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Trend analysis of temperature and relative humidity across the climatic zones of Nigeria

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ABSTRACT

This paper presents the trend analysis of temperature and relative humidity in the climatic zones in Nigeria using Mann-Kendall trend test. The daily Temperature and relative humidity data was obtained from Nigerian Meteorological Agency (NIMET) via the data bank of the West African Science Service Center on Climate Change and Adaptive Land Use (WASCAL) of the Federal University of Technology Minna for the period of Thirty-three years (1981-2014). In order to determine the nature of the trend and significance level, Mann-Kendall trend test and Sen's estimate were employed. From this study, it was observed that temperature shows a positive Kendall's Z value which indicates an upward trend and also, implies increasing trend over time. The result also indicates that there is a significant increase in the trend at 5% level of significance since (p-values (0.0001) <0.05). The results of the relative humidity also indicate that there is an increase in the trend at 5% level of significance since (p-values (0.0001) <0.05). It can also be seen from both the Mann-Kendall and Sen's Slope that there is possibility of increment in temperature and relative humidity. This could be due to the impacts of climate change and this leads to devastating unfavorable changing in conditions in the study area. It is therefore recommended that the variability of temperature and relative humidity should be monitored in order to reduces its effects on human activities

Keywords: Variation, trend, temperature, relative humidity

Geophysical Investigation of Groundwater Potentials in Selected Areas of Kaduna, Nigeria

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ABSTRACT

Water is essential to people and the largest available source of fresh water lies underground. Increased demands for water have stimulated development of underground water resources. As a result, techniques for investing the occurrence and movement of groundwater have been improved, better equipment for extracting groundwater has been developed, and concepts of the resource management have been established. Geophysical investigation was carried out at Giwa Road, Narayi High Court and U/Pama Sabo Thasha Kaduna with the purpose of locating a suitable and high ground water potential site for drilling a productive and good water yielding borehole. Vertical Electrical Sounding (VES) method using symmetrical Schlumberger configuration with maximum current electrode separation of 200m was used in the investigation around the selected area. The VES data were collected and processed using IP2 WIN software. The processed data were interpreted to determine/recommend the suitable sites for exploitation of groundwater on the basis of thickness of aquiferous layer. From the result obtained, VES station 1 for Giwa Road, Narayi High Court was considered most suitable suitable for sinking of borehole in the area while for U/Pama Sabo Thasha VES station 1 was also considered suitable for the construction of borehole that will serve as sustainable water supply in the area. **Keywords:** Aquifer; Borehole; Low Resistivity Layer; Terameter; Vertical Electrical Sounding.

Application of Frequency Domain Electromagnetic for Mapping Gold Mineralization Potential in Iperindo, Ilesha Schist Belt, Southwestern Nigeria

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ABSTRACT

Gold is a precious metal of high commercial value and great economic importance that Nigeria is endowed with. There are reports of artisanal mining (with associated ills such as banditry, communal clashes and environmental degradation) of the resource in-place of commercial exploitation which is able to contribute meaningfully towards the GDP growth of the country. This study applied Frequency Domain Electromagnetic geophysical investigation technique to evaluate the gold mineralization potential of Iperindo in Ilesha Schist Belt, southwestern Nigeria, where thriving artisanal mining of the resource have been reported and commercial exploitation capable of generating revenue and employment for the inhabitants has been challenged by lack / inadequate subsurface geological/geophysical information. The sorted and gridded electromagnetic data acquired through six (6) 336 m long E – W trending profiles, established 10 m apart from each other, delineate isolated near surface but thick (> 40 m) high conductivity zones. Some of the delineated high conductivity zones (14 – 22.12 mS/m) present vertical sharp edges, likely created by vertical faults that flank the zones on both sides. The high conductivity of these zones could be attributed to the occurrence of conductive material such as gold and associated base metals which probably exist in pegmatitic veins within the zones.

Keywords: Gold Mineralization; high conductivity Zones, Vertical Faults; Pegmatitic Veins; Iperindo.

Climate Variability and Its Effects on Malaria Prevalence in Kuje Area Council, Federal Capital Territory, Nigeria.

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ABSTRACT

Malaria is on the increase in the world at large, particularly in Africa, where climate has a strong and direct influence on the development, reproduction and survival of tropical insects such as mosquitoes. This study investigated the climate variability and its effects on malaria prevalence in Kuje area council, Federal Capital Territory. The study used secondary data of rainfall, temperature and relative humidity obtained from the Nigerian Meteorological Agency, Abuja and the recorded malaria morbidity cases from Kuje General hospital in Kuje Area Council from 2006-2015. Descriptive and inferential statistics were used to analyze the data, Pearson moment correlation was used to determine the strength of the relationship between the recorded malaria morbidity cases and the selected climatic elements. Also, trend analysis was used to study the variation of malaria morbidity cases and rainfall, temperature, relative humidity within and over the years for the period under study. It was observed that malaria morbidity cases, rainfall, temperature, and relative humidity, had a positive trend except temperature which showed a slightly positive trend over the period under study, it was also shows that malaria morbidity cases had a significant trend. This indicates that the recorded malaria morbidity cases in the area council will continue at an increasing rate as the year advances, if no efficient mitigation measures are implemented. However, the selected climatic elements of rainfall, temperature, relative humidity and recorded malaria morbidity cases did not show clear patterns over the years during the study period (2006-2015). The observed results reveals that the malaria morbidity cases tend to increase during the

peak of rainfall and relative humidity and then varies afterwards. This concludes that the varying wet and dry seasons creates a conducive habitat for malaria prevalence in the area council. Thus, it recommends that mitigation measures should be put in place to minimize the occurrences of malaria.

Keywords: climate variability, malaria, malaria prevalence.

An Assessment of the Impact of Climate Change on Rice Production at Katcha, Niger State

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ABSTRACT

The production of enough food to match population growth while preserving the environment is a key challenge, especially in the face of climate change. This study analyses the relationship between climatic variable (rainfall) and rice production. The extent of variability in the annual rainfall and rice production at Katcha, Niger State, Nigeria has been determined. Data on annual rainfall (mm) and rice production (tonnes) were collected for a period from 1987 to 2011. The analytical tools used were Pearson's Product Moment Correlation, Standard deviation, Coefficient of variation, line graph and questionnaire. The final result of the correlation (0.72) shows that there is significant relationship between rainfall and rice production in Katcha. The final result of Coefficient of variation shows that 9.1% variability in the amount of rainfall led to a great loss of 37.7% of rice production during the period (1987-2011). This is equivalent to 1% (297.0 mm) variability in annual rainfall amount led to 4.1% (17,830.2 tonnes) loss of annual rice production during the period. The questionnaire revealed that erratic pattern of rainfall has largely affected rice production farmers in the study area. It is suggested that rice varieties that can survive with good yield in adverse climatic conditions be developed by breeders to reduce rainfall effects on rice production. It is also recommended that religious and traditional rulers be engaged to convince the farmers to accept daily, monthly and annual rainfall forecast irrespective of their religious believe.

Key Words: Climate Change, Rainfall Variability, Rice Production, Katcha, Niger State.

Palynostratigraphy, Biochronology and Paleobathymetry of a section of Awaizombe-1 Well in the Eastern Niger Delta, Nigeria

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ABSTRACT

The ditch cutting samples from a section of Awaizombe-1 well located in the Northern Delta depobelt of eastern Niger Delta were analysed for palynomorphs content using acid method of sample preparation for palynomorphs recovery. The analysis recorded well-preserved and diverse assemblage of palynomorph, rich in pollen, spores and dinoflagellate cysts. The first and last occurrences of marker species, such as *Racemonocolpites hians*, *Psilatiriporites* sp., *Doualaidites laevigatus*, *Praedapollis africanus*, *Homotryblum oceanicum*, *Praedapollis flexibilis*, *Retitricolpites ituensis*, *Verrucatosporites usmensis* and *Retimonocolporites* sp. were used for the biostratigraphic interpretation. The following interval range zones were established: *Psilatiriporites* sp. – *Racemonocolpites hians* Zone, dated Early Oligocene (Rupelian age), *Praedapollis africanus* – *Doualaidites laevigatus* Zone, dated Late Eocene (Priabonian age), *Doualaidites laevigatus* –

Praedapollis flexibilis Zone, dated Middle Eocene (Lutetian and Bartonian ages) and *Verrucatosporites usmensis* - *Retitricolpites ituensis* Zone, dated Early Eocene (Ypresian age). The first downhole occurrence of *Doualaidites laevigatus* at the 1482 m marks Late Eocene/Early Oligocene boundary. Paleoenvironmental and paleobathymetric interpretations using environmental/bathymetric diagnostic species revealed two environments: brackish/fluvio-marine and inner neritic to outer neritic (0 – 200 m) under relatively warm-water marine condition indicated by thermophilic dinocyst taxa, such as *Lingulodinium machaerophorum*, *Polysphaeridium zoharyi* and *Homotryblum* sp.

Key words: Palynostratigraphy, biochronology, paleobathymetry, Awaizombe-1 Well, Niger Delta, Nigeria

An Intelligent Model of Determining the Sensitivity of Attributes in Mobile Learners' Profile for Learning Management System

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ABSTRACT

Mobile learning is enhanced through learner information analytics. Electronic learning systems are capable of offering personalized learning experiences with regards to learners' distinct attributes including knowledge, skills, and competencies required in evolving effective learning and teaching. User profiles on the LMS networks is evolving area of research by utilising social networks plugins in order to harvest data for sentiment analysis. Recently, a high-level sentiment analysis is adopted for the purpose of understanding the opinions of learners concerning a specific product or trends from reviews or tweets. Therefore, sentiment analysis is useful in improving the understanding of learners/user opinion, and also extracting trends about privacy and security of profile information on the LMS. The automated schemes are trained with hidden patterns in the comments or reports, then assign diverse sentiments to different reports indicating the severity and sensitivity regarding privacy of attributes in the learner profile information supplied to the LMS during the registration. The existing approaches require manual prioritization and partitioning, which is complex and time-inefficient. The first phase is the design of an opened questionnaire to be adopted during voluntary interview sessions with selected learners on different LMS such as CODEL, NOUN, and other LMSs for the purpose of generating learners profile information. In the second phase, 20 attributed were identified as most relevant for inclusion in mobile learner's profile information in which 12 attributes were considered to be most-sensitive, more-sensitive (2), less-sensitive (3), nominal (3), and non-sensitive (0) respectively. In this regard, the paper proposes deep learning networks techniques such as convolutional neural network (CNN), LSTM- based recurrent neural network (RNN) techniques for the purpose automatically discovering sensitive attributes requiring privacy and protection from the public access or exploitation. The outcomes were better when compared to the manual-based thematic approach previously utilised in terms of effectiveness and accuracy.

Keywords: Intelligent, Attributes, Sensitivity, Profile, Learner, Privacy, Security, LMS.

Construction and Comparative Study of a Savonius and Combined Savonius-Darrieus Vertical Axis Wind Turbine

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ABSTRACT

In a previous work, a Savonius and Darrieus vertical axis wind turbine was designed and simulated. In this current work, the designed Savonius and Darrieus vertical axis wind turbine was constructed using wood and metals and the resulting blades were field tested under various wind speeds. The results of this test showed that under standard wind conditions the Savonius rotor will always respond to wind flow before the Darrieus VAWT. More so, the Darrieus VAWT has a higher revolution per minute (RPM) than the Savonius rotor. It was also observed that though it takes the Darrieus VAWT a longer time to start rotation, it also takes it a longer time to stop even when the wind speed is lowered. The Savonius rotor proves to self-start at a wind speed of 2m/s with a maximum RPM of 82rpm at a wind speed of 3.5m/s and a minimum of 43rpm at a wind speed of 6m/s. on the same note, the Darrieus blade proves to self-start at a wind speed of 3.5-4m/s with a maximum RPM of 101rpm at a wind speed of 6m/s and a minimum of 50rpm at a wind speed of 3m/s.

Characterization of Hydrothermally Synthesized WO₃ nanowires and Chlorine-Calcium co – doped WO₃ nanowire composite

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ABSTRACT

Doping WO₃ nanowires with non-metal and metal is a viable strategy to enhance its properties as compared to undoped counterpart. In this study, Response Surface Methodology optimization based on Box – Behnken design was employed for the synthesis of WO₃ nanowires via hydrothermal method where sodium-tungstate and oxalic acid were used as precursors. While sodium chloride and calcium nitrate at different mixing ratios was used as structure directing agents to prepare Cl-Ca co-doped WO₃ nanowires composites through wet impregnation- hydrothermal method. The prepared WO₃ based nanowires were characterized for their morphology, elemental composition, microstructure and mineral phase using X-ray diffraction (XRD), high resolution scanning electron microscopy (HRSEM), Energy dispersive spectroscopy (EDS), high resolution transmission electron microscopy (HRTEM), Selected area electron diffraction (SAED) and XRD/HRSEM/HRTEM analysis confirmed that the synthesized WO₃ were monoclinic, highly crystalline, compacted spherical and nanowires shaped with a diameter between 104.5 nm – 125.nm. The EDS revealed tungsten and oxygen as the dominant element irrespective of the synthesis conditions. The HRSEM/HRTEM results of the chlorine-calcium co-doped WO₃ showed morphological changes and the formation of large and narrow bundles nanowires of different length depending on the Chlorine-Calcium mixing ratio. The XRD analysis demonstrated phase changed from monoclinic to triclinic due to the presence of chlorine and calcium in the lattice layers of WO₃ nanowires composite. The EDS results for the co-doped samples revealed tungsten, oxygen as the dominant elements and calcium, chlorine in varying amounts. It was found that addition of the two dopants was responsible for the increase in the diameter of the nanowires from 178.82 to 203.50 nm compared to 125 nm obtained for pure WO₃ nanowires alone.

Keywords: Doping, hydrothermal method, nanowires, Tungsten trioxide

Synthesis and Characterization of NiO Nanowires and B₂O₃/NiO Nanocomposite via Hydrothermal Route

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ABSTRACT

Nickel Oxide (NiO) is a p-typed semiconductor with an excellent optical, electrical, magnetic and photocatalytic properties. Boron oxide (B₂O₃) is one of the additives widely used to modify textural and acid-based properties of metal oxides due to its excellent anti-wear and reducing friction capability. Therefore, doping NiO nanowires with B₂O₃ will significantly enhance its active surface area, morphology and its adsorptive properties. In this study, NiO nanowires and NiO/B₂O₃ nanocomposite were prepared via hydrothermal route. The synthesized NiO nanowires and NiO/B₂O₃ nanocomposite were characterized by High Resolution Scanning Electron Microscope (HRSEM), Energy Dispersive Spectroscopy (EDS), X-Ray Diffraction (XRD) and UV-Visible Spectroscopy. The morphological and crystal studies of NiO nanowires and NiO/B₂O₃ nanocomposite revealed densely dispersed wire-like structure, with face-centered cubic and orthorhombic phase of crystallite size of 6.43 and 3.26 nm respectively. While the optical analysis revealed a surface plasmon resonance at 300 nm and 394 nm for NiO nanowires and 233 nm and 385 nm for B₂O₃/NiO nanowires. Hence, it can be concluded that doping NiO nanowires with B₂O₃ changes its orientation with a decrease in particle size and wavelength.

Keywords: characterization, hydrothermal method, NiO nanowires, B₂O₃/NiO nanocomposites, synthesis

Ethyl Methane Sulfonate Induced Mutation in Selected Soybean [*Glycine max* (L.) Merrill] Genotypes for Agromorphological Traits and Seed Retention

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ABSTRACT

Soybean (*Glycine max*) is one of the most important legume crop worldwide grown mainly for its protein and oil rich seeds, Africa holds tremendous potential for increasing sustainable soybean production. Despite its importance, pod shattering causes about 34-99% yield losses. There have been limited success breeding cultivars for resistance to pod shattering, hence the need for alternative means of achieving this through mutation is paramount. Four selected genotypes prone to shattering were collected from National Cereal Research Institute (NCRI), Badeggi, Niger State and treated using 0.00% (control), 0.20%, 0.40%, 0.60% and 0.80% EMS concentration and their morphological data taken every two weeks after seedling emergence. The data analysis was done using IBM SPSS V23. Results of the Qualitative analysis showed that all accessions had green leaves with the exception of second replicates of both TGX1904-6F with 0.60% EMS and TGX1835-10E with 0.80% EMS which had chlorosis. The leaflets were mostly 3 and ovate except the 0.60% and 0.80% EMS which had 4-5 leaflets and mostly lanceolate and intermediate. The flower colours were pinkish to purplish except the third replicate of TGX1987-10F with 0.40% EMS which had whitish flowers. Results of the quantitative analysis showed that TGX1835-10E control had significantly ($P < 0.05$) highest number of pods per plant (188.25) while TGX1987-10F with 0.80% EMS had the lowest (22.00). TGX1987-10F control had the highest shattering percentage (44.18%) while TGX1448-2E with EMS 0.20%, 0.40% and 0.80%, TGX1904-6F with EMS 0.40%, 0.60% and 0.80%, TGX1835-10E with EMS 0.40%, 0.60% and 0.80%, TGX1987-10F with EMS 0.40% and 0.80% all had the lowest (0.00%). The various qualitative and quantitative variations observed could be explored for future soybean improvement.

Keywords: EMS, Mutation, Soyabean, Phenotypic variations and Pod shattering.

Geology and Geochemical investigation for structurally controlled mineralization in Mariga, North-Western Nigeria

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ABSTRACT

Aeromagnetic and geochemical investigation was undertaken as a reconnaissance an important component in enhancing the geologic information of Mariga area as it pertains a potential for the extraction of economic gold, gemstones and associated structurally controlled mineralization. This is done with an aim of understanding the structural setting, delineating lithological contacts and possible alteration zones as well as identification of prospective zones for structurally controlled mineralization. The area is bounded between Latitude 9 50 9 55 and Longitude 5 55 to 6 00. The study area falls within the Schist Belt of north-western Nigeria. The lithological variations include coarse to fine grained, clastics pelitic schists, phyllites, banded iron formation and mafic metavolcanics (amphibolites). For the enhancement and general understanding of the structural geology of the area, the original TMI grid was processed, filtered and transformed to other grids using Oasis montaj software with associated extensions of the package such as MAGMAP, SPI and CET. First Vertical and Second Vertical Derivatives, Analytic Signal, Tilt Derivative and Horizontal Gradient were produced. These were done in order to extract the magnetic lineaments of the area. Density heat map was produced by employing image analysis techniques such as texture analysis and symmetric feature detection algorithms to identify the magnetic anomalies and vector analysis on their line segments to identify structural complexity. Geochemical analysis was done on soil samples and analysed for elements such as gold, silver, manganese, copper, zinc and iron. ArcGIS 10.8.1 was used for weighted overlay thematic maps such as geology, lineaments, feature orientation and geochemical anomaly. Results of aeromagnetic interpretation show that the magnetic signatures vary from -142 nT to 145 nT in the area which is quite appreciable contrasting signature for magnetic anomaly delineation. Several lineaments with major NE -SW trend was identified in the area. Also, major regional faults trending NE-SW and E-W delineated around the north-western part cross-cuts some of the lineaments and lithologic contacts. Feature intersection orientation density heat map showed areas associated contact aureoles and other deposits along with hot spot edges seem to be closely associated with structural complexity, identifiable in the aeromagnetic map. Prospective areas have been identified after the weighted overlay analysis and indicate that the north-western portion of the study area is deemed more prospective. This area recommended for further ground geophysics detailed investigations follow up.

Keywords: Aeromagnetic data, Lineaments, Lithologic contact, Feature orientation, Mineralization

Volatility Modelling And Forecasting Of Stock Price Returns In Nigeria

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ABSTRACT

Trades in stock market anywhere in the world is faced with intense volatility due to stocks prices instability in real time that is mostly driven by information and other market dynamics. This research examines three volatility models with three different error distributions innovations in modelling and forecasting the continuous compounded return series (CCRS) of Nigeria All Share Index (NGX-ASI) spot prices spanning the period of January 30, 2012 to June 30, 2021. The Generalized Autoregressive

Conditional Heteroscedastic (GARCH), Exponential GARCH (EGARCH), and Asymmetric Power ARCH (APARCH) volatility models under Student-t Distribution (StD), Skew Student-t Distribution (SStD), and Generalized Error Distribution (GED) error innovations are utilized. The best fitted model is determined using Akaike's Information Criterion (AIC) and Bayesian Information Criterion (BIC) while Mean Square Error (MSE) and Mean Absolute Error (MAE) are used to evaluate the forecasting performance of the fitted volatility models. The results from the analysis showed that amongst competing models, APARCH (1,1)-GED was selected to be the best fitted volatility model with better forecasting power for the CCRS-NGX-ASI spot prices. This is because it produces the smallest AIC, BIC, MSE, and MAE values.

Keywords: Volatility Modelling, Forecasting, Stock Price Returns

Modelling of Loglinear and some Ordinal Contingency Variables Method

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ABSTRACT

Association in contingency tables is traditionally studied using Chi square but it can only handle two way contingency tables. However, a new approach to analysis capable of analyzing multi way contingency tables evolved. This method is similar to ANOVA and it is called log linear model. Log linear models are commonly used to analyze multi way contingency tables that evolve more than two variables. The log linear models do not recognized ordering that may be inherent in some of the variables involved in contingency tables. To overcome this inadequacies ordinal log linear contingency tables models in the form of Uniform (U), Row (R), Column (C), R+C and RC associations models among others came into being. Each of these models is applicable in different circumstances. It was the focus of this research to find out if all two factor interactions present in a fitted log linear model were necessarily found to be statistically significant in some ordinal contingency tables association models and to also identify which of the association models performed best for each pairs of factors. Data involved were gender and university attended. Model estimation was done by iterative proportional fitting models and model comparison was carried out using Akaike Information Criterion and Bayesian Information Criterion. Both the likelihood ratio and Pearson Chi square statistics with respective P-values of 0.722 and 0.753 suggested adequacy of the fitted log linear model. Out of the ten two ways contingency tables involved in association models analysis, the null model performed best on seven occasions, R on no occasion, C on one occasion and U on two occasions. The study concluded from log linear modeling corroborated by the U models that graduating grades was the major determinant of higher grades obtained, results of log linear modeling and that of association models have agreed.

Keywords: Ordinal variables, Association models, Contingency tables, log linear models, Chi- square, R (Row), C (column), U (column).

Aeromagnetic investigation of underlying Geological Structures of Rafin Rewa Warm Spring and its environs

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ABSTRACT

The study area lies between latitudes 10° N to 11° N and, longitudes 8° E to 9° E. The exact location of the warm spring manifestation is 10° 25' 35.7" N and 8° 30' 47.0" E with an elevation of 729m above sea level. This research paper is aimed at delineating the geologic structures which could gave rise to the manifestation of the warm spring in Rafin Rewa, Dan Alhaji village Lere, North western Nigeria. Four High Resolution Aeromagnetic (HRAM) data of Dutsen wai (sheet 125), Ririwai (sheet 126), Bital

(sheet 146) and Rahama (sheet 147) which covered the study area and beyond, were purchased from the Nigerian Geologic Survey Agency (NGSA). The anomalies on the aeromagnetic map were defined by fitting a first order polynomial to the total fields, by the method of least squares to obtain the residual field data. Qualitative interpretation from second vertical derivative and analytic signal anomalies revealed the distinct pattern of the magnetic signatures. A fault trending NE-SW is observed very close to the location of the Rafin Rewa warm spring and can be suspected to be a conduit for heat transfer from within the earth. 3D Euler solution of the aeromagnetic data with structural index of one (SI = 1.0 for dyke) produced depth solutions and the predominant source depth range from 100 m to 1,500 m and can be observed to cluster along suspected fault zones. In conclusion the study area, could be consider for further geothermal exploration.

Key words: Aeromagnetic; Faults; Rafin Rewa, warm spring.

Discriminant Analysis with Logistic Regression Methods in Prediction of Baby's Weight at Birth in Niger State, Nigeria

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ABSTRACT

The study compares two statistical methods: Discriminant analysis with Logistic regression model in predicting birth weight of an expectant mother. Normal birth weight and Low birth weight. 240 cases of (infants) was observed with the following measurements considered maternal height (x_1), maternal weight (x_2), maternal age (x_3), baby's weight (x_4), baby's sex (x_5), gestational age (x_6) and parity (x_7) of an expectant mother, Discriminant Analysis classified the Normal birth weight correctly (64.6%) while it recorded (64.7%) success rate in classifying the Low birth weight. In the case of the Logistic regression, it recorded (76.8%) and (52.9%) success rate in classifying the Normal birth weight and Low birth weight respectively. The overall predictive performance of the two models was high with the Logistic regression having the highest value (65.8%) Among the seven characteristics examined, maternal height, maternal age, Baby's weight, sex, gestational age and parity were not significant variables for identifying Birth weight by both methods while Mothers weight is important identifying variable for both except Mothers age which was significant in the Discriminant analysis. The study shows that both techniques estimated almost the same statistical significant coefficient and that the overall classification rate for both was good while either can be helpful in selection of birth weight however, given the failure rate to meet the underlying assumptions of Discriminant Analysis, Logistic Regression is preferable.

Keywords: Logistic Regression, Classification, Birth Weight, Discriminant Analysis

Study of Mechanical and Thermal Properties of the Waste Polystyrene Foams and Chemically Modified Sweet Potatoes Starch Composites

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ABSTRACT

Recycled polystyrene waste / chemically modified sweet potatoes starch blended composites were prepared by melt blending on the two roll to reduce the plastic wastes in the environment. The effect of the chemically modified starch contents of 0, 10, 20 and 30 wt% on the physical and mechanical

properties of the composites were examined. Starch from sweet Potatoes was treated with 3.16M H₂SO₄ to reduce the particle size of the starch and increase its surface reactivity. It was observed that there was a decrease in the tensile strength (from 3.16 MPa at 10% starch content and then begin to increase rapidly), percentage elongation at break (from 3.09 % to 2.36 %), Impact strength (from 0.18 j/mm to 0.17 j/mm) and Flexural modulus (from 7.4462 MPa to 6,4107 Mpa) properties as the modified starch content increases from 0-30wt% when compared with the pure polystyrene waste. The impact strength improved at (20wt %) as modified starch content increases when compared to the pure polystyrene waste. Also there was an increase in young modulus (from 18.30 MPa to 314 MPa), density (from 1.18 g/cm³ to 1.40 g/cm³) and water absorption (from 10% starch content to 30% starch content) properties as chemically modified starch content increases. It can be concluded that effective blending of polystyrene waste with chemically modified sweet Potatoes starch produced plastic sheets that could be used in the household or for industrial applications.

Keywords: Plastic Waste, Chemically Modified Sweet Potatoes Starch, Biodegradability

Antibacterial Activity and FTIR Characterization of subfractions from Ethylacetate Fraction of *Piliostigma thonningii* against some *Salmonella* species

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ABSTRACT

The present study deals with the antibacterial activity and functional group analysis of *Piliostigma thonningii* extract, its fractions, sub-fractions and column isolates. The crude methanol extract of the plant (PT1), its partitioned-soluble fractions (PT1-01, PT1-02, PT1-03 and PT1-04), sub-fractions from VLC fractionation of ethyl acetate fraction (VLC1 –VLC7) and column sub-fractions (Et1-Et6) were screened for their antibacterial potentials using agar well diffusion technique. The crude methanol leaf extract was first partitioned with different organic solvents to afford the n-hexane- chloroform- and ethyl acetate-partitioned-soluble fractions. The antibacterial active ethyl acetate – partitioned soluble fraction was further fractionated over a vacuum liquid chromatography followed by column chromatography of the antibacterial active VLC sub-fraction (VLC5). Characterization of the antibacterial active column sub-fractions was done using Fourier transform infrared spectroscopy (FTIR). The results showed that all the fractions possess antibacterial activity on at least one of the bacteria tested, however, the ethyl acetate fraction (PT1-03) exhibited the widest zone of inhibition on the test bacteria (14-16mm) at the concentration of 100mg/ml. The zones of growth inhibition increased with increasing concentration of the extracts. The corresponding increase in concentration and growth inhibition zone was significant (p<0.05). The FT-IR result of the column isolate from the ethylacetate fraction revealed the presence of phenols, aldehydes, ketones, amines, amides and carboxylic acids. The spectra of the activity exhibited by the isolates signified their potency for the development of therapeutic agents against these pathogenic bacteria.

Keywords: Antibacterial activity, Column chromatography, Growth inhibition, Solvent partitioning, Spectrophotometer

Analysis of dynamic transmission of coronavirus disease with Astrazeneca vaccine as control measure in Nigeria.

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ABSTRACT

SARS Cov-2, COVID-19 (Coronavirus) emerged in Wuhan in early December 2019 and then spread exponentially across the globe. Although, a series of prevention strategies such as (lockdown, social-distancing, Hand Washing) have been enforced to control this pandemic. Based on the data issued by March 30, 2020 daily report, the epidemic of SARS-CoV-2 so far has caused 693224 cases and resulted in 33106 deaths in more than 200 countries. Referring to the data reported, World Health Organization declared the outbreak a pandemic. In this context, the purpose of the study is to analyse the dynamic transmission of coronavirus disease, with Astrazeneca vaccine as control measure in Nigeria. Analysis of Variance (ANOVA), Principal Component Analysis (PC) and Discriminant Analysis are utilized. After applying ANOVA the researcher concludes that the recovery rates for all the states in Nigeria are significantly higher than the mortality rate, this also implies that the vaccine (AstraZeneca) plays a vital role in reducing the spread of the disease in addition to the preventive measures. The two powerful multivariate statistical methods: The Principal Component Analysis and Discriminant Analysis was able to dictate correct placement of 0.595 based on the data obtain from NCDC COVID-19 Situation Report | covid19.ncdc.gov.ng

Keywords: AstraZeneca, Discriminant Analysis, ANOVA, Principal Component Analysis

A Note on Combustible Forest Material (Cfm) of Wild land Fire Spread

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ABSTRACT

In this paper, a mathematical model for combustible forest material of a wild land fire is presented. We carefully studied the equations describing the fractional components of forest fire. The reaction before a forest can burn or before fire can spread must involves fuel, heat and oxygen. The coupled dimensionless equations describing the phenomenon have been decoupled using perturbation method and solved analytically using eigen function expansion technique. The results obtained were graphically discussed and analysed. The study revealed that varying Radiation number, and Peclet energy number enhances volume fractions of dry organic substance and moisture while they reduced volume fraction of coke.

Keywords: Combustion, eigen function expansion, fire, fuel, ignition

Groundwater exploration in Sheet 42 Minna (1:250,000), North-Western Nigeria, using Integrated remotely sensed and geophysical data: Case study of a heterogeneous geologic terrain

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ABSTRACT

Traditional groundwater exploration studies usually involve reconnaissance geophysical surveys which were conducted on various sites to identify potential water bearing structures. These surveys were then

followed by detailed ground surveys. This type of exploration is very time consuming and expensive for regional groundwater exploration campaigns. In certain cases, it is only economical to use ground geophysical methods. However, in other cases, it is best to use airborne magnetic survey. This type of survey provides high resolution data and is usually performed for target identification. Additionally, in hydrogeologically complex areas, incorporation of remotely sensed datasets proves to improve success rates in groundwater development efforts. This paper will discuss the advantages of using high-resolution aeromagnetic surveys and remotely sensed datasets for groundwater exploration. It will also show how these methods can reduce the time and cost involved in drilling dry boreholes.

Keywords: Aeromagnetic data, Geophysical methods, Remote sensing, Groundwater, Hydrogeology

Impact of agricultural credit facilities and Farmers' socio-economic characteristics on small scale farming in Niger state: Binary Logistic Regression Modeling approach

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ABSTRACT

Inadequate support for farmers from government-owned financial institutions in terms of agricultural credit facilities has been identified as one of the major problems affecting farming operation, particularly that of the small scale farmers, in Nigeria. This work investigates and models the impact of agricultural credit facilities as well as that of socio-economic characteristics of farmers on small scale farming in Niger state using CHANCHAGA AND BOSSO Local Government areas of the state as a case study. The research design employed the use of data from Bank of Agriculture, Minna Branch office in order to achieve an accurate representation of the population under study. Binary Logistic Regression modeling approach was used on the collected data. It was observed that the amount of loan granted to the farmer, the purpose of the loan, as well as the gender, among others, contributed significantly to the performance of the loan at $P < 0.001$ level of significance. Credit facilities therefore plays a crucial role in the operation of small scale farming, this ensures the derived output which sustain the growth and development of the economy.

Keywords: Agricultural credit finance, socio economic characteristics, loan performance, modelling

Urban Forest Degradation and Vulnerability to Pandemic Nexus in Minna Town, Niger State, Nigeria

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ABSTRACT

Most efforts to stem the tide of pandemics tend to focus on vaccine development, early diagnosis and containment, which is akin to treating the symptoms without addressing the underlying cause(s). As humans degrade urban forest structure and composition, there is likelihood for increasing the risk of disease pandemics such as COVID-19. This study is aimed at examining the effect of urban forest degradation on vulnerability to pandemic outbreak and incidence in Minna town. The study employed field survey method based on qualitative and quantitative analysis of 8 indicators of urban forest (structure and composition) degradation; 12 indicators of ecosystem services degradation and 5

indicators of vulnerability to pandemic incidence. Relative Importance Index (RII), Ecological Risk Index (ERI) and Risk Analysis Matrix (RAM) were used to analyze the data collected. Findings from the study revealed that virtually all the parameters of structure and composition of urban forest have undergone significant degradation. It was also found that ecosystem services have declined considerably over the 30 years covered. Consequent upon the current status of urban forest, vulnerability to pandemic was found to be very likely (0.37- 0.45). The study thus conclude that urban environment in Minna is conducive to host potentially dangerous conditions and pathogens that can trigger or escalate some poor human health conditions. The study hereby recommends strengthening and sustaining regulations on urban land use, urban trees, green areas and pollution. Thus, conserving urban forest is vital for avoiding the next pandemic in Minna.

Key words: Pandemic, Urban forest, Ecosystem services, Degradation, Vulnerability.

Effects of Exchange Rate on import and export of oil and non-oil products: A multivariate GARCH models Approach

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ABSTRACT

An exchange rate is the value of a nation's currency in terms of the currency of another nation or economic zone. The study aimed to determine the effect of Exchange Rate volatility on import and export of oil and non-oil products in Nigeria using yearly data from 1981 to 2020. The research employs Constant Conditional Correlation (CCC) and Diagonal Vector Error Correction Heteroskedasticity (DVECH) components of Multivariate Generalized Autoregressive Conditional Heteroskedasticity (GARCH) models. We observed that the distribution is positively skewed which is an indication of a non-symmetric series, meaning that there is an asymmetric effects (not normally distributed) in the data. The result of DVECH and CCC exhibit similar behavior showing significant influence of Exchange Rate on importation and exportation of oil and non-oil products. The DVECH model is found to be the best model with Log likelihood = -1396.76. The result of Johansen tests for cointegration shows that there is long run effect of Exchange Rate on import and export of oil and non-oil products.

Keywords: Multivariate Garch, Exchange rate, Volatility

Evaluation of the Phytoconstituents, Mineral Contents, Essential Oil Composition and Antibacterial Activity in Mentha Piperita (Peppermint) Leaf Extract

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ABSTRACT

Medicinal plants are important in traditional and modern pharmaceutical drugs; therefore, the interest in the analysis of their chemical composition and healing potential is increasing. The purpose of this research was to evaluate *M. piperita* with the aim of quantifying its chemical information that might serve as a guide to exploit its healing potentials and benefits for human nutrition. The leave sample after collection was air dried under room temperature and later grounded into powdery form for further analysis. The preliminary phytochemical screening revealed the presence of flavonoids, saponins,

alkaloids, tannins, steroids and glycosides. The proximate analysis shows that it contains 53.16% carbohydrate, 7.30% protein, 5.2% lipids, 8.75% fibre, 23% ash and 8.5% moisture respectively while the elemental analysis of the minerals revealed that contained K 23%, Na 7.7%, Ca 0.05%, Mg 0.23% and P 0.33% respectively. The extraction was done using clavenger distillation apparatus and soxhlet apparatus respectively. Chemical composition of hydro-distilled essential oil obtained from mint leave was analyzed by gas chromatography – mass spectrometry (GC-MS) to determine the various compounds present and it was determined that *M. piperita* contains menthol as the major component. The antibacterial activity of the leave extract (essential oil) was evaluated against pathogenic bacteria like *P. aureus*, *P. aerogenosa*, *S. aureus*, *S. pyogenes* and *E. coli*. The essential oil was found possess a strong antibacterial activity against a range of pathogenic bacteria as revealed by *in vitro* agar well diffusion method. In conclusion, *M. piperita* can be an excellent source of nutrient and healing potentials with minimal side effect when compared to synthetic drugs.

Key words: *M. piperita* L, antibacterial activity, healing potentials, essential oil, proximate, nutritional, medical plant

Prevalence of *Escherichia coli* in Some Selected Well in Bida Metropolis Niger State Nigeria

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ABSTRACT

In developing countries such as Nigeria, majority of rural dwellers depend on well water as their main source of water supply for drinking and other domestic activities. This source of water can be easily contaminated by faecal contaminants and human activities. An investigation was carried out to determine the water quality and prevalence of *Escherichia coli* in selected well water within Bida metropolis. Well water samples (10 closed and 5 open) were collected from selected points in Bida metropolis. The total coliform of the water sample were determined using multiple tube fermentation technique. Some physicochemical parameters such as temperature, pH and dissolved oxygen were also determined. In all the well water samples collected, a high prevalence of *E.coli* and coliform was observed, which ranged between $0.1 \times 10^2 - 0.2 \times 10^2$ MPN/100ml and $0.15 \times 10^2 - 11 \times 10^2$ MPN/100ml which exceeds the zero MPN/100ml World Health Organisation (WHO) recommended standard. The pH of the water samples ranged from 6.0 to 6.8, which conform to the WHO standard of 6.5 to 8.5. Dissolved oxygen presented in this study ranged from 1.3 to 2.9mg/L, which is within the 1.0 to 10mg/L recommended standards. This study showed a high bacteriological contamination by the presence of disease causing pathogens in well water in Bida metropolis. Management of this contamination can be achieved by treatments of the well water, educational awareness, digging deeper wells and locating wells far away from dumping sites and latrines.

Key words: *Escherichia coli*, Well water, Coliform, World Health Organisation.

An Application of Analysis of Covariance (Ancova) Technique in Eliminating the Effect of Concomitant Variables in the Analysis of Volume of Sales

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ABSTRACT

Analysis of covariance (ANCOVA) is an extension of analysis of variance (ANOVA) that allows modelling and adjustment for input variables that were measured but not randomized or controlled in the experiment. ANCOVA tests whether factors have an effect after removing the variance due to covariates. This research employs the ANCOVA technique to determine the effect of age and gender on the volume of sales of grand cereal oil. The data were collected from grand cereals and oil mills limited, Jos. It was observed that the model account for a significant ($p=0.05$) amount of the variation in the experiment (nearly 55.5%). The result shows that gender and age have a statistically significant effect on the volume of sales considering the p-value at 0.005. The effect of age after adjusting for the covariate was observed to be significant with a p-value of .0005. Mean squared error (MSE) was found to be 0.5800 - a substantial reduction which gained us the power to detect the difference. The effect of the covariate after taking into consideration the effects of the gender was done using the Type III sums of squares and it was shown that the covariate is significant after adjusting. We then conclude that, the middle age group has a significant effect on the volume of sales than the young and old considering their work experience and their strength.

Studies on Fungi Associated with Date Fruit (*Phoenix dactylifera* Linn) Sold in Bida, Niger State, Nigeria.

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ABSTRACT

A study was carried out on the fungi associated with healthy date fruits (*Phoenix dactylifera* Linn). Samples of healthy dried dates were collected from vendors of six selected retail points in Bida metropolis Niger State, Nigeria. The samples were processed by cutting into 3mm sizes with sterilized razor blade and surface was sterilized using 1% hypochlorite for 2 minutes. The processed samples were plated onto Potato Dextrose Agar and incubated for 5 days at room temperature. Pure fungal isolates and stock cultures were obtained on Potato Dextrose Agar plates and slants bottles using standard mycological procedures. The pure fungi isolates were characterised and identified using standard taxonomic guidelines. The most prevalent fungi obtained from this investigation is *Aspergillus* sp (50%) in Big gate, 45% in Small gate, and 41% in Lemu and BCC road and the least prevalent fungi was *Penicillium* sp at 0% in small and Big gate. Proper storage, use of suitable wrapping sheets, separation of infected from healthy dates and proper washing of dates should be encouraged to reduce the risk of infection by these organisms.

Key words: Fungi, Isolation, *Phoenix dactylifera* Linn (date fruits).

Evaluating Students' Academic Performance using Clustering Techniques: A Case Study of School of Engineering, Federal Polytechnic, Bida

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ABSTRACT

Predicting students' performance becomes more challenging due to the large volume of data in educational databases. Data Clustering is the task of grouping a set of objects in such a way that objects in the same group are more similar to each other than to those in other groups. Clustering categorizes data into groups such that objects are grouped in the same cluster when they are similar according to specific metrics. It is one of the methods in data mining to analyse the massive volume of data. With clustering, interesting patterns and structures can be found directly from very large data sets with little or none of the background knowledge. This work studies and compares four clustering algorithms using the data on final raw score grade of Higher National Diploma students of School of Engineering, the Federal Polytechnic, Bida. The Data were collected from the Examination and Records Unit of the Polytechnic. The algorithms used for the research are k-Means, k-Medoids, Fuzzy C Means (FCM) and Expectation Maximization (EM). The performance of the clustering algorithms are compared based on the factors: Purity, Normalized mutual information (NMI) and time taken to form cluster. Also, the result of K-cluster mean algorithm grouped students into 3 distinct groups having poor, average and excellent performing students. Recommendations for further studies were given at the end of the study

Building Density and Housing Submarket: A Historico-geographic Approach on Urban Morphology

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ABSTRACT

An increase in building density as a result of urban densification has become a global trend as it changes the urban forms of many cities of the developing world. This study investigates spatial changes in the building density of housing submarkets of Bida, Nigeria from 2008 to 2018. Data collected for the study includes satellite images and base maps of demarcated areas, which were georeferenced and the buildings were digitised using point features and vector approach in ArcGIS environment to achieve the area coverage, number of buildings, and buildings per hectare (ha) in the housing submarkets. The finding of the study reveals that from 2008 – 2018 the Town housing submarket had the highest number of buildings per area coverage with >10 building units/ha. The study further reveals that in the year 2018, the Gbazhi housing submarket had its highest number of buildings per area coverage with >10 building units/ha. It was concluded that the housing submarkets had a high number of buildings in the total area coverage which indicates that larger parts of the area coverage of these submarkets have already been exhausted. It was therefore recommended that there is the need for rational densification (planned densification) for urban development to check the increasing uncontrolled building density.

Keywords: Building density, housing submarket, urban morphology, urban densification

Effects of Missing Observations in Central Composite Designs on Estimates of Model Coefficients and their Standard Errors

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ABSTRACT

We may be confronted with a situation in which some observations are lost or unavailable due to some accident or cost constraints and their absence has a very bad impact on the estimates of the regression coefficients. This work investigates the effect of one missing observation of different types of design points on the estimated model for the candidate central composite designs considered. The regression coefficients and their standard errors were first studied for the full designs and then, similar results were investigated separately for one factorial point missing, one axial point missing and one center point missing for each of the designs considered. It was observed that when a factorial point is missing, the estimated effect of model parameter is almost doubled and its standard error also becomes much higher, for each of the CCDs considered. The same is the case when a center run is missing, but the axial point seems less influential for the regression estimates for this design. Quadratic effects behave similarly for the missing design points for each of the designs considered. For the full designs, the interaction terms are the most significant. With a factorial point or center point missing, these interaction terms still remain significant. The situation demands that we should use a design which is more robust to missing data, to improve the quality of the fitted model.

Rain fade characteristics at Ku- and Ka-bands in some parts of Nigeria

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ABSTRACT

Rain fade characteristics at Ku- and Ka-bands in parts of North-eastern (Damaturu, Bauchi and Maiduguri) and South-western (Abeokuta, Ibadan and Ikeja) regions of Nigeria is presented in this work. 33 years (1983-2015) rainfall data were collected from the Nigerian Meteorological Agency (Nimet) for the locations. Chebil rain rate model was used to compute the point rainfall rate, while ITU-R P.618-12 model was used to compute the rain-induced attenuation at frequencies of 11 GHz, 14 GHz, 20 GHz, and 40 GHz. Point rainfall rate of 85.24 mm/h, 98.20 mm/h and 99.30 mm/h were obtained at Damaturu, Maiduguri and Bauchi respectively, while higher rainfall rate of 99.70 mm/h, 104.8 mm/h and 108.20 mm/h, were recorded at Abeokuta, Ibadan and Ikeja respectively. Three elevation angles were considered: 23°, 42.5° and 55°. The results obtained show that rain-induced attenuation for the Southwestern region varied from 20.56 dB to 41.00 dB at 23° elevation angle, 12.85 dB to 26.44 dB at 42.5° elevation angle and 10.61 dB to 22.34 dB at 55° elevation angle at Ku band, while the rain-induced attenuation computed for the Northeastern region varied from 18.59 dB to 37.65 dB at 23° elevation angle, 11.61 dB to 23.46 dB at 42.5° elevation angle and 9.59 dB to 20.52 dB at 55° elevation angle for exceedance time percentage of 0.01% at Ku-band. For the Ka-band, the rain-induced attenuation for the Southwestern region ranged between 59.71 dB and 183.75 dB at 23° elevation angle, 40.39 dB and 133.48 dB at 42.5° elevation angle and 35.12 dB and 122.11 dB at 55° elevation angle, while the rain-induced attenuation computed for the Northeastern region ranged between 54.06 dB and 168.97 dB at 23° elevation angle, 36.50 dB and 120.79 dB at 42.5° elevation angle and between 31.71 dB and 111.76 dB at 55° elevation angle for same 0.01 percentage of time exceedance.

Keywords: Elevation angle, Ka-band, Ku-band, rain-induced attenuation, rain rate.

The Martingale Model with Application to Stock Price in Nigeria.

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ABSTRACT

Stock price volatility has been a major concern amongst investors as this plays a major role as one of the determinants of whether an investment should be made. This paper tries to find out if time has any

effect on stock price volatility. Ten years (2010-2019) historical stock price data obtained from Nigeria Stock Exchange (NSE) was used for the purpose of this research. Using continuous time martingale (Brownian Geometric Model), the results of the analysis shows that the expected volatility of stock price is an increasing function of time. This implies the market price of stocks cannot be predicted as it's uncertain.

A DFT Study on the Effect of Beryllium Doping in WO₃

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ABSTRACT

Tungsten trioxide (WO₃), in its chemical compound contains oxygen and a transitional metal with wide range of applications such as in gas sensors and photocatalysis. Modification of oxide semiconductors including doping of transitional metals or rare earths could enhance their performance (Xueting et al, 2011). In this work, the structural and electronic properties of pure hex-WO₃ and WO₃ doped with Beryllium (Be) [Be_xW_{1-x}O₃; x= 0.25, 0.5] are calculated using generalized gradient approximation (GGA – PBE) Pseudopotentials within density functional theory (DFT) as implemented in Quantum ESPRESSO (QE) simulation package code. The results shows that the bond length of pure hex- WO₃ is 1.9371Å, but that of the Be doped WO₃ are respectively 2.0116, 2.1024Å. The result similarly shows that the pure hex-WO₃ is a semiconductor with an indirect band gap, which is in agreement with the experimental results. Doping of pure hex-WO₃ with Be of a certain percent causes disappearing of band gap and induced metallic behaviour. Density of state (DOS) and projected density of state (PDOS) of pure hex-WO₃ and doped system are similarly discussed.

Key words: WO₃, structural, electronic properties, DFT, GGA, QE

First Principle Investigation on the Effect of Mg Doping on Optical Properties in WO₃

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ABSTRACT

Tungsten trioxide (WO₃) is a metal oxide which grabbed considerable attention because of its wide technological applications. Investigation revealed that it is widely used in gas sensor application (Mansouri and Mahmoodi, 2016). Modification of oxide semiconductors including doping of transitional metals or rare earths could enhance their performance (Xueting et al, 2011). In this study, the electronic and optical properties of pure hex-WO₃ and Mg doped WO₃ (Mg_xW_{1-x}O₃; x= 0.25, 0.5) are calculated using generalized gradient approximation (GGA – PBE) Pseudopotentials and Norm conserving Pseudopotentials within density functional theory (DFT) as implemented in Quantum ESPRESSO (QE) simulation package code. The result depicts that the pure hex-WO₃ is a semiconductor with an indirect band gap, which is in agreement with the experimental results. Doping of pure hex-WO₃ with Mg of a certain percent causes disappearing of band gap and induced conductor behaviour. Density of state (DOS) and projected density of state (PDOS) of pure hex-WO₃ and doped system were discussed. The complex dielectric function [$\epsilon_{real}(\omega)$ and $\epsilon_{im}(\omega)$] and electronic energy loss function

were calculated for both pure and doped system. The relations of the complex dielectric function to inter band transitions were also discussed.

Key words: WO₃, electronic and optical properties, GGA, DFT, QE

Effect of Exchange Rate on Government Expenditure and Inflation in Nigerian Economy

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ABSTRACT

The exchange rate in Nigeria has been stable between 1960 and 1983 and this period fall within the period of oil boom in the nation. The stability then encouraged importation of all kinds of goods into the country but discouraged exportation. This is due to the fact that exchange rate policy encourage over valuation of the naira. This study investigates the impact of government expenditure, revenue and inflation on exchange rate in Nigeria over a period of 21 years (1997 to 2017). Data on government expenditure, revenue, inflation and exchange rate for the period under review were extracted from the World Bank website. Cointegration test was first carried out on the extracted data so as to check for existence of relationship among the variables. The Vector Error Correction Modelling (VECM) approach and Granger Causality test were then used to model that relationship among the variables. The cointegration test revealed the existence of a long run relationship among the variables, which was found to be significant and negative while the VECM test revealed that an increase in government expenditure and inflation is associated with a significant decrease in exchange rate in the short run while in the long run it is associated with an increase in exchange rate. An increase in revenue is associated with significant increase in exchange rate in the short run while in the long run, the increase is not significant. The Granger Causality test revealed that exchange rate does granger cause revenue but the reverse is not true, also revenue does granger cause inflation but the reverse is not true. Thus, exchange rate exchange has a significant impact on revenue and inflation.

Keywords: Vector Error Correction, Granger Causality, Revenue, Inflation, Government Expenditure.

Vector Autoregressive and Autoregressive Integrated Moving Average Modeling of inflation Rate in Nigeria: time series estimates dynamic causal effects and correlation over time.

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ABSTRACT

Inflation is an important indicator of economic activity often used by decision makers to plan economic policies and remains a subject of utmost concern and interest to policy makers. This work models inflation over the period 1990-2018, using autoregressive integrated moving average (ARIMA) and Vector Auto regression (VAR) modeling techniques. ARIMA model is used to fit Nigerian historical consumer price index (CPI) time series expressed in terms of past values of itself plus current and lagged values of error term. Data for the last six months were used to evaluate the performance of the prediction. VAR model is used to investigate the effect of money supply, Nigeria oil prices and exchange rate on inflation rate over the same period. Unit root test (Augmented Dickey- Fuller test) was used to check the integration order of the variables. A cointegration analysis with the four variables was then employed. Both the trace test and max Eigen value statistics revealed that individual variables are cointegrated with inflation at 5% significant level. A Vector Error Correction Model (VECM) was

then estimated. It was observed that there is no long run causality running from the independent variables to inflation. In addition, money supply and exchange rate has no short run causality to inflation. The result ARIMA model shows that ARIMA (1,1,0) was the best model out of the fitted ARIMA models.

Key Words: ARIMA model, VAR model, Inflation

Item Response Theory Models: On Propensity of Endorsing Item-Options in Multi-Category Test Items and Response Categories Analysis

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ABSTRACT

The use of unordered multi-category responses have been on increase virtually in our Nigeria universities today even before the advent of COVID-19 pandemic to solve problems encountered by increasing number of examinations students and lack of suitable examinations hall without sacrificing the validity of test items. In most cases, lopsided test items, and defectives item-options (items' distractors) in a multiple choice questions have endangered the quality, integrity, and awards of certificates. A 35 multiple choice questions in a compulsory undergraduate statistics course where options A, B, C, and D were coded 1, 2, 3, and 4 respectively were used to illustrated this framework. A nominal response theory model was focused here to investigate and analyse the propensity of endorsing each of the item-options as a function of their ability in statistics, often describe as a category probability curve for each of the four option responses. Each of the item option curves shows how students perceived each of the items' distractors thereby helped us in identifying poor, marginal, defectives, and even good response options. The analysis was done using stata 16SE on window 7

Keywords: category, item-option, response, propensity, unordered

Fungi Species Associated with Postharvest Spoilage of Sweet Oranges (*Citrus Sinensis*) Sold in Bida Metropolis, Niger State Nigeria

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ABSTRACT

An investigation was carried out on postharvest spoilage fungi associated with apparently diseased sweet oranges (*Citrus sinensis*) and pathological studies of these fungi on obviously healthy sweet oranges. Samples of diseased and healthy sweet oranges were collected from vendors from ten different locations in Bida metropolis, Niger State Nigeria. The samples were processed by surface sterilization using 85% ethanol, homogenized, inoculated on Potato Dextrose Agar and incubated for 7days at 30°C. The mean viable mycological count of the samples was determined. Pure fungal isolates were obtained, identified and pathogenicity test of the pure isolates on healthy oranges were carried out using standard techniques. The study revealed over 90% of the samples were infected with one or more fungal species with mean mycological counts ranging from 1.60 X 10² cfu/ml to 4.60 X 10² cfu/ml. The highest occurring fungus encountered in this study was *Aspergillus* sp with 27.6% occurrence. Others include *Mucor* sp. (23.1%), *Rhizopus* sp. (15.7), *Alternaria* sp. (13.2%), *Fusarium* sp. (13.2%) and *Penicillium* sp. (7.4%). All the fungal isolates re-infected the healthy oranges with the exception of *Fusarium* sp. Good post production practices such as proper handling, transportation and storage should be

encouraged. Separation and subsequent isolation of diseased oranges from healthy ones should be practiced to prevent economic loss due to these fungal pathogens.

Key words: Fungi, Postharvest, Spoilage, Sweet oranges.

Nitrous Acid Induced Mutation on Agro-morphological and Shelf Life of Selected indigenous Leafy Green Vegetables in Nigeria.

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ABSTRACT

The mutagenic effects of Nitrous acid on Agro-morphological and Shelf-life of three leafy vegetables were investigated. Dry seeds of *Celosia argentea* (NGB00023), *Solanum macrocarpon* (NHGB/09/133) and *Amaranthus hybridus* (NGB00077) were collected, presoaked and treated with varying concentrations of Nitrous acid (0.02mM, 0.04mM, 0.08mM and 1.0mM) for 1hour, the untreated was designated as control and planted in a complete Randomized Design (CRD) with four replicates. Morphological parameters such as plant height, Number of Leaves, leaf length and leaf width were taken weekly after seedlings emergence. Also twenty fresh leaves each of the different genotypes and concentrations was harvested early in the morning and kept under room temperature, Hours to weight loss at an interval of 12hours, wilting index and days to yellowing were recorded respectively. The data analysis was done using IBM SPSS 23. The qualitative observations showed leaf irregularities of bifurcated apex, curved apex, invaginated margin and distorted leaf shapes were more prominent in 0.08mM treatment. Quantitative analysis showed that NGB00023 with 1.0mM (160cm) had the highest plant height and lowest at control (7cm) and highest number of leaves (102) with 1.0mM, In NHGB/09/133 with 1.0mM had highest number of leaves (25) and lowest (6) with control, highest plant height with 1.0mM (44cm), NGB00077 with 0.08mM had highest number of leaves (95) and lowest at (21) with control. In addition, Nitrous acid is potent in increasing shelf life as NGB00023 with 0.02, 0.04, 0.08 and 1.0mM showed rapid decline in yellowing of leaves, NHGB/09/133 with 0.02mM and control had higher physiological weight lost at (75%). From the result, all parameters show significance differences at ($p < 0.05$) on the quantitative and qualitative traits. Nitrous acid is more effective in 0.08mM and 1.0mM concentration in all the three leafy vegetables and could be utilized for further improvement.

Keywords: Nitrous acid, Leafy green vegetables, Shelf life, Concentrations, Parameters.

Additive Main Effect and Multiple Interaction Model of Some Varietal Trials and Multiple Locations

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ABSTRACT

Additive main effects and multiplicative interaction (AMMI) is the one that estimate the magnitude and significance of GE interaction effect of each variety response. It essential combined ANOVA and principal component analysis into a single model where ANOVA allows studying the main effect of genotype by environment, while GE interaction is treated by multiplicative PC. This study aimed at

modeling and investigating the genotype by environment interaction of the multi-environment trial of five varieties of rice crop (*Oriza sativa*) sampled from multiple locations in Niger State, Nigeria, using a split plot design. The study further attempts to examine the adaptability of different rice genotype at multiple location and examine the phenotypic stability of varieties of rice genotypes at multiple location in Niger State. The data used were collected from, National Cereal Research Institute Badeggi, Niger State. Secondary method of data collection is adopted.

Keywords: AMMI model, ANOVA, Rice, Split-plot design, PCA, multi-environmental trials and locations.

Epilepsy detection and Classification using Linear Discriminant Analysis Algorithm and Artificial Neural Network

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ABSTRACT

Epilepsy is a condition that affects 8 out of every 1000 persons on the planet. It's a condition that alters the brain's nerve cell activity, resulting in seizures in the patient. For more than three decades, people have been fascinated by the idea of detecting and forecasting epileptic episodes. According to studies, irregular brain activity occurs a few minutes before the onset of a seizure, which is referred to as the preictal stage. Electroencephalography (EEG) is an electrophysiological monitoring technique for detecting and predicting epileptic seizures by recording the electrical activity of the brain. Detecting and predicting epileptic seizures before they happen can help prevent them and guarantee adequate seizure control. Many researchers have attempted to anticipate the preictal stage of a seizure, but successful prediction with high sensitivity and specificity remains a challenge. This proposes a machine learning approach for detection and classification of EEG signals into seizure and non-seizure data that uses Linear Discriminant Analysis for feature extraction and an Artificial Neural Network for classification. An EEG recording of ten patients was used to test the proposed technique. The data was filtered, and features were selected using Linear Discriminant Analysis. An artificial neural network was used to classify the data into seizure and non-seizure data. The model had an overall accuracy, sensitivity, precision, specificity and F1-score of 85%, 69%, 80%, 96.2% and 72%, respectively. The result shows that the proposed method provides an effective method for detecting epileptic seizures. Also, the use of Linear Discriminant Analysis, which is a less computationally intensive feature extraction technique, enables faster seizure detection and classification when compared to similar techniques in the literature.

Antidiarrhoeal Activity of *Scoparia Dulcis* Linn. Methanoli Crude Extract

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ABSTRACT

Diarrhoea is a form of gastrointestinal infection caused by a variety of bacterial, viral and parasitic organisms through contaminated food, drinking water or from person to person as a result of poor hygienic practices. The current study evaluated the antidiarrhoeal activity of *Scoparia dulcis* methanol

leaf extract in Castor oil-induced albino whistar rats. The crude methnolic extract was screened for phytochemical composition, castor oil induced diarrhea, castor oil induced enterpooling and castor oil induced charcoal meal tests. The extract exhibited a non-dose dependent activity in tested parameters. The 200 mg/kg dose ($P < 0.05$) showed the highest activity in antidiarrhoeal activity. In castor oil induced enterpooling, it showed a significant ($P < 0.05$) reduction in the weight and volume of intestinal content and in castor oil induced charcoal meal test, it inhibited the intestinal transit of charcoal meal when compared to the negative control group. Although the observed activity is significantly lower ($P < 0.05$) than that of the standard drug (loperamide), the extract is a potential source for antidiarrhoeal compounds.

Key words: Antidiarrhoeal, castor oil, charcoal meal, *Scoparia dulcis*

Applications of Slide Scan Images of Thin-Sections for Sedimentological Studies During Lock-Down Periods

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ABSTRACT

Several conventional and unconventional digitization tools have been used to improve viewing and acquisition of information in the field of sedimentology and sedimentary petrology, in geology and in science and technology in general. Slide scan images of sedimentary rock thin-sections provide inexpensive, very good, whole thin-section views at magnifications similar to those of the conventional microscope. This paper demonstrates how slide scan images can be obtained and how they can quickly be used to gather detailed textural, structural and compositional information of sandstones at microscopic scale. The method has been used in studying features such as grain size, grain shape, fabric, contact between grains, graded bedding, cross lamination and porosity without the need for polarizing microscope and photomicrograph. This unpopular, unconventional method is not known by most researchers even though they can be used at times of lock-down to provide vital geological information relevant to both academia and the industry. This method is also recommended to teachers in low-equipment universities and research centers where research petrological microscopes are either absent or inadequate because it utilizes simple everyday equipment such as scanners to obtain the images and personal computers, laptops, tablets and even smartphones to view the images.

Keywords: lock-down period, thin-section, slide-scan image, sedimentology, texture

The MLE-Distributions Fitting for Detecting Extreme Points, and Possible Repetitions of Sudden Breaking Points in Big Data

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ABSTRACT

This work reports on how to use probability graphical method through the maximum likelihood estimation (MLE) approach to obtain the various pivoting model's parameters that gives the highest estimate value among the class of unbiased estimates, despite the constraint with heterogeneous compositions such as the one with heterogeneous social-economic data used in the work. The probability distribution fitting implemented through the graphical method helps to detect various outliers, intervals and the possible repetitions of sudden breaking points. The fitting was also obtained

to predict and help in assessments during breakdowns such as that, halt economic activities. Self-written R code and the Easyfit software were used to fit the household income data to suggest the possible probability distribution(s) for the data. The pdfs were taken as the functional form of the income's(X as a r.v) probability distribution and they were empirically solved using the MLE method. The estimate that is most consistent with the sample data were solved analytically based on the distribution function(s).

Keywords: Extreme points, probability graphical plots, panel data, sudden breakdown, Maximum likelihood estimation

Updates on the Geological Map of Paiko Sheet 185 on a Scale of 1:100,000

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ABSTRACT

Geological mapping of Paiko Sheet 185 was carried out on a scale of 1:100,000 in order to update the existing geological map of the area. Traverse as well as green line methods of mapping were employed. At each location the lithology, colour, texture, nature of contact between lithologies and structures were noted and documented. Field observations show that the area is composed of migmatite (66.154%), coarse grained granite (14.233%), medium grained granite (13.061%), sandstone (4.177%), tonalite (2.142%), ironstone (0.092%), soapstone (0.089%) and marble (0.052%). The modifications made to the existing map which was produced in 2009 and was colour coded in 2015 include; replacement of the alluvial lithology with the bedrock (migmatite) and renaming of talc-tremolite-actinolite schist to soapstone due to the absence of schistosity. Other modifications are: the removal of schist because it is actually located on the adjacent Abuja Sheet; inclusion of Sakpe Formation around Lapai as well as harmonizing the marble occurring around Kwakuti as one unit. Structures such as folds, faults, joints, unconformities, exfoliations, strain-slip cleavage, trace fossils, bedding and bedding plane were observed and recorded. The result of joint direction measurements shows that the principal joint direction is in the northwest - southeast. The economic geological resources within the sheet include, gold, lead, zinc, marble, soapstone, rocks, laterite, clay, sand and gravel.

Impact of Precipitation on Flood Episodes at River Niger at Lokoja, Kogi state, Nigeria

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ABSTRACT

Precipitation is one of the factors that triggers flood occurrence. This study analysed the impact of precipitation on flood event at River Niger at Lokoja, Kogi state. The data used for this study were annual precipitation and water level data of River Niger at Lokoja from 1986-2020 (35years) from the Nigeria Meteorological Agency (NiMET) and the National Inland waterways Authority (NIWA) Headquarters Lokoja, Kogi state respectively. The study adopted the least square regression analysis and mean and standard deviations were used to achieve the results of this study. This study found out that precipitation increases and decreases by 2.98% from 1986-2020, also about 69% of flood episodes can be explained by the precipitation in the study area and 864mm of precipitation is required to raise the water to the warning level.

Keywords: flood, Precipitation, river.

Theoretical Nuclear Data Evaluation for the Production of ^{64}Cu , A Tool in PET & SPECT

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ABSTRACT

Radioisotopes of copper have received considerable research effort because they offer a varying range of half-lives and positron energies, making them useful for diagnostic imaging and / or targeted radiotherapy. Among the isotopes of copper, copper -64 was more suitable for therapeutic purposes. Copper -64 ($T_{1/2} = 12.7$ hrs), β^+ 0.653MeV (17.8%) β^- 0.578MeV (38.4%) EC (43.8%) has decay characteristics that allow for positron emission tomography (PET) imaging and targeted radiotherapy of cancer. The 12.7hours half-life of ^{64}Cu provide the flexibility to image both smaller molecules, larger and slower clearing proteins. Copper-64 was produced in large scale using cyclotrons based on the reaction of ^{64}Ni (p,n) ^{64}Cu . Also the half live of 12.7hrs is ideal for the purposes of nuclear medicine, as it allows for experiments extending over several days, yet is short enough to limit the patient's exposure. Nuclear model calculation was performed for the reactions of ^{64}Zn (n,p) ^{64}Cu within the energy range of 0-20MeV, ^{64}Ni (p,n) ^{64}Cu within the energy range of 1-25MeV and ^{66}Zn (d, α) ^{64}Cu within the energy range of 1-200MeV using EXFOR code and compared it with ENDF/B-VIII. ^{64}Cu provide higher image quality than other isotopes of copper hence it is more suitable in PET.

Keywords: ^{64}Cu , positron emitters, nuclear model calculations

Modeling the Control of Carriers Receiving Treatment and Exposed Receiving Treatment for the Spread of Amoebiasis (Amoebic Dysentery)

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ABSTRACT

A mathematical model of Amoebiasis (Amoebic Dysentery) is formulated incorporating the effects of carriers receiving treatment and exposed receiving treatment. In this work, the basic reproduction number is computed using the next generation method. The disease free equilibrium (DFE) point of the model is obtained. The local stability of the disease-free equilibrium point of the model is established. The result show that the DFE is locally asymptotically stable if the basic reproduction number is less than one

Keywords: Amoebic Dysentery; Basic reproduction number; Disease-Free equilibrium.

Timeseries Analysis of Incidence of Covid 19 Pandemic in Nigeria

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ABSTRACT

This research was to examine the incident of covid 19 in Nigeria the study was done to access critically the impact of covid 19 in Nigeria and effort towards reducing it, the time series analysis was used as method of solution to analyze thoroughly, the incidence of covid19 in Nigeria and its impact. To implement a predictive model in forecasting the near future number of positive cases expected in the country following the present trend an Auto Regressive Integrated Moving Average (ARIMA) model prediction was performed on the epidemiological data obtained from Nigerian Centre for Disease Control to predict the epidemiological trend of the incidence of COVID-2019. We conclude that the difference H-distribution of people who contacted covid19 in Nigeria and that the rate of occurrence is also the same with male and female also the aggregate of contacting of covid 19 is not the same in all the state in Nigeria the following recommendation where made the specific major such as using a face mask use of sanitizer to wash hand, social distance, majors has to be taken by government to provide vaccine for the teaming population so as to reduce the menace of the disease.

Key words: covid 19, time series, incidences ARIMA

Non-Local Vibration of Double – Walled Carbon Nano-Tube using Finite Element Method

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ABSTRACT

In this study, based on non-local elasticity theory and Euler – Bernoulli Beam theory, vibration equation of double – walled carbon nano-tube is established on simply supported system. The effects of both inner and outer surface layer on the nano-tube are taken into consideration. Finite element method is used to discretize the equation of motion to obtain the natural frequency. Detailed parametric analysis is conducted focusing on small scale, elastic medium, velocity on the stability of the pipe. Result of this research can be applied in design and improvement of fluid conveying application embedded in elastic medium

Keywords: Nano, Carbon, Vibration, Beam, Elastic, Velocity, Tube, Local

Chemometric Analysis of the Physico-Chemical Parameters and Heavy Metal Accumulation in Bosso Dam, Minna

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ABSTRACT

Water quality is extremely important for a number of reasons from the protection of marine organisms and the wellbeing of marine ecosystems to the health of people in the region and the safety of industries such as aquaculture. As a result it is essential that environmental health in water body is monitored. Over the past two decades, considerable attention has been given to heavy metals in both terrestrial and aquatic ecosystems because they can be accumulated by biota and at high concentrations are potentially toxic. Traditional monitoring methods include assessment of biological indices or direct measurements of water quality, which are based on in situ data collection and hence are often spatially or temporally limited. But the complexity of information requires new analysis techniques that allow us to identify the components and possible causes of spatial and temporal variability. Bosso dam is a major source of water for both domestic and agricultural purposes in Minna metropolis. In this study, toxic heavy metals such as Pb, Ni, Mn, Zn, Cd, Cu and Cr were determined in water from Bosso dam during wet season. One hundred water samples were collected and homogenized into ten composite samples. Techniques

of Chemometrics such as Principal Component Analysis (PCA), Hierarchical Component Analysis (HCA) and Correlation Analysis (CA) were used to analyze pollution data sets from heavy metal determination and assessment of the physicochemical parameters such as pH, temperature, turbidity, Si, conductivity, NO_3^- -N, NH_4^+ -N, NO_2^- -N of water. Pb and Cd were below detection limits while Cr, Zinc, Cu, Ni, Mn were detected in the water samples. Application of PCA and CA helped to identify the underlying pollution sources and signature at the monitoring site.

Keywords: Water, Heavy metal, Chemometrics, Pollution, Datasets

Phytochemical and GC-MS profiles of African walnut (*Tetracarpidium conophorum*) extract and solvent fractions

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ABSTRACT

Phytochemical and GC-MS profiles of African walnut (*Tetracarpidium conophorum*) extract and solvent fractions Daniel Ejim Uti, Grace Ufedo Umoru, Samuel Ogar Nfona, Godwin Eneji Egbung and Item Justin Atangwho * *Department of Biochemistry, University of Calabar, P.M.B. 1115, Calabar, Nigeria Correspondence: ijatangwho@unical.edu.ng; dratangwho@gmail.com +234 805 558 2864 African walnuts purchased from a farmstead in Shagamu, were de-shelled, sun-dried and pulverized. Whole nut ethanol extract (WE) and its liquid-liquid fractions - ethylacetate (ET) and residue (RES) were prepared and assessed for phytochemical compositions using standard methods. The qualitative result showed the presence in abundance of water-soluble phytochemical namely alkaloids, tannins, saponins, flavonoids, and glycosides. The quantitative data largely corroborated the qualitative results indicating 16.65 % of flavonoids, 6.07 % of alkaloids and varying compositions of glycosides (1.97 %), tannins (1.43mg/100) and saponins (0.49 %). The GC-MS data for WE revealed 16 compounds with the essential fatty acids making up 67.74 % (linolenic acid ethyl ester 33.63 %, linolenic acid 25.29 %, and linoleic acid 8.82 %) and the major saturated fatty acid, stearic acid, made up 8.34 %. In the ET 18 volatile components were detected, also with unsaturated fatty acids making up 79.99 % of the overall components (ethyl linolenic acid 47.95%, linolenic acid 19.66%, linolenic acid methyl ester 12.38 %) and the main saturated fatty acid, octadecanoic acid being 7.58%. Ten (10) volatile components were found in the RES with unsaturated fatty acids making 91.00 % (linolenic acid 50.93 %, linoleic acid 7.76 %, linolenic acid methyl ester 5.68 % and linolenic acid ethyl esters 26.63%) and the saturated fatty acids making 5.45 % (n-Hexadecanoic acid). These data underpin the reported nutritional and pharmacological importance of the African walnut, as the fatty acids play significant role as metabolic precursors of physiologically active mediators of inflammatory, immunological and blood clotting mechanisms.

Keywords: African walnut, phytochemical, essential fatty acids, gas chromatography-mass spectrometry

Phytochemical analysis and evaluation of *H. verticillata jacq* leaf extract for its anti-hyperglycaemic activity

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ABSTRACT

Uncontrolled hyperglycaemia and oxidative stress are implicated in the development of Diabetes Mellitus. The therapeutic benefits of *Hyptis verticillata* and its traditional use have been reported. This study evaluated phytochemical and anti-hyperglycaemic activity of *H. verticillata* leaf extract. The leaf extract was analysed for phytochemical constituents using GC-MS (30 m x 0.25 mm ID x 0.25 µm film thickness). Fifty-four rats were divided into two main groups consisting of diabetic and non-diabetic rats. The animals were treated with oral doses of metformin (500 mg/kg b.w), quercetin (10 mg/kg b.w), ethanol extract of *H. verticillata* leaf (250 mg/kg b.w and 500 mg/kg b.w) as well as 0.2 ml/10 % DMSO for the control groups and treatment lasted for 28 days. The result obtained for the GC-MS analysis showed the leaf extract to contain 4,7- methano-1H-indene (4.80%), 3a,4,5,6,7,7a-hexahydro-4,7-methanoindene (2.83%), 1-octadecyne (3.54%), (Z) - Methyl cis-6-octadecenoate (3.97%), R-R*,R*-E- trans-phytol (4.68%), 1-fluorodecane (3.01%), spiroandrost-5-ene-17,1'-cyclobutan-2'-one, 3-hydroxy-(3a,17a), (16.11%), 9,12,15-octadecatrien-1-ol (2.87%), eicosane (7.65%), squalene (50.54%). Animal studies presented significantly increased body weight and decreased blood glucose level ($p < 0.05$) in diabetic and normoglycaemic experimental animals while the level of glycated haemoglobin following treatment with *H. verticillata* leaf extract declined significantly. We therefore concluded that *H. verticillata* has anti-hyperglycaemic properties and its therapeutic effect is strongly related to the phytochemical constituents present in the plant.

Keywords: Hyperglycaemia, *Hyptis verticillata*, phytochemicals, metformin

Profiling of Selected Nigerian Local Rice Varieties for their Essential Trace Elements Content

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ABSTRACT

Rice is a staple food crop which are widely grown across continents. This study evaluates the essential trace element content of selected locally grown rice varieties in Nigeria. Eighteen local variety samples originating from 10 rice producing states in Nigeria were obtained from popular markets. Samples were dried, homogenized and later digested using proportionate amount of $\text{HNO}_3/\text{H}_2\text{O}_2$. The concentrations of the four elements (Cu, Zn, Mn, Fe) were determined using Atomic Absorption Spectrophotometer. The method used was validated using a certified reference material. The result showed the following ranges of concentrations: Cu (1.00 ± 0.02 - 5.00 ± 0.14), Fe (10.85 ± 0.50 - 38.40 ± 0.99), and Mn (1.95 ± 0.65 - 32.10 ± 0.24) mg/kg. The prominent Cu, Fe and Mn in the studied local rice suggests their nutritional potentials as food for sourcing essential trace elements. The values of the essential trace elements are quite below the WHO permissible limit indicates consumption safety. The rice from Idanre and Lafiagi have substantial content of Cu. Ofada and Ikirun rice are rich in Fe content. Substantial amount of Mn is found in Abakaliki and Efon-Alaaye rice. The studied local rice could play a beneficial role in management of mineral deficiency diseases.

Keywords: local rice; Nigeria; trace elements; essential; copper; manganese; iron; mineral deficiency

Synthesis and Characterization of Gold-Iodine Nanocomposite and Evaluation of its Kinetic Delivery using Dialysis Bag Method

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ABSTRACT

In this research, gold nanoparticles were synthesized using green method via reduction of gold chloride using *Agerantum conyzoides* leaves extract to study their pharmacokinetic release on selected bacteria. The green synthesized gold nanoparticles were doped with povidone iodine using wet impregnation and ultrasonication method and further characterized using UV-visible spectrophotometer, HRTEM, SAED, EDX. Similarly, the in-vitro controlled release study of the gold-iodine nanocomposite on *staphylococcus aureus*, *E.coli* and *pseudomonas aeruginosa* was carried out using dialysis bag method. The UV-visible spectra of the gold nanoparticle and gold-iodine nanocomposite showed a broad peak at 533 nm and 540 nm respectively. The HRTEM micrograph of the gold nanoparticle revealed spherical shapes with different size distribution while the gold-iodine nanocomposite was well dispersed with average particle grain size of 27.62 nm and different shapes (spherical and triangular). The EDX confirmed the elemental composition of gold for both gold nanoparticle and gold-iodine nanocomposite. The SAED pattern of gold nanoparticle revealed sharp diffraction rings from inner to outer atomic planes with discrete spots indicating the formation of polycrystalline face centered cubic structure, while SAED of gold-iodine nanocomposite is amorphous having dull concentric rings. The gold-iodine nanocomposite has the most sustained and controlled release efficiency (18.92% at 60 min) on *staphylococcus aureus*, *E.coli* (17.07% at 60 min) and *pseudomonas aeruginosa* (13.41% at 60min) compared to povidone iodine with a “burst release” of 78.4% at 20mins on the selected bacteria. The in-vitro release study shows a controlled and target release of the gold-iodine nanocomposite and follow Kosmeryer-peppas and first order model.

Keyword: Green, Synthesis, Gold nanocomposite, *Agerantum conyzoides*, Delivery, Dialysis bag

Measurement of Signal Powers and Path Loss Predictions of Ibrahim Badamasi Babangida University Lapai Click FM (89.9 MHz) within the Main Campus

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ABSTRACT

Several factors affect radio propagation. These factors are determined by its path from point of propagation to the point of reception. Therefore, there arises the need to measure the received signal power at points away from the transmitter base in order to reduce these effects. The measurements of the signal power of 89.9 MHz Ibrahim Badamasi Babangida University Campus Click FM Radio was conducted along four profiles, namely Profile A (along 250 Hall), Profile B (along ICT Centre), Profile C (towards Entrepreneurship Centre) and Profile D (towards the Senate Building). Five measurements were considered with intervals of 50 m away from the base station successively for each profile. An Agilent handheld spectrum analyzer, GPS receiver tape rule and a mobile receiving antenna were used for the measurements. It was observed that the signal strength – Line of Sight distance (LOS) characteristics were very similar in each of the four routes and that the little variation among them was due to environmental factors such as vegetation and buildings. In most cases, the signal power reduces with an increase in distance, and therefore, the path loss prediction was made using the Free Space Path Loss Model, Ericsson Model and Lee’s Model. The highest losses were 237.5 dB, 265.5 and 214.00 dB for Free Space Path Loss Model, Ericsson Model and Lee’s Model respectively while the lowest losses were 225.5 dB, 224.1 dB and 189.8 dB respectively. Ericsson Model was found to be more suitable for the radio station as it put into consideration more parameters than the Free Space Path Loss and Lee’s Model. The contour map was also developed. The studies recommend that the radio frequency of the

station and the transmitting antenna height should be increased.

Keywords: contour map, line of sight, path loss, signal power

Spatial Distribution of Healthcare Facilities and Workforce in Wushishi Local Government Area of Niger State, Nigeria

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ABSTRACT

This study examined the spatial distribution of healthcare facilities and workforce in Wushishi Local Government Area of Niger State. The objectives of the study are to assess the healthcare facilities and workforce available, the spatial pattern of the facilities, distribution of the workforce and the relationship between population and the available healthcare facilities and workforce. Primary data was collected using a handheld GPS to obtain Coordinates (Longitude and latitude) of the individual health care facility; the secondary data were collected from Niger State Ministry of Health and National Population Commission. The two sets of data were merged together to produce map and nearest neighbor analysis results using ArcGIS 10.4.1 software interface. The population from National Population Commission was projected to 2021. Tables were also used to show the ratio of population to the healthcare facilities and workforce. The result of the nearest neighbor analysis shows that the spatial pattern is clustered with Z-score of (2.737318) at (0.006194) level of significance (P value). The distribution of health facilities and workforce were uneven as they are concentrated around 4 wards of Akare, Sabon Gari, Tukurji/Yamigi and Zungeru leaving the remaining 7 wards at disadvantage regarding access to healthcare services. In terms of workforce the study area is lacking Doctors and Nurses/Midwives as there are only 5 Doctors and 18 Nurses/Midwives available to cater for the entire study area. For Health facilities, Beds and Community Health Extension Worker, the study area meet the State, Country and World Health Organization target in terms of population ratio, however they are also unevenly distributed across the L.G.A. The Study therefore recommends that the government should employ more doctors and nurses and also distribute the healthcare facilities and workforce equitably to every member of the society according to need.

Health Implication of Dam in Some Parts of Tafa Local Government Area of Niger State, Nigeria

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ABSTRACT

Although dams have beneficial effects, they are also acknowledged as having serious environmental repercussions if they are not properly managed. The aim of this research was to examine the impact of Kofa dam in Niger State on the health status of a riparian community downstream (Kofa) against a control community (Karfe). The objectives of the study are to assess the health implications of proximity to Kofa dam and to investigate the perception of the community members located near the dam on its health implication. A convenient 3% sample size was adopted resulting to 130 respondents and questionnaires, focus group discussion and personal observation were used to elicit data. The result unveiled that communicable water-related diseases are more common in the catchment area, which were identified as malaria, water related diseases (bilharzias, diarrhea, rashes measles) and cholera among others which are mostly associated with water. Case-control study was then conducted in one community (Karfe) which is about 5km away from the experimental community in order to ascertain the health status of the communities with regards to the function of the dam. Most of the diseases

identified in the control community are conventional diseases in Nigeria such as: Malaria, Ulcer, Diabetes, which invariably signifies that the diseases identified there has no correlation what so ever with the waterborne diseases found in the experimental community. The study therefore shows some degree of association between the presence of the dam and poor health status of the downstream community in close proximity to it. However, it was recommended that Government should assist in providing the community with safe drinking water so as to prevent the community from using the untreated dam water for their domestic use and provide the community with health education, mosquito netting, medical facilities and drugs to promptly diagnose and treat infected persons in the communities particularly Kofa as it is the community located in close proximity to the dam and is mostly affected by waterborne disease.

Keywords: dam, health, waterborne disease, conventional disease, riparian

Assessment of geothermal Potential in Parts of Niger Delta, Nigeria using high Resolution Aeromagnetic Data

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ABSTRACT

The current energy challenges in Nigeria, in recent time had rendered so many small and medium scale enterprises (SMEs) useless as result many Nigerian giant and multinational companies have been sent packing due to this daunting energy challenges. Therefore the need for alternative energy source preferably, a renewable energy source can be of help to this situation. This study is focused on the assessment of geothermal resources within some parts of Niger Delta area of Nigeria where most of the countries multinational industries resides. Some of the villages around the study area where these industries are located are totally inaccessible with current energy supply. The study area covers a total area of 24,200 km². This area is covered by four aeromagnetic data sheets and it is bounded by latitudes 5°00' and 6°00' N and longitudes 5°50' and 7°50' E. The total magnetic grid data produced from four aeromagnetic sheets was reduced to the magnetic equator (RTE). The RTE was divided into 18 overlapping blocks and later subjected to spectral analysis. The Centroid depth and depth to top boundary obtained from the spectral analysis were used to obtain the Curie point depth (CPD). The CPD obtained were used to obtain the geothermal gradient and the heat flow over the area. The results showed that CPDs vary between 20.34 and 57.36 km, the highest CPD can be found at South Eastern part of Warri, Kwale and at the northern part of Ahoada. The shallowest CPD can be found at Burutu, Patani and at the southwestern part of Okigwe. The geothermal gradient and the heat flow vary from 10.11 to 28.51 °C/km and from 25.27 to 71.29mW/m² respectively. The highest heat flow in this area corresponds to Patani area with heat value of 72 mW/m² and slightly high value about 50mW/m² can be obtained at Burutu and at southwestern part of Okigwe. The only viable area for geothermal exploration is around Patani, other parts of the study area are not too viable for geothermal exploration.

Assessing the Environmental Impact of Poor Drainage in Bosso Town, Niger State, Nigeria

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ABSTRACT

The research is to examine the environmental impacts of poor urban drainage system in Bosso town. Poor drainage system have become a problem which lead to soil erosion, flooding and other land

degradation processes of the ground surface, gully erosion and excess surface water to the infrastructure and settlement which also lead to flooding. The research is also to locate the erosion prone areas and examine the drainage pattern within the study area, to identify and analyze the major environmental impacts of poor drainage in the study area. The data for the analyses was collected through terrain analysis on the study area with the aid of digital elevation model (DEM) from shuttle radar topographic mission (SRTM) and the drainage network of the study area was extracted through the interpolation of flow accumulation and flow direction from the SRTM data (DEM) using ArcGIS 10.3 software, the digital elevation model was further classified using image classification scheme feature in Idrisi software and an overlay of the DEM and google earth image of the study area to generate the risk map of the study area and Questionnaire was used which frequency-percentage technique was adopted as one of the techniques for the analysis. The analysis of frequency percentage is one of the first techniques used in the analysis of research data that were collected through the use of questionnaire. The frequency-percentage technique is relatively easy to analyze, present and interpret. Frequency percentage = number of observed total number $\times 100$. there are a lot of poor drainage system in the study area which have result to very high erosion risk zone attributed to low slope and high surface soil moisture while the very low risk zones can be attributed to factor such as high slope and low run-off respectively which the drainage should be linked to solve the problem of erosion and other land degradation processes.

Keywords: drainage, flooding, land degradation, impact, digital elevation model (DEM), shuttle radar topographic mission (SRTM)

Spatial Distribution of Hotels in Minna: A Gis Cloud Mapping Technology Model

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ABSTRACT

Hotels are important to every society. This is because they create lodging facilities for businesses people and tourists. Hotels commonly provide a number of different services within the same or different building which are often available for the use of both residents and non-residents of the hotel. This study evaluates spatial distribution of hotels in Minna metropolis using Geographic information techniques and creating a mobile application of the hotels using GIS cloud. Coordinates and information about each hotel used in this study was collected. The points were analyzed in ArcGIS 10.2 environment to depict each hotel's geographical location on the map. A total of 46 hotels were surveyed. 6 Guest inns, 5 lodges, 1 motel, 2 Suites and 32 Hotels were surveyed. A cursory look at the map of the metropolis shows that hotels are found almost throughout the metropolis. It can also be seen that most of these hotels are situated along major roads for easy access. The hotels data were imported into the GIS cloud engine in csv. Format. A database was created on the GIS cloud engine anchoring the data using javascript. GIS cloud Mobile Data Collection was obtained from iOperating System Appstore to anchor the data on mobile phone. It is recommended that hoteliers who already have hotels should endeavor to upgrade their services so that they can compete with other international brands.

Keywords: Hotels; Geographic Information Systems; GIS Cloud; Mobile Data Collection.

Economic Impact of Coronavirus Pandemic: Seasonal ARIMA Models for Forecasting Monthly Air Traffic Passengers in Nigeria

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ABSTRACT

As the reality of the coronavirus pandemic has come hard on Nigeria, like the rest of the world has begun canceling events, flights, and other socio-economic activities such as social, educational classes and religious activities. The study aims at time series modeling and forecasting for air traffic passengers in Nigeria using the data 'collected from the radio station of the Arik Air at the Nnamdi Azikiwe International Airport (NAIA), Abuja from 2006 to 2018. Seasonal Autoregressive Moving Average (SARIMA) models was proposed for the monthly passenger flows in Nigeria in order to understand to the patterns of air traffic flows and general eco-tourism potentials of the country. The study fitted twelve SARIMA models and 2 neural network models. All models performances were evaluated using measures of prediction accuracy. It was established that the best model for the data at hand was SARIMA model of order three SARIMA (1, 1, 3) × (1, 1, 3)₁₂. The model performance was evaluated using Akaike Information Criteria (AIC), mean average percentage error (MAPE), mean absolute deviation (MAD) and mean standard deviation (MSD) we conclude SARIMA (1, 1, 3) × (1, 1, 3)₁₂ is the best model over than ARIMA model for the data under study. The best model was used to forecast for 24 months ahead.

Mathematical Modeling of Blood Flow in the Stenosed Artery

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ABSTRACT

In this paper, an analytical study of effects of blood flow and heat transfer in the blood vessels have been investigated. The viscosity of the blood is assumed to be varying radially with hematocrit throughout the region of the artery. The blood flow is assumed to be Newtonian fluid, incompressible, laminar, and steady. The coupled linear partial differential equations are solved by parameter expanding method and eigenfunction expansion technique. The graphical summaries of the system responses are also provided.

Keywords: Blood flow, Viscosity, Heat transfer, Artery, Variable viscosity, Eigenfunction.

Effects of Ethyl Methane Sulphonate on Vegetative Traits of Selected Genotypes of Groundnut (*Arachis hypogaea* L.)

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ABSTRACT

Groundnut (*Arachis hypogaea* L.) is a multi-purpose legume crop widely cultivated in Sub-Saharan Africa (SSA). However, several species of groundnut suffer substantial yield losses as a result of narrow genetic base and insect-pest attack. The present study aimed to investigate the effect of EMS on morphological traits of four (4) groundnut (*Arachis hypogaea* L.) genotypes viz Samnut 24, Samnut 25, Samnut 26 and ICG4412. Field experiment was laid out in Complete Randomized Design (CRD) with three (3) replicates. The seeds of the four (4) groundnut accessions were treated with various concentration of EMS (0.0 %, 0.1 %, 0.2 %, 0.3 % and 0.4 %) for 6 hours, they were then removed and rinsed with distilled water to remove the trace of mutagen sticking to the seed coat. Data on vegetative parameters were collected following standard procedures. Results obtained showed that 0.1 % EMS

concentration had the highest plant height (46.79 cm) at week 12 but was not significantly different from 0.3 % and 0.4 % concentrations (43.37 and 43.28 cm) respectively. The significantly least plant height at week 12 after planting was recorded at 0.2 % concentration (35.28 cm). No significant difference was observed among the varieties in terms of plant height. EMS concentration 0.1 % showed the significant highest number of leaves per plant at week 12 (297) while the least was recorded at 0.4 % concentration (177). Among the varieties, ICG 4412 had the significant highest number of leaves (289.20) at week 12 after planting and the least value was obtained in variety SAMNUT 26 (158.93). EMS concentration 0.1 % had the significant highest number of branches at maturity (13.25) while the least was recorded at 0.4 % EMS concentration (8.92). In terms of varietal performance, Samnut 26 had the significantly highest number of branches per plants (12.47), but was not significantly different from ICG 4412 (12.07). SAMNUT 25 was observed to have the significantly least number of branches per plant (9.13). The results obtained showed significant amount of variability in morphological parameters of the genotypes as a result of exposure to EMS which may essentially affect their productivity. This study revealed that EMS concentration 0.1 % is the optimum concentration for inducing genetic variability in groundnut plant.

Keywords: Accessions, ethyl methyl sulfonate (EMS), genotypes, groundnut and mutagens.

Analysis of T_1 and T_2 Relaxation Times from Bloch Equation for the Estimation of Age of Human Organs

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ABSTRACT

As one of the preferred diagnostic imaging tools, Magnetic Resonance Imaging (MRI) has become a diagnostic modality which has made an in-road into age estimation. However, many works in this area were carried out using observed statistical data to classify and analyze findings. In this research work, a time-independent non-homogenous linear differential equation from the Bloch Nuclear Magnetic Resonance (NMR) equations is evolved. The equation is solved under the influence of radio frequency magnetic field [$\text{rf}B_1(x, t) \neq 0$] and in the absence of radio frequency magnetic field [$\text{rf}B_1(x, t) = 0$]. T_1 and T_2 relaxation times were varied with a view to analyze the signals as it relates to the age of any human organ.

Keywords: T_1 relaxation time, T_2 relaxation time, radio frequency field, Magnetic resonance fingerprinting, magnetization.

Box-Behnken Design Optimization of Process Variables for the Sol-Gel Synthesis of Zinc Tungstate Nanoparticles

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ABSTRACT

Highly crystalline Zinc Tungstate Nanoparticles (ZnWO₄) were successfully synthesized by a simple sol-gel technique using water and ethanol (1:1) as solvents. Effects of synthesis parameters such as reaction temperature, pH and stirring speed on the synthesized ZnWO₄ nanoparticles were investigated experimentally based on Box-Behnken Design. The synthesized ZnWO₄ at the optimum conditions was subjected to calcination at temperatures between 100°C – 900°C. The produced nanoparticles were analyzed by X-Ray diffraction (XRD), High Resolution Scanning Electron Microscopy (HRSEM) and Electron Dispersive X-ray spectroscopy (EDX). HRSEM analysis confirmed the formation of aggregated spherical shape irrespective of the synthesis conditions while EDX analysis showed Zn, W and O as the dominant elements under the applied conditions. XRD analysis demonstrated formation of highly crystalline, monoclinic phase of ZnWO₄ with a crystallite size of 14.51 nm at the optimum conditions of solution pH (7.5), reaction temperature (30°C) and stirring speed (2000 rpm). Characterization results further showed formation of well distinct spherical shapes at temperature between (100°C-800°C) and wire-like morphology was formed at 900°C. Variation of the calcination temperature resulted to the formation of monoclinic, triclinic and zincite phases of ZnWO₄ and ZnO respectively. The study showed that morphology, phase types and crystallite sizes of ZnWO₄ depends on the applied process variables.

Analysis of Drought and Flood Occurrence Using Markov Chain

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ABSTRACT

Flood and drought are among the most common natural disasters affecting the world. In this paper, Markov model has been used to analyse and predict flood and drought occurrences in Birnin Kebbi Nigeria. The Standardized Precipitation index (SPI) was used to classify the annual rainfall of Birnin Kebbi into three states (flood, normal and drought). After some successful iterations of the model, the model stabilized to equilibrium probabilities, revealing that in the long-run 20% of the years in Birnin Kebbi will experience flood, 60% will experience normal rainfall and 20% will experience drought. It was also observed that, a drought year cannot be followed by a flood year and the probability of a drought year to be followed by a normal year is high while the probability of a normal year to be followed by a drought year and a drought year to be followed by another drought year is extremely small. Results from this research is an important information to the government and people of Kebbi state for better understanding of rainfall dynamics in their locality.

Keyword: Markov model, Annual Rainfall, Standardized Precipitation Index, Transition Probability, Equilibrium Probabilities.

Effects of Ethyl Methane Sulphonate (EMS) on Morphological Evaluation of Cowpea (Vigna Unguiculata)

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ABSTRACT

Cowpea [*Vigna unguiculata* (L.) Walp.] is a widely cultivated legume in the semiarid tropics of Africa and the United States. Low yield of cowpea is often associated with insect pest attacks. This study aims at evaluating effect of Ethyl methane sulphonate (EMS) on the morphological traits of selected cowpea. The seeds were planted at the experimental garden, Department of Plant Biology, Federal University of Technology, Minna using a Complete Randomized Design (CRD) with 3 replicates. Four cowpea genotypes (Early white, Local variety, IT90K-76 and IT97-556-4) were treated with different

concentrations of EMS (0.00%, 0.10%, 0.20%, 0.30% and 0.40%) for 6 hours, after which the seeds were thoroughly rinsed with distilled water. The morphological parameters measured were Plant height, length of leaf, width of leaf and number of leaves. The accessions showed significant difference ($P < 0.05$) in most of the parameters studied indicating difference in their genotypic composition, probably due to EMS application. Concentration 0.00% of accession IT97K-556-4 recorded the highest length in terms of plant height (70.73cm), accession IT97-556-4 also recorded the highest number of length of leaf and number of leaves at concentration 0.20% (21.97cm and 98.67cm) respectively. Accession IT97-556-4 had the highest width of leaf at concentration 0.10% (14.83cm) which shows no significant difference. The accessions varied considerably in terms of morphological parameters. It is therefore recommended that further studies should be carried out to ascertain the effect of EMS on other important traits such as yield and nutritional composition.

Keywords: Accession, Cowpea, Ethyl methane sulphonate (EMS) and Genotypes.

High Performance Liquid Chromatography-Diode Array Detection (HPLC-DAD) Profiling and *in vivo* antimalarial activity of phenolic compounds of *Combretum glutinosum* Perr. Ex. stem bark

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ABSTRACT

Combretum glutinosum is used by traditional healers for the management of malaria. This study investigates the phenolic contents of the acetone stem bark extract as well as its antimalarial potential. The acetone stem bark extract of the plant was subjected to phytochemical screening using standard procedures. Total Phenol (TPC) and total Flavonoid content (TFC) was carried out using Folin-ciocalteus and $AlCl_3$ colorimetric method respectively. Diode array detector was used for high-performance liquid chromatography analysis (HPLC-DAD). Acute toxicity and antimalarial potential of the crude acetone extract were also evaluated. The phytochemical screening detects the presence of some selected phenolic compounds (Phenols, flavonoids, coumarins, quinones, tannins and phlobatannins). The total phenol content expressed as gallic acid equivalent (GAE) was 22.95 ± 0.17 mg/g and total flavonoid content of the sample expressed as quercetin equivalent was 230.81 ± 0.89 mg/g. The HPLC analysis revealed the presence of Phenolic acids (gallic acid, chlorogenic acid, caffeic acid), flavonoid glycoside (rutin) and flavonol (catechin) where gallic acid > rutin > chlorogenic acid, caffeic acid and catechin. The crude acetone stem bark extract revealed no sign of toxicity or mortality in mice up to 2000 mg/kg body weight (bw). *In-vivo* antimalarial activity of the plant extract against *P. berghei* using Peter 4-day suppressive test revealed that at 600 mg/kg body weight (bw), the plant extract suppressed the level of parasitemia, prolonged the mean survival time significantly ($p < 0.05$) and protected infected mice against reduction in packed cell volume, rectal temperature and body weights; all in comparison with Artemether at 6 mg/kg/day. This connotes that *Combretum glutinosum* is a potential source of phenolic compounds working either singly or in combination with other compounds which may serve as lead molecules in the development of new and effective antimalarial drugs.

Keywords: Antimalarial activity, *Combretum glutinosum*, high-performance liquid chromatography, total phenolic content and total flavonoid content.

Application of Geological and Geophysical Data to Characterise E8000 Reservoir in Afenmai Field of Niger Delta Basin, Nigeria

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ABSTRACT

Afenmai Field is a partially assessed discovery within the Central Depobelt of eastern Niger Delta Basin in Nigeria. It occupies 242 km² surface area and presently has eight wells, giving it an average well density of one well per 31 km². Improved assessment of the discovery is required to upgrade the field to development drilling status. As a contribution to improving the assessment, this study characterised the E8000 sand, which bears hydrocarbon in Well 007. The data utilised comprised information on subsea vertical depth to top and base of sand and shale units, foraminifera content, geophysical logs, checkshot data, fluid contact depths, and 3D seismic volume. Sequence stratigraphic concept was employed to analyse the sand and shale units, foraminifera content, and geophysical logs. The E8000 sand was mapped through the 3D seismic volume, and time- and depth- structure maps were produced. The maps reveal a major structure building synthetic fault in the middle of the field. The fault runs approximately east –west in the eastern part of the field and northwest- southeast in the western part. The sand is a lowstand systems tract with a roll-over anticlinal structure that forms a three-way closure with a crestal synthetic fault. The reservoir pay occupies about 4.5 km² areal extent, with opportunities for drilling four development wells along the east-west axis of the closure. Opportunities exist for drilling a minimum of three development wells southwards of Well 007. Approximately 4000 – 5000 root mean square amplitude value characterise hydrocarbon in the reservoir. A prospect is generated within the eastern part of the of the major structure building fault's upthrown block.

Keywords: Partially assessed discovery, roll-over anticlinal structure, development wells

Empirical Electric Field Strength Models for Digital Terrestrial Television Signals in Minna, Niger State, Nigeria

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ABSTRACT

Propagation models play vital roles in planning network coverage, the interference estimations and analyzing radio communication networks. This work adapted some existing empirical field strength models that are best suitable for Minna, Niger State, Nigeria, using the Ultra High Frequency (UHF) signal of StarTimes Terrestrial Television, Minna. The models used are: free space, Hata, ITU-R P. 529-3 and ERC Report 68 models. The television station transmits at a frequency of 642 MHz. The signal levels of the transmitted signal were measured radially along four radial routes using Digital Signal Level Meter, GE-5499 and the corresponding distances were also measured using Global Positioning System (GPS). Data processing and computation were carried out using Microsoft Excel spread sheet. The results show that the free space model gives a better prediction for signal field strength in Minna after the general modification with the correction factor of -27.88 and Root Mean Square Error of 7.21 dB μ V/m.

Keywords: Coverage area, empirical propagation model, field strength, signal level, UHF

Hydrogeophysical Prospecting in Shallow Basement Aquifer using Electrical Resistivity Profiling and Vertical Electrical Sounding: A Case Study at Himma International, Minna, Nigeria

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ABSTRACT

The general four-electrode arrangement of electrical resistivity investigation consisting of a pair of current electrodes and a pair of potential electrodes using the Schlumberger configuration was used to investigate the groundwater potential of Himma International School. Geologically the study area is composed of the Precambrian crystalline basement complex consist mainly of metamorphic and igneous rock of various types. A total of 5 profile lines were established with each profile line consisting of 5 to 7 sounding stations. Two VES points indicating relatively low resistivity values on the profiles were further sounded to obtain detail subsurface information. The profile signature depth was set at 20 m with a targeted approximate resistance value of 0.5 Ω . The VES Maximum current electrode half-spacing (AB/2) was terminated at 50 m. The north-western and part of the south-western portions of the studied area which includes VES V7P2, V6P4 and V5P4 indicate good priority potentials for VES investigation and groundwater exploitation at shallow depths. The resistance and apparent resistivity of these points on the profiles ranges from 0.12 Ω to 0.17 Ω and 30.0 Ω m to 41.9 Ω m respectively. Points V7P2 on profile line 2 and V6P4 on profile line 4 indicates the lowest resistivity to be considered for further VES investigation. The lower resistivity readings obtained in the profiles regarding the study area may be as a result of the present of fractured and saturated basement underlying these portions. Moderate priority locations which may also be considered for VES investigation include V1P1, V1P7, V2P2, V3P2, V6P3, V5P3 and V1P4. Profile line P3 with points V2P3, V3P2 and V4P3 are not recommended for further VES investigation because they indicates high resistive areas which may be related to the freshness of the basement rocks and absent of fractures in the near subsurface of the profiled portions. From the VES and HERP Profiles and the model resistivity curves it is observed that the area of water saturated horizon falls within the depth range of 30 m to 50 m indicates that mechanised shallow depth borehole of 50 m will be more successful than shallow hand dug-wells.

Keywords: Shallow Aquifer, Vertical Electrical Sounding, Profiling, Himma International.

Quality Characterisation of Plastic Sachet Water Products in Minna, North-Central, Nigeria

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Abstract

Physico-chemical and bacteriological quality of randomly selected brands of popular sachet water sold within Minna metropolis were successfully determined in the laboratory. The results of the analysis were compared to that of the Nigerian Standard for Drinking Water Quality (NSDWQ) (NIS 554:2015) and the. The analysed constituents were grouped into physical/organoleptic parameters, major constituents (1.0 to 1000 mg/L), secondary constituents (0.01 to 10.0 mg/L) and bacteriological constituents. All the sachet water samples indicated physical parameter values lower than the NSDWQ except samples 11 which has a low pH of 6.20. The secondary constituent values except nitrite were in conformity with the NSDWQ permissible values for drinking water. Bacteriological quality analysis indicated that sachet water brands sold in various part of the Minna Metropolis are not free from microbiological contaminants. Although E. Coli was absent in all the analysed water samples. Total coliform with coliform count of 8.0, 25.0 and 33.0 were present in sample 6, 7 and 8. This suggest the non-potability of some brands of sachet water sold within Minna metropolis.

Keywords: Sachet water; Nigerian Standard for Drinking Water Quality; Minna metropolis.

A Grey-Markov Model for the Prediction of Vehicular Accident's Human Casualties along Lokoja-Abuja-Kaduna Express Way, Nigeria

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ABSTRACT

Providing government of Nigeria with reliable and dependable information for road safety policy formulation to reduce loss of lives and properties along Lokoja-Abuja-Kaduna Express way is the thrust of this research. The World Health Organization (WHO) reported that road traffic accident claims roughly 1.3 million lives annually which make it one of the top causes of death worldwide. A Grey-Markov model that predicts yearly number of human casualties recorded in Vehicular accidents has been developed and implemented on Lokoja-Abuja-Kaduna express way in Nigeria. The data used in the research were collected from the archive of federal Road Safety Corps of Nigeria for a period of ten years (2010-2019). The fitted model recorded excellent performance of accuracy; this shows the model is reliable and dependable. Therefore, results from this model could serve as source of information for road safety policy formulation.

Keywords: Road, Crashes, Casualty, Accident, Lokoja-Abuja-Kaduna, Express Way, Nigeria, Markov Chain and Grey-Markov

Geoelectrical Investigation for Groundwater Potential at Government Secondary School, Kwakuti Niger State, Nigeria

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ABSTRACT

Vertical Electrical Sounding (VES), using Schlumberger array was carried out to investigate the subsurface layer parameters used to delineate groundwater potential of a 500 x 500 m area of land defined by latitude 9.416622 N to 9.421171 N and longitude 6.618314 E to 6.622833 E located at Government Secondary School, Kwakuti, Niger State. A total of 36 VES points at 100 m interval were sounded with a 100 m maximum half inter current electrode spacing (AB/2). Result revealed that the study area is underlain by three (3) geoelectric layers which include: the top soil with 104.5 to 2260.5 Ωm , 0.6 to 3.8 m and 0.6 to 3.8 m as its range of resistivity, depth and thicknesses respectively; the weathered/fractured layer having resistivity of 44.9 to 606.0 Ωm , depth of 4.3 to 28.6 m and thickness of 4.2 to 26.2 m was considered aquifer layer. The fresh basement has 919.4 to 3816.9 Ωm as its range of resistivity value with undefined depth and thickness. The observed curve types were 100% H. Five (5) VES stations C3, C4, D2, D5, and E4 were delineated as aquifer potentials of the study area, their resistivity, depth and thickness range from 135.2 to 227.7 Ωm , 20.6 to 28.6 m and 17.8 to 26.2 m respectively.

Determination of Uranium, Thorium and potassium Concentration in Building Materials in Minna, Niger State.

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ABSTRACT

The present research was conducted to measure the concentration of the natural radionuclides in building materials imposes radiological hazard to human population. Both alpha and gamma radiation are produced from decay chain of uranium and thorium while the potassium itself is a source of gamma radiation. The results showed that the mean activity concentration of uranium value $30.649 \pm 4.6 \text{ Bqkg}^{-1}$ is higher in concrete compare to thorium and potassium values $23.285 \pm 3.492 \text{ Bqkg}^{-1}$ and $10.691 \pm 1.603 \text{ Bqkg}^{-1}$ respectively in bricks and mud blocks. The values of activity concentration for each sample are $30.649 \pm 4.6 \text{ Bqkg}^{-1}$, $36.717 \pm 5.508 \text{ Bqkg}^{-1}$ and $420.98 \pm 63.147 \text{ Bqkg}^{-1}$ for ^{238}U , ^{232}Th , and ^{40}K respectively in concrete blocks, the mean activity concentration values $23.285 \pm 3.492 \text{ Bqkg}^{-1}$, $100.639 \pm 15.095 \text{ Bqkg}^{-1}$ and $707.869 \pm 106.180 \text{ Bqkg}^{-1}$ obtained in brick blocks and values $10.691 \pm 1.603 \text{ Bqkg}^{-1}$, $91.590 \pm 13.738 \text{ Bqkg}^{-1}$ and $759.189 \pm 113.878 \text{ Bqkg}^{-1}$ obtained in mud blocks. The concentrations of the major oxides (Al_2O_3 , SiO_2 , K_2O , CaO , Fe_2O_3 etc) in the samples were determined using Energy Dispersive X-ray Fluorescence technology (EDXRF). High potassium and iron content in the samples might be attributed to the active fault of mountain valley in Minna.

Effect of Hyptis Suaveolens Methanol Leaf Extract on Trypanosoma brucei brucei Infected Mice

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ABSTRACT

The search for new antitrypanosomal drug lead owing to the setback associated with commonly used conventional drugs is highly recommended. In the present study, trypanostatic activity of the methanol leaf extract of *H. suaveolens* was investigated in mice infected with *Trypanosoma brucei brucei* (T.b.b or T. brucei). A total of Twenty (20) mice were selected into 5 groups (A-E) of 4 mice each. Groups A to D were intra-peritoneally inoculated with 0.2 ml of blood containing approximately 106 cells/ml parasite. Group A, B and C mice were treated with 300 and 400mg/kgbw leaf extract of *H. suaveolens* and 3.5mg/kgbw of diminazene aceturate (Berenil®) respectively for 9 days, while group D and E served as negative control and positive control respectively. The level of parasitaemia was monitored on a daily basis. Also, effect of the extract on haematological parameters was investigated. The result revealed a dose dependent decrease in parasite in mice treated with leaf extract of *H. suaveolens* compared with untreated mice. The infected untreated mice also shows significant decrease in PCV, HB and RBC and increase the WBC when compared with the control mice. However, administration of methanol leaf extract of *H. suaveolens* at dose of 300 and 400mg/kgbw increase the level of PCV, HB and RBC and decrease the WBC in a dose dependent fashion when compared with infected untreated mice. It is concluded that *H. suaveolens* inhibited T.brucei parasite and ameliorated the parasites induced anemia in mice. Therefore, could be useful for management of Africa trypanosomiasis

Keywords: Hyptis Suaveolens, Trypanosoma brucei brucei, Methanol, Africa trypanosomiasis

A review on CZTS ($\text{Cu}_2\text{ZnSnS}_4$) synthesis methods and characterisation

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ABSTRACT

$\text{Cu}_2\text{ZnSnS}_4$ (CZTS) is a p-type semiconductor with high absorption coefficient and a low cost promising absorber material, having a direct band gap from 1 to 1.5 eV, which is ideal for making absorber layer

for solar cell. In this paper, we present a brief review on different synthesis methods and characterisation of CZTS material. It is therefore, essential for engineering of CZTS material and the optimisation of the fabrication method for the improvement of solar cell.

Keywords: Cu₂ZnSnS₄, Optimisation, Fabrication.

Estimation of Depth to Structures Associated with Gold Mineralisation Potential over Southern Part of Kebbi State using Aeromagnetic Data

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ABSTRACT

In this study, magnetic signatures together with the geological settings of the area were employed in estimating the depth to structures that may host gold mineral over southern part of Kebbi State and its environs. Acquired aeromagnetic grids data covering the study area was processed, analyzed and interpreted using the following techniques; IGRF computation, Reduction to Equator (RTE), First Vertical Derivatives (FVD) and Euler Deconvolution. Results from these techniques have revealed the alteration zones and depth to the structures that could be host to gold mineralisation. These regions were corresponded to the following areas; Fakai, SE parts of Yauri and Shanga, Ngaski, Zuru, Magama, Rijau, Eastern part of Wasagu/Danko and Bukkuyum. FVD technique revealed the spatial and structural resolution in imagery thereby showing major structures which normally play an important role in determining the gold mineral. The structures found within the aforementioned areas are the architecture of a mineralized body as compared with the geology of the area, which falls under the following earth materials; quartz-mica schist, granite, biotite, gneiss, diorite, medium coarse grained and biotite homblende granite. Estimated depth to magnetic sources (anomalies)/ or structures that could be host to gold mineralisation was found to be from 81.616 m to 181.171 m using algorithms Euler Deconvolution.

Keyword: Depth to Structures, Gold Mineralization, Yauri-Zuru Schist Belt, FVD and Euler Deconvolution.

Molecular Docking Studies of CSRC Cancer Target with Dasatinib and Curcumin as Novel Inhibitor

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ABSTRACT

Breast cancer is one of the most common type of malignancies in women worldwide and it's a nonreceptor tyrosine kinase. Cellular Src (cSrc) is always upregulated. However current chemotherapeutics are beset with problems of undesirable side effects, poor bioavailability and lack of selectivity. In view of these limitation, there is need to search for new therapeutic of cSrc inhibitor. In this study, computer aided drug designing approach was applied to predict the suitability of docking curcumin in cSrc protein site and their interaction evaluated using auto dock vina software and lig-plot. In order to achieve the aim MSA was carried out on chain A and B of the cSrc protein sequence on NCBI database. To perform docking studies two-dimensional chemical structure of curcumin in SDF

format was retrieved from PUBCHEM-NCBI database and was converted into PDB format by pymol for further analysis. The 3D crystallized chemical structure of cSrc (4ybi) with dasatinib were processed similarly as control. Automated docking software auto dock vina 4.2, chimera was used to evaluate binding affinity of ligand to the homology model of cSrc. The interaction of docked poses was evaluated using lig-plot. The MSA result indicate that chain A and chain B are homologous with E-value of zero and percent identity of 100%. Also, the binding energy of curcumin with cSrc is -9.2kcal/mol compared to dasatinib of -11.9kcal/mol. The in-silico study of curcumin in cSrc pocket region provides an alternate good inhibitor for cancer regulation.

Keywords: Breast Cancer, cSrc, Dasatinib, Curcumin, Molecular Docking, Binding Energy, E-value.

Application of Queuing Theory Model in Evaluating the Efficiency of Service in Students' Academic Affairs, Niger State Polytechnic Zungeru.

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ABSTRACT

This study investigated the application of queuing theory model in evaluating the efficiency of service in students' academic affairs, Niger State Polytechnic Zungeru. The data used were primarily collected through the mean of direct observation at the office of students' academic affair, Niger State polytechnic Zungeru from 9.00am to 2.00pm for a period of 10 days. The data collected were subjected to a single queuing model. The result of the study demonstrated that the arrival rate when the service point is 1 was 0.344 and the average time a student stays in the student's affair was 27.97 minutes. The study revealed furthered that the probability of the system is busy was 0.7367 (73.67%,) the probability that there was no students in the system was 0.26 (26%), and average of number of students in the system is 2.8 while the average time spent in the system is 0.14. the study therefore recommended that school management students' should provide more server or staffs in support of the existing one to the office of academic affairs, Niger State polytechnic Zungeru so as to improve the service render to the students.

Keywords: Academic Affairs, Analysis, Applications, Efficiency of Service, Queuing Model.

Hydrochemical and Bacteriological Evaluation of Surface and Groundwater Sources in Mpape Area of Abuja, North Central Nigeria

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ABSTRACT

Access to potable water is a major concern confronting most developing nations particularly with the overwhelming health burden posed by polluted water and its sources. A total of fifteen water samples were collected and analysed for their chemical and bacteriological parameters to evaluate quality status of surface water and groundwater sources in Mpape Area of Federal Capital Territory, North Central Nigeria. The results of the physical parameters measured on site were within the recommended limits while other parameters were analysed using equipment in accordance with American Public Health Association Standard in a standard laboratory. The result of the laboratory analyses of the water samples showed that the mean concentration of some of the physico-chemical parameters such as sodium, calcium, magnesium, potassium, sulphate, chloride, nitrates, fluoride and phosphate were within the

permissible limit recommended by both World Health Organization (WHO) and Nigerian Standard for Drinking Water Quality (NSDWQ). However, the mean concentration of iron, manganese, turbidity, total suspended solids, lead, cadmium, nickel and chromium were found to be higher than their respective recommended limits. Water Quality Index (WQI) based assessment revealed that over 85% of the samples were contaminated by E.coli and total coliform with the highest values recorded in surface water and this inferred anthropogenic contamination in almost all the water samples and these bacteria could cause water borne diseases.

Keywords: Hydrochemical, Bacteriological, Evaluation, Contamination, Water quality index

The Effects of Lead-Zinc Mining on Water Resources around Enyigba, South-Eastern Nigeria, Part of Abakiliki Sheet 303 Ne

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ABSTRACT

The present work was aimed at analyzing and establishing the physicochemical composition of water and evaluation of results to establish effects of mining of PbZn in water in Enyigba, South-Eastern Nigeria. The heavy metals in the environment greatly degrades soil and water quality, agricultural produce and eventually the health of organisms. Heavy metals such as Lead-zinc cannot be degraded but are deposited, assimilated or incorporated in water, sediments and aquatic bodies causing heavy metal pollution in water bodies. The study of the geology of the area was carried out using existing literature and traverse methods. A total of forty four samples were collected and analyzed using absorption spectroscopy and ultra violet / visible spectroscopy. The parameters used to assess the contamination level of Lead-Zinc in water are PH (ranging from 1.25-9.73), TDS (highest value 91.66 Mg/L) Temperature (highest temp. of 29oC. The area is underlain by Abakiliki formation of the Lower Benue trough. Based on the lithological characteristics observed in the field, the shale unit may be divided into two lithofacies: dark grey shale lithofacies and light grey highly fissile shale. Hydrochemical results show that the water resources in the study area has Pb > 1.5mg/l, Zn > 10.00mg/l, Ni > 0.15mg/l. Highest values were recorded from water samples around the mining sites and this is due to mineralization in the area. These values observed are above the WHO recommended standard for drinking water. The potential health risk associated with accumulation of toxic heavy metals in the body includes, cancer, cardiovascular diseases, arsenicosis, parkinson's disease, alzheimers amongst others. Generally, the study reveals that the water sources in the study area is unsuitable for consumption. Therefore, provision of alternative water supply and sensitization on the potential health risk is highly advocated in this community. The assessment and early curbing of the contamination level of lead-zinc in Enyigba community will greatly aid in the avoidance of another Zamfara disaster.

Keywords: Hydrogeochemistry, Lead-Zinc Mining, Enyigba, Abakiliki, Surface and Ground water quality

Impact of Waste Disposal Site on Groundwater Quality at Rafin-Tofa Solid Waste Dumpsite, Kampala, Niger State, Nigeria

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ABSTRACT

A massive solid waste dumpsite at the outskirts of Minna metropolis was investigated using 2D electrical resistivity imaging (ERI), with the aims of determining the impact of the dumpsite on groundwater quality. By visual observation of solid waste dumpsite, it is found that it consists of various constituents

such as paper, organic matter, metals, glass, ceramics, plastics, textiles, dirt, and wood among others. Resistivity data were collected from parallel survey profile lines using a Wenner-Alpha array configuration. Inversion of the data was carried out using 2D regularized least-squares optimization methods with robust (L1-norm) model constraints. Potential zone of leachate infiltration into the subsurface from the dumpsite was identified from the electrical imaging. A synthetic resistivity inverse model was used to discuss and validate the field results. The 2D ERI sections of the model resolve clearly the subsurface lithological variations. Interpretation of the field data showed that 2D ERI technique was effective in delineating groundwater contaminated zones. The vertical and horizontal sensitivity of the 2D Wenner-Alpha array for sub- surface resistivity variations made it possible to determine the position and extent of leachate infiltration into groundwater. The current work demonstrates the usefulness of the ERI technique as a complementary tool for environmental site investigation.

Keywords: 2D, waste, dumpsite, resistivity, leachate, infiltration, Wenner-Alpha, groundwater

Subsurface Soil Characterization using Electrical Resistivity Tomography for Pre-Foundation Studies at Three Arm Zone, Minna, North-Central Nigeria

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ABSTRACT

The 2D electrical resistivity measurements involving the Alpha Wenner array configuration were carried out along four traverses at the three Arms Zone, Minna, North-Central Nigeria to determine the competence of the subsoil as basis for foundation support for any civil engineering structures. The survey employed the use of ABEM SAS4000 Terameter with 31 electrodes spacing at 10 m minimum and 90 m maximum. The 2D resistivity data were inverted using RES2DINV software to provide both lateral and vertical variation of the subsurface resistivity in the study area. The pseudosection result revealed three different lithology based on their resistivity values which are top soil, weathered basement rock and fresh basement. the top soils composed of clay, dry sandy clay/clayey and peat/clay material with resistivity value ranging from 10.8 Ωm – 29.9 Ωm and 49.7 Ωm – 82.7 Ωm which covered an average depth of 2.5 m – 24. 9 m. The resistivity value ranging from 80 Ωm – 350 Ωm which is observed across profile 1 to profile 3 is an indicative of weathered basement rocks while the area associated with high resistivity value ranges from 1297 Ωm – 1769 Ωm which is found in both profile 1 and profile 2 suggest to be fresh basement. At the distance of 120 m to 135 m and 180 m to 220 m in profile, there is an occurrence of moderately weathered basement rock which shows resistivity range of 9.78 Ωm to 42.2 Ωm . the subsurface of this profile has good signal strength and moderate features that compromise between the ability to resolve horizontal and vertical resistivity variations which implies its effectiveness to support engineering foundations and designs. Generally, the area associated with high resistivity mostly the fresh basement rock is considered as the best suitable materials for the foundation while the conductive zone of low resistivity which consists of clay, dry sandy clay/clayey and peat/clay material is inimical to massive engineering structures. Therefore, it can be deduced that the most suitable and competent layer for the foundation laying is observed in both profile 1, profile 2 and profile 3 which is the fresh basement rocks, but profile 4 is not feasible for a massive engineering structures due to different lithologies associated with low resistivity.

Keywords: Electrical resistivity tomography (ERT), subsurface structures, soil characterization, competent layer, pre-foundation, alpha Wenner array configuration, lateral profiling (LP)

Second Refinement of Preconditioned Accelerated Overrelaxation Method for Solution of Linear Algebraic Systems

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ABSTRACT

This present work concerns the numerical solution of linear system of algebraic equation $Ax=b$ by second refinement of accelerated overrelaxation (AOR) method. This technique is especially useful in solving linear systems arising from discretisation of ordinary differential equations or partial differential equations where the coefficient matrix is an irreducibly diagonally dominant L -matrix. A suitable preconditioner is applied to the linear system before a second refinement algorithm is processed. As in all iterative methods for linear systems, this is aimed at minimizing the spectral radius in order to reduce the number of iterations needed for convergence. Numerical examples proved the efficiency of second refinement of preconditioned AOR over the AOR, preconditioned AOR and first refinement of AOR methods.

Keywords: AOR, Preconditioned AOR, First-degree refinement, Second-degree refinement, Irreducible, Weak diagonal dominance

Investigation of the effect of High Concentration of Radioactive Elements on Geothermal Parameters within Parts of Kaduna and Plateau State, Nigeria

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ABSTRACT

The study focuses on both quantitative and qualitative analysis of high resolution aeromagnetic data for the determination of geothermal parameters within Naraguta and Maijuju, Plateau State. The result is correlated with the analysis of radiometry concentration data of the study area. The study area covers a total of 6,050 km². Two aeromagnetic data sheets were used which cover the major towns Naraguta and Maijuju. The study area is bounded by latitude 9°30' to 10°00' and longitude 8°30' to 9°30'. The aeromagnetic data was divided into sixteen blocks. Each of the blocks was subjected to Fast Fourier Transform analysis and then spectral analysis to determine the Curie depth within the study area. The modified Curie depth method was then used in evaluating the geothermal parameters. The region was found to have a shallow Curie point depth of 2km which occurs at Western and Southern edge of the study area. The heat flow of the study areas has values ranging from 20 to 305 mW/m² with an average heat flow of 111.00 mW/m². The regions with anomalous high heat flow ranging from 110 to 305 mW/m² was obtained around Bowon Dodo, Dan Tsofo, Kadunu, Gimi, Kaura and Zankan of the study areas. The geothermal gradients also has a value ranging from 5 to 125 °C/Km with an average of 44.40 °C/Km. Correlating this result with analysis of the radiometric data, regions of high radioelement concentration did not correspond to region of high heat flow as expected. The high concentration of uranium, thorium and potassium measured within the study area must have arisen from the weathered in-situ basement rocks that give rise to the high geothermal gradient.

Key words: Curie point depth, heat flow, geothermal gradient, radiometric data