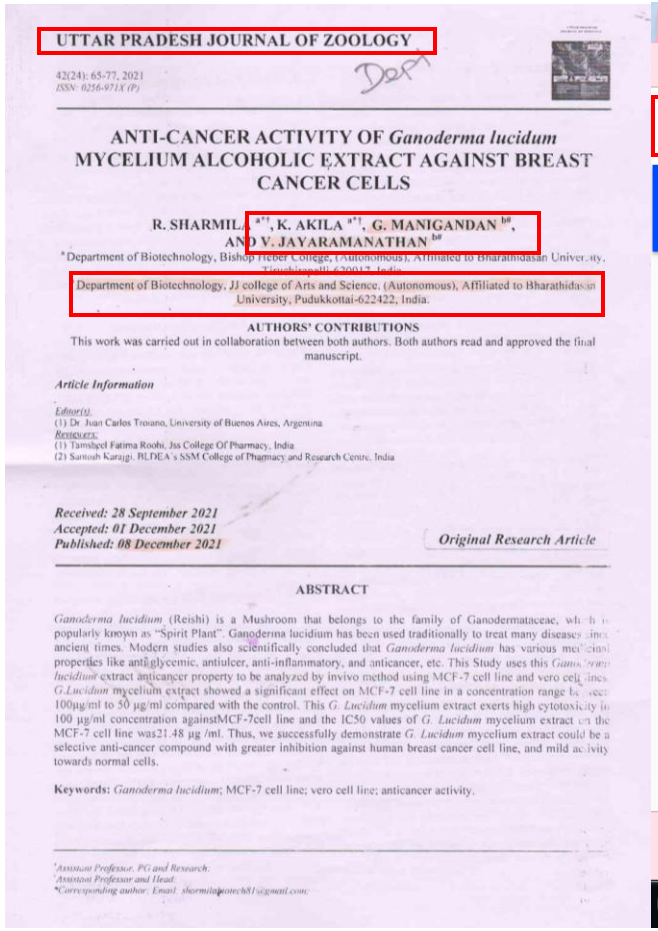

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ANTI-CANCER ACTIVITY OF *Ganoderma lucidum* MYCELIUM ALCOHOLIC EXTRACT AGAINST BREAST CANCER CELLS

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AUTHORS' CONTRIBUTIONS

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

Ganoderma lucidum (Reishi) is a Mushroom that belongs to the family of Ganodermataceae, which is popularly known as "Spirit Plant". Ganoderma lucidum has been used traditionally to treat many diseases since ancient times. Modern studies also scientifically concluded that *Ganoderma lucidum* has various medicinal properties like anti-glycemic, antiulcer, anti-inflammatory, and anticancer, etc. This Study uses this *Ganoderma lucidum* extract anticancer property to be analyzed by invivo method using MCF-7 cell line and vero cell lines. *G.Lucidum* mycelium extract showed a significant effect on MCF-7 cell line in a concentration range between 100µg/ml to 50 µg/ml compared with the control. This *G. Lucidum* mycelium extract exerts high cytotoxicity in 100 µg/ml concentration againstMCF-7cell line and the IC50 values of *G. Lucidum* mycelium extract on the MCF-7 cell line was21.48 µg /ml. Thus, we successfully demonstrate *G. Lucidum* mycelium extract could be a selective anti-cancer compound with greater inhibition against human breast cancer cell line, and mild activity towards normal cells.

Keywords: *Ganoderma lucidum*; MCF-7 cell line; vero cell line; anticancer activity.

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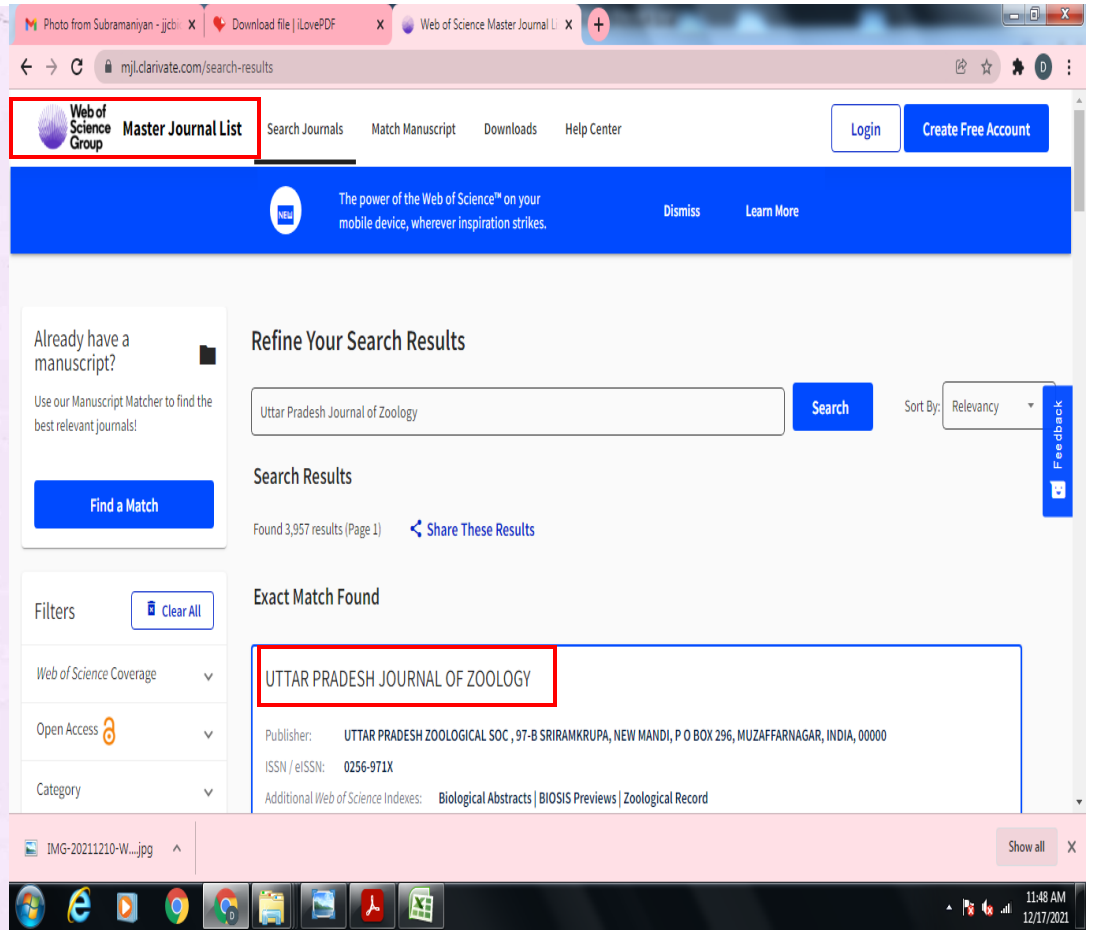

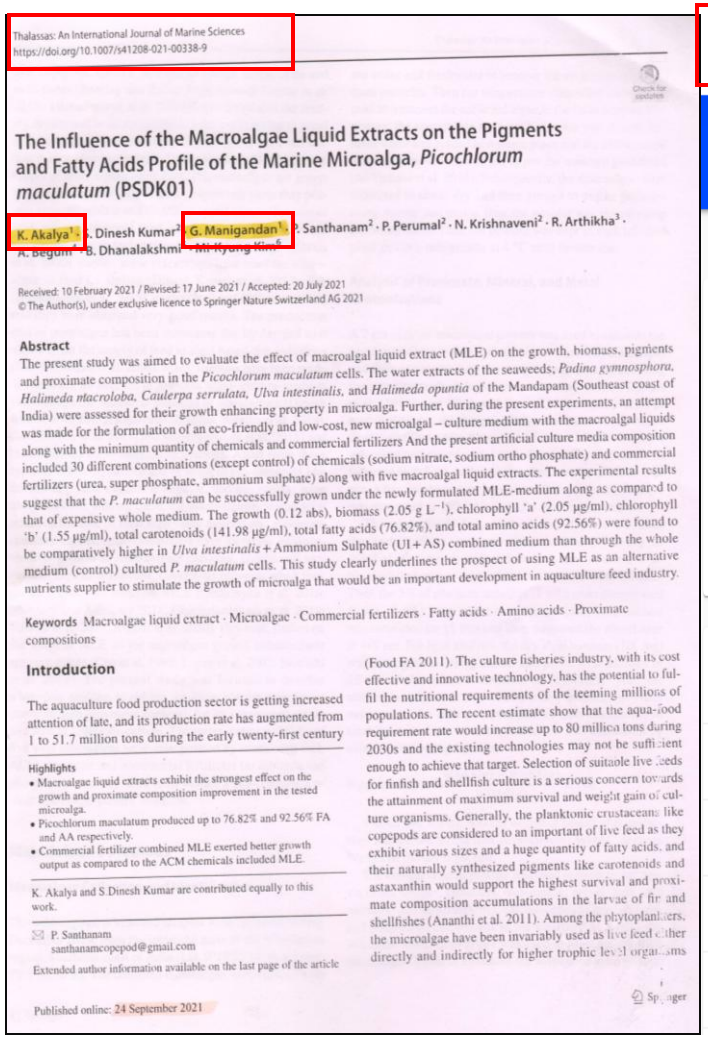

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The Influence of the Macroalgae Liquid Extracts on the Pigments and Fatty Acids Profile of the Marine Microalga, *Picochlorum maculatum* (PSDK01)

K. Akalya[1] · S. Dinesh Kumar[1] · G. Manigandan[1] · P. Santhanam[2] · P. Perumal[2] · N. Krishnaveni[2] · R. Arthikha[3] · A. Begum[4] · B. Dhanalakshmi[5] · Mi-Kyung Kim[6]

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Abstract
The present study was aimed to evaluate the effect of macroalgal liquid extract (MLE) on the growth, biomass, pigments and proximate composition in the *Picochlorum maculatum* cells. The water extracts of the seaweeds; *Padina gymnosphora*, *Halimeda macroloba*, *Caulerpa serrulata*, *Ulva intestinalis*, and *Halimeda opuntia* of the Mandapam (Southeast coast of India) were assessed for their growth enhancing property in microalga. Further, during the present experiments, an attempt was made for the formulation of an eco-friendly and low-cost, new microalgal – culture medium with the macroalgal liquids along with the minimum quantity of chemicals and commercial fertilizers And the present artificial culture media composition included 30 different combinations (except control) of chemicals (sodium nitrate, sodium ortho phosphate) and commercial fertilizers (urea, super phosphate, ammonium sulphate) along with five macroalgal liquid extracts. The experimental results suggest that the *P. maculatum* can be successfully grown under the newly formulated MLE-medium along as compared to that of expensive whole medium. The growth (0.12 abs), biomass (2.05 g L^{-1}), chlorophyll 'a' (2.05 µg/ml), chlorophyll 'b' (1.55 µg/ml), total carotenoids (141.98 µg/ml), total fatty acids (76.82%), and total amino acids (92.56%) were found to be comparatively higher in *Ulva intestinalis* + Ammonium Sulphate (UI + AS) combined medium than through the whole medium (control) cultured *P. maculatum* cells. This study clearly underlines the prospect of using MLE as an alternative nutrients supplier to stimulate the growth of microalga that would be an important development in aquaculture feed industry.

Keywords Macroalgae liquid extract · Microalgae · Commercial fertilizers · Fatty acids · Amino acids · Proximate compositions

Introduction

The aquaculture food production sector is getting increased attention of late, and its production rate has augmented from 1 to 51.7 million tons during the early twenty-first century (Food FA 2011). The culture fisheries industry, with its cost effective and innovative technology, has the potential to fulfil the nutritional requirements of the teeming millions of populations. The recent estimate show that the aqua-food requirement rate would increase up to 80 millica tons during 2030s and the existing technologies may not be sufficient enough to achieve that target. Selection of suitaole live feeds for finfish and shellfish culture is a serious concern towards the attainment of maximum survival and weight gain of culture organisms. Generally, the planktonic crustaceans like copepods are considered to an important of live feed as they exhibit various sizes and a huge quantity of fatty acids, and their naturally synthesized pigments like carotenoids and astaxanthin would support the highest survival and proximate composition accumulations in the larvae of fin and shellfishes (Ananthi et al. 2011). Among the phytoplankters, the microalgae have been invariably used as live feed either directly and indirectly for higher trophic level organisms

Highlights
- Macroalgae liquid extracts exhibit the strongest effect on the growth and proximate composition improvement in the tested microalga.
- Picochlorum maculatum produced up to 76.82% and 92.56% FA and AA respectively.
- Commercial fertilizer combined MLE exerted better growth output as compared to the ACM chemicals included MLE.

K. Akalya and S.Dinesh Kumar are contributed equally to this work.

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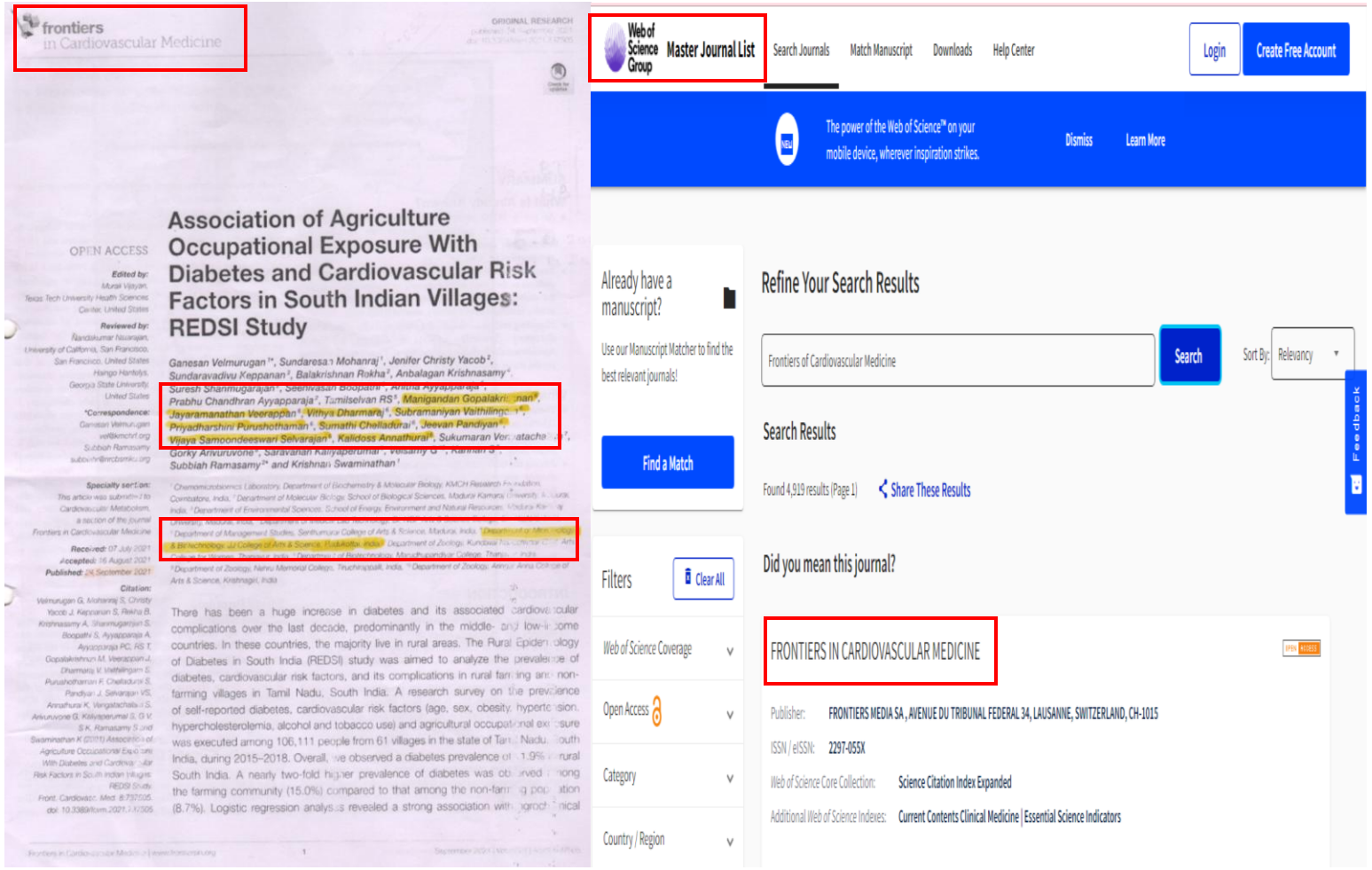

frontiers in Cardiovascular Medicine

ORIGINAL RESEARCH

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Association of Agriculture Occupational Exposure With Diabetes and Cardiovascular Risk Factors in South Indian Villages: REDSI Study

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There has been a huge increase in diabetes and its associated cardiovascular complications over the last decade, predominantly in the middle- and low-income countries. In these countries, the majority live in rural areas. The Rural Epidemiology of Diabetes in South India (REDSI) study was aimed to analyze the prevalence of diabetes, cardiovascular risk factors, and its complications in rural farming and non-farming villages in Tamil Nadu, South India. A research survey on the prevalence of self-reported diabetes, cardiovascular risk factors (age, sex, obesity, hypertension, hypercholesterolemia, alcohol and tobacco use) and agricultural occupational exposure was executed among 106,111 people from 61 villages in the state of Tamil Nadu, South India, during 2015–2018. Overall, we observed a diabetes prevalence of 1.9% in rural South India. A nearly two-fold higher prevalence of diabetes was observed among the farming community (15.0%) compared to that among the non-farming population (8.7%). Logistic regression analysis revealed a strong association with agrochemical

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ANTI-DIABETIC ACTIVITIES OF ISOLATED COMPOUND BETA-SITOSTEROL FROM THE ETHANOLIC EXTRACT OF STEM OF *ANDROGRAPHIS ECHIOIDES*

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Keywords:

Andrographis echioides stem, betasitosterol, Anti-oxidant activity, alpha amylase and alpha glucosidase inhibitory activity

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ABSTRACT: To study the anti-oxidant and anti-diabetic activities of isolated compound beta-sitosterol from the ethanolic extract of stem of *Andrographis echioides* under the *in-vitro* model. The isolation was done using column chromatography using gradient elution with different mobile phases. Structural elucidation was carried out on the basis of spectral analysis. Anti-oxidant activity was determined by 2,2-diphenyl-1-picrylhydrazyl scavenging assay. The anti-diabetic activity was evaluated by the inhibitory potential of isolated compound beta-sitosterol against alpha-amylase and alpha-glucosidase assays. The study revealed that the beta-sitosterol exhibited significant α-amylase (58.57±0.29) and α-glucosidase (43.85±0.032) inhibitory activities respectively and well compared with standard acarbose drug. The beta-sitosterol showed the best scavenging activity (74.46±0.036) against the tested radicals like 1,1-diphenyl-2-picrylhydrazyl, The infra-red spectrum specific absorption bands for beta-sitosterol *viz*: 3427.78 cm^{-1} (O-H stretching.); 2937.40 cm^{-1} (aliphatic C-Hstretching); 1640.58 cm^{-1} (C=C absorption peak); other absorption peaks includes 1464.31cm^{-1} (CH_2); 1381.56 cm^{-1} (OH def), 1054.11 cm^{-1} (cycloalkane) and 800.97 cm^{-1}. Structural elucidation of beta-sitosterol was done by spectrum analysis such as 13C and 1H depth nuclear magnetic resources. Therefore, it is concluded that beta-sitosterol is a potential source for natural anti-oxidant and anti-diabetic compounds and could have potential use in the management of diabetes mellitus.

INTRODUCTION: Diabetes mellitus is a chronic metabolic disorder, and it also affects the metabolism of carbohydrates, protein, and fat. The main reason is the production of the low amount of insulin by pancreas [1]. Type I diabetes occurs due to low amount of insulin production by β cells, while type II diabetes occurs due to β cell dysfunction [2].

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Diabetes mellitus type 1 and type 2 are associated with microvascular complications and macro-vascular complications. Microvascular complications: Hyperglycemia and hypertension is the major reason for microvascular complications. Diabetic nephropathy is the leading cause of mortality [3, 4].

The enzymes alpha-glucosidase are responsible for the breakdown of oligo- and disaccharides to monosaccharides. α -amylase and α- glucosidase inhibitors is useful for lowering the process of glucose absorption and decreases glucose level in blood [5, 6]. Diabetes mellitus patients suffer from a high blood sugar level, unusual thirst, frequent

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ORIGINAL PAPER

Gibberellic acids promote growth and exopolysaccharide production in *Tetraselmis suecica* under reciprocal nitrogen concentration: an assessment on antioxidant properties and nutrient removal efficacy of immobilized iron-magnetic nanoparticles

A. Prathipa[1] · G. Manigandan[3] · S. Dinesh Kumar[2] · P. Santhanam[2] · P. Perumal[2] · N. Krishnaveni[2] · K. Nanthini Devi[2] · S. Vijayalakshmi[3]

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Abstract
The present study was aimed to assess the effect of gibberellic acids to enhance the growth, biomass, pigment, and exopolysaccharides production in *Tetraselmis suecica* under reciprocal nitrogen concentrations. For this study, the seven types of experimental media (N-P, NL-P/2GA3, N0-P/2GA3, NL-P/4GA3, N0-P/4GA3, NL-P/6GA3, and N0-P/6GA3) were prepared with the addition of gibberellic acids under various nitrogen concentrations. The experiment lasted for 15 days and the cell density, biomass, chlorophyll 'a', and exopolysaccharides (EPS) concentration of *T. suecica* were estimated for every 3 days. Then the EPS was subjected to the analyses of chemical (carbohydrate, protein, sulfate, and uronic acid), and antioxidant activity. In addition, nutrient removal efficiency was evaluated using different concentration of EPS. The highest DPPH (2,2-diphenyl-1-picrylhydrazyl) (86.7 ± 0.95%) and hydroxyl radical activity (85.7 ± 2.48%) were observed at the EPS concentrations 2.5 and 1.2 mg/mL, respectively. The immobilized magnetic Fe_3O_4–EPS (ferric oxide–exopolysaccharides) nanoparticles (5.0 and 10.0 g/L) have efficiently removed the excessive phosphate (89.5 ± 1.65%) and nitrate (73.5 ± 1.72%) from the *Litopenaeus vannamei* cultured wastewater. Thus, the application of gibberellic acids combined with limited nitrogen concentration could produce higher EPS that could exhibit excellent antioxidant activity, and nutrient removal efficacy in the form of Fe_3O_4–EPS magnetic nanoparticles.

Keywords Exopolysaccharides · *Tetraselmis suecica* · Antioxidant activity · Nitrogen starvation · Fe_3O_4 · EPS · Nutrient removal

Introduction

The microalgae being single-cell organisms, it is tough task for them to convert the inorganic compounds like CO_2, N_2 and phosphate in to valuable biomass of high value products like pigments, lipids, and EPS, through autotrophic process. An innovative research approach on microalgae resulted in day to day increase in conversion rate with high biomass and compounds like pigments, exopolysaccharides (EPS) with the help of CO_2, N, and P (Villay et al. 2013; Reshma et al. 2021). The ratio of EPS in microalgae is being dominant extracellular one than the other contents. The EPS are tightly linked with the algal cell wall and is constructed by biological macromolecules that are secreted by microalgae. Mostly, they are protecting algal cells from the toxic substances of the surrounding habitats (Xiao and Zheng 2016). Also, their

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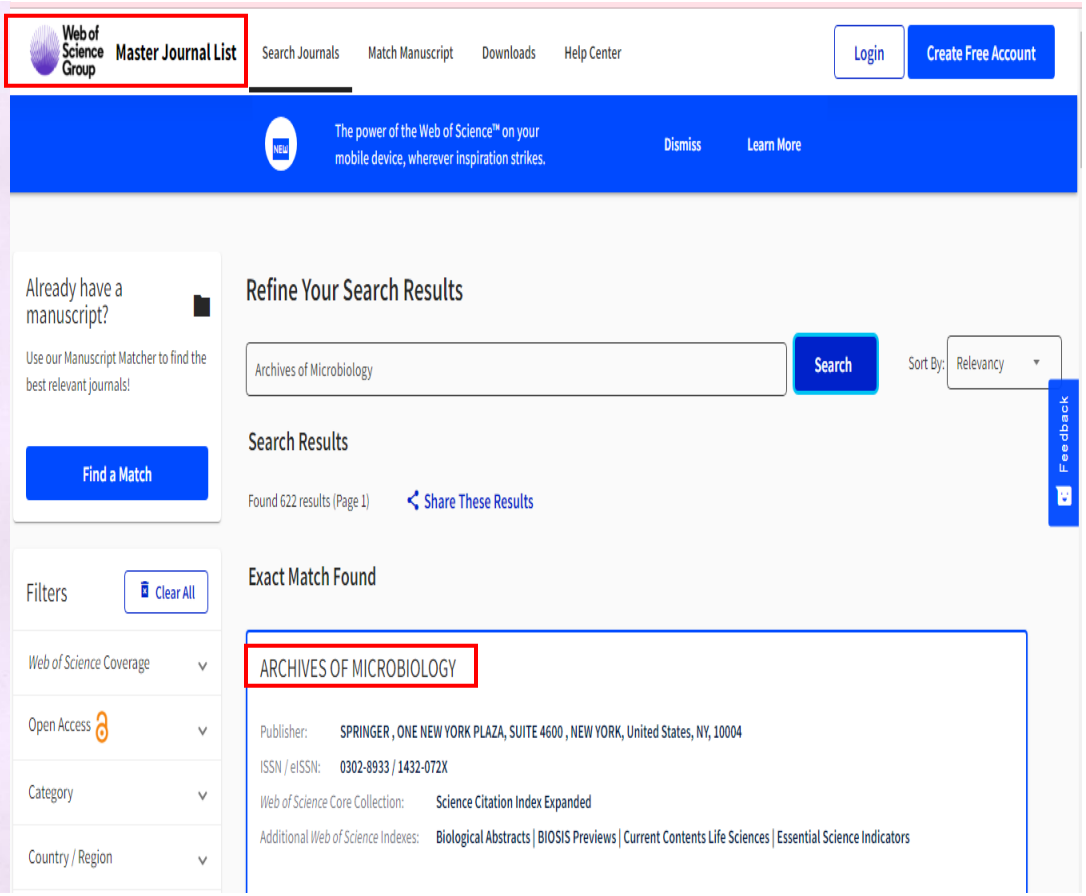

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Research Article

Isolation and Identification of Multiple Drug Resistant Bacterial Pathogens from Well Water Samples in and Around Wolaita Sodo Town, Southern Ethiopia

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Abstract

Water for human consumption is required to be free from any bacteria that might pose a health risk. The worldwide prevalence of pathogen contamination is a serious concern, and enhancing the understanding of major pathogen sources and their significant impacts on water resources is crucial. Further, these organisms underwent multiple drug resistance in their systems. The present study mainly focused on Multiple Drug Resistant (MDR) bacterial pathogens in well water system in and around Wolaita Sodo Town. A total of 380 well water samples were collected and screened for SPC, enrichment process and selective media isolation. Further all the isolates were used to know the sensitivity/resistant patterns by Bauer-Kirby method and based on resistant pattern MDR isolates were assessed and recorded. Amon 380 well water samples screened for water potability by SPC method, 154 samples were positive. Among 154 SPC positive water samples yielded 106 different isolates of bacteria and it includes five genera, namely *Escherichia coli*, *Salmonella* spp., *Shigella* spp., *Proteus* spp. and *Enterococcus* spp. All the isolated five genus were confirmed by preliminary characters, colony morphology and biochemical tests. Among 106 isolates, 13 isolates of *E. coli*, 3 isolates of *Salmonella* spp., 21 isolates of *Shigella* spp., 9 isolates of *Proteus* spp., and 4 isolates of *Enterococcus* spp. were documented as MDR bacterial pathogens. The high prevalence rate of multiple drug resistant bacterial pathogens in the well water samples could potentially pose a threat to people consuming this water. Therefore, the present study suggesting to monitor the quality of water and strict quality control measures should be put in place to ensure the effective treatment of drinking water.

Keywords: Water samples, Standard Plate Count, Antibacterial Susceptibility Test and MDR

INTRODUCTION

Water is a natural resource and is essential to sustain life. Accessibility and availability of fresh clean water does not only play a crucial role in economic development and social welfare, but also it is essential element in health, food production and poverty reduction.[1] Water helps to maintain the moisture of internal organs of the body; maintains normal volume and consistency of fluids such as blood and lymph; regulates body temperature; removes poisons or toxins from the body through, urine sweat and breathing; and is essential for regulating the normal structure and function of the skin.[2] Around 700 million people suffer from lack of access to clean and safe water and 2.2 million people die from water-borne diseases every year globally. Infants are the most vulnerable targets of these diseases.[3] The problem is even severe in developing countries where generally the drinking water is untreated. Bacteria constitute one of the major contaminants of water and they have been reported to persist even in the extreme environmental conditions and oligotrophic conditions.[4]

Diseases related to contamination of drinking water constitute a major burden on public health. The principal risk to the health is from ingestion of water contaminated with faeces containing pathogens that cause infectious diseases such as cholera and other diarrhea diseases, dysenteries and enteric fevers.[5] As a result, water related diseases continue to be one of the major health problems globally.[6] It is estimated that globally 80% of all illnesses are linked to use of unsafe and microbiologically poor water quality.[7,8] Increase in antibiotic resistance level is now a global problem. Infections with antibiotic resistant bacteria make the therapeutic options for infection treatment, extremely difficult or virtually impossible in some instances.[9]

Antibiotic resistance is not only found in pathogenic bacteria but also in environmental organisms inhabiting terrestrial and aquatic habitats. Higher numbers of resistant bacteria occur in polluted habitats compared with unpolluted habitats, indicating that humans have contributed substantially to the increased proportion of resistant