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OF ABSTRACT

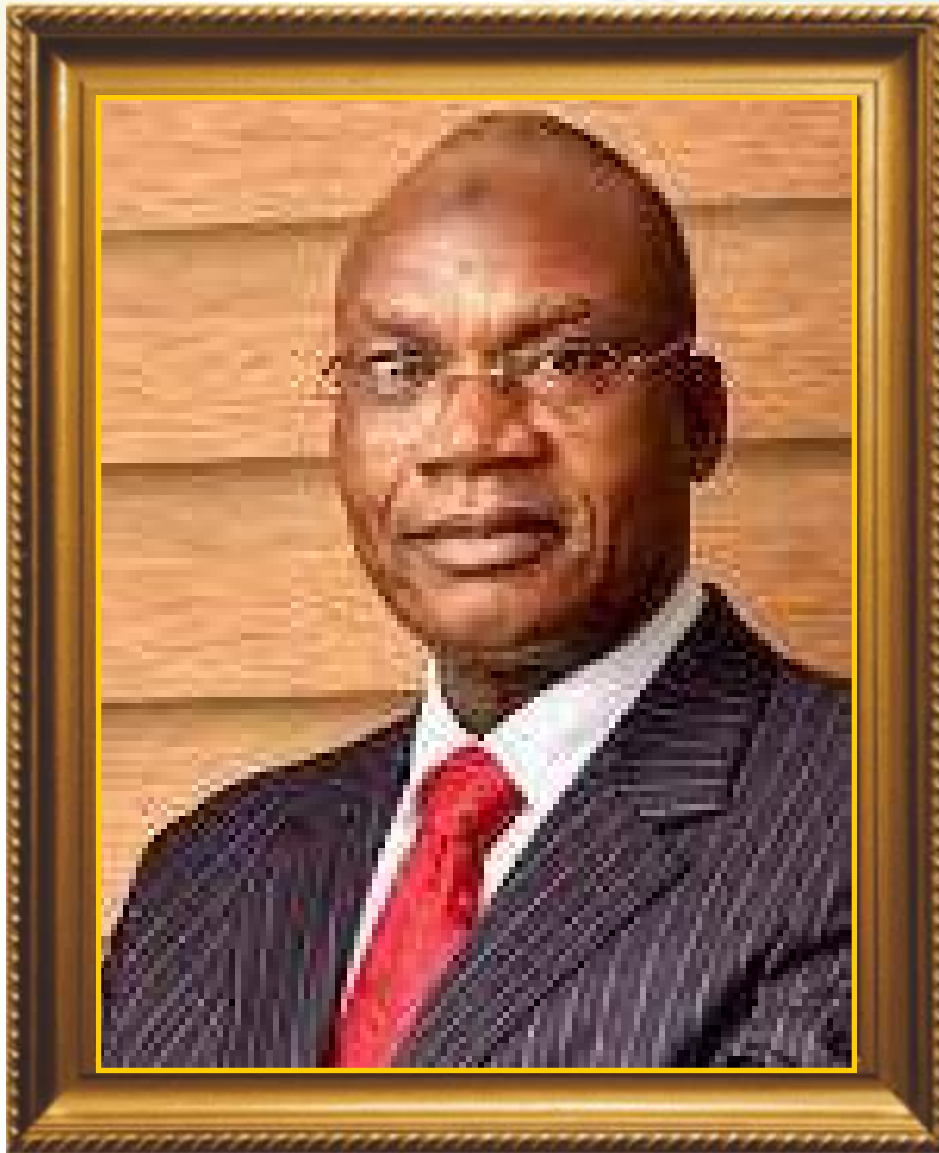FEDERAL UNIVERSITY DUTSIN-MA, KATSINA STATE, NIGERIA

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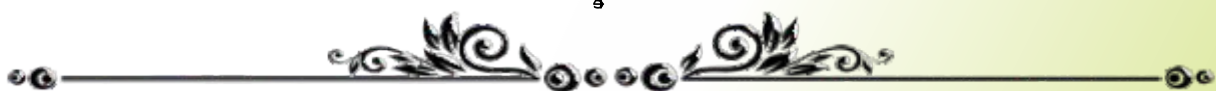
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SECTION A

AGRICULTURE/AGRO/ALLIED APPLICATION/FOOD SAFETY AND SECURITY

A1

EMERGING ISSUES ON GENETICALLY MODIFIED FOODS IN NIGERIA: RISKS AND PUBLIC ACCEPTANCE

Rukaiyat Lawal Mashi, Jamila Yahaya Lawal and Auwalu Jalo

Federal College of Education Katsina

Abstract

Genetically Modified (GM) foods today have generated wide controversies, concerns, interest and debate both in developed and developing Nations of the world with fairly sufficient food supplies. Consumers now display misconceptions, limited knowledge, and even unfamiliarity with GM food products. Genetic modification is a special set of gene technology that alters the genetic machinery of such living organisms as animals, plants or microorganisms. Combining genes from different organisms is known as recombinant DNA technology and the resulting organism is said to be 'Genetically modified (GM)', 'Genetically engineered' or 'Transgenic'. The principal transgenic crops grown commercially in field are herbicide and insecticide resistant soybeans, corn, cotton and canola. Other crops grown commercially and/or field-tested are sweet potato resistant to a virus that could destroy most of the African harvest, rice with increased iron and vitamins that may alleviate chronic malnutrition in Asian countries and a variety of plants that are able to survive weather extremes. There are bananas that produce human vaccines against infectious diseases such as hepatitis B, fish that mature more quickly, fruit and nut trees that yield years earlier and plants that produce new plastics with unique properties. Technologies for genetically modifying foods offer dramatic promise for meeting some areas of greatest challenge for the 21st century. Like all new technologies, they also pose some risks, both known and unknown. Controversies and public concern surrounding GM foods and crops commonly focus on human and environmental safety, labelling and consumer choice, intellectual property rights, ethics, food security, poverty reduction and environmental conservation. With this new technology on gene manipulation what are the risks of "tampering with Mother Nature"?, what effects will this have on the environment?, what are the health concerns that consumers should be aware of? and is recombinant technology really beneficial? This review will also address some major concerns about the safety, environmental and ecological risks and health hazards involved with GM foods and recombinant technology.

Keywords: Genetically Modified Foods, Genetic Engineering, Emerging Issues

A2
AN ASSESSMENT OF RAINFALL VARIABILITY AND TRENDS IN WUKARI, NIGERIA FROM 1981 TO 2021

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Taraba State, Nigeria.

Abstract
This study assessed the trends and variability of rainfall in Wukari, Nigeria, from 1981 to 2021, using the ECMWF ERA5 reanalysis data sets. Rainfall trends and variations over the study period were analyzed using Mann Kendal trend test and the Theil Sen slope estimator. The assessment of monthly rainfall variation for the rainy months (May-October) showed an increasing trend for August, September, and October, with August having the highest increasing trend of magnitude 0.051mm/month. The result also showed an encroachment of the dry spell towards the rainy season and vice versa. This will create a variation in the onset of rainfall and cessation in the coming decades, which will affect the farming season in Wukari in terms of the planting and harvesting time of crops. The rainfall pattern revealed a periodic trend on a decadal basis, with an increasing trend followed by a decreasing trend in the next decade. Based on the trend pattern, an increasing trend in rainfall amount is expected in the next decade (2021-2030) Therefore, it is recommended that Government Agencies and stakeholders in the agriculture sector should be proactive in educating/enlightening farmers on the likelihood of a change in the farming season and make adequate preparation to mitigate the effect of flooding in the area.

Keywords: Rainfall trend; rainfall variation; climate change; climate change impact; rainfall variability

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A3
POLYAROMATIC HYDROCARBONS (PAH) AND TOXIC METALS IN SPICES AND CONDIMENTS IN SUB-SAHARAN AFRICA: A REVIEW

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Abstract
Polyaromatic hydrocarbons (PAH) and toxic metals are environmental contaminants of growing concern due to their potential health risks, particularly when ingested through food. This abstract provides an overview of the presence of polyaromatic hydrocarbons and toxic metals in spices and condiments in Sub-Saharan Africa, highlighting the need for
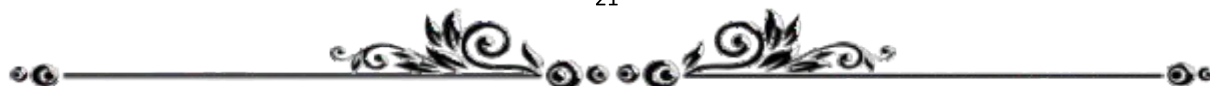
comprehensive assessment and monitoring of these contaminants to safeguard public health. Spices and condiments are essential ingredients in the cuisine of Sub-Saharan Africa, adding flavour, aroma, and nutritional value to various dishes. However, the increasing industrialization and urbanization in the region have raised concerns about the quality and safety of these culinary essentials. PAHs, a group of organic compounds formed during incomplete combustion or pyrolysis of organic materials, are known to be present in various food products, including spices and condiments, as a result of traditional cooking practices, open fire cooking methods, and contamination during storage and processing. Furthermore, toxic metals such as lead, cadmium, and mercury are known to contaminate the environment through industrial activities and can accumulate in food products. This study underscores the potential health hazards associated with the ingestion of spices and condiments contaminated with PAHs and toxic metals, including neurotoxicity, carcinogenicity, and adverse effects on reproductive and developmental health. To address these concerns, studies and investigations into the levels of PAHs and toxic metals in spices and condiments from different regions within Sub-Saharan Africa are essential. Comprehensive analytical techniques, such as gas chromatography-mass spectrometry (GC-MS) and inductively coupled plasma mass spectrometry (ICP-MS), have been employed to quantify the concentrations of these contaminants in various food samples. This study also explores the potential sources of contamination, including soil, water, air, and storage conditions, which can contribute to the presence of PAHs and toxic metals in spices and condiments. It emphasizes the need for regulatory measures and guidelines for safe levels of these contaminants in food products and calls for enhanced awareness and education about proper food handling and storage practices among consumers, food vendors, and producers. In conclusion, the presence of polyaromatic hydrocarbons and toxic metals in spices and condiments in Sub-Saharan Africa poses significant health risks to the population. This study underscores the importance of continuous monitoring, regulatory measures, and public awareness to ensure the safety and quality of these essential food items. Further research is necessary to provide a more comprehensive understanding of the extent and sources of contamination, enabling the development of effective mitigation strategies to protect public health.

Keywords: Sub-Saharan Africa, PAH, GCMS, Spices and Condiments

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A4 URANIUM AND THORIUM CONTAMINATIONS OF BAOBAB LEAVE POWDER CONSUMED IN SELECTED LOCATIONS OF KATSINA STATE, NORTH WEST NIGERIA

Anakor, P. C. and Joseph, E.
Federal University Dustin-Ma

Abstract
The need to know the level of contamination of radioactive elements, especially uranium and thorium, in the common foods we eat particularly the Baobab leave powder is highly

significant due to their detrimental health effects. The presence of uranium and thorium in significant concentrations also presents an exposure risk to populations. In this study, six (6) baobab samples were collected from Daura, Funtua, Dustin-Ma, Kankia, Katsina, and Malumfashi in Katsina State. The samples were analyzed for uranium and thorium content using Instrumental Neutron Activation Analysis (INAA). Concentration level of uranium was detected to be (0.068±0.011 mg/kg) in Daura and (0.021 mg/kg) in Dustin-Ma, while in Funtua, Kankiya, Katsina and Malumfashi, the concentrations were below detection limit. Thorium concentration was equally found to be (0.66±0.07 mg/kg) in Malumfashi, (0.54±0.07 mg/kg) in Daura, (0.43±0.06 mg/kg) in Dutsin-Ma, (0.25±0.04 mg/kg) in Kankia and (0.33±0.05 mg/kg) in Funtua. The concentration level of uranium and thorium accumulated in the baobab leave when analysed was found to be far below joint ATSDR/NIH safe limit of Uranium and Thorium intake in the human body. From this present work, we can see that the Baobab leave powder is safe for human consumption even though care should be taken to avoid contaminations.

Keywords: Uranium, Thorium, baobab

SECTION B

ALTERNATIVE GR EEN ENERGY

B1   REGULATING THE DC VOLTAGE GENERATION FROM AN ALTERNATOR DRIVEN BY EXERCISE BICYCLE USING WIND TURBINE REGULATOR

Isiyaku Abubakar, Isaac Babatunde Olaleke and Nasiru Bello Kadandani,
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Abstract
The small power generation using Exercise Bicycle is one of the current areas patronized by researchers. This is due to the two major benefits obtainable from the Exercycle machine, the benefit of exercising your body and the utilization of electrical power generated. Wind Turbine Regulator is specifically designed to regulate the output voltage of a wind turbine generator, which is characterized by varying speed and hence varying output power. The exercise bicycle driven alternator has a similarity with wind turbine generator in terms of variable speed, especially when ridden by different personalities. This research work is aimed at analyzing the performance of a designed and constructed DC generator using stationary bicycle, by regulating its output using small wind turbine regulator. The wind turbine regulator will serve two purposes in this analysis, it will eliminate the use of the diode rectifier and the use of voltage regulating circuit in the previous work. Analysis of the system shows that, a regulated output within the range of 12V is obtained for all the tested loads, which makes the system more compatible with all types of 12V DC loads. Also, the excitation voltage of the machine is improved from 4.5V in the previous case to 2.5V when the wind turbine regulator is used. With the improved power generation in this work the exercise bicycle will be a better alternative source of power which can be useful in DC lightings, DC fans, charging batteries and Laboratory experiments.

Keywords: power generation, Wind Turbine Regulator, Exercise Bicycle

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B2   THERMOGRAVIMETRIC STUDIES AND INFRARED SPECTRAL ANALYSIS OF RICE HUSK PYROLYSIS PRE-TREATED IN ACIDS

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Abstract
Thermogravimetric analysis (TGA) is a leading thermochemical conversion process to study the mechanistic information of products in energy production. This study subjected samples to acid and water washing experiments before pyrolysis. The sample of water washed is RHC, the HCl acid washed is RHL and the acetic acid washed is RAA. Pyrolysis of biomass was preferred in TGA Analyser at heating rate of 10 °C/min in a nitrogen atmosphere with flow rate of 60ml/minute, between 20 – 900 °C,. Proximate, ultimate analyses were carried out on samples to establish the level of devolatilization and moisture. Also, Infrared spectral analysis was used to investigate the effect water or

pretreatment of rice husk to examine the intensity of the absorption at functional group or finger print region. The devolatilization and decomposition pattern portrayed by TGA curves for all samples were similar but showed different peak temperatures rates. The peak temperatures of RHC, RHL and RAA were 260.85, 402.05, and 399.3 ℃, respectively an indication for decomposition of cellulose, hemicellulose and lignin. All the samples three samples: RHC, RHL and RAA, water washed, HCl acid washed and Acetic acid washed respectively, showed one strong C-C bending vibration in the finger region at 1037cm-1 with different intensity of absorption at 81.05%, 90.01% and 88.57% for RHC, RHL and RAA, respectively.

Keywords: Thermogravimetry, Infrared, Proximate, Acid, Water

B3   **PRODUCTION OF BIODIESEL FROM BAOBAB SEED OIL USING CaO/Al-MCM -41 AS A SOLID BASED CATALYST**

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Abstract
Biodiesel is a renewable, biodegradable, and non-toxic fuel that can be produced from various feedstocks. The fuel known as "biodiesel" is made up of long-chain fatty acid mono-alkyl esters that are derived from renewable sources like vegetable oils and animal fats which can overcome problem associated with fossil fuels such as its non-renewability, polluting nature and global politics dependence on petrol. In this research, biodiesel was produced from the seed oil extracted chemically using Soxhlet setup from baobab (*Adansonia digitata*) with methanol in the ratio of 6:1 (v/v) of the oil to methanol using CaO/Al-MCM-41 mesoporous structures which was confirmed by XRF analysis as solid based catalyst at optimized reaction condition of 1 g catalyst amount at 90 min and 60 ℃, the results obtained is 74 % of biodiesel. It was clear that the produced biodiesel formed was confirmed by the GC-MS analysis.

Keywords: Optimization, Fatty acid, Catalyst, Soxhlet-apparatus

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B4   **THE INFLUENCE OF DIFFERENT SOLVENTS ON THE SYNTHESIS OF REDUCED GRAPHENE OXIDE USING GREEN APPROACH**

Timothy Busayo Daramola and Isaiah Eze Igwe
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Abstract
Replacing conventional chemical reduction method to achieve reduced Graphene Oxide (rGO) with cheap, widely available, safe, environmentally friendly, and easy-to-prepare reducing agents is a key to large-scale commercial production of reduced graphene oxide. The appropriate solvent to be used for obtaining plant extract during the reduction process

is still an open research question. Herein, the influence of different solvent on the structural properties of reduced graphene oxide using the green synthesis method was investigated. The rGO obtained from plant extract (*Spondia mombin*), using warm water, cold water and ethanol was characterized by FTIR and EDX. The results confirmed the successful reduction of GO to graphene. Further findings also revealed that plant extract obtained using ethanol was most appropriate compounds for reducing and capping agent in the green synthesis and could be the preferred method for the large-scale production of graphene-based materials.

Keywords: Graphite, Graphene oxide, Reduced graphene oxide, *Spondia mombin*

SECTION C

BIOTECHNOLOGY

C1

OPTICAL CHARACTERIZATION AND PROFILOMETRIC ANALYSIS OF BORON DEPOSITED ZINC SELENIDE (ZnSe:B) THIN FILM VIA SPRAY PYROLYSIS

Q. A. Adeniji, J. A. Rabiu and Kola Odunaike
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Abstract
Zinc Selenide (ZnSe) Thin films was deposited on Soda Lime Glass (SLG) via Spray Pyrolysis Technique at varied deposition Temperature. The precursors for the films were Zinc acetate di-hydrate ($Zn(CH_3COO)_2.2H_2O$), Selenium oxide (SeO_2) and Boric acid (H_3BO_3) for Zinc and Selenide and Boron respectively. The films were deposited on glass slides at varied boron concentration from 0.1 to 0.4 at a step of 0.1. The deposited thin films were characterized using UV-VIS-NIR spectrophotometer in the wavelength range 200-1200 nm and Profilometer machine. The results of the study showed that the reflectance of ZnSe:B Thin film deposited with 0.1 boron concentration has the highest reflectance of 2% and the lowest reflectance of 0.1% was observed at 0.4 boron concentration within the wavelength trend. The transmittance of ZnSe:B thin film deposited with 0.3 boron concentration has the highest transmittance of 46 % and the lowest transmittance of 10% was observed at 0.4 mole ratio. The highest and the lowest absorbance of 90% and 52.5% were observed respectively at 0.4 and 0.3 mole ratio. The highest and lowest absorbance coefficients of 1.2×10^{13} and 0.92×10^{13} cm^{-1} were observed at 0 and 0.3 mole ratio respectively. At 0, 0.1 and 0.3 mole ratios the observed bandgaps are 3.9, 3.5 and 4.6eV respectively. The profilometric results showed the following thickness with their corresponding boron dopant concentration; (25, 25, 20, 500 and 2000 nm) at (0, 0.1, 0.2, 0.3 and 0.4 mole ratio) respectively.

Key Words: Boron concentration, Reflectance, Transmittance, Absorbance, Absorbance coefficient, Bandgap and Thickness.

C2

REPERCUSSION OF QUIESCENCE ON THE FINAL SIZE DISTRIBUTION OF SIR EPIDEMIC MODEL US ING SELLKE CONSTRUCTION

Usman Sanusi, Mas'ud Ahmed and A. Usman
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Abstract
Sellke construction is a potent technique for examining the final size distribution of infectious disease outbreaks. It has been used with other epidemic models, such as the SIR model to analyze the final size distribution of an epidemic. Majority of research that are currently available assume that the infectious period follows a defined distribution, like an exponential or gamma distribution. But in reality, depending on the illness and the person, the length of infectiousness might change. Additionally, during an out- break, some infected people might become quiescent (i.e., the parasite become inactive and theretofore the

patient is momentarily non-infectious) . It is unclear how pathogen quiescence affects the final size distribution of an epidemic. In this study, we build a Susceptible-Infected-Quiescence-Recovered (SIQR) epidemic model and investigate the relationship between the timing and frequency of quiescence events and the influence of quiescence on the final size distribution of the epidemic. Amazingly, we find that quiescence phase decreases the final size distribution of the pandemic. We also estimate an important epidemiological parameter of an outbreak that include reproduction number R0, incidence rate and disease prevalences under the influence of Quiescence via Sellke construction.

Keywords: Sellke construction, SIR epidemic model,

C3

FEDERATED LEARNING -DRIVEN OPTIMIZATION OF DETECTION PERFORMANCE: EXPLORING LOCAL DEVICE SELECTION AND HYPER-PARAMETER TUNING

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Abstract
Modern detection systems rely on a myriad of local devices and hyper-parameters to ensure accurate and efficient detection of various phenomena. This study addresses the critical issue of optimizing detection performance by investigating the intricate interplay between the selection of local devices and the fine-tuning of hyper-parameters. In an era characterized by an abundance of data sources and complex algorithms, this research seeks to enhance the effectiveness of detection systems across diverse applications. The primary objectives of this research are as follows: To comprehensively analyze the impact of different local devices on detection performance. To investigate the influence of hyper-parameters on detection accuracy and efficiency. To develop a systematic approach for optimizing detection systems through the judicious selection of local devices and hyper-parameter configuration. To achieve these objectives, we employ a multifaceted methodology: Collection of diverse datasets representing various detection scenarios. Implementation of a range of local devices, including sensors, cameras, and IoT devices. Extensive experimentation with different hyper-parameter settings, such as threshold values, learning rates, and model architectures. Performance evaluation using established metrics, including precision, recall, F1-score, and computational efficiency. Development of a unified framework for optimization, leveraging machine learning and optimization algorithms. Our investigation yields several key findings: Local device selection significantly influences detection performance, with certain devices excelling in specific scenarios. Hyper-parameter tuning is essential for achieving the desired balance between precision and recall. The proposed optimization framework demonstrates substantial improvements in detection accuracy and efficiency. Case studies across various domains, including healthcare, security, and environmental monitoring, showcase the versatility and applicability of our approach. In conclusion, this study underscores the pivotal role of local device selection and hyper-parameter tuning in optimizing detection performance. By

systematically exploring their impact and presenting a unified optimization framework, we provide a valuable resource for practitioners and researchers working on detection systems. Our findings pave the way for enhanced detection accuracy, reduced false positives, and improved real-time responsiveness, ultimately contributing to the advancement of numerous applications, from autonomous vehicles to healthcare diagnostics.

Keywords: detection systems, hyperparameter tuning, optimization

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C4   **DETECTION OF β- LACTAMASE AMONG MULTI DRUG RESISTANCE STAPHYLOCOCCUS AUREUS ISOLATE FROM TWO CLINICAL SOURCES FROM GENERAL HOSPITAL KATSINA.**

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Abstract

Resistance to antibiotics is most often due to penicillin binding proteins (PBPs) and B-lactamases production. characterization of Beta- lactamases production Methicillin resistant staphylococcus aureus (MRSA) is one of the most important causes of nosocomial and community infections and most clinical isolates are B-la rams and multidrug resistant. The present study was to evaluate the presence or production of beta-lactamases resistance to multidrug antibiotics resistance. staphylococcus aureus isolate from general hospital katsina. Characterization of Beta-lactamases is important for choosing appropriate antibiotic therapy, therefore 100 S.aureus were collected from two clinical samples b clinical sources that were randomly selected from patients in general hospital Katsina. Results of all tests were not dependent of bacteria type (CNS or S.aureus) several S.aureaus beta-lactamase producing isolates were from the same herd. Phenotypic tests excluding in vitro resistance to penicillin showed a strong association measured by the kappa coefficient for both bacteria species. Nitrocefin and CLT are more reliable tests for detecting beta lactamase production in staphylococci.

Keywords: *β-lactamase, Coagulase Negative, Staphylococcus aureus, rsa*
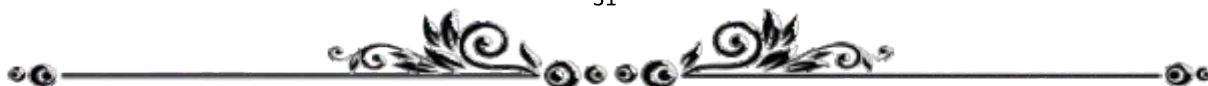
C5

NANOPARTICLE: GREEN SYNTHESIS A BETTER ALTERNATIVE?

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Abstract
Nanoparticles, with their unique properties and diverse applications, have garnered significant attention in the fields of science and technology. This abstract delves into the compelling concept of "Nanoparticle: Green Synthesis – A Better Alternative," which emphasizes the growing shift towards sustainable and environmentally friendly methods for the production of nanoparticles. Traditional methods of nanoparticle synthesis often involve the use of hazardous chemicals, high-energy consumption, and the generation of toxic byproducts, raising environmental and safety concerns. Green synthesis, on the other hand, offers a more sustainable and eco-friendly approach by utilizing natural resources, biogenic agents, and benign reaction conditions. The review highlights the numerous advantages of green synthesis in nanoparticle production, such as reduced environmental impact, cost-effectiveness, and enhanced biocompatibility of the resulting nanoparticles. Green synthesis methods often involve the use of plant extracts, microorganisms, or biomolecules as reducing and stabilizing agents, resulting in nanoparticles with tailored properties suitable for a wide range of applications, including catalysis, drug delivery, and environmental remediation. Furthermore, this review explores the role of green synthesis in mitigating the adverse effects of conventional synthesis methods, such as the generation of toxic waste and energy consumption. It underscores the potential of green synthesis to address the global demand for sustainable and environmentally responsible technologies, aligning with the principles of green chemistry. This review also discusses the ongoing research efforts and innovations in the field of green synthesis of nanoparticles, with a focus on improving the scalability and reproducibility of these methods. The adoption of green synthesis not only offers a more sustainable alternative but also opens new avenues for the development of innovative nanomaterials with tailored properties. In conclusion, "Nanoparticle: Green Synthesis – A Better Alternative" serves as a reminder of the pivotal role green synthesis methods play in promoting sustainability and environmental responsibility within the field of nanotechnology. As the demand for nanoparticles continues to rise, the adoption of green synthesis approaches stands as a promising solution to reduce the ecological footprint of nanoparticle production while fostering innovation in materials science and technology.

Keywords: Nanoparticles, green synthesis, plants extract and scalability

SECTION D

COMPUTATIONAL/MATHEMATICAL MODELING

D1

MODELLING THE DYNAMICS OF TUBERCULOSIS MATHEMATICALLY WITH VACCINATION AND QUARANTINE

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Abstract

This study examines the effects of an imperfect vaccine and quarantine by extending a deterministic mathematical simulation of the dynamics of TB transmission. The study examined the qualitative aspects of the model, including various unique aspects of disease transmission. The next-generation matrix technique presents the effective reproductive number, gauging TB's potential spread. We look into the endemic equilibrium point, TB-free equilibrium point, and sensitivity analyses' local and global stability. Furthermore, the findings show that quarantine and imperfect tuberculosis vaccines are consistently successful at halting the transmission of infectious diseases among people, even though the overall impact grows as efficacy and coverage rise. It has been demonstrated that a small proportion of those who receive vaccinations at steady-state and vaccine effectiveness play a comparable effect on lowering disease burden. A population can efficiently control tuberculosis by using a subpar vaccination and quarantine. The numerical simulation results reveal that employing an imperfect vaccine and implementing quarantine measures can effectively manage tuberculosis within a population as long as the vaccine's effectiveness, vaccination coverage, and the rigour of quarantine are maintained at moderately high levels.

Keywords: Tuberculosis, Imperfect, Quarantine, Vaccination, Effective Reproduction Number

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D2

AN OPTIMAL BLOCK BACKWARD DIFFERENTIATION FORMULA WITH DIAGONALIZATION FOR INTEGRATING FIRST ORDER STIFF INITIAL VALUE PROBLEMS

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Abstract

In this research, a new diagonally implicit block of backward differentiation formula with optimal accuracy for solving stiff IVP of ODEs is developed. In the proposed schemes, three approximate solution values are computed concurrently at each integration step. The order and stability properties of the proposed schemes are evaluated and it is found to be of order 5, Zero and A-Stable; capable of integrating Stiff IVP. Some Samples of first order stiff IVPs are computed, the performance of the proposed methods are presented. The results

are compared with some existing methods. The computed results with the plotted graphs have shown that the newly proposed scheme possess an optimal accuracy in the scale error over the other methods compared. The proposed scheme is recommended for solving first order stiff IVP ODEs.

Keywords: A-Stable, Block, Implicit, IVPs, Points, Ordinary Differential Equation

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D3 ## MATHEMATICAL MODEL FOR THE DYNAMICS OF KALARE CRIME WITH REHABILITATION PROGRAMME IN GOMBE STATE

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Abstract
Like the rest of Nigeria, Gombe state is home to a sizable population of young males without jobs who have few chances to better their socioeconomic standing. Some of these teenagers in Gombe have developed Kalare Boys, loosely organized criminal gangs. In this study, we developed a mathematical model based on a set of ordinary differential equations to analyze the dynamics of Kalare crime while considering a Gombe state rehabilitation plan. We used the Lipchitz condition to test for the existence and uniqueness of the solution for the model, determining the solution's positivity and the invariant region, respectively. The basic reproduction number A was calculated using a next-generation matrix technique. According to the study, the Kalare Crime-free equilibrium (KCFE) is unstable whenever it exceeds one and locally asymptotically unstable (LAS) whenever it is less than 1. The Kalare Crime Free Equilibrium (KCFE)'s global stability was also attained. Numerical investigations illustrated that reduction in the Kalare conversion rate, an increase in the arrest rate of Kalare boys, and a boost in the rehabilitation programme will significantly help reduce and eradicate Kalare thuggery.

Keywords: Kalare, Crime, Gombe, Positivity of solution, Rehabilitation, invariant region

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D4 ## IMPLEMENTATION OF NEW ITERATIVE METHOD FOR SOLVING NONLINEAR PARTIAL DIFFERENTIAL PROBLEMS

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Federal University of Technology, Minna, Niger State

Abstract
Nonlinear partial differential equations (PDEs) are prevalent in various scientific and engineering fields, demanding efficient solution methods. This study focuses on the

practical application and evaluation of a well-established iterative method; New Iterative Method (NIM) for solving nonlinear PDEs. The primary aim is to assess the method's performance and applicability in solving nonlinear PDEs. We present the chosen iterative method, discuss its mathematical basis, and analyze its convergence properties, accuracy, and computational efficiency. We also provide insights into practical implementations and conduct numerical experiments on diverse nonlinear PDEs. Numerical experiments across various nonlinear PDEs confirm the method's accuracy and computational efficiency, positioning it favorably compared to existing approaches. The NIM's versatility and computational efficiency makes it a valuable tool for tackling complex problems. This innovation has the potential to greatly benefit scientific and engineering communities dealing with nonlinear PDEs, offering a promising solution for challenging real-world problems.

Keywords: Nonlinear partial differential equations

D5　　　**AN ADAPTIVE BLOCK ITERATIVE PROCESS FOR A CLASS OF MULTIPLE SETS SPLIT VARIAT IONAL INEQUALITY PROBLEMS AND COMMON FIXED -POINT PROBLEMS IN HILBERT SPACES**

Yusuf Ibrahim Suleiman
Aliko Dangote University of Science and Technology, Wudil-Nigeria

Abstract
In this paper, we present extension of a class of split variational inequality problem and xed point problem due to Lohawech et al. (J. Ineq Appl. 358, 2018) to a class of multiple sets split variational inequality problem and common xed point problem (CMSSVICFP) in Hilbert spaces. Using the Halpern subgradient extragradient theorem of variational inequality problems, we propose a parallel Halpern subgradient extragradient CQ-method with adaptive step-size for solving the CMSSVICFP. We show that a sequence generated by the proposed algorithm converges strongly to the solution of the CMSSVICFP. We give a numerical example and perform some preliminary numerical tests to illustrate the numerical efficiency of our method.

Keywords: split variational inequality problem, Hilbert spaces

D6   **ENHANCED APPROACH FOR CHANGE OF COURSE OF STUDY IN NIGERIA TERTIARY INSTITUTIONS USING FUZZY LOGIC**

Karma Mathew Solomon, Zachariah Babangida, Aminu Jibril, Isaac Samson, Yusuf Luqman and Kakangi Ibrahim Yusuf

Department of Mathematical Sciences, Kaduna State University Kaduna Nigeria

Abstract
In tertiary institutions of Nigeria, students are admitted through the Unified Tertiary Matriculation Examination (UTME) to study courses of their choice. However, most students often perform poorly. Thus, the need to change their programme of study becomes a necessity or risk being withdrawn from the university. The student for a change of programme is required to present cumulative grade point average (CGPA), which informs the student's status and commonly used criteria to determine the student's qualification for a change of programme of study. The students are allowed to choose or advised which programme to choose based on their perceived strength. This is not scientific and have proven ineffective since it is may be based on biased perception. Thus, most of these students still perform poorly in the new programme of study and may end up being withdrawn. In order to minimize subjectivity and handle uncertainty in such a decision process, this paper proposed a fuzzy logic approach for the change of programme of study by considering the student's Senior Secondary School Certificate Examination (SSCE) result(s), UTME scores, and grades obtained in the various examined and related courses. The CGPA initiates the entire process and state the student status for proper change of programme. Therefore, enhancing the chances that a student may perform in their newly proposed programme.

Keywords: CGPA, Change of Course, Fuzzy Logic, Fuzzy Set, SSCE, UTME

D7   **AN OPTIMAL CONTROL MATHEMATICAL MODEL AND ANALYSIS OF DRUG ADDICTION AMONG A DOLESCENT'S POPULACE IN NIGERIA**

S. I. Okoro, J. O. Fatokun, A. M. Sagir and F. Balogun

Department of Mathematical Sciences, Anchor University, Lagos

Abstract
Adolescent drug abuse has become a serious problem, and this has greatly increased the number of social vices committed by young people in Nigeria. To understand the transmission dynamics of addiction and how it can be controlled or eradicated, we built a five-compartment model, which resulted in non-linear deterministic equations. To determine the fundamental reproduction number (), the next generation method was used. When the threshold quantity is smaller than one, the drug-free equilibrium point was discovered and demonstrated to be locally asymptotically stable. Sensitivity analysis was carried out to determine how different parameters behaved in relation to the threshold quantity in order to determine the best course of action. Additionally, the model included

an optimal control approach that considered certain control measures.The analysis is conducted, numerical simulations are run, and the findings are graphically displayed. In addition, a better outcome was obtained by performing a numerical simulation of the control.

Keywords: Drug addiction, Mathematical model, stability, basic reproduction number, sensitivity analysis, optimal control.

D8 — DEVELOPMENT OF A MATHEMATICAL MODEL FOR OPTIMAL RESPONSE OF LOWLAND RICE PRODUCTION TO FURROW IRRIGATION AND FERTILIZERS APPLICATION

Hakimi Danladi, Shehu Alhaji Batagi, Lawal Adamu, Emmanuel Daniya, Yahaya Ahmed Abubakar and Hassan Suleiman

Federal University of Technology, Minna

Abstract
In this work, we developed a mathematical model for optimal response of lowland rice production using furrow irrigation and fertilizers application as a system of second order (degree) of variables such as F (furrow irrigation), N (nitrogen fertilizer), W (NPK fertilizer), R (Lowland rice), Z (Zinc fertilizer), Se (Selenium fertilizer) which was solved and expressed as a product of matrices to optimize growth and yield of lowland rice production to give a bumper harvest to Nigerians.

Keywords: lowland rice, furrow irrigation,

D9 — DEVELOPMENT OF MATHEMATICAL MODEL FOR OPTIMAL PRODUCTION OF SOME CROPS

Hakimi Danladi, Yahaya Ahmad Abubakar, Shehu Musa Danjuma, Emmanuel Daniya and Batagi Shehu Alhaji

Federal University of Technology, Minna

Abstract
Agriculture plays a pivotal role in sustaining global food security and addressing the challenges posed by a growing global population. Optimizing crop production is essential to ensure sustainable agriculture, minimize resource use, and enhance food supply. The objective of this research is to develop a mathematical model for the optimal production of some selected crops, namely (Rice, Maize, Yam and Cassava) with a focus on maximizing yield while minimizing resource inputs. The mathematical model that integrates various parameters, including Rainfall, temperature, soil nutrient, input cost, and land size. This research work adopts a multiple linear regression approach with aim to bridge the gap

between mathematics and agronomy, providing a tool that can aid farmers, agronomists, and policymakers in making informed decisions about crop production, leading to sustainable and efficient crop production practices. The model holds promise for addressing food security challenges and mitigating the environmental impact of agriculture while ensuring the long-term viability of crop production systems. The results of this study have the potential to guide decision-makers in crafting policies that promote optimal crop production, thereby contributing to a more secure and sustainable global food supply.

Keywords: Mathematical modeling, Agriculture, Crop production and Food security.

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D10 FUZZY COGNITIVE MAPS INITIAL CONNECTION MATRIX EXTRACTION FROM STATE ACTIVATIONS VECTOR A ND ITS APPLICATION TO INDUSTRIAL CONTROL PROBLEM

Eli Adama Jiya and F. S. Bakpo
Federal University Dutsin-Ma

Abstract

Fuzzy Cognitive Maps (FCMs) are single layer neural network-like Supervised Machine Learning Algorithm which can be used as a tool for modelling dynamic systems in a graphical cause-effect relationships form. Though a powerful tool and as its common with Machine learning algorithms, FCM will not produce desired result without training and therefore evolutionary or Hebbian learning algorithms has to be used to find the connection matrix that will lead it to a stable state. Hebbian variants are the simplest and acclaimed as computationally less expensive than evolutionary algorithms; however, they depend on human experts for initial weight matrix before they can be applied or learning commences. So, without human experts, these algorithms are limited and even with availability of human expert, the weights assignment could be difficult when the number of the nodes are very large. This paper presents scientific method and algorithm for finding initial weight from state activation vectors and applied the technique to industrial control problem. This allows application of Hebbian learning algorithms without human experts and Hebbian Learning solution of FCM which may provide optimal solution than single map expert initial map.

Keywords: Initial weight, connection weight, Hebbian learning, Fuzzy cognitive map

OUTDOOR BACKGROUND RADIATION AND RADIOLOGICAL HAZARD ASSESSMENT AROUND THE VICINITY OF HOUSEHOLDS AT NNPC, KADUNA

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Abstract

Humans and man-made activities are well known processes that contribute to background radiation. In this study, the assessment of outdoor background radiation around the vicinity of households at NNPC Kaduna state, Nigeria has been conducted. An in-situ measurement for outdoor background exposure rate for twenty (20) different locations was taken using a portable nuclear radiation detector model XR1- Tool0015, with G-M technology, at an elevation of 1.0 m above ground level with a geographical positioning system (GPS) for geographical location. Using established radiological relations, the radiological health hazards, values were obtained and compared with recommended permissible limits in order to determine the radiological hazard status of the environment. The mean values of the outdoor background exposure levels (0.13 µSv/h), Annual Effective Dose Equivalent (0.16×10^{-3} mSv/y), and excess lifetime cancer risk (0.57×10^{-3}). The mean value of the background exposure and annual effective dose equivalent are below the recommended safe limit of 1.0 mSv/y. The mean value obtained is 0.57×10^{-3}. This mean value is higher than the world average value of 0.29×10^{-3}. This high value for excess lifetime cancer risk indicates that there exist the possibilities of cancer development by residents who wish to spend all their life time in the area. Generally, the study shows that the radiological indices evaluated was found to be within the acceptable safe limit of 1 mSv/y for the public and the excess lifetime cancer risk was found to be higher than the safe limit.it is therefore advisable that residence take precautionary measures as they live within this study area.

Keywords Radiation, NNPC Kaduna, Annual effective dose, Excess lifetime, background exposure

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RADIATION EFFECT OF HIGH VOLTAGE TRANSMISSION LINES IN RESIDENTIAL AREAS WITHIN KATSINA STATE

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Abstract

Having an understanding of the effects of electromagnetic fields (EMFs) radiation emitted by high voltage transmission lines (HVTLs) on residential areas at a particular location is essential so as to ensure health and safety of residents. This research gives an analysis of EMF emitted by 132kV, and also a 33 kV HVTL in Kankia, Malumfashi and Kankara, Katsina State respectively and compare measurements of these EMFs with international standard threshold values. The research findings indicated a consistent decrease in electric and
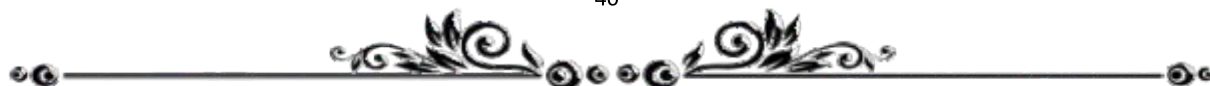
magnetic field levels with increasing distance from the high voltage transmission lines. In this project work, radiation effect of high voltage transmission lines in residential areas within Katsina State, three study sites that are in close proximity to high voltage transmission lines were identified, namely; Malumfashi (Latitude, 11° 47' 0.53"N; Longitude, 7° 37' 19.84"E), Kankia (Latitude: 12° 32' 34.19" N Longitude: 7° 49' 18.59" E) and Kanakara (Latitude, 11° 55' 44.04"N; Longitude, 7° 25' 3.74"E). To measure the fields from the HVTL an electromagnetic radiation tester which detects magnetic field in units of tesla or gauss, electric field in unit of V/m and high frequency RF EMF strength signal was used. Measurements (5m, 10m, 15m, 20m, …100m) of electric and magnetic fields was taken at the selected locations, Malumfashi, Kankia and Kanakara in Katsina State, Nigeria. Both electric fields and magnetic fields were measured. Each measurement was acquired over a short period. Upon stabilization of a reading, the maximum value was recorded. Continuous measurements were performed at different distances at each measuring points. The measurements were taken at a height of 10m above sea level. The electric field was measured in units of V/m and the magnetic field was measured in units of µT.. Importantly, these field levels generally fell within safe limits according to guidelines set by the International Commission on Non-Ionizing Radiation Protection (ICNIRP). Guidelines for limiting exposure to electromagnetic fields (100 kHz to 300 GHz). A short exposure to a magnetic field larger than 100 µT does not necessarily constitute a risk. By setting the limit at 100 µT, a large safety margin has been included. Most devices are also not used close to the body. For occupational situations, the safety limit is set at 500 µT. For precautionary measure, as population density increases near transmission lines, recommendations were provided to mitigate the effect of the radiation from HVTLs on residents.

FORECASTING NIGERIA ECONOMIC GROWTH USING STATISTICAL MODELS.

D13

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Abstract
This study examined the capacitated contributions of non-oil income tax to economic growth in Nigeria from 2015 to 2020. An attempt was made to forecast the Nigerian economic growth using artificial statistical model, which aims at analyzing the contributions of non-oil income tax generation to economic development in Nigeria, while the primary objective is to obtain and implement the statistical model that is capable of simulating a real non-oil income tax with respect to the forecasting accuracy through a series of experiments with the Non-oil income tax data (Corporate Income Tax) gathered from National Bureau of Statistics (NBS). This paper starts with a brief introduction of Nigerian Economic growth, an overview of multiple regression analysis used for prediction. System design and data normalization using MINITAP software were described. Best training graphs showing the training, validation, test and all regression values were analyzed, multiple linear regressions were applied. Finding from this research can be used to improve the society by improving the economic sector which massively contributes to
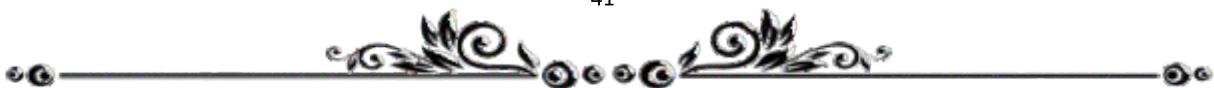
the people and their communities, it will also help government in making decisions, help statisticians and some other researchers.

Keywords: Multiple Regression, Economic growth, Forecasting, Non-Oil Revenue
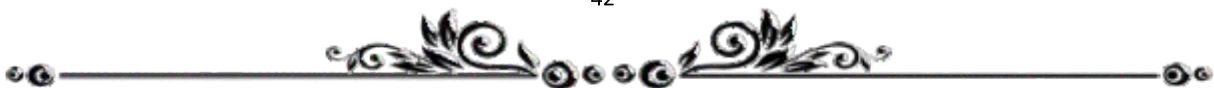
SECTION E

CONSERVATION AND UTILIZATION OF OUR NATURAL HERITAGE

E1

CONVERGENCE ANALYSIS OF THE HYBRID VARIABLE STEP SIZE BLOCK METHOD FOR INTEGRATING INITIAL VALUE PROBLEMS

Ibrahim Muhammad, Abdu Sagir Masanawa and Muhammad Abdullahi

Department of Mathematics, FUDMA

Abstract

In this paper, the convergence analysis of the hybrid variable step size block method for integrating stiff initial value problems of ordinary differential equation is established. The scheme adopted a variable step size technique. The new hybrids block method for integrating stiff ODEs developed by Sagir et. al., are varied by the variable step size ratio (), to obtained different stable method. However, the paper focuses on analyzing the convergence of the stable method, by establishing the necessary and sufficient condition for convergence. The method is found to satisfy the entire stability criteria, so the scheme is consistent and Zero stable capable of solving stiff initial value problems. Existing Stiff initial value problem is solved using the proposed method and the numerical result obtained using the new method are found to be efficient at certain step sizes. Hence, the new scheme is recommended for the solutions of stiff Initial Value Problem of ODEs.

Keywords: Convergence analysis, ordinary differential equation, hybrids block method

E2

NUMERICAL TREATMENT OF TUMOR -IMMUNE INTERACTION MODEL OF STIFF ODES USING HIGHER ORDER HYBRID SUPER CLASS OF BLOCK BACKWARD DIFFERENTIATION FORMULA WITH VARIABLE STEP SIZE STRATEGY

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Abstract

In this research, a system of tumor-immune interaction model which consist interaction between the effector cells, tumor cells, and the cytokine (IL-2), is considered. The tumor-immune dynamic model used to be stiff ODEs; its solution in most cases cannot be obtained simply using analytical method or some partial implicit numerical schemes. However, an A stabled fully implicit scheme is determined to solve any stiff IVPS. This work aimed at deriving a new fully implicit higher order super class of block backward differentiation formula to approximate solutions for the model. The proposed newly developed method is zero stable and A-stable scheme, capable of solving any stiff IVPs. The developed method is used to obtain the solutions of an existing Tumor-Immune interaction Model. The computational results are tabulated and the graphs are plotted to depict clearly the accuracy of scale errors and minimum executional time of the method and other schemes considered. The proposed scheme got an advantage over the methods sampled in this research. Hence, the method is recommended for solving a stiff system of tumor-immune interaction model

Keywords: Tumor Immune Interaction Model. IVPS

E3

UNSTEADY MHD FREE CONVECTION FLOW WITH THERMAL RADIATION IN A POROUS CHANNEL SATURATED WITH POROUS MATERIALS

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Abstract
The objective of this paper is to investigate unsteady Magnetohydrodynamic (MHD) free convection flow with thermal radiation in a vertical porous channel saturated with porous materials. This is motivated due to the importance of MHD flow of fluids through porous medium in sciences and engineering applications, particularly in heat exchangers, ground spread of pollutants, thermal insulation and in the field of chemical engineering for filtration and purification processes in petroleum industries, drying of porous solids and so on. The Partial Differential Equations (PDEs) modeling the flow behavior together with appropriately defined dimensionless quantities are given. These PDEs are changed into dimensionless forms using the defined quantities after which their solutions are obtained with the aid of regular perturbation and the method of undetermined coefficients. The solutions gotten via these methods are coded into MATLAB where responses of the parameters of interest are presented on graphs and discussed.

Keywords: Unsteady flow, MHD flow, free convection flow, thermal radiation, porous material and porous channel.

E4

A CLASS OF NEW MODIFIED HIGHER ORDERS ADAMS METHODS FOR THE NUMERICAL SOLUTIONS OF INITIAL VALUE PROBLEMS

Fatokun J. O., A. Shehu and Tanimu A.
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Abstract
In this work, derivation of a modified higher order Adams pair Predictor – Corrector schemes are proposed. However, the research considers fourth order modified Adams Fair method in the implementation, the stability properties of all the derived methods are investigated and the schemes are found to be zero stables. Numerical experiments are carried out with some IVPs in literature and comparisons of results are made in terms of accuracy of the absolute errors with some existing schemes. The result shows that the new methods got some advantages over all of the methods compared in terms of accuracy. It is therefore, established that the newly derived pairs are recommended for the solution of first order IVPs.

Keywords: First Order, ODEs, Predictor – Corrector, Zero Stable, IVPs

E5   **STEADY MHD FREE CONVECTION FLOW WITH TEMPERATURE DEPENDENT VISCOSITY, VISCOUS DISSIPATION AND JOULE HEATING IN A VERTICAL POROUS CHANNEL**

Yusuf A.B. and Abdullahi F.
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Abstract

In this present work, we investigate the effects of temperature dependent viscosity, viscous dissipation and Joule heating on the follow characteristics of MHD fluid through a vertical porous channel. Due to consideration of these parameters, the governing flow equations which represent the flow formation are highly nonlinear coupled whose solutions cannot be obtained easily through analytical method. This therefore called the use of Adomian decomposition method of solution (ADM). The ADM is a powerful tool capable of decomposing the coupled differential equations into series form and the series solutions are then simulated via computer algebra package of MAPLE where results under varying situations are presented on graphs with conclusions drawn. This investigation may have numerous importance in the aspect of crude oil extraction as the components of crude oil are extracted under varying temperatures.

Keywords: Temperature-dependent viscosity, viscous dissipation, Joule heating, MHD fluid, porous channel and Adomian decomposition method

E6   **OPTIMISING DISEASE CONTROL STRATEGIES FOR INFECTIOUS DISEASES WITH QUIESCENT**

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Department of Mathematics and Statistics, Umaru Musa Yar'adua University

Abstract

Understanding the dynamics of transmissible diseases and creating efficient public health measures both rely heavily on epidemiological models. A key tool for modelling the transmission of infectious dis- eases within a community is the Susceptible-Exposed-Infectious-Recovered (SEIR) model. However, many real-world epidemics experience periods of quiescence during which the parasite/pathogen is dormant creating particular difficulties for control measures. In this investigation, we investigate how optimal control theory might be applied to the SEIR model while considering quiescence. The goal of our research is to optimize vaccination and treatment plans in which the parasite exhibits dormancy/quiescence. We build a deterministic Susceptible-Exposed-Infectious-Quiescence-Recovered (SEIQR) model that adds quiescence as a third state, capturing the disease's changes between active and quiescent stages. We develop control measures to reduce the disease's effects on the populace while taking resource limitations and societal costs into account, drawing on optimal control theory. The optimal timing and distribution of immunization and treatment interventions during both the active and quiescent periods have been identified as key findings from our study. We take into account elements

including the effectiveness of vaccines, the accessibility of treatments, and the affordability of interventions. Our findings demonstrate that quiescence-accounting tailored strategies can greatly increase the effectiveness of disease control interventions. This study offers important information that will aid in the creation of public health initiatives that are flexible and sensitive to illnesses that show quiescent behaviour. We present a viable strategy to reduce the effects of infectious diseases inside the SEIQR framework, ultimately enhancing our capacity to safeguard and advance public health in a dynamic epidemiological environment.

Keywords: transmissible diseases, disease control, vaccines

E7   **NATURAL CONVECTION FLOW IN A POROUS CHANNEL FILLED WITH PO ROUS MATERIALS DUE TO TEMPERATURE DEPENDENT VISCOSITY, VISCOUS DISSIPATION AND THERMAL RADIATION EFFECTS**

Yusuf A. B. and Suleiman U.
Federal University Dutsin-ma, Katsina

Abstract
The purpose of the present article is to examine natural convection flow in a porous channel filled with porous materials due to temperature dependent viscosity, viscous dissipation and thermal radiation effects. This is motivated by the study of Yusuf and Ajibade (2018) which neglected the effects of temperature dependent viscosity and viscous dissipation in their mathematical model. The emanating equations realized while considering these two parameters are solved using Runge-Kutta order four method where results realized are stimulated and presented on graphs and tables for the purpose of discussion.

Keywords: natural convection, porous channel, porous material, temperature dependent viscosity, viscous dissipation, thermal radiation, Runge-Kutta order four.

E8   **SORET AND DUFOUR EFFECTS ON MHD CASSON NANOFLUID WITH NONLINEAR THE RMAL RADIATION AND CONVECTIVE BOUNDARY CONDITION IN A POROUS MEDIUM**

Baoku, Ismail Gboyega and Idris Umar
Federal University Dutsin-Ma, Katsina

Abstract
The goal of the current research is to study the impact of Soret and Dufour effects on a magnetohydrodynamic casson nanofluid model using Brownian motion and thermophoresis. Thermal and concentration convective boundary layer are evoked on the

heat and mass transfer characteristics, for the boundary layer flow behaviours along a nonlinear stretching sheet. The governing partial differential equations for the problem are converted into nonlinear higher order ordinary differential equation with the aid of suitable transformations. The transformed coupled systems of differential equation are solved numerically through Runge - kutta Fehlberg method of fourth – fifth order with shooting method. Influences of physical parameters on velocity, temperature nano particle volume friction and Concentration profiles are presented in forms graphs and expatiated accordingly. Numerical tabulated value of skin – friction coefficient, local Nusselt, Sherwood and reduced Sherwood number with requisite discussion against numerous governing parameters are also included and are adjudged to have signed effects on the data.

Keywords: Thermal radiation, Convective Condition, Dufour effect, Soret effect, Non-linear stretching sheet, second grade nanofluid

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E9   **SOFT BCK/BCI-EXT-IMPLICATIVE IDEAL OF SOFT BCK/BCI - EXT-ALGEBRAS**
Yusuf, A. O. and Sanusi, B.
Federal University Dutsin-Ma, Katsina

Abstract
This paper introduces the concept of soft BCK/BCI-ext-implicative ideals and BCK/BCI-ext-implicative idealistic soft BCK/BCI-ext-algebras, and explores their fundamental properties. It also investigates the relationship between soft ideals and soft BCK/BCI-ext-algebra-implicative ideals in soft BCI-algebras. Furthermore, the paper explores the connection between idealistic soft BCK/BCI-ext-algebras and BCK/BCI-ext-implicative idealistic soft BCI-algebras. The paper establishes the operations of intersection, union, "AND," and "OR" for soft BCK/BCI-ext-implicative ideals and BCI/BCI-ext-implicative idealistic soft BCK/BCI-ext-algebras. The concept of soft sets is used to provide characterizations of (fuzzy) BCK/BCI-ext-implicative ideals in BCK/BCI-algebras, and the paper examines the relationship between fuzzy BCK/BCI-ext-implicative ideals and BCK/BCI-ext-implicative idealistic soft BCI-algebras.

Keywords: Ideal, implicative ideal, soft BCK/BCI-ext-implicative ideals, soft set, fuzzy BCK/BCI-ext-implicative ideals.

E10   **ASSESSMENT OF NATURAL RADIOACTIVE NUCLIE IN ROCK SAMPLES COLLECTED FROM KACI GRANITE QUARRY SITE IN DUTSE LGA, JIGAWA STATE**

Khaleed Salisu Khaleed and Emmanuel Joseph
Federal University Dutsin-Ma

Abstract

The toxicity risks of being over exposed to ionizing radiation in the environments are of great concern to environmental and health scientists. The levels of natural radioactivity of ^{40}K, ^{226}Ra and ^{232}Th were investigated at Kaci Granite Quarry Site located at 13 km away from Dutse Local Government Area of Jigawa State, in the North-Western geological zone of Nigeria using Gamma Spectroscopy with NaI (TI) detector. Radium equivalent activity (Ra_{eq}), absorbed dose rate, annual effective dose rates, hazard indices (Hex and Hin), gamma and alpha index were calculated and compared to the world recommended value. The results obtained show the measured activity concentration due to ^{40}K ranges from 188.16 Bq/kg ± 14.95 to 480 Bq/kg ± 94.25 with an average value of 378.24Bq/kg ± 68.64. ^{226}Ra range from 92.12 Bq/kg ± 13.65 to 260.68 Bq/kg ± 13.65 with an average value of 150.04 Bq/kg ± 14.76. ^{232}Th range from 173.94 Bq/kg ± 17.655 to 343.98 Bq/kg ± 33.71 with an average value of 259.51 Bq/kg ± 21.67 respectively. The radium equivalent activity (Ra_{eq}) was found to be 549.398 Bq/kg which is higher than world average 370 Bq/kg, the mean absorbed dose rate obtained is 280.02 nGy/h and is higher than the world average of 55 nGy/h. The measured average indoor annual effective dose rate 1.168 $mSvy^{-1}$ and is higher than the world average value of 1 mSv/y while the outdoor annual effective dose rate is 0.349 $mSvy^{-1}$ which is lower than the world average value of 1 mSv/y. The measured average values of external and internal hazard index which are 1.521 and 1.957 and are higher than the world permissible limit, the measured gamma and alpha index are 3.17 and 0.839 in which gamma index is higher than the world average value while alpha is less than world average value. This indicate that the sediments in all the sampling site poses significant radiological effect to the workers and inhabitant of the area, therefore Public awareness on the health implication of these radionuclides is recommend.

Keywords: toxicity, radioactivity, Dutse

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E11   **NUMERICAL STUDY ON MHD SL IP FLOW ON CONVECTIVE HEAT AND MASS TRANSFER OF A MAXWELL VISCOELASTIC - BASED MICROPOLAR FLUID WITH THERMAL RADIATION   AND PARTICULATE THERMOPHORESIS**

Baoku, Ismail Gboyega, Dahiru J. and Bashir S.
Federal University Dutsin-Ma, Katsina

Abstract

The present work deals with the influence of MHD, thermal radiation, chemical reaction of nth order and particulate thermophoresis on convective heat and mass transfer in a slip

flow of a Maxwell viscoelastic-based micropolar fluid. The governing partial differential equations are transformed into a set of coupled ordinary system of differential equations. The system of ordinary differential equations is solved numerically using the sixth-order Runge-Kutta scheme with shooting method. The effects of various significant parameters such as Soret, Schmidt, Prandtl and Dufour numbers; nonlinear thermal radiation, permeability, viscoelastic, order of chemical reaction and other parameters on the dimensionless velocity, micro-rotation velocity, temperature and species concentration profiles are presented using graphs. This investigation discusses variations on the effects of relevant thermophysical parameters on the flow, heat and mass transfer characteristics as well as on the physical quantities such as skin-friction coefficient, Nusselt and Sherwood numbers on the viscoelastic-based micropolar fluid. The results are validated with other related research works in the literature.

Keywords: Viscoelastic-based Micropolar Fluid; Dufour effect, Soret effect; Nonlinear Thermal radiation, Convective Heat and Mass Transfer.

E12 ## AN EXPOSITION ON THE GENERALIZED MULTISET THEORY *(J)*

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Abstract

This work studies the generalized multiset theory T. We present a comparative analysis of axioms proposed in T and the two-sorted multiset theory MST, which appears to be a widely used multiset theory. Multisets in T contain objects whose multiplicities are from the set R (this could be a negative number), making it an extension of the theory MST; which deals with multisets that are modeled by positive integer-valued functions. Relative to the classical set theory, multiset theory is in a primal stage of development and has no unanimous approach to its axiomatization. This study presents the axioms of the theory T in contrast with those of MST. The strengths and possible limitations of the two multiset theories are discussed. In the sequel, some recommendations are outlined.

Keywords: Multisets, Axiomatic systems, Multiset theory, Generalized Multiset theory

PARTIAL LEAST SQUARES STRUCTURAL EQUATION MODELING (PLS-SEM) ON THE STUDENTS' ADOPTION BEHAVIOR OF VIRTUAL MEETING TECHNOLOGY: A STUDY OF FACULTY PHYSICAL SCIENCES

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Abstract
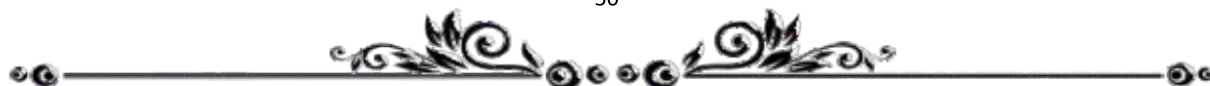
Application of virtual meeting technology in university globally has been considered as a key factor in ensuring effective teaching and learning (Roy et al., 2020). This research examined students' adoption behavior of virtual meeting technology using partial least square structural equation modeling based on technology acceptance model. The questionnaire was developed based on the Perceived Usefulness, Perceived ease of use, students' attitude and behavioral intention attributes of the Technology Acceptance Model. The questionnaire was also validated through reliability and validity tests. A sample of 350 students were randomly selected using simple randomly sampling technique from the Faculty of Physical Sciences, Federal Univeristy Dutisn-Ma, Katsina Katsina State. The result of Partial Least Squares Structural Equation Modeling (PLS-SEM) indicated that the Perceived Ease of Use and Perceived Usefulness had significant effects on Students' attitude and behavioral intention to use virtual meeting technology.

Keywords: Virtual meeting, Structural equation modelling, Technology Acceptance model, Validity, Reliability.

A RESULTS ON GENERALIZED JORDAN TRIPLE REVERSE DERIVATIONS OF SEMI -PRIME RINGS

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Federal University Dutsin-Ma, Katsina

Abstract

In this paper, represent a semiprime ring.: An additive mapping is called left reverse centralizer of if and also is said to be left triple reverse centralizer of if for all A mapping is called Jordan triple reverse derivation, if for all Using the above proposed definitions, we prove that a generalized reverse derivation is a generalized derivation and a generalized Jordan triple reverse derivation is generalized triple reverse derivation.

KEYWORDS: Semiprime ring, derivation, generalized reverse derivation, generalized Jordan triple derivation, left centralizer.

INFLUENCE OF TEMPERATURE DEPENDENT VISCOSITY AND THERMAL RADIATION ON F REE CONVECTIVE FLOW IN A CHANNEL WITH SUCTION/INJECTION

Aliyu Umar
Federal University Dutsin-Ma

Abstract

This article investigates the influence of temperature dependent viscosity and thermal radiation on free convective flow in a channel with suction/injection. It is motivated by the

Study of Yusuf and Ajibade (2018) which do not consider an important parameter of viscous dissipation in their formulation. Here, their model is modified to suit the purpose after which the resulting equations are solved using finite difference methods of solution. The results highlight the impact of temperature dependent viscosity and thermal radiation on the velocity and temperature profiles. Response of the parameters such as Brinkmann number,suction/injection parameter, viscosity variation index, e.t.c are presented on tables and graphs with conclusions drawn.

Keywords: temperature dependent viscosity, thermal radiation

DETERMIN ATION OF ALKALI CONTENT FOR SOAP PRODUCTION FROM INCINERATOR BOTTOM ASH FOUND IN UMARU MUSA YAR'ADUA UNIVERSITY KATSINA

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Federal University Dutsin-Ma, Katsina

Abstract
Incinerator bottom ash is the coarse residue left on the ground level of waste incinerators, composed of mixture of ceramics, polymers, grasses, and glassy materials. The making of soap from ash- derived alkalis offer cheap alternatives to imported ones. In this research incinerator ash was collected from Umaru Musa Yar'adua university katsina, the sample was re-ashed in amuffle furnance for 3hours at 600 ^{0}c. the sample 200 g was extracted using 2litre of aques solvent for 3days. The molarity, pH value, ash content, spectrochemical analysis(XRF), and saponification test were carried out on the sample. The molarity was determined to be 0.25 M, the pH of the extract was found to be 9.5 this shows that its alkaline. Ash content of the extract is found to be 63.7%. the spectrochemical analysis (XRF) of the extract indicates that K_2O has low percentage of only 1.735% by weight, the saponification result of the extract shows that no saponification. From the result obtained we conclude that the incinerator bottom ash in Umaru Musa Yar'adua university cannot be used to produce soap.

Keywords: Incinerator Bottom Ash, Soap, Alkali, Saponification

SECTION F

ENERGY AND MINERAL RESOURCES

F1

ANGSTROM - PRESCOTT MODEL FOR ESTIMATING GLOBAL SOLAR RADIATION IN YELWA, NORTH - WESTERN, NIGERIA

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Abstract

n this study, The Monthly mean daily meteorological data measured in Minna (09.65ºN, 06.47ºE) For a period of twenty-one years (1990-2010) were obtained with permission from Nigeria Meteorological agency, Oshodi, Lagos, Nigeria. These data are measured global solar radiation, sunshine hour and minimum and maximum temperatures, which were analyzed, based on Sunshine and temperature-based models to generate several models (equations) for predicting global solar radiation. These models were subjected to statistical error test methods of the Mean Bias Error (MBE), Root Mean Square Error (RMSE), Mean Percentage error (MPE), Coefficient of determination (R), Coefficient of correlation R^2 and t test to ascertain the best performing Models. The results of R and R^2 are within the range of $0.792 - 0.927$ and $0.628 - 0.861$ which shows statistically significant between the measured and predicted global solar radiation. The Mean percentage error is within the range $-0.3724 - (-0.80714)$. The calculated global solar radiation is in good agreement with the three sunshine and temperature-based models. This study shows that more than one sunshine and temperature -based models can be used to predict solar radiation in Niger state, Nigeria. In order to test for the performance of statistical significance of the models, Mean Bias Error (MBE), root mean square error (RMSE), mean percentage error (MPE) and t-test values were adopted, the results show that despite overestimation and underestimation of the models, there are fairly good level of significance at both confidence level of 95% and 99%. The results of the coefficient of determination indicate that the calculated clearness index and relative sunshine duration shows excellent data.

Keywords: Global Solar Radiation, Clearness index, Sunshine Hours, Minimum and Maximum Temperature, Regression Constants, Temperature and Sunshine hour-based Models, Yelwa Kebbi State, Nigeria.

F2

NEUTRON REFLECTOMETRY IN THE CHARACTERIZATION OF BENEFICIATED GRAPHITE INTENDED FOR USE IN GRAPHENE SYNTHESIS

Ige Olumide Oluwasanmi, Abubakar Buhari, Nwali Timothy and Jonah Sunday A.
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Abstract

Graphite's profile, as the main natural precursor for synthesized graphene, especially when its mechanical super qualities are in focus, has incentivized increased search for graphitic ore of sufficient quality, which, after beneficiation, can be suitable for any of the appropriate graphene synthesis methods. Here, as part of a work in progress, we report the comparative characterization of mined and beneficiated graphite ore from three main locations in Nigeria, using Neutron Reflection Technique (NRT) with 1 Ci Am-Be source and

an He-3 Detector. Using this simple but novel approach capable of Non-Destructive bulk Hydrogen content and (O+C)/H ratio determinations; raw graphite from Saulawa, Birnin Gwari Local Government of Kaduna State, Dutsen Haiyar in Ningi Local Government Area of Bauchi State, and Gayama in Donga Local Government of Taraba State have been investigated. The analysis of the neutron reflectometric measurement of the raw graphite ore, compared with the 99.9% high purity standard, establish differential quality of the different sources and the need for beneficiation in all the ores. Using Froth Floatation Beneficiation (FFB) technique with AGO as collector, quality improvement in all cases were highlighted using the bulk Hydrogen and (O+C)/H analysis when comparatively studied with the standard. With this novel nondestructive approach, the viability of obtaining graphene synthesis grade graphite from abundant local raw mined graphitic ore is demonstrated.

Keywords: Graphite, Graphene, Neutron Reflectometry, He-3 Detector, Am-Be Source, Froth Floatation Beneficiation

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F3   SYNTHESIS OF MAGNETIC DATA FOR VALIDATING DEPTH ESTIMATION TECHNIQUES

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Federal University of Technology Babura, Jigawa State.

Abstract
To determine the basement depth of a magnetic source, various depth estimation techniques can be used. To validate such techniques for their effectiveness, synthetic data can be used to test the effectiveness of the techniques. In this study, the synthetic data was generated using a FORTRAN programme and the data were mapped to produce total magnetic field map. The field intensity ranges between 1.2 nT and -1.5 nT. Spectral analysis was employed for the analysis and the result shows that the depth to the magnetic source was 2 km. The result indicate that spectral analysis is very effective and can be applied to real data for Oil and Gas prospecting over some areas in Gombe, Yobe and Borno state covering latitude 10^0N-11^0N and longitude 11^0E-12^0E.

Keywords: Magnetic Source, Depth, Spectral analysis.

F4

EFFECT OF 3-CHLOROACETOPHENONE DERIVATIVE ON CORROSION INHIBITION OF MILD STEEL IN ACID IC MEDIUM

Sani Ibrahim, A. A. Siaka, K. S. Kabo, A. Garba, Ibrahim Garba,
Lawali Hashimu, J. Arockia Selvi and Muhammad M. Rumah
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Abstract
Acetophenone derivatives are environmentally friendly corrosion inhibitors having an excellent trammel efficiency upon corrosion of Mild Steel (MS). This study investigated the inhibition behaviour of 3-Chloroacetophenone (3-CA) on mild steel in 1N hydrochloric acid Solution. Five different concentrations of the inhibitor ranging from 50-250ppm were used at four temperatures (303, 313, 323 and 333k) to determine the optimum corrosion inhibition behaviour. The inhibition effect of 3-CA was examined by means of weight loss measurement, potentio-dynamic polarization techniques and electrochemical impedance spectroscopy, scanning electron microscopy and Density Functional Theory (DFT) measurement was also used. The results showed that the adsorption of 3-CA on mid steel sample obeys Langmuir adsorption isotherm and that polarization studies revealed that the 3-CA behave as mixed type of inhibitor mostly controlling anodic reaction.The result of surface morphology study supported the adsorption of 3-CA on MS. The effect of 3-CA on corrosion IEs and certain molecular parameters were further studied by quantum chemical calculations based on density functional theory (DFT). The wettability and hydrophobicity nature of the mild steel surface was also observed through contact angle measurement. Finally, the results obtained clearly revealed that 3-Chloroacetophenone performs fairly as corrosion inhibitor for mild steel due to less percentage inhibition efficiency.

Keywords: Mild Steel, Corrosion inhibition, Weight loss measurement, EIS, SEM, DFT

F5

EXTRACTI ON OF ALUMINA FROM KANKARA KAOLIN

Zakariyya Danyaro, Zakariyya Danyaro, Kamaluddeen Suleiman Kabo,
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Abstract
Alumina can be extracted from different locations, using different methodologies and materials. Kaolin from Kankara town, Katsina state, Nigeria was used as raw materials for alumina production. This study focus on the extraction of alumina from kaolin via leaching process, using aqueous solutions of acids, hydrochloric acid as a leaching agent. Crude kaolin was crushed and calcined first before leaching. Calcination of the crude kaolin was taken place at 70 ^{o}C for 2 h, leaching of alumina from the calcined kaolin was conducted with hydrochloric acid under stirring time of 2 h. The extracted alumina was characterized using XRD analysis to investigate the crystal structure and amount of impurities present.
Keywords: Acid, Calcination, Crude, Kaolin, Leaching.

F6   **PRODUCTION AND FUEL PROPERTIES OF BIODESEL FROM AZADIRACHTA INDICA SEEDS (NEEM SEEDS)**

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Abstract

In the current energy view of fossil fuel, renewable energy sources such as biodiesel, bioethanol and biogas from wastes of many substrates have become the subjects of great interest. These fuels contribute to the reduction of dependence on fossil fuels. In addition, energy sources such as these could partially replace the use of those fuels which are responsible for environmental pollution and may be scarce in the future. For these reasons they are known as alternative fuels. Vegetable oil cannot be directly used in the diesel engine due to its high viscosity, high density and high flash point. So it needs to be converted into biodiesel to make it consistent with fuel properties of conventional fuel. This research work considered the production of biodiesel from Azadirachta indica (Neem Seed) extracted its oil and converted to biodiesel and analyzed some of its fuel properties such as: Pour point, Density, Flash point, Viscosity and others. The seeds of Neem contain 30-40 % oil. Biodiesel obtained from Neem oil which are mono alkyl esters produced using Transesterification process. The optimum conditions to achieve maximum yield of biodiesel were determined. It was clear that the fuel properties of biodiesel lie within the recommended standards biodiesel properties of kinematic viscosity 4.92 mm2/s (8.61 cm^2/s), Density 861kg/m3 ($8.61\times105g/cm^3$), and other parameters. Biodiesel is a better alternative to the fossil fuel, today biodiesels is increasingly attractive, less or non-toxic and its biodegradable.

Keywords: Neem seeds, Neem oil, alkyl ester (biodiesel) Transesterification, Fuel properties, viscosity, density, flash point and cloud point.

F7   **A COMPARATIVE STUDY ON OCCURRENCES OF SELECTED RARE EARTH ELEMENTS (REEs) IN GEOLOGICAL AND BIOLOGICAL SAMPLES ANALYZED BY INSTRUMENTAL NEUTRON ACTIVATION ANALYSIS (ENAA); THE PROSPECTS OF NIGERIA**

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Abstract

This study aims to comparatively investigate the occurrences of rare earth elements (REEs) in geological and biological samples determined by Neutron Activation Analysis (NAA). The

findings outlined in this report are derived from a review of existing literature on REE research, which examined a range of geological and biological samples. In all cases, the samples were tested using neutron activation analysis to establish the concentrations of REEs present in them. Trends from the results were then compared to determine differences in the concentrations of REEs in the two sample types. The neutron activation analysis revealed higher REE concentrations in geological than biological samples. The light REEs, lanthanum and cerium, showed higher concentrations in geological rather than biological samples. Higher concentrations of other REEs, including samarium and europium, were also observed in the geological samples, although not as pronounced as with lanthanum and cerium. This study has found that geological and biological samples contain rare earth elements (REEs), and their concentrations are typically higher in geological samples. This insight can help us understand how REEs are distributed in the environment and can inform further research on the biogeochemical cycling of REEs.

Keywords: Rare Earth Elements, Neutron Activation analysis

F8

ASSESSMENT OF WIND RESOURCE AND ITS ENERGY POTENTIAL IN SEVEN STATES OF NORTHWEST NIGERIA

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Abstract

The growing need for clean energy to address the environmental issues caused by the usage of fossil fuels results to the need for Nigeria to develop an alternative energy from untapped wind which is in abundance in the region. This study examines the literature that has already been written on the subject to estimate the wind energy resources in Nigeria. It also measures the wind potential in the seven states of Northwest Nigeria. The Nigerian Meteorological agency (NIMET) provided the wind speed data spanning 25 years (1996-2020). In the analysis, Weibull two-parameter statistical model was used. The distribution of wind speed across Nigeria demonstrates that some areas in the North are equipped to generate wind. Microsoft excel was used in analyzing the wind speed data obtained. In addition, evaluation of the region's wind energy resources shows that Kano and Sokoto recorded the highest potential, with WPD of 443.03 and 340.67 Wm^{-2} respectively at 10m AGL with annual WED of 4.921 and 5.354 $kWhm^{-2}day^{-1}$, Kebbi and Dutse have the lowest potential of 86.52 and 7.69 Wm^{-2}, with WED of 0.998 and 0.712 $kWhm^{-2}day^{-1}$. As a result, Gusau and Kaduna are ideal for small scale wind power generation, while Kano, Sokoto, and Katsina are suitable for large scale wind power generation. However, Dutse and Kebbi may not be viable due to their low wind potential.

Keywords: wind, clean energy, northwest

SECTION G

ENVIRONMENTAL QUALITY AND POL LUTION

G1

ANTIBACTERIAL EFFICACY OF *JARTROPHA CURCAS* LEAF EXTRACT AGAINST SOME BACTERIA ISOLATED FROM THE ORAL CAVITY OF SOME STUDENTS OF FEDERAL UNIVERSITY DUTSIN-MA, KATSINA STATE, NIGERIA

Aminu Ado, Abduljalal Mukhtar and Kamala Abdullahi
Federal University Dutsin-Ma, Katsina State, Nigeria

Abstract
Oral health is a crucial aspect of overall well-being, and maintaining a healthy oral cavity is of paramount importance, particularly among students. This study aimed at exploring the potential antibacterial properties of *Jartropha curcas* leaf ethanolic extract as a natural remedy against oral cavity bacteria. A total of twenty-five (25) oral cavity samples were collected using sterile swab sticks. Soxhlet extraction, phytochemical screening, FTIR, GC-MS, isolation, and agar well diffusion standard procedures were employed. Six prominent phytochemicals, namely alkaloids, cardiac glycosides, saponins, tannins, and reducing sugars, were identified. Octadecanoic acid 2,3-di-hydroxypropyl ester ($C_{21}H_{42}O_4$) was found as a prominent phytoconstituent in *J. curcas* leaf extract. Two bacterial species were isolated, *Staphylococcus aureus* and *Streptococcus* species, from the student's oral cavity. *J. curcas* leaf extract showed minimal antibacterial activity against the isolates. Further research should be carried out to isolate and characterize the bioactive principle in *J. curcas.*

Keywords: antibacterial, *Jartropha curcas,* oral cavity

G2

EFFECT OF 3-CHLOROACETOPHENONE DERIVATIVE ON CORROSION INHIBITION OF MILD STEEL IN ACIDIC MEDIUM

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[2]Department of Chemistry, Federal University Dutsin-Ma, Katsina State, Nigeria

Abstract
Acetophenone derivatives are environmentally friendly corrosion inhibitors having an excellent trammel efficiency upon corrosion of Mild Steel (MS). This study investigated the inhibition behaviour of 3-Chloroacetophenone (3-CA) on mild steel in 1N hydrochloric acid Solution. Five different concentrations of the inhibitor ranging from 50-250ppm were used at four temperatures (303, 313, 323 and 333k) to determine the optimum corrosion inhibition behaviour. The inhibition effect of 3-CA was examined by means of weight loss measurement, potentiodynamic polarization techniques and electrochemical impedance spectroscopy, scanning electron microscopy and Density Functional Theory (DFT) measurement was also used. The results showed that the adsorption of 3-CA on mid steel sample obeys Langmuir adsorption isotherm and that polarization studies revealed that the 3-CA behave as mixed type of inhibitor mostly controlling anodic reaction. The result of

surface morphology study supported the adsorption of 3-CA on MS. The effect of 3-CA on corrosion IEs and certain molecular parameters were further studied by quantum chemical calculations based on density functional theory (DFT). The wettability and hydrophobicity nature of the mild steel surface was also observed through contact angle measurement. Finally, the results obtained clearly revealed that 3-Chloroacetophenone performs fairly as corrosion inhibitor for mild steel due to less percentage inhibition efficiency.

Keywords: Mild Steel, Corrosion inhibition, Weight loss measurement, EIS, SEM, DFT.

G3

PHYTOREXTRACTION OF CHROMIUM POLLUTED SOIL USING CITRULLUSLANATUS(WATER MELON)

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Abstract
Phytoextraction potential of *Citrullus lanatus* of Chromium was studied. A pot experiment was carried out for the period of six weeks. The pots were filled with 5kg of soil and soaked seeds were planted in an artificially polluted soil with 0ppm (control), 10ppm, 20ppm, 30ppm, 40ppm and 50ppm of Chromium respectively. The physicochemical properties of the soil before and after the experiment were measured using standard methods. *Citrullus lanatus* leaves, shoots and roots were analysed for Cr uptake with AtomicAbsorption Spectrophotometer (AAS). The result revealed that the plant had accumulated a significant concentration of chromium in the leaves (14.77mg/kg), shoot (13.087mg/kg) and roots (12.292mg/kg) and there was no significant difference in the concentrations of chromium used in the study at $p > 0.05$. The phytoextraction ability of *C. lanatus* was assessed in %remediation factor (RF), Bioconcentration factor (BCF) and elemental translocation factor (TF). The amount of chromium in the shoots and roots after 6weeks showed that more concentration of chromium was translocated from the roots to the leaves. The results of this investigation suggest that *Citrullus lanatus* could be used for phytoextraction of chromium from contaminated soil.

Keywords: Phytoextraction, Phytoremediation, Bioconcentration, Chromium

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G4

DETERMINATION OF HEAVY METAL CONCENTRATION IN SELECTED BOREHOLES IN THE VICINITY OF DANA STEEL ROLLING MILLS IN KATSINA METROPOLIS, KATSINA STATE, NIGERIA.

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[1]Umaru Musa Yar'adua University Katsina, Katsina State.
[2]Department of Chemistry, Federal University Dutsin-Ma, Katsina State, Nigeria

Abstract
In the current study, groundwater samples from five (5) boreholes near the Dana Steel Rolling Mill in Katsina, Nigeria, were examined for variations in the concentrations of specific heavy metals (Cd, Fe, Cu, Cr, and Pb) and physicochemical parameters (Electrical conductivity, Ph, total suspended solids, total dissolved solids, and turbidity) during the rainy seasons, using atomic absorption spectrometer and other conventional analytical methods, respectively. For locations A, B, C, and D, respectively, the concentration levels of Cd were 0.036 mg/kg, 0.011 mg/kg, 0.077 mg/kg, 0.041 mg/kg, and 0.057 mg/kg; Pb was 0.789 mg/kg, 0.622 mg/kg, 0.889 mg/kg, 0.756 mg/kg, and 0.556 mg/kg; Fe was 0.158 mg/kg, 0.207 mg/kg, 0.170 mg/kg, 0.178 mg/kg, and 0.178 mg/kg; Cr was 0.089 mg/kg, 0.068 mg/kg, 0.059 mg/kg, 0.102 mg/kg, and 0.091 mg/kg, and Cu was 1.034 mg/kg, 0.997 mg/kg, 0.998 mg/kg, 0.578 mg/kg, and 0.997 mg/kg for locations A, B, C, and D, respectively. Of all the metals examined, only copper was determined to have dropped below the health regulatory organizations' suggested allowable limit. The results of the physiochemical parameters of the water samples revealed that the water is safe for drinking.

Keywords: Borehole, Heavy Metal, Pollution, Contamination, Groundwater

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G5   ADSOPRTION OF HEAVY METALS FROM WASTEWATER USING FIBER BASED CELLULOSE SUPPORTED POLYMER LIGANDS

*[1]**Anas Lawal and** [2]**Ikechukwu Ogadimma Alisi**
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Abstract
Bagasse, a fibrous residue obtained from sugarcane processing, offers potential as renewable source of cellulose extraction and subsequent modification for various application. In this study, we focused on the extraction of cellulose from bagasse and its subsequent grafting with acrylic acid. Grafting of the extracted cellulose with acrylic acid was performed through a free radical polymerization process. The reaction condition include: initiator dosage, monomer concentration, reaction time and temperature were optimized to achieve maximum grafting efficiency. The resulting cellulose grafted acrylic acid copolymer were characterize using FT IR, and SEM to verified the successful grafting and assess the surface morphology. The result indicated a significant percentage yield of the grafted cellulose, demonstrating the effectiveness of the optimized reaction conditions and potentials for various applications including wastewater treatment.

Keywords: Cellulose extraction, Acrylic acid grafting, Percentage yield, Copolymer characterization.
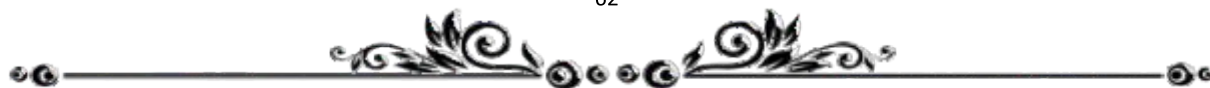
G6   DETERMINATION OF HEAVY METAL CON CENTRATIONS IN FISH AND
WATER OF AJIWA DAM, KATSINA STATE, NIGERIA
**Uduma A. Uduma, Muhammad Sani Muhammad, Awagu E. F. ,
Okunola Oluwole J.,**
Department of Chemistry, Federal University Duitsin-Ma, Dutsin-Ma,
Katsina State

Abstract
In this current study determination of the physicochemical parameters of water and the concentration of heavy metals in catfish bone from Ajiwa dam, Katsina State, Nigeria, were conducted. Standard methods were employed in the sampling protocol and the analysis. The physicochemical parameters of the water were recorded as follows; P_H ranges from 7.23±0.15 to 6.17±0.06, Turbidity ranges from 196±1.73 to 148.67±2.08 mg/L, Hardness ranges from 47.14±0.01 to 40.41±0.02 mg/L, Nitrate ranges from 0.99±0.006 to 0.002±0.001 mg/L, Phosphate ranges 19.37±0.015 to 1.89±0.002 mg/L, Sulphate ranges from 23.40±0.53 to 15.00±1.00 mg/L, Electrical conductivity ranges from 105.37±0.32 to 89.77±0.06 mg/L and Total Dissolve Solid ranges from 50.03±0.06 to 43.40±0.00 mg/L. Spectrophotometric method was used to evaluate the concentration of Nitrates, Phosphates, Sulphates, P_H , Total Dissolve Solids and Electrical Conductivity, while titrimetric method was used for the determination of hardness. The concentration of Zinc (Zn), Lead (Pb), Iron (Fe), Manganese (Mn), Copper (Cu), Cobalt (Co), Nickel (Ni), Cadmium (Cd) and Chromium (Cr) in catfish bone and water from Ajiwa dam were determined using Atomic Absorption Spectrophotometer (AAS). A total of seven samples each of catfish and water were collected and analyzed for heavy metals. Data obtained were subjected to analysis of variance (ANOVA) test at 0.05% confidence level, principal component analysis, cluster analysis and Pearson correlation. The result showed that all the metal concentrations in both catfish bone and water were below the WHO recommended values: Pb (0.05 mg/l), Fe (10.1 mg/l) Zn (5.0 mg/l), Ni (0.02 mg/l), Cd (0.005 mg/l), Cr (0.05 mg/l), Co (0.05 mg/l) Cu (1.0 mg/l) and Mn (0.05 mg/l) for water and Pb (0.4 mg/l), Fe (3.0 mg/l), Cd (0.03 mg/l), Cu (2.0 mg/l), Mn (0.4 mg/l) Zn (3.0 mg/l) Cr (0.05 mg/l) Ni (0.02 mg/l) and Co (0.05 mg/l) for catfish bone. This findings indicate that the fish and water are safe for both aquatic *life and human consumption.*

Keywords: Heavy Metal, Catfish Bone, Ajiwa Dam and Statistical Analysis

G7   **ASSESSEMENT OF HEALTH RISKS ASSOCIATED WITH HEAVY
METALS IN SEDIMENT FROM HAND DUG WELLS IN KATSINA
METROPOLIS, NIGERIA**
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Abstract

The present study was conducted to evaluate the level of contamination of heavy metals concentration (Zn, Pb, Fe, Cu, Mn, Ni, Co and Cr) in the sediment samples using Atomic Absorption Spectrophotometer AAS) from 5 selected hand –dug wells within Katsina metropolis. Results obtained revealed that concentrations of the heavy metals in sediment ranged from 0.06 ± 0.001 to 2.86 ± 0.15mg/Kg for Zn, 0.10 ± 0.008 to 0.33 ± 0.014 mg/Kg for Pb, 13.73 ± 0.27 to 552.43 ± 13.55mg/Kg for Fe, 0.15 ± 0.001 to 5.85 ± 0.012mg/Kg for Cu, 0.11 ± 0.001 to 10.73 ± 0.11mg/Kg for Mn, 0.05 ± 0.008 to 0.60 ± 0.006mg/Kg for Ni, 0.02 ± 0.004mg/Kg for Co and 0.29 ± 0.19 to 5.02 ± 0.017mg/Kg for Chromium. These metal concentrations were within the permissible limits set by WHO and other regulatory agencies. Descriptive statistics was applied on the data set generated to analyze the mean and standard deviation. Other statistical tools such as analysis of variance (ANOVA), Pearson Product Moment Correlation, Cluster analysis and Duncan's Multiple Range Test (DMRT), were utilized in evaluating the significant differences within the parameters evaluated. The human health risk assessment in this study classifies the selected hand dug wells as safe with regards to human exposure to the heavy metals in which the Hazard Quotient (HQ) and Hazard Index (HI) were < 1, indicating that there is no health risk associated with the hand dug wells. However, despite the low levels of the metals in this work compared to other literatures, they could still lead to serious health hazard in future if not checked, considering their bioaccumulation effects in humans and other living organisms in the environment.

Keywords: Heavy Metals, Sediment, Health Risk Assessment, Hand Dug Wells, and Katsina Metropolis

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G8   EVALUATION OF SELECTED AMBIENT AIR CONCENTRATIONS IN MAJOR ROUNDABOUT AND SOLID WASTE DUMP SITE IN KATSINA METROPOLIS, KATSINA STATE, NIGERIA

Uduma A. Uduma, Mohammed Idris Ruma, Awagu E. F. and Okunola Oluwole J.,
Department of Industrial Chemistry, Federal University Dutsin-Ma

Abstract

This current study is aimed at investigating the ambient air concentration of major roundabouts and waste dump site within Katsina metropolis. This was carried out with reference to four air pollutants which includes Nitrogen dioxide (NO_2), sulfur (IV) oxide (SO_2), carbon monoxide (CO) and Ammonia (NH_3), with the sole objective of determining their atmospheric concentrations in order to evaluate their ambient air level in Katsina metropolis. Six locations and one control were studied from November 2021 to February 2022. Measurements were carried out three times daily (7am-9am, 12pm-3pm and 4pm-7pm) by using Gasman air monitor. Descriptive statistics and multivariate analysis were used in analyzing the data set generated. Results of the air pollutants showed that KTSTA

roundabout has the highest CO (10.61), KTSTA round about exhibited highest pollutant concentration in NH_3 (2.056) and GRA roundabout was the lowest. While both Kofar Kaura and KTSTA roundabouts have highest pollutants of NO_2 (0.69) and (0.69. Kofar Kaura, Liyafa Roundabout and Behind ATC dumpsite had same and highest SO_2 concentration (0.10), (0.10 CO was found to be highest in concentration in the morning period (10.39). The findings of this study shows that there are lots of commercial and vehicular activities in the vicinity from 7am-9am, which are responsible for the observed elevated ambient air level. However, the ambient air pollutants concentration at the control site were all time low compared to the studied sites. According to Nigerian ambient Air Quality Standard, elevated ambient air pollutants are responsible for many of the respiratory related diseases. Regular and strict monitoring of the levels of ambient air pollutants of the studied area is therefore recommended in view of the adverse health implications of elevated ambient air pollutants on humans.

Keywords: Ambient air Concentration, Air Pollutants, Air Quality, Dumpsite, and Katsina Metropolis

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G9   **PREPARATION AND CHARACTERIZATION OF CHITOSAN /CuO NANOCOMPOSITES**

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Abstract
In this study, a simple preparation of chitosan is reported. The preparation consists of three steps: (1) deproteinisation of the crab shells using NaOH, (2) demineralization of the deproteinised crab shells using HCl to produce chitin (3) the produced chitin was subjected to deacetylation using NaOH to obtain chitosan. Moreover, the copper oxide nanoparticles were synthesized using a modified sol-gel while the chitosan/CuO nanocomposite was prepared using a wet impregnation method. Furthermore, the prepared chitosan, synthesised CuO nanoparticles, and their nanocomposites were characterized by UV–visible spectroscopy and X-ray diffraction. UV–visible spectroscopy showed an electronic excitonic transition at 245 nm clearly revealing the formation of CuO-NPs. X-ray diffractogram obtained showed the phase structures of the chitosan at diffraction peaks at 2θ of 12.56° and 19.92° corresponding to planes (020) and (110) typical of semi-crystalline chitosan while that of CuO nanoparticles showed at diffraction peaks of 2θ values of 32.72, 35.9, 38.97, 48.74, 53.62, 58.34, 61.70, 66.20, 68.11, 72.54, and 75.44o correspond to the (110), (101), (002), (211), (112), (310), (202), (113), (220), (311), and (222) planes of CuO, respectively. Notably, this study showed that a novel chitosan/CuO nanocomposite

could be prepared via a simple method.

Keywords: chitosan, nanocomposite, demineralization

G10 ## ASSESSMENT OF RADIOLOGICAL RISK USING NATURAL RADIONUCLID ES IN SOME HERBAL REMEDIES PRODUCED IN KATSINA, NIGERIA

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Abstract
The use of herbal remedies for treatment of various ailment are common practice in developing countries, but the formulation of this products is usually complex, hence, the need for thorough quality check especially with possible health risk these could pose. Therefore, this study examined the plant mix of *Anogeissus leiocarpus, Prosopis Africana, Boswellia odorata and Guiera senagalensis* in ten (10) herbal remedies samples sold in Katsina, Nigeria using cluster analysis of the natural radionuclides (K-40, Ra-226 and Th-232). Also, the radiological hazard (Average Annual Committed Effective Dose (AACED) and Annual Gonad Equivalent Dose (AGED)) due to consumption of the herbal remedies was evaluated. The concentration of the K-40, Ra-226 and Th-232 was determined using gamma spectroscopic analysis. The results recorded the concentration of K-40 ranges from 63.92±2.78 - 210.43±6.54 Bq/Kg, Ra-226 varied from 8.55±4.07 - 41.19±2.71 Bq/Kg and Th-232 concentration ranges from 30.51±0.27 - 157.31±1.29 Bq/Kg. The exposure of human consuming the herbal remedies using the AACED showed ingestion of K-40, Ra-226 and Th-232 in the herbal remedies is below the average radiation dose of 0.3 mSv. However, the indexes, Ra_{eq} and AGED in three samples are above 370 and 300 mSvyr[-1] recommended limits, respectively. Hence these herbal remedies are not safe for consumption based on radiolological hazard.

Keywords: Natural, Radionuclides, Activity, Herbal Remedies, Nigeria

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G11 ## SMOKED FISH QUALITY AND SAFETY: A REVIEW

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Abstract
Fish is an important source of proteins to human that helps to improving human nutrition and economic growth. However, many communities and poor rural households relying on fish to meet their end needs are still constrained by postharvest losses of fish and fish products in the value chain due to spoilage, expensive processing technologies and inability to start a fish business venture. Hence, fish smoking becomes the most common method of preservation used. To address the issue   of quality and safety of the smoked fish.
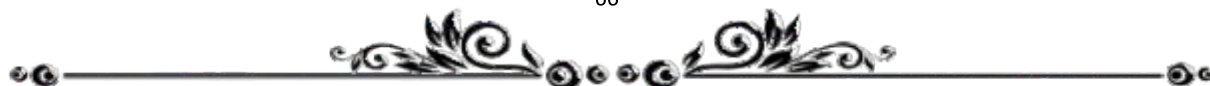
This study provided a comprehensive review on acceptable practices to address potential hitches threatening safety of fish and fish products, specific factors influencing the smoking process and the reward for adopting improved techniques as well as eight stimuli for safe food processing and production in developing countries.

Keywords: Fish, Smoked, Quality, Safety

G12   **EFFECT OF COPPER OXIDE NANOPARTICLES FUEL ADDITIVES ON THE PERFORMANCE OF DIESEL ENGINE**

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Abstract

The present work investigates the effect of copper oxide nanoparticles on diesel engine performance and emissions. The CuO nanoparticles were biosynthesized using aqueous extract of orange peels and characterized by UV spectroscopy. Subsequently, the nanoparticles blended diesel samples (D10, D20, and D40) were prepared by mixing a certain volume of commercial diesel with the CuO nanoparticles in the mass fractions of 10, 20, and 40 mg using homogenizer at 700 rpm for 15 minutes respectively. The performance and emission tests were done in the diesel engine to investigate the effect of nanoparticles using each of the diesel samples as fuel at varying speeds in the range of 1000 - 2200 rpm and constant fuel injection pressure The results obtained were compared with a commercial diesel sample (D). The change in the colour of the aqueous copper nitrate solution from blue to green and the presence of an absorption band at a maximum wavelength of 245 nm in the UV spectrum of the nanoparticles indicate the formation of copper nanoparticles. For the engine performance test, results revealed that all the CuO nanoparticles blended diesel samples show a decrease in brake-specific fuel consumption (10.792, 18.331, and 21.086 %) compared to the commercial diesel sample.

G13   **OUTDOOR BACKGROUND RADIATION LEVE L AND RADIOLOGICAL HAZARDS ASSESSMENT IN KADUNA CITY, KADUNA STATE, NIGERIA**

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Abstract

This research reports on the background radiation assessment in Kaduna city, Kaduna State, Nigeria over several selected dumpsites where, there was background ionization radiation measurements. This was achieved by measuring the *micro-sievert per hour* (Svhr $^{-1}$) radiation exposure rate by a radiation survey meter (Radex one Outdoor 55130719 NA). The detector was positioned at a height of roughly one (1) *meter* above ground level in four (4) sample locations to take readings. In the month (January) 2023, the readings were taken three times in a week in four different locations within each of the Dumpsites. The results showed that the annual effective dose rate measurements taken in the four dumpsites are Unguwan Rimi 0.23 *mSv/yr*, Hayin Danbushiya 0.25 *mSv/yr*, Badarawa Kaduna 0.31 *mSv/yr*, and Unguwan Shanu Kaduna 0.30 *mSv/yr* with a mean value of 0.27 *msv/yr*, while 0.95X 10^{-3} is the mean excess life cancer risk (ELCR). The results demonstrated that the total dumpsites' annual absorbed dose rate has not exceeded the 1.0 *mSv/yr* maximum permissible limit suggested by International Council on Radiological Protection (ICRP, 2000) for the general public and non-nuclear industrial environment. For the dumpsite personnel, scavengers, and nearby people (residents) around the dumpsite, it was found that the mean average exposure values from the site were discovered to be less than 1.16 x 10^{-3} (the typical background standard). This means that the exposure to the dumpsite is minimal and within safe limits.

Keywords Absorbed Dose, Annual effective dose, Background radiation, Radiation survey meter

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G14   **RADIOLOGICAL ASSESSMENT OF GROUNDWATER OF BAUCHI NORTH IN BAUCHI STATE FOR NATURAL RADIONUCLIDES AND METAL CONTAMINATIO NS**

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Abstract
Besides surface water, groundwater is the most commonly used water resources by human beings for consumption. Hence the assessment of its quality against radiological and other forms of contamination is a vital and crucial issue. Human exposure to high concentrations of water contaminants such as natural radionuclides, radon-222, some heavy metals, gross alpha and gross beta constitute great health consequences. This study seeks to assess the quality of groundwater sources within Bauchi-north district of Bauchi state, estimate the annual effective doses (AED) and the check the correlation between the concentrations of these water contaminants and some physiochemical parameters of water (PH, temperature and conductivity). In this study three (3) different techniques: Liquid Scintillation (LSC), X-ray fluorescent (XRF) and Gas proportional counter will be employed to analyse natural radionuclides as well as their progeny such as radon-222, heavy metals, gross alpha and beta respectively. The result of this study is expected to produce activity concentrations of radon-222, gross alpha and beta, AED and concentrations of heavy metals which will be either above, or below the maximum contaminant level sets by World Health Organization

(WHO) and other regulatory agencies. Moreso, the relationship between these concentrations and the physiochemical parameters will either be significant (>0.5) or insignificant (<0.5), positive or negative.

Keywords: groundwater, contamination, natural radionuclides

G15   **PHYSICOCHEMIC AL ANALYSIS OF WATER SAMPLES FOUND IN AJIWA DAM, KATSINA STATE**
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Abstract
Water is essential for the survival of all living organisms. It has numerous applications in domestic, industrial, commercial and agricultural activities. It is one of the raw materials for photosynthesis — a process through which plants prepare their own food. It is used as solvent: in various chemical processes requiring gaseous media. However, numerous health problems arise from unhygienic water which lead to many health problems including diarrhea, dysentery and can lead to an abrupt death. This work reports on the assessment of water quality parameters in Ajiwa Dam for suitability of its usage for human consumption. Water samples from dam were collected from three randomly selected sections of the dam. The various physical and chemical parameters; pH, Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Total Dissolved Solids (TDS), nitrates, and color were analyzed using standard methods of analysis. A number of mathematical equations provided by the standard sources were used to compute the results. The results obtained showed that most of the water samples analyzed are not suitable for use as portable water for drinking because the analyzed parameters are found to exceed or fell short of the accepted limits of World Health Organization (WHO).

Keywords: water, dam, World Health Organization (WHO)

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G16   **CORROSION INHIBITION POTENTIAL OF** *Caralluma Dalzielii*(N.E Brown): FT-IR AND GC-MS INFORMATION**
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Abstract
The corrosion study of *Caralluma Dalzielii* (N.E Brown) was carried out and the Gas Chromatography and Mass spectrum (GC-MS) done, revealed the presence of twelve (12) compounds in the extracts of the plant stems. The functional groups in the compounds of the stem extracts were also examined and identified by Fourier Transformed Infra-Red Spectroscopy (FTIR) which revealed the presence of ten (10) functional group. The FTIR

study investigate the various functional groups among the extract, the blank and the inhibited corrosion product, while the GC-MS investigation reveals the organic molecules in the stem extracts.

Keywords: corrosion, *Caralluma Dalzielii*, Gas Chromatography

G17

BACTERIOLOGICAL A NALYSIS OF POULTRY WATER FROM POULTRY FARMS WITHIN DUTSIN -MA TOWN

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Abstract
This study aimed to investigate the bacteriological quality of poultry water from different poultry farms within Dutsin-ma, Katsina State, Nigeria. Samples of poultry water were collected from seven different locations within the area used for rearing poultry. The Water samples were analyzed for Total Bacterial count, Total coliform count and Isolation and Identification of Indicator organisms using standard microbiological techniques. The results for Bacterial count showed that Unguwar Alkali, Unguwar Abba Jaye, Kadangaru and Hayin Gada had the highest bacterial load of (8.25×10^1cfu/ml), (7.96×10^1 cfu /ml), (7.2×10^1 cfu /ml), and (6.72×10^1 cfu /ml) respectively. While FUDMA Farm had (1.0×10^3 cfu /ml), Isah Kaita Farm (1.72×10^2 cfu /ml), and Dangani Farm (2.02×10^2 cfu /ml) recorded the least bacterial load respectively. The total viable bacterial count ranged from (4.7×10^3-5.9×10^3cfu/ml) while the Total Coliform count ranged from (1.3×10^3-3.9×10^4cfu/ml. *Staphylococcus aureus* and *Escherichia coli* were the most prevalent bacteria species in the samples with prevalence of (23.33%) each, while *Salmonella* spp. had the prevalence of (21.62%). There was no significant difference in the viable count of bacteria between the five locations. The results reveal that the water quality for poultry rearing within these locations are above the WHO acceptable limits. This suggests that interventions such as adequate chlorination and proper treatment of the samples should be employed to meet the standards set by the World Health Organization.

Keywords: Water, Water Quality, Water borne Pathogens, *Escherichia coli*

G18

EXTRACTION AND KINETICS PARAMETE RS ANALYSIS OF THE EXTRACTION PROCESS OF RICE BRAN OIL FROM RICE MILLING COMPANY FUNTUA, KATSINA STATE, NIGERIA

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Abstract

In this study, the yield and kinetic parameters of the oil extraction process from rice bran using n-hexane as a solvent were evaluated for different temperatures, moisture contents of the solid phase, and particle sizes. The extraction process yield increased with increase in temperature and contact time of solid particles with the solvent until reaching equilibrium (saturation of the solvent), for all the temperatures, moisture contents, and average particle sizes. These parameters significantly influenced (95% confidence) the extracted oil yield. The extraction was done at three different temperatures 70 °C, 80 °C, and 90 °C. The kinetic model found that the extraction reaction was first-order reaction and the increase in temperature increased the oil yield from 8.60g/L at 70 °C to 15.68g/L at 90 °C after 1 hour 30 minutes of extraction.

Keywords: Rice, Yield, Oil, Temperature, Kinetics.

G19

SEASONAL ASSESSMENT OF CADMIUM AND LEAD IN SOIL SAMPLES FROM DUTSIN -MA IRRIGATED FARMLANDS IN KATSINA STATE, NIGERIA

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Abstract

Heavy metal pollution causes major changes in soil quality and ecological status of the environment, they are extremely persistent in the environment because of their non-biodegradable nature, long biological half-lives, and thermal stability hence becoming sources of pollution in the soil. Once soil is contaminated, it will not only affect the rapid growth of crops and quality yield of agricultural products but also pose a threat to human health via the food chain. This study was conducted to assess the seasonal variations of cadmium, and lead in soil sampled obtained from Dutsin-Ma irrigated farmlands, so as to evaluate the impact of using these soils for agricultural or pastoral farming. A total of ten (10) soil samples were collected from ten irrigated farmlands in the dry and wet season. The samples were ground, sieved, digested and analysed using flame atomic absorption spectrophotometer. Descriptive and inferential statistics were adopted for data interpretations. Mean levels of Cd and Pb in soils during dry season were 0.239 ± 0.022 and 0.21833 ± 0.011 mg/kg respectively and 0.134 ± 0.01 and 0.293 ± 0.021 mg/kg respectively during wet season. There was a significant difference in the levels of these metals across the sampling sites and seasons ($P < 0.05$). All the soil across the sampling location had Cd and Pb below WHO, and NESREA threshold limit except Daguda soil (DSL) and Makera soil

(MSL) with Cd mean levels of 0.386 ± 0.02 mg/kg and 0.363 ± 0.030 mg/kg respectively during dry season. The contamination factor (CF), pollution load index (PLI), and geoaccumulation index (Igeo) of the soils were low across the sampling sites and therefore of acceptable quality for agricultural and pastoral as at the time of this study.

Key words: Analysis, Agricultural, Concentration, Pastoral, Pollution

SECTION H

EXPLORING IONIZING RADIATION FOR NATURAL DEVELOPMENT

H1 SIMULATION OF NUCLEAR CROSS SECTIONS FOR Cs-130 AND Cs-131 PRODUCTION USING (a,n) AND (a,g) REACTIONS ON STABLE I-127 FROM 1 TO 20 MeV

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Abstract
Use of radionuclides in diagnoses and therapies of many diseases is becoming a routine part of national and even local healthcare systems around the globe in recent times. Commonly employed nuclear diagnostic procedures such as Positron Emission Tomography (PET) and Single Photon Emission Computed Tomography and many other specialist imaging procedures are now becoming choice means for detecting cancer of many organs and other anomalies just as radiotherapy is being utilized to treat cancers like that of the thyroid with I 131. This research investigates the excitation function calculation for the production of Caesium 130 and 131 via the (a,n), and (a,g) reactions respectively, on stable I-127 within the energy range of 1-20 MeV using EXIFON Code. Cs-130 and 131 are important radionuclides for radiotherapies of several vital organs as Cs-130 serve as intracavity implant while 131 provides soft X-rays for Brachytherapy. The calculations aim to establish threshold energy, maximum cross sections and Excitation functions for the reactions in an effort to facilitate their production and to prevent medical crisis that could result in case of shortage of these radionuclides.

Keywords: Excitation Function, EXIFON, PET, Radionuclide, SPECT

H2 INFLUENCE OF SPECIFIC ACTIVITY OF NEUTRON FLUX MONITOR (Al-0.1%Au) THIN WIRE IN PROTOCOLS DEVELOPM ENT FOR NIRR-1 EPITHERMAL NEUTRON ACTIVATION ANALYSIS FOLLOWING HEU TO LEU CONVERSION

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Abstract
The significance of ENAA in the field of science research, technological advancement, and creating innovations on how humans interact with elemental components in food chain and environment lead to development of ENAA protocol in research reactors. The Nigeria Research Reactor-1 is a Miniature Neutron Source Reactor primarily modeled for Neutron Activation Analysis (NAA), The thermal neutron (90–95%)component of the irradiation channel have energies below 0.5 eV and are in thermal equilibrium with the atoms used to bombard a sample, due to its drawbacks of Compton effects that interfere with the measurement of gamma rays of trace elements as observed in activation of Na and CI in biological samples, Na, Al, and Mn in rock samples leads to the idea of filtering out of thermal neutrons by using Cd or B shield to carryout Epithermal Neutron Activation Analysis(ENAA). Epithermal neutrons, which have energy between 0.5 eV and 0.5 MeV, are

increasingly needed by reactor clients. The activity of flux monitor Al-0.1%Au wire of 0.0122 g was calculated to be 5_8 count/s.gusing A1 inner channels of the Cd line irradiation which can be used for the determination of epithermal flux in the channel A1, making the reactor safe for ENAA after its conversion from HEU to LEU.

Keywords: Neutron Source Reactor, Neutron Activation Analysis

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H3   INVESTIGATION OF RADIATION SHIELDING PARAMETERS IN PARKIA PODS USING PHY-X SOFTWARE

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Abstract
Investigations and researches on the photons and radiation shielding parameters of materials focus mostly on rocks, soil, concretes and glasses. The investigations are silent on some biological samples such as plants and trees. In this study, the investigation focuses on the elemental composition and shielding parameters of Parkia pods using PHY-X software. The elemental composition of the sample was analyzed using Energy Dispersive X-ray Fluorescence (EDXRF). The linear attenuation coefficient, mass attenuation coefficient, tenth value layer, mean free path and effective atomic mass of the sample were computed by PHY-X software. The results showed that the linear attenuation coefficient decreases as the photon energy increases 1.00E-01 MeV, 25.689 cm^{-1} and 1.00E+01 MeV, 2.042 cm^{-1}. While the HVL and TVL are increasing with the increase in photon energy 1.00E-1 MeV, 0.012 cm, 1.00e+01, 0.339 cm. And the mass attenuation coefficient decreases as the photon energy increases. The values for the energy photon in MeV and effective atomic mass (Z_{eff}) are ranging from 1.00E-01, 1.50E-01, 2.00E-01, 2.84E-01, 3.00E-01, 3.47E-01, 4.00E-01, 8.26E-01 to 8.00E+00 and 43.53, 34.39, 28.65, 24.00, 22.35, 21.53, 20.63, 20.14 and 19.95, respectively. The results showed that the sample is efficient for radiation shielding due to lead (Pb) content in it.

Keywords: Attenuation coefficient, value layer and shielding

H4   BACKGROUND IONIZING RADIATION ASSESSMENT OF URBAN WASTE DUMPS; REVIEW OF ASSESSMENT STANDARD AND LEVEL

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Abstract
This review takes a brief analysis of some studies on gaps involved in approaches of some

screened and selected research outputs conducted In-Situ Background Ionizing Radiation, (BIR), assessments with regards to attempts at attaining basic objectives of the assessment. The review surfed across available In-Situ BIR studies of urban waste dumps mainly throughout different parts of Nigeria. The outcome of the review revealed that majority of studies conducted on radiation dose emission via In-Situ approach neglected necessity to evaluate Excess life Cancer Risks, ELCR. Also discovered, quite sizable number of researchers did not boarder to measure background ionizing radiation of the environment at some proximate distance from waste dumps of study, an error which literarily deny research team ability to isolate true value of radiation dose emission at site to be factors due to effect of unregulated waste dumping practice.

Keywords: In-Situ Back ground Ionizing Radiation, urban waste dump, radiation dose, Excess life cancer risk, Sievert

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H5

RADIOACTIVITY ESTIMATIO N OF BAOBAB PLANT IN KATSINA METROPOLIS, KATSINA STATE NIGERIA
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Abstract
Natural radioactivity sources are mostly from soil, water, plants and vegetation. The major isotopes of concern from these sources are potassium, uranium and the decay product of uranium, such as thorium and radium. In this study, radioactivity estimation of baobab plants was carried out in Katsina metropolis, Katsina State, Nigeria. Samples of soil, roots, and leaves were collected, prepared and analyzed to estimate the activity concentration of the natural radionuclides of U-238, Th-232, and K-40 using a low background detector of NaI (TL) gamma ray spectrometer. The results obtained showed that the activity concentration ranged from 0.1 Bq/kg to 33.26 Bq/kg, 1.98 Bq/kg to 64.98 Bq/kg and 65.89 Bq/kg to 1009.69 Bq/kg with overall mean values of 11.35, 18.87 and 545.14 in Bq/kg for ^{238}U, ^{232}Th and ^{40}K respectively. The mean values obtained for U-238 and Th-232 are lower than the world average values of 30 Bq/kg for U-238 and 35 Bq/kg for Th-232, while K-40 was found to be higher than the world average of 420Bq/kg. This current study indicates that there is no any radiological health risk in using the roots and leaves of Baobab plants for any purposes. Moreover, the measured soil around the study area was found to be safe and will not pose any radiation exposure to the population. Hence, this radioactivity estimation will serve as baseline for detection of any future released activities of related natural radionuclides especially around the consumable plants. However, effort should be made to ensure that the radiological parameters of the study area are kept as low as reasonably possible.
Keywords: radioactivity, baobab, Katsina

SECTION I

INTERNET AND ITS THINGS

I1
ENSURING PRIVACY IN IOT APPLICATIONS: AN IN -DEPTH EXAMINATION THROUGH LITERATUR E REVIEW

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Abstract
The Internet of Things (IoT) has revolutionized how smart devices collaborate with each other and interact with both physical and virtual objects over the Internet to accomplish complex tasks. These smart devices find application in various fields such as smart grids, healthcare, and smart environments, where multiple stakeholders share data for specific purposes. In these domains, data often contain sensitive information and are closely tied to the habits of their owners. Consequently, the IoT has given rise to significant concerns regarding data privacy and protection. This paper presents the findings of a comprehensive literature review that delves into privacy-preserving solutions employed within Cooperative Information Systems (CIS) in the IoT domain. The research work conducted an exhaustive search for scholarly works on this topic. This paper focused on a subset of these aspects, which include: definition of IoT, techniques used for safeguarding privacy, and adherence to ISO privacy principles. Ultimately, the research work offered recommendations to enhance the integration of privacy principles and fulfill security requirements in IoT applications by combining Blockchain and machine learning method.
Keywords: Internet of Things, Privacy, Blockchain, IoT Architecture

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I2
NETWORK TOPOLOGY ANALYSIS AND STRUCTURES

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Abstract
Distributed computer systems have gained significant importance and popularity in modern computing. They offer high-performance capabilities at a cost-effective price point. These autonomous computers are interconnected through communication networks within a distributed computing environment, organized into geometric structures known as network topologies. This paper offers a comprehensive examination and analysis of network topologies, including definitions of both physical and logical network topologies. This paper explores the evolution of network topologies and logical communication structures within computer networks. For the physical topology, the types and the weaknesses were provided more so, it analyzes the shortcomings of traditional shared media and token-based topologies and proposes an advanced approach, Mesh-hybrid for physical topology the Switched Ethernet Topology for logical based, which eliminates collisions, optimizes bandwidth, ensures low latency, and offers scalability. This innovative method addresses the complexities of modern network communication, providing enhanced reliability and efficiency for a wide range of applications.
Keywords: Internet of Things (IoT), Thread-Level Parallelism (TLP), Scalability

SECTION J

MEDICINE AND BIOMEDICA L

J1

**ANTIBACTERIAL EFFECT OF *ANANAS COMOSUS* (PINEAPPLE) PEEL
EXTRACT AGAINST *ESCHERICHIA COLI* AND *SALMONELLA* SPECIES
ISOLATED FROM OPEN WELL WATER IN KADANGARU, AREA OF
DUTSIN-MA LOCAL GOVERNMENT, KATSINA STATE, NIGERIA**
Abduljalal Mukhtar and Abdulhaleem Musa Kabo
Federal University, Dutsin-Ma

Abstract
Access to safe drinking water is a fundamental requirement for public health, particularly in rural areas where open well water sources are commonly utilized. Contamination of these sources with pathogenic bacteria poses a significant health risk. This study investigates the potential antibacterial properties of *Ananas comosus* (pineapple) peel extract against waterborne pathogens. Twenty (20) water samples were collected from open wells in the Kadangaru area of Dutsin-Ma Local Government, Katsina State, Nigeria. Soxhlet extraction, phytochemical screening, FTIR, GC-MS, isolation, and agar well diffusion standard procedures were employed. Escherichia coli and Salmonella species were identified as the predominant contaminants of the open well water. Eleven (11) prominent phytochemicals were identified, namely: alkaloids, anthraquinones, coumarin, flavonoids, fatty acids, phenols, quinones, saponins, tannins, steroids, and terpenoids. The most prevalent phytoconstituent in the A. comosus peel is delta.13-cis-Docosenoic acid ($C_{22}H_{42}O_2$). A. comosus has shown promising with an inhibitory zone of 21 mm at 50 mg/ml against Escherichia coli and 20 mm at 25 mg/ml against Salmonella species, respectively. The vast array of bioactive ingredients of A. comosus peel methanolic extract informed its potential as a good candidate for drug development.

Keywords: antibacterial, *Ananas comosus*, salmonella

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J2

**ANTIBACTERIAL ACTIVITIES,   PHYTOCHEMICAL TEST, GAS
CHROMATOGRAPHY MASS SPECTROPHOTOMETER (GCMS) ANALYSIS
AND FURRIER TRANSFER INFRARED (FTIR) ANALYSIS OF AQUEOUS
AND ETHANOLIC EXT RACTS OF GUAVA LEAF (*PSIDIUM GUAJAVA*)
ON *E. COLI* AND *SALMONELLA SPECIES***
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Microbiology Department Federal University, Dutsin-Ma P. M. B 5001 Dutsin-ma, Katsina State Nigeria.
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Abstract
The guava (Psidium guajava) is a plant used in folk medicine that is believed to have active components that help to treat and manage various diseases. The many parts of the plant have been used in traditional medicine to manage conditions like malaria, gastroenteritis, vomiting, diarrhea, dysentery, wounds, ulcers, toothache, coughs, sore throat, inflamed

gums, and a number of other conditions. The aim of this research work was to determine the phytochemical constituents, antibacterial activities, gas chromatography mass spectrophotometer (GCMS) analysis and furrier transfer infrared (FTIR) analysis of aqueous and ethanolic extracts of guava leaf on E. coli and Salmonella species. The extracts component was subjected to Phytochemical screening using standard procedure. The leaf of Psidium guajava was Extracted using ethanol and water as solvents. The leaf extracts was tested for in vitro antibacteria activity against Salmonella and E.coli using different concentrations (50 mg/ml, 100 mg/ml and 200 mg/ml). Using agar well diffusion method. The gas chromatography mass spectrophotometer (GC-MS) analysis of the extract and furrier transfer infrared (FTIR) analysis of aqueous and ethanolic extracts was analyzed. The results of the phytochemical test reveal the presences of alkaloids, flavonoids, saponins, phenols, tannin and glycosides while in the aqueous extracts tannin was absent with the presences of alkaloids, flavonoids, saponins, phenols and glycoside. The ethanolic and aqueous leaf extracts were inhibitory to the test organisms (Salmonella and E. coli) with the highest inhibition recorded 24 mm and least zone of inhibition 12 mm at 50 mg/ml. The gas chromatography mass spectrophotometer (GC-MS) analysis of the ethanolic extract quantify and reveal the chemical profile of the extracts with different compound names, distinct peaks, retention time, (RT), molecular formular, molecular weight (MW), chemical structures and percentage area (%). With twenty (20) components were identified in the ethanolic extract. The furrier transfer infrared (FTIR) analysis of ethanolic extract indicate six (6) chemical compounds with different peak numbers, wave length and intensity while the aqueous extract reveals three (3) chemical compounds. The presence of the various compounds confirms the use of the leave extracts of Psidium guajava for the treatments of various ailments by traditional methods of medicine.

Keywords: Psidium guajava, Antibacteria activities, GC-MS analysis, FTIR analysis and Extracts

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J3

HEALTH RISK ASSESSMENT OF SELECTED HEAVY METALS IN IMPORTED HEERBAL TEAS SOLD IN DUTSINMA TOWN KATSIN A STATE, NIGERIA

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Abstract
Herbal teas are the second- most popular beverage worldwide, behind water and Nigerians have increased their use of them. Nigerians have consumed more tea as a result of its known health benefits. The goal of this study is to determine the concentration of selected metals (Pb, Zn, Fe, Cu and Cd) in herbal teas as well as to estimate the danger to human health from consuming them. Twenty samples of popular herbal teas were randomly purchased from herbal tea vendors in Dutsin-Ma town of katsina state located in Northen region of Nigeria. Atomic absorption spectrometer (AAS) and Micro-plasma emission spectrometer were used to evaluate the health risk assessment and concentration of heavy
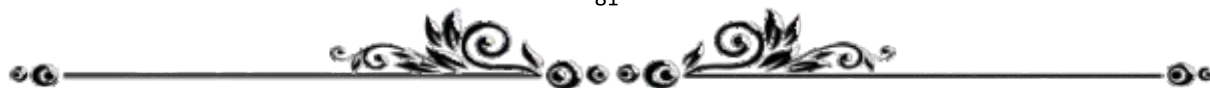
metals of the samples. The evaluation indicated that the level of heavy metals varied between the various brand of the herbal teas, though according to the estimated daily intake of the heavy metals iron (Fe) was found to be more concentrated in the samples while lead (Pb) is the least. In the order Fe>Zn>Cu>Pb the average mean of dose intake of metals was 0.657,0.118,0014,0.0009 m/kg/day respectively. The value of the hazard index (HI) and Target hazard quotient (THQ) were <1. These implies that consumption of such herbal risk carried a modest risk of heavy metals exposure and has minimal negative health effect, while they are good source of iron to human.

Keywords: hazard index, herbal tea, heavy metals, AAS

J4

STUDIES OF PHYTOCHEMICALS WITH ANTIMICROBIAL ACTIVITY FROM *Vernonia Kotschyana* (Sch BipEx Walp) RHIZOME FOUND IN DUTSIN-MA

Tijjani Ali, Abubakar Dahiru Rimi and Maryam Kemi Gafar
Federal University Dutsin-Ma, Katsina State, Nigeria

Abstract
The family Asteracea contains about 24000 species including *Vernonia kotschyana* sch. (*V.kotschyana*). The *V. kotschyana* (a medicinal plant of various medicinal applications) was studied in this research. Ethnomedicinal uses of *V. kotschyana* includes it use to treat ulcers, typhoid fever, diarrhoea and wounds. The root of the plant, after preparation, was subjected to maceration using n-hexane, dichloromethane (DCM), ethyl acetate and methanol. Extracts obtained were subjected to antimicrobial tests (with *Staphyloccocus saureus, Salmonella typhi, Bacillus subtilis and Pseudomonas aeruginosa* as test organisms). Subsequently, the most active extract (DCM) was analysed with gas chromatography mass spectrometry (GCMS). Antimicrobial test result showed that the extracts were active against *Bacillus subtilis*, *Staphylococcus aureus*, *Salmonella typhi* and *Pseudomonas aeroginosa* (with zone of inhibition range as 7mm-21mm). The highest activity was recorded by DCM extract against *Staphylococcus aureus* (zone of inhibition was 21 mm). Campesterol, stigmasterol, 1, 3 propanediol, 2 (hydroxymethyl)2-nitro, decane and tetrapentacontane were found to be the most abundant molecules out of the twenty six (26) compounds identified by the GCMS . These findings are in conformity with some of the traditional uses of *V. kotschyana*.

Keywords: Phytochemicals, Studies, *Vernonia kotschyana*, antimicrobial, Dutsin-Ma.

J5   **PREVALENCE OF *TREPONEMA PALLIDUM* AMONG PREGNANT WOMEN ATTENDING CLINIC OF FEDERAL UNIVERSITY DUTS IN-MA, KATSINA STATE, NIGERIA**

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Abstract

Sexually transmitted infections (STIs) during pregnancy pose significant risks to both maternal and foetal health. Among these infections, *Treponema pallidum*, the causative agent of syphilis, stands out as a preventable and treatable yet potentially devastating condition if left untreated. This study aimed to assess the prevalence of *Treponema pallidum* among pregnant women attending the University clinic of Federal University Dutsin-Ma, providing valuable insights into the burden of syphilis in this population. A cross-sectional study was conducted among pregnant women attending antenatal care at the clinic between August and September 2023. A total of 40 pregnant women were enrolled, and each participant underwent a serological test for *Treponema pallidum* using a rapid diagnostic test kit. Demographic and clinical data were collected through structured interviews and medical record reviews. The study observed that the prevalence of *Treponema pallidum* among the samples of pregnant women was 12.5% (5/40). Among patients who tested positive for the disease, the highest (40%, 2/5) percentage occurrence was observed among each of the age groups 25-34 and above 45 years old while none was observed among those aged 18-24 years. Patients having unprotected sex also showed the highest (60%, 3/5) percentage occurrence of the disease followed by each of those having multiple sexual partners (20%, 1/5) and those living in polygamous marriage (20%, 1/5). Previous medical history of the patients showed that patients with previous preterm birth had the highest (60%, 3/5) occurrence followed by patients with previous miscarriage (40%, 2/5). The prevalence of 12.5% found in this study was higher than the National Average of 0.3% for syphilis among pregnant women in Nigeria. This study also showed an increasing prevalence of syphilis in pregnant women attending antenatal clinics. The important risk factors for syphilis in pregnant women were a history of unprotected sex, multiple sex partners, and polygamous relationships. Rapid diagnosis and drugs should be employed for the screening and treatment, of syphilis. The practice of safe sex should also be promoted.

Keywords: Sexually transmitted infections, *Treponema pallidum*

J6
ANTIMALARIAL AND ANTIOXIDANT ACTIVITIES OF LUMEFANTRINE FORMULATION ON *PLASMODIUM BERGHEI* INFECTED MICE

Ganiyu Aderounmu Ibrahim, Benjamen Maina Yohanna, Ali Siddiq Idoko, Balkisu O. Abdulrahman and Jubril Olayinka Akolade
Federal University Dutsin-Ma

Abstract

Antimalarial drug resistance is one of the greatest challenges towards eradicating malaria. Exploring new combination therapies can overcome challenges of antimalarial resistance. The present study examined antimalarial and antioxidant activities of lumefantrine formulated with polyethylene glycol (LUM-PEG) on *Plasmodium berghei* infected mice. Mice weighing 27 ± 2.5g were randomized into five groups of seven mice per group. Group 1 received dimethyl sulphoxide, group 2 (infected $1x10^7$ *Plasmodium berghei* and untreated), group 3, 4 and 5 were infected and treated with chloroquine, lumefantrine and LUM-PEG respectively. Thin blood smears were prepared 72hrs after inoculation with parasites and after 3 days' treatment, blood sample were collected for biochemical analyses. Data obtained were subjected to statistical analysis. There was no significant ($p>0.05$) difference in percentage parasitaemia in all the groups compared to the control after 72hrs inoculation. Parasitaemia reduced significantly ($p<0.05$) in the treatment groups producing 22.89%, 26.27%, and 18.81% parasitaemia in chloroquine, lumefantrine and LUM-PEG respectively compared to untreated group and corresponding parasitaemia inhibition recorded were 50.94, 44.14 and 59.64 in treated groups respectively. Untreated groups showed significant increased ($p<0.05$) in white blood cell count, lymphocyte and granulocytes levels while decreased in hemoglobin, red blood cell count, haematocrit, mean corpuscle haemoglobin and mean corpuscle haemoglobin concentration were recorded. Significant decreased in superoxide dismutase and catalase with increased malondialdehyde in untreated compared to the control. Results indicate that lumefantrine formulation has antimalarial properties and can be used in the treatment of malarial after clinical trials.

Keywords: Antimalarial, drug resistance

J7
STUDIES OF PHYTOCHEMICALS WITH ANTIMICROBIAL ACTIVITY FROM *Vernonia Kotschyana* (Sch Bip.Ex Walp) RHIZOME FOUND IN DUTSIN-MA

Abubakar Dahiru Rimi, Tijjani Ali and Maryam Kemi Gafar
Federal University Dutsin-Ma Katsina

Abstract

The family Asteracea contains about 24000 species including *Vernonia kotschyana* sch. (*V.kotschyana*). The *V. kotschyana* (a medicinal plant of various medicinal applications) was

studied in this research. Ethnomedicinal uses of *V.kotschyana* includes it use to treat ulcers, typhoid fever, diarrhoea and wounds. The root of the plant, after preparation, was subjected to maceration using n-hexane, dichloromethane (DCM), ethyl acetate and methanol. Extracts obtained were subjected to antimicrobial tests (with *Staphyloccocus saureus, Salmonella typhi, Bacillus subtilis and Pseudomonas aeruginosa* as test organisms). Subsequently, the most active extract (DCM) was analysed with gas chromatography mass spectrometry (GCMS). Antimicrobial test result showed that the extracts were active against *Bacillus subtilis* , *Staphylococcus aureus*, *Salmonella typhi* and *Pseudomonas aeroginosa* (with zone of inhibition range as 7mm-21mm). The highest activity was recorded by DCM extract against *Staphylococcus aureus* (zone of inhibition was 21 mm). Campesterol, stigmasterol, 1, 3 propanediol, 2 (hydroxymethyl)2-nitro, decane and tetrapentacontane were found to be the most abundant molecules out of the twenty six (26) compounds identified by the GCMS . These findings are in conformity with some of the traditional uses of *V. kotschyana*.

Key words: Phytochemicals; Studies, *Vernonia kotschyana*; antimicrobial; Dutsin-Ma.

SECTION K

MOBILE COMMUNICATION AND TRENDS

K1   PATH LOSS MODELING OF FM RADIO CHANNEL (EXPRESSFM 90.3MHz) OVER THE URBAN CITY OF KANO, NIGERIA

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[2]Katsina State Institute of Technology and Management

Abstract

This study investigated the Received Signal Strength of Express Radio (90.3 MHz) in the urban City of Kano Nigeria, using two different routes with the base station as reference point. The signal strength was measured with a signal meter while a Global Positioning System (GPS) receiver was used to determine the elevation above sea level, the geographic coordinates and the line of sight of the various data points from the base station. The measurement was done at interval of 1 km up to about 15 km for each route through drive test protocol. Path loss was calculated using empirical models and the results were then used to generate the variation of path loss with distance and a set of path loss models by employing the least squares algorithm, with the aim of estimating the path loss of future Radio Networks in the city. Average path loss of 108.96 and 114.68 dB were recorded along routes A; FM Transmitter to Madobi Road and B; FM Transmitter to Hadejia Road respectively. The results reveal that the environment of the urban city of Kano has an effect on the propagation of the radio signal. Furthermore, the results also show that the mean and standard errors of the generated models are acceptable when compared to the measured values. It is expected that the proposed models will be useful for designers of future wireless networks in the urban city of Kano.

Key Words: FM Radio Signal, Path Loss Model, Drive Test Protocol and Received Signal Strength

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K2   ROLE OF EFFECTIVE EARTH RADIUS FACTOR IN RADIO COMMUNICATION IN DUTSE, NIGERIA

[1]Akinsanmi Akinbolati, [2] Sabiru Aminu Yaradua and [2]Florence N. Ikechiamka
[1]Department of Physics, Federal University Dutsin-Ma
[2]Department of Physics, Umaru Musa Yaradua University

Abstract

Planning and designing a radio communication system encounters a setback that affects the quality of radio signal transmission and limits the coverage of the transmission unless maximum consideration is put to secondary radio climatic factors. This research studied the effective earth radius factor (k-factor) and its propagation effect on satellite communication over the city of Dutse, Jigawa State. Data of forty-one years of secondary data (1980-2020) of temperature, pressure rainfall and humidity at the surface 12, 100 and 250 m above ground level retrieved from the European Centre for Medium-Range Weather Forecasts (ECMRWF) ERA-5. The k-factor was computed and analyzed using the latest ITU-

R Models. The range of the mean values of the k-factor of the twelve months at the location of the study is 4.44395- 1.82210 where the largest and least values are obtained at September and February. It was observed that secondary radio-climatic variables exhibit seasonal type dependence, during the dry season, the k-factor varies from 2.38011 to 1.82210, with maximum and minimum values in November and February, respectively. The average dry season k-factor over forty-one years is 1.97818, pointing to significant super-refraction in radio signal propagation during this season. During wet season months, the k-factor varies from 4.44395 to 2.08349, with maximum and minimum values occurring in September and April. The average wet season k-factor over forty-one years is 3.21266, implying a predominantly super-refractive situation in radio signal propagation. This indicates that k-factor values were observed to be higher during the wet season compared to the dry season months, indicating significant variations in the regions' moisture conditions.

Keywords: k-factor, Temperature, Pressure, Humidity and Rainfall

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K3

INVESTIGATION OF RADIO REFRACTIVITY AND ITS EFFECTS ON RADIO WAVE PROPAGATION OVER ABUJA, USING FORTY - ONE YEARS ATMOSPHERIC DATA

[1]Usman, S. L., [2]Nkechiamaka, F. N. and [2]Akinbolati, A.
[1]Department of Physics, Nigerian Defence Academy, Kaduna, Nigeria.
[2]Department of Physics, Federal University Dutsin-Ma

Abstract
Secondary radio climatic factors play a significant role in shaping wireless communication system design and can have detrimental effects on signal quality and coverage. This study focuses on assessing surface radio refractivity, refractivity gradient, and their implications for wireless communication in the Federal Capital Territory (FCT) of Abuja, Nigeria. Secondary Data of meteorological parameters spanning 41 years (1980-2020) were retrieved from the European Center for Medium-Range Weather Forecasts (ECMRF). Data analysis involved computing the radio refractivity for surface (12 m), 100 m and 250 m Above Ground Levels (AGL) using the latest International Telecommunication Union Radio Study Group (ITU-R, 2019-2021) model. Seasonal variations were also investigated with findings showing higher values during wet compared to dry season moths. Result reveals that radio refractivity decreases with increase in height (AGL). The mean values of 356.9533N-uints, 344.966N-uints, and 332.3189N-uints were obtained for the surface, 100m and 250m respectively. The overall findings will be useful for terrestrial radio link over the study area.

Keynotes: Terrestrial radio links; Meteorological variable; Radio refractivity.

K4   **INVESTIGATION AND ANALYSIS OF WHITE LED FOR VISIBLE LIGHT COMMUNICATION USING BLUE FILTERING AND EQ UALIZATION TECHNIQUES**

[1]Magaji, A.B, [2]Ikechiamaka, F. N. and [2]Akinbolati, A.
[1]Department of Physics, Umaru Musa Yar'adua University Katsina, Nigeria.
[2]Department of Physics, Federal University Dutsin-Ma, Katsina State, Nigeria

Abstract

One of the most difficult issues in VLC with white LEDs is modulating the optical signal to carry data while maintaining acceptable levels of light. On-Off Keying non-return to zero (OOK-NRZ) modulation is a popular technique in VLC systems that switch the LED intensity between two states to represent binary data. The suggested method incorporates blue filtering and equalization techniques, the latter tries to lessen the impact of the phosphor coating while improving the modulation capabilities of the white LED's blue component. Equalization techniques were used to adjust for transmission medium-induced signal degradation, such as multipath interference or noise. OOK-NRZ modulation signal generated with the light beam intensity, the relative eye-opening percentage decreases from 5 Mbps to 10 Mbps, and the eye-opening drops dramatically to 50% at a data rate of 3.5 Mbps. With the 20MHz of bandwidth the white and blue light's shows a relatively flat line at lower frequencies, at 9.0 mV and gradually decreasing to 10.5 mV at 6.5 MHz. The decline continues as the frequency increases, there is drop in signal strength between 10 MHz and 11 MHz for Equalization1 across the entire frequency range. Quality factor was obtained with driver current of 100mA at 34.5°C with Q-factor 13.2 and it decreases as temperature increases. Beyond 100°C, 300mA starting Q-factor at 34.8°C is around 14.2, and it decreases as the temperature rises. Findings have broad implications for the adoption and improvement of VLC technology, as it demonstrates the viability of OOK-NRZ modulation for VLC systems.

Keywords: (OOK-NRZ On-off-keying non-return to zero), LED (visible light communications)

K5   **RELATIONSHIP BETWEEN METEOROLOGICAL PARAMETERS AND EFFECTIVE EARTH RADIUS FACTOR**

Sabiru Aminu Yaradua and Muhammad Ibrahim Bagudo
Federal University Dutsin-Ma, Dutsin-Ma, Katsina State

Abstract

This research studied the impact of meteorological parameters (Rainfall, Humidity, Temperature and Pressure) on effective earth radius factor (k-factor) over the city of Dutse, Jigawa State. A data of forty-one years of secondary data (1980-2020) of

temperature, pressure rainfall and humidity is retrieved from the European Centre for Medium-Range Weather Forecasts (ECMRWF) ERA-5. The k-factor was computed and analyzed using the latest ITU-R Models. The results shows that the rainfall approximately followed the pattern of the k-factor, but the k-factor doesn't directly depend on the amount of rainfall, but relative humidity which is always high during the rainy season. The presence of raindrops causes evaporative cooling as they fall through the air. This cooling effect can lead to a decrease in the temperature of the lower atmospheric layers. The correlation coefficient computation further reveals a very weak positive correlation between k-factor and temperature and pressure which reveal a slight positive relationship between them and a strong positive correlation between k-factor and rainfall and humidity which reveal that strong positive relationship between them. These indicates that changes in temperature and pressure are hardly related to changes in the k-factor while on the other hand changes in humidity and rainfall are related to changes in the k-factor.

Keywords: meteorological parameters, Weather Forecasts

K6   **ENHANCING RESOURCE OPTIMIZATION IN CLOUD COMPUTING THROUGH ARTIFICIAL INTELLIGENCE -DRIVEN FAULT PREDICTION TECHNIQUES**

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Abstract
The majority of current fault tolerance techniques primarily focus on creating clones to replace a failing virtual machine (VM) rather than proactively predicting the failure in advance. Some of these techniques prioritize VM migration over recovery due to resource limitations and concerns about server availability. Examples of these one-dimensional approaches include fault tolerance, migration prediction, and simply expecting failure. Fault tolerance is a critical aspect of this research, where the research aim at identify the most efficient strategy for transitioning from an underperforming system to a functional one. Timely prediction of VM failures is crucial to address issues like wasted resources, energy, and costs. The reliability of virtual machines (VMs), an integral part of fault tolerance systems has been a persistent challenge in cloud computing since its inception. Therefore, it is imperative to focus on enhancing and emphasizing the proactive prediction of VM failures. This effort is driven by the desire to reduce downtime and enhance scalability. This research work employs a technique to safely transfer predicted failing resources from one VM to another, effectively reducing migration time and optimizing resource usage. This article harnesses artificial intelligence to facilitate effective fault prediction techniques in cloud computing for improved resource optimization.

Keywords: resource optimization, cloud computing, fault tolerance
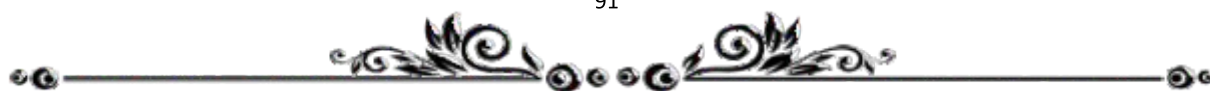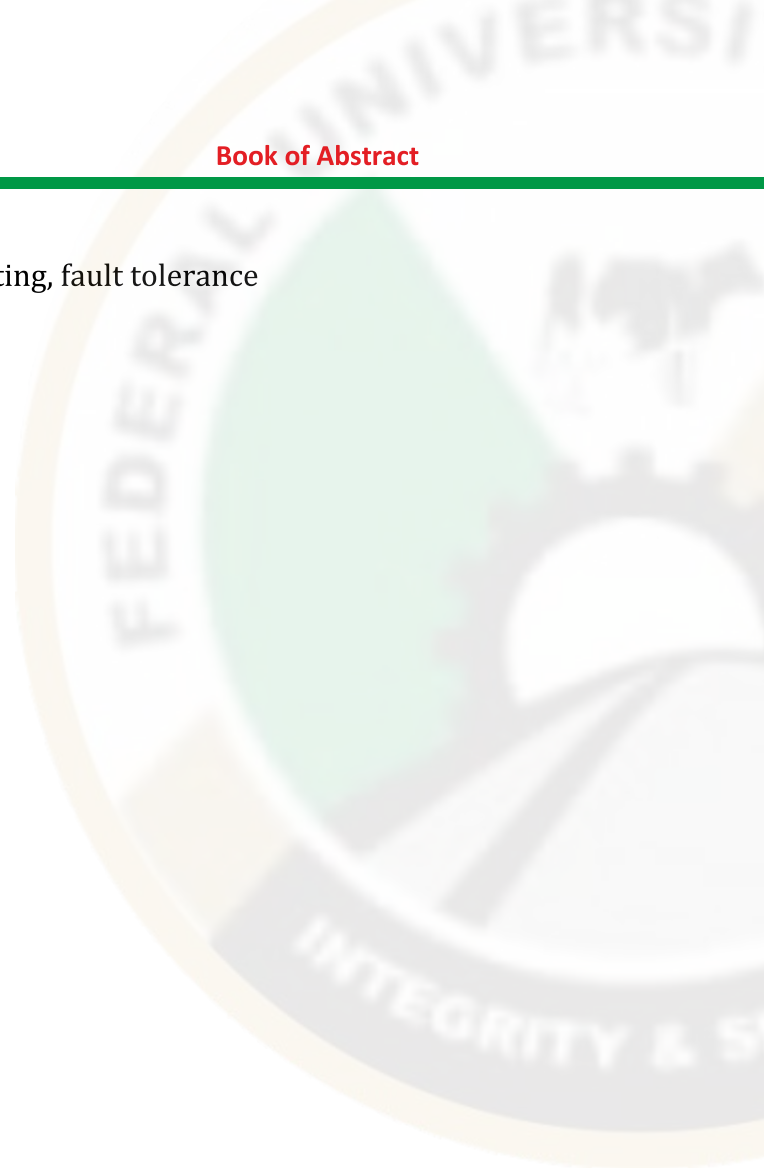
SECTION L

NANOTECHNOLOGY

L1   ENHANCEMENT OF SOLAR THERMAL COLLECTOR COATED WITH ($Al_{1-x}NB_X$) NANOCOMPOSITE IN VARIED THICKNESS RATIOS

Abdulkarim Hamza El-ladan
Umaru Musa Yaradua University Katsina

Abstract

The Nanocomposite ($Al_{1-x}NB_x$) in varied thickness ratios is grown using reactive sputtering technique at room temperature on aluminium alloy and further annealed at 400°C for thermal resistance improvement in solar thermal collector. The surface morphology of the grown material is analyzed with Field Emission Scanning Electron Microscope (FESEM) indicating average particle size of 200 nm while the topography analysis with the help of Atomic Force Microscopy (AFM) and Nanoscope software shows low roughness in ~82-227 nm. High-resolution X-Ray Diffractometer (XRD)(Advance Bruker D8) is used for structural characterization and thus confirmed the presence of Cubic aluminium nitride (c-AlN) (200 and 220), cubic boron nitride (c-BN) (111) and cubic aluminium (c-Al) (111 and 311) crystal planes respectively. To further confirm the presence of the (AlN) and (BN) phases, the Fourier-Transform Infrared Spectroscopy (FTIR) is used and a very shallow and clear transflectance spectra between ~ 545 cm^{-1} and 1672 cm^{-1} were obtained. The thermal performance of coated aluminium alloy is analysed using the cumulative structure function analysis which indicates excellent reduction in total thermal resistance (Rth j-a) along the thermal path of the high power (LED) package and the alloy to more than 42% above the bare aluminium alloy. This is indicating outstanding performance the grown composite ($Al_{1-x}NB_x$) compared to my previous results of (AlNB) with 20% and (BAlN) with 40% respectively and thus highly recommended for solar thermal applications (solar dryer, solar water heater, solar cooker and CSPs) as well as solar photovoltaic thermal (PVT).

Keywords: Nanocomposite, Solar, Atomic Force Microscopy

SECTION M

NATURAL PRODUCTS AND APPLICATIONS
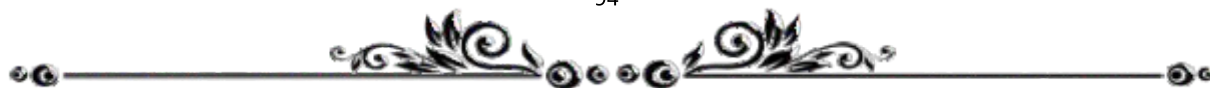
M1 **PRODUCTION OF ANTIMICROBIAL SOAP USING SOYA BEANS OIL, NEEM SEED OIL AND SESAME SEED OIL.**

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[2]Department of Pure and Industrial Chemistry, Faculty of Natural and applied Sciences, Umaru Musa Yar'adua University Katsina, Katsina State, Nigeria

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Abstract

In this study, a saponification reaction was used to create soap using sesame seed oil, neem seed oil, and soy bean oil. A pH value of [10.34] was one of the parameters used to analyze the soap produced, indicating that it is not corrosive to skin. Test results for foam ability [6.1 cm] indicate that the soap produced has a higher foam ability. The results of the solubility test [0.30g] indicate that the soap will not dissolve quickly in water. Corrosiveness test [3.0] results show that the soap has a low percentage of free alkali, which lessens the soap's corrosiveness to skin and qualifies it for bath use. Additionally, the disc agar diffusion method was used to evaluate the antimicrobial activity of the soap produced in vitro. Bacillus cereus and Staphylococcus aureus, two gram-positive and gram-negative bacterial species, are the reference microbes. *Aspergillus nigar* and *Candida albicans,* two fungal species, were tested at three different concentrations [500 mg/l, 250 mg/l, and 125 mg/l].

Keywords: Soya beans oil, Neem seed oil, sesame seed oil, Soap, Physiochemical, Antimicrobial.

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M2 **FERRIC REDUCING ANTIOXIDANT POWER AND DPPH RAD ICAL SCAVENGING ASSAY OF THE EXTRACTS OF *Neocarya macrophylla***

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Abstract

N. macrophylla is a multipurpose plant with wide variety of applications which are attributed to the numerous phytochemicals present in different parts of the plants. Antioxidants are reported to play central roles in reducing or preventing free radical damage in the above oxidative stress related diseases. This study was aimed to evaluate the total phenolic content by Folin-Ciocalteu method and antioxidant capacity of the ethylacetate and methanol leaf extracts of using 2,2-diphenyl-2- picrylhydrazyl hydrate (DPPH) radical scavenging activity and ferric reducing antioxidant power (FRAP). The results of the antioxidant assay were compared with that of butylated hydroxyl toluene (BHT) and ascorbic acid as standards while the polyphenolic contents were expressed as mg of tannic acid equivalent per gram of extract. The methanol extracts showed strong antioxidant activity in both DPPH (IC_{50} 52.87 μg/mL) and FRAP assays which is consistent

with their polyphenolic contents (methanol extract have 122 mgTAE /gm while ethylacetate extract displayed 86 mgTAE /gm). There is a strong correlation between total polyphenol content and antioxidant activities (r^2 = 0.845) indicating polyphenol compounds contribute significantly to the total antioxidant properties of medicinal plant extracts. In addition, the results of the present study indicated that both the ethylacetate and methanol extracts are potential source of natural antioxidants and pharmaceutical plant-based products.

Keywords: ferric reducing antioxidant power, radical scavenging activity

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M3 PHYTOCHEMICAL SCREENING, PHARMACOLOGICAL ACTIVITY AND FTIR ANALYSIS OF THE STEM OF *kalanchoe pinnata* PLANT

Maryam Hassan Sada, Abdulazeez Lawal Maigoro and Abdussalam Shehu Shema
Federal University Dutsin-Ma, Katsina State.

Abstract
In some regions of Nigeria, *kalanchoe pinnata*, often known as the "Life" or "Miracle plant" and also known by the scientific name *Bryophyllum pinnatum*, is utilized in traditional medicine. This study's primary goal is to assess the stem bark of *Kalanchoe pinnata* for the presence of phytochemicals, pharmacological activity and FTIR analysis. Using 300 ml of n-hexane and ethanol, the plant's stem was extracted, and the crude extract was tested for phytochemical screening that revealed the presence of phenols, alkaloids, flavonoids, saponins, terpenoids, and a variety of other compounds, with the exception of tannins and fatty acids for hexane, and the absence of tannins for ethanol. Pharmacological activity: *Aspergillus niger, Klebsiella pneumonia, Pseudomonas aeruginosa, Staphylococcus aureus, Echerichia coli*, and *Bacillus cereus* were among the microorganisms that responded favorably to the stem bark's antimicrobial susceptibility test, but *Salmonella typhi* and *Candida albicans* did not and the crude extract produced the most significant cytotoxic activity against brine shrimp *Artemia salina* (LC_{50}: 0.181mg/mL). FTIR results confirmed the existence of C-H, C=O, $-CH_2$, $-NO_2$, and C-O. In conclusion, the results of this study have given the local people's long-standing use of the herb to fight illnesses a scientific justification and the plant studied can be a potential source of biologically active compounds as antitumor agent, antibacterial and pesticide.

Keywords: Kalanchoe pinnata, cytotoxic, FTIR, antimicrobial

M4   **PHYTO-PHARMACOLOGICAL ACTIVITIES OF PHYLLANTUS AMARUS: AN OVERVIEW**

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Abstract
This study provides an overview of the phyto-pharmacological activities of Phyllanthus amarus. The plant is reported to have a lot of phytochemicals including alkaloids, flavonoids, terpenoids, saponins, and tannins etc. which are responsible for its pharmacological activities. Examining its medicinal properties reveals a spectrum of bioactive compounds with potent anti-inflammatory, antiviral, antileptospira, hepatoprotective effects, nephrotic effects, and other pharmacological effects. The plant's diverse therapeutic potential extends to many medicinal applications, making it a subject for various health applications. Understanding the multi-faceted phytochemistry and pharmacology of Phyllanthus amarus is crucial for harnessing its beneficial effects in the development of therapeutic functions.

Keywords: Hepatoprotective, Antiviral, Anti-leptospira, Pharmacology.

M5   **TALINUM TRIANGULARE'S HEALTH CONCERNS: WHAT WE DO NOT KNOW**

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Abstract
Renewed interest in vegetables is increasing especially in sub-Sahara Africa i.e., Nigeria. This great awareness was necessitated because of hunger-related diseases and hidden hunger. They are mostly cheap solutions to nutrition-related problems and provide a source of income to low-income earners and village dwellers. Population increases which gives rise to urbanization and high anthropogenic activities is quietly causing harm to what we believe to be our delicacies (Vegetables). *Talinum triangulare*, also called waterleaf is a common vegetable in sub-Sahara Africa, its culinary uses cannot be overemphasized, and its traditional and medicinal properties have been established and validated by many authors. Evidence abounds from the literature about the hidden danger that this good but dangerous edible plant poses to human health. This review highlights besides the easy inherent bioaccumulation characteristics of heavy metals by *T. triangulare,* there are strong indications of the presence of toxic natural compounds in *T. triangulare*. However, the review suggested that there should be further research to better understand the mechanisms of toxicity and to establish safety guidelines for the consumption of *Talinum triangulare*.

M6

COMPARATIVE STUDIES ON SOME PHYSICOCHEMICAL PROPERTIES OF BLACK, NEEM, AND BAOBAB SEED OILS

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Abstract

The deployment of natural resources in soap production is becoming more economical and sustainable in soap making especially with ones with established chemical properties. Hence, the present study evaluates some physicochemical properties of some indigenous seed oil: Black, Neem and Baobab seeds. The percentage oil yield, saponification value, iodine value and peroxide value were determined using standard methods. Result obtained showed that Neem Seed, Black Seed and Baobab Seed yielded 37.0±2.1 %, 28.0±1.8 % and 24.0±1.5 % oil, respectively. The Chemical Properties of these seeds shows that Neem seed oil has significantly higher saponification value (198.0±1.0 mg/g) compared to Baobab seed oil (188.0±0.5 mg/g) and Black seed oil (185.0±0.5 mg/g) which are almost in the same range. Similarly, iodine value are 113.0±2.0 g/100g, 86.0±2.1 g/100g and 175.0±1.2 g/100g for Black, Baobab and Neem seed oils, respectively. The peroxide value of Neem seed oil (8.2±0.2 mEq/kg) and Black seed oil (8.3±0.2 mEq/kg) indicates that the two seed oils have almost similar Peroxide value compared to Baobab seed oil of 4.1±0.5 mEq/kg. Thus, the three seed oils have different percentage yield and different chemical properties and some of these properties are indicator that the seed oils can be used for cosmetic productions.

M7

PHYTOCHEMI CAL EVALUATION OF ANTIMICROBIAL SECONDARY METABOLITIES FROM THE STEM BARK OF XERODERR IS STUHLMANNII

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Abstract

The increasing resistance of microorganisms to conventional antibiotics has become a major concern in the field of healthcare. In order to address this issue, it is crucial to explore alternative sources of novel antimicrobial agents. The research seeks to evaluate the Phytochemical and antimicrobial effect of secondary metabolites from the stem bark of Xeroderris stuhlmannii. The plant samples were collected from Dan takiri village of Dutsin-Ma, the sample was identified by a Botanist in the Department of Biological Science Federal

University Dutsin-Ma. Extraction was carried out on the stem bark using solvents of different polarity; n-hexane, dicloromethane, ethylacetate and methanol successively. The phytochemical screening was carried out qualitatively. The extracts obtained were subjected anti-microbial test against seven bacteria; *Bacillus amyloquefaciens, Staphylococcus aureus, Klebsiella pneumonia, Pseudomonas auruginosa, Trichophyton rubrum, Salmonella typhi, Aspergillus niger.* Subsequently the most active extract (DCM) was analysed with Gas Chromatography Mass Spectrometry (GC-MS). phytochemical screening showed that the Secondary metabolites; Alkaloids, flavonoids, steroids, triterpeniods, antraquinones, saponins, tanins, and glycosides with pharmacological activity were found to be present in the crude extract. Antimicrobial test result showed that the extracts were active against *Bacillus amyloquefaciens, Staphylococcus aureus, Klebsiella pneumonia, Pseudomonas auruginosa, Trichophyton rubrum, Salmonella typhi, and Aspergillus niger* (with zone of inhibition range as 7 – 30 mm). The highest activity was recorded by DCM extract against Salmonella typhi (zone of inhibition was 30 mm). Lupeol was found to be the most relative abundance compound out of the twenty-seven (27) compounds identified by GC-MS. These findings show that the stem bark have pharmacological activity to cure diseases and can be used as chemo preventive to avoid several diseases.

Keywords: Phytochemicals; Evaluation; Secondary metabolites *Xeroderris stuhlmannii*; antimicrobial; Dutsin-Ma.

M8 **BIOAUTOGRAPHY STUDIES OF *Crinumornatum*(AITON) BULB EXTRACTS AGAINST *SALMONELLA TYPHI***

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Abstract
Crinum Ornatum (Aiton), is a well-known traditional plant recognized for its medicinal properties, is known to contain bioactive compounds with potential of antibacterial activity. However, *Salmonella typhi*, the causative agent of typhoid fever, continues to pose a significant global health threat (most especially in developing worlds) due to its increasing antibiotic resistance. In the search for alternative and complementary therapies, the present study investigates the antibacterial potential of *Crinum Ornatum* (Aiton) bulb extracts against some panel of microorganisms including *Salmonella typhi*. Promising antibacterial activity exhibited by the plant extracts especially against *Salmonella typhi* and also to ascertain the actual phytochemical(s) responsible for the antimicrobial activity warranted the deployment of bioautography on the *Salmonella typhi*. In this research, a crude extract from *Crinum Ornatum* bulbs was obtained through solvent extraction (maceration) with ethyl acetate and methanol. The extracts so obtained were subjected to antibacterial tests. Most active extracts were then chosen for thin-layer chromatography (TLC) and bioautography to assess its antibacterial activity against *Salmonella typhi*. Results from the bioautography studies revealed the presence of distinct inhibitory zones

on the TLC plates, suggesting the presence of antibacterial compound(s) within the *Crinum Ornatum* bulb extract. These inhibitory zones were particularly evident when exposed to *Salmonella typhi* cultures, indicating the specificity of the antibacterial activity against the target pathogen. Hence, the results of this study demonstrate the potential of *Crinum Ornatum* (Aiton) bulb extract as a source of antibacterial compounds effective against *Salmonella typhi.*

Keywords: Bioautography, Studies, *Crinum Ornatum*, Extracts, *Salmonella typhi*

M9 **EVALUATION OF PHYTOCO MPOUNDS WITH ANTIMICROBIAL PROPERTIES FROM DUTSIN-MA *Olea europaea* LEAF EXTRACTS**

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Abstract
Olea europaea (olive) leaves is a common herb that is locally used to treat various microorganisms related ailments, including typhoid fever, in northern Nigeria. This study aimed to identify the compound(s) from *Oleaeuropaea* (olive) leaves that may possess potent antibacterial properties, most especially against *S. typhi* (causative agent of typhoid fever). Fresh leaves of *Olea europaea* were collected, thoroughly washed, and dried under shade. The dried leaves were subjected to cold extraction using n-hexane dichloromethane, ethyl acetate and methanol in this order. The extracts obtained were evaluated for its antibacterial activity (against *Staphyloccocus saureus, Salmonella typhi, Bacillus subtilis and Pseudomonas aeruginosa)* using standard methods. The most active extract (i.e ethyl acetate extract) was thereafter subjected to Gas chromatography Mass Spectrometry (GCMS) analysis. The extracts exhibited good antimicrobial activity especially against *Salmonella typhi* (with MIC ranging from 9mg/ml to 14mg/ml). Thirty five (35) compounds were identified using GCMS and eight (8) molecules (Behenic alcohol, 1-Nonadecene, 1-Nonadecene, 1-Nonadecene, 1-Heptadecene, 4-Di-tert-butylphenol, 1-pentadecene, and 1-Dodecene) were found to be most abundant, exhibited highest peaks areas, >5% peak areas on GC chromatogram. The activity against *S. typhi* is scientific proof for the use of plant`s leaves in the treatment of typhoid fever traditionally. Compounds responsible for this activity could be the most abundant molecules detected by the GCMS present in the plant's leaves.

Keywords: Evaluation; Phytocompounds; Antimicrobial; Dutsinma; *Olea europaea*

M10   SECONDARY METABOLITES PROFILING AND BIOLOGICAL
ACTIVITY OF ETHANOLIC EXTRACTS OF   *CRATEVA RELIGIOSA*
AND *AGELANTHUS DODONEIFOLIUS*LEAVES

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Abstract
This work analyzed and assessed the health-promoting benefit of two (2) underused and indigenous plant species (UIPs) that grow in the northern portion of Nigeria namely: *Crateva religiosa* and *Agelanthus dodoneifolius* in order to emphasize the importance of dietary diversification for rural populations. The secondary metabolites contained in the polyphenolic-rich fraction of the ethanolic extract of the plants were identified using liquid chromatography-mass spectrometry (LC-MS) analysis. Furthermore, the antioxidant capacity using different assays i.e. 2,2-diphenyl-1-picryl-hydrazylhydrate (DPPH), hydrogen peroxide (H_2O_2), 2, 2'-azino-bis (3-ethylbenzothiazoline-6-sulphonic acid) (ABTS) was assessed while antidiabetic activity was evaluated employing α-amylase and α-glucosidase assays for validating their health-promoting anti-degenerative chemical properties. H_2O_2 showing the best activity with a value of 16.26058 and 17.85 for *Crateva religiosa* and *Agelanthus dodoneifolius* respectively compared to other antioxidant assays in the study. The order of antioxidant activity follows the order H_2O_2> DPPH > ABTS. In the antidiabetic assay showed that the *Crateva religiosa* had better activity in the α-amylase at concentration of 500μg/ml (21.40523) against *Agelanthus dodoneifolius* (67.23) compared to α-glucosidase which had its best activity at 500 μg/ml (22.21159). Result from the LC-MS showed that nine (9) compounds were confirmed to be present. These compounds include dihydroquercetin, 3-feruloylquinic acid, sinapic acid, rhamnoside, malic acid, 6-hydroxydiscodermindole, Neoeriocitrin, Vitexin glucoside and Nicotiflorin. With implications for other food and medicine plants, these findings collectively demonstrate that antioxidant phenolic metabolites mediate the antiglycation activity of our collection of medicinal plants.

Keywords: α-amylase, *Crateva religiosa, Agelanthus dodoneifolius,* anddihydroquercetin

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M11   INSIGHTS INTO RESEARCH ON PHYTOCHEMISTRY AND
BIOLOGICAL ACTIVITIES OF   *Diospyros mespiliformis*

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Abstract
Diospyros mespiliformis often called jackal-berry or African ebony, is a sizable dioecious evergreen tree that may be found mostly in African savannas. This particular tree species is well-known for both its fruit, which is of great interest, and its therapeutic qualities. The

purpose of this review is to look into the ethnobotanical, pharmacological, chemical constituents and probable toxicity potential of the fruit and leaves of *Diospyros mespiliformis*. Literatures and past researches that are related to *Diospyros mespiliformis,* jackal berry, phytochemistry of *Diospyros mespiliformis* and biological activity of *Diospyros mespiliformis* were search on "google scholar", "the plant list", "google chrome" and "Research gate". Findings of this review suggest that *Diospyros mespiliformis* has a wide array of health promoting abilities both scientific and ethnobotanical ranging from antidiabetic, antiproliferative, antiviral, antifungal, antiplasmodial, antiulcer and antihyperlipidemic potential. The phytochemistry of *Diospyros mespiliformis* shows that only twenty-one (21) compounds have been reported from the plant so far, hence the phytochemistry of the plant have not been fully studied.

Keywords: Diospyros mespiliformis, phytochemistry, ethnobotanical, biological activities.

M12   **INSIGHT INTO BIOLOGICAL ACTIVITIES OF CHEMICALLY CHARACTERIZED EXTRACT FROM FICUS GLUMOSA: *IN VITRO*, AND *IN SILICO* APPROACHES**

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Abstract
Medicinal plants have been reported to inhibit AGEs hence the phytochemical profile of polyphenolic-rich fractions from ethanolic extracts of the leaf of *Ficus glumosa* (LFG) was assessed by LC-MS/MS analysis. Furthermore, the antioxidant and anti-diabetics properties were determined using 2,2-diphenyl-1-picryl-hydrazylhydrate (DPPH), hydrogen peroxide (H_2O_2), 2, 2'-azino-bis (3-ethylbenzothiazoline-6-sulphonic acid) (ABTS), α-amylase and α-glucosidase assays while ascorbic acid and acarbose are a positive control. Chimera was used in preparation of protein while PyRx was used to dock the ligand and the protein. The 2D interaction profile of the docked molecule was generated on the protein plus website. The antioxidant inhibitory activity of LFG was ascertained via DPPH reducing (LFG = 68.98) displayed excellent antioxidant activity compared to other assays, LEB showed good activity towards α-amylase assay with 57.35 at 20 µg/mL (better than the acarbose). Some compounds were identified i.e. 3-Feruloylquinic acid, N-Acetyl-6-O-L-fucosyl-D-glucosamine, Quillaic acid, Malic acid and Dihydroquercetin. Quillaic acid and 3-feruloylquinic acid showed the highest binding affinity (−9.4 and -9.2) with significant non-bonding interactions with 1Z32, Quillaic acid and Dihydroquercetin showed the highest binding affinity (-7.7 and -7.2) with significant non-bonding interactions with 5nn4. This study establishes a favorable association between anti-diabetic, and antioxidant

actions of *F. glumosa*. Together, these findings show that antioxidant phenolic metabolites mediate the antioxidant activity of our collection of medicinal plants, with implications for additional food and medicine plants.

Keywords: Dihydroquercetin, Quillaic acid, *in silico* and *in vitro*

M13   **SYNTHESIS, CHARACTERIZATION AND ANTIBACTERIAL EVALUATION OF DIVALENT METAL COMPLEXES OF SCHIFF BASE [(4-METHOXY - BENZYLIDENE) - AMINO] - ACETIC ACID**
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Abstract

Infections caused by multidrug resistant bacteria are an increasing medical problem worldwide, particularly among immunocompromised patients. Both Gram positive and Gram negative bacteria have developed high level resistance to multiple classes of antibacterial agents which include methicillin resistant *Staphylococcus aureus* (MRSA), *Pseudomonas aeruginosa*, *Escherichia coli* and vancomycin resistant enterococci (VRE). Few available drugs such as linezolid, glycopeptides, and tigecycline are active against MRSA and VRE, but their success rates are very variable. Therefore, there is a need to explore other sources of effective antibacterial compounds to augment the limited choice of drugs for therapeutic treatment. New Schiff base derived from 4-anisaldehyde and glycine in an ethanolic media and its complexes with Co(II), Ni(II), Mn(II), and Cd(II) have been prepared. The complexes have been characterized by FTIR, UV-Vis, solubility, melting/decomposition temperature determination, conductivity test and Jobs method of continuous variation. The Ligand was found to be bidentate as the metals coordinate with the Ligand through the carboxylic oxygen and Azomethine nitrogen The ligand and the metal complexes show antimicrobial properties against *Escherichia coli* and *Staphylococus aureus* strains with the metal complexes having a higher inhibition activity (10—20mm diameter inhibition zones) compared to the free ligands (8—10mm diameters) which is due to chelation. In all the cases studied, the cadmium complex proved to be a better antimicrobial agent (up to 20mm diameter inhibition zone against *E. coli*)

Keywords: Antibacterial activity, Schiff base, FTIR, 4-anisaldehyde.

SECTION N

SCIENCE AND SECURITY

N1

PHYSICOCHEMICAL PARAMETERS AND HEAVY METALS ANALYSIS IN BOREHOLES WATER OF SELECTED LOCATIONS IN DUTSIN-MA LOCAL GOVERNMENT AREA, KATSINA STATE, NIGERIA.

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Abstract
This study assessed the levels of some physicochemical parameters and determines the heavy metals concentrations of borehole water from some locations in Dutsin-ma local town. The water samples were collected from Bayan Area, Unguwar Kudu, and Unguwar Yamma and labelled as A, B,and C respectively. Physicochemical parameter such as pH, Electrical conductivity, TDS, Turbidity, and TSS was determined using standard analytical methods and compare with permissible limit of WHO. The results obtained as pH (6.55.76.5), Electrical conductivity (9.9s/cm, 27.888.2), TDS (5.03mg/L 14.10mg/L and 44.10), Turbidity (0.323 NTU, 0.313 NTU and 0.130 NTU) and TSS (23.3, 16.1, and 13.1), Hardness (210 196 mg/L, and 179. mg/L) for all the locations A, B and C respectively and found to be within the permissible limit, except pH level of sample B, and Hardness in sample C, which are below the standard limit set by WHO for drinking water. Heavy metals concentrations of (Cu, Cr, Mn, Zn) was also investigated using Atomic Absorption Spectrophotometer (AAS). The results obtained shows that the mean concentrations of Cu were (0.73 mg/L, 0.78 mg/L, and 0.71 mg/L), Cr (0.02 mg/L, 0.04 mg/L, and 0.10 mg/L), Mn (0.54 mg/L, 0.32 mg/L and 0.18 mg/L), and Zn (0.52 mg/L, 0.78 mg/L and 0.00 mg/l). Both metals concentrations are not within the permissible limit set by WHO with the exception of Cu, and Zn. Hence, the need for further investigations and proper enlightenment.

Keywords: Physicochemical Parameters, Borehole water, Heavy metals, WHO.

N2

REVIEW OF POULTRY MONITORING USING COMPUTER VISION

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Abstract
Poultry farming is an important unit in global agronomy, contributing immensely to the production of meat and eggs. Safeguarding the health and welfare of poultry is vital for ethical and financial reasons. In recent years, computer vision awareness has gained prominence as a powerful tool for poultry monitoring. This review paper provides an outline of the application of computer vision in poultry monitoring. We explore the different phases of this technology, with real-time image acquisition, object recognition, and behavior analysis. By connecting cameras and sophisticated algorithms, a computer vision system can distinguish unusual behavior, track poultry activities and observe its environmental conditions. Furthermore, this study discovers the benefits of computer

vision in poultry farming, including early detection of disease, better production efficiency and improved animal welfare. In conclusion, the application of computer vision in monitoring poultry holds immense potential for the industry; by providing a corridor to a more sustainable and ethical poultry farming system with increased productivity. This paper equally discusses recent developments, challenges, and forthcoming prospects in the field.

Keywords: Behavior Analysis, Computer Vision, Image Acquisition, Object Recognition, Poultry Monitoring.

N3

## IMPLEMENTATION OF A LOW -COST SMART PARKING SPACE
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Abstract
Conventional parking system is not effective because it leads to loss of time in searching for parking space, causing traffic congestion at some instant of time. This paper proposes the implementation of low-cost smart parking system using sensor-based technology. The system aims to improve the efficiency of the parking process by reducing the time spent searching for parking spaces, and decreasing traffic congestions. The system consists of Infrared and sound sensors installed at the entrance and exist of the parking space, a Servo motor, a microcontroller ATMEGA328 and a LCD user interface. The implementation involves connecting the sensors to the central controller, which process the data and provide real time information to the user interface. When the park is empty, the system displays Welcome Slot Left: **4** on the LCD meaning no car is parked in any of the slots. As a car approaches the gate controlled by servo motor, the sensor at the ENTRANCE detects the presence of a car and turns the lever up thus opening the gate for the car to drive in while the car is driving in, the sensor at the EXIT detects the car and causes the lever to close and the count on the LCD is incremented. This cycle continues until the park is full and the LCD would also display the parks status and the gate would not open for any other car to drive in. Hence, the system can reveal number of available spaces in the parking lot in real time. A prototype for a four-slots parking system successfully implemented can be upgraded. It is recommended that GSM technology be incorporated to help car users' book for parking space ahead of time.

Keywords: Parking space, Sensors, ATMEGA328, Servo motor LCD
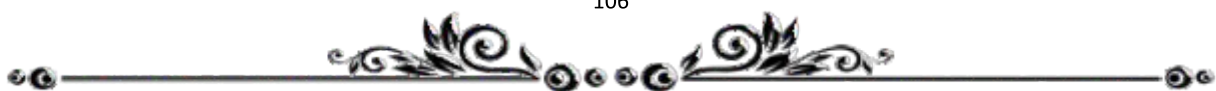
CHARACTERIZATION OF THERMAL POWER REACTOR OPERATING ON LOW ENRICHED URANIUM CORE AT THE CENTRE OF ENERGY RESEARCH AND TRAINING ZARIA - NIGERIA

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Abstract

Characterization of thermal power in reactor is essential. As such the Nigeria Research Reactor-1 (NIRR-1), operating at LEU is re-evaluated for smooth running of the reactor. Utilizing the heat balance method is presented in this study. The calibration was done at 15 kW, which is half the power output. The power was then assessed in relation to the rate of temperature rise. The sum of heat losses from the reactor pool to the environment and the power estimated as a function of temperature-rise rate is the total thermal power. The heat balance method consisted of the steady state energy balance of the cooling loop of the reactor. For this method, the measurement of the inlet temperature, outlet temperature and temperature difference were carried out; to have an average value of 32.43 ^{o}C, 43.49 ^{o}C and 9.04 ^{o}C, respectively. Additionally, it was determined that the average coolant flow rate through the core was 0.3966 kg/s. The total thermal power was determined by calculating the power as a function of flow rate and temperature differential, adding the values for heat losses, and then summing those values up to be 15.23 kW. During these experiments, the average increase in water temperature was between 29.5 and 32.0 ^{o}C for the half-power calibration levels. The thermal power obtained on average has a value of 14.97 kW. It was found that the heat balance method and the reactor's overall power dissipation at half power thermal calibrations agree well. Therefore, it is advised that the heat balance approach be used for the NIRR-1's routine thermal power calibration.

IOT BASED WEATHER MONITORING STATION

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Abstract

The conventional weather station monitoring requires active human interactions to determine weather conditions hence the reliability is low. The aim of this project is to implement a simple weather monitoring station based on internet of things (IOT) and sensor technology. The system employed microcontroller and several sensors to monitor and control the temperature, pressure, humidity, and carbon monoxide levels in the environment where it is installed. The data obtained are automatically sent to the web

page. Hence, making it visible for others around the world. The results of temperature and humidity obtained from the designed weather station are (33.1ºC and 30.83%) and that of phone device (32.8ºC and 31%) has no significant difference. Though a functional IOT based weather monitoring station was achieved, the paper recommends that internet in our communities be boosted to encourage its deployment especially in research institutions.

Keywords: Weather Station, IOT, sensors, microcontroller, web page

SECTION O

SCIENTIFIC MODELS AND INFORMATION TECHNOLOGY

HEALTH WORKERS' PERCEPTION ON THE USE OF ELECTRONIC MEDICAL RECORD: COMPARATIVE STUDY OF USERS AND NON-USERS

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Alqalam University Katsina

Abstract

Electronic Medical Record (EMR) is a simplified Health Information System intended to eliminate the costs and inefficiencies of manual record-keeping. Thus, EMR improves health workers' productivity which translates into quality patients' care. However, despite the potential benefits of EMR, its adoption rate in Northern Nigeria remains low. Previous research has predominantly explored the barriers to EMR adoption through the lens of the Technology Acceptance Model (TAM), with a focus on constructs such as Perceived Usefulness and Perceived Ease of Use. In the context of Northern Nigeria, where EMR deployments are limited, there has not been substantial research investigating health workers' Perceived Usefulness and Perceived Ease of Use of EMR systems. This survey study aims to bridge this gap by examining and comparing the perceptions of health workers who have experience using EMRs with those who have no prior exposure to these systems. The findings reveal that both health workers with EMR experience and those without such experience hold positive perceptions of EMR adoption. Notably, there exists a statistically significant difference in perceptions between these two groups, with EMR-experienced individuals exhibiting a more favorable attitude toward EMRs compared to their non-experienced counterparts. The results underscore the importance of deploying EMR systems and encouraging their use among healthcare workers in Northern Nigeria. Over time, it is evident that health workers' perceptions of EMRs are likely to improve, ultimately contributing to more successful adoption and the realization of the associated benefits.

ENHANCED PHOTOCATALYTIC DEGRADAT ION OF CONGO RED OVER NANOSIZED C –ZnO AND Cu-ZnO UNDER VISIBLE LIGHT IRRADIATION

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Abstract

This work presents a new, highly efficient visible-light responsive nanosized C-doped ZnO (C-ZnO) and Cu-doped ZnO (Cu-ZnO) synthesized by mechanochemical and co-precipitation methods for the heterogeneous photocatalytic removal of Congo Red (CR) from the wastewater. The prepared catalysts were characterized by x-ray diffraction (XRD), scanning electron microscopy (SEM), energy dispersive spectroscopy (EDS), ultraviolet-visible (UV-Vis) spectrophotometry and surface area analysis. The XRD patterns

for the synthesized C-ZnO and Cu-ZnO nanoparticles were in good agreement with that of the standard wurtzite structure of the standard ZnO catalyst. The EDS analysis confirmed the present of C, Cu, Zn and O atoms for the C-ZnO and Cu-ZnO respectively. Both XRD and SEM were consistent with the EDS analysis. Cu-ZnO photoresponsive catalyst was found to exhibit better visible light photocatalyic activity than C-ZnO under identical experimental conditions due to the larger surface area and low band gap of Cu-ZnO nanocrystalline.. Therefore, C-doped ZnO and Cu-doped ZnO photocatalysts can be used to remove congo red dye from the wastewater.

Keywords: Photocatalysis, ZnO, C-doped ZnO, Cu-doped ZnO, and Congo red.

O3   PERFORMANCE EVALUATION O F SOME PATH LOSS MODELS OVER DIGITAL UHF CHANNEL IN KANO CITY, NIGERIA

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Abstract
This study investigates the path losses of Digital Terrestrial Television Base Station (STAR TIMES, DTTBS) over Kano City, Nigeria. The Received Signal Strength (RSS) of the DTTBS was measured at intervals of 1 km upto 20 km along three selected routes around the station using a digital signal strength meter. So also, the transmitter-receiver distances of data points with their corresponding geographic coordinates and heights were measured using a hand-held GPS receiver. Method of data collection was the drive test protocol with data collected during dry and wet season months' covering a period of one year. Path losses were calculated using Free Space model, Plane Earth model, Okumura-Hata model, COST 231 model and ECC-32 model. Results for all the routes and seasons revealed that path loss increases with increase in distances, and were higher during wet compared to dry season's month for almost all the models. Result further indicates that; the ECC- 32 model was the best among the selected having the closest Root Mean Square Error to the measured path loss over the study area.

Key Words: Path loss models, Performance evaluation, transmitter-receiver distances

DESIGN AND SIMULATION OF A MICROGRID SYSTEM FOR FEDERAL UNIVERSITY DUTSIN -MA TAKE -OFF CAMPUS

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Abstract
The design and simulation of a microgrid for Federal University Dutsinma take-off campus, is an essential aspect of ensuring reliable and sustainable energy supply on campus. This research focused on developing a comprehensive microgrid system that integrates solar electric power energy source, diesel generator, energy storage, and intelligent control algorithms to optimize energy generation, consumption and management. This is introduced to provide the solution to the lingering power problem associated with incessant grid collapse, obtaining energy from renewable sources, stable, cost effective and reliable energy supply. The control system monitors real-time energy generation, demand, and storage levels, and optimizes the operation of the microgrid to minimize cost, reduce carbon emissions and enhance the grid resilience. The simulation phase employs the use of MATLAB/Simulink to model and analyze the microgrid's components and their performance under various operating conditions. The simulation considers factors such as weather patterns, energy demand fluctuations, and the performance characteristics of renewable energy sources and storage systems. Through this simulation, the microgrid's ability to meet the university's energy requirements, maximize renewable energy utilization, and provide reliable power supply is assessed.

Keywords: Simulink, Photovoltaic Panels, Battery Storage system, Main grid, Diesel generators

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ENHANCING BACTERIA CLASSIFICATION METHOD USING IMAGE PROCESSING AND CONVOLUTIONAL NEURAL NETWORK

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Abstract
Bacteria classification plays a vital role in the medical field, facilitating the diagnosis and treatment of various diseases. Traditionally, clinical specialists have relied on conventional techniques for classification, which lack predictive capabilities. Manual classification of bacteria is a laborious and time-consuming task that demands significant human effort. However, advancements in technology have opened up possibilities for microorganism classification through the utilization of novel machine learning algorithms. Among these

algorithms, Deep Neural Networks (DNNs) have emerged as a promising approach for image classification. Specifically, Convolutional Neural Networks (CNNs), a variant of DNNs, have demonstrated efficiency in solving classification problems and will be employed in this research for bacteria classification. In this study, CNNs will be deployed to classify sample of bacterial images. The proposed methodology involves three main stages: image acquisition, feature extraction, and classification. First, bacterial samples are obtained through microscopic imaging, which captures their morphological characteristics. Next, a series of image processing techniques are employed to enhance the quality of the acquired images, such as noise reduction, contrast enhancement, and image segmentation. furthermore, deep learning models, specifically the ResNet-50 CNN model will be utilized for feature extraction and subsequent classification. To evaluate the effectiveness of the proposed approach, experiments were conducted on a dataset comprising diverse bacterial species. The results demonstrate that the image processing techniques effectively improve the quality of acquired images, enhancing the performance of the subsequent classification task. The trained CNN model achieves high accuracy in classifying bacteria, outperforming traditional methods and showcasing the potential of deep learning in this domain.

Keywords: Bacteria classification, CNN, DNN

SECTION P

WASTE TREATMENT AND WASTE TO WEALTH

P1   THERMODYNAMI C STUDIES AND INFLUENCE OF pH ON NICKEL (II) ADSORPTION FROM AQUEOUS SOLUTION USING BANANA PEEL

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Abstract

This study examines how effectively banana peel may remove Ni (II) ions from aqueous solutions using comparative adsorptive removal. The design of the experiment was used to identify the ideal adsorption conditions on operational parameters, posthoc significant statistical tests were also carried out. Adsorbent dose, pH, contact time, particle size, and temperature were each independently changed for their parametric effects, and their effects on the percentage of Ni (II) ion removal were estimated. At a pH of 8.0, both adsorbents reached the maximum % removal. The ideal conditions were 4.5 g of adsorbent dose, 120 minutes contact time, and $25^{o}C$ reaction temperature.

Keywords: Banana peel, Adsorption, Adsorbent Dose, pH, Temperature.

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P2   PREPARATION AND CHARACTERIZATION OF COW AND GOAT BONES ACTIVATED CARBON FOR ADSORPTION OF METAL IONS FROM WASTE WATER

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Abstract

Activated carbon has long been recognized as one of the most versatile adsorbents for effective removal of pollutants in waste water. This study aims at investigating the physicochemical properties of activated carbon from cow and goat bones. Bone samples were collected from Dutsin-Ma Old Market, Katsina State, and washed with deionized water to remove contaminants before drying in an oven at 110℃ for 24 h. Bones were mechanically ground into powder, stored in polythene bags at room temperature for further use. Samples were carbonized in a muffle furnace at 700℃ for 2 h, ground and sieved with a 300 um sieve to obtain uniform particles. The carbon were activated with concentrated hydrochloric acid at a ratio of 10 mL per 50.0 g for 4 h. Next, the activated carbon were washed with deionized water to a neutral pH of 6-7, for an enhanced surface area. Activated carbon were characterized by Fourier transform infrared spectroscopy (FTIR) and scanning electron microscopy (SEM). FTIR spectra showed both activated carbon have surface functional group for absorbing metal ions in waste water. SEM images of both activated carbon revealed similar morphologies with higher surface areas different from carbonized samples. The presence of surface functional groups on the activated carbon coupled with their high surface area compared to the carbonized samples, it can be concluded that cow and goat activated have been successfully prepared. Hence cow and goat bone activated carbon may serve as new and alternative adsorbents for removal of

pollutants from aqueous solutions.

Keywords: Bone; Activated carbon, Metal ions, Characterization, Adsorption

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P3   **MICROPLASTICS AN UBIQUITOUS MATERIAL AND RI SK TO HUMAN HEALTH**

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Abstract
There is growing concern about microplastics (MPs), driven not least by ever-mounting evidence of just how pervasive they are but being ubiquitous in the environment. This is potentially of concern because the microplastics can be ingested by organisms. The review is focus on the microplastics ubiquitous nature and its possible risk to human health. Occurrence of MPs, the method of extraction of MPs, physical and chemical characterization, and possible risk indices of MPs are discussed in details in the review. Available data from literature showed MPs in water was at least coming from surface run-off, waste water effluents and packaging or bottling itself. A reproducible and time-effective method for fast and thorough morphological and chemical characterization of microplastics using a semi-automated scanning of particles coupled to micro-Raman spectroscopy was identified as good method for chemical characterization of MPs. The rapid analysis of large number of collected particles allows for an exhaustive assessment of both large sample sizes and small subsamples. precautionary principle should be adopted to address concerns on possible human health effects from consumption of MPs. Further research should aim to standardize experimental protocols to aid comparison and elevate quality.

Keywords: Microplastics, Ubiquitous, Risk, Health

P4   **SORPTION PROPERTIES OF MODIFIED AND UNMODIFIED MILLET HUSK ON AQUEOUS SOLUTIONS OF CADMIUM II IONS**

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Abstract
Agricultural wastes of plant origin have been observed to possess great sorption capacity for heavy metal ions in aqueous solution. The contamination of water by heavy metals is a worldwide challenge. Unlike the organic pollutants in which most of them are susceptible

to biological degradation, heavy metals are non-biodegradable. The sorption properties of modified and unmodified millet husk on aqueous solutions of via kinetic and thermodynamic studies were investigated in this research. Both modified and unmodified millet husk were processed and subjected to adsorption studies. Marcaptoacetic acid was employed in the thiolation of the modified millet husk. Both samples were subsequently subjected to thermodynamic and kinetic studies. Also Langmuir, Friendlich and Tempkin models were employed to investigate the interaction between metal ion in solution and the adsorbents. The thermodynamic studies revealed endothermic physisorption mechanisms for both modified and unmodified millet husk. Also, a spontaneous process was observed for modified millet husk, while non-spontaneous process was observed for the unmodified millet husk. An examination of the kinetics models indicated that the pseudo second order provided a better fit to the experimental data with highly encouraging values for both modified and unmodified millet husk. This search brings to light the possible use of millet husk as an adsorbent for heavy metal ions.

Keywords: Sorption properties, Millet husk; Cadmium (II) ions, Kinetics, Thermodynamics

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P5   **MORPHOLOGICAL AND ELEMENTAL ANALYSIS OF SUGARCANE, BEANS AND RICE HUSKS ASH (SBRHA)**
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Abstract
Using agricultural crop wastes such as sugar cane back, rice husks, beans pod, as a partial replacement of sand in the manufacture of cement blocks, because they contain high calcium, silicon, aluminum, iron and other ingredients when control. The need to convert them into useful materials to minimize their negative effect on the environment. 100 g of untreated samples was measured in ratio 2:1:1:, which is 50 g of sugar cane back, 25 g of beans pod and 25 g of rice husk. Sugarcane, beans and rice husks ash (SBRHA) as a silica source was structured, resulting from burning at a temperature of 1000c within 4:00 hours in an electric furnace. (SBRHA) consists of inorganic, combustible matter in the rice husk that has been fused into an amorphous structure. Microscopic techniques, such as x-ray fluorescence (XRF), x-ray diffraction (XRD) and scanning electron microscopy (SEM) were used to observe the surface and internal structure of the (SBRHA) the results among other things revealed that (SBRHA) consist of mainly Si, (61.43%), K (14.81%), Fe (1.41%), Al (2.05%) and Ca (5.59%) microscope examination showed that has a porous cellular structure and consists of irregular – shaped particles

Keywords: Crop wastes, SBRHA

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