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Editorial

We are delighted to extend a warm welcome to all participants attending the International Conference 2024 on 18th – 19th December 2024. This conference provides a vital platform for researchers, students, academicians, and industry professionals from all over the world to share their latest research results and development activities in multidisciplinary fields. It offers delegates an opportunity to exchange new ideas and experiences, establish business or research relationships, and explore global collaborations.

The proceedings for International Conference 2024 contain the most up-to-date, comprehensive, and globally relevant knowledge across various disciplines. All submitted papers underwent rigorous peer-reviewing by 2-4 expert referees, and the papers included in these proceedings were selected for their quality and relevance to the conference. We are confident that these proceedings will not only provide readers with a broad overview of the latest research results but also serve as a valuable summary and reference for further studies.

We are grateful for the support of many universities and research institutes, whose contributions were vital to the success of this conference. We extend our sincerest gratitude and highest respect to the professors who played an important role in the review process, providing valuable feedback and suggestions to authors to improve their work. We also appreciate the efforts of the technical program committee, reviewers, and authors for their dedication.

Since October 2024, the Organizing Committee has received more than 55 manuscript papers, covering various aspects of multidisciplinary research. After review, approximately 17 papers were selected for inclusion in the proceedings of International Conference 2024.

We thank all participants for their significant contribution to the success of the conference. Our gratitude extends to the keynote speakers, individual speakers, technical program committee, reviewers, and the organizing committee for their efforts in making this conference a reality.

Acknowledgement

The International Conference 2024, was successfully held in 18th – 19th December 2024. We extend our heartfelt gratitude to our colleagues, staff, professors, reviewers, and members of the organizing committee for their unwavering support in making this conference a success.

We would also like to thank all the participants who traveled far and wide to attend this conference and those who attended the event virtually, making it a truly global event. This conference provided a platform for students, professionals, researchers, and scientists to share their latest research and developments in various disciplines.

The aim of the conference was to promote research and development activities and to encourage scientific information exchange between researchers, developers, professionals, students, and practitioners from all around the world. Once again, we thank everyone who contributed to making this conference a resounding success.

Dr. JenniIrani Mithra
Director
World Academics (WA)

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Abstract

Integrating SERVQUAL, QFD, and IPA for Enhancing Hotel Service Quality: A Case Study of a Hotel, Oman

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Abstract:

As global tourism continues to surge, the hotel industry faces heightened competition where delivering superior service quality is essential for retaining customers and expanding market share. This study aims to assess and enhance service quality at Citadines Hotel in Oman by integrating three powerful methodologies: SERVQUAL, Quality Function Deployment (QFD), and Importance-Performance Analysis (IPA).

A SERVQUAL-based survey was administered to 30 guests who stayed at the hotel for at least one night, capturing their perceptions and expectations across five service dimensions: tangibles, reliability, responsiveness, assurance, and empathy. The Wilcoxon signed-rank test was applied to identify significant gaps between customer expectations and actual service experiences.

To further explore the impact of each service dimension on overall satisfaction, regression analysis was conducted, offering insights into their relative importance. Additionally, QFD and IPA were employed to translate customer feedback into actionable improvement strategies, pinpointing critical service areas that require enhancement.

The study demonstrates a structured, data-driven approach to refining hotel services, empowering management to align their offerings with customer needs. SPSS software was utilized for data analysis, ensuring accuracy and reliability. This integrated framework provides a strategic roadmap for continuous service improvement, enhancing guest satisfaction and competitiveness in the dynamic hospitality market.

Keywords:

Hotel Service quality, Customer Satisfaction, SERVQUAL, Quality Function Deployment, Importance-Performance Analysis.

An Analysis of Public Perceptions of the Development of a Sea-Based Aquaculture Development Zone within Algoa Bay, Eastern Cape, South Africa

Stephen Hosking
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Abstract:

This paper assesses public perceptions on the economic merit of establishing substantial offshore aquaculture industry in Algoa Bay. It finds it to be problematic that finfish farming enterprise at two locations within Algoa Bay has not been recommended on the grounds that the public think they have the potential to cause significant economic losses. It reports an assessment that indicates the relevant public perceive there to be economic merit and demerit, so they are required to make a trade-off. It concludes that this assessment finds public perceptions favoured the approval of finfish farming projects at the two locations. It recommends that the Department of Forestry, Fishing and the Environment revisit the restricted approval they have granted for finfish farming at the two locations.

Application of Possibility Theory to the Possibility Markov Transfer Matrix in Waves

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President, Analog Image Technology Development Laboratory, Japan

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President, MILAI Technologies, Inc., Japan

Kazuyuki Matsumoto
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Abstract:

We propose that an isosceles triangular-type possibility system distribution is employed to map/change from the analog waves to the real waves, making the full use of Zadeh's extension principle of mapping. Furthermore, we show that the actual waves follow a Gaussian process, and the system could be efficiently controlled via Monte Carlo simulation. However, due to the several uses of fuzzy OR logic in the extension principle of mapping and many compositions for real waves, the resulting ambiguity increases significantly. To address this issue, a Possibility Markov Chain is proposed, incorporating possibility theory to mitigate the explosion of ambiguity. In this study, we propose a novel modeling approach that utilizes a possibility transition matrix without relying on fuzzy OR logic, based on the possibility theory. Additionally, we introduce the Sea-Control Algorithm, which artificially introduces system error into the system function, thereby enabling modification of the possibility transition matrix through the deliberate manipulation of possibility information within the fuzzy system.

Keywords:

Possibility Theory, Analog Gaussian Process, Vague Event.

Integrating Mindfulness in Modern Education: A Case Study on Boosting Cognitive and Emotional Growth in EFL University Students"

Faiza Haddam Bouabdallah
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Abstract:

Education has always been a driving force for individual development and societal progress. However, today's learners face numerous challenges, including difficulties maintaining focus, managing stress, and coping with emotional issues that impede their learning. Innovative approaches like mindfulness—characterised by awareness and attentiveness to the present moment—are emerging as potential solutions to create supportive learning environments. This study aimed to investigate the impact of mindfulness practices on improving learners' cognitive abilities and emotional well-being. The research objectives were to assess how these practices can enhance intellectual skills and emotional health and to explore the influence of factors such as age, culture, and the duration of practice on their effectiveness. An exploratory study was conducted with EFL students participating in university clubs at Abu bekr Belkaid University of Tlemcen. Both qualitative and quantitative methods were employed, including an online questionnaire for students and semi-structured interviews with teachers and club leaders. The findings, analysed through qualitative and quantitative lenses, underscored the importance of incorporating mindfulness practices into education. Insights from teachers, club leaders, and students emphasised the positive effects of these techniques on enhancing cognitive abilities and emotional well-being across various ages and cultures.

Keywords:

Modern Education – Mindfulness – Cognitive abilities – Well-being.

Small-Scale Mining and Heavy Metal Concentration in Manso Adubia in the Amansie South District, Ghana

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Abstract:

Small-scale mining is a significant economic activity in many developing countries but poses severe environmental and health risks. A key consideration that has eluded the attention of emerging literature on the subject is the increasing concentration of heavy metals in the soil. Using a mixed-methods approach (i.e. Atomic Absorption Spectroscopy, and qualitative interviews), to gather data on soil and plant samples from fresh mining sites, abandoned mining sites, and a control field with no mining history, this study examined the impacts of small-scale mining activities on heavy metal concentrations in soils and crops in Manso Adubia, Ghana, with particular focus on fresh and abandoned mining sites. The key findings revealed high concentrations of Fe, Pb, and Cd across all sites, with levels exceeding WHO/FAO permissible limits. The findings also showed that crops grown on mined soils also contained heavy metals above safe thresholds, except for Cu, which remained within acceptable limits. The findings underscore the urgent need for policy interventions, including training miners on sustainable practices such as reforestation and pit reclamation. Public health measures and soil remediation strategies are also recommended to mitigate the adverse effects of heavy metal contamination on agriculture and community well-being.

Keywords:

Small-scale mining, heavy metal contamination, soil pollution, crop safety, environmental health.

TSPO Ligand YL-IPA08 Promotes Brain Recovery Post-Stroke by Inhibiting Microglia-induced Neuroinflammation

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Abstract:

Microglia activation plays a pivotal role in the progression of ischemic stroke by driving neuroinflammation and a cascade of pathological events. However, effective targets for regulating neuroinflammation in the acute phase following stroke remain unidentified. By integrating single-cell RNA sequencing (scRNA-seq) and spatial transcriptomics (ST) data, we found that the expression of translocator protein (TSPO) was elevated in activated microglia within the peri-infarct area of stroke model mice. In this study, we demonstrate that the TSPO ligand YL-IPA08 reduced the volume of brain infarction and promoted the recovery of cognitive and motor functions in stroke model mice. Experimental results show that YL-IPA08 administration inhibited microglial and astrocyte activation, repaired the blood-brain barrier, and enhanced neuronal plasticity. Collectively, these findings suggest that YL-IPA08 holds promise as a therapeutic agent for ischemic stroke by targeting TSPO.

Keywords:

TSPO, YL-IPA08, microglia, scRNA-seq, ischemic stroke

Engagement of KMO in Circular RNA SCMH1-Regulated Mitophagy and Functional Recovery Following Stroke

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Abstract:

Metabolism dysfunction is considered a key event after ischemic stroke. However, the role of circular RNA SCMH1 (circSCMH1) in promoting post-stroke repair by regulating metabolism remains to be

elucidated. In this study, we investigated the effect of circSCMH1 on the kynurenine pathway, which is the major pathway of tryptophan metabolism. Kynurenine 3-monooxygenase (KMO) is a key enzyme in kynurenine metabolism. Specifically, we found that circSCMH1 regulated the kynurenine pathway after cerebral ischemia and promoted mitochondrial fusion. Mechanistically, CircSCMH1 bound to STAT5B and inhibited its translocation to the nucleus, resulting in decreased Kynurenine 3-monooxygenase (KMO) expression, a key enzyme in kynurenine metabolism. Our data demonstrated that circSCMH1 enhanced mitochondrial fusion and inhibited mitophagy after stroke via STAT5B-regulated KMO, providing insight into the mechanism by which circSCMH1 promotes stroke recovery.

Keywords:

Ischemic stroke, KMO, microglia reactivity, mitophagy, STAT5B

The Balkan-Egyptian Identity Catching the Waves and Bursting the Rifle

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Abstract:

Egyptians referring to Rubin Zemon *Socio-Cultural Anthropology of Egyptians in the Balkans (* Dukagjini, Pejë, 2013*pg.55) have strong ideologies and weak pragmatics for maintaining *WE* which means they are *Inside Others for the dominant communities in the Balkans. Their in-group has no other *insiders, being the *identity of the commitment of the community where they are part of and are an adequate ethnic reality.

From the interviews we conducted in ten Egyptian families in the city of Elbasan during the period of April 2018, 11 families made has married among their community, one Egyptian has married with a Roma woman, another family, an Egyptian woman has married with an Egyptian-mulat mixed with white arvanitas father, Egyptian mother, and three white men has married with Eguptian womans.

Their memory of the origin of their ancestry time remains in the Egyptian ethnonym, in the way of life, work skills and ethnoculture that distinguish them from others, but also in their inner consciousness that is half asleep.

This half-sleeping consciousness comes to us from the Day of Waves, which is characteristic of the Egyptians of Albania and which coincides with every of May 6. According to the legend narrated by the Egyptians woman *Hane Cani, 72 years old, and Bardhyl Maloku, 63 years old, the Egyptians get up at midnight or early in the morning as soon as the dawn breaks and they rush to the coast usually, and when they are away from it to the *riverbanks jumping in with all their clothes and praying to *break the spell *to wash away the sins of the past year, *to throw them into the sea all the misfortunes that have passed and pray for wishes, for work, joys and a better life.

This annual rite leads us to the assumption that the Egyptians who came from the north of Africa, more precisely from ancient Egypt, must have flocked in really large groups to the Balkans via the Mediterranean Sea, whose hazy memory is associated with overcoming the waves as an annual ritual that still exists today among the Egyptians of the Balkans, especiale in Albania.

A proverb or hardened semantic group is the expression *cracks the gipsys rifle's, which comes to us in several variants such as *shoots like a gipsus's rifle, *takes fire like the gipsus's rifle *makes a lot of noise until it's nothing..etc.

The Egyptians themselves associate this expression with the day of May 6, which they usually set as a Friday or Sunday, they associate it with the day of the blooming of flowers, the emergence of leaves and the awakening or opening of the eye of the snake called Bullari and that it has been asleep all winter and in the spring it approaches the houses and in this case the jevgu shoots with a rifle to scare the snake away from the house where it lives. Another variant from the Egyptians is that on May 6, the time has come for making tiles, or baking clay for vases, bowls, pitchers, and pitchers, so the work begins and they take out rifles for the joy of work that begins in the spring with washing. of

the vegetable as a wish that the spring and summer fall would find them pure, that is, homogeneous like the ancient and glorious ethnic group.

Other people associate the expression *the rifle of the gepsy bursts with a prejudice that the Egyptians do not know how to fight, or catch fire like a straw that catches fire at once and goes out very quickly.

The methodology of this paper is the theoretical treatment of the issue of the Egyptians of the Balkans according to studies of Egyptian origin such as Rubin Zemon but also other researchers of the Balkans and beyond, the concepts and psycho-physical perceptive skills on this problem, the set of comparative methods on individual interviews and in the group of Egyptians of the Balkans.

Keywords:

Ballcan-Egjiptian, Identity, etnic minority group, the married, mix, social and culture.

Impact of Digital Technologies on Employment Patterns in Developing Economies: A Kenyan Study

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Abstract:

Digital technologies have become a defining force in the 21st century, profoundly impacting economic structures, social dynamics, and employment patterns across the globe. Digital transformation is the strategic adoption of digital technologies to improve processes and productivity, deliver better customer and employee experiences, manage business risk, and control costs. An array of complex challenges ranges from the need for employees to be technologically savvy to physical replacement of employees by technology. Therefore, this study seeks to assess the impact of digital technologies on employment pattern in developing countries, the empirical case of which is Kenya. The study employed descriptive and correlational research designs to examine the effect of the dynamics of employment patterns in developing countries amid technological innovations. The study adopted quantitative secondary data from internationally recognized sources such as, World Bank, and World Development Indicators (WDI). The study used annual time series data covering a period of 20 years spanning from 2001to 2021. Hierarchical regression analysis was done to determine the mediating effect of unemployment rate (M) on the relationship between technological innovation employment pattern in developing countries. The findings for stationarity test revealed that all the variables had unit root problem at levels where the MI, IU, and UR problem was resolved after second differencing while EP was found to be stationery at first difference and therefore, all were significant with pv<0.05 after differencing. The correlational results indicated the absence of high collinearity among the residuals. From the results, mobile internet access (MI) had a positive significant (0.6275, p<0.05) relationship with employment pattern, The (R2) value was 0.6001 showing that the independent variable included in the model explains 60% of employment pattern in developing nations. After the inclusion of unemployment as a mediator (M) the goodness of fit (R-squared) increased from 0.6001 to 0.8901, which is a high- positive effect of 29%. Considering the results and discussions that followed, it can be concluded that, there is a connection between technological innovations (mobile internet access, internet usage) and employment patterns.

Keywords:

Digital Technologies, Development Economies, Employment patterns, Kenya.

How Oligodendrocytes Precursor Cells Act in Neurocysticercosis

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Abstract:

Background: Neurocysticercosis (NCC) is a zoonotic parasitic disease caused by the larva form of pig

tapeworm Taenia solium (Ts). In this study, we look for the role played by oligodendrocyte (OLG) and oligodendrocyte precursors cells (OPC) in the pathogenesis of NCC and after reviewing this topic we formulate some hypotheses regarding to its role in the mechanism of NCC calcifications, epileptic seizures (ES), and secondary epilepsy (SEp).

Method: We searched the medical literature comprehensively, looking for published medical subject heading (MeSH) terms like "neurocysticercosis", "pathogenesis of neurocysticercosis", "comorbidity in NCC"; OR "oligodendrocytes"; OR "oligodendrocyte precursor cells (OPC/NG2)"; OR "epileptic seizures (ES)/Secondary epilepsy (SEp)/NCC" OR "oligodendrocytes (OLG)/ES/SEp"; OR "calcified NCC/OLG"; OR “OLG Ca2+.”

Results: All selected manuscripts were peer-reviewed, and we did not find publications related to OLG/NCC.

Comments and concluding remarks: We have hypothesized on the role played by OLG/OPC/NG2 on the pathogenesis of cysticerci perilesional edema, the role of OLG/OPC/NG2 on the pathogenesis of ES/SEp and calcified NCC.

Elimination of Fungi Harmful to Human Health, Inhabiting Historic Fabrics, Using a New Technique of Fogging with Ethanol and Antibiotics (Benzylpenicillin and Streptomycin)

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Abstract:

Aim: Aim of the study was to assess the biocidal efficacy of a new decontamination technique of 90% ethanol with the addition of antibiotics (streptomycin and penicillin) applied in the form of a mist on the surface of textile materials from historical objects in the collections of the Auschwitz-Birkenau State Museum in Oświęcim, Poland (A-BSM).

Materials and method: Microorganisms used for the study Alternaria alternata, Aspergillus niger, Aspergillus ochraceus, Aspergillus versicolor, Cladosporium cladosporoides, Chaetomium elatum, Mucor plumbeus, Penicillum chrysogenum, Aspergillus flavus were isolated from the surfaces of textile objects in A-BSM. A strain from the American culture collection Chaetomium globosum ATCC 6205 was also used for the study. The fungi were inoculated on solid SDA medium. Incubated for 7 days at 25°C. Suspensions of mould spores were prepared in distilled water to obtain a density above 1x106 cfu/ml. Samples of model cotton fabrics and historical fabrics were inoculated with microorganisms at a concentration of 104 CFU/ml.

A mixture of antibiotics was prepared: 0.4056 g/100 ml benzylpenicillin and 0.0512 g/100 ml strepromycin. Antibiotics in 90% alcohol solutions for testing the killing effect were applied using a VE 0707 airbrush with a pressure of 0.2 MPa and a PA HEAD VLH-5 nozzle with a tip diameter of 1.05 mm.In order to obtain more effective disinfection after the application of ethanol mist, the samples were stored in PE foil at 21oC ± 1oC for 22 ± 1h.

Result: The reduction of the number of microorganisms on modern cotton fabric and on historical fabric after the use of ethanol in the form of a mist of 90% ethanol with the addition of streptomycin and penicillin eliminated 100% of the tested 9 species of mold fungi and one species of fungus from the American Culture Collection (ATCC 6205).

Intermittent Vacuum-Assisted Closure (Vac) Therapy in Sacral Pilonidal Cysts

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Abstract:

Introduction: cyst excision Intermittent VAC therapy is quite an efficient method in treatment of surgical wounds post pilonidal cyst excision.

Methods: The study presents 21 patients treated for the period of five years. After excision, wounds were managed with intermittent VAC therapy (-125 mmHg) for 14 days, with weekly dressing changes. Granulation tissue formation, infection rates, and healing outcomes were evaluated.

Results: Intermittent therapy significantly improves granulation tissue formation and reduces the wound size without infection or fibrin deposits. Patients reported improved comfort and shorter healing period was observed.

Conclusion: Intermittent VAC therapy is a viable alternative to continuous therapy, offering enhanced wound healing and good patients' outcome.

Further studies are recommended to refine its application in pediatric populations.

The Necessity of Sharing Medical Information in the Virtual Space Regarding Congenital Git Anomalies

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Abstract:

Introduction: The development of information technologies and the expansion of the virtual space create new opportunities for the exchange of information and experience between doctors, parents, and patients. By sharing clinical symptoms, diagnoses, and treatment options online, a global community of specialists and patients is established, significantly improving access to vital information and accelerating recovery processes. This article examines the necessity and effects of sharing medical information about congenital GIT anomalies online.

Material And Methods: A smart device application has been created to provide information about congenital GIT anomalies. The app is accessible to the parents of these children and contains summarized information about the types of GIT anomalies. A survey was conducted among the parents of surgically treated patients regarding the need for sharing medical information in the virtual space.

Results: The survey conducted among parents of surgically treated children reflects their positive attitude toward sharing medical information in the virtual space. The possibility of timely access and consultation with a pediatric surgery specialist makes telemedicine a particularly preferred means of communication between doctors and patients.

Discussion: Sharing information about the condition of patients with congenital GIT anomalies online provides multiple opportunities to facilitate parents in carrying out the necessary care. The analysis of existing research and data shows that access to information and the exchange of clinical data are key factors in improving the quality of treatment.

The Flavor of Peace: Agrotourism Based on the Coffee Culture of the Town of Gaitania, Colombia

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Abstract:

In the township of Gaitania (Colombia) one of the coffees that in recent years has been highly recognized, both nationally and internationally, for its sweet and mild flavor produced in a traditional manner by farmers who have mostly associated with the purpose of generating shared value through the production of this type of coffee in their farms and plots.

Based on the qualities of this coffee from Gaitania, its traditional forms of production and the impressive mountain landscapes found in this region, the objective of this research was to analyze the challenges and opportunities for the design and implementation of an agrotourism route, based on the coffee growing culture and the resilience of the farmers of Gaitania, taking into account that this has been a territory that has suffered several periods of violence and armed conflict during the second half of the twentieth century.

Keywords:

coffee, agrotourism, Gaitania, Colombia.

The Effect of Zinc Management of Patients with Femoral Fractures

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Abstract:

Background: This study explores the impact of zinc management on nutritional status, hospital stay length, and complications in patients with femoral neck fractures.

Methods: Sixty-one patients from 2021 who did not receive zinc monitoring or supplementation formed the non-management group. In 2023, 60 patients received zinc testing, and 59 were found deficient and supplemented, forming the zinc management group (zinc levels: 53.0 ± 14.3 µg/dL at admission; 92.7 ± 21.3 µg/dL after three weeks). Outcomes measured included albumin change (ΔAlb), zinc levels, hospital stay length, and complications.

Results: Patients with greater ΔAlb showed significantly shorter hospital stays ($p = 0.002$). Although zinc management showed a trend toward improved nutritional outcomes compared to non-management, the interaction effect was not statistically significant ($p = 0.161$). Zinc supplementation reduced hospital stays by 3.7 days, but this was not significant ($p = 0.402$). Complications such as urinary tract infections and aspiration pneumonia extended stays by 10.9 days ($p = 0.003$).

Conclusion: Zinc management may support improved albumin levels and nutritional status. However, further research with larger samples is needed to clarify the role of zinc management and its interactions with other factors on patient outcomes.

Influence of the Quantity of Natural (Alfa) and Commercial (Polypropylene) Fibers on the Physico-Mechanical Properties of Mortars

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Abstract:

In order to enhance the value of natural alfa fibers, abundant in Algeria, these fibers were used to replace commercial fibers, which have a very high cost and which influence the cost price of the finished product.

The main objective of this work is to make a comparative study on mortars made from different types of fibers such as: mechanically and chemically extracted alfa fiber with artificial fiber (polypropylene) whose percentages vary from 0.5%; 1%; 1.5% and 2% of the mass of the cement, for each fiber in order to know the influence of the fiber rate (natural and commercial) on the physico-mechanical and physical properties of fiber mortars. The results obtained show that the performance of fiber mortars is improved by the incorporation of fibers for an optimal fiber percentage of 0.5% for polypropylene fibers, 1% for chemically treated fibers and 2% for mechanically treated alfa fiber with resistances (46.41MPa) to compression and (4.99MPa) to bending. This study also allows us to conclude that the fibers extracted by mechanical treatment are much more suitable for the manufacture of fiber mortars.

Keywords:

fiber mortar, alfa fiber, polypropylene fiber, mechanical resistance chemical and mechanical treatment.

Diversity of Actinobacteria in Thermal Waters of Eastern Algeria: An Unsuspected Source of Hydrolytic Thermoenzymes

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Abstract:

Actinobacteria are highly sought after because of their ability to produce different biomolecules with multiple interests. Research on these bacteria in extreme ecosystems has long been neglected, in favor of soils and waters, which offer limited biodiversity (Hayakawa et al., 2000; Katleen et al., 2005). More recently, researchers have focused on the least explored habitats in order to isolate innovative species that can offer interesting metabolic capabilities, which can be used in all sectors of biotechnology, like biodegradation of pollutants and bioremediation of hot ecosystems. In this work, the presence of actinobacteria was highlighted for the first time in the thermal waters of eastern Algeria. In these waters, 69 actinobacteria were selected and identified by sequencing their 16S rRNA genes. The majority of these bacteria (82%) belong to the genus Streptomyces. Les autres genres isolés sont Rhodococcus, Thermoactinomyces, Ghordonia et Rhathayibacter. The majority of isolates showed the ability to produce heat-resistant hydrolytic enzymes such as cellulases, xylanases, lipases and proteases. To our knowledge, this is the first time that this result has been described for actinobacteria in thermal waters. These innovative investigations deserve, in our opinion, to be continued.

Keywords:

Actinobacteria, hot spring, enzymes, biotechnology.