The Effects of Static Magnetic Field and Short Wave Ultraviolet on Some Pathogenic Fungi

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Abstract

Background: Electromagnetic radiation is the radiant energy released by certain electromagnetic processes. Visible light is one type of electromagnetic radiation; other familiar forms are invisible electromagnetic radiations such as radio waves, infrared light and X rays**.**

Objective: To estimate the effects of static magnetic field and short wave ultraviolet on different types of pathogenic fungi (growth of fungi, diameter and pigmentation of colony).

Material and method: This study was carried out at biophysics and microbiology research lab, College of Medicine-Erbil, during the period from January 2010 till April 2010,
seven types of fungi were included, growing culture was examined carefully and colony morphology was recorded, then preparation of slides from the colony was stained by Lacto phenol or Gram stain. Examination were made on the fungi (*Fusarium solani.,Penicillium sclerotogenum, Candida albicans, Aspergillus parasiticus, Ulocladium spp., Penicillium citrinum, Aspergillus tamari*), they were isolated from the dusts, cultures were grown on Sabourauds dextrose agar. The inoculums for our experiments were taken from the growing zone of basic cultures.

All of these fungi are exposed to (375-750) gausses of static magnetic field and short long wave ultraviolet at a periodic time (2,4,6,8,10,12,14,16,18,20,22,24.26) hours each days respectively.

Results: The results of this study show that by using t-test there was significance difference between experimental and control groups of fungi length after exposures to the mentioned field at periodic times (2,4,6,8,10,12,14,16,18,20,22,24,26) day's respectively, shows that there is significance difference between two groups after exposure to the (375-750) gausses of static magnetic fields and none significance difference between experiments and control groups of fungi after exposures to the short radiation wave and long wave of ultraviolet .

Conclusion: No change of dimensional length of fungi after exposure to short UV light, the change which are caused in all types of fungi length after exposure to static magnetic field at range (375-750) gausses

Key words: Bioelectromagnetics, static magnetic field, growth of fungi, and stopping growth with UV light.

Received: 23th April 2015

Accepted: 17th May 2015

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Introduction

Electrical phenomena are found in all living organisms, moreover electrical current existing in the living organisms is capable to produce magnetic field that extend out side, the body consequently they can influence by external magnetic and electromagnetic fields. The earliest studies on the influence of electromagnetism on organisms date back to the late 19th century, probably beginning in [1].

All fungi are eukaryotic organisms, approximately 80,000 species of fungi have been described, but fewer than 400 are medically important, and less than 50 species cause more than 90% of the fungal infections of humans and other animals. Rather, most species of fungi are beneficial to humankind. They reside in nature and are essential in breaking down and recycling organic matter. Some fungi greatly enhance our quality of life by contributing to the production of food and spirits, including cheese, bread, and beer. Other fungi have served medicine by providing useful bioactive secondary metabolites such as antibiotics (eg, penicillin) and immunosuppressive drugs (eg, cyclosporine). Fungi grow in two basic forms, as yeasts and molds (or moulds). The fungi are classified in four phyla: Chytridiomycota, Zygomycota, Ascomycota, and Basidiomycota [2] .Among the earth's complex of conditions affecting the life and development of populations is the sphere of electromagnetic interactions and UV radiation. Electromagnetic interactions influence living organisms, which may modify their structures and processes and on survival, growth and pigmentation of fungal mycelium and spores [3].

Study done by Najy (2002) who suggested a light-driven, radical-pair mechanism for the growth and sporulation of phytopathogenic microscopic fungi was studied under static magnetic field, which is demonstrated from [4]. The applied flux densities were (0.1 to 1) mT decreased growth of colonies [5]. The effects of light and the various types of electromagnetic fields on living microorganisms are widely studied [6].

The effects of visible and uv-c radiation as well as static and 50HZ frequency sinusoidal magnetic fields on germination, mycelia growth and sporulation of plant pathogenic fungi were studied in vitro [7].

Static magnetic fields in by using special magnetic plates of different thickness and size the following magnetic field was measured at the area of culture media of fungi by Teslameter in order to obtained correct magnetic field strength .The experimental fungi group placed in the magnetic field with determination the north and south polesans it was placed with the 35c for 48hr. All of these fungi are exposed to (375-750) gausses of static magnetic field and short long wave ultraviolet at a periodic time (2,4,6,8,10,12,14,1618,20,22,24,26)days respectively.

Material and methods

This study was carried out at biophysics and microbiology research lab, college of medicine-Erbil, during the period from January 2010 till April 2010, Seven types of fungi were investigated, growing culture were done and examined carefully, colony morphology was recorded, then preparation of slides from each colony and stained with Lactophenol or Gram stain.

Examination were made on the fungi *(Fusarium solani., Penicillium sclerotogenum, Candida albicans, Aspergillus parasiticus, Ulocladium sp, Penicillium citrinum, Aspergillus tamari)* ,they were isolated from the dusts, the culture were grown on Sabourauds dextrose agar. The inoculums for our experiments were taken from the growing zone of basic cultures.

The cultures were incubated for (5-7) days after inoculation at 28C, in darkness, after the incubation the cultures uniform from the point of view of growing and morphology were placed into magnetic field. A ventilator could be used for this purpose, in course of experiments that ambient temperature and relative humidity were the some for the control and the treated cultures. The diameters of growing cultures were measured every 24 hours, in two directions, perpendicular each other, the average of these two diameters were used as the diameter of culture.

Magnetic field measurement, magnetic field in the environment come from a number of sources the level of these fields is called background nearly 50μTesla, this background level produce from schools, hospitals, homes, and work places is always increasing due to the rapid increases in uses of electricity, the background field must be considered, While the magnetic field from a particular source.

To determine the magnetic field at a particular location (from a coil), the teslameter probe should be rotated through all possible angle so that field can intersect with the probe such as a way to display the maximum reading , this means that the maximum flux density of magnetic field.

A good teslameter shows the strength of the field its directions and polarization, (the direction is outside of the coils are from north to the south, but the directions of the magnetic field inside of the coils are from south to the north), teslameter measure the fields in one direction at a measuring time and display the field at maximum strength at that location.

Statistical analysis

Statistical package for science service was used in this data. All results are present as shown by ANOVA test used for comparison between the data of the exposed and non-exposed group to the magnetic field and UV waves.

Results

The results in Table(1) and Figure(1) shows that there was significance difference between experimental and control groups of different types of fungi length after exposures to the 375 gausses of static magnetic fields at periodic times (2,4,6,8,10,12,14,16,18,20,22,24,26) hours daily respectively.

Table (1): The effects of 375 gausses of static magnetic field on different types of fungi.

Types of fungi	Experimental (No. 13) Mean±SD	Control (No. 7) Mean±SD	P-values	
Fusarium solani	7.85±0.72	6.95±0.00	0.0001	**Highly Significant**
Penicillium sclerotogenum	4.43±0.32	3.9±0.00	0.0001	**Highly Significant**
Candida albicans	3.6±0,09	2.90±0.00	0.001	**Significant**
Aspergillus parasiticus	5.24±0.69	3.5±0.00	0.0001	**Highly Significant**
Ulocladium spp.	7.09±1.31	4.25±0.00	0.0001	**Highly Significant**
Penicillium citrinum	3.89±0.21	4.35±0.00	0.0001	**Highly Significant**
Aspergillus tamari	7.47±1.22	4.75±0.00	0.001	**Significant**

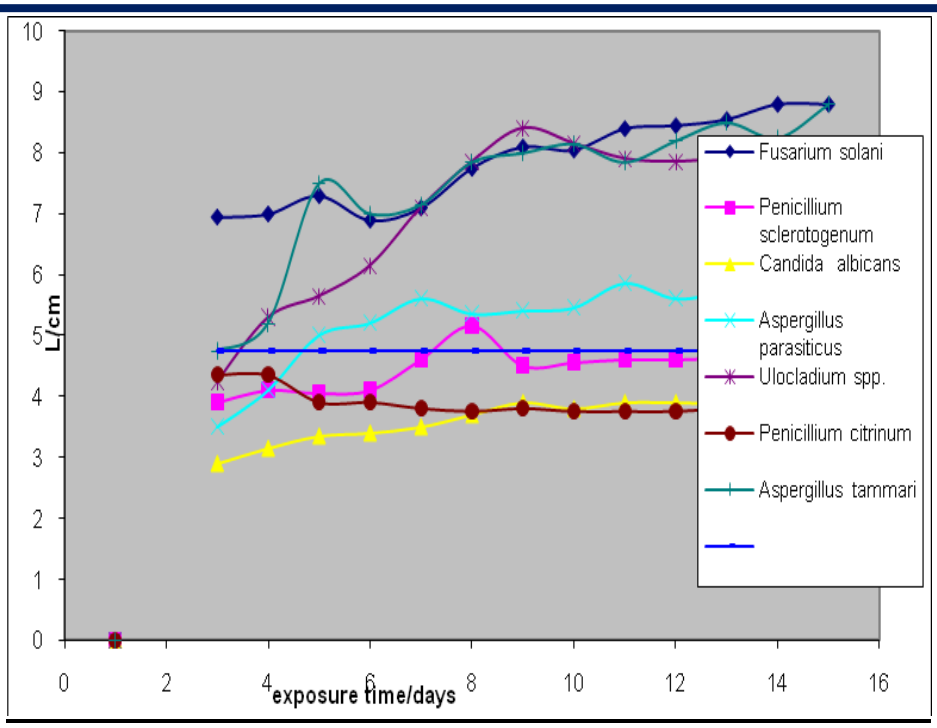

Figure (1): shows the rate of growth as a function of exposed time to static magnetic field.

Table (2) and Figure (2) shows the effects of 750 gausses of static magnetic field on different types of fungi(*Penicillium sclerotogenum, Candida albicans ,Aspergillus parasiticus, Ulocladium spp., Penicillium citrinum and Aspergillus tamari)* highly significantly increases growth of fungi after exposures to the static magnetic field at range 750 gausses, when compared with controls of fungi (non-exposure groups of fungi).

Table (2): The effects of 750 gausses of static magnetic field on different types of fungi.

Types of fungi	Experimental	Control	P-values	
	Mean±SD	Mean±SD		
Fusarium solani	7.28±0.62	6.95±0.00	0.0001	**Highly Significant**
Penicillium sclerotogenum	4.78±0.44	3.90±0.00	0.0001	**Highly Significant**
Candida albicans	3.89±1.01	3.05±0.00	0.0001	**Highly Significant**
Aspergillus parasiticus	4.46±0.84	3.50±0.00	0.0001	**Highly Significant**
Ulocladium spp.	5.12±0.94	4.25±0.00	0.0001	**Highly Significant**
Penicillium citrinum	3.87±0.18	4.35±0.00	0.0001	**Highly Significant**
Aspergillus tamari	5.68±0.62	4.75±0.00	0.0001	**Highly Significant**

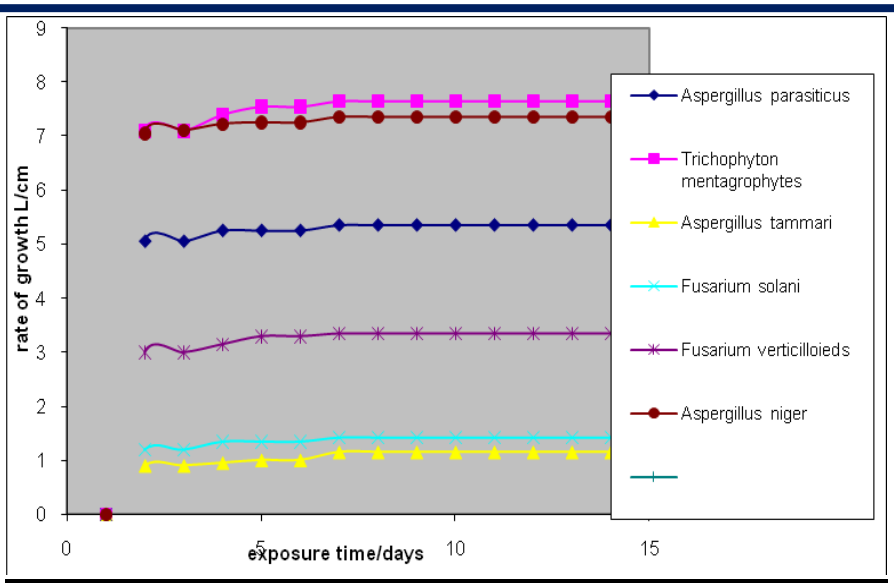

Figure (2): shows the rate of growth as a function of exposed time to static magnetic field.

Table(3) and figure(3) shows the effects of long wave ultraviolet on different types of fungi(*Fusarium solani ,Penicillium sclerotogenum, Candida albicans ,Aspergillus parasiticus, Ulocladium spp and Aspergillus tamari)* none non significantly difference between experiment and control groups of different types of fungi.

Table (3): The effects of short wave of ultraviolet on different types of fungi.

Types of fungi	Experimental Mean±SD	Control Mean±SD	P-values
Fusarium solani	1.2±0.00	1.2±0.00	**Non- Significant**
Aspergillus niger	7.05±0.00	7.05±0.00	**Non- Significant**
Trichophyton mentagrophytes	7.I±0.00	7.I±0.00	**Non- Significant**
Aspergillus parasiticus	5.05±0.00	5.05±0.00	**Non- Significant**
Aspergillus tammari	0.90±0.00	0.90±0.00	**Non- Significant**
Fusarium verticilloieds	3.00±0.00	3.00±0.00	**Non- Significant**

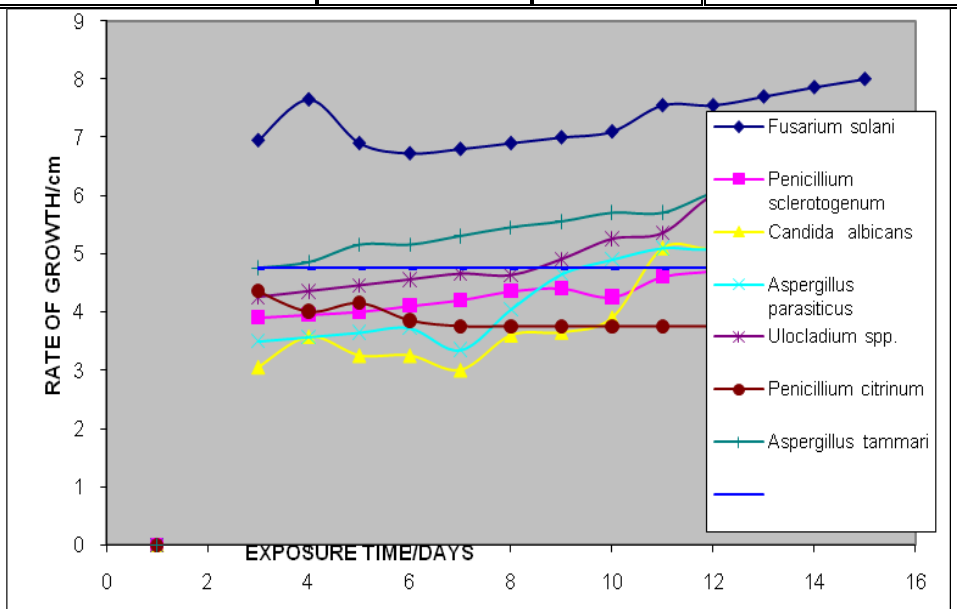

Figure (3): shows the rate of growth as a function of exposed time to short wave of UV light.

Discussion

This study refers to the bioelectromagnetic, which is means that study interaction between magnetic fields and microorganisms, in this study I want to show the effects of 375 ,750,and short wave ultraviolet on different types of fungi.

The results in Table and Figure(1) shows the highly significant difference in experiment groups of fungi (*Fusarium solani*, *Penicillium sclerotogenum*, *Aspergillus parasiticus*, *Ulocladium spp.*, and *Penicillium citrinum*), were significance difference in growth of fungi of(*Candida albicans*,and *Aspergillus tamari)*,when compared with control groups of fungi (*Fusarium solani*, *Penicillium sclerotogenum, Candida albicans*, *Aspergillus parasiticus, Ulocladium spp.*, *Penicillium citrinum*,and *Aspergillus tamari*) if exposed to 350 gausses of static magnetic field ,this results agree with other workers [7,8, 9].

The results in Table and Figure (2) shows highly significant different between exposed to magnetic field at range 750 gausses (*Fusarium solani*, *Penicillium sclerotogenum, Candida albicans*, *Aspergillus parasiticus, Ulocladium spp.*, *Penicillium citrinum*,and *Aspergillus tamari*) and none exposed groups of fungi ,this results agree with other researchers [5,9, 10].

Table and Figure(3) shows none significant different between experimental(exposed to short wave ultraviolet) and control groups of fungi(*Fusarium solani*, *Penicillium sclerotogenum, Candida albicans*, *Aspergillus parasiticus*, *Ulocladium spp.*, *Penicillium citrinum*,and *Aspergillus tamari*) and none exposed groups of fungi ,this results agree with results of [6, 7, 11, 12].

The biological effects of static magnetic field on different type of fungi, indicated to the effects of static magnetic field at ranges (375-750) gausses on size and shape of the cells, physical and chemical properties of cells (pH of cultures), breakdown of cell membrane and growth hormone of different types of fungi, which is demonstrated that accelerated by bioenergetics effects of electromagnetic field at mentioned field. This explanation agrees with other results of [13, 14, 15 and 16].

But stopping the growth of different type of fungi after exposed to short wave ultraviolet light, this result is refers to the reducing and stopping hormonal growth of fungi or indicated to the killing of those different types of fungi. Agree with other results of researchers [1, 4, 17 and 18].

In conclusions, the application of static magnetic fields on growth of seven types of pathogenic fungi after exposure to mentioned magnetic fields, no change of dimensional length of fungi after exposure to short UV light, the change which are caused in all types of fungi length after exposure to static magnetic field at range (375-750) gausses and stopping growth by exposures to the short wave and long wave of ultraviolet light.

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