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THE CONSERVATION OF MUSHROOM IN ANCIENT EGYPT THROUGH THE PRESENT

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Ancient Egyptians believed that the mushrooms were plants of immortality and called them “a gift from the God Osiris”. Egyptian pharaohs proclaimed mushrooms to be food reserved only for royalty; common people were not even allowed to touch them. Conservation of nature by ancient Egyptians was recorded on walls of temples and papyrus sheets. Egypt considered as the cradle of mycology when ancient Egyptians produced a number of hieroglyphic depictions of psychedelic mushrooms on temple’s walls and through hieroglyphic texts throughout the country. The majority of temples with countless pillars, e.g. Philae temple, are like huge mushrooms and both ancient Egyptian crowns, white and triple, were inspired from the primordia of *Psilocybe cubensis*. Many old dynastic ear studs and other structures obviously resembled mushrooms. The Hearst (1550 B.C.) prescriptions 89-92 deal with the treatment of skin abrasions or contusions. They recommend the application of moldy bread crumbs, salt, and rags. Here one may assume an ancient observation on the possibility of molds being helpful in preventing skin infections in connection with abrasions. Arab society for fungal conservation designed a series of mycological expeditions to underpin the achievement of specific fungal conservation aims. In 2013, the expeditions were operated for the first time in Egypt in which various habitats were screened in Nile Delta. Macrobasidiomycete specimens were collected from Nile Delta many times since February 2013. Order *Agaricales* came first among all surveyed orders by recording 80% of occurrence and *Agaricaceae* (30%) among all families of *Agaricales*. The *Ganodermataceae* was the most represented family in the *Polyporales*. The most common species of *Ganoderma* were *G. resinaceum* Boud., *G. lucidum* (Curtis) P. Karst. and *G. mbrekobenum* Otto et al. on *Causarina*, palm and citrus trees. *Ganoderma* species were identified by morphological and molecular means. Dried basidiomata and pure culture of saprobic species were deposited in the Fungarium of Arab Society for Fungal Conservation, Suez Canal University, Egypt. Although basic research in Egypt is still needed to advance knowledge of fungi to the level of other kingdoms and the multitude of well-known species all clearly illustrate that Egyptian macrofungi are far from data deficient. Given the enormous potential of fungi to provide novel pharmaceuticals, chemicals and new technologies, the

biotechnology industry has a vast, largely untapped resource for discovery of new chemicals and novel processes. It is important to protect the agroecosystems and fungi to ensure that rights of indigenous people to an appropriate share in resulting benefits are recognized. Egyptian mycologists are responsible to deliver this message to public and politicians. Egyptian conservation legislation is strongly focused on protecting animals, plants and fungi are still neglected. To solve such problems in Egypt collaboration between mycologists, amateur fungal groups, Arab Society for Fungal Conservation, Egyptian protectorates and Egyptian Environmental Affair Agency. The Mohamed bin Zayed Fund is thanked for support in producing this work.

Keywords: Pharmaceutical, *Ganoderma*, Delta, Mohamed bin Zayed Fund, Data deficient.

[02]

MICROBIAL CONTROL OF CERTAIN OLIVE PATHOGENIC FUNGI USING SOME EFFECTIVE SOIL MICROORGANISMS

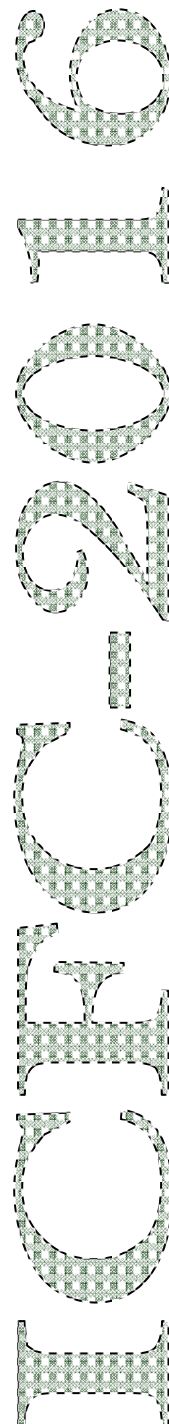
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A screening approach was developed to evaluate the potential of some effective soil microorganisms to control *Fusarium* root rot and *Verticillium* wilt of olive trees grown at Siwa Oasis, western Desert, Egypt. Antagonistic *Azotobacter*, *Pseudomonas* and *Bacillus* isolates recovered from rhizospheric soil of olive trees. The purified isolates were subsequently screened in vitro for their antifungal activities against *Verticillium dahliae* and *Fusarium solani* in addition to their plant growth promoting activities. The nitrogen fixing ability of *Azotobacter* isolates were also investigated. The result could be summarized as follow: 11 *Azotobacter* sp, 7 *Bacillus* isolates and 3 *Pseudomonas* isolates exhibited antifungal activity against *V. dahliae* and /or *F. solani* in vitro. Nearly all *Azotobacter*, *Bacillus* and *Pseudomonas* isolates showed pronounced growth promoting activity All *Azotobacter* isolates exhibited appreciable levels of N₂ fixation. Out of this collection, three isolates exhibited potential antifungal activity were chosen for further studies. These isolates were *Azotobacter* SA5, *Bacillus* SB2 and SP3 were identified as *A. chroococcum*, *B. megatherium* and *P. fluorescence*. The potential of the selected biocontrol organisms to produce plant growth regulators was examined in culture. Data revealed that *Azotobacter* SA5 was the most active producer of IAA, gibberellins, abscisic acid and all cytokinin compounds.



Bacillus megatherium and *P. fluorescence* were also efficient but exhibited lower levels of Phytohormone production.

Keywords: Olive diseases, *Verticillium*, *Fusarium*, Siwa Oasis.

[03]

EXPLOITATION OF VOLATILE FUNGAL METABOLITES TO CONTROL POSTHARVEST FUNGAL ROTTING OF FRUITS IN EGYPT

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Postharvest diseases of fruits result in serious economic damage. We usually fail to consider postharvest disease loss in several steps in the pipeline of harvested fruits, for example, disease loss in market, restaurant and in kitchens are often not well documented. Several non-chemical treatments have been proposed for fungal decay control. Recently, the exploitation of natural products to control decay and prolong storage life of perishables has received more and more attention. Fungal volatile organic compounds (VOCs) have been used as part of biological control strategies to prevent post-harvest fungal growth, in what is termed “mycofumigation. The development and utilization of VOCs from fungi have been of increasing interest since they are naturally produced without chemical synthesis. This work aimed to test the potentiality of fungal volatiles of Egyptian taxa in reduction of postharvest disease severity and to apply the most active isolate(s) that can be used at commercial scale. Isolated fungal strains conserved at the Fungarium of Suez Canal University.

Keywords: VOCs, mycofumigation, natural products, Egyptian taxa, severity.

HOW MANY SPECIES OF ENDOPHYTIC FUNGI PRODUCED ANTI-DIABETIC METABOLITES ARE IN EGYPT?

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Diabetes mellitus (DM) is a metabolic disorder resulting from deficiency in insulin secretion, insulin action, or both promoting disturbance of carbohydrate, fat and protein metabolism by alpha amylase. In 2010, about 285 millions people in the age group 20-79 were envisaged to have diabetes worldwide, about 70% of whom live in developing nations. This estimate is expected to increase to about 438 millions, by 2030. Further, by 2030, the number of people with impaired glucose tolerance (IGT) is projected to increase to 472 millions, or 8.4% of the adult population. There were over 7.8 million cases of diabetes in Egypt in 2015. There is an urgent need to develop new drugs against DM and the aim of this study was to investigate the anti-diabetic activity of secondary metabolites isolated from the endophytic fungi of *Zygophyllum album*, *Morus alba*, *M. nigra*, *Ficus carica*, *Olea europaea*, *Trigonella foenumgraecum*, *Allium cepa*, *Medicago sativa*, and *Zingiber officinale* in Egypt. Fungal cultivation and fermentation used to obtain secondary metabolites. Active components extracted from the secondary metabolites of isolated taxa, and their activities were tracked by using alloxan induced–diabetes rat model. The present work contributed to filling the gap concerning endophytic fungi in Egypt and isolated taxa were conserved *ex situ* in the Fungarium of Suez Canal University.

Keywords: *Ficus carica*, Alloxan, Metabolites, alpha amylase, impaired glucose tolerance, Diabetes mellitus.



[05]

EGYPTIAN ENDOPHYTIC FUNGI A NEW SOURCE FOR PRODUCTION OF PHARMACEUTICAL AND INDUSTRIAL ENZYMES

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Endophytic fungi are microfungi, which hosted healthy living plant tissues for all or part of their life cycle without causing apparent harmful symptoms. Fungal enzymes are used in pharmaceuticals, food, beverages, confectionaries, textiles and leather industries. They are often more stable than enzymes derived from other sources. The aim of the present study is to survey the capability of native endophytic fungi isolated from medicinal plants in Saint Katherine protectorate for production of amylase, protease, L-asparaginase, chitinase, tyrosinase and lactase enzymes. Results showed that *Lasiodiplodia theobromae*, *Ulocladium atrum*, *Cladosporium cladosporioides*, *Aspergillus niger*, *Alternaria alternata*, *Mucor hiemalis* and *Drechslera hawaiiensis* were the best among all surveyed species. Taxa were subjected to sequencing for confirmation of phenotypic identification. The internal transcribed spacer (ITS) 1–5.8 s – ITS2 rDNA sequences obtained were compared with those deposited in the GenBank Database. The strong enzymatic activities of these taxa show a high potential for clinical microbiology and therapeutic applications.

Keywords: L-asparaginase, *Lasiodiplodia theobromae*, Saint Katherine, confectionaries.

[06]

BIOACTIVE EXTROLITES PURIFIED FROM ASPERGILLUS NIDULANS, FUSARIUM OXYSPORUM AND VERTICILLIUM CHLAMYDOSPORIUM

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The consequent and continuous use of antibiotics has led to the emergence of resistant *Staphylococcus aureus* which has a remarkable ability to methicillin

resistance (MRSA) being an increasing public health issue. The emergence of strains accompanied by a limited antibiotic therapy leads to the need of new therapeutic options including natural products. Most of fungi have the ability to produce extracellular secondary metabolites with potential therapeutic activity. Within this context, two anti-MRSA secondary metabolites isolated from *Aspergillus nidulans* and *Fusarium oxysporum* in addition to two other anti-MRSA secondary metabolites isolated from *Verticillium chlamyosporium* have been purified and characterized using elemental analysis, Mass, IR and ¹H-NMR spectrometry. The isolated compounds also exhibited antimicrobial activities against Gram positive and Gram negative bacteria as well as fungi with promising MIC values were also demonstrated in this study. Further *in vivo* pharmaceutical and toxicological studies were recommended for these bioactive compounds.

Keywords: Fungal metabolites, MRSA, antimicrobial activity, MIC and spectroscopic analyses.

[07]

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Nanomaterials have been emerged as important substances for future applications, especially in medical and environmental fields. Although physical and chemical approaches succeed in their synthesis, these methods produce toxic by-products and not cost-effective. In this regard, green synthesis of nano-materials has gain much attention as it is an eco-friendly, cost effective method. Bio-agents, such as bacteria, fungi, algae, plant extracts, can be used for their green synthesis. In the present review, the recent work done on biosynthesis of nanoprticles has been reviewed. In addition, it demonstrates the microorganisms usually used and their mechanisms that are involved in the synthesis of such new materials.

Keywords: Nanotechnology, Metal nanoparticle, Green Synthesis of Nanoparticle, Microbial Biosynthesis of nanoparticles.



(GACA)₄ IDENTIFICATION FOR DERMATOPHYTES
ISOLATED FROM PRIMARY SCHOOL CHILDREN
SUFFERING FROM TINEA CAPITIS IN ISMAILIA - EGYPT

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The major causes of superficial fungal infections in children are dermatophytes. Dermatophytes are divided into three common genera *Trichophyton*, *Microsporum* and *Epidermophyton*. Tinea capitis is one of these infections involving the scalp usually caused by the genera *Trichophyton* and *Microsporum*. Identification of these dermatophytes by routine methods is time consuming, complex and affected by external factors such as temperature and medium, so species or strain identification is very difficult. Molecular identification of dermatophytes through polymerase chain reaction (PCR) by using simple repetitive oligonucleotides (GACA)₄ is simple, specific, rapid, accurate and highly sensitive method. This molecular technology is capable of generating band patterns specific to dermatophyte species or strains, these patterns can be detected by agarose gel electrophoresis. PCR amplification was done using 50 µl volume reactions containing extracted DNA of seventy samples isolated from primary school children suffering from tinea capitis in El-Sheikh Zaid Dermatology Centre in Ismailia, colourless maxima hot start PCR master mix (2X) and (GACA)₄ primer. Band patterns appeared were about 4 to 11 bands with size ranged from 300 bp to 2500 bp in length. The results showed that the clinically isolated dermatophyte samples were belonged to three species: *Trichophyton violaceum* (29 samples), *Microsporum canis* (14 samples) and *Microsporum gypseum* (27 samples). From this study, we concluded that this molecular technique is more beneficial and rapid for dermatophytes identification than phenotypic characterization as PCR depends on genetic makeup which is more constant.

Keywords: Dermatophytes, *Trichophyton*, *Microsporum*, Tinea capitis, (GACA)₄.

A NEW INTEGRATED STRATEGY FOR UTILIZATION OF AGRICULTURAL WASTES AND EXOTIC PLANTS IN BIOETHANOL, FOOD AND ENZYMES PRODUCTION BY EGYPTIAN FUNGI (CLEANEGYPT©)

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The quantity of Egyptian agricultural waste (AWs) reaches 31 million ton/year (Agricultural Waste Recycling Unit (AWRU), the Ministry of State for Environmental Affairs (MSEA) in 2005. The main major crop residues in Egypt is estimated about 3.1 million tons/year of rice straw are disposed by direct burning in open field and caused environmental degradation to air quality of Cairo and the Delta governorates contributing to the Black Cloud Phenomenon. Other exotic plants (EPs) such as water hyacinth and reeds are the most abundant in Egypt in which water hyacinth annual yield is 400,000 tons. Lignocellulosic biomass provides a promising and renewable resource of non-food sugars for sustainable biofuel production. The objectives of this study are to investigate a new integrated strategy for disposing of agricultural waste and exotic plants and to design an alternative model for maximizing benefits from them in production of Bioethanol, Food and Enzymes by using Egyptian Fungi. Fifty-two isolates of Egyptian fungi were isolated from four agricultural wastes and one exotic plant composting sources. Pretreatment results showed that on the economic scale acetic acid treatment with compressed hot water at 180 °C for two days is the best. Twenty isolates were tested for their potential to decompose lignocellulosic straw by assessing their growth rate and biomass production, as well as their ability to decompose lignin and cellulose on straw-powder-amended media. Four isolates (EF7, EF13, F37, and EF49) were selected as potential lignocellulolytic agents for *in vitro* compatibility study based on their optimum growth rate, biomass production, and lignocellulolytic activities. The results indicated that *Saccharomyces cerevisiae* and fungal strains EF13 and EF49 were found to be the most suitable strains for the ethanol production using AWs straw as major substrate. From the observation and estimation of ethanol yield, EF13 and *S. cerevisiae* are mutually grows together in liquid and solid media and proved to be excellent in producing ethanol compared to other combinations. The highest production of bioethanol found as 18.99% on the eighth day where the highest reading was recorded for the combination of EF13, EF49 and *S. cerevisiae*. The new direct conversion of AWs and EP by Egyptian fungi using new adopted reactor will be registered soon as a new patent. Production of *Pleurotus ostreatus* showed the best result on AWs straw + 10% manure + 1% lime. Results showed that rice straw showed the best biological efficiency



(68.00%) among all studied agricultural wastes for production of mushroom. Cultivation of strawberry and tomatoes in compacted rice straw bales showed promising results and reduced the incidence of fusarial wilt diseases in tomatoes. All isolates were conserved in the Fungarium of Suez Canal University. CleanEgypt® by using Egyptian fungi is a new strategy to save energy, control of air pollution, production of bioethanol, industrial enzymes and food is highly recommended to support farmers all over Egypt.

Keywords: Bioreactor, direct conversion, lignocellulosic biomass, *Pleurotus ostreatus*, *Saccharomyces cerevisiae*.

[10]

CHARACTERIZATION OF RALSTONIA SOLANACEARUM AND BIOCONTROL AGENTS ISOLATED FROM DIFFERENT RHIZOSPHERES

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Bacterial wilt caused by *Ralstonia solanacearum* phylotype II sequevar I (race 3 biovar 2), is considered one of the most destructive bacterial diseases of potato plant. The aim of this study was to evaluate the potential of bacterial antagonists to suppress the causative bacteria. In this regard, 420 isolates of *R. solanacearum* were recovered from different habitats at different Egyptian governorates. The variation between isolates was assessed on the basis of pathogenic potentials to tomato seedlings in the greenhouse condition. The evaluation indicated that, the highest potential, as shown by the wilt severity was obtained by 11 out of 420 isolates. The most virulent *R. solanacearum* isolates were identified by molecular techniques. To lay down a biological control protocol, a collection of 318 isolates of rhizobacteria from rhizosphere different plants, were tested for antibiosis against *R. solanacearum* selected strains. In vitro, 14 isolates of rhizobacteria were more effective in suppressing the pathogen at different levels of relative power of antibiosis. These isolates were categorized into three groups according to their gram-staining reaction, cell morphology and cultural characteristics. Further evaluation, under the greenhouse condition, has shown that six of the isolates were effective in suppressing disease development, as expressed by the Area Under Disease Progress Curve (AUDPC). These isolates were identified by 16s rRNA:

Streptomyces toxytricini, *Stenotrophomonas maltophilia*, *Stenotrophomonas maltophilia*, *Bacillus pseudomycooides* and *Brevibacillus brevis*.

Keywords: microbial antagonists, biological control, *Bacillus pseudomycooides*, *Brevibacillus brevis*, *Streptomyces toxytricini* and *Stenotrophomonas maltophilia*.

[11]

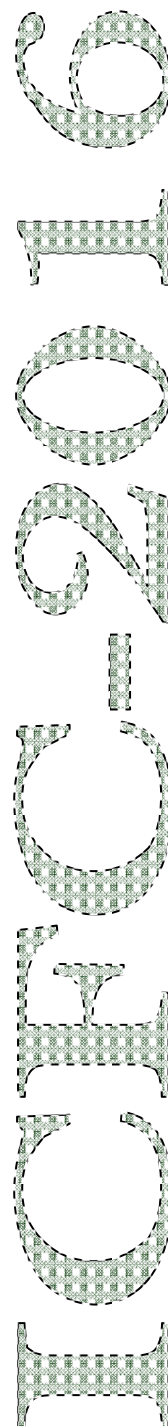
ANTIFUNGAL ACTIVITY OF PLANT GROWTH PROMOTING RHIZOBACTERIA (PGPR) AGAINST PHYTOPHTHORA BLIGHT IN SWEET PEPPER

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Fifteen bacterial isolates of plant growth promoting rhizobacteria (PGPR) were isolated and identified from rhizosphere and roots of different plants grown in reclaimed soil at Nobarria district. The isolates were tested, *in vitro*, for antibiosis against *Phytophthora capsici* Leonian causing root-rot and blight of sweet pepper, as well as their effects on plant growth. Out of fifteen only five isolates showed moderate to strong inhibition and increased vigor index of sweet pepper. Selected isolates were tested for the production of indole acetic acid (IAA) and phosphorous solubilization capability. The biocontrol ability of these antagonistic isolates was evaluated against *P. capsici* *in vivo* assay. Accordingly, three selected isolates *Pseudomonas fluorescens*, *Brevibacillus brevis* and *Bacillus subtilis* were further tested for their ability to induce resistance, production of defense-related enzymes and phenols in sweet pepper against *Phytophthora* in pot experiment. The maximum activities of peroxidase (PO) and polyphenol oxidase (PPO) were observed in *P. fluorescens* pretreated pepper plants challenged with *P. capsici*. Moreover, accumulation of phenolic content was observed in *P. fluorescens* and *B. brevis* pretreated plants and challenge inoculated with *P. capsici*, and the higher amounts of phenolics were noticed even on 10th day after the pathogens challenge inoculation. Under the field conditions, the mixture of the three bacterial isolates with peat moss was most effective in suppressing *Phytophthora* blight development as expressed by infection percentage and disease severity. Mixture of the three isolates formula was most effective to decrease the percentage of root-rot and disease severity compared with other treatment and untreated treatment.

Keywords: *Brevibacillus brevis*, *Bacillus subtilis*, *Pseudomonas fluorescens*, biological control, *Phytophthora capsici*.



[12]

ECOLOGICAL STUDIES ON NATIVE FUSARIUM ISOLATES TOLERATED SILVER NITRATE

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The aim of this study is to do a ecological studies on native *Fusarium* isolates tolerated silver nitrate screen silver tolerating terricolous *Fusarium* isolates recovered from four fields. Significant variations in 22 isolates for cultural and morphological characteristics were recorded using Potato Dextrose Agar medium. Recovered isolates were tested for their growth on silver nitrate (1mM) supplemented Czapek-Dox agar and liquid medium. Out of 22 isolates, fifteen isolates were selected for further study based on silver tolerance results. Only six isolates namely T18, T22, TA, MB, KhG and KhD tolerated high concentration of silver nitrate (2.5mM). Optimizations of cultural parameters of *Fusarium* isolates were investigated. In physiological studies the *Fusarium* isolates grew best on Czapek-Dox agar medium and least on Malt Extract Agar medium. Glucose was found to be the best whereas Starch was the least carbon source. Similarly sodium nitrate (NaNO₃) was the best and ammonium sulphate (NH₄)₂SO₄ was least nitrogen source. Growth of *Fusarium* isolates was best at pH 7. Similarly, 0.2% NaCl was found best salinity level and 0.4% NaCl was least salinity level.

Keywords: Egyptian soils, silver ion, Czapek-Dox agar, ammonium sulphate, Optimization.

[13]

ENHANCEMENT OF STEVIOSIDE AND REBAUDIOSIDE PRODUCTION IN STEVIA REBAUDIANA BY INOCULATION WITH AZOSPIRILLUM AND ARBUSCULAR MYCORRHIZAE

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This study was carried out at Desert Research Center Station at Balouza, North Sinai, Egypt to evaluate the influence of biofertilizers (*Azospirillum*

brasiliense, *Glomus mosseae* and *G. fassiculalum*) and two rates of potassium sulphate (45 and 30 kg/ fed) on *Stevia rebaudiana* growth parameters (plant height, stem diameter, leaf area index, chlorophyll content, root length, fresh and dry weight of aerial parts and root). Also mineral nutrient contents and main active principles (stevioside and raubodioside) in leaves were measured. Results indicated that plants treated with combined biofertilizers recorded the highest growth values of the aforementioned parameters, compared with the single applications of microbes. Also results expressed significant increase in the growth parameters when K applied at high concentration. A highest increase in biomass yield (87.8%) recorded (87.8%) when plants treated with combined biofertilizers at high rate of K. Both total nitrogen and phosphorus content of plants increased significantly by using combined biofertilizers regardless the amount of K applied. Finally the total content of stevioside and rebaudioside (98.9, 78.6%) of treated plants was increased in comparison with control. Summing up the results, mixed application of the bacteria and mycorrhizal fungi performed better than the single applications for enhancing the plant yield and production of active principles.

Keywords: Phosphorus content, biofertilizers, *Azospirillum brasiliense*, Potassium.

[14]

METABOLITES OF EGYPTIAN ENDOPHYTIC FUNGI MAY BE A NOVEL SOURCE OF ACETYLCHOLINESTERASE INHIBITORS

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Endophytic fungi are a continuous source of novel bioactive metabolites. Endophytic fungi promote plant growth, improve the host plant's resistance to biotic and abiotic stresses, and can produce the same or similar biologically active substances as the host e.g. Acetylcholinesterase Inhibitors (AChEI). Alzheimer's disease is the most common form of dementia among the elderly population that causes a gradual decline in cognitive abilities. Recently more than 44.4 million people suffered from Alzheimer worldwide and this number will increase to an estimated 75.6 million in 2030. There is an urgent need to develop new drugs against Alzheimer's and the aim of this study was to investigate the anti-acetylcholinesterase activity of secondary metabolites isolated from the endophytic fungi of *Ricinus communis*, *Vicia faba*, *Punica*



granatum, *Melia azedarach* and *Albizia lebbek* in Egypt. Fungal cultivation and fermentation used to obtain secondary metabolites. Active components extracted from the secondary metabolites, and their activities were tracked by using Alzheimer's disease of $AlCl_3$ induced rat model. The present work contributed to filling the gap concerning endophytic fungi in Egypt and isolated taxa were conserved *ex situ* in the Fungarium of Suez Canal University.

Keywords: $AlCl_3$ induced rat model, AChEI, Egypt, *Punica granatum*.

[15]

EFFECTS OF TERFEZIA BOUDIERI CHATIN AQUEOUS AND ORGANIC EXTRACTS ON MORPHOLOGICAL AND ULTRASTRUCTURAL CHARACTERISTICS OF CERTAIN NATIVE BACTERIAL AND FUNGAL ISOLATES

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Scanning electron microscopy (SEM) and transmission electron microscopy (TEM) were used to study the effect of aqueous and organic (chloroform, acetone, methanol) extracts of *Terfezia boudieri* on phenotypic and ultrastructural characteristics of four native bacterial and fungal isolates. Those isolates represented by Gram positive and Gram negative bacteria (*Bacillus subtilis* and *Pseudomonas aeruginosa*), filamentous fungus (*Aspergillus niger*) and a yeast (*Candida albicans*). all those taxa showed high sensitivity to aquatic and organic extracts. Phenotypic changes (aggregation, distortion, elongation, swollen) and alteration of ultra-organelles measurements of tested fungal isolates were reported.

Keywords: *Terfezia boudieri*; antimicrobial activity; bacterial fungal isolates; SEM; TEM.

WHERE ARE MN(II)-OXIDIZING FUNGI IN EGYPT?

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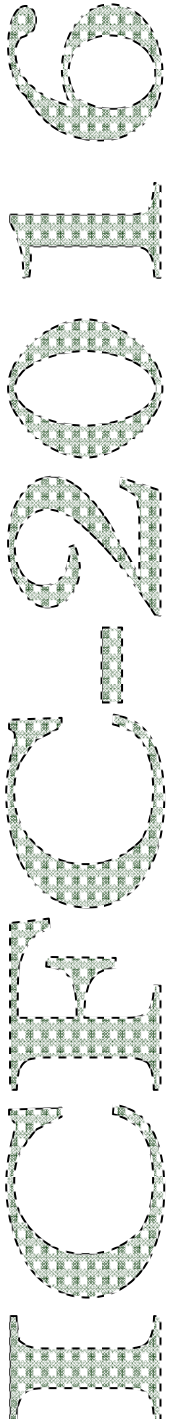
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Our knowledge of different ecological groups of Egyptian fungi is fragmentary compared to values of the same groups worldwide e.g. Agaricales, Glomeromycota, lichenized fungi and yeasts. Manganese (Mn) is considered to be the 12th most abundant element in the biosphere and its oxides are environmentally abundant that mediate the biogeochemical cycling of nutrients, contaminants, carbon, and numerous other elements. Filamentous fungi and bacteria are responsible for the majority of Mn oxide formation in the environment and various parameters concerning this issue is largely unresolved. The oxidation of Mn(II) by most Ascomycete fungi remains poorly understood, and apparently serves no known physiological or ecological benefit to these organisms. Mn(II)-oxidizing fungi in Egypt still mystery and never been the target of any study before. In this study, we begin to address these knowledge gaps by investigating the Mn(II)-oxidizing filamentous Ascomycete from different manganiferous deposits in Egypt. The expected results will add new taxa and fill the gap of diversity of this group of fungi in Egypt. Moreover, this work will explore the potential presence and character of a mechanistic link between Mn(II) and carbon oxidation via common secreted enzymes and reactive metabolite generation pathways,

Keywords: Enzymes, Biodiversity, Ascomycetes, Manganese, Mn oxide.



EGYPTIAN ENDOPHYTIC FUNGI: A CONTINUING SOURCE OF NOVEL DRUG LEADS

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Bioprospecting is generally described as the search for naturally occurring chemical compounds and biological material, especially in extreme or biodiversity-rich environments e.g. Saint Katherine Protectorate, arid Sinai, Egypt. Biologically active metabolites are produced by a great number of *Fungi* and most bioprospecting programs have been limited to certain ecological groups of Egyptian fungi. Natural products from medicinal plants, bacteria and fungi are the most consistent and productive source for the 'first-in-class' drugs. Recently scientists mentioned that: 51% of the biologically active substances isolated from endophytes were previously unknown. In the last ten years, Abdel-Azeem and his co-workers searched the biologically active natural products produced by Egyptian endophytic fungi for different pharmaceutical, agriculture and industrial application. Those natural products should be renewable, eco-friendly and easily obtainable. Many of these compounds, lovastatin as an example, are being used for the treatment of a number of diseases e.g. cancer, liver diseases, rheumatoid ...etc. The present review gives a detailed account about Egyptian endophytic fungi and traces natural products drug discovery, outlining important drugs from endophytic fungi that revolutionized treatment of serious diseases. It is clear Egyptian endophytic fungi will continue to be a major source of new drug leads, and effective drug development depends on multidisciplinary collaborations. Our review discussed the threats to Egyptian endophytic fungi, their conservation status and the role of Suez Canal University' Fungarium. The depository of the Egyptian endophytic fungi in Suez Canal University is a pillar for promoting fungal diversity, conservation and exploitation in Egypt.

Keywords: Lovastatin, Conservation, Fungarium, threats, pharmaceutical, medicine.

[18]

IDENTIFICATION OF BIOSURFACTANT-PRODUCING ACTINOBACTERIA ISOLATED FROM EGYPTIAN SOIL BASED ON 16s rDNA GENE AND BIOINFORMATICS TOOLS

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Biosurfactants are amphipathic molecules which reduce surface tension, and widely used in pharmaceutical, cosmetic and food industries. In the present study thirty actinobacterial isolates recovered from soil and sediments from Menoufiya Governorate, Timsah Lake and Qaroun Lake using dilution method. Isolates were screened for their extracellular production of biosurfactants using surface tension measurement of cell-free culture broth and oil-displacement test. Isolate ak showed high biosurfactant activity and reduce surface tension of the starch nitrate liquid medium by 17.2 mN/m, and displace crude oil (Aish-El-Mallah region) by 1.5 cm as a diameter of clear zone. Isolate ak was subjected for molecular identification and the gene sequences obtained were compared with those deposited in the GenBank Database and registered with accession number KX181607. Meanwhile the Phylogenetic results with MEGA.6 programe showed that ak isolate was closely related to *Streptomyces atrovirens*. This report is the first about this isolate as a biosurfactant- producing actinobacteria in Egypt.

Keywords: *Streptomyces atrovirens* , KX181607, MEGA.6, Crude Oil, Timsah lake.

[19]

FIRST RECORD OF NEOSCYTALIDIUM DIMIDIATUM CAUSES CANKER DISEASE OF FICUS NITIDA AND F. BENJAMINA IN ASSIUT GOVERNORATE, EGYPT

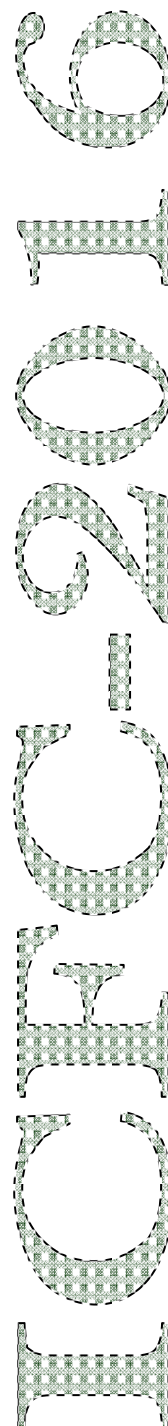
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In September 2013, Canker disease of *Ficus nitida* and *F. benjamina* was noticed and reported for the first time in Assiut governorate, Egypt. The infected plants were collected from different locations at Assiut governorate namely Assiut University plantation, Al-Fath, Abnub and Abo-Tig. Pure culture of the



fungal pathogen was isolated using Potato Dextrose Agar (PDA) medium at 25° C from both diseased plants. The causal pathogen was identified as *Neoscytalidium dimitiatum* based on morphological characteristics and DNA sequence comparisons. The pathogenicity test was conducted using 2-year-old plants of each host. The pathogenicity test gave rise to 100 % success and the pathogen was re-isolated from the infected plants. A pure culture of *N. dimitiatum* was deposited in the culture collection of the Assiut University Mycological Centre (AUMC) under the code AUMC 9293.

Keywords: Canker disease, *Ficus nitida*, *F. benjamina*, *Neoscytalidium dimitiatum*.

[20]

FUNGAL TRANSFORMATION OF FERULIC ACID FROM SUGARCANE BAGASSE AND RICE STRAW TO NATURAL VANILLIN

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Most of the vanillin used nowadays come from the chemical synthesis, while, the natural vanillin derived from plants is very expensive. Vanillin appears as an intermediate in the microbial degradation of several substrates, including ferulic acid. Eight Egyptian fungal strains were used in this study to produce ferulic acid, vanillic acid and vanillin through three steps from sugarcane bagasse and rice straw as agro-industrial by-products. Also, the determination of moisture, fats, proteins, fibers and total sugars in each agricultural waste were conducted before the pre-treatment and final treatment processes which include thermal, chemical and mixed ways that gives suitable media for production of vanillin and other beneficial compounds by fungal fermentation. The total phenolics were determined in both wastes before the cultivation (Sugarcane bagasse: 623.7 mg/L and Rice straw: 487.5 mg/L) and after cultivation, and the highest concentration was recorded for *A. oryzae* (1395.7 mg/L) on sugarcane bagasse and *A. awamori* (1290.3 mg/L) on rice straw ,while, Ferulic acid was determined in both wastes after cultivation and the highest concentration was recorded for *Phanerochaete chrysosporium* (55.1 mg/L) on sugarcane bagasse ,while, at the end of this step, the antioxidant activity of ethyl acetate extract for each fungal culture was determined and its secondary metabolites were separated on TLC plates. The ferulic acid that extracted

from the rice straw and sugarcane bagasse in the first step of fermentation was further utilized as a substrate for vanillic synthesis by studied fungi in the second step, recording the highest concentration (36 mg/L) for *Penicillium chrysogenum*. Then vanillic acid was further utilized as a substrate for vanillin synthesis by studied fungi in the final step, while, the culture of *Phanerochaete chrysosporium* is the only active giving moderate yield of vanillin at the optimum condition which about 152 mg/L of vanillin using maltose as carbon source, diammonium tartrate as nitrogen source, pH 7 and temperature 37C° for five days. Finally, the extracted vanillin was separated by GC mass and examined as natural antioxidant agent.

Keywords: *Phanerochaete chrysosporium*, Egypt, GC mass, rice straw, TLC.

[21]

SCREENING OF PROSPECTIVE PROBIOTIC YEASTS FROM EGYPTIAN DAIRY PRODUCTS

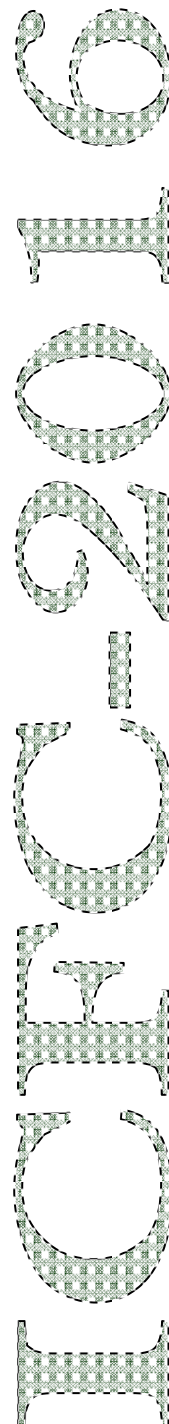
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The occurrence of some dairy products at high levels even though, are environmental pollutants yeasts could represent a potential danger to human health especially for the immune-compromised patients. This study reports the results of a survey of yeast species in samples of buffalo milk products collected from five local Egyptian markets of El-Obour city. Yeast taxa were isolated from different collected dairy products including sweetened cheese (Karish), plain yogurt and raw buffalo milk. The most frequent yeast species further investigated through several physiological and biochemical probiotic tests as well as identified morphologically and genotypically. Three taxa were identified by using the variability in the ITS rDNA region namely: *Saccharomyces cerevisiae*, *Saccharomyces boulardii* and *Kluyveromyces fragilis*. The antibacterial activity of those yeasts against pathogenic bacteria of *Serratia marcescens*, *E. coli*, *Staphylococcus aureus*, and *Bacillus cereus*, *in vitro* was determined by well's diffusion method. Most of the investigated yeasts showed high antibacterial activity against tested pathogenic bacteria. The ability to tolerate different concentrations of bile salts, low pH, and gastric and intestinal juices were also studied as probiotic test parameters. The results showed that the yeast isolates *Saccharomyces boulardii* and *Kluyveromyces fragilis* were the most promising isolates as probiotic strains since they were more resistant to the investigated probiotic test parameters than the remaining one when exposed to bile salts, low pH, and gastric and intestinal juices. These taxa were then



giving an accession number to be conserved at the Regional Center for Mycology and Biotechnology (RCMB) culture collection of Al-Azhar University.

Keywords: Probiotic yeast, characterization, identification, Dairy products.

[22]

BIOETHANOL PRODUCTION FROM AGRICULTURAL WASTES BY USING NEW EGYPTIAN STRAIN (EG3)

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Biofuel considered as one of the most important renewable energy sources used worldwide. However, ethanol produced from corn or sugar cane currently dominates the biofuel market, which consequently has a negative impact on the food demands. Therefore, it is highly desirable to produce biofuel from plant parts which not embedded on the food. Our research strategy focused on consolidated bioprocessing (CBP) using bacteria of genus *Clostridium*. This research has been accomplished in four phases. Phase one is recovering of *Clostridium sardiniense* bacterium from canal sediments in Bani Suf governorate which characterized as anaerobic, mesophilic, cellulolytic bacterium. Phase two is the examination of bacterium fermentation capability to produce ethanol which carried out on different sources of carbon such as cellulose, cellobiose, glucose, lactose, fructose, sacchrose and dextrose. Our results showed positive ethanol production. Phase three is the molecular identification of the isolated bacterium based on 16s rRNA gene. Phase four is application of bioinformatics tools to analyze the obtained sequence. BLASTn analysis showed 100% similarity between our sequence and *Clostridium sardiniense*. *Clostridium sardiniense* EG3 16s rRNA sequences have been submitted into the Genbank which had been realized under accession number KU306930 as Egyptian strain 3 and it might to be as a patent.

Keywords: Bioethanol, *Clostridium sardiniense*, 16s rRNA gene, Fermentation, KU306930, Bani Suf.

CONSERVATION AND BIOPROSPECTING: DISTRIBUTION OF TERRICOLOUS FUNGI AT ELBA NATURAL PROTECTED AREA

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No information on the population status of fungal species and its fluctuation in the Egyptian protected areas is available. No legislation exists in Egypt for protection of *Fungi* from over-collecting or other threats. The aims of our survey are to record and assess the extent of occurrence area of micro and macro-fungi in its natural habitats in Egypt, to verify the threats that they face, and finally to propose measures for its protection and conservation *in-situ* and *ex-situ*. In this study the diversity of soil mycobiota in Elba protected area in Egypt was investigated. Soil and dilution plate techniques were applied in order to get as good diversity as possible. Czapek's yeast extract, potato dextrose and modified Leonian's agars as isolation media supplemented with Rose Bengal and chloramphenicol for suppression of bacterial growth were used. Soil gypsum, organic matter, total calcium carbonates, cations, anions, electric conductivity and pH were determined. Particle size distribution was carried out by sieving method. Isolated taxa belonged to twenty three of eleven genera. On the higher taxa level, *Zygomycota* were represented only by two species (6.25 % of the total species number), teleomorphic *Ascomycota* (7 species, 21.87 %) and anamorphic *Ascomycota* (23 species, 71.80%). The prevailing genera were *Aspergillus* (11 species including anamorph stages of one *Emericella* and two *Eurotium* species; 34.37% of the total isolates), *Penicillium* (4 species; 12.5%) and the remaining taxa were represented only by two to one species each. The frequent species were in decreasing order; *Aspergillus niger*, *A. flavus*, *A. terreus*, *Cladosporium cladosporioides*, *Alternaria alternata*, *Penicillium chrysogenum*, *Rhizopus stolonifer*, *Lichtheimia corymbifera*, *Sarocladium strictum*, and *Trichoderma viride*. In Egypt as well as in other developing countries, the information on diversity of fungi associated with protectorates is either fragmentary or limited. Although basic research in Egypt is still needed to advance knowledge of fungi to the level of other kingdoms and the multitude of well-known species all clearly illustrate that Egyptian fungi are far from data deficient. The present work contributed to the inventorying and conservation of fungi in Egypt by *ex situ* conservation of isolated taxa in the Fungarium of Suez Canal University.

Keywords: Gebel Elba, Biodiversity, Conservation, Fungarium, Egypt, Protectorates.





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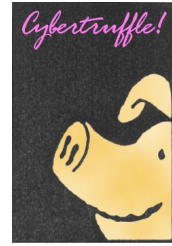
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