.39	12.92	12.65	12.35	-
YY-14	-	+	15.53	16.22	17.39	14.81	14.45	13.72
YY-15	-	+	16.70	17.23	16.96	15.39	14.37	14.11

(+) present (-) No activity Agar well =8mm

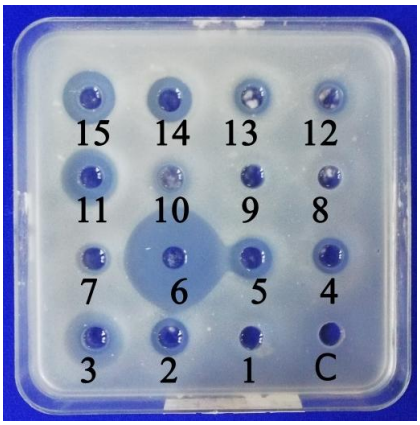


Figure 7 Antifungal activity of the isolated fungal strains against *C. albicans*

Table 9 Antibacterial Activity of the Isolated Fungal Strains against *P. fluorescens*

Isolated Fungi	Fermentation period (Days) and Inhibitory Zone (mm)							
	3 -days	4-days	5-days	6-days	7-days	8-days	9-days	10-days
YY-1	-	-	-	-	-	-	-	-
YY-2	-	-	13.30	12.02	11.83	11.79	+	+
YY-3	-	-	-	11.33	19.12	13.23	+	+
YY-4	-	11.75	12.58	11.93	11.89	11.24	+	-
YY-5	-	-	-	-	11.34	12.93	11.82	+
YY-6	-	+	+	21.97	24.41	27.39	28.33	27.25
YY-7	-	-	-	-	-	10.25	13.04	15.36
YY-8	-	-	-	-	-	-	-	-
YY-9	-	-	-	-	-	-	-	-
YY-10	-	-	-	-	+	13.51	+	-
YY-11	-	-	+	15.50	20.90	21.07	19.40	19.05
YY-12	-	-	-	+	+	12.09	+	-
YY-13	-	-	-	+	+	12.04	13.28	+
YY-14	-	11.77	13.29	15.59	14.38	13.43	12.33	+
YY-15	-	+	14.39	14.58	16.02	14.61	14.85	+

(+) present (-) No activity Agar well =8mm

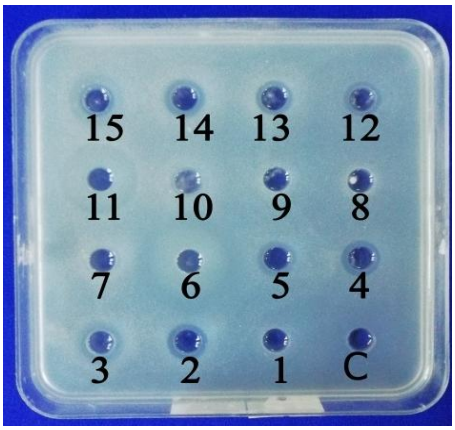


Figure 8 Antibacterial activity of the isolated fungal strains against *P. fluorescens*

Table 10 Antibacterial Activity of the Isolated Fungal Ftrains against *S. aureus*

Isolated Fungi	Fermentation period (Days) and Inhibitory Zone (mm)							
	3 -days	4-days	5-days	6-days	7-days	8-days	9-days	10-days
YY-1	-	-	-	-	-	-	-	-
YY-2	-	-	+	12.19	11.26	+	+	-
YY-3	-	-	-	+	+	17.87	13.30	-
YY-4	-	-	-	+	+	+	+	-
YY-5	-	-	-	13.29	11.48	+	+	-
YY-6	-	-	+	21.69	27.14	28.24	26.02	21.94
YY-7	-	-	-	-	-	-	13.28	15.53
YY-8	-	-	-	-	-	-	-	-
YY-9	-	-	-	-	-	-	-	-
YY-10	-	-	-	-	+	+	+	-
YY-11	-	-	-	17.38	18.04	19.71	19.92	20.05
YY-12	-	-	-	+	+	+	-	-
YY-13	-	-	-	+	+	11.18	12.25	+
YY-14	-	11.47	12.32	13.93	14.14	13.61	13.28	+
YY-15	-	-	+	16.76	16.10	15.63	15.51	13.12

(+) present (-) No activity Agar well =8mm

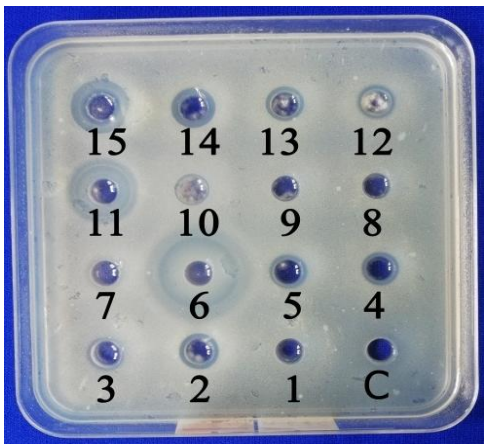


Figure 9 Antibacterial activity of the isolated fungal strains against *S. aureus*

Table 11 Antibacterial Activity of the Isolated Fungal Strains against *A. tumefaciens*

Isolated Fungi	Fermentation period (Days) and Inhibitory Zone (mm)							
	3 -days	4-days	5-days	6-days	7-days	8-days	9-days	10-days
YY-1	-	-	-	-	-	-	-	+
YY-2	-	-	-	-	+	+	16.22	16.65
YY-3	-	-	-	-	+	+	15.46	+
YY-4	-	-	-	-	11.36	14.77	+	+
YY-5	-	-	-	-	-	-	-	+
YY-6	-	-	-	+	+	+	+	+
YY-7	-	-	-	-	+	-	-	+
YY-8	-	-	-	-	+	-	-	+
YY-9	-	-	-	-	+	-	-	+
YY-10	-	-	-	-	+	-	-	+
YY-11	-	-	+	+	+	+	-	-
YY-12	-	+	+	+	+	+	15.66	+
YY-13	-	-	+	+	+	+	13.95	+
YY-14	-	-	+	+	+	12.26	13.10	+
YY-15	+	+	+	+	+	+	-	-

(+) present (-) No activity Agar well =8mm

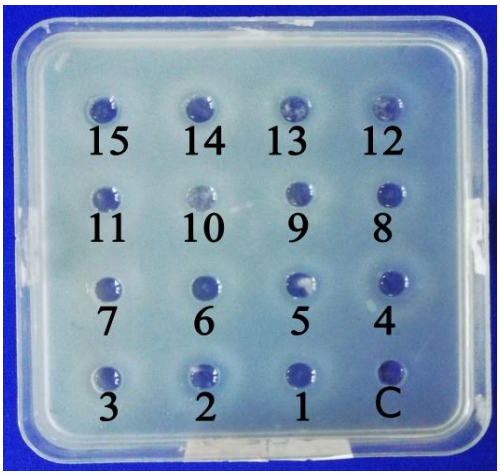


Figure 10 Antibacterial activity of the isolated fungal strains against *A. tumefaciens*

Table 12 Antifungal Activity of the Isolated Fungal Strains against *M. furfur*

Isolated Fungi	Fermentation period (Days) and Inhibitory Zone (mm)							
	3 -days	4-days	5-days	6-days	7-days	8-days	9-days	10-days
YY-1	-	-	-	-	-	-	-	-
YY-2	-	-	-	12.64	13.48	13.09	+	
YY-3	-	-	16.18	18.09	18.87	13.78	+	-
YY-4	-	-	-	12.57	13.74	11.37	+	-
YY-5	-	-	-	14.96	12.54	12.32	11.32	+
YY-6	-	-	18.90	29.71	31.40	31.90	28.70	23.63
YY-7	-	-	-	-	-	-	12.22	14.67
YY-8	-	-	-	-	-	-	-	+
YY-9	-	-	-	-	-	-	-	+
YY-10	-	-	-	+	+	+	+	-
YY-11	-	-	-	15.44	18.45	18.52	16.82	15.73
YY-12	-	-	-	11.83	12.84	12.69	+	-
YY-13	-	-	-	12.52	12.54	13.76	13.47	11.11
YY-14	-	-	-	13.88	13.89	14.18	14.27	15.52
YY-15	-	+	18.16	16.93	15.99	15.86	14.60	13.64

(+) present (-) No activity Agar well =8mm

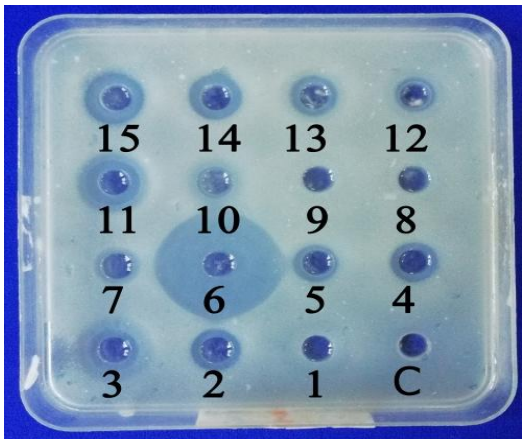


Figure 11 Antifungal activity of the isolated fungal strains against *M. furfur*

Conclusion

The present study is mainly involved in the isolation and antimicrobial activity of soil fungi based on the cultural, morphological and antagonistic activity. The results of this study indicated that 15 fungi were isolated from soil samples. Out of these isolates, 8 fungal strains were white colour and other were pale yellow, pale green and gray colour while their reverse colour were cream, white, yellow and pale yellow. Antimicrobial activities of all fungal strains were observed on eight test organisms and all fungi had the activity. Among them, isolated fungi (YY-11, 14 and 15) showed the antimicrobial activity on *E.coli, B. pumilus, C. albicans* and *M. furfur* while YY-2 showed the antibacterial activity on *B. subtilis.* Especially, YY-6 showed the highest antimicrobial activity on six test organisms. Therefore, it is expected that the current attempt will be useful for the identification and the best fermentation conditions of selected soil fungi and extraction of secondary metabolites.

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