BOOK OF ABSTRACTS

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FACULTY OF SCIENCE

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Global Climate Challenges: A SADC Cry on Water, Energy, Health & Food Security

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DAY 1 ABSTRACTS

KEYNOTE SPEAKER

Computational Chemistry to Complement Experimental Research Relevant to Africa

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Abstract

Research is an iterative process of systematic investigation of a particular topic using scientific methods. One of the purposes of research is to contribute to the development of a country and ultimately to address the world's problems. In the same line, scientists in Africa have been working to solve problems pertinent to the continent. Chemistry is an experimental natural science which makes use of laboratory equipment in order to carry out competitive research. Computational chemistry is a relatively new discipline because it requires software and computational resources to deliver scientific insights for experimentally relevant systems. Efficiently coded quantum chemical programs are now available and the speed of computational hardware has increased in the last decades. These have contributed to the present situation, where chemical research developed to an experimental and theoretical discipline. There is nowadays essentially no area of chemical research without the use of modern computational methods. This holds for classical synthetic work in fundamental organic and inorganic chemistry as well as for presently highly important applications of chemical studies in areas such as material sciences, drug design, energy storage and photochemistry. Some of these topics are particularly relevant for Africa, which has specific challenges in terms of food supply, agriculture, medical treatment and energy shortage. There is urgent need to study within African countries the most efficient ways to solve the pressing problems and remedy the shortages and to develop practical and efficient ways to meet the requirements of the people. This presentation will review (i) the applications of computational chemistry in areas of research relevant to Africa; (ii) our research using computational chemistry ranging from fundamental to applied research, and (iii) our programme in training scientists from Africa in computational chemistry.

PLENARY SPEAKERS

Financial-Risk Management in the context of global climate challenges

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Abstract

In this talk, we give an overview of how climate change risk affects financial risk management by looking at the different financial risks which are, but not limited to, operational risk, market risk, credit risk, foreign exchange risk, volatility risk, liquidity risk, inflation risk, legal risk and reputational risk. We posit that the issue of climate change risk has to be addressed now if the world is to avoid another financial crush of bigger proportions

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Climate change: Threats and Opportunities to Food Security in SADC

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Abstract

Each human being is ideally expected to have physical and economic access at all times to sufficient safe and nutritious food to meet their dietary needs and food preferences for a healthy and active life. This essentially means that no child or adult must suffer from hunger, malnutrition (obesity, undernutrition) and no stunting. When these hold true for an individual person or a household, then there is food security. Often they do not hold true though and thus each person or household experinces chronic or transitory food insecurity. There are several dimensions to food security, namely food availability, access to available nutritious food in sufficient quantities, utilisation through the metabolism of the food and all these must be stable at all times throughout all seasons and years. While all these dimensions can be influenced by many socio-cultural-political-economic factors, climate change and/or variability can affect directly and primarily the food availability dimension. Over half of sub-Sahara human populations dwell mostly in rural and peri-urban areas, where they depend on self-production of food by planting crops and vegetables, rearing livestock, collection of wild food resources and through small-scale fishing. This contribution focuses on the effect of climate change on the food resources and access to it. It also highlights the roles of technology and indigenous knowledge in mitigating impact of the effects of climate change on the food resources. It asks who are the most impacted by climate change effects? Are the impacts positive or negative? Climate change effects can variably influence the yield of these efforts and the type of food resources which become available during a particular climate regime. How have the subsistence farmers and/or fishers

and/or wild food resources collectors make lemonade from the lemons of climate change and/or variability? A select climate change and/or variability effects and their associated threats and opportunities to livelihoods are outlined to raise the debate on and contextualise the extent of climate change impacts on food security at various levels.

Potential of microalga Spirulina platensis for Bioenergy with Carbon Capture and Usage

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Abstract

Global warming is considered to be the most important long-term challenge of this century. In addition to fast and strong reduction of greenhouse gas emissions, especially in industrialized countries, there is a great need for direct carbon dioxide removal from the atmosphere using biotechnology approaches. Photoautotrophic organisms such as microalgae are known to have high carbon dioxide fixation rates - exceeding even those of fast growing terrestrial plants. We developed the concept of BCCU (Bioenergy with Carbon Capture and Usage) which is based on the use of biomass from CO2-fixing microalgae such as Spirulina (Arthrospira) platensis. Here we focus on Spirulina strain SAG 21.99 (EPSAG, Göttingen, Germany), originally isolated at Walfishbay, Namibia, to implement photoautotrophic production of Spirulina biomass at lab scale (50 ml – 3 l) to technicum scale (30 l – 500 l) both in closed and open pond bioreactors. Our current BCCU approach includes use of Spirulina biomass as direct food source for farm animals such as poultry, isolation and processing of Spirulina protein for human nutrition and use of microalgae biomass for biofertilizer production to be used for agriculture and afforestation. Last not least, we recently started with a project to investigate pharmacological effects of Spirulina compounds on physiologically relevent human cell cultures. In order to work on these different projects simultaneously, we have been establishing a collaboration network with leading German research institutions such as Fraunhofer Society, German Research Centre for Geosciences, Potsdam Institute for Climate Impact Research along with international partners such as University of Lagos, Nigeria, and UNAM.

INVITED SPEAKERS (ORAL PRESENTATIONS)

The potential of the photovoltaic industry in climate change adaptation.

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Abstract

As sub-Sahara Africa and the SADC subcontinent continues to feel the full brunt of climate change, especially in the form of severe drought episodes, it is imperative that mitigation actions are taken in order to minimize and curtail the full effect of climate change. Namibia has an abundant solar energy resource regime and as such is well positioned to employ photovoltaics in its climate adaptation programs. This paper proposes that a well-coordinated, multifaceted program be rolled out by government and where relevant, the private sector. Nampower should increase the share of renewables in its energy mix by building solar parks or wind farms and/or allowing independent renewable energy producers fill this role. In rural Namibia, Agrivoltaics should be introduced by utilizing underground water by means of solar water pumps to grow crops and fodder. Along the coast, solar power desalination plants should supply coastal towns and infrastructure should be put in place to connect desalination plants to inland dams to replenish water levels and allow agriculture to flourish in the inner and more fertile parts of the country.

Fabrication of a bio-inspired stiff, biocompatible Polyelectrolyte/$CaCO_3$ Film by layer-by-layer Method

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Abstract

An ideal biomaterial for biomedical engineering should mimic the intrinsic properties of natural tissue, especially high toughness, in order to withstand cyclic loading and repair skin and muscle damage. In addition, excellent cell affinity and tissue adhesiveness enable integration with the surrounding tissue after implantation. Organic/inorganic bio-inspired nano composites with outstanding mechanical and biochemical properties is extensively studied, although it is challenging to integrate the functional properties such as biocompatibility with mechanical properties for their multi-functional purposes. Inspired by nature, we have developed a nanocomposite using polyelectrolytes of polyacrylic acid (PAH), poly (amido amine) (PAMAM) and nano calcium carbonate (nano $CaCO_3$) via a layer-by-layer self-assembly method(LbL), with potential applications in biomedical field. The

prepared hybrid nanocomposite films were characterized by using atomic force microscopy (AFM). The nano $CaCO_3$ were characterized by scanning electron microscope (SEM), transmission electron microscopy (TEM), X-ray diffraction (XRD), Fourier transform infrared spectroscopy (FTIR), and Raman spectroscopy. The XRD attest that the calcium carbonate mineralized on the PAH/PAMAM matrix as a polycrystalline type, and the polymorphs obtained are spherical vaterite and rhombohedral calcite, which can be seen in XRD electron diffraction analysis. Apart from the crystalline nature, the TEM also attest that there is a presence of amorphous nature of $CaCO_3$ in the PAH/PAMAM matrix. In addition, mechanical and functional properties of the composite film were evaluated. Following mineralization, synthesized composite film $(PAH/PAMAM)_{7.5}$-$CaCO_3$ showed remarkable mechanical properties with an average Young's moduli of 10.6 GPa in comparison with unmineralized composite films PAH/PAMAM with an average Young modulus of 5.2 GPa. Furthermore, the mineralized composite films showed improved piezo electric properties in comparison with the control samples. Cytocompatibility evaluation of the composite material was tested on human lung Fibroblast cells(hLFCs) using the LIVE/DEAD assays, and the results indicated negligible toxicity towards cells. The cells attached and grew onto the composite film and spread after 48 h of incubation. Moreover, drug release through the composite film was examined using a drug model methylene blue (MB), as well as an antibiotic gentamycin sulfate (GS) and the results reveled that the composite film possess sustained drug release properties. Owing to improved mechanical properties, excellent biocompatibility, and tunable drug release behavior, the present $(PAH/PAMAM)_{7.5}$-$CaCO_3$ hybrid nanocomposite film may find broad applications in biomedical fields.

The Benguela Current Large Marine Ecosystem: Climate change and its anticipated impact on Biodiversity and the Fishing industry.

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Abstract

The Benguela Current Large Marine Ecosystem (BCLME) is undoubtedly one of the most productive Large Marine Ecosystems (LMEs) of the world. And it is this productivity that has propelled Namibia into one of the world's most significant exporters of marine fish. The fishery sector is however under threat from the effects of Climate change, which is already being felt in many parts of the world. What is however not clear is how exactly climate change will impact our fishing industry and in general, the food security. This paper will therefore zoom in on the anticipated changes in the Namibian marine ecosystem and its biodiversity. How will this impact the industry, the costal coastal communities and the country's food security.

Co-designing Namibian solutions for securing sustainable water, energy, health and food: what does it require?

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Abstract

While the UN Goals for sustainable development are well-thought-of guidelines for designing digital solutions for a better tomorrow, they suffer from the flavor of top-down orientation. Especially in rural areas where most Namibians are living, the sources of water, energy, health, and food are local, and therefore, the sustainable solutions for their access and use should be in local brains and hands, from the very beginning of the solutions' design process. The demand for local, or contextual, design certainly applies also to digital tools. We call the local initiative, ownership, contribution and commitment throughout the design process co-design.

While co-design is a sine qua non for reaching sustainable development goals in a given context, its realization is far from straightforward. Based on my research team's work in various co-design projects in Finland but especially in Africa, the requirements fall under the categories of attitudes, values, skills, and knowledge, for each member of a co-design team. For example, the aspect of empathy, a prerequisite for any meaningful or functional design, does not only require designers' learning the facts of a given community, but curiosity and respect towards the people living therein, and their stories and heritage. Without technical skills, at the side of local community, the design will remain at the level of needs, stated from outside and above, rather than reflecting the real demands of the future users of the technologies under the design process.

Climate change impacts water resources in SADC region

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Abstract

Water scarcity, water cleanliness and water related sustainability, a major problem in the developing world, including many African states. Soil degradation results in a vicious cycle of major seasonal flooding, further exacerbating soil erosion with consequential deaths, reduced land fertility and loss of properties. Water and climate change are inextricably linked, as a lot of the technologies required to tackle climate change required an accessible source of water. The shortage of water from the draught is already costing lives and having serious

health effects on communities. Increased frequency of floods, cyclones, and draughts may damage infrastructure, destroy agriculture crops, disrupt livelihoods, and cause loss of life. El Nino (El Nino and La Nina are a natural of the global climate system) has caused water shortages across the region, with many dams running dry (water reserves are on average at 10 per cent capacity). Water authorities in Botswana, Swaziland, South Africa and Namibia are limiting water usage because of low water levels. The economic theory, tragedy of the commons, helps to identify how the earth is reaching a tipping point for water scarcity; when no one individual, business or association has entitlements to a resource, it leads to over exploitation because preservation is not in the user's interests. The ongoing El Nino has resulted in a severe drought across much of southern Africa. Rains, which typically begin in October/November, have been 10 to more than 50 days late and significantly below average. Across many parts of the region, the October-December period was the driest in over three decades. In maize surplus-producing Free State and North West provinces of South Africa, the start of seasonal rains was more than 50 days past the average onset. Parts of southern Mozambique and northern Namibia experienced a delay in the start of the rainy season of up to 40 days; rains also arrived 10-30 days late in parts of central and southern Malawi. The agricultural sector uses about 75 per cent of all water use, and Green Scheme is likely to add another 80 per cent above current irrigation abstraction. Critical water shortages have impacted rural and some urban communities' water availability and sanitation, impacting nutrition, health and access to education. Already unreliable in much of the SADC region, access to water is predicted to become more challenging with the continued onset of climate change. The governments and its entities dealing with water resources need to move fast to respond to the needs of the water community, taking a leadership role in sponsoring research to understand the relationship between climate change and water quality and quantity issues, as well as the impacts of climate change at different points in the hydrologic cycle.

Pedo-microbiology-IKS-Climate Change Nexus: An applied case for Namibia

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Abstract

Many parts of the world including Namibia are currently grappling with the aggressive effects of climate change. One of the impacts of climate change is reduced food production. Innate and acquired climate change coping mechanisms have been around. In this paper, a discussion of the relationship between endophytic and rhizospheric bacteria in assisting a dry-adapted legume called *Tylosema esculentum* (Marama bean) is presented. This discussion is contextualized to Namibia in making applications of indigenous traditional knowledge (ITK) understand plant coping mechanisms to heat and drought stress in the Namibia agro-ecological settings. The nexus between indigenous knowledge and microbiology albeit not easy to conceptualize at face value, has led to many

interesting discoveries worldwide. In this paper this nexus was used to discover bacteria involved in arid climate adaption by marama bean. Marama bean grows naturally in Omaheke and Otjozondjupa regions of Namibia producing edible protein-rich seeds, yet the soils there are low in nitrogen and phosphorous. To date many plant growth-promoting bacteria (PGB) have been reported in this marama bean system and are now being tested in inoculant technology (biofertilizer) development for deployment in aridity-prone regions to support Namibia's food security initiatives.

Antimicrobial and anti-biofilm activity of indigenous edible tubers of Namibia

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Abstract

Infectious diseases are the leading cause of morbidity and mortality globally accounting for 50% of deaths in developing countries. Microbial resistance to existing antibiotics is also an emerging concern in the health industry, giving rise to research into natural antimicrobials. Medicinal plants have been used for treatment, but recently food based plants emerged as a potential source of new anti-infective compounds due to their low toxicity. This study is therefore aimed at evaluating the antimicrobial and antibiofilm activity of extracts from selected indigenous tuberous vegetables. These vegetables include *Brachystelma gymnopodum, Coccinea rehmannii, Eulophia hereroensis, Fockea angustifolia, Trachomeria macrocarpa* and *Walleria nutans*. Powdered plant material was sequential extracted at room temperature, using analytical grade solvents: hexane, dichloromethane (DCM), ethyl acetate, acetone, ethanol and distilled water. Disc agar diffusion method was used to screen for antimicrobial activity against four strains: *Candida albicans, Escherichia coli, Klebsiella pneumoniae* and *Staphylococcus aureus*, and MIC of the extracts were determined. Microtiter plate broth dilution method and SDS-PAGE were used to evaluate the mode of action of the extracts. Evaluation of the extracts against *S. aureus* biofilm was evaluated using staining assay with crystal violet as the staining agent and $MBIC_{50}$ and $MBEC_{50}$ were recorded. All of the solvent extracts of *C. rehmannii* and *F. angustifolia* were devoid of antimicrobial activity. The DCM extracts showed better activity for all strains and *E. heroroensis* gave the best MIC of 2.5 mg/mL against *E.coli* and 5 mg/mL against *K. pneumoniae*. At high concentrations (5 & 10 mg/mL) the extracts showed bactericidal properties. *W. nutans* showed the best biofilm inhibition with an $MBIC_{50}$ of 1.348 mg/mL (±0.224), while *E. hereroensis* gave the best biofilm reduction with an $MBEC_{50}$ of 0.785 mg/mL (±0.023). In conclusion, the antimicrobial activity of extracts from the selected tuberous vegetables in Namibia is reported here for the first time. Furthermore, this study identified three vegetables namely *Eulophia hereroensis, Trachomeria macrocarpa* and *Walleria nutans* which merit further studies such as profiling the extracts for compounds with activity.

Association of Faecalibacterium, Lachnospira, Veillonella and Rothia with childhood wheezing

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Abstract

Wheezing is a prevalent respiratory tract symptom among children in different populations globally. There is increasing evidence on the contribution of faecal microbiome in the occurrence of allergic diseases. A single study has observed reduced abundance of bacterial genera Faecalibacterium, Lachnospira, Veillonella and Rothia (FLVR) in stools of three-month old Canadian infants with atopy-wheeze symptoms. It is not known whether this is true in different human populations worldwide. This study aimed to determine the association of FLVR bacteria with wheezing and recurrent-wheezing outcomes; as well as to determine the sensitivity of FLVR bacterial load within the first four days of an infant life in the prediction of wheezing outcome. A total of 533 human stool samples collected at four time-points (birth, six weeks, six months and 12 months) from wheezing and non-wheezing infants, were screened for the presence of FLVR bacteria by SYBR Green-based qPCR. Mann-Whitney test was used to determine the difference in FLVR bacterial load between wheezing and non-wheezing infants. The association of FLVR bacteria with childhood wheeze and recurrent wheeze was determined at two levels: first using bacterial detection and second using bacterial load. Conditional and generalised logistic regressions were

used to determine the association of FLVR bacteria with wheezing and recurrent-wheezing respectively. Receiver operating characteristic (ROC) curves were used to determine the sensitivity of each FLVR bacterium as well as their combinations in predicting the wheezing outcome. Three wheezing phenotypes were considered in the ROC analysis: 'any wheeze' (wheeze with or without lower respiratory tract infections (LRTIs)), 'no-LRTIs wheeze' (wheeze without LRTIs), and 'LRTIs wheeze' (wheeze with LRTIs). Data were statistically analysed using RStudio version 3.4.4 and, we considered a P-value less than 0.05 to be significant. The bacterial load was converted to log base 10 in all the analysis. Using qPCR, we detected Rothia, Veillonella, Faecalibacterium and Lachnospira in 90% (479/533), 73% (388/533), 51% (274/533) and 14% (77/533) of the samples, respectively. This study observed a significantly reduced Rothia load within the first four days of life in infants at risk of wheezing (P<0.001). A conditional logistic regression also verified that infants at low risk of wheezing (adjusted odds ratio (aOR)=0.54, 95%CI: 0.280.93) and recurrent-wheezing (aOR=0.29, 95%CI: 0.05-0.88) had high Rothia load very early in life. Lachnospira load within the first four days of life was significantly high in wheezing infants (P=0.00562). However, the regression analysis showed no significant association of Lachnospira with wheezing. The ROC curve analysis showed that quantification of Lachnospira (AUC=0.833, 95%CI: 0.64-1.00) and Rothia (AUC=0.707, 95%CI: 0.62-0.79) in the first four days of life performs best in wheeze prediction. Lachnospira alone was more sensitive in predicting wheeze, compared to other FLVR bacteria whose performances increased upon interaction with each other.

Essential oils of Namibia: Application of current fragrance analysis trends

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Abstract

The essential oils and aromatic extracts of a number of plant species indigenous to southern Africa is of commercial interest to the region. These plants have a variety of traditional uses, including being used by the Ovahimba women of Namibia as the main ingredients for their perfume (resin) and as soap (gum). Although these products have drawn some international attention in recent years, their detailed chemical composition and biological properties were not known. In our studies the detailed chemical characterisation of the volatile constituents of the essential oil and aromatic extracts of material from different indigenous plants was performed using gas chromatography – mass spectrometry (GC-MS) and GC coupled to a flame ionisation detector (FID). The latest requirements for the identification of flavour and fragrance compounds using retention indices were applied. In addition, enantioselective GC analyses were performed in order to determine the enantiomeric excess of the major chiral constituents. Furthermore, the current quantitative analysis trends were also applied, including

the use of predicted relative response factors when using FID. In a number of the studies, the *in vitro* antimicrobial and antioxidant activities of the oils and extracts were also determined.

Complex mixtures of compounds were detected in the oils and extracts, and it was found that they contain biologically active constituents with known medicinal properties. The accurate qualitative and quantitative determination of these biologically active constituents is therefore important, since this knowledge may be used by perfume, cosmetics and detergent manufacturers to guide the formulation of their products when using these oils and extracts as ingredients. Finally, it is envisaged that the scientific support provided by our studies will contribute to the international exposure and sales of these unique Namibian products.

Namibian plants for health and nutrition

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Abstract

Namibia is known for its rich and diverse flora and species endemism. Among these plant species, there are plants that are commonly used by various communities as sources of medicine, nutrition, supplements, energy and material production. Despite the wide use of plants by the Namibian society, very limited studies have been done to determine their chemical constituents and thus add value, encourage their use and produce economically valuable products. In the case of medicinal plants, indigenous knowledge is reserved within families or communities. As for fruits, they are regarded as the main sources of minerals, fiber and vitamins, which provide health benefits and nutritive values. Wild fruits play an important role in the daily life and wellbeing of many people in rural and urban areas in Namibia. Cultivated fruits are however favored over wild fruits, but due to their high cost and inadequate irrigation infrastructure in the country, cultivated fruits are less accessible in poor communities. Wild fruits on the other hand are easily accessible, but their lack of nutritional information hamper their informed consumption. This research therefore aims to uncover information that has an impact on the Namibian community, which will contribute to food security and poverty alleviation by means of value addition to edible and medicinal plants, indigenous knowledge gap filling, safe use of traditional medicine as well as creating awareness through creation of database of nutritional composition, traditional medicinal uses and scientific data of Namibian plants.

Fabrication of copper and copper-based functional thin-films by spray-coating method and its potential impact on the industrialization and sustainable development of Namibia

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Abstract

Copper is referred to as the first metal of humankind civilization. According to the Copper Alliance, the global copper industry is making a positive impact on areas of critical societal concerns such as energy efficiency and security, climate change mitigation, public health, food supply, green building, etc. and, they have identified three UN's Sustainable Development Goals (SDGs) that closely match their focus. Namely; (1) Affordable and clean energy, (2) Sustainable cities and communities and (3) Climate action.

Copper (in the form of blister copper which is 98.5% pure copper) is one of Namibia's main mining products. In 2014 alone, the Tsumeb smelter produced about 49 600 tons of blister copper which were then exported out of the country. It's, therefore, a challenge to realize the industrialization of Namibia if there is no value addition made to the mined resources. This implies that value-addition and processing of these resources into finished and/or semi-finished products before local utilization or exportation is a vital component for sustainable development of Namibia and quality of life improvement for the Namibian people.

A thin-film that is less than a micrometer in thickness can modify several properties such as electrical, magnetic and optical functions of a substrate. Thin-films of copper find applications in electrical conductors, radiofrequency shielding, thermal collectors, antimicrobial touch surfaces, etc. Copper-based thin-films, such as thin-films of Cu_2O have potential applications in the fabrication of solar cells and the production of hydrogen gas through water splitting. Recently, the present authors reported the fabrication of highly conductive and well-adhered Cu thin-film with an electrical resistivity of $3.8(6) \times 10^{-5}$ Ω cm by using the spray-coating method. Although relatively new, the spray-coating method is being used as a viable method for low cost-fabrication of functional thin-films for various materials. The fabrication of copper and copper-based functional thin-films by the spray-coating method and its potential impact on the industrialization and sustainable development of Namibia will be discussed.

The exact size of the smallest maximal packing of pairs by triples

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Abstract

A packing of pairs by triples on a finite v-set V is a system of triples (i.e. 3-subsets) of V such that no pair of distinct elements of V is contained in more than one of the triples. A packing P of pairs by b =|P| triples is (inclusion wise) maximal if adding any other triple from V to P produces a system of triples that is not a packing any more. In this presentation for any positive integer v we find the smallest number b such that a maximal packing of pairs by triples exist.

Analysis of Current-Voltage Characteristics of Thermally Annealed Polymer - Fullerene Photovoltaic cells

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Organic photovoltaic solar cells can offer advantages of being mechanically flexible and durable, large area devices, lightweight, made from a diversity of materials, and could be fabricated at low-cost when compared to silicon technology Their efficiency is, however, still too low for commercial exploitation. Empirical observations reveal that polymer-fullerine (P3HT:PCBM) based solar cell performance depends on thermal annealing processes employed, especially the annealing temperatures and durations, as well as the environment in which the annealing takes place. The annealing parameters are known to influence the energetics and kinetics of the blending process or morphology, but the associated physics is not fully understood. In this work, current density-voltage characteristics of P3HT:PCBM bulk heterojunction organic solar cells, thermally annealed at different temperatures, 65 – 160 °C post fabrication, were investigated under dark and illuminated conditions, and compared to their as cast conterparts. In certain electrical regimes as-cast devices showed higher values of current density in comparison to the corresponding annealed devices. Such performance was attributed to air-borne chemical doping of the as-cast semiconductor layer, which creates electrically conductive percolation pathways within the as-cast devices. We propose that annealing of semiconductors must be a two - step process, which first initiates decrease in conductivity, followed by its increase. As-cast devices P3HT-PCBM bulk heterojunction solar

cells prepared under atmospheric conditions were observed to have comparatively superior photovoltaic performance in comparison to thermally annealed devices. The efficiency drop in the annealed counterparts is attributed to dedoping due to thermal annealing. An annealing temperature of ~ 140 °C was found to be optimum for power conversion efficiency in the bulk heterojunction, 1:1 by mass, P3HT:PCBM based solar cells.

Addressing Development under Climatic Stressed Environment

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Abstract

Addressing poverty in Namibia is one of the priorities of the Namibian government. However, with the prolonged economic recession, achieving desired levels of poverty seems to be an impossible task. As if that was not enough, the country also witnessed many years of extended drought which is associated with the climate change phenomena. Climate change (defined as the average weather conditions, spread over decades, of a region, including temperature, rainfall, and wind due to persistent anthropogenic changes in composition of the atmosphere or in land use), is one of the biggest crises faced by the world in 21st century. As a result, there have been more intense storms, more rain falls followed by longer and drier droughts (a challenge for growing crops), as well as changes in the ranges in which plants and animals survive. Climate change has already had observable effects on the environment and it is affecting societies in far reaching ways. In fact, human wellbeing are influenced by environmental and climate change factors. For example certain types of extreme weather (such as heat waves, droughts, water shortages) lead to crop failure and increases prevalence of infectious diseases, which became more frequent and/or intense in the country. Forgoing that climate change risks threaten to derail a country's development, and contrariwise, the development choices and socio-economic pathways give raise to the important determinants of climate change outcomes i.e. GHG emissions. Above said, it is obvious that the country will struggle to address the desired level of Sustainable Development Goals (SDGs), in particular goals that focuses on the general well-being of the people (poverty and hunger). The proposed economic activities in Namibia (such as timber harvesting in the North Eastern parts of the country and the mining of phosphate on the seabed of the Atlantic Ocean) are expected to bring about development in the country. However, these also come with own consequences to the environment. Moreover, the rolling out of the Food Bank programme caters for the basic needs of the impoverished Namibians but with the increased frequency and intensity of climatic hazards. The already unsustainable programme is becoming more unmanageable as more people glide into extreme poverty in the absence of sound development and persistent climatic-induced extreme weather events. Thus, this presentation will address the difficulties that developing countries face when deciding on development pathway (less environmental friendly programme/projects), while confronted by devastating realities and at the same time expected to conform to international treaties.

Clean energy for cooking in Southern Africa

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Abstract

The traditional biomass fuels remains the most primary sources of cooking energy used by over 80% of the total population in sub-sahara Africa. Given the significance in fighting poverty, environmental and health issues, access to clean cooking compared to access to electricity, for example has remained an often neglected tool for development and climate change mitigation. This presentation addresses some of the challenges and solutions responsible for transitioning to clean cooking energy in southern Africa.

Climate Change as a Global Challenges: A Policy Glimpse

LC. Mundia

Ministry of Higher Education Training and Innovation

Abstract

Climate change has been prioritised in many strategic documents of the world. The United Nations Sustainable Development Goals (SDGs), African Union (AU) Agenda 2063 Goals and its priority areas and the Southern African Development Community (SADC) conventions both has highlighted the importance of prioritising climate change agenda. Namibia is a member state to the UN, European Union (EU), AU and SADC. The SDGs, in the following goals: No. 6. Ensure availability and sustainable management of water and sanitation for all; No. 7. Ensure access to affordable, reliable, sustainable and modern energy for all; No. 13. Take urgent action to combat climate change and its impacts and No.15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss. The AU Agenda 2063 Goal No. 7. Emphasises on environmentally sustainable and climate resilient economies and communities. The priority areas on the AU agenda 2063 highlights the importance on biodiversity, conservation and sustainable natural resource management; water security; climate resilience and natural disasters preparedness. Furthermore, Namibia as a SADC Member States are party to the United Nations Framework Convention on Climate Change, which advocates for reduced emissions toward lowering global temperatures and offers guidance on coping with impacts of climate change; the Ramsar Convention on Wetlands, which specifically targets the preservation of internationally important wetlands; it also contains a resolution covering climate change impacts, adaptation, and mitigation; and the Convention on Biological Diversity, which has resulted in numerous decisions and technical papers describing the links between biodiversity and mitigation of

climate change effects. The SADC Climate Change Adaptation (CCA) Strategy recognises that water issues impact a range of sectors, including Energy, Health, and Agriculture. In the Namibia context, a number of elaborative strategic documents has highlighted the goals of our National Policies on Climate Change to contribute to the attainment of sustainable development in line with Namibia's Vision 2030 through strengthening of national capacities to reduce climate change risk and build resilience for any climate change shocks. The strategic documents, among others, include our Vision 2030, National Policy On Climate Change for Namibia; National Climate Change Strategy & Action Plan 2013 – 2020. The policies and strategies implies that our national research agenda towards development are aligned to both international and national strategic documents.

Preparation of transition metal doped iron chromium nano oxides for application in water purification

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Abstract

The safety and accessibility of drinking-water are major concerns throughout the world. Health risks may arise from consumption of water contaminated with infectious agents, toxic chemicals, and radiological hazards. Improving access to safe drinking-water can result in tangible improvements to health. Population explosion and higher standards of living also contribute to increase in demand. On the other hand this has also lead to contamination of water which promotes water borne diseases. Many techniques used to purify water are cheap but are not accurate enough. Nanotechnology brings new opportunities to explore and adopt water treatment and purification processes. Nanomaterials offer better properties and characteristics such as specific surface areas, high reactivity, adsorption, magnetic and optical properties. Magnetic nanoparticles can be injected directly into the contaminated ground, and loaded particles can be removed simply through a magnetic field. For that purpose, we have synthesized $Mg_{0.2}Fe_xCr_{1.8-x}O_3$ nano oxides with $x = 0.3, 0.5, 0.7, 1.1$. Single phase corundum structure and nanophase structure of the as-synthesized samples were confirmed by X-ray diffraction (XRD) and by transmission electron microscope (TEM). Crystallite sizes were calculated using the Scherrer's formula whilst particle sizes were obtained by TEM and found to have an average of 50 nm for the samples synthesized at different iron content. The optical measurements were performed by UV-visible spectroscopy. We observe that the band gaps and the refractive index vary with iron content. The different properties analysed give an understanding on how to use them in water purification.

Key words: nanoparticles, hydrothermal method, structural properties, optical properties**.**

Plastic: a good servant and a bad master

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Abstract

We are living in an age dubbed "the plasticene epoch", indicative of the most widely used material that encompasses almost all human activity - plastic. Plastics are any synthetic or semi-synthetic polymers that can be shaped without breaking. Though plastic materials are used in many industrial sectors, about 40% of global plastic production is dedicated to packaging - giving rise to the "on-the-go" lifestyle of cheap and easily disposable materials. As a result, plastic pollution is increasingly becoming a topical research and environmental management issue. Conventional plastics do not decompose easily, instead they disintegrate into smaller fragments, micro – and nanoplastics, facilitating further and faster dispersal into the ecosystem. In Namibia, there is a lack of adequate scientific data on the pathways, extent of spread, effects and quantification of plastic waste on land, riverine and marine ecosystems. Information on the impacts of animals and humans also need to be explored. Studies from other parts of the world have shown that plastics are the most common non-penetrating foreign bodies ingested by ruminants. Domesticated, stray and even wild animals are not spared as exposure to or ingestion of plastics can cause malnutrition, suffocation, entanglement, habitat destruction and toxicological effects, thus threatening biodiversity. Here we outline the pathways and incorporation of plastics into various ecosystems, impacts on the ecosystem and human health, as well as propose the way forward in resolving the manace of plastic pollution in Namibia.

Removal of Weeds and Sediments from the Calueque – Oshakati Canal

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Sam Shaanika, University of Namibia

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Abstract

The Cuvelai - Etosha Basin is the most densely populated area in Namibia. In this basin, water is transported to the demand sites through the 160 km long open Calueque-Oshakati Canal. The water is mainly used for irrigation and domestic purposes. Anthropogenic activities along the canal have exposed it to various forms of pollution, mainly nutrients pollution which is resulting in high costs of operation, maintenance and purification of the raw water sourced from this canal. Of priority is the growth of freshwater weeds and sediments in the canal which limit the flow of water to the demand sites. For this reason, this study is aimed to design, fabricate and test a mechanical method or tool that could possible remove freshwater weeds from the Calueque - Oshakati canal.

Several methods have been used to remove weeds and sediments from the Calueque – Oshakati canal but all these methods have failed to effectively removal weeds and sediments from the canal. The data for this study was qualitative with very little quantitative data. The data were collected through interviews, direct personal observations and focus group discussion. Two sampling techniques were employed, namely non-reactive and snowball sampling techniques. The Cause Effect Analysis Method was used to investigate and identify the root cause of a known effect. In conclusion it was found that, the methods used by NamWater to remove weeds and sediments from the canal were ineffective. Northern Namibia constitute about half of the country's total population with an estimate of 1.5 million people. Improved supply of water from the canal will be beneficial for domestic use, irrigation farming, crop and livestock farming, small scale businesses and industrial use. The value proposition in the northern area of Namibia is that, there will be an increase in water availability to schools, hospitals, town councils, villages and farmers (crop and livestock) along the canal. Indirectly this will create jobs and give opportunity to new small scale farmers and green irrigation scheme along the canal.

Vaccination of goats with a combination Salmonella Vector expressing four Brucella antigens (BLS,PrpA,Omp19, and SOD) confers protection against Brucella abortus infection

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Abstract

Salmonella is an intracellular pathogen with a cellular infection mechanism similar to that of *Brucella*, making it a suitable choice for use in an anti-*Brucella* immune boost system. This study explores the efficacy of a *Salmonella* Typhimurium delivery-based combination vaccine for four heterologous *Brucella* antigens (*Brucella* lumazine synthase, proline racemase subunit A, outer-membrane protein 19, and Cu/Zn superoxide dismutase) targeting brucellosis in goats. We inoculated the attenuated *Salmonella* delivery-based vaccine combination subcutaneously at two different inoculation levels; 5 × 109 colony-forming unit (CFU)/mL (Group B) and 5 × 1010 CFU/mL (Group C) and challenged the inoculations with virulent *Brucella abortus* at 6 weeks post-immunization. Serum immunoglobulin G titers against individual antigens in *Salmonella* immunized goats (Group C) were significantly higher than those of the non-immunized goats (Group A) at 3 and 6 weeks after vaccination. Upon antigenic stimulation, interferon- from peripheral blood mononuclear cells was significantly elevated in Groups B and C compared to that in Group A. The immunized goats had a significantly higher level of protection as demonstrated by the low bacterial loads in most tissues from the goats challenged with *B. abortus*. Relative real-time polymerase chain reaction results revealed that the expression of *Brucella* antigens was lower in spleen, kidney, and lung of immunized goats than of non-immunized animals. Also, treatment with our combination

vaccine ameliorated histopathological lesions induced by the *Brucella* infection. Overall, the *Salmonella* Typhimurium delivery-based combination vaccine was effective in delivering immunogenic *Brucella* proteins, making it potentially useful in protecting livestock from brucellosis.

Farm diversification and climate change: implications for food security in northern Namibia

Chalmers Mulwa

Abstract

Limited non-farm opportunities in the rural areas of the developing world, coupled with population growth, means agriculture will continue to play a dominant role as a source of livelihood in these areas. Thus, while rural transformation has dominated recent literature as a way of improving welfare through diversifying into non-farm sectors, improving productivity and resilience to shocks in smallholder agricultural production cannot be downplayed. This is especially so given the changing climatic conditions affecting agricultural production, and thus threatening many livelihoods in rural areas. Farm diversification is an important strategy for creating resilience against climatic shocks in farm production. Using cross-sectional data from northern Namibia, the study assesses the barriers and success factors related to effective crop and livestock enterprises diversification and the effect of these on food security outcomes. A Seemingly Unrelated Regression model is used to assess the joint factors explaining total farm diversification, while a step-wise error correction model is used to evaluate the conditional effect of diversification in each of the two farm enterprises on two measures of food security: food expenditure and dietary diversity. We find that past exposure to climate shocks informs current diversification levels and that access to climate information is a key success factor for both livestock and crop diversification. In terms of food security, greater diversification in either crop or livestock production leads to higher food security outcomes, with neither crop nor livestock diversification showing dominance in affecting food security outcomes. However, an overall higher level of diversification in both livestock and crop enterprises is dominant in explaining food security outcomes.

An assessment exposure of human to DDT from IRS

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Abstract

Exposure to Dichlorodiphenyltrichloroethane (DDT) from Indoor Residual Spray (IRS) is of very serious concern. Adverse effects associated with this kind of exposure are possible disruption in semen quality, menstruation duration, lactation, and gestational length. DDT exposure may also lead to cancer and endocrine disruption. Exposure can be through 3 main pathways, inhalation, dermal contact or ingestion of contaminated food. A study to assess exposure of human in an IRS area in Limpopo Province, South Africa was conducted. Samples were collected from both air, food (chicken and vegetables) and in and outside dust from sprayed and non-sprayed huts. A total of 30 huts x 7 sampling intervals i.e. 210 PUF air samples were collected from sprayed huts. Ninety GMF dust deposition samples (30 huts x 3) were collected over four sampling intervals (-1hour, 1 hour, 29 hour and 84 days after spraying). A total of 8 x huts x 1 sampling interval i.e. 8 dust samples were collected from control (non-sprayed, Tshakuma) huts. Statistical results show that villages in IRS areas were exposed to a significantly high levels of DDT isomers through both ingestions of chickens and inhalation trough out the different sampling periods P-Value = 0.036 and P-Value = 0.021 respectively. Analysis was done in chicken fat and muscle tissue. Exposure from vegetable ingestion show that there was no significant difference in the concertation of DDT isomers in both areas and were in very small concentration. Dust samples collected from outdoor soils have very similar concentrations. Both sites show that dermal exposure rates to residents in both villages was similar. Ingestion had the highest exposure (15181 µg/year) rate over a year compare to inhalation (11 928 µg/year) and ($9.643e^{-10}$ µg/year) dermal contact over a period of one year. There is need to limit human exposure through all the pathways.

Culturing, isolating and identifying campylobacter in Rhodes university water sources

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Abstract

Campylobacter is a gram negative bacterium that is often found in contaminated water sources, and is a common cause of gastroenteritis. It is a slow growing bacterium that requires very specific conditions in order to achieve optimal growth. To attempt culturing campylobacter and assess the faecal contamination of harvested rainwater around Rhodes university, water sample collection was conducted at 3 sampling areas with both rain water and drinking water tanks, to provide a total of 6 sites. Selective skirrow agar was used to isolate *Campylobacter* and this was used as a control. H_2S kits were used as indicators of faecal contamination in the water samples. There was little to no growth of *Campylobacter* on the skirrow agar and this was due to the anaerobic condition it was subjected to. *Campylobacter* requires microaerophilic conditions and incubation of 42℃ for growth. A total of 150 H_2S kits were used to screen samples for faecal coliforms and there was a 50% overall correspondence rate. The results from this study demonstrate a significant difference when comparing with the results from previous studies, and this could be as a result of rising ambient temperatures caused by climate change. Low levels of bacterial DNA were detected in the samples and further studies are needed to identify the species present in the Rhodes Jojo tanks

INVITED SPEAKERS (POSTER PRESENTATIONS)

Prevalence of skin bleaching among University of Zambia female medical students aged 18-45

Lovisa Elago

Abstract

A cross sectional study n (217) to determine the prevalence of skin light use among female medical students aged 18-50 at Ridgeway Campus –University of Zambia School of medicine Lusaka, Zambia 2108.To investigate the social-economic factors and the knowledge about the side effects cause by the skin bleaching products. A systematic random sampling method was used at an interval of 3. Questionnaire were distributed and filled in after consent was obtained the data was analyzed with stata version 12. Only 60 participants of the n (217) bleached their skin which gave a prevalence of 28%. The married females were 22 and only 8 used skin lightening products whilst 195 of the respondents were single and 52 bleached their skin. It was found that 62% of n (217) believed that man prefer women with light skin hence the increase in the use of skin lightening products in anticipation that they will get married. Only 9 (15%) of those who bleached their skin actually knew the banned ingredient in lightening cream. There was a statistical significant association between the participant's complexion and the use of skin lightening products p-value 0.003. A prevalence of 28% was calculated.

Online Assessment of Scientific Reasoning Skills and Motivation to Learn Science among Grade 5 and 7 Students in Northern Namibia

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Abstract

This study aimed to assess students' scientific reasoning skills using an online assessment method and explore the relationship between their reasoning skills and motivation to learn science. Research participants were 270 Grade 5 and 346 Grade 7 students in the Oshana region of Namibia. The online reasoning skills test consisted of 36 items with 16 tasks assessing conservation, proportional, correlational and probabilistic reasoning, and logical operations in a science context. The five point Likert scale Science Motivation Questionnaire II consisted of 25 items with five subscales. Tasks were developed within and delivered by the eDia platform via the Internet. The reliability of the reasoning skills test was acceptable (Cronbach's alpha=.74), and it was very good for the Science Motivation Questionnaire (Cronbach's alpha=.91). The reasoning skill tasks were moderately difficult for the students: M=40.56%; SD=13.47%. One-parameter Rasch analyses showed that there were few items to differentiate students at the low skill levels. Task analysis showed major obstacles in students' reasoning skills for science learning. Students reported that they were moderately motivated to learn science. A weak correlation was

found between the tested scientific reasoning skills and motivation to learn science (r=.21, p<.01). The study suggests that the basic ICT infrastructures in Namibian schools should be improved to exploit the advantages of online assessment.

Overview of the University of Namibia High Performance Computer

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Abstract

High performance computing (HPC) refers to the practice of aggregating computing power of several computing nodes in a way that delivers much higher performance than one could be achieving by a typical desktop computer in order to solve large problems in business, science, or engineering. UNAM has so far received two HPC racks from the Centre of High Performance Computing (CHPC), South Africa. The delivery was facilitated by the National Commission on Research Science and Technology (NCRST). The racks are primarily for human capacity development and awareness in HPC and form part of Namibia's readiness in participating in the Square Kilometre Array (SKA) and African Very Long Baseline Interferometry Network (AVN) projects. The two racks have a combined total of 88 computing nodes, with the currently operational rack having 48 nodes. Thus far, the operational rack has been used in various projects such as modelling the broadband emission of globular clusters and analyses of gamma-ray data of active galactic nuclei, recorded with the H.E.S.S. telescopes in the Physics department, Land Degradation Assessment Baseline report: Omusati Region" by the Department of Geography, History and Environmental Studies Geo-Information Science (GIS) unit in conjunction with GIZ and the Ministry of Agriculture, Water and Forestry, as well as various MSc and BSc projects in the School of Computing. Very recently, the UNAM HPC site was used to model weather case studies by in collaboration with the Namibia Meteorological Services.

This presentation will give an overview of the use-cases of the HPC cluster as well as of its performance.

Bringing Artificial Intelligence to Agriculture

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Abstract

Artificial intelligence (AI) is an area of Computer Science that emphasizes the creation of intelligent machines that work and react like humans. AI has been introduced in many different fields in the past, this was to allow computers to be able to perform tasks that humans do. This approach has enabled the world to move towards what is now being referred to as the 4th Industrial revolution with AI being the biggest force behind this movement. However, this advancement has not been fully adopted in developing countries due to many factors such as cost implications, and a lack of skills. In this study, we outline AI methods that can be implemented in Agriculture. These methods include image recognition applied in automatic detection and remedy of pests and weeds that can be automated by the Internet of Things. We sum up by presenting a smart agriculture architecture that can be implemented to adapt to climate change while improving crop yields by optimizing environmental parameters that directly affect crop production whereas well managing water resources.

Design of a Passive Solar Dryer for Pearl Millet (Omahangu)

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Abstract

This work outlines the design of a Solar Dryer for Pearl Millet (Omahangu), as it is noticed that most Pearl Millet are lost, destroyed by insect and contaminated with dust during the drying process at open space known as Oshipale. The numerical mathematic and Computational Fluid Dynamics (CFD) models to describe the performance of the solar collector were developed. While a thin layer drying kinetics model was adopted and modified in an attempt to incorporate temperature and humidity effects on the drying curves. The numerical model was programmed in MatLab, while viscous/turbulence Realizable k-epsilon model was selected for CFD simulation. Both models were analysed using ongwediva weather conditions and were run for different solar irradiation and air velocity values. The inlet temperature to the collector was kept constant at 303K. The outlet air temperature and collector's efficiency from both models were compared using the T-test and generally showed good agreement at a significance level of 0.05. The collector numerical model showed good agreement with results from computational fluid dynamics simulation except at low velocities, where the model's turbulent flow

assumption loses a significant amount of accuracy. It was found from the results that the collector should have flow rates of about 0.2m/s to achieve outlet temperatures of about 50˚C over most of an October day in Ongwediva. The drying model predictions were compared to drying curves of some authors on pearl millet and foxtail millet. The drying method proved to be good only for rough estimate of the drying trend when applied to pearl millet. It was concluded that there is need to carry out experiments to determine the drying kinetics model for Namibia's variety of pearl millet.

Evaluation of Interpolation Methods for Mapping Potential Hydrogen for Windhoek Municipal Boreholes

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Abstract

Groundwater is one of the most significant spatial phenomena in the world, where its quality and quantity is threatened on. Potential hydrogen is a basic water quality parameter whereby the biological availability of chemical elements and solubility are determined by it. Therefore, mapping the contemporary condition of groundwater quality in boreholes offers a better management in Windhoek municipal boreholes. Furthermore, Interpolation techniques used provide a platform to accurately predict values at un-sampled points and produce a continuous dataset of spatial distributions. In this research, spatial and Geostatistic analytic tools were used to accurately compare the different interpolation methods based on groundwater spatial pattern in Windhoek, using Arc GIS 10.6. Fifty five municipal boreholes were selected to assess the groundwater potential hydrogen. Moreover, deterministic interpolation method such as Radial Basic Function, Inverse Distance Weighting and geostatistical interpolation method such as kriging were used in both geostatistical and spatial analysis. Additionally, Empirical Bayesian Kriging was used for geostatistical analysis. The method which shows least average standard error, root mean square standardized error, root mean square error and mean square error was selected as the best method to interpolate the spatial variation for potential hydrogen in boreholes. Geostatistical analytic tool such as the Empirical Bayesian Kriging with linear semivariogram model shows the least error values compared to Universal Kriging in spatial analytic tool. A conclusion can be made that geostatistical interpolation is a superlative method than the deterministic interpolation method for mapping potential hydrogen in Windhoek Municipal Boreholes.

Women's Knowledge of Health Promotion in the Prevention of Breast and Cervical Cancer in Oshakati Health District, Namibia

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Abstract

The study aimed to explore and describe the knowledge of women regarding health promotion in the prevention of breast and cervical cancer. This study was carried out in the Oshakati district at the Intermediate Hospital Oshakati. A quantitative approach was used for this study. This approach was chosen in order to provide a comprehensive picture and understanding of the women's knowledge or awareness of health promotion in the prevention of breast and cervical cancer. The study population consisted of all women of child-bearing age, aged 15 to 49, in the Oshakati health district, that is, 41,985. The research sample was identified as 10% of the study population, thus numbering 419 respondents. The researcher personally distributed 419 questionnaires to every second woman of child-bearing age admitted to the Intermediate Hospital Oshakati. The findings indicate that awareness of information relating to breast and cervical cancer exists in Oshakati Health District. However, overall knowledge on the causes of breast and cervical cancer, risk factors for breast cancer and warning signs of cervical cancer was very poor. The findings also revealed that while many respondents were informed about breast self-examination (BSE) and had practised it, very few respondents acknowledged clinical breast examination (CBE) attendance once a year, or the use of mammography and sonar attendance as additional screening methods. Based on the findings the study recommends that women should share information with their peers; in addition, radio should be used to disseminate such information as it is the most reliable source of information in the rural areas. Information, education and communication materials on the prevention of breast and cervical cancer should be developed and disseminated to the public. Women should be encouraged to develop a reading culture in order to increase their knowledge

Seaweed Amended Rice Straw Substrate and Its Influence on Health Related Nutrients, Trace Elements, Growth and Yield of Edible White Elm Mushroom (*Hypsizygus ulmarius*)

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Abstract

Edible mushrooms have been widely used for a long time as a source of food and beneficial health related nutrients. With mushrooms being saprophytic feeders, the nutrient content of edible mushrooms is widely dependent on the substrate composition. This study thus looked at the possibility of improving the quality of rice straw substrate by amending it with seaweeds and its influence on substrate biological efficiency (BE), mushroom (*H. ulmarius*) health related nutrient and trace metal contents. The results indicated that incorporation of 5% seaweeds resulted in the highest total yield with 22% higher BE than that of the control; whilst incorporation of 10% and 20% seaweeds reduced total yield and BE by 14% and 22%, respectively, compared to the control. Similarly, incorporation of seaweeds at 5% level resulted in significantly the highest crude protein concentration in the mushrooms. However, this high concentration in crude protein did not result in a direct increase in the 9 essential amino acids (EAA) determined in this study, with the control actually having a higher concentration of most of these EAA. Incorporation of seaweeds resulted in higher concentration in trace metals such as Na and K, which are beneficial to human health. Among the heavy metals determined, Cd and As significantly increased under the seaweed amended treatments, though their concentrations were below the maximum permissible levels set for food materials. The results of this study clearly showed that seaweed incorporation into rice straw at 5% level optimized the substrate conditions resulting in the highest mushroom yield, minerals and protein content. Further studies should evaluate the influence of specific seaweeds incorporated into different substrate with several oyster mushroom species on final health related nutrients and heavy metal accumulation.

Chemical Characterization and Biological Screening of Essential Oil Extracted from Commiphora kraeuseliana resin

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Abstract

The Burseracaea family is best known for its aromatic resin producing plants. Resins consist of highly concentrated, volatile oils known as essential oils, as well as non-volatile solids which tend to make the resin thick

and sticky. Essential oils are typically extracted via distillation or cold pressing. The genus Commiphora is the largest of the Burseracaea family, and the only genus present in both South Africa and Namibia. Resins from plants of the genus Commiphora are commonly used as antiseptics, to treat various skin infections, in cosmetics, as flavouring substances and as pharmaceuticals, due to their chemical, antimicrobial, anti-inflammatory and antioxidant properties. Commiphora essential oils typically consist of various secondary metabolites, such as terpenoids, steroids and flavonoids. The Opuwo Processing Facility is interested in producing and commercialising essential oils from the Commiphora genus, including Commiphora kraeuseliana essential oil. Commiphora kraeuseliana is a dioecious shrub, which is indigenous to the north-western region of Namibia, and typically grows on rocky hill slopes. In this study, essential oil was extracted from the C. kraeuseliana resin using hydrodistillation. The chemical characterization of the volatile constituents of the resulting oils was performed using gas chromatography-mass spectrometry (GC-MS) and gas chromatography-flame ionisation detection (GC-FID). The antimicrobial activity of the oil was determined using the broth dilution test against Klebsiella pneumaniaea, Candida albicans, Staphylococcus aureus and Escherichia coli. The antioxidant activity of the oils was determined using the DPPH radical scavenging assay and reducing power method. An average yield of 2.51% w/w of the C. kraeuseliana essential oil could be produced by hydrodistillation. Eleven compounds were identified in the oil. The major compound was identified as nonane (>90w/w%). The findings of this study could be used for guiding the formulation of cosmetics or pharmaceutical products, when using the oil as an ingredient.

Challenges Of E-Commerce Adoption Within A Namibian Organization

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Abstract

Electronic- commerce known as e-commerce has evolved since its inception in the nineties and still evolving with the growth of new technological solutions (Laudon & Traver, 2017). It has globally revolutionized the trading industry (Turban et al., 2018). However, if we examine Namibia, the country is gradually moving into the fourth industrial revolution and thus far, the infiltration of e-commerce is still in the infant stage. "E-commerce is undoubtedly the future that most companies will have to face"(Varela, Araújo, Vieira, Manupati, & Manoj, 2017, p. 4). The research project sought to discover the factors that influence the adoption of e-commerce unique to a Namibian organization. It identified challenges of e-commerce adoption and critical success factors; how e-commerce can be effectively adopted within a Namibia organisation? The study only considered the aspect of buying and selling of tangible products online, the study did not consider other modes of e-commerce except business to customer. On the Business to Customer model only the sell-side (business side) was studied, this was under the bases that e-commerce has not yet infiltrated the Namibia market enough to have a concentrated buyer-side (Customers). Both quantitative and qualitative data was collected and was interpreted using data triangulation.

The study offers substantial information on e-commerce within the Namibian context. The research findings indicate that the legal aspect is the primary challenge to be addressed for e-commerce to be considered in a Namibian aspect including perceived security and risk-related issues. The study has indicated recommendations to overcome the existing challenges and for future studies on e-commerce related issues.

DAY 2 ABSTRACTS

POSTGRADUATE STUDENTS' PRESENTATION (ORAL PRESENTATIONS)

Chemical characterization of the volatile constituents of the aromatic extracts of Sarcocaulon mossamedense

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Abstract

Sarcocaulon mossamedense, also called okamuti (small tree) by Himba communities, belongs to the family of Geraniaceae. The plant is mostly found in Namibia, the western part of South Africa and the southern part of Angola. Although no local traditional knowledge is associated with the species, the plant has attracted some commercial interest. The Opuwo Processing Facility, an essential oil production facility in Namibia, is exploring the possibility of producing essential oil from the bark of S. mossamedense. However, attempts to produce essential oil using steam distillation resulted in low yields, therefore solvent extraction methods must be used. The purpose of this study was to produce different aromatic extracts from S. mossamedense bark and to characterise their major volatile constituents. Solvent extraction with dichloromethane (DCM) and ethanol (EtOH) was performed. Extraction with dichloromethane provided the best yield. Subsequently the extracts were analysed with gas chromatography – mass spectrometry (GC-MS) and GC with flame ionization detection (FID). A total of 28 compounds were identified in the extracts, of which 9 were only present in the DCM extracts and 6 were only present in the EtOH extracts. The oil of S. mossamendese was found to contain a complex mixture of compounds, mostly triterpenoids, acetic acid esters, and aliphatic hydrocarbons. The compound present in the highest concentration in the extracts was identified as a triterpenoid, α-amyrin.

Exploration of Lead-Like Enhanced (LLE) front-loading to source lead compounds from medicinal plants in Namibia

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Abstract

Medicinal plants remain an important source of new drugs, new drug leads and new chemical entities (NCEs). Natural products, sourced from medicinal plants, have contributed approximately 50% of all current approved drugs, and the important physicochemical properties of these molecules in the development of drugs has been recognized. We have embarked on a study to evaluate the antimalarial and antitubercular potential of eight selected indigenous medicinal plants, by applying a method developed by Camp et al., which entails front-loading crude extracts with lead-like and drug-like properties. In this approach, lead-like enhanced (LLE) extracts were prepared using solid phase extraction (SPE) with Strata-X as adsorbent to separate drug-like compounds from the crude extracts. Antiplasmodial activity against the chloroquine-sensitive NF54 strain of Plasmodium falciparum was evaluated using the parasite lactate dehydrogenase assay and antimycobacterial activity against the Mycobacterium tuberculosis H37Rv-GFP strain. The results obtained, showed that the LLE extracts of Terminalia sericea, and Sarcocaulon marlothii displayed superior antiplasmodial activity with IC50 values of 3.3 µg/mL, and 2.1 µg/mL, respectively, compared to their crude extracts - IC50 values of 8.78 µg/mL and 8.8 µg/mL respectively. For Adansionia digitata, an IC50 of 2.37 µg/mL was obtained for the MeOH fraction from the SPE, which is two-fold more active compared to the crude, wheras the LLE was devoid of avtivity. Surprisingly, none of the LLE extracts displayed antimycobacterial activity. A comparison of the NMR profile of the crude organic, LLE extract and MeOH fraction of S. marlothii and the application of preparative thin layer chromatography lead to the isolation of five partially pure compounds which are currently undergoing biological testing.

Performance evaluation of Photovoltaic (PV) modules under different deployment conditions

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Abstract

Commercially available photovoltaic (PV) modules currently are comprised of two main groups: crystalline silicon modules and thin film modules. Crystalline silicon modules are based on mono- or poly-crystalline forms of silicon while thin film modules are based on amorphous silicon or compounds like Cadmium Telluride (CdTe) and copper indium diSelenide (CIS). The thin film modules are cheaper due to lower production cost. They also exhibit lower temperature coefficients compared to crystalline silicon. There is a perception in the PV industry that thin film modules will exhibit superior performance in hot climates as well as better tolerance and better performance in lower solar radiation locations. Our task was to determine if there is a scientific evidence for such perceptions.

Measurements were done at two stations in South Africa with different climates: Port Elizabeth (PE), having coastal humid and relatively cool climate, and Johannesburg (JB), having dry, semi-arid climate. One minute interval power output of the modules and irradiance incident on the modules were provided for JB during a period of 6 months. For PE, the power output and module temperature were provided while the GHI and ambient temperatures were obtained from the SAURAN website.

The assessment was based on the following performance indicators: specific yield (SY), specific yield per unit land/roof area occupied by modules (SY/A) and the relative module efficiency ($\eta rel.$) for sunny days and cloudy days in each location. ANOVA statistical test and Tukey post-hoc test at 5% significance level were used for comparison of the daily SY, SY/A, $\eta rel.$ and average module temperatures between the different technologies at each location.

A regression model was created to determine how the solar radiation and ambient temperatures at a location affect the SY of the modules. Our findings indicate that both these conditions have an impact on a module's SY, with the SY increasing linearly with the solar radiation while decreasing linearly with the ambient temperature during sunny days.

At both locations under cloudy conditions, the performance of all types of modules is comparable. Under sunny conditions, CIS shows the highest SY in both locations, CdTe shows the highest SY/A in JB while p-Si shows the highest SY/A in PE, and a-Si shows the lowest SY, SY/A and $\eta rel.$ in PE. Furthermore, CIS remained the coolest and p-Si the hottest in the JB location.

In conclusion, significant difference in performance between technologies is only ob- served during sunny conditions. The performance cannot be generalised for thin films, as they have shown vast differences in performance between different performance indi- cators. These results are based only on the first year of module deployment and can be expected to change with time due to module degradation.

Determination of local meteoric water lines along a precipitation gradient, Namibia

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Abstract

Precipitation is the main input in the hydrological cycle and plays a big role in groundwater recharge. To understand the isotopic fingerprint of groundwater, it is important to first comprehend the isotopic signature of precipitation, the mother source. Isotopic composition of precipitation was determined along a precipitation gradient at three sites namely: Tsumeb (600 mm/a precipitation; Waterberg (450 mm/a) and Kuzikus (240 mm/a precipitation). Precipitation samples from Tsumeb and Waterberg were collected during the rainy season from 2017 to 2018, while Kuzikus samples were collected between 2014 and 2015. A total number of 83 precipitation samples were collected, whereby 20 samples are from Tsumeb, 29 samples from Waterberg and 34 samples from Kuzikus. Precipitation samples were analysed using a Los gatos water stable isotope spectro analyser at the hydro-lab, University of Namibia. Precipitation isotopic values for $\delta^{18}O$(‰) range from -9.08 to 5.19 for Tsumeb, -15.96 to 5.09 for Waterberg and -12.54 to 4.75 for Kuzikus, while $\delta^{2}H$(‰) isotopic values for Tsumeb, Waterberg and Kuzikus range from -73.3 to46.7; -117.5 to 40.6 and -82.5 to 47.8 respectively. Scattering of rain samples along the global meteoric water line in the areas could be attributed to a seasonal effect. No significant correlation was observed between $\delta^{18}O$ and the amount of precipitation for Tsumeb, Waterberg and Kuzikus as the R^2 values are 0.0841, 0.0881 and 0.2083 respectively. Local meteoric water line equations for Tsumeb, Waterberg and Kuzikus were obtained using a linear regression method and are $\delta^{2}H = 7.782\ \delta^{18}O + 6.7361$, $R^2 = 0.953$; $\delta^{2}H = 7.3748\ \delta^{18}O + 5.7704$, $R^2 = 0.9713$; $\delta^{2}H = 6.6349\ \delta^{18}O + 10.037$, $R^2 = 0.9308$ correspondingly. All the slopes obtained from three study sites are lower than that of a global meteoric water line equation. A lower slope could be an indication that the local precipitation has experienced some subcloud evaporation, leading to enrichment of heavy isotopes. The effect is more pronounced at Kuzikus where the slope is 6.634. Our findings could serve as baseline for those three study sites with regards to further isotopic investigations in the study areas especially in tracing the origin of groundwater.

Identification of toxic compounds of the Wild Onion, Dicadi glaucum

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Abstract

Dipcadi glaucum is a poisonous plant that is known to be toxic to livestock, but the compounds responsible for the toxicity have not yet been identified. In this study the phytochemical profile of D. glaucum was investigated to identify its toxic compounds. Firstly, phytochemical screening was carried out on the leaves and bulbs of the plant in order to determine which classes of phytochemicals are produced by the plant. Then a detailed chemical screening approach was followed where gas chromatography – mass spectrometry (GC-MS) and high pressure liquid chromatography – ultraviolet spectroscopy – high resolution tandem mass spectrometry (HPLCUV-HRMSMS) were used to screen for the presence of compounds with potential toxicity. The phytochemical screening revealed the presence of alkaloids, coumarins, flavonoids, triterpenes, saponins, sesquiterpene lactones, and cardiac glycosides, which are groups of phytochemicals know to be toxic to livestock. The GC-MS data showed that some of the major constituents of the dichloromethane (DCM) extracts are straight-chain alkanes (C29-C35). An α,β-unsaturated lactone that is known to be a potent acetylcholinesterase inhibitor (and hence may potentially be neurotoxic), dihydroactinidiolide, and its hydroxylated, and ester analogues were also identified in the DCM extracts. The LC/MS/MS analysis of the methanol extracts of the plant material revealed the presence of a number of nitrogen-containing compounds, including 2amino-1,3-octadecanediol, citrulline, a 1,2-aminoalkyl alcohol, and an unidentified alkaloid.

Determining large vertebrate herbivory effects on ranch condition and vegetation composition from water points in Khaudum National Park, Namibia

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Abstract

Drought conditions lead to water shortage causing National Park and Game reserve managers to provide supplementary water to wildlife. These large vertebrate herbivores however spent more time around water points during the dry season which may lead to degradation of vegetation and soils. In Khaudum National Park, large Vertebrate Herbivore numbers have increased rapidly around water points during the dry season and had

profoundly altered vegetation composition thus, compromising ecosystem integrity. Therefore, the study sought to determine to what extent large vertebrate herbivores have contributed to changes of rangeland condition, species composition, diversity and richness from Doringstraat, Burkea, Tsau and Leeupan #1 water points. Vegetation inventories were done in plots demarcated from the piosphere, 0 m, 100 m, 200 m, 500 m, 750 m, 1000 m, 1200 m, and 1500 m radiating from each Water Point. Chi-square was used to test for differences in the ecological classes of grasses. Hierarchical Cluster Analysis (HCA) was used to test for differences in species composition. Two way ANOVA was used to test for differences in species diversity and richness from water points. The ecological classes of grasses showed differences along the distance gradient ($\chi^2 = 59.74$; $p = 0.00$) and among water points ($\chi^2 = 40.13$; $p = 0.00$) as a result of overgrazing. HCA separated vegetation into seven distinct floristic associations thus, revealing 30% dissimilarity of the least similar species. Species diversity and richness revealed no differences from the water points. Results from this study suggested that k-selected species increased further from the water points due to moderate disturbance regimes whilst r-selected species showed the opposite. This caused decreaser species to decline by 27% in highly disturbed sites whilst increaser species increased by 77% in disturbed sites within the first 200 m distance from water points. This was because large vertebrate herbivores spent approximately 37.5% of their time around water points. It was concluded that herbivory and trampling actions led to degradation of vegetation composition. However, differences in vegetation attributes was further agreed to derive from inherent differences in edaphic, topographic and feeding preferences. Therefore, it was recommended that the closing or resting of over-utliised water points would be a good management practice to ensure recovery of vegetation.

Quantification of model uncertainty in financial derivatives markets

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Abstract

There is a myriad of probabilistic and stochastic model describing the dynamics of financial markets among which jump-diffusion models, stochastic volatility models and many others. The questions of how to select a model, comes naturally, since the successful use any model depends on where and in which circumstances it is and/or remain valid. Knight (1921), distinguishes between model risk and model uncertainty. He describes a model framework of known probabilities as model risk, and model uncertainty when probabilities information associated with the model under consideration is not well known. So, different approaches can be used to select models to account for model uncertainty. However it remains difficult to get the anaytical formulas for distorted expectation, and numerical methods are rather often used to analyze model uncertainties. This work id focus on numerical methods that illustrate the ability to quantify uncertainty in financial markers. This research is intend to propose Local Risk minimizing (LRM) strategies and its implementation for some financial derivatives.

Diagnostic reference dose levels for conventional radiography examinations in Windhoek, Namibia.

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Abstract

The purpose of the study was to develop (Local Diagnostic Reference Levels (LDRL's) for commonly performed conventional radiography projections in Windhoek, Namibia. The objectives of the study were to: Measure KAP for for postero-anterior (PA) and lateral (LAT) chest, antero-posterior (AP) and LAT lumbar spine, AP pelvis, and PA and LAT skull projections. Calculate entrance skin and effective doses from the recorded KAP values. To compare the KAP, entrance skin doses and effective doses with internationally established reference levels for the same procedure as well as similar studies in Africa. Develop conversion coefficients from KAP values for estimation of effective and skin doses in clinical practice. The study was conducted in three (3) hospitals located in Windhoek, Namibia. Hospital one (1) was a national referral hospital with a total capacity of 964 beds. Hospital two (2) was a private radiology practice attached to a private hospital with a total capacity of 1024 beds. Hospital three (3) was an intermediate hospital with a capacity of 955 beds. All three hospitals utilise computed or digital radiography x-ray imaging systems and are affiliated to the University of Namibia. Ethical approval was gained from the research ethics committee (REC) of the Cape Peninsula University of Technology as well as the Permanent Secretary of the Ministry of Health and Social Services (Namibia), Director of the National Radiation Protection Authority (NRPA) and permission to conduct the study received from the principal radiographers of the hospitals in the study. Geometric data, exposure parameters as well as KAP measurements were obtained from 218 patients referred for seven projections that is PA and LAT chest, AP and LAT lumbar spine, AP Pelvis, PA and LAT skull. Specifications concerning the x-ray equipment for each hospital were obtained from the manufacturer's manual available at each hospital. The information recorded included generator type, name of the manufacturer, type of x-ray tube, anode angle, and total tube filtration. Entrance skin, and effective doses were calculated through Monto Carlo simulations by entering the geometric data, exposure parameters and equipment specifications and KAP values into PCMXC 2.0 software (Finland). Microsoft excel 2016 was used to analyse data. Third (3^{rd}) quartile values for KAP, ESD and ED were calculated. The research question was answered by means of inferential statistical analysis. The correlation between the ESD, ED and KAP were determined using Pearson's tests. The third quartile values of the ESD and KAP obtained were also compared with that published in the literature. In this study, Local DRL's established for PA chest (0.0033mGy2), 0.0066mGy2 for LAT chest (0.0197mGy2) for AP Lumbar Spine, (0.0274mGy2) for LAT Lumbar spine, (0.0250mGy2) for AP Pelvis, (0.0092mGy2) for PA skull and (0.0058mGy2) for LAT skull by combining data from the three hospitals (Table5.1).

Assessment of antimicrobial activity of endophytic fungi associated with moringa ovalifoliA Dinter & A. Berger

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Abstract

Antimicrobial resistance has become a global issue. Thus, safer and novel antimicrobial drugs are eagerly awaited. Moringa ovalifolia is a native tree to Namibian and Southwestern Angola arid zones. Investigations of its endophytic microbiome and their potential to produce novel and unique classes of secondary metabolites has not been explored. The purpose of this study was to evaluate the diversity and antimicrobial activity of endophytic fungi isolated from M. Ovalifolia from Kiamsab West Farm (Khomas Region) against selected human pathogens. In total, forty five endophytic fungal isolates were obtained on Malt extract agar. Molecular identification using the internal transcribe spacer (ITS) sequences revealed that all isolates belonged to Ascomycota phylum, 64% were Aspergilus species, 25% were Penicillium species, 7% were Davidiella species and 4% were other unclassified species. Twenty eight morphological different isolates depicting good antimicrobial activities by agar well diffusion methods with highest inhibition zone 13 mm and lowest being 1 mm were subjected to secondary metabolites extraction. The minimum inhibitory concentration (MIC) values of the ethyl acetate extracts ranged from 50 mg/ml to 6.25 mg/ml. The viable count studies suggested these extracts to be bactericidal. Maximum likelihood revealed the phylogentic relationships of all isolates from this study. Fungal isolates were optimized for maximum production of the antimicrobial agents. Most isolates had their best activities against at least three pathogens at pH 7, temperature 30-35oC after 21 days incubation. The findings of this study indicate that endophytic fungi associated with M. ovalifolia serve as a potential source of bioactive compounds, deserving further investigations for clinical applications.

Antimicrobial synergy testing by time-kill methods for plants traditionally used as herbs and spices from Kabbe constituencies in Zambezi region, Namibia

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Abstract

Scientific research on indigenous knowledge as an alternative key to unlock the power of food safety has gained much interest recently. However, there is a lack of verified scientific information about the usage of indigenous plants as traditional herbs and spices; and their contributions toward food safety. The aim of this study was to determine the synergistic effects of plants extracts traditionally used as herbs and spices in Kabbe constituencies of the Zambezi region against selected food-borne pathogens. The time-kill synergy study was performed in triplicate on seven DCM:MeOH plant part extracts exhibiting the strongest antimicrobial activity (6.25 mg/ml): Eucalyptus sp. leaves, Eucalyptus sp. barks, Morus sp., Nymphaea lotus, Capsicum sp., Cleome gynandra, and Ludwigia leptocarpa and twenty-one combinations of these extracts. Mean of colony counts (log10 CFU/mL) versus time at 0, 4, 18 and 24h was analysed. Individual plant extracts were considered microbicidal when a ≥ 3 $\log_{10}$ decrease in CFU/ml was reached compared with the initial inocula. On the other hand, the synergy of the plant extracts combination was defined as a ≥ 2 $\log_{10}$ decrease in colony count at 4, 18, or 24 hours with the antimicrobial combination compared to the most active single plant extract. Indifference was defined as a < 2 $\log_{10}$ increase or decrease in colony count at 4, 18, or 24 hours with the combination compared with the most active plant extract alone. Antagonism was defined as a ≥ 2 $\log_{10}$ increase in colony count at 4, 18, or 24 with the combination compared with that by the most active plant extract alone. The Eucalyptus sp. extracts were reported to have microbicidal effect against all nine test microbial culture. Twenty-three synergistic effects were observed with Saccharomyces cerevisiae, Salmonella typhimurium, Staphylococcus aureus, Proteus vulgaris, Pseudomonas aeruginosa, Escherichia coli, and Clostridium perfringens. The combinations of Eucalyptus sp. extracts with either Morus sp., Nymphaea lotus, or Cleome gynandra had antagonistic effects on all nine test microbial culture. This results demonstrated the antimicrobial activity in traditional herbs and spices in addition to their indigenous uses. Evaluation of mechanism of actions for these plant extracts against food-borne pathogens is needed, in order to understand better the antimicrobial activity observed. Toxicity studies are also needed to support the safe usage of these plants as food additives and natural preservatives for food safety applications.

Mercury concentration in muscles,livers,gills and stomach content of Southern mullet(Liza richardsonii) in the Walvis Bay lagoon

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Abstract

The Southern mullet (Liza richardsonii) is one of the most dominant fish species found in the Walvis Bay Lagoon. It is a commercial species that is being caught by the artisanal fishers over many years. However, its ecology was still not well understood. The study aimed to investigate the bioaccumulation of Mercury (Hg) in southern mullet's tissues. The study compared the total Hg concentration between different tissues including muscles, livers, gills and stomach content tissues and related the Hg concentration to fish body size (total length). The study was conducted in the Walvis Bay Lagoon. A total of 25 individuals from subsamples of the total catch were collected monthly.Samples were analysed using the Direct mercury analyser. Results indicated the significant differences between total Hg concentrations among the four tissues. The concentrations of Hg were below the World Health Organisation limits for fish (0.5 mg/kg). The understanding of mercury bioaccumulation in the southern mullet, which is an important food resource for humans, may lead to it being used for assessing the extent of pollution in the Walvis Bay lagoon.

Evaluation of machine learning classification of ham and electronic fund transfers scam smses

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Abstract

The last decade saw the emergence of mobile banking and a pervasive transcendence of spams from email to SMS communications. M-banking offer users an ability to execute EFT transactions using mobile devices and allow them to receive SMS notifications acknowledging their transactions. While this offers convenience to normal m-banking users, in the age of SMS spams it present prospects that spammers leverage to scam money and goods from them. To execute these scams, spammers send forget EFT (e.g. e-wallet) deposit notification SMSes to unsuspecting users' mobile numbers, then contact them and request for reverse transfers of the supposed erroneous deposits acknowledged by the bogus notifications. When contacting the users, spammers often only

request back a portion of the purported deposited amounts and at times use socially engineered stories to entice and lure users to fall for the scams. Similarly, during goods exchanges, scammers use forged deposit notification SMSes to trick sellers to believe that they paid for goods. The high affordability for Namibia's mobile operators SIM cards and the readily access to m-banking accounts such as e-wallet to anyone with valid SIM numbers provides a favorable operating environment for the EFT SMS scammers. This work was inspired by the pervasive reporting of EFT SMS scams in local media, which mostly involves FNB Namibia, the country's largest bank by market share and the observed lack of dedicated IT solutions to address the problem especially on the users' side. Drawing key inferences from literatures on novel spam filtering techniques, this study's work draws out a roadmap of research methods essential to aid a successful employment of machine learning classification to address the EFT SMS scam problem. The study collected ham (or legitimate) and EFT scam SMS datasets from FNB Namibia m-banking users, extract features for classification from the datasets and optimized them. The features were then used to build and evaluate Support Vector Machine, Naïve Bayes and Random Forest SMS classifier models following a 10-fold cross validation technique. The study results suggests that if guided by appropriate research to warrant noble efficacy, machine learning based SMS classification could be implemented into effective practical mobile applications for detecting EFT scam SMSes. The envisaged future works extension to this study would look toward realization of such implementation.

Properties of front-end electronics of the compact high energy camera prototype for gamma-ray astronomy

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Abstract

Electronics are a key component for all modern detector systems. The Compact High Energy Camera (CHEC) is a full-waveform camera designed for the dual-mirror Small-Sized Telescopes (SST) of the Cherenkov Telescope Array (CTA). The main components of the front-end electronics for CHEC are photo-sensors, preamplifiers and TARGET modules. CTA is planned to be a large observatory with up to 70 SSTs, and 2048 camera channels per SST. In this study pulse waveforms generated by the camera channels and output by the preamplifier channels were analysed and parameterised in order to identify the different characteristics of the pulse waveforms. Characterising the pulse waveforms will help to better understand the behaviour of different electronic channels during camera mass production and during observations as well. An automated analysis procedure that will be able to identify faulty camera channels has been established. A cubic spline has been fit to the data in order to get a good representation of the data and for better comparison of the behaviour of the different electronics channels. The interpolated pulse waveform has a gradually rounded peak, while the actual pulse waveform has a rather sharp

peak. In addition, for comparing the behaviour of the different electronic channels, the frequency distribution of the different characteristics are determined. In this study, it was found that the rise time of the pulse waveform is on average (6.0 ± 0.3) ns, with an average fall time of (15.0 ± 0.8) ns, thus showing consistency in the behaviour of the different channels.

The spawning dynamics of two hake species (Merluccius capensis and Merluccius paradoxus) off the Namibian coastline

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Abstract

There is limited information describing the spatial and temporal maturation dynamics of the two hake species. These species are evaluated and managed as a single stock in Namibia and South Africa. Therefore, comprehensive knowledge of their reproductive dynamics is needed to inform management, if the current management approach advantage one species over the other, regarding their recruitment. The study aimed to asses and compare the reproductive dynamic aspects such as the length-frequency composition (LFC) sex ratio (SR), length-weight relationships (LWRs) and Condition factor (K) and investigate maturation dynamics including gonadal maturation, Gonadosomatic Index (GSI) and Hepatosomatic Index (HSI) of the two coexisting hake species. Analyses were based on total samples of 8162 specimen of which 4378 were M. capensis and 3783 were M. paradoxus collected on a monthly basis from January 2018-September 2019 by Tunacor commercial fishing company. Preliminary findings of this study showed that the length range for M. capensis was 21.1-78.5cm while M. paradoxus was 21.5-72.8cm for both sexes. The male to female sex ratio for M. capensis and M. paradoxus in the ecosystem found to be 1:2.8 and 1:4.9 respectively and both species exhibited an isometric growth (b=3). Based on the monthly variations of the gonadosomatic index and the percentage of the different gonadal development stages revealed that M. capensis spawning period occurred from August to September. Furthermore, results showed that both sexes of the two species were all in better condition throughout (K=1). This study concluded that young fish did not constitute the highest percentage of all the population and females outnumbers the for the two species. The length of both sexes of the two species increased with an equal proportion in the body weight. Gonadal maturation for M. capensis indicated that the fish stock did mature in the habitat, but M. paradoxus did not. Merluccius capensis uses its energetic reserves contained in the liver to assure gonadal maturation. The study further revealed that the habitat provided a good ecosystem to support the two fish populations.

Sustainable livelihood assessment of the Namibian marine subsistence shore anglers

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Abstract

This study assessed the contribution of fisheries to the livelihood of the Namibian marine subsistence anglers. These anglers are fishing for a living from the beach using fishing rods. They are not recognized by law therefore, they are using recreational fishing permit or register with Hanganeni Artisanal Fishing Association (HAFA) a government established association in Henties Bay. Studies focused on these anglers are limited resulting in little knowledge available concerning their livelihood and socio-economic status. The focused objectives are to assess the: a) livelihood assets, b) dependency level on fishing, c) vulnerability perspective of the anglers in Henties Bay. This study adopted the mixed-method data collection following the fact that livelihood research combines qualitative and quantitative methods drawn from a range of disciplines. Since only 6.5% of the Namibian population resides in the coastal area of which less than 200 marine subsistence anglers were reported in 2003, a total of at least 50 anglers was targeted. A structured questionnaire (consisting of both closed and open-ended questions) was employed to collect data through personal interviews. The questionnaire was formulated based on the sustainable livelihood framework by the Department for International Development (DFID) with five major sections: 1, Livelihood assets 2, Vulnerability context 3, Transforming structures and process 4, Livelihood strategies and 5, Livelihood outcomes. For preliminary results, 23 marine anglers were interviewed along Henties Bay fishing beach from April to May 2019. Among the most caught species, galjoen (Dichistius capensis) and silver kob (Argyrosomus inodorus) were highly demanded compared to other retained species such as Steenbras (Lithognathus aureti), blacktail (Diplodus sargus) and barbel. More than 90% of the anglers are literate aged 31-60 years old and few aged 21-30 including scholars. More than 70% of these anglers are living in permanent or temporally build houses at serviced land, well equipped with potable water and sanitary facilities. Majority of them have family sizes of 5-10 people and other additional dependants. Most anglers earn N$ 1000 to 3000 and N$ 3000- 5000 per month from fishing and other sources respectively. The results showed no relationship between the anglers' dependency level on fishing and their monthly income from fishing, the number of dependants and age groups. Majority of anglers have no challenges and some have no clue, what climate change means. Anglers with at least five years of fishing experience have noticed a decrease in both number and size of all species.

Determination of the suitability of mt gamsberg in namibia for millimetre wave astronomy by measurements of the precipitable water vapour

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Abstract

Precipitable Water Vapour (PWV) is the amount of water vapour in the atmospheric column above a location equivalent to the amount of liquid precipitation that would result if all the water vapour in the column was condensed. Water vapour is the main source of opacity in the Earth's atmosphere at infrared and millimetre to sub-millimetre wavelengths. The Event Horizon Telescope (EHT) is a large network of millimetre to sub-millimetre telescopes across the globe that is used to image supermassive black holes. The Africa Millimetre Telescope (AMT)isplannedtobebuiltonMtGamsberginNamibiaandshallcomplimenttheEHT.Inthis study, PWV at Mt Gamsberg and at the H.E.S.S. site was determined in order to asses the two sitesregardingtheirsuitabilitytoconductmillimetrewaveastronomyandfortheAMTtobuilt on Mt Gamsberg. PWV at the H.E.S.S. site was indirectly determined from sky temperature data which was taken from 2004 to 2019 by radiometers on four of the H.E.S.S. Cherenkov Telescopes (CT). The PWV at H.E.S.S. as a function of sky temperature as given by the CT radiometers was determined by relationships given by data from two other equipment present at the H.E.S.S. site, namely the NASA AERONET station and an ATMOSCOPE with the equipment recording PWV and sky temperature, respectively. The PWV at Mt Gamsberg was determined by scaling the PWV from the H.E.S.S. site to what it would be at the height of Mt Gamsberg. The monthly mean PWV was computed, from which seasonal variations were also characterized for both sites. The presented results indicate Mt Gamsberg is a suitable site to conduct millimeter wave astronomy and to host theAMT, however it was recommended that direct PWV measurements should be taken at Mt Gamsberg to confirm the result of this study.

A hybrid analysis approach to the high energy stereoscopic system phase ii mono-analysis

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Abstract

The High Energy Stereoscopic System (H.E.S.S.) is an array of imaging atmospheric Cherenkov telescopes located in the Khomas highlands of Namibia. Their primary purpose is to detect Cherenkov light (CL) produced by particles in extensive air showers which are produced by high energy particles (gamma-rays or cosmic rays), incident on the Earth's atmosphere. The array consists of four 107 m^2 optical telescopes and a larger 614 m^2 collective surface area telescope in the centre of the array. The larger telescope has the ability of detecting showers induced by lower energy gamma rays, allowing for the threshold of the entire array to be lowered. This can be accomplished by sophisticated analysis techniques. However, the analysis techniques that have thus far been used have not increased the differential sensitivity of the array as a whole as would be expected but perform worse than the standard 4-telescope analysis technique at medium and high energies. Data taken by the H.E.S.S. telescopes is analysed by fitting parameterized shower model images to actual images produced when observing a source (Model++ Analysis), using a goodness of fit approach. This work explores the distribution of one shower parameter introduced in 2009, the depth of first interaction (or primary depth). Adjustments to the primary depth selection criteria to distinguish signal against noise are made and applied for a more sensitive result.

In addition, multi-wavelength time-lag studies of Cygnus X-3 are also presented. Light curve correlations between hard/soft X-rays versus radio emissions over long periods are studied. These studies are laid out as supporting suggestions that lowering the energy threshold while maintaining the differential sensitivity to those energies would assist in the study of micro-quasars and possibly also to infer properties of blazars.

The new predictor-corrector method for systems of fractional differential equations arising in mathematical biology

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Abstract

A powerful predictor-corrector method is derived for the numerical solutions of linear and nonlinear ordinary differential equations of fractional order. Recently, fractional differential equations (FDEs) has being explored for a wide range of applications in sciences and technologies, for example, in biology, engineering, fluid mechanics, finance, physics, etc. In this work, we consider two such systems of FDEs arising in biology. The derivation, analysis and applications of this numerical method will be presented at the conference.

The Immunogenicity of Plant-produced Human Papillomavirus (HPV) Virus-like particles (VLPs)

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Abstract

The Human papillomavirus (HPV) L1 capsid protein can self-assemble into virus-like particles (VLPs) that are structurally like native virions. Three commercially available HPV vaccines that are effective at preventing HPV infections, are VLP based. However, these vaccines are expensive, therefore limiting their use in the poorer developing countries. Recently, the use of plants to produce vaccines has begun to be more favourably looked upon as a cost-effective alternative to conventionally used expression systems. The aim of this study was to evaluate the plant-based transient expression system as a tool to produce potentially cost-effective HPV L1 VLP-based vaccines, particularly for developing countries. The L1 proteins of eight high-risk HPV types (HPV 16, 18, 31, 33, 35, 45, 52, and 58) and two low risk types (HPV 6 and 34) were transiently expressed in Nicotiana benthamiana and the assembly of VLPs assessed by transmission electron microscopy (TEM). HPV 35, 52 and 58 VLPs were selected for immunogenicity studies in mice, as HPV 35 is the fifth most prevalent type in Africa and HPV 52 and 58 are among the most frequently reported high-risk types in Sub-Saharan Africa. The immunogenicity of the vaccines was evaluated by testing for the presence of anti-L1 antibodies in sera from immunised mice using enzyme-linked immunosorbent assays (ELISAs) and western blots. Sera from immunized mice were also tested for the presence of neutralising antibodies using pseudovirion based neutralization assays

(PBNAs). L1 proteins of all ten HPV types were successfully expressed in N. bethamiana, and TEM analysis showed the presence of fully assembled VLPs and/or capsomeres. The analysis of the immune response showed that type-specific L1-specific antibodies were produced which were able to successfully neutralize homologous pseudovirions in PBNAs. This study successfully demonstrated the potential for using plant-based transient expression systems to produce affordable and immunogenic HPV vaccines, particularly for developing countries.

The Investigation of the Pedagogical Orientations of Grade 8 Chemistry Teachers in Orchestrating Practical Demonstrations at Schools in Oshikoto Region, Namibia

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Abstract

The use of practical work in the teaching and learning of science is ubiquitous in all science classrooms in Namibia and globally. The Namibian National Curriculum for Basic Education [NCBE] (2018) advocates for incorporating practical work during science instruction. Despite the call from the NCBE for engaging learners in hands-on practical work, teachers in the Oshikoto Region resort to enacting practical demonstrations due to certain contextual factors. This study investigated the Physical Science teachers' pedagogical orientations when leading Grade 8 Chemistry practical demonstrations at schools in Oshikoto Region, Namibia. The first author is a Physical Science from Oshikoto Region and has particular interests in understanding how other teachers teach chemistry demonstrations in their classrooms. In terms of the contextualization of this study, the following aspects of Namibian teachers' pedagogical orientations with regards to practical demonstrations are investigated: teachers' pedagogical preferences; pedagogical actions; and views on the learning outcomes. Subsequently, the research was guided by the following question: What pedagogical orientations do Grade 8 teachers display when orchestrating chemistry demonstrations? The study was underpinned by the pedagogical content knowledge (PCK) as a theoretical framework and pedagogical orientation as a conceptual framework. This study followed a sequential explanatory mixed methods approach, of which phase I involved collecting quantitative data by means of a questionnaire survey that was administered to 87 Grade 8 Physical Science teachers from Oshikoto Region in Namibia. Phase II involved collecting qualitative data through lesson observations and semi-structured interviews of the 10 who opted for teacher-orchestrated demonstrations from a pool of 87 teachers who completed the questionnaire. Quantitative data were analysed by means of the IBM Statistical Package for Social Sciences 25, for the generation of percentages and graphs whereas data obtained from lesson observations and interviews were transcribed and coded using ATLAS.ti 7. The findings from this study revealed that the majority of teachers in the Oshikoto Region exhibit a preference for teacher-orchestrated demonstrations rather than entrusting practical activities to learners. The existence of contextual factors such as a lack of resources to conduct practical work,

insufficient curriculum time allocated for practical lessons and large class sizes are deemed to influence this preference. Teachers maintain that these demonstrations support learners in developing an understanding of science concepts, acquiring practical skills and developing an interest in science. The results further showed that through teacher-orchestrated demonstrations, teachers frequently apply certain pedagogical actions. These include inviting learners to make a prediction, asking learner to explain their observations, and facilitating a class discussion after the demonstration. This suggests that although demonstrations are teacher-orchestrated, teachers interact with learners through these actions to ensure that they are cognitively engaged.

Towards Greener preservation of edible oils: Use of Polyphenols

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Abstract

Edible oils such as sunflower oil, rapeseed oil, soyabean oil, canola oil and olive oil are important components in human diet and are extensively used in the food industry. Safe storage of edible oils has always been a problem in the food industry because the oils can easily undergo oxidative deterioration. Consumption of rancid oils by humans and lipid peroxidation in human bodies affects various metabolic processes through overproduction of free radicals. It is increasingly being realized that many of the modern human diseases are due to oxidative stress initiated by overproduction of free radicals. Studies focusing on polyphenols as a source of natural antioxidants of plant origin to delay oxidative deterioration of food products have increased worldwide. Both natural and synthetic antioxidants are widely used in protecting oils against oxidative deterioration and increasing the shelf life oil-containing foods. Natural antioxidants are greener preservatives because they are known to be safer than their synthetic counterparts. Currently there is an increased interest in sources of natural antioxidants to enrich oils towards shelf life enhancement. This review highlights some research works in which natural antioxidants from plant materials have been used to preserve edible oils. Most of the natural compounds from medicinal plant extracts have been found to be able to preserve edible oils against oxidative deterioration. The potential of most natural antioxidants from plant materials to preserve edible oils is comparable to that of synthetic antioxidants. Use of natural antioxidants from plant materials for preservation of edible oils is a promising approach that can be adopted by edible oil manufacturers.

Comparative Nutritional Analysis of Tylosema esculentum (Marama Bean) Germplasm Collection in Namibia

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Abstract

Malnutrition is a medical condition caused by chronic unbalanced diets. It is characterised by stunting and wasting in children. Malnutrition causes approximately 45% of all deaths in children between 0-59months worldwide. In Namibia, 24% of children under the age of 5years are stunted while 6.2% are wasted. Therefore, a need for nutritious alternatives like Tylosema esculentum, commonly known as marama bean, an underutilised legume is essential. Marama bean seeds have high protein and lipid contents and low cultivation demands as it grows in sandy soils with minimal water and fertiliser requirements. Ten accessions of marama bean seeds were analysed for their nutritional composition. Minerals analysed were calcium, iron, magnesium, phosphorus and zinc. Their range of concentrations were 750.1-2306.2 $mgkg^{-1}$, 53.9-322.4 $mgkg^{-1}$, 1764.1-7415.0 $mgkg^{-1}$, 4300.8-5267.9 $mgkg^{-1}$ and 32.2-48.8 $mgkg^{-1}$ respectively with no significant difference in concentration among the ten accessions. Correlation analysis of the minerals within the accessions showed that the correlations between zinc-magnesium and zinc-phosphorus concentrations were significantly different as compared to the rest of the pairs for all accessions. The ranges of crude fats and carbohydrates' content were 29.9%-44.1% and 19.4%-39.0% respectively and were not significantly different. However, protein analysis determined that there was a significant difference with PMBC2 (mean 34.6%) being the most significant accession. Therefore, PMBC2 was found to be the most suitable accession for crop development and domestication. This study's main contribution to the domestication of marama bean was the identification of superior accessions based on nutritional composition.

Production Boreholes Water Quality Evaluation Using GIS Based Geostatistical Algorithms in Windhoek

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Abstract

The contemporary threats of climate change have however prompted the dependency on production boreholes as a sustainable supply for domestic water in Windhoek. Therefore, maintaining the production boreholes water quality has however remained a vital intervention for a city like Windhoek. The aim of this research is to provide an overview for evaluation of water quality for production boreholes in Windhoek, through applying geographic Information system and geostatistical algorithms. Furthermore, the production boreholes water quality parameters, chloride, Iron, temperature, pH and electrical conductivity were all sampled and analyzed from existing production boreholes owed by the City of Windhoek; maps of each parameter were created using geostatistical (kriging) approach. Experimental semivariogram values were tested for different ordinary kriging models to identify the excellent fitted for the five water quality parameters and the exceptional models were selected on the basis of mean square error, average standard error, root mean square error and root mean square. The results showed that this method is an appropriate tool for environmental spatial distributed parameters. However, pro-active measures must be taken into consideration before the water of the production boreholes are used domestically, as the water is not save at certain areas of Windhoek due to high temperature causing bacteriological contamination to occur in the production boreholes.

UNDERGRADUATE STUDENTS' PRESENTATION (ORAL PRESENTATIONS)

BIOLOGICAL SCIENCES

ANALYSIS OF ACTINOMYCETES FROM MINE TAILINGS, THEIR PLANT GROWTH PROMOTING ACTIVITIES AND HEAVY METAL TOLERANCE

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Abstract

Mine tailing heavy metal contamination can cause many human health risks and serious ecological problems. There is, therefore, a pressing need for the development of highly selective yet cheap and efficient alternatives that can mitigate heavy metal concentrations in mine tailings to environmentally accepted levels. Nowadays, bioremediation using microorganisms is receiving much attention due to their good performance. The aim of this work was to investigate heavy metals resistant actinomycete strains with plant growth traits isolated from abandoned mining in Uis Erongo Region. The isolates were screened for indole-3-acetic-acid (IAA) production, protease activity, phosphate solubilization and heavy metal resistance against copper, cobalt and lead. Results for heavy metal resistance showed that most of the isolates were resistant to the 3 metals at the lowest concentration (10mM) especially UMT 5, UMT 6, UMT 10, UMT 11 grown on media supplemented with Pb. The results showed different levels of heavy metal resistance; the minimum inhibitory concentration (MIC) recorded was 1.51 mg/L for Pb , 2.10 mg/L for Co and 2.00 mg/L for Cu. All 12 isolates were found to possess plant growth enhancing traits. The majority of the isolates exhibited more than one trait and were classified as follows; 6 phosphate solubilizers, 12 IAA producing isolates, and 7 isolates with proteolytic activity. The results indicate that actinomycetes from Uis mine tailings can be used as efficient plant growth enhancing agents and that plants can be grown in soils contaminated with low concentrations of heavy metals in the presence of those isolates.

Keywords: Uis mine tailings, PGPR, heavy metals, plant growth enhancing.

Antibacterial effect of *Moringa oleifera* leaves and seeds

Abstract

Moringa oleifera is considered as the most useful plant in the world since it has many benefits and its well-known bactericidal potential. In this study, ethanolic extract of the Namibian *Moringa oleifera* leaves and seeds were extracted and investigated for the ability to inhibit bacterial growth using disc diffusion method. *Moringa oleifera* seeds and leaves inhibited the activity of bacteria species which include *Bacillus cereus, Escherichia coli, Salmonella typhi, Shigella sonnei and Leisteria monocytogenes*. *Moringa oleifera* extracts has inhibited the growth of bacteria species where the leaves extract show the greatest mean inhibition zone of 7.3 and the seed shows mean inhibition zone of 6.58 . Three replicates were carried out. Data were analyzed in SPSS by testing for normality, t-test and one-way analysis of variance (ANOVA). The data were normaly distributed. According to the T-test, p(0.485)>0.05 therefore there is no significant difference how seeds and leaves inhibeted bacteria strains. The ethanolic extract of *Moringa oleifera* leaves and seeds showed antibacterial activity against tested bacteria while the aqueous extract showed no antibacterial effect.

Mutation breeding study on oyster and shiitake mushrooms using gamma irradiation

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Abstract

Shiitake and Oyster mushrooms have a variety of benefits ranging from human consumption to various industrial and medicinal uses. High yield and good quality are the primary objectives for agriculturally important crops, mushrooms included. Significant agronomic traits such as a shorter growth cycle and the prevention or reduction of spore formation have been recommended to be considered for better mushroom breeding. The narrow genetic variation in the present mushrooms hampers the strain selection of the growers. Mutation breeding by using gamma radiation has been noticed to create genetic variation in mushrooms. Six different species were grown on Potato dextrose agar (PDA) media and radiation was applied using a CO60 source Gammacell Model No. 220. The gamma radiation doses used ranged from 0 Gy, 0.5 Gy, 0, 75, 1.0 Gy and 1, 5 Gy. 0 Gy is used as a comparative control. Sample tests were replicated two times. Records were based on visual observation and mycelia growth measurements for running bottles and bags. Harvested fruiting body were weighed and their average stipe and diameter measurements were recorded. The results obtained in both the mycelia growth and fruiting bodies of the species were inconsistent. There was a declining effect with the increase of the radiation in some species, while in others it seemed random. The findings of the study affirms that irradiation can have an impact on the genotype of the mushrooms and can be used to derive desired mutant characteristic that can be economically beneficial in the mushroom industry.

Key words: Mushroom, cultivation, irradiation, Gammacell Model No. 220

Physico-chemical, Microbiological and Sensory analysis of Probiotic yoghurt fortified with Baobab fruit pulp

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Abstract

Baobab (*Adansonia digitata* L.*)* is referred to as a majestic tree which produces high amount of nutrients and polyphenol content. The baobab fruit has potential to improve local diets and livelihoods. It is underutilised and its potential not yet fully acknowledged therefore, there is a need to unpack its potential into value added products. The aim of the study was to develop and evaluate the effects of adding different concentrations of baobab fruit pulp on the quality characteristics of yoghurt made from cow's milk. The slightly tart and refreshing taste makes it a good flavour enhancer, and it blends well with both sweet and savoury recipes. The baobab fruit pulp has high pectin content (around 25%), giving it a thick and creamy mouth-feel, which makes it an ideal and functional ingredient in many applications from smoothies to yoghurts. Yoghurt is a fermented dairy product, which has several health benefits. Yoghurt starter culture consists of *Streptococcus thermophilus* and *Lactobacillus delbrueckii* bulgaricus. These Gram-positive thermophilic organisms ferment the sugar lactose to lactic acid which makes the yoghurt tart, discourages the growth of pathogens, and prevents spoilage. Lastly the lactic acid causes casein, to form a solid curd, which results in a thick texture. The study focused on the physicochemical, microbiological and sensory analysis of baobab-yoghurt fortified with baobab pulp. Physicochemical characteristics and microbial load of baobab yoghurt and the plain yoghurt were assessed over a course of 28 days stored at 4 °C. The pH of the plain yoghurt reached 4.6 at the end of 28 days while the 40% fortified yoghurt reached 3.6 at the end of 28 days stored at 4 °C. Moreover the results indicated that the baobab fruit pulp yoghurt had a mean moisture content of 79.76% while the plain yoghurt had a higher mean of 84.64%. Titratable acidity values were within the average value of 0.4 acidity recommended for plain yoghurt. Microbial count for yeast and mould kept increasing for day 28 for the 40% fortified yoghurt. Lastly the protein concentration increased due to the addition of the baobab fruit pulp. Sensory evaluation test indicated good consumer acceptability with a mean score of 4.67 for yoghurt fortified with 30% baobab fruit pulp. This study shown and confirmed that value addition to locally produced food and beverages could be achieved with local additives to enhance the nutritional and organoleptic properties of this product and increase its value in the local market.

Determination of Antibiotic and Lignocellulolytic Enzyme Producing Fungal and Bacterial Communities in the Hot Springs of Namibia

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Abstract

Extremophiles have over the last few decades gained popularity among researchers due to their robust proteins which enable them to survive in extreme environments. Hot springs can be classified as an extreme habitat due to its extremely high temperatures which can rise to 100 ºC or more. Various microorganisms belonging to all 3 domains of life that thrive in hot spring environments have been studied, with some studies primarily focused on their extremozymes and antimicrobial properties. However, there is a dearth of information on the enzyme and antibiotic producing potentials of bacteria and fungi isolated from Namibian hot springs. This study was therefore aimed at determining the diversity, antibiotic and lignocellulolytic enzyme producing potentials of fungi and bacteria isolated from the Gross Barmen Hot Springs in Namibia. For determination of lignocellulolytic enzyme production, the strains were cultivated on a minimal salt medium supplemented with sawdust as the carbon source and incubated for 21 days at temperatures of 25ºC for fungi and 30ºC for bacteria. Crude extracts from each isolate were then used as crude enzymes for the digestion of cellulose and xylan using CMC and xylan agar as substrates, respectively. Determination of antimicrobial activity was done following the agar well diffusion method against a range of clinical pathogens grown on Mueller-Hinton agar. Sequencing analysis of microbial genomic DNA resulted in the identification of four bacterial and three fungal isolates. Seven of the ten isolates showed CMCase and Xylanase activity though none of the isolates exhibited antimicrobial activity. Crude fungal cellulase enzymes liberated glucose from CMC in quantities ranging from 0.4 mg/ml/minute - 1 mg/ml/minute while production of glucose by crude bacterial cellulases ranged from 0.5 mg/ml/minute - 1.9 mg/ml/minute. These isolates may come in handy in future biomass conversion strategies involving the use of lignocellulosic materials for production of biofuels.

Production of Antimicrobial and Antioxidants from Heavy Metal Resistant Filamentous Fungi.

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Abstract

The resistance acquired by pathogens against the commonly used antibiotics has become an important health issue throughout the globe. Therefore, the scientific community is continuously searching for new classes of antimicrobial systems that could act efficiently against these pathogens. Fungi have emerged as an interesting option capable of synthesizing numerous bioactive metabolite compounds that are known to have a potential source of antioxidant among other properties. The aim of this study was to investigate in vitro antioxidant, and antibacterial activities of the extracts of the Fungi isolated from mine tailings in Uis, Erongo region. The antioxidant and antimicrobial activities were tested using stable free radical DPPH and disc diffusion methods respectively. The antimicrobial activity of the extracts was tested against gram-positive bacteria *(Listeria monocytogenes, Bacillus cereus and Enterococcus faecalis*), *gram-negative bacteria (Escherichia coli, Campylobacter jejuni, C. coli, Pseudomonas Aeruginosa, Shigella sonnei and Staphylococcus typhi*) and the fungus *Candida albicans*. The 8 species isolated from the Uis mine tailing were identified as *Aspergillus terreus, Aspergillus subramanianii, Phoma sp., Phoma sp., Penicillium chrysogenum, Penicillium sp., Penicillium sp.* and *Aspergillus niger*. Heavy metal tolerance was assessed using Zinc, Copper, Lead, Cobalt and Nickel salts. Heavy metal salts dilutions with SDA were prepared for various increasing concentrations. *A. subramanianii* was found to exhibit unique tolerance traits in zinc supplemented medium, with maximum growth still seen at dilution as high as 23g/l, with no MIC recorded. Fungal isolates were tested. Based on results obtained, preliminary antimicrobial screening showed that fungal species each inhibited 2 or more test pathogens. *A subramanianii, P. chrysogenum, Penicillium sp.,* and *Penicillium sp.* all exhibited antifungal activity against *C. albicans* as well as antibacterial activity against 2 or more bacteria while the rest of the fungi only showed antibacterial properties. Fungal mycelia of the fungi grown on SDA were used to prepare methanolic extracts from which antioxidant properties were determined. Each isolate exhibited strengths and shortcomings in the different assays. These findings indicate that potential antioxidants and antimicrobial compounds of great interest are present in these fungal species and can be used for the improvement and defence of human health.

Key words: antioxidants, antimicrobial, methanolic extracts, Uis mine tailings, Heavy metal tolerance.

Assessment of condition index and bioaccumulation of heavy metals in two mussel species, *Perna perna* and *Mytilus galloprovincialis* along the central west coast of Namibia

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Abstract

The use of bivalves such as mussels, *Perna perna* and *Mytilus galloprovincialis*, is common in the study of marine pollution and the effect of pollutants on ecosystems. Namibian coastal ecosystems are threatened by pollution from mining, industrialization, commercial fishing and population growth. The aim of this study was to assess the bioaccumulation of heavy metals (Cd, Pb, Cu and Zn) and the condition index (CI) of mussels, *P. perna* and *M. galloprovincialis* at four sites (Oyster Farm (OF), Walvis Bay harbor (WBH), Dolphin beach (DB), and Long beach(LB), along the central west coast of Namibia. The accumulation of Cd, Pb, Cu and Zn within mussels was investigated using inductively coupled plasma optical emission spectrometry (ICP-OES) by the Analytics Laboratory Services (Analab). Condition index of *M. galloprovincialis* from OF was significantly ($P<0.05$) higher (33%) than CI of *M. galloprovincialis* (0.49%) from WBH. Heavy metal concentration in mussels varied significantly ($P < 0.05$) between sites with OF recording the lowest levels of Cu (4.7mg/kg), Cd (1.6mg/kg) and Pb (0.3mg/kg). Overall *M. galloprovincialis* recorded higher levels of Cd and Zn while *P. perna* recorded higher levels of Cu and Pb, This confirm that different mussel species bio accumulate heavy metals differently hence multispecies assessment of heavy metals is recommended. Heavy metals concentration were below the permissible limits by World Health Organization (WHO) except for Pb (from all sites), Zn at OF and LB. This is a concern as mussels are harvested for human consumption.

Keywords: Bioaccumulation, Condition Index, Mussels (*P_perna* and *M_galloprovincialis*), Heavy metals, Central west coast of Namibia

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ISOLATION, MORPHOLOGICAL AND PHYSIOLOGICAL CHARACTERISATION OF *ACTINOMYCETES* ISOLATES FROM DOROB NATIONAL PARK (NAMIB DESERT) SOIL SAMPLES

Abstract

Actinomycetes are the most widely distributed groups of microorganisms in nature which primarily inhabit the soil. They are the most economically and biotechnologically valuable prokaryotes, and have been recognized as sources of several secondary metabolites, antibiotics, and bioactive compounds which affect microbial growth. Desert habitats are especially rich in Actinobacteria, not necessarily extensive in taxonomic diversity, and also in the genetic diversity of their biosynthetic pathways for synthesizing novel new secondary metabolites. The main objective of this study was to isolate and characterize potentially antibiotic producing actinomycetes from the soil samples of Dorob National Park, Namibia.The soil samples were collected from the Dorob National Park in the Namib Desert, coast of Namibia. The collected samples were transferred to the microbiology research laboratory, in the department of biological sciences, UNAM, Windhoek, Namibia, where the research project was conducted. The soil samples were serially diluted and spread on ½ Zhang's Starch Soil Extract (½ ZSSE) actinomycetes isolation agar supplemented with nalidixic acid and cyclohexamide for inhibition of bacteria and fungi, respectively. Solid state fermentation and crude extraction was used for morphological characterization of colonies from pure culture by gram staining as well as for the physiological characterization of the isolates. CTAB and the ZYMO research kit were used for DNA extraction. The extracted DNA was amplified by Polymerase Chain Reaction (PCR) using 27F7 and 1492R7 universal primers which target a 1491bp region of the 16S rRNA. The samples were sequenced by Inqaba, Pretoria, South Africa, and a phylogenetic tree was constructed using the sequences of the amplified DNA. Different types of bacterial actinomycete colonies were observed, which had characteristic features such as rough powdery appearance with convex, concave or flat surface and different colours ranging from white, grey and crème. Molecular identification did not reveal strain of actinomycetes. However, the morphological characterization showed that the Dorob National Park soil has a diversity of actinomycetes. It is worth noting that isolation and characterizing of actinomycetes from such areas may contribute to the discovery of new actinomycetes. Further purification, structural elucidation and characterization are recommended to know the quality, novelty and commercial value of these actinomycetes and the antibiotics they produce.

Keywords: Actinomycetes, Isolation, ½ Zhang's Starch Soil Extract, secondary metabolites, Antibiotics, characterization.

COMPARISONS OF BODY CONDITION OF CATTLE AND ZEBRA ON FARM KIAMSAB WEST 364, CENTRAL NAMIBIA.

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Abstract

The body condition score (BCS) of animals is used to assess the proportion of reserved energy stored in body fat and muscle tissues of an animal. It is recognized by animal scientists and producers as an important and useful management tool for distinguishing differences in animal productivity, health and nutritional needs. The overall objective of this study was to determine and compare the body condition of zebra and cattle on Farm Kiamsab West 364. On the farm, which is situated 100km from Windhoek along C26 road in the Khomas Region, visual inspection of the animal's body was done using binoculars. The animals were observed and scored from distances ranging between 50 - 80m. A scoring method using a numerical score ranging from 1 (emaciated) to 5 (extremely fat) was used. Assessments were done in the beginning of May, and a total of 18 zebra and 150 cattle were sampled. There were no animals in BCS 1, BCS 2 and BCS 5 and all animals were in good body condition ranging between score 3 and 4. A comparison of body condition scores between cattle and zebra, revealed that body condition was significantly associated with animal species, with cattle having higher counts of individuals increasing from BCS 3(38.62%) to BCS 4 (48.97%). This could be attributed to the differences in digestion and nutritional requirements between ruminants (cattle) and hind-gut fermenters (zebra) which enabled cattle to digest available food sources more efficiently than zebra. To compare body condition between male and female in cattle and zebra, the results showed that there was no significant association between body condition and sex in either cattle ($\chi2=0.007$, df =1, $p>0.05$) nor zebra($\chi2=1.231$, df =1, $p>0.05$). This could be because animals were sampled at the beginning of early dry season when resources were still readily availaible, thus females retained extra fat after calving while males stored excess fat to retain their reproductive fitness in the winter. Body condition and zebra age group comparisons, showed no significant association ($\chi2=0.554$, df =2, $p<0.05$). This could possibly suggest that we monitored expanding populations for which food resources were not limited, thus body condition was equally distributed between age groups. However, body condition and cattle age groups, revealed a significant association ($\chi2=14.574$, df =2, $p<0.05$). Adults were in better body condition than juveniles and sub-adults, because adults are more dominant in their social ranking and may get preference to access better quality food resources than juveniles. Adults are physically stronger than juveniles which could have allowed them to access resource areas that are inaccessible to juveniles .

Key words: Body condition score, Farm Kiamsab West, Zebra, Cattle, Namibia.

In vitro screening of *Colophospermum mopane* and *Nymania capensis* extracts for anticancer activity and cytotoxicity

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Abstract

Melanoma skin cancer is one of the most deadly form of cancer due to uncontrolled growth of abnormal cells, this occurs when unpaired DNA damage to skin cells triggers mutations, or genetic defects, that lead the skin cells to multiply rapidly and forms malignant tumors. Topical chemotherapy is one of the methods used to treat skin cancer, which uses anti-cancer drugs to destroy cancer cells; however, in certain individuals, development of alopecia occur due to consequence of non-specific cytotoxicity. There has been, therefore, a growing interest in cancer research to develop alternative cancer treatments, which are less toxic. The use of plant-based drugs is perceived to be more effective than synthetic based-drugs, as they display potential anticancer activities and are less harmful to overall human health. The aim of the study was to identify phytochemical compounds in *Colophospermum mopane* bark and *Nymania capensis* root plant extracts and evaluate potential anticancer activity on human skin cancer cells A375 and cytotoxicity on fibroblast cells 3T3. The study was conducted at the University of Namibia, Faculty of Science, Biological Department in the Malaria Research Lab. The plants were extracted with –dichloromethane (DCM)-methanol (MeOH) (1:1 v/v). The presence of different phytochemical compounds were identified qualitatively with thin-layer chromatography (TLC), confirmed by the use of different spraying reagents. The compounds tested were alkaloids, coumarins, anthraquinones, flavonoids, steroids and terpenoids. Anticancer activity of A375 cancer cells as well as cytotoxicity activity of 3T3 fibroblast cells were treated with different concentrations of *C. mopane* bark and *N. capensis* root extract treatment solutions, re-suspended in dimethyl oxide (DMSO) and media, in 96-well plates. Viability post-treatment was assessed using the Sulforodomine B (SRB) assay and absorbance was measured at 540 nm. Experiments were done in triplicates. The phytochemical results indicated a presence of alkaloids, coumarins, anthraquinones, steroids and terpenoids and absence of flavonoids in both *C. mopane* bark and *N. capensis* root extracts. The study results lead to the conclusion that *Colophospermum mopane* root extracts had the highest cell viability of 92.7% at 3.125µL extract concentration in cytotoxicity activity on 3T3 fibroblast, while *Nymania capensis* bark extract had the lowest cell viability of 28.1% at 100µL extract concentration in antiacancer activity on A375 cancer cells. Further investigation on phytochemical analysis is recommended, as well as to determine apoptotic or necrotic effects of extracts.

Key words: *Colophospermum mopane*, *Nymania capensis*, Fibroblast cell (3T3), Melanoma cancer cell (A375), SRB assay, anticancer and cytotoxicity.

Determining the Phenological Response of *Aptosimum lineare* to Climate Change in Namibia

ABSTRACT

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Climate change is causing changes in the phenology of plants and animals globally. This study focused on the effects of temperature, rainfall, latitude and longitude on the flowering phenology of *Aptosimum lineare* over the period 1960 to 2016 in Namibia. Simple linear regression was used to explore trends in temperature, rainfall, latitude & longitude as well as phenological responsiveness of *Aptosimum lineare* to these parameters. The Chi-square of independence was used to test the association between the two *Aptosimum lineare* forms and season. Results of the study revealed that the average annual maximum and minimum summer temperature, and mean minimum summer temperature increased significantly from 1960-2016 in Namibia (P-value<0.05). However, the mean maximum of summer and winter temperatures did not significantly change (P-value>0.05). There was a significant shift in flowering time of *Aptosimum lineare* from 1922-2016 (P-value<0.05). This study has demonstrated that changes in flowering phenology of *Aptosimum lineare* are attributable in part to the changes in average annual maximum and minimum summer temperature, mean minimum and maximum summer temperature. Results further revealed that flowering dates of the *Aptosimum lineare* delayed by 8 days/degree during the period from 1922 to 2016. It was also revealed that the two forms of *Aptosimum lineare* flower in the same season and may not be reproductively isolated. However, *A. lineare* with dark blotched throat showed a significant response to change mean summer minimum and maximum temperature and also to winter rainfall (P-value<0.05).

Keywords: climate change, phenology, *Aptosimum lineare*, temperature, rainfall, Namibia

DIVERSITY ANALYSIS AND LIGNOCELLULYITC ENZYME PRODUCTION POTENTIAL OF HALOPHILIC BACTERIA ISOLATED FROM NAMIBIAN SALT POND.

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Abstract

Microbial enzymes play a key role as industrial catalysts, leading to their diverse applications and use in various industries. The rapidly changing industrial dynamics require that there be a constant search for novel microbial enzymes which could be key for new product development and profit realisation. Bacteria form a significant group of microbial populations in soil, plant tissues and marine environments. They produce many valuable extracellular enzymes which can decompose a variety of organic materials. Enzymes produced by some bacteria are applied in different industrial processes as cellulases, proteases, amylases, lipases, xylanase, chitinase, cutinases and pectinases. While there has been a search for bacteria and other microorganims from diverse extreme environments, not much is known about bacterial populations thriving in Namibian extreme environments, neither their potential as producers of novel enzymes. This study was, therefore, aimed at determining the diversity, as well as the lignocellulytic enzymes (xylanase and cellulases) producing potentials of halophilic bacteria isolated from Namibian salt ponds. The bacterial isolates were obtained by culturing salt pond soil samples on starch casein agar. The resultant colonies were purified by sub-culturing followed by genomic DNA extraction and PCR amplification targeting the 16S rRNA gene. The amplified DNA was then subjected to sequencing analysis to determine the identities of the isolates. For enzyme analysis, the isolates were grown in fermentation media for 21 days followed by centrifugation to separate the cell mass from the crude enzyme, which was then applied in agar well diffusion assays to determine enzyme activity. Identification by 16S rRNA gene sequencing revealed that the obtained isolates were closely related to the *Cutibacterium*, *Stenotrophomonas, Enterobactericiae*, *Acinetobacter* and *Halomonas* genera, respectively. Among them, isolates belong to the genera *Cutibacterium*, *Stenotrophomonas, Acinetobacter* and *Halomonas* were positive for xylanase production when grown on nutrient agar supplemented with 2.5 g of xylanase. Further screening was done to test for their enzymatic activity using 3,5-Dinitrosalysaclic acid (DNS) of which *Cutibacterium acnes* and unidentified marine *bacterioplankton,* had the highest absorbance of 3.00 at 540 nm with the least enzyme activity by *Stenotrophomonas.* Bacteria such as *Cutibacterium acne, Halomonas magadiensis, Stenotrophomonas maltophilla* can be industrially used as sources of biofuel sources hence they produce many valuable extracellular enzymes which can decompose a variety of organic materials.

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Effectiveness of *Moringa oleifera* seed as coagulant for water purification

Abstract

The method of water purification using synthetic coagulants puts a financial burden on developing countries and this leads to the rise in price for good quality water. Therefore, rural folks find it hard to afford the purified water and this forces them to get water from contaminated sources such as dams, rivers and streams. It is in this light that this research was carried out to evaluate the effect of *Moringa oleifera* seed powder as a natural coagulant which is cheap and readily available. A complete randomized design in three replicates was used to test the following seed powder amounts: 4.0 g, 6.0 g and 8.0 g into 400 ml of the stream water. The effect of the *Moringa* seed powder amounts on pH, turbidity and colony number was determined. Data were analyzed in SPSS by testing for normality, t-test and one-way analysis of variance (ANOVA). The results showed that there were no significant differences in the number of colonies for the three amounts of *Moringa* seed powder. However, for mean colony number, t-test showed a significant difference between *Moringa* seed powder and the control without *Moringa* seed powder at $p(0.00)<0.05$.Therefore, *Moringa oleifera* seed powder has the potential to be used as a natural coagulant for water purification purposes.

Key words: coagulant, pH, turbidity and colony

The Effects of Ocean Acidification on Calcifiers from the Intertidal zone off the Namibia Coast

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Abstract

Ocean Acidification (OA), a result of anthropogenic CO_2 presents a threat to calcifying marine organisms of ecological and economic importance, globally. The pH of surface water in the open ocean has already dropped by 0.1 pH units and are expected to drop by a further 0.3-0.4 by 2100. However coastal zones are characterized by pH variations and acidification could either buffer or amplify the response of calcifiers. This research highlights how elevated levels of CO_2 in seawater may impact the shell size and dissolution rates of different molluscan species. In this study we focused on Pacific oysters (*Crassostrea gigas*), Brown mussels (*Perna perna*) and Granular limpets (*Scutellastra granularis*). *P. perna* and *S. granularis* are native species, while *C.gigas* is an exotic species that contributes to Namibia's economy through its extensive use in aquaculture for export. A

laboratory study was conducted where seawater was carbonated to pH ranges of 7.0, 7.5, 7.8 and 8.1 (control). Calcifiers were exposed to these 4 different treatments, containing 10 replicates each for a period of 3 weeks. There is a significant decrease in size (length and weight) with lowered pH levels. The Two-Way Anova test on the weight and length of shells revealed, *p* value of 0.00 < 0.05. There is an increase in weight dissolution rates among all the species, which expresses sensitivity towards ocean acidification. The Two-Way Anova test indicated a significant difference ($p<0.05$) between the mean weight of shells before and after exposure to treatments. However, the mussel *P. Perna* was strongly affected at pH 7.0 compared to the oyster *C. gigas* and the limpet *S. granularis.* There was a significant relationship between pH and species type and the influence on shell size. We demonstrate that calcifiers from the Namibian coast are vulnerable to OA. The negative impact on species could affect food web dynamics and the abundance of species. OA could also decrease the productivity of edible calcifiers which are of great consequence to the economy.

Keywords: Ocean acidification, *Crassostrea gigas*, *Perna perna*, *Scutellastra granularis*, shell dissolution

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DIVERSITY OF XYLANASE PRODUCING ACTINOMYCETES IN THE DUNES OF THE CENTRAL NAMIB DESERT.

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Abstract

Actinomycetes are Gram-positive bacteria with high G+C content that are important for nutrient recycling of natural substrates and degradation of soil organic material. Actinomycetes can secrete enzymes to degrade organic material such as lignocellulose. Some enzymes produced by actinomycetes for degradation of lignocellulose include hemicellulose, especially xylanase. The aim of the present study was to isolate and screen for xylanase producing actinomycetes from the sand dunes of the Namib Desert. Desert sand dune samples were serially diluted and spread plated on ½ Zhang's Starch Soil Extract (ZSSE) agar. Isolated colonies having characteristic features such as powdery appearance with convex, concave or flat surface and colour ranging from white, purple, gray, green, orange, cream to pinkish and yellowish were selected. Pure colonies were targeted for genomic DNA extraction followed by PCR amplification and sequencing analysis to identify the isolates. For enzyme production determination, isolates were grown in Erlenmeyer flask containing ½ Zhang's Starch Soil Extract broth for 3 weeks. The 3-week broth was centrifuged to separate the crude enzyme (supernatant) from the cell mass. Hemicellulase activity was determination using the agar well diffusion test where the crude enzyme extract was filled into wells on xylan agar plates. Hemicellulase activity was observed by formation of halos around the wells.

All isolates were able to produce the enzyme, with halos ranging from 4 mm to 13 mm in diameter. Sequencing results showed that 5 of the isolates were related to the genera *Rhodococcus*, *Acinetobacter*, *Bacillus*, *Stenotrophomonas*, and *Ralstonia*. The study indicated that Namibian Desert soil had diverse group of actinomycetes.

Keywords: Actinomycetes, Isolation, hemicellulose, xylanase, lignocellulose, screening.

SPATIAL AND TEMPORAL COMPARISONS OF HERBACEOUS SPECIES COMPOSITION AND DIVERSITY AT FARM KIAMSAB WEST 364, CENTRAL NAMIBIA

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Abstract

A comparative study on temporal and spatial variations in species composition and diversity was conducted at Farm Kiamsab West 364. The farm is mainly a semi-arid savanna, located 100km south-west of Windhoek, along a C26 gravel road. Two contrasting ecozones were identified based on the topography. Ecozone 1 was characterized by rugged steep mountains whilst Ecozone 2 had gentle rolling mountains with a groundwater dam. In these two ecozones, herbaceous species richness, composition and forb diversity were determined using a stratified systematic sampling approach. For spatial comparison, herbaceous plant richness, composition and forb diversity were compared between Ecozone 1 and Ecozone 2. Data from a similar study carried out in Ecozone 1 in 2018 was used to compare herbaceous species richness, composition and forb diversity with results of the current study. In each Ecozone, a total of ten 50m line transects were placed at 200m intervals. Along each transect, six 1m2 quadrats were placed 10m apart, in which all herbaceous species were identified and the abundance of forbs recorded. Forb species diversity was calculated using the Shannon-Wiener diversity index (H') and compared using a Mann-Whitney U test. A Hierarchical Cluster Analysis (HCA) was used to compare species composition between years (Ecozone 1 in 2018 and 2019) and sites (Ecozone 1 and Ecozone 2 in 2019) using species weighted data. The study revealed that both the herbaceous composition and richness differed significantly between years (2018 and 2019) ($U=1154.500$, $p<0.05$) as well as between sites [Ecozone 1 and Ecozone 2] ($U=1414.00$, $p<0.05$). The mean forb diversity was significantly higher ($U=1686.500$, $p<0.05$) during 2019 than in 2018. Similarly, Ecozone 2 had significantly higher mean forb diversity compared to Ecozone 1 ($U=1060.000$, $p<0.05$). Variations in rainfall between 2018 and 2019 and the spatial topographic heterogeneity could have contributed to varying herbaceous composition, richness and forb diversity between years (2018 and 2019) and sites (Ecozone 1 and Ecozone 2). Low rainfall received in 2019 (28mm) compared to that received in 2018 (57mm) led to some species becoming less abundant while others even disappeared. High topographic heterogeneity in Ecozone 1 created niches for more species to occupy resulting in higher species richness, composition and diversity in Ecozone 1 compared to Ecozone 2. Furthermore, the level of disturbance by grazing was low in Ecozone 1 because cattle

struggled to climb up the steep mountains, resulting in higher species richness, forb diversity and distinct species composition.

Keywords: Herbaceous composition, Herbaceous diversity, Farm Kiamsab West, Species richness; Namibia

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Antioxidants and microbiological quality of red (wine) grape pomace of Kristall Kellerei winery in Namibia

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Abstract

Grape pomace (GP), also known as marc, is the by-product produced when grapes have been pressed for the production of wine and consists of grape seed, skin and small stalks meshed into a pulp. For centuries this was exactly what marc was seen as, just another waste or by-product. However, during the last decade or so, several researchers around the world could provide evidence that this by-product is more than a gold mine when looking for bioactive phenolic compounds and beneficial microflora, some of which contribute to the production of bioactive compounds. These bioactive phenolics or secondary metabolites possess antioxidant activities that can either be produced as phytochemical compounds (phenolic and flavonoid content) or by the microflora present in the GP, including yeast and lactic acid bacteria (LAB). There is however limited literature on Namibian wine and the composition of its by-product. Therfore, this research work is aiming to contirubute to the knowledge on the red wine GP of a Namibian vineyard. Samples were collected from Kristall Kellerei, Omaruru, 220 km North West of Windhoek and analysed for their potential antioxidant activities and microbiological quality. Phytochemical content was determined with regards to total phenolic content (TPC) and total flavonoid content (TFC). Further aims were to establish whether the red wine GP exhibits free radical scavenging antioxidant activities (A.A) and, finally, to deduce the total microflora in the red wine marc with special emphasis on yeast, LAB and mould. TPC and TFC values ranged from 22,28±5,75 to 29,43±2,64 µg gallic acid equivalent (GAE)/mL and 7,89±3,37 to 22,52±4,73 µg catechin equivalents (CE)/mL respectively. Furthermore, the GP extracts showed high percentage of A.A to be present for DPPH radical scavenging activity (77,20±1,61 to 83,94±0,20%), however, it reduced by about 50% comparing to hydrogen peroxide radical scavenging assay (21,14±2,82 to 58,77±3,59 %). Yeast was cultured on Sabouraud Dextrose Agar (SDA) at 25°C, under aerobic conditions, with total plate counts that ranged from 7,07±0,03 to 7,65±0,19 log CFU/mL. Further evaluation of yeast colonies under the microscope revealed that there are at least 3 different types of yeast present in the GP. LAB was first cultured in de Man Rogosa and Sharpe (MRS) agar at 37˚C, under anaerobic conditions and showed total plate counts ranging from 7,21±0,21 to 7,26±0,17 log CFU/mL. The results obtained in this study however do not apply to all the vineyards in Namibia as geographical location and other environmental factors play an important role in the microbial and phytochemical composition of red wine GP. Our results showed that

red wine GP is a rich source for antioxidants and its microbial diversity is promising for future investigations especially for biotechnological applications and their roles in wine fermentation.

Assessment of the anti-malarial potential and cytotoxicity of *Terminalia sericea* and *Mundelea sericea*

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Abstract

Malaria is a life-threatening disease caused by the genus of parasitic protozoan *Plasmodium.* The World Health Organization estimated that in 2017 there were 219 million cases of malaria reported in 89 countries. In that same year an estimated 435 000 deaths were reported due to malaria. Africa carries the highest burden of malaria in the world, with 92 % of malaria cases and 93 % of malaria deaths. The emergence of resistant strains of *Plasmodium* presents a potential barrier, meaning there are not many effective chemotherapeutic drugs to treat malaria, this makes the testing and development of new antimalarial compounds very important. In most parts of Africa, people still use traditional medicines even if there is no scientific evidence of the efficacy or the safety of these medicines. Oxidative stress, defined as the imbalance between oxidative and antioxidative conditions in the body has been linked to the development of systemic complications caused by malaria, although antimalarial drugs induce oxidative stress to kill the parasites, recent research has shown that plant extracts with antioxidant properties showed high schizontocide and antiparasitic activity with only minor changes in the hosts reduction-oxidation balance. Also, the increase in total antioxidant capacity has been correlated to significant reduction in parasitaemia. *Terminalia sericea a*nd *Mundelea sericea* are used traditionally to treat malaria. This study, was therefore, carried out to assess the antioxidant properties of *T. sericea a*nd *M. sericea* as well as *in vitro* cytotoxicity, so as to determine the potential benefits of these two plants as an adjuvant antimalarial. Organic extracts of *T. sericea a*nd *M. sericea* were prepared, after which thin layer chromatography (TLC) was carried out to determine the classes of compounds present in the extracts. 2,2-diphenyl-1-picrylhydrazyl (DPPH) assay was carried out to determine the free radical scavenging activity. Sulforodomine B (SRB) assay was used to measure cytotoxicity. The 3T3-L7 Embryonic Fibroblast cell line from mice was used. The TLC showed the presence of alkaloids, anthraquinones, coumarins, steroids and terpenoids, which are major antiplasmodial compounds as well as terpenoids, steroids and alkaloids which are antioxidants. The DPPH assay showed that the *T. sericea* had a high free radical scavenging activity with an average percentage of 84.4 ± 0.097 for the highest concentration, *M. sericea* had moderate activity with an average percentage of 29.3 ± 1.362. The extracts showed very low cytotoxicity, *T. sericea* had an average cell viability of 98.91 ± 3.403 % for the highest concentration while *M. sericea* had an average cell viability of 158.9 ± 2.325 % for the highest concentration. With the low cytotoxicity

and high free radical scavenging activity, the use of these plants traditionally is supported and further investigations using *in vitro and in vivo Plasmodium* models is recommended.

Keywords: Malaria, sulforodomine B, 2,2-diphenyl-1-picrylhydrazyl, alkaloids, anthraquinones, coumarins, steroids, terpenoids, antioxidant, *Terminalia sericea, Mundelea sericea,* 3T3 cell line, Thin Layer Chromatography, free radicals.

Diversity and antimicrobial producing potential of fungi isolated from the dunes of the Central Namib Desert

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Abstract

Fungi are ubiquitous in nature, and are prominent producers of secondary metabolites which have various applications ranging from antimicrobials to enzymes to pigments of industrial use. Fungi from desert sand dunes have particularly been recognized as an important source of unique antimicrobial compounds in various studies. However, there is a dearth of information regarding fungi isolated from The Namib Desert, which therefore remains a potential reservoir of novel fungal species. This study was therefore carried out on the hypothesis that the Central Namib Desert sand dunes harbor a variety of fungi that are potential producers of antimicrobial agents. Sand dune samples were collected from the sand dunes of Central Namib Desert (near Swakopmund). Fungi were isolated by culture method on Potato Dextrose Agar. A total of 5 fungal isolates were identified and tested for antimicrobial activity against 10 test pathogens namely *E. coli, C. coli, C. albicans, S. sonnei, L. monocytogenes, P. aeruginosa, C. jejuni, E. faecalis, S. typhi* and *B. cereus.* Fungal isolates were first grown in fermentation medium for 21 days after which the crude extract was then used as crude antibiotic for determination of antimicrobial activity. Ampicillin and distilled water were used as positive and negative control respectively. Screening for antimicrobial activity was done using the well diffusion method on Muller Hinton Agar (MHA). Primary screening was carried out using fermented yeast extract broth. Secondary screening was done using the crude extract from different solvents namely, Hexane, Ethyl acetate and Chloroform. Zones of inhibition were measured after the incubation period of 24 hours at 30 ^{o}C. The presence of inhibition zone around the well indicates the antimicrobial activity of the isolate. The absence of the inhibition zone around the well indicated that the fungal isolate cannot inhibit the growth of that specific test pathogen. This study indicated proof that the Namib Desert harbor a variety of fungi that are potential producers of antimicrobial compounds.

Antimicrobial and antioxidant activity of halophilic microorganisms isolated from the Namibian Dead Sea.

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ABSTRACT

Ever since the 1980s, the rate of new antimicrobial discovery has declined drastically. Whereas, some pathogens have begun to develop resistance even to the third generation of antibiotics at an alarming rate. In addition, oxidative stress is involved in the development of cancer, Parkinson's disease, Alzheimer's disease and atherosclerosis in humans. Evidences suggest that halophilic habitats harbour microorganisms with promising sources of biologically active natural compounds that might be the ultimate solution to this problems. One such habitat is the sediment of Namibian Dead Sea, a former Strathmore South Tin Mine in the Namib Desert. Thus this study aimed in isolating and screening for antibacterial and antioxidant activities from halophilic microorganisms isolated from sediment of the Namibian Dead Sea. Ten microorganisms of which 7 are bacteria namely *Marinococcus luteus*, *Aquibacillus halophilus*, *Sediminibacillus albus*, *Virgibacillus kekensis*, *Buttlauxella ferragutiae*, *Aquibacillus salifodinae*, *Lysinibacillus haloterans,* and 3 fungal isolates: NDS057, NDS010 and NDS081 were isolated. The potent isolates were subjected for fermentation. The metabolites were extracted using chloroform solvent and were subjected for antimicrobial and antioxidant screening. Antimicrobial activity tests were carried out using agar disc diffusion methods with ten human pathogenic microbial strains (*Camplobacter coli, Campylobacter jejuni, Shigella sonnei, Escherichia coli, Salmonnela typhimurium, Bacillus cereus, Pseudomonas aeruginosa, Enterococcus faecalis, Listeria monocytogenes* and *Candida albicans)*. All isolates showed both antibacterial and antifungal activities, with *Lysinibacillus haloterans* showing activity against all the ten pathogens. However, *Virgibacillus kekensis* showed higher (27.3 mm and 16.3 mm) activity against *Shigella sonnei* and *Candida albicans* and isolate NDS081, *Aquibacillus salifodinae* showed antibacterial activity only against *Pseudomonas aeruginosa , Enterococcus faecalis, Campylobacter jejuni and Listeria monocytogenes*. The antioxidant properties of the extracts were appraised by means of two different antioxidant tests, namely; total phenolic content and 2,2-diphenyl-1-picrylhydrazyl (DPPH) free radical scavenging activities. The total phenolic content of the isolates varied from 4.38 mg GAE/g to 0.13 mg GAE/g. Total phenolic content of *Virgibacillus kekensis* was higher (2.75-4.38 mg GAE/g) as compared to the phenolic content of the other 10 isolates. The free radical scavenging activities of chloroform extract for *Marinococcus luteus* showed 78.1 % inhibition followed by NDS057 and NDS081 showing 56.6 % and 52.3 % inhibition respectively and the inhibition was compared with standard antioxidant ascorbic acid which showed 87.5 % inhibition. This study revealed that halophilic microorganisms isolated from the Namibian Dead Sea are an excellent source of secondary metabolites with antioxidants and antibiotics activities.

Keywords- Antimicrobial activity, antioxidant activity, oxidative stress, drug resistance

CHARACTERIZATION OF ANTIBIOTIC AND ANTIOXIDANT PRODUCING ACTINOMYCETES FROM THE NAMIB DESERT DUNES

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ABSTRACT

Actinomycetes have the ability to produce useful bioactive secondary metabolites with commercial and medicinal potential. Oxidative stress is characterized as an imbalance between the production of reactive species and antioxidant defense activity. Its enhanced state has been associated with many of the chronic diseases such as cancer, diabetes, and neurodegenerative and cardiovascular diseases. Due to the drastically increase of antibiotic resistant pathogens and non-communicable diseases, there is a great need for novel antibiotics and antioxidants. Therefore, the aim of this study was to evaluate the antimicrobial and antioxidant potential of actinomycetes from the Namib Desert dunes. Actinomycetes were isolated and grown on Starch Casein Agar. A total of 4 actinomycetes isolates were characterized, identified and tested against *Escherichia coli, Candida albicans, Pseudomonas aeruginosa, E.feacalis, C. jejuni, Campylobacter coli, Salmonella typhi, S.sonei, Listeria monocytogenes,* and *Bacillus cereus* for antimicrobial activity. Primary screening was done using agar well diffusion method. For the extraction of secondary metabolites three solvents, namely, ethyl acetate, chloroform and n-hexane were used and for the screening for antimicrobial activity the disc diffusion method was used and the MIC was determined. Chloroform extract showed maximum antibacterial activity followed by ethyl acetate. The antioxidant potential of the Chloroform crude extract exhibited strong reducing power activity. Therefore, this study proved that actinomycetes isolated from the Namib Desert dunes can be characterized and that they have antimicrobial and antioxidant activities.

Keywords: Soil actinomycetes, isolation, antibiotic activity, antioxidant activity, characterization

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Isolation of Actinomycetes from Namibian Desert soil samples (Dorob National Park 2)

ABSTRACT

Actinomycetes are filamentous, Gram positive bacteria that form spores and have genomic G+C content that is over 55%. These bacteria have been recognized as sources of several secondary metabolites, antibiotics, and bioactive compounds that have an effect microbial growth. The main objective of the present study was to isolate and characterize actinomycetes from Namibian Desert soil. The soil sample were collected from Dorob National Park 2, which is located in the Namibian Desert. The collected samples were transferred to the microbiology research laboratory, Department of Biological Science, University of Namibia, Windhoek, Namibia, where the whole project was carried out. Isolation of Actinomycetes strains were obtained by serial dilution method and grown on actinomycetes isolation agar. Colonies of pure cultures were physiologically and morphologically characterized by gram staining in order to fully characterise the isolates. Deoxyribonucleic acid (DNA) extraction was performed using the CTAB and ZYMO kit. Polymerase Chain Reaction (PCR) was used to amplify a 1491 bp region of the 16S rRNA using universal primers (27 F and 1492R). The samples were sent for sequencing to Inqaba, Pretoria, South Africa. Bacterial phylogenetic trees of maximum likelihood were constructed. Isolation plates developed different types of bacterial actinomycete colonies. Colonies having characteristic features such as powdery appearance with convex and flat surface and colour ranging from white, grey to cream were selected. The molecular characterization did not show any presence actinomycete, however morphological characterisation indicated that Namibian Desert soil have diverse group of actinomycetes.

Keywords: Actinomycetes, Isolation, Soil, DNA extraction, sequencing, characterization

Anti-biofilm activity of selected Namibian medicinal plants

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Abstract

The aim of this study was to investigate the anti-biofilm activity of selected plant extracts. The objectives were to determine the prevalence of nasal *Staphylococcus aureus* in smoking and non-smoking students from UNAM main campus. *S.aureus* were isolated for their ability to produce biofilms and their antibiofilm activity were assessed with plant extract.

The study involved 20 purposive randomly selected students were selected, with 10 females and 10 males. Of the 10 male/female 5 were smokers and the other 5 were non-smokers with a total of 10 smokers and 10 non-smokers. Informed consent was obtained from participants. The parties involved were all over 18 years of age with their age having been recorded in months. Clinical specimens were obtained from the nasal passage of the participants by swabbing with a cotton swab. The swabs were inoculated onto Mannitol salt agar (differentiating media). Yellow colonies surrounded by yellowing of the agar were observed on some plates, which was in indication of mannitol fermenting bacteria.

Pure cultures were obtained from the mixed cultures. Morphological, microscopical and biochemical essays were to determine whether the pure colonies were *S.aureus.* Gram staining, blood agar haemolysis and coagulase test were performed so that *S.aureus* isolates were obtained. Once all the biochemical tests have been done and pure cultures of *S.aureus* were stored in the fridge. Two smoking and three smoking females were positive for *S.aureus* whilst three non-smoking males and four non-smoking females were positive for *S.aureus.* Biofilm assay were performed on the 12 clinical samples. The same biofilm assay process was repeated but plant extracts were added to the microtiter plate to test for inhibition.

In conclusion the non-smokers were more prevalent to *S.aureus* within their nasal carriage whilst the smokers were not. Smoking might cause oxidative stress or reduce the overall population of *S.aureus.*

Key words: Prevalence, anti-biofilm resistance, *Staphylococcus aureus*, UNAM students.

LEAF EPIDERMAL STRUCTURES IN NAMIBIAN *CROTON* SPECIES AND THEIR TAXONOMIC SIGNIFICANCE

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Abstract

The taxonomic usefulness of trichome characters was explored in Namibian *Croton* species. The main trichome types among the *Croton* species were studied using the Scanning Electron Microscopy. Foliar trichomes of 7 Namibian *Croton* can be separated into four types namely lepidote, stellate, dendritic and glandular trichomes. In this study, the lepidote type comprises three subtypes namely subtype stellate-lepidote (radii webbed 30-50%) with porrect radius, which occurs in *C. leuconeurus*; subtype dentate lepidote (radii webbed 50-80%), found in *C. gratissimus* var. *gratissimus* and *C. gratissimus* var. *subgratissimus* and subtype lepidote sub-entire (radii webbed 80-100%), which occurs in *C. menyharthii* (with porrect radius) and *C. psuedopuchellus* (with lobed radii). Dendritic trichomes with porrect radius occur in *C. megalobotrys*. The glandular trichomes are characteristic of *C. benthamii*. In addition, a UPGMA-generated phenogram using macromorphological characters revealed 7 distinct clusters belonging to *C. benthamii*, *C. megalobotrys*, *C. psuedopuchellus*, *C. gratissimus* var s*ubgratissimus*, *C. gratissimus* var *gratissimus*, *C. menyharthii* and *C. leuconeurus*. Plant height and petiole length emerged as significant diagnostic characters for separating the Namibian *Croton* species ($p<0.05$). *Croton benthamii*, *C. pseudopuchellus* and *C. menyharthii* have petiole length shorter than 10 mm while the rest of the species have petioles longer than 10 mm. *Croton benthamii* and *C. pseudopuchellus* are shorter than 1 m and the rest of the species are generally taller than 1 m. The study also revealed that the two forms in gratissimus complex are indeed morphologically distinct from each other. A key to the *Croton* species of Namibia is for the first time constructed and presented using foliar trichome characters. A combined key using both macro- and micromorphological characters is also presented.

Keywords: *Croton*, Namibia, Taxonomy, Trichomes, Scanning Elecron Microscopy.

Molecular Speciation of *Anopheline* Mosquitoes from Kavango East Region, Namibia Using the Polymerase Chain Reaction (PCR)

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Abstract

Malaria is caused by protozoan parasites of the Genus *Plasmodium*, which have a sexual and asexual life stage with the latter taking place in humans and is responsible for the symptoms of the disease malaria. The sexual stage takes place in female *Anopheles* mosquitoes, the malaria vector responsible for transmission of parasites. Malaria can be prevented through protection of humans from *Anopheline* mosquitoes, when the mosquitoes are unable to have blood meals, they cannot transmit the disease. The *Anopheline* malaria vectors fall mainly into family complexes, the gambiae complex and the funestus complex whose members have different resting and feeding behaviours. Endophagic and endophilic members feed and rest indoors whilst exophilic and exophagic prefer to do so outdoors hence effective preventative approaches depend on the particular vector species. Mosquito species from the gambiae complex cannot be differentiated morphologically and molecular approaches are required for speciation and this information can be used to determine the best malaria vector control interventions based on the resting and feeding behaviour of the mosquitoes.

Anopheline mosquitoes were collected in Shadikongoro, Kavango East region using the human landing catch method and stored on silica gel until required for analysis by the Polymerase Chain Reaction. A mosquito leg or wing was used as the DNA source and primers for 18sRNA were used to differentiate the species using the method of Agubuzo (2018). Samples from known species, *Anopheles arabiensis*, *Anopheles gambiae s.s.*, *Anopheles merus* and *Anopheles quadrannulatus* were used as positive controls. The amplicons were run on a 2.5% agarose gel and the banding pattern was observed. A total of 448 mosquitoes were tested using this method, 96% of the samples were confirmed to be *An. arabiensis* from the *An. gambiae* complex by the size of the amplicon band (315 bp). A previous report by Kamwi (2005) showed that 89% of identified mosquito species by PCR were *An. arabiensis*. This shows that *An. arabiensis* continues to be the dominant vector in Kavango East region over a decade later. Both results show why malaria in the northern region remains endemic, *An. arabiensis* is an anthropophilic and endophilic (feeds on man and rests indoors, respectively), and exophilic (rest outdoors) vector. These characteristics make it an effective vector as it can be found resting both indoors and outdoors, thus they can avoid the humans protected by the IRS and LLINs indoors and feed on those not protected outdoors. It is recommended that IRS and LLINs should be used in combination with wearing long sleeves and trousers and applying spatial repellents in order to strengthen the mechanical barrier between the humans and the vectors both indoors and outdoors.

Key words: *Anopheles* species, IRS, LLINs, Malaria, Mosquitoes, Polymerase Chain Reaction, Endophilic, Exophilic, Endophagic, Exophagic

The effect of smoking on the prevalence of *staphylococcus* species among UNAM students.

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Abstract

The main aim of this research was to investigate if smoking effects the prevalence of *staphylococcus* species isolated from the nares of students from the university of Namibia. The objectives were: To determine the prevalence of nasal *staphylococcus aureus*, to determine the effects of cigarette smoking on the prevalence of *S. aureus*, to identify species that is coagulase negative, to determine whether age and gender also affect the prevalence of different *staphylococci* species. Before the swabs were taken from 20 randomly selected students, 10 males and 10 females, each student was provided with a consent form and a pamphlet that explains the purpose and aim of the research and how it will be carried out. With inform consent swabs were then take from each student and incubated in a nutrient rich agar at 37 degrees. 24 hours later swabs were then inoculated on to a mannitol salt agar and incubated at 37 degrees. Growth was observed by looking at shapes and colors of different colonies that grew and whether they can ferment the mannitol salt agar. When mannitol is fermented it produce acid, phenol red in the medium and changes color from red to yellow, 18(30%) of the 60 plates (first generation plates) were fermented. Creamy and yellow colonies were observed on the MSA. Gram stain was done to observe the shape (cocci) of the nasal bacteria, of the 40 plates, all (100%) were gram positive and cocci in shaped when viewed under the light microscope. Catalase test was also done to observe whether the gram + cocci is a *staphylococcus* or a *streptococcus*, all 40 (100%) plates (second generation) were gram positive staphylococcus because bubbles were observed when a small portion of a colony was mixed with hydrogen peroxide and salt water. Lastly a coagulase test was done to observe different species that are coagulase positive and negative. Blood agar and Baird-parker agar were used. For tube coagulase test 38(95%) of the 40 plates (second generation) tested positive for *staphylococcus aureus*.

THE DIVERSITY OF XYLANASE PRODUCING FUNGI IN THE NAMIBIAN "DEAD SEA"

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ABSTRACT

Extreme environments have usually been regarded as a source of microorganisms that produce proteins that enable them to survive in these harsh habitats. The Namibian Dead Sea can be considered an extreme habitat due

to the fact that it contains significant concentrations of sodium, chloride and other salts, with saline levels surpassing that of the ocean. However, some microorganisms survive in this environment. While bacteria derived from extreme environments have been extensively studied, studies on fungi from extreme environments are lacking, which creates a scientific data vacuum in this regard. The aim of this research was therefore to determine the diversity of fungi in the Namibian Dead Sea, as well as to determine their potential to produce xylanase enzymes. A total of 6 fungi were isolated (FG10, FG12, FG16, FG18, FG29 & FG57), and of these, 4 (FG10, FG16, FG18, FG57) were isolated from the soil sample while the other 2 (FG29, FG12) where isolated from the water sample. All 6 fungal isolates were grown on xylan agar (xylan as the sole carbon source) and results showed that 3(FG10, FG16, FG57) of the 6 (FG10, FG12, FG16, FG18, FG29 & FG57) fungi isolates were able to produce xylan degrading enzymes as clear zones were observed after staining the plates with iodine. FG16 isolate was the best producer of xylanase with significantly bigger halo/zones (with the triplicate zones having an average of 29mm) than the rest of the isolates (FG57 had an average of 25mm and FG10 an average of 23mm) ($P < 0.05$). The other 3 isolates (FG12, FG18, FG29) did not exhibit any xylanase activity. The growing demand for new and more robust xylanases for biotechnological applications (e.g. for biofuel production) has refocused biodiscovery efforts to environments never before explored, in an attempt to isolate and characterize new fungal strains with biotechnological potential. Some fungal isolates obtained in this study showed potential to degrade xylan, and could be possible candidates for use in biotechnological applications, especially generation of biofuels from lignocellulosic biomass.

Keywords: Xylanase; xylan; fungi; extreme environment

Evaluation of *Dichrostachys cinerea* extract for *in vitro* anti-inflammatory activity

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Abstract

Traditional medicine is described as the sum total of knowledge, skills and practices which are used to maintain or improve health, and to prevent, diagnose or treat physical and mental illnesses. These are usually based on the various assumptions, beliefs and experiences that are native to different cultures. In African countries, medicinal plants play an important role in healthcare systems. Use of medicinal plants as treatment instead of more conventional methods involving allopathic medicine, is common since they are usually the most inexpensive and accessible resources in local communities.

However the validity of most African medicinal plants has not been scientifically proven, thus creating a gap in the information on the effectiveness and safety of a significant number of indigenous plants. *Dichrostachys cinerea* is an example of a plant which is used traditionally to treat various inflammatory ailments such as tooth-ache, rheumatism and arthritis. However, the information on its safety and exact mode of action is limited.

This study was conducted to screen the methanolic extract of *Dichrostachys cinerea* for anti-inflammatory activity and the presence of classes of phytochemicals associated with such activity. The study also evaluated the cytotoxicity of the plant extract. The presence of coumarins, alkaloids, flavonoids, anthraquinones, steroids and terpenoids in the methanolic extract of the plant was determined using thin layer chromatography (TLC). Anti-inflammatory activity was performed on a melanoma cell line A375, using sandwich ELISA to analyse the potential inhibition of cytokine (IL-8) production by the plant extract. The cytotoxicity of the plant was tested using a 3T3 mouse fibroblast cell line and the Sulforhodamine B (SRB) assay.

Flavonoids, steroids, anthraquinones and terpenoids were detected in the *D. cinereal* organic extract and coumarins were absent. Cells treated with increasing concentrations of *D. cinerea* exhibited high cell viabilities (94.4 ± 3.30% -115.2 ± 1.40 %) which shows that the extracts were not cytotoxic to the 3T3 mouse fibroblast cells after the 48 hour incubation period. On the other hand, assessment of anti-inflammatory activity is currently on-going.

Thus, for now one can conclude that use of the plant in moderation may not negatively affect the individual if used at a concentration range of 3.125µg/ml -100µg/ml.

Key words: Inflammation, anti-inflammatory, phytochemicals, medicinal plants, *Dichrostachys cinerea*.

Screening for toxins production by *Staphylococcus aureus* isolated from UNAM students including smokers and non-smokers.

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Abstract

Staphylococcus aureus is a microorganism resident in the skin and nasal membranes with a dreadful pathogenic potential to cause a variety of community and hospital-acquired infections. The frequency of these infections is increasing and their treatment is becoming more difficult. The ability os S aureus strains to form biofilms, presence of enzyme coagulase, blood hemolysis, clamping factor, are some of the reasons tha determines the staphylococcal virulence factors among which the production of wide variety of toxins is highlighted. This study is aimed to (1) investigate the prevalence of nasal *Staphylococcus aureus* which is a coagulase positive staphylococci in UNAM students (main campus); (2) to compare the prevalence of *Staphylococcus aureus* between smoking and non-smoking including toxins production; (3) to characterise bacteria using morphological differences and biochemical tests; and (4) to screen bacteria isolates for their ability to produce toxins. This is the first study to report on the prevalence of *S. aureus* in nasal carriages of UNAM students and the screening of

toxins production. A total of 20 nose swab samples were collected from 2o students which includes smoking (10 students; 5males and 5females) and non-smoking (10 students; 5 males and 5 females) students in UNAM. All twenty students were found to be carriers of *staphylococcus* strains of which 60% isolates (25% smokers and 35% non-smokers) harboured *S. aureus* strains. The presence of the enzyme coagulase was tested using the tube coagulase test whereby 15 isolates (8 smoking and 7 smoking) were coagulase(+) and 5 isolates (2 smoking and 3 non-smoking) were coagulase(-) The most frequent toxins found were hemolysins that lysed the red blood cells when grown in blood Agar. To study the microbiologic characteristics of the special hemolytic phenotype was verified on the sheep blood agar plates whereby 50% of the isolates had no hemolysins, did not lyse the blood cells in the blood agar (Gamma hemolysis) consisting 4 non smoking 6 smoking isolates. 3 isolates caused beta hemolysis, 4 isolates caused double hemolysis (either gamma and alpha, betta and alpha, or betta and gamma) of which were 3 smoking isolates and 1 non-smoking. Virulence factors such as biofilm formation, coagulase, hemolysis and agglutination were the only things tested to verify if the strains were able to produce toxins. According to the results non-smokers had high prevalence of *S. aureus* and the high number of coagulase(+) Staphylococci in smoking isolates. Smoking isolates had more production of toxins due to its high hemolysis capabilities. While on the other hand, non-smoking isolates formed more biofilms compared to the smoking isolates.

Keywords: Nasal carriages, Enterotoxins, *Staphylococcus aureus*, UNAM students, coagulase, hemolysis, biofilm, agglutination, smokers, and non-smokers

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Assaying the effect of different flavoring ingredient on yoghurt quality.

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Abstract

Yoghurt is an increasingly popular cultured dairy product in most countries. Yoghurt is easily digested, has high nutritional value, and is a rich source of carbohydrates, protein, fat, vitamins, calcium, and phosphorus. The purpose of this study is to determine the effect of different flavouring ingredient on yoghurt quality and to determine different types of bacteria present on yoghurt. In this study, Three different types of yoghurt flavour were used, Banana, Strawberry and Peach. Two different types of agar were used Nutrient agar and EMB agar. Serial dilution and inoculation of plates was done, Incubation at 25ºC for one day. control (without additive) set type yoghurt were produced and stored for 1 days at 25ºC .Number of bacteria colony, Physico-chemical, microbiological properties and sensory quality of yoghurt samples were determined after incubation period, In this study, during storage period the results were analysed, resulted in total solids between 14.58-20.51%, fat 2.95-3.10%, protein 3.61-4.34%, ash content 0.82-1.08%, acidity 1.27-1.62, and pH 3.93-4.29 were found. Data were analyzed by analysis of variance (ANOVA) and T test. The results showed that total mesophilic bacteria count

were significantly different among yoghurt samples (P<0.05). Moreover Mold and yeast count showed significant increase during storage period. Sensory evaluation results showed that there were no any statistical differences among the yoghurt samples. In conclusion this study make use of ingredient with good flavor e.g. banana and to avoid the use of ingredients with major limiting factors e.g. use of soybeans flavor that hindering the production of testable yoghurt. To produce yoghurt with a good texture ,color and to increase the life span of yoghurt.

EVALUATION OF EFFICACY OF PLANT EXTRACTS AS ANTIBACTERIAL TREATMENTS.

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Abstract

Antibaterial resistance has continued to rise over the past decades due to the continuous use of conventional antibiotics. These resistant bacteria can cause serious diseases and this is a major public health problem as it results in higher medical costs and increased mortality. On the other hand, traditional health practitioners have been using medicinal plants to treat different infections for millennia. Hence, there is a great need to exprole medicinal plants as alternative next generation treatment for infectious diseases by evaluating their efficacies against different infectious organisims.The aim of this study was to evaluate the efficacies of selected plant extracts that are used by traditional health practitioners in Namibia to treat different infections.

In this study, the medicinal plant parts: *Colophospermum mopane* root and leaves, *Diospyros lycioides* leaves and *Ziziphus mucronata* root were screened for the presence of phytochemical compounds such as: alkaloids, flavonoids, coumarins, steroids, anthraquinones and terpenoids using thin layer chromatography. The disk diffusion assay was performed to evaluate the efficacies of the antibacterial activity against pathogens; *Escherichia coli*, *Enterococcus faecalis*, *Staphylococcus aureus* and *Shigella sonnei* . Ampicillin was used as the positive control and DCM/ MeOH was used as the negative control. Cytotoxicity was carried out to determine the viability of the cells after treatment with each plant extract, therefore determining the toxicity of the plants using the Sulforhodamine B (SRB) assay on the 3T3 fibroblast cell line.

For phytochemical screening; alkaloids, coumarins, steroids, anthraquinones and terpenoids were present in *C. mopane r*oot and leaves, *D. lycioides leaves and Z. mucronata* root. Flavanoids were absent in all plants. For the antibacterial assay both *Z. mucronata* root and *D. lycioides* leaves showed activity at 250 mg/ml, 100 mg/ml and 50 mg/ ml concentrations. The antibacterial activities of *Z. mucronata* methanolic extract against the pathogens at 250 mg/ml were as follows; *S. sonnei* (10.7 ± mm, n=3), *E. coli* (11.3 ± mm, n=3), *S. aureus* (10 ± mm, n=3) and *E.faecalis* (10.3 ± mm, n=3).

Antibacterial activities of *Z. mucronata* methanolic extract against the pathogens at 100 mg/ml were as follows*; S. sonnei* (8.3 ± mm, n=3), *E. coli* (8.3 ± mm, n=3), *S. aureus* (8.7 ± mm, n=3) and *E.faecalis* (8.7 ± mm, n=3). Antibacterial activities of *Z. mucronata* methanolic extract against pathogens at 50 mg/ml were as follows; *S. sonnei* (7.3 ± mm, n=3), *E. coli* (7 ± mm, n=3), *S. aureus* (7.3 ± mm, n=3) and *E.faecalis* (7.3 ± mm, n=3).

Antibacterial activity of *D.lycioides* methanolic extract against *S. aureus* was observed as follows; 10 ± mm, n=3 at 250 mg/ml , 8.7 ± mm, n=3 at 100 mg/ml and 8 ± mm, n=3 at 50 mg/ml. *C. mopane* root and leaves did not show any antibacterial activity at any concentration against the pathogens. Ampicillin showed antibacterial activity against *E. coli (*21 ± mm, n=3), *E. faecalis (*22 ± mm, n=3) , *S. aureus(*21 ± mm, n=3), and *S. sonnei (*21.3 ± mm, n=3). For the cytotoxicity test, the cell viabilities were above 100 % after treatment with each extract. This showed that the plant extracts were not toxic to the cells.

Further studies on evaluating the *in vivo* efficacy and safety of *Z. mucronata* root and *D. lycioides* leaves should be conducted before consindering them as antibacterial treatments.

Keywords: Phytochemical compounds, Antimicrobial, *Z. mucronata*, *D. lycioides*, *C. mopane*, 3T3 fibroblast, *E. coli*, *E. faecalis*, *S. aureus* and *S. sonnei*

THE NAMIBIAN DEAD SEA'S BACTERIA DIVERSITY AND THEIR LIGNOCELLULYTIC ENZYME PRODUCING POTENTIALS.

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Abstract

Lignocellulolytic bacteria are promising sources of new enzymes for next-generation lignocellulosic biofuel production. Bacteria recovered from halophilic and unexplored regions have been reported to have applications in the medical and biotechnological fields. Lately, such bacteria have been employed in the production of biofuels from lignocellulolytic biomass. However, the diversity and lignocellulolytic potential of extremophilic bacteria from the Namibian landscape has not been explored. The aim of the study therefore was to determine the diversity of bacteria from the Namibian Dead sea, and to asses their lignocellulytic enzyme producing potentials. Sediment samples from the Namibian Dead Sea were cultured onto CMK for the isolation of presumptive bacteria. The resultant isolates were purified and tested for the following lignocellulytic enzyme activities: carboxymethylcellulases (CMCase), filter paper cellulase (FPCase) and xylanases. The taxonomic diversity of the bacterial strains was determined using sequencing analysis. For enzyme production, the bacteria strains were grown on CMC and basal salt agar medium and cellulase and xylanases activity was confirmed by formation of halos around the colony on upon staining with Congo Red stain. The enzyme assays for three enzymes FPCase, CMCase and xylanases were examined by methods recommended by the International Union of Pure and Applied Chemistry (IUPAC). Sequencing analysis revealed that all isolates belonged to phyla *Firmicutes*, suggesting that

Firmicutes are the dominant phyla found in the Namibian Dead Sea sediments. Eight bacterial isolates, including *Aquibacillus albus, Aquibacillus halophilus, Lysinibacillus halotolerans, Marinococcus halotolerans, NDS052* and *NDS065* were able to degrade filter paper and CMC while only five strains (*Aquibacillus albus, Bacilliceae bacterium, Marinococcus halotolerans, Lysinibacillus halotolerans and NDS052*) were effective in degrading xylan. The extracellular cellulase activities ranged from 0.223 to 0.472 IU/mL at day 7 and from 0.344 to 0.586 IU/mL after day 17. For FPCase, activity ranged from 0.240 to 0.979 IU/mL at day 7 and 0.337 to 1.166 IU/mL after 17 days. Based on 16S rRNA gene sequencing, the isolated bacterial genera *Aquaibacillus, Bacillacieae, Lysinibacillus and Marinococcus* represent rarely or never before studied hemicellulytic or cellulolytic species. The study revealed a relationship between phylogeny and lignocellulose-degrading potential, supported by Kruskal–Wallis statistics ($p<0.001$) which showed that enzyme activities of cultivated genera were different enough to be considered representatives of distinct populations. This can better inform future experiments and enzyme discovery efforts.

Keywords lignocellulytic enzymes, cellulase, hemicellulase, Namibian Dead Sea sediments.

CHEMISTRY AND BIOCHEMISTRY

The use of curcumin as a scaffold in the synthesis of mono-ketone pyrazole derivatives and the evaluation of their antioxidant and antimicrobial activities

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Abstract

Curcumin is famed for its antioxidant activity and is widely used in beauty creams, particularly those that are intended to deter the process of aging. Despite curcumin's potential to progress through a drug discovery project and its tolerance at even high doses, no curcumin containing drug is on the market as yet. Mono-keto curcumin analogs have been reported to exhibit better anti-oxidant, antimicrobial, anti-tumor and anti-inflammatory activities compared to the parent natural product, curcumin. Additionally, pyrazoles form part of the pharmacophore of many naturally occurring and biologically active compounds.

The aim of this project is therefore to synthesize novel pyrazole mono-ketone curcumin analogs using the Claisen-Schmidt reaction and to test the intermediates and target molecules for antimicrobial activity against *Candida albicans, Escherichia coli* and *Staphylococous aureus* using the broth dilution method. In addition, to evaluated their antioxidant activity of the synthesized compounds using the DPPH free radical scavenging assay. Characterization of the mono-ketone curcumin analogs and the corresponding pyrazole derivatives will be done using GC-MS analysis. This presentation will report on the structure-activity relationships delineated from the antimicrobial and antioxidant activities of the pyrazole derivatives.

Synthesis and characterization of a multi columetric sensor for naked eye detection of biological important ions in aqueous soluble medium

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Abstract

Detection of Heavy Transition Metal (HTM) ions is necessary for the safety of living beings. The identification and removal of these harmful anions and cations is a vital practice in medical diagnostics, food and products quality control, and environmental chemistry. Thus, in this chemosensing ensemble, a highly selective and

sensitive sensor, referred to as sensor **EN** was synthesized, characterized and spectroscopically analysed. The sensor recognition properties towards various biologically important anions as well as several cations was investigated through naked eye observation and spectroscopic methods such as UV-vis in water soluble DMSO: H_2O in the ratio of (9:1). The addition of 5 cations, Co^{2+}, Cu^{2+}, Fe^{2+}, Ni^{2+} and Sn^{2+} has resulted in a visible colour change from light yellow to red, olive green, dark green, brown respectively, as well as Sn^{2+} from light yellow to orange. Further studies were carried out on the anion. The addition of SO_4^{2-} and NO_3^- to chemosensor EN has resulted in visible colour change from light yellow to colourless for both anions. Chemosensor EN possess large dipole moment due to strong intramolecular charge transfer (ICT) excited state. The UV-vis transition spectrum of EN ($1x10^{-5}$) in DMSO: H_2O in the ratio 9: 1 displayed a characteristic band for Ag^{2+}, Co^{2+}, Cu^{2+}, Fe^{2+}, Hg^{2+},Ni^{2+}, Pb^{2+}, Sn^{2+} and Zn^{2+} due to ICT. Deducing from the spectra of the cations listed above, it is evident that the addition of these cations to the sensor has resulted in a decrease in absorbance from lower wavelengths up approximately 340 nm, the total absorbance remains constant during the addition in a range of 340-365 nm, which is ideally the isosbestic point. Moreover, the spectrum later displayed an increase in absorbance as from 365 – 500 nm. These changes may be due to the charge transfer reaction from the receptor site to the –NH moiety. However, the addition of all anions exhibited no significant change in the absorption spectra of EN. This suggests a high selectivity of AcO^-, F^- and PO^-_3.

Evaluation of oil extracted from four landraces of Bambara groundnut seeds

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Abstract

Bambara groundnut (*Vigna subterranea* (L.) Verdc) is an underutilized, indigenous African legume usually grown for human consumption. The grain legumes serve as a cheap source of protein to a large people in poor countries such as Namibia. Due to the increasingly extension of the production of other crops of interest, Bambara groundnut crop is regarded as less significant. The more important fact about Bambara groundnut it is grown in unfavourable environments such as the northern part of Namibia without enough water, fertilizers and possible pest or disease control. The objective of this study was to evaluate oil extracted from four landraces of Bambara groundnut seeds which were; Uniswa red, S.19/3, KFBNO105 and KFBNO116. The oil was extracted in hexane using two methods; namely room temperature extraction and soxlet extraction. The oil can also be extracted by steam distillation, CO_2 extraction, Maceration, Enfleurage, cold press extraction, etc. The oil can be used to manufacture soups, purees and flat cakes. This oil is also regarded as good cooking oil. The four landraces of Bambara groundnut seeds; Uniswa red, S.19/3, KFBNO105, FBNO116 gave a yield of 7.4 %, 9.2%, 7.0 % and

6.9 % respectively for the hot extraction.The results showed that both landraces contain linoleic and oleic as fatty acids. KFBNO105 contains the highest % fatty acid with 15.4%, and S.19/3 being the lowest with 13.3%, Uniswa red and KFBNO116 contain 14.8% and 14.0% respectively. In comparison, the soxlet extraction is the best method to be used to extract the oil since it gave better yield than the room temperature extraction.

The soxlet extraction gave better yield and has advantages of small solvent dosage as well as high efficiency. This gives a clear indication on how less important the traditional methods for oil extraction are. After this study various countries are expected to stop using traditional methods since they require large amount of solvent and time consuming but rely primarily on the soxlet extraction. The oil within all four landraces contains high iodine value which makes it to be useful in daily diet to prevent goiter that occurs as a result of iodine deficiency. The oil is important because it has low cholesterol concentration which must be avoided in a diet as it is believed to causes high blood pressure.

The phytochemical analysis of *Combretum imberbe*

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Abstract

Studies have shown that medicinal plants play an important role in preventing the development of cancer, heart - and ageing diseases, amongst others. They contain bioactive compounds which can alleviate symptoms or and heal various types of diseases. This study focused on one plant, *Combretum imberbe* which is commonly used to treat fever, headaches, abdominal pains and heart diseases.

This study is aimed to provide evidence to back up the alleged therapeutic activity of this plant by traditional healers. A known mass of the crude organic extract of the bark was subjected to flash chromatography using different solvents starting with hexane, 1:1 hexane:dichloromethane, dichloromethane, 1:1 dichloromethane: ethyl acetate, ethyl acetate and 1:1 ethyl ecatate:methanol and methanol. Phytochemical screening was performed on all seven dried fractions obtained, to test for the presence of terpenoids, tannins, alkaloids, phenolics and flavonoids. The results obtained showed that all the extracts contained alkaloids, and terpenoids, whilst only the 1:1 HEX:DCM and DCM fractions showed the presence of flavonoids. The screening of phenols are still under way.

Terpenoids, tannins, and flavanoids are known to be anti-inflamatory, antioxidant and anti-cancer. They are also known for treating burns, vomiting and nausea. Alkaloids are used as a painkiller and as an anti-malarial drug. The presence of terpenoids, tannins, flavonoids confirms the ethnobotanical use as anti-inflamatory, anti-caner ,anti-malaria and antioxidants, amongst others.

Antioxidant activity and phytochemical screening of *Dregia macrantha.*

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Abstract

The plant *D. macrantha* has many tuberous sundews that grow as rosettes of flat leaves pressed against the soil. The plant forms fragrant flowers after the leaves have finished growing and The flowers are usually white, and appear in either multiple, single blooms or are clustered. *D. macrantha* is easy to grow from seeds and it grows up to 10.5m in height and produces 2.54 cm white or pink flowers. The genus *Dregia* is comprised of different species, *Dregia apocynaceae* is one of the species and is commonly used by traditional healers to treat male dysfunction and treat mental illnesses.

Firstly the purpose of the study was to use antioxidant assays namely, ferric reducing antioxidant (FRAP) and 2, 2-diphenyl-1-picrylhydrazyl (DPPH) assay to evaluate the antioxidant activity of *D. macrantha*. Secondly to investigate the different phytochemical compounds (alkaloids, flavonoid, phenols, glycoside, saponins, anthraquinones, diterpenes and tannins) present in the crude extract of *D. macrantha*, lastly to determine the total phenolic and flavonoids of *Dregia macrantha* extract.

For qualitative phytochemical sreening procedures outlined by Tiweri et al, was used to evaluate the phytochemical activity of *Dregia macrantha* and total phenolic and total flavonoid were determined using previously described procedures by Marinova at al. Determination of antioxidant , DPPH free radical scavenging activity was measured according to modified protocol previously described by Kapewangolo et al. The FRAP assay were conducted as described by Ferreira at al.

Qualitative phytochemical only alkaloids, flavonoids, phenols glycosides and diterpenes was tested positive. The total content of phenol and flavonoid obtained is higher as its significantly above 0.05 ($P<0.05$).

The plant sample were tested positive for antioxidant due to the fact that the plant sample extract showed reasonable DPPH free radical scavenging activity however the obtained results or value is lower than the actual content of Vitanim C, this means the plant Dregia macrantha can be used as source of antioxidant agent. The preliminary screening of sample, alkaloid, flavonoids and glycosides are (+) slightly present while phenols (++) medium present and diterpenes gave a strong response (+++) highly present

In Vitro Antioxidant Activity of Selected Hydrazone Based Compounds

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Abstract

Hydrazone based compounds are a unique class of organic compounds, which consist of a wide variety of biological activity. Hydrazone based compounds are an essential class of compounds that are of interest in the new drug development process, due to the presence of an azometin –NHN=CH-. They are potential antimicrobial, antitumoral,vasodilator, antiviral and anti-inflammatory. The aim of this study was to evaluate the antioxidant potential of three selected hydrazone based compounds, namely: 2- (pyridine -2yl) -3a,4-dihydr0-1H – benzo [de] isoquinoline–1,3 (2H)-dione (**C**), 1 -(1,3 –dioxo-3a,3a[1] –dihydro-1H-benzo[de] isoquilinolin -2(3H) -yl)-3-phenylthiourea (**8**), 2-(1,5-dimethyl-3-0xo-2phenyl-2(,3-dihydro-1H-pyrazol-4yl)-3a-3a[1]–dihydro-1Hbenzo[de]isoquinoline -1,3 (2H)- dione (**9**) .The antioxidant activity of the compounds were investigated using a series of assays, namely; 2,2- picrylhydrazyl (DPPH) radical-scavenging diphenyl-1- activity (DPPH), reducing power and ABTS. Compound 8 demonstrated exceptionally good inhibition for DPPH, and ABTS scavenging activity, with IC_{50} 18.5 ± 0.04 and 20.8 ± 0.68 µg/µl respectively. Whereas, compound 9 and C, indicated poor inhibition. Reducing power of compound 8 is directly proportional to the concentration. These results demonstrate that compound 8 could be a good antioxidant agent.

Starch Hydrolysis of Boiled and Fermented Pearl Millet and Sorghum Grains varieties and their cooked meals

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Abstract

Pearl millet and sorghum grains are important staple food in arid and semi-arid regions in Africa and Asia. Starch is a major storage form of carbohydrate in sorghum and millets. It consists of amylose, a straight chain polymer and amylopectin, a branched-chain polymer of glucose. The digestibility of the starch, by salivary and pancreatic amylases and the glucosidases in the small intestine, determines the amount and rate of glucose releases into the blood. This impacts homeostasis and its regulation. Processing these grains by methods such as steaming,

fermentation, pressure-cooking, boiling, flaking or micronization affects the extent and rate of digestibility of the starch. This has been attributed to the gelatinization and release of granules of starch from the protein matrix making them more susceptible to enzymatic hydrolysis. This research investigated the rate of starch hydrolysis, in both pearl millet varieties *Kangara, Kantana* and *Okashana* and sorghum grain varieties Marcia *and red sorghum* following treatment. One of the treatments that the grains underwent was the boiling pre-pulverizing. The grains were boiled, 10g of grains to 100ml water for 15 minutes, with an occasional 15 minutes stirring. The grains were then dried and pulverized to flour. The flour was then treated with enzymes alpha-amylase and amyloglucosidase that hydrolyze glycosidic bonds in starch to yield glucose. The absorbance of the samples for the digestibility of starch at 20 minutes to 120 minutes was then recorded. These absorbance recordings together with the moisture content recordings were then used to calculate the average glucose (µg/g sample) in every sample at 20 minute intervals for 120 minutes. *Kangara* found to have 0.42 average glucose (µg/g sample) at 20 minutes and 0.24 average glucose (µg/g sample) at 40 minutes, for the boiled grains whereas it was found to have decrease from 0.17 to 0.09 average glucose (µg/g sample) for the fermented grain treatment. *Kantana* was observed to increase from 0.09 to 0.32 average glucose (µg/g sample) and 0.11 to 0.15 average glucose (µg/g sample), in both boiled and fermented grains respectively. Moreover, *Okashana* was observed to increase from 0.49 to 0.59 average glucose (µg/g sample) and slightly decreased from 0.19 to 0.18 in the boiled grain treatment and fermented grain treatment respectively. Furthermore, an increase in the average glucose of the fermented grains was observed for both *Marcia* and *Red sorghum* as they increased from 0.05 to 08 average glucose (µg/g sample) and 0.2 to 0.3 average glucose (µg/g sample) respectively, however Marcia decreased slightly from 0.03 to 0.02, while boiled Red sorghum remained steady at 0.07 average glucose (µg) in the given interval from 20 to 40 minutes both for the boiled grain treatment. From the observed results it can be concluded that boiled red sorghum which was recorded to have the lowest rate of starch hydrolysis over the given interval can be used in the control of Type II diabetes.

Characterisation of UV-active constituents of *Sclerocarya birrea* (marula) seed oil using high performance liquid chromatography

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Sclerocarya birrea (marula) is an indigenous African tree renowned for its tasty and famous juice, locally known as "*omagongo*". Marula trees bear fruits which enclose light brown seeds with soft white kernels that are rich in oil and protein. Marula oil has been increasingly attracting attention due to its good skin ourishing properties, high levels of fatty acids and natural antioxidants, which make it an ideal cosmetic and food ingredient. Although the oil holds so much value, the chemical composition of the oil is not so well-known as previous

studies has mainly focused on the use of gas chromatography with mass spectrometry, which is only suitable for analysis of volatile and semi-volatile constituents. The current study therefore focused on the chemical characterisation of the non-volatile constituents of marula seed oil using high performance liquid chromatography with UV detection. HPLC method developed entailed screening of a number of common organic solvents and their mixtures on different polar and non-polar stationary phases. A mobile phase based on acetonitrile, methanol and isopropanol was found to be best solvent system for the separation of the oil samples on both C18 and C30 reversed-phase columns. Although fats and oils components are known to have poor UV activity due to absence of suitable chromophores in their chemical structures, a good signal of a large number of UV-active compounds was recorded for marula oil. UV spectra for early eluting compounds displayed a maximum absorption band around 200 nm, while the later eluting compounds exhibited two maxima bands, a strong band at around 200 nm and a weaker band in the region of 270-290 nm. Based on these absorption patterns, it could then be tentatively said that the oil contain some unsaturated non-conjugated fatty acids, which are known to absorb UV maximally around 200 nm, and some polyunsaturated fatty acids which absorb to a lesser extent in the range of 270-280 nm. Although oil components could be tentatively assigned to different lipid classes through comparison of their UV absorption spectra with literature reports, definite identities of individual components could not be established from UV data alone. It is therefore recommended that the developed HPLC method should be combined with suitable analytical instruments such as mass and nuclear magnetic resonance spectrometers to allow identification of individual chemical structures. The use of alternative detection methods would also enable detection of non-UV active components which could not be detected with the UV detection method used in this study.

Quantitative Structure Property Relationship (QSPR) Study of a Secondary Metabolite from Namibian Marine Algae

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Abstract

In an effort to optimize potential drug candidates from secondary metabolites derived from marine algae, a computational study has been carried out on (1Z,3E,5S*,6S*)-1-bromo-5,6-dichloro-2,6-dimethyl-octa-1,3,7-triene, a halogenated monoterpene isolated from *Plocamium cornutum* species. Twenty two analogues of the lead compound were computed and their structures fully optimized via equilibrium conformer calculations, using Density Functional Theory (DFT) B3LYP method in conjunction with the 6-31+G* basis set. Employing the optimized geometries of the structures in vacuum, several physicochemical properties were computed at the B3LYP/6-31+G* level. This was followed by Quantitative Structure Property Relationship Study to relate the

computed physicochemical properties with LogP of the lead compound and its analogues. Using Multiple Regression Analysis, the best models obtained from this project are given by the Hansch equations:

Log P = (0.713±0.195) π + (-0.004±0.0041)MaxElpot + 2.885

Log P = (0.417±0.246) π + (0.151±0.086)MinElpot + (0.0067±0.0039)MaxElpot - 1.638

Characterisation of Selected Fermented Traditional Brews (*Efau, Epwaka, Okatokele, Otombo*)

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Abstract

Sorghum and millet are normally produced as important food crops in semi-arid and arid regions of Africa. Their grains are processed through malting and fermentation, often in a traditional setting. Malted and fermented products are assorted in Africa. With a prevailing food insecurities in Africa, there is a need to use available crops to develop food products of high quality and value. Millet is relative abundant crop in Africa and has good nutritional composition. Malt alcoholic beverages in Namibia include *otombo*, *epwaka*, *efau*, *okatokele*, *oshafuluka*, and *munati*. *Otombo* is traditionally fermented from malted sorghum (*Sorghum bicolor L. Moench)* grains, *efau* fermented from malted sorghum meal, *okatokele* from pearl millet *(Pennisetum glaucum L. R. Br)* meal and epwaka from pearl millet bran. Production and consumption of these beverages is confined to the informal markets. Their malt quality and characteristics of the brews (*efau, epwaka, okatokele, and otombo)* is limited in terms of reports. Therefore, the study looked at the ingredient's quality (Free amino nitrogen (FAN), and reducing sugars), and brews characteristics (pH, color, alcohol content). There was not a significant difference when analysed for FAN between pearl millet bran and malted sorghum grains (261.52±66.15 mg/100g; 283.86±19.14 mg/100g) at $p>0.05$. Test for reducing sugars showed that there was not a significant difference between pearl millet meal and malted sorghum grains (14.21±4.78 mg/g;4.8 ± 0.749 mg/g) at $p>0.05$. Malted sorghum grains and pearl millet bran were significant (168.01±14.19 mg/g; 89.45±3.33 mg/g) at $p<0.05$. With the Least Significant Difference of 11.76%. Malted sorghum meal was found to have the highest concentration of both free amino nitrogen (578.45 ± 27.13 mg/100g) and reducing sugars (184.9 ± 11.84 mg/g) compared to other ingredients (malted sorghum grains, pearl millet meal and pearl millet bran). This can be explained by the rate of enzymatic activity in malted sorghum meal, which could have been faster than in other ingredients. Malted sorghum grains reducing sugar concentration (4.83±0.75 mg/g) was the lowest.

Key words: Sorghum, pearl millet**,** free amino nitrogen (FAN), Reducing sugars

Synthesis and Characterization of a Colorimetric Sensor via the Organic Nanoparticle Method, for Selected Cation Detection in Aqueous Soluble Environments

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Abstract

Ions have imperative biological functions. However, they are greatly toxic to the biological tissue if the concentration exceeds cellular requirements, which will cause many serious neurodegenerative diseases. They can also be toxic to living organisms, and a trace amount of intake of ions can therefore result in death. Therefore, developing a method for the detection and sensing of ions is a tremendously attractive target in the field of chemosensor research. A novel series of compounds have been established for the recognition of metal ions and it is found that the site of substituent in the organic compound has showed to be the determining factor for the development of a chemosensor. Organic nanoparticles are solid atoms composed of organic compounds extending from a diameter of 10 nm to 1 μm. Over the years, organic nanoparticles have received excessive attention due their high potentialities in industrial parts extending from electronic to photonic, medicine to biotechnology and most importantly as conducting materials for sensors in supramolecular chemistry extents. Supramolecular chemistry of host–guest interaction is a vibrant area of research owing to its applicability in biochemistry and environmental science. In this study, sensor **D** was synthesized in a high yield reaction of 1,8-napthalic anhydride (5.046 mmol) and 2-aminothiozole (5.067 mmol). The selectivity and sensitivity of sensor **D** towards anions and cations in DMSO were studied through naked eye detection and spectroscopic methods. The sensor is sensitive and selective towards the detection of Co^{2+}, Cr^{2+}, Cu^{2+}, Fe^{3+}, Pb^{2+} and Zn^{2+} in DMSO. The interaction of D with cations was characterized by different colours upon addition, concomitant with varying spectral changes, signifying different interactive modes. No significant changes were observed upon the molar addition of other metals used as well as anions. Thus, **D** is only specific to specific cations in a given aqueous soluble environment.

Characterization of mineral-rich rock samples using a gamma-ray spectrometer

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Abstract

Naturally occurring radionuclides can be a potential health risk. It is well known that all rock formations in various geological systems have primordial radionuclides present in low concentrations. However, these naturally occurring radionuclide can be pre-concentrated due to human activities such as mining, excavations and when used as building material or as kitchen counters. This study focuses on the evaluation of the presence and distribution of ^{40}K, ^{232}Th and ^{238}U in different rock and granite samples taken from a mineral rich area in the vicinity of Grosse Spitzkoppe in Erongo region, Namibia. The samples were ground, homogenized, hermetically sealed and thus the results are indicative of the chemical composition and activity concentration of the elements present in each sample.

The activity concentrations of radionuclides were obtained using a high-purity germanium gamma (HPGe) detector and the elemental analysis of stable elements obtained using a portable HandheldNiton X-ray Florescence (XRF) spectrometer. The Handheld Niton XRF Analyzer uses the energy dispersive x-ray fluorescence technique. This method is used mainly to obtain a semi-quantitative elemental concentrations. The activity concentration is used to compute radiological hazards that the small scale miners in this area are exposed. Specific activities of ^{238}U, ^{232}Th and ^{40}K radionuclides, radium equivalent activities (Ra_{eq}), External hazard index (H_{ex}), absorbed dose rate (D_{air}), annual effective dose equivalent (AEDE), annual gonadal dose equivalent (AGDE) and the Clark value $^{232}Th/^{238}U$ ratio were computed.

This study is aimed at contributing to the knowledge of the background concentrations of these radionuclide elements from rocks from the mineral rich region. The results are presented in table and graphs with permissible maximum limits.

THE ROLE OF PRECURSOR CONCENTRATION AND ANNEALING TEMPERATURE ON OPTICAL PROPERTIES OF ZnO THIN FILMS FABRICATED BY THE MOLECULAR PRECURSOR METHOD

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Abstract

Zinc oxide (ZnO) is a transparent conductive oxide with excellent properties such as high chemical stability, a wide band gap (3.37 eV), high electron mobility that make it attractive for various applications in a number of

devices such transparent thin-film transistors, photodetectors, light-emitting diodes and solar cells. In this work, the role of precursor concentration (10, 12, and 14 mM) and annealing temperature (350 ^{0}C, 450 ^{0}C and 550 ^{0}C) on optical properties of ZnO thin films synthesized by the molecular precursor method was investigated. When the concentration and temperature was increased, absorption of the films increased and the transmittance decreased. The optical band gap of the fabricated thin films is in the range of 3.14 – 3.30 eV, with 14 mM-ZnO thin films with the lowest band gap of 3.14 eV and 10 mM-ZnO with the highest band gap of 3.30 eV. In conclusion, concentration and temperature affected the optical properties of ZnO thin films, however there was only a slight narrowing of the optical band gap and extension in the visible region was not achieved.

The synthesis, characterization and *in vitro* evaluation of pyrazole mono-keto curcumin analogs for their antimicrobial and antioxidant activities

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Abstract

Mono-keto curcumin analogues display an improved pharmacological activity and bioavailability compared to the parent natural product curcumin. They display a wide range of biological activities including antimicrobial and antioxidant. Pyrazoles are reported to possess a wide range of biological activities such as antimicrobial, antifungal, antioxidant, anti-inflammatory, anti-tubercular, anticancer, neuroprotective and antiviral. This study is aimed at incorporating a pyrazole nucleus in mono-keto curcumin analogues. It is envisage that it will yield analogues with promising biological activities, considering the common antimicrobial and antioxidant properties reported for both mono-keto curcumin analogues and pyrazole derivatives.

The Claisen-Schmidt condensation yielded novel mono-keto curcumin analogues with yields ranging from 8-99 %. These intermediates were converted to pyrazole analogues through reaction with hydrazine and phenyl hydrazine through a Schiff base reaction to ring the total number of synthesized compounds to **13**. Characterization of the mono-keto curcumin analogues and pyrazoles will be done using GC-Ms analysis. Antimicrobial testing will be done using disk diffusion method against *Escherichia coli, Staphylococcus aureus, Klebsiella pneumoniae and Candida albicans*. While the antioxidant testing will be done via the 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging assay.

Synthesis and characterization of a chemosensor for copper ions and selected anions

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Abstract:

Heavy metals have been widely used for various industrial practices for decades, henceforth their immense contribution towards the global industrial market through different activities with mining amongst other benefits. However, their toxicity and tendency to accumulate in biological systems make them a significant health hazard. Henceforth, the recognition of ions by means of molecular frameworks, more specifically chemosensors have now taken precedence over the conventional methods, due to their simplicity in application and cost-saving during analysis. Thus the need to develop other methods to monitor heavy metals in the environment at large is of the utmost importance. Copper is known to be the third most abundant trace element in the human body and it's responsible for very vital or rather fundamental processes within humans from enzyme functions to redox processes and alike. With the alarming rate at which this particular heavy metal is found to be leaching into underground water streams that are easily accessible by the human populace at large. Therefore, the need to develop a new more accessible analytical method for the detection of Cu^{2+} in an industrial work environment setting is very crucial. Thus this study was particularly geared at achieving such a resolution with a highly selective chemosensor (**Q**) being synthesized through a simple Schiff base mechanism. The sensor was found to be sensitive and selective to Cu^{2+} and Hg^{2+} upon the molar addition of these ions. The addition of these cations resulted in significant spectral changes that are concomitant with the colorimetric turn-on response in the DMSO solution. The addition of other cations (heavy-metal based) has not displayed any significant or noticeable change, even when high amounts were added. The characterization of the sensor was done using spectroscopic methods of 1H NMR, UV-vis and FTIR techniques.

Optical and Electrical Studies of Ag/TiO_2 Composite Thin Films Fabricated using Flow Coating method

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Abstract

To study the optical properties and electrical conductivity of Ag-nanoparticle/titania composite thin films, The Ag-nanoparticle/titania thin films with various amount of Ag (10 mol% ≤ 100 mol%) were fabricated on quartz glass substrate using the molecular precursor method (MPM) by flow coating. The precursor solutions for Ag-nanoparticle and titania were prepared from silver salt and Titania complex. Titania was doped with Ag-

nanoparticles to increase the absorption efficiency regarding its use in solar cell system, whereby the UV-vis spectra were obtained by UV- visible spectrophotometer to determine absorption, band gap variation. A Surface Plasmon Resonance (SPR) peak was observed around 400nm, whereas wide range absorption spread in the wide vis-region at wavelengths greater than 400nm which is due to intraparticle plasmonic coupling of tip and cavity resonance (LSPR). It is well-known that metal incorporation into an insulating matrix must inevitably deal with the fact that the use of numerous different preparation methods for obtaining these materials may have given rise to their different electrical conductivity properties. In order to validate that, the electrical conductivity of the fabricated thin films were measure and calculate using an ohmmeter to determine the resistance of thin film samples of 2 cm length and 4 cm^2 surface area. An ohmmeter with two contacts, one at each end of the sample was employed, to determine the resistance. The electrical resistance of all thin films values were too high to be determined using the conventional apparatus employed in the present study. This is due to the smaller silver particles coalesce to form large aggregates, and their greater number results in a larger gap between the aggregates, which prevent the electron flow (current) by electron hopping or tunneling. Thus, there is a significantly higher electrical resistivity being observed for the thin films prepared by flow coating method.

Antioxidant analysis and phenolic content of Omukaru and Omuteatupa leave extracts.

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Abstract

Buffalo thorn (*Ziziphus macronata*) known by Herero's as Omukaru is commonly known for its medicinal importance such as treating measles, chest pains, stomach aches, coughs, etc. Camphor bush (*Tarchonanthus camphoratus*) identified by Herero's as Omuteatupa is a woody plant known for its medicinal uses treating abdominal pains, tooth and stomach aches, coughs, etc. The objectives of the study were to firstly evaluate the antioxidant activity in Omukaru and Omuteatupa leave extracts, secondly to determine the total phenolic and flavonoid contents of Omukaru and Omuteatupa leave extracts.

Room temperature extraction was used to extract powdered leaf materials in 80% methanol for 48hours, and the solvent was left to evaporate under the fume hood. Antioxidant activity of the two leave extracts was analyzed using, 2,2-diphenyl-1-picryl hydrazyl (DPPH), ferric reducing power, nitric oxide assay, and total antioxidant capacity. The results of DPPH assay and nitric oxide scavenging assay were expressed as IC_{50}. Total phenolic and total flavonoid content were evaluated using Folin-Ciocalteu method with gallic acid as standard and aluminium chloride method with quercetin as standard respectively.

The reducing power assay showed that as the concentration increased the absorbance also increased. DPPH assay had IC_{50} values of 23.95µg/ml for Omukaru and 25.76µg/ml for Omuteatupa. IC_{50} values obtained for nitric oxide scavenging assay were 0.7713µg/ml and 0.3489µg/ml for Omukaru and Omuteatupa respectively. Total

antioxidant capacity showed that Omukaru had a more reducing capability of MO(VI) to MO(V) as compared to Omuteatupa. Omuteatupa had a value of 3.06mgAAE/g of sample and Omukaru had a value of 1.22mgAAE/g of sample. Omuteatupa had a total flavonoid content of 49.24mgQE/g of sample, while Omukaru had a value of 19.87mgQE/g of sample. For total phenolic content Omuteatupa showed the highest value of 31.41mgGAE/g of sample, whereas Omukaru had a value of 23.36mgGAE/g of sample. Omuteatupa showed the highest total phenolic and flavonoid content as compared to Omukaru.

The study revealed that both Omukaru and Omuteatupa leave extracts presented antioxidant activity. The presence of antioxidants in the leaves is indicative that other parts of the plants might also have antioxidant activity. This suggests that other parts of the plants such as roots and bark be analyzed for antioxidants.

Synthesis and characterization of a colorimetric sensor via the organic nanoparticle method, and its applications to detecting cations in aqueous soluble solvents

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Abstract

Organic nanoparticles are popularly used in biological and chemical sensors, owing to their fascinating chemical, optical, and catalytic properties. Particularly, the use of organic nanoparticles is widespread in colorimetric assays because of their simple, cost-effective fabrication, and ease of use. More importantly, the organic nanoparticle sensor response is a visual change in color, which allows easy interpretation of results. Therefore, numerous studies of organic nanoparticle-based colorimetric assays have been reported, and some review articles published over the past years. Most reviews focus exclusively on a single organic nanoparticle-based colorimetric technique for one analyte of interest. Herein, an organic chemosensor (**E**) was prepared using 1,8-Naphtalimide and 2-amino pyridine. The chemosensor activity of the naphthalimide-based receptor was evaluated following the synthesis via the organic nanoparticle method by the reprecipitation process. The photophysical properties of the nanoparticle-based **E** were evaluated using UV spectroscopy and naked eye observation of colorimetric changes. The studies revealed that the sensor was selectively recognizing Cu^{2+} ions only. The interaction is suspected through the coordination of Cu^{2+} ion through the nitrogen and oxygen atoms within the structural skeleton of **E**. The spectral changes induced by the presence of Cu^{2+} ions in **E** is concomitant with the color changes, ascribed to coordination induced charge transfer.

Antibacterial Activity and Phytochemical Screening of *Cyperus papyrus*.

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Abstract

Cyperus papyrus is a medicinal plant from the genus *Cyperus*, and of Cyperaceae family. *Cyperus* papyrus is native to Central Africa and has spread over tropical Africa (including Madagascar). It has been cultivated in Egypt and neighbouring areas since ancient times. Nowadays it is widely grown as an ornamental. The plant is originally from Australia, and widely distributed throughout the world. The genus Cyperus contain about 700 species which are widely spread all over the world. It's used traditional in East African to treat oedema, in Uganda used for the treatment of vaginal and rectal prolapse and in Tanzania treatment of female sterility. It is also used in Botswana as a cough remedy. There are no reports on the antibacterial activity conducted on the plant hence the current study aimed at evaluating the phytochemical as well as the antibacterial activity of the plant. Phytochemical screening on the plant extract revealed the presence of some biochemical compounds such as phenolic, tannins, and flavonoids. The crude extracts were tested for antibacterial activity against gram-positive bacterium (*Staphylococcus aureus, streptococcus mutans*), and gram-negative bacteria (*Klebsiella pneumonia and Escherichia coli*) using the agar disc-diffusion method however little to no inhibition was show for E. coli. . The MIC values for antimicrobial analysis were recorded as the least concentration of plant extracts that completely inhibited the growth of the microorganism. The MIC value for the ethanolic extract on *Staphylococcus aureus, streptococcus mutans* and *klesiella pneumonia* was 0.63 mg/ml and for *Escherichia coli* no inhibition during screening hence no MIC.

Quantitative determination of the total phenolic, total tannins and total flavonoid contents of the ethanol extract was done using the Folin Ciocalteu method as well as aluminum chloride complex forming assays, with the results expressed in mg of gallic acid equivalents (GAE)/g of dry weight (DW), mg of quercetin equivalents (QE)/g of DW and mg of Tannic acid equivalent (TAE)/g of DW respectively. The quantitative phytochemical determinations were performed in triplicate and expressed as means (± standard deviation) and of the phytochemicals that were quantified, tannins were present in large amounts with 234.4±0.003 mg TAE/g of extract followed by phenol 65.6±0.001 mg of gallic acid equivalents (GAE)/g of dry weight and the least was flavonoids which was 11.6±0.002 mg of quercetin equivalents (QE)/g of DW.

Keyword: Phytochemical screening, Alkaloids, flavonoid, Saponins, quantitative, *Cyperus papyrus*, Anti-becterial activity, minimum inhibitory concentration

Quantitative Structure Property Relationship (QSPR) studies of (3R/4S)-3, 4, 6, 7-tetrachloro-3, 7-dimethyl-octen-1-ene: A Potential Lead for Esophageal Cancer

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Abstract

Quantitative Structure Property Relationship (QSPR) is based on the idea that the structure of a molecule is related to its biological activity. This project is a QSPR study of a halogenated monoterpene (3R/4S)-3,4,6,7-tetrachloro-3,7-imethyl-octen-1-ene, a metabolite isolated from the Namibian seaweed Plocamium suhii. The compound has been characterized and found to have esophageal anticancer activities. The structure of this lead compound and 38 of its analogues were computed and optimized using B3LYP density functional and the 6-31+G(d) basis set. The structures were found to be genuine minima via frequency calculations. Using the optimized geometries of the lead compound and the 38 analogues, several physicochemical properties were computed, and the relationship between the response variable (polarizability) and the predictors (the computed physicochemical properties) were modelled via multiple regression analysis. Polarizability, as the response variable, is an electric response property that measures the extent of charge distortion when an atom or molecule is exposed to an external electric field. This molecular property is important in describing the weak but ubiquitous interaction of a ligand (drug molecule) with a target receptor. Its magnitude is also related to molecular volume. The model developed in this study is given by the Hansch equation:

Polarizability = 0.081479±6.14E-05CPK Volume - 0.00056±0.000107 PSA +

5.38E-05±1.25E-05Max El Pot – 0.23698±0.001044 HOMO-LUMO + 0.003905±0.000796 Log P - 0.00928±0.001976 π + 41.2874.

Antioxidant Potential of Selected Schiff Base Ligands

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Abstract

Schiff base ligands reportedly demonstrate antibacterial, antifungal, anticancer, anti-inflammatory, antioxidant, antimalarial as well as antiviral activities. Schiff bases have a donor structure with an electron pair on the nitrogen which can be used as a ligand in the formation of many metal complexes and therefore, gaining unique features for

biologic applications. The aim of this study was to investigate the antioxidant potential of (E)-N-(1-naphthyl)-1-(2-thienyl)methanimine (**3**) and (E)-1-(2-furyl)-N-(1-naphthyl)methanimine (**4**). The antioxidant potential was determined by means of 2,2-diphenyl-1-picrylhydrazyl (DPPH), reducing antioxidant power (Fe^{3+} to Fe^{2+}), 2,2′-azino-bis-3-ethylbenzthiazoline-6-sulphonic acid (ABTS) and total antioxidant capacity assays. For DPPH scavenging activity, ligands **3** and **4** displayed good inhibition with IC_{50} values of 51.58 ± 0.43 and 73.66 ± 1.38 µM respectively. The ABTS assay showed that the ligands demonstrated antioxidant potential with IC_{50} values of 8.48 ± 18.82 and 59.9 ± 16.50 µM for ligands **3** and **4**, respectively. The ligands demonstrated a reducing capacity that was concentration dependent. The TAC of the ligands was found to be 0.0202 and 0.0121 µgAAE/g for ligands **3** and **4**, respectively. The results indicate that ligands **3** and **4** could be potential antioxidant agents.

Keywords: Schiff base, antioxidant, DPPH, reducing power, ABTS, TAC, IC_{50}

Synthesis of pyrazole derivatives of mono-ketone curcumin analogues and the evaluate of their antioxidant and antimicrobial activities

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Curcumin is a natural product derived from the rhizome of the herb *Curcuma longa* and well-studied for its antioxidant activities and antimicrobial activities. However, studies show that the β-diketone moiety in curcumin is responsible for its instability and poor pharmacokinetic profiles. It has been previously reported that pyrazoles have a wide spectrum of pharmacological activities such as anti-inflammatory, anti-cancer, antitumor and antibacterial. Therefore, this project was aimed to design, synthesize and evaluate a series of symmetrical mono-keto curcumin derivatives of pyrazoles for their antioxidant and antimicrobial activities. In this study, **11** compounds were synthesised through a Claisen-Schmidt condensation. The pyrazole were synthesised by reacting the intermediate with a hydrazine derivative through a Schiff base reaction.

The synthesized compounds will be tentatively confirmed using gas chromatography-mass spectrometry (GC-MS), and are yet to be chemically characterized using spectroscopic techniques such as NMR and IR spectroscopy. The compounds are also to be evaluated for their antioxidant activity by DPPH free radical scavenging assay in triplicate. The antimicrobial activities will be evaluated by Broth test against *Escherichia coli, Staphylococcus aureus, Klebsiella pneumoniae and Candida albicans* by serial plate dilution method.

Phytochemical and bioactive studies of *Terminalia sericea*

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Abstract

Terminalia sericea is a well-known medicinal plant widespread to Africa, distributed across the Northern, Northwest, and Southern parts of the continent. The plant is credited for its diverse medicinal applications and embraces a rich history in African traditional medicine. *T. Sericea* has diverse therapeutic applications in traditional system of medicines. This study aimed to investigate the phytochemical analysis of *T. sericea* present in the root extract.

The extraction was done using the column chromatography packed with silica gel. A known mass of crude organic extract of the roots was subjected to flash chromatography using different solvents starting with 100 % Hexane, 1: 1 Hexane: Dichloromethane (DCM), 100 % DCM, 1: 1 DCM: Ethyl Acetate, 100 % Ethyl Acetate, 1: 1 Ethyl Acetate: Methanol, 100 % Methanol and 9: 1 Methanol: Water. Phytochemical screening of terpenoids, anthraquinones, flavonoids, alkaloids and phenolics were performed on all the extracted fractions by use of the Thin Layer Chromatography spray reagents.

The present study revealed that roots extracts of *T. sericea* contain terpenoids, flavonoids, anthraquinones, alkaloids and phenolics. However, those phytochemicals were not detected in 100% Hexane extract. Flavonoids were detected in almost all fractions in more appreciable amount. On the other hand, phytochemical such as phenolics, terpenoids, anthraquinones and alkaloids present and the amount varies in each extracts.

The phytochemicals present in the plant extracts are associated with antibacterial, anti- carcinogenic, anti-viral, anti-hypertension and antioxidant activities. The presence of these phytochemical compounds confirm the bioactivities potential of the plant constituents. Therefore, these compounds can be related to the traditional use of treating infections and diseases such as diarrhea, cough, skin infections and sexual transmitted diseases such as gonorrhoea. Knowledge of the composition of *T. sericea* can be used towards drug discovery and may contribute marketing of homegrown resources.

Synthesis and Characterization of a Naked- Eye Chemosensor, Sensing Toxic Anions in Semi-Aqueous Solutions

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Abstract

Heavy metal ions' pollution is a serious global problem because it is very deleterious to human health and the environment. Among these toxic metal ions, Pb^{2+} is one of the oldest known and most widely studied toxins. In nature, lead and other heavy metals ubiquitously exist in various forms including elemental, inorganic and organic compounds. Generally, expensive and technically demanding spectroscopic methods (equipment) such as flame atomic absorption spectrometry, graphite furnace atomic absorption spectrometry, and spectrophotometry are widely used for the detection of metal ions in trace level. However, chemical sensors, especially optical sensors, are an elegant alternative to the traditional analytical instruments. They have the advantages of size, cost effectiveness, simplicity, no necessity of the reference solution, and field work applicability. The modification of chemosensors through scientific research is of great essence at the moment and analytical methods and tools that allow a hands-on and inexpensive mechanism to monitor the environment for toxic ions are required. In this context, chemosensors appear as a suitable alternative and as a complementary analytical tool. In this study, a chemosensor molecule (**WM**) was synthesized via a Schiff-Base condensation reaction of L-Histidine and 2-hydroxy-1-naphthaldehyde and the characterization of its application in the detection of various ions in trace amounts studied closely. The resulting compound WM was then taken through a few qualitative analysis methods both classical and instrumental to analyze the ability of WM to function. Some naked eye tests of classical colorimetric analysis were carried out and; some cations and anions to which WM was selective could change colour. The instrumental analyses carried out were done via UV-Vis, Fluorescence and NMR spectroscopy. In all cases, a desirable and practical concentration of WM was prepared in a 9:1 DMSO-H_2O solution ratio. With these analyses carried out in the research, it was evident that WM was sensitive to mainly the anions (NO_3^- , HSO_4^- , PO_3^- , AcO^- , N_3^- , F^- , OH^- , Br^- , OCN^- and CN^-) tested. The research is deemed to have been worth the time invested in it as WM carries good characteristics that will aid in singling out the presence of toxic substances when put to work (as per Data Analysis results obtained). The static characteristics of WM were extracted from the response curves obtained in the instrumental analyses. It is expected of WM to be highly selective to various other analytes but with a restriction to only minimal species. This corroborates with the good properties that a chemosensor should possess.

Analysis for naturally occurring radionuclides in semi-purified water in Windhoek using gamma-ray spectrometry

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Abstract

The focus of this study was to investigate the presence of naturally occurring radionulcides and determine their activity concentration in semi-purified water used for irrigation purposes as well as in water samples taken at the inlet and outlet sampling points at the Goreangab dam. Several sample were collected from different sites such as UNAM irrigation taps and Goreagab dam in the City of Windhoek, these samples were processed and placed in labelled 500 mL plastic bottles that were hermetically sealed.

The gamma spectra were obtained by using a high purity germanium detectors at the University of Namibia (UNAM). The intensities of selected gamma lines were used to calculate the activity concentrations of the gamma emitting radionuclides ^{226}Ra, ^{232}Th and ^{40}K in the semi-pure water samples. The hazards associated with the presence of these radionuclides were determined by computing hazard paremeters such as absorbed dose rate, annual effective dose rate, radium equivalent and hazard index.

Determination of naturally occurring radionuclides in drinking water using gamma-ray spectroscopy

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Abstract

This study was carried out to determine the concentration of naturally occurring radionuclides in drinking water in the city of Windhoek from tap water as well as bottled water available in supermarkets. Additionally, various hazard parameters such as absorbed dose rate, annual effective dose rate, radium equivalent activity and hazard index were computed from the radionuclide activity concentration values. The water samples were collected between May and July when it was particularly a dry period with water usage restriction in place by the City of Windhoek (CoW). Naturally occurring radionuclides of interest during the study were ^{226}Ra, ^{232}Th and ^{40}K. Uranium and thorium, have extremely long half-lives. Due to its radio- and chemical toxicity, high concentrations of uranium can have adverse health effects. The most common source of ^{226}Ra and ^{228}Ra in drinking water is from radiological decay of naturally occurring Uranium and Thorium deposit within the earth's crust.

A gamma-ray spectrometer was used in this research project, because it is one of the fundamental measuring techniques used for unambiguous, clear identification of radionuclides, even in mixtures of various isotopes. A

gamma-ray spectrometer was used to obtain the spectras that were evaluated with Genie 2000 software to determine the signals from the radionuclides of interest and those were converted to activity concetration for each radionuclide. Using the radionuclide concentrations, radiological hazard parameters were calculated. Lastly, the hazard indexes are key concepts in determining the health effects due to the radionuclides present in drinking water.

Nano activated Carbon from Banana Peels for Waste Water Treatment: An environmentally green approach

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Abstract

Namibia is amongst the driest countries in Africa with major concern of safe and drinkable water in the near future. In the past, water sanitation was not as effective as it is today reason being methods that were used for water treatment were detrimental for human consumption, as most diseases arose from contaminated water. With the help of technology scientists have discovered that activated carbon from coconut shell, peat, hard and soft wood, lignite coal, bituminous coal, olive pits and various carbonaceous specialty materials have the potential to remove organic compounds, dyes and odour from waste water. Activated carbon is carbonaceous, highly porous adsorptive substance that has a complex structure composed mainly of carbon atoms, that has the ability to adsorbed some of the impurities found in contaminated water. The aim of this research was to evaluate the efficiency of nano activated carbon from banana peels for waste water treatment. The nano activated carbon was prepared by two methods calcined at 900 $^{\circ}$C for an hour. Prepared nano activated carbon was applied to Sea water, Fe contaminated water, Okamanya water and Oil contaminated water. Methyl orange, methylene blue and red food colouring were also treated with nano activated carbon to remove the colour. The results were characterized with UV instrument to check the efficiency of nano activated carbon for removal of colouring matter from water. PH of both samples was tested at different temperatures (which showed indirectly proportional relationship). Due to the amorphous/porous nature of samples density of samples were done using the tapping method from 50-100 taps. Furthermore, other studies such as solvent dispersion study (acetone showed the best results throughout) and TDS (sea water contained the most salt) were done. Results from IR showed C-H stretch at 2900 cm^{-1}, are strong adsorption was observed at 1084 cm^{-1} and small bands were observed at 1400- 1000 cm^{-1}. The morphology of the different nano activated carbon prepared from banana peels was studied by SEM and TEM analysis. SEM analysis showed the formation of nanopores well scattered externally and internally, while TEM analysis showed nano porous and nano sheets were formed by the etching process at 900°C. In conclusion nano activated carbon from

banana peels have given positive results for treating waste water. Hence, an economic and eco-friendly process have been developed for waste water treatment this can be applied at industrial level in Namibia.

Fabrication of Cu_2O Thin Films from Aqueous Precursors Involving Cu(II) Complexes and the Formation of a Cu/Cu_2O Schottky Solar Cell

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Abstract

There is a shortage of energy around the world, and environmental pollution resulting from the burning of fossil fuels to produce energy has been increasing significantly over the past years. Therefore, the continued development of alternative sources of energy is compulsory. The application of thin films in solar cells is considered to have an impact on the development of alternative sources of energy. Thin films have the advantage that they save cost and resources, they have high performance and the miniaturization effect. An example of a solar cell employing thin films is the Schottky solar cell. A typical Schottky solar cell is a Cu/Cu_2O system, fabricated by forming a thin layer film of Cu_2O onto metallic Cu. There are, however, challenges in the fabrication of a Schottky solar cell: The Cu_2O film must be < 1μm in thickness. However, techniques that are currently used to fabricate such thin films are expensive and have complicated experimental setups. This highlights the need for affordable and effective techniques to fabricate thin films for solar cells.

The molecular precursor method (MPM) represents a simple yet effective, wet-chemical process for thin-film fabrication of various metal oxides and phosphates. The MPM is compatible with various coating techniques such as spin-coating, flow-coating, dip-coating, and spray-coating. The spray-coating technique benefits from its relatively simple and inexpensive instrumentation set-up, reduced material losses, and the ability to be adjusted for large area deposition in comparison to other techniques.

In this study, aqueous solutions involving Cu(II) complexes were prepared by reacting 98% copper acetate with ammonium hydroxide in water. The solutions were further reacted with formic acid in order to establish 1:4, 1:6 and 1:8 acetate to formate ratios. The final precursor solutions had a Cu^{2+} concentration of 0.1500 mmol/g. Films of Cu_2O were fabricated by spray-coating the aqueous precursor solutions onto glass substrates pre-heated to 180°C. The properties of the fabricated films will be discussed.

Extraction of Endogenous Metabolites from *Ganoderma lucidum*, and their Evaluation for Antimicrobial Activity

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Abstract

Ganoderma lucidum, a well-known medicinal mushroom, has many pharmacological activities such as antimicrobial, and anti-cancer effects. The study was aimed at performing a comparative of the antimicrobial activities of cultivated and wild *G. lucidum*. Both samples underwent phytochemical screening for alkaloids, steroids, phenols, flavonoids, saponins, and terpenes. Additionally, the phytochemicals present in *G. lucidum* were quantified. The samples were sequentially extracted with various solvents of increasing polarity, and the crude extracts subjected to antimicrobial testing against *Escherichia coli, Staphylococcus aureus, Klebsiella pneumoniae* and *Streptococcus* group D microorganisms. The assays used were the disc diffusion method and the broth method for determining the minimum inhibitory concentration. Both samples tested positive for saponins and terpenoids. The samples contained 57.3 % (cultivated) and 28.6 % (wild) saponin content. The terpenoid content was 0.82 % (cultivated) and 0.88 % (wild). The wild chloroform extract showed highest activity at 2.5 mg/mL against *E. coli* (13 mm); the lowest against *S. aureus* (2 mm) at 5 mg/mL. The cultivated chloroform extract exhibited highest activity against *S. aureus* (16 mm at 5 mg/mL), whilst *Streptococcus* was least inhibited (5 mm) at 2.5 mg/mL. The wild ethyl acetate extract best inhibited *S. aureus* (13 mm) at 2.5 mg/mL. The extract showed no activity against *K. pneumoniae* (10 mg/mL) and against *Streptococcus* at all concentrations. The highest inhibitory activity of the cultivated ethyl acetate extract was 12 mm against *E. coli* (2.5 and 5 mg/mL), *Streptococcus* (2.5 mg/mL) and *K. pneumoniae* (10 mg/mL). A low inhibition of 4 mm was observed against *S. aureus* (5 mg/mL). The wild methanol extract didn't inhibit *K. pneumoniae* and *S. aureus* at 5 and 2.5 mg/mL, respectively. The highest activity observed was 10 mm against *E. coli* (5 mg/mL). The cultivated methanolic extract also failed to inhibit *K. pneumoniae* and *S. aureus* (2.5 and 10 mg/mL, respectively). The highest inhibitory action was against *Streptococcus* at 5 mg/mL (12 mm). The wild petroleum ether extract showed best activity of 12 mm against *K. pneumoniae* and *S. aureus* (2.5 mg/mL). All the wild extracts had the lowest MIC (0.63 mg/mL) recorded against *Streptococcus*, while the highest MIC was 10 mg/mL (cultivated petroleum ether against *K. pneumoniae*). The study shows that under extensive *in vivo* and pharmacological research, *G. lucidum* can be used in the treatment of various bacterial diseases.

Synthesis and Characterization of a Multi-sensor and its application to Cations and Anions sensing in Aqueous Soluble medium

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Abstract

Nowadays most of the environmental process occurs in the presence of certain cations and anions as most of the aqueous solutions are composed of different ions and their presence needs to be monitored and identified regularly, as being in excessive levels is highly toxic to organisms and generate enormous quantities of pollution to our living environment. Currently their presence can only be detected using huge and expensive conventional methods of analysis such as ICP-MS, AAS and IR. Scientists need to synthesis a sensor using coordination chemistry replace these instrument, which is designed and synthesis from organic molecules and it should be eco-friendly, non-harmful and highly sensitive and selective towards metals ions and most of the anions in aqueous media. In this study the Schiff base condensation mechanisms was used to synthesis the sensor **MP**. The symmetric Schiff base of Phenylhyrazine $C_6H_5NHNH_2$ and 2-Hydrox-1-Naphthaldehyde $C_{11}H_8O_2$ are the reduced derivatives (LH_2^H and LDM^HH_2) of this Schiff bases to synthesis a multi sensor MP and examined for its potential use as fluorescent chemosensors for the detection of any group D elements and anions in aqueous soluble medium the analysis was conducted in 9:1 DMSO and H_2O solution. The obtained sensor has a good affinity of detecting Hg^{2+} and OH^- ions when the classical analysis method was conducted; this is a pre method of testing the synthesised sensor if it has an affinity. The observation was confirmed using the UV analysis which titrate the ions (0.003M) against MP (1×10^{-5}M) to obtain all the sensed ions that were not observed during the classical methods and more than one ions were sensed such as Ni, Hg, Ag and Cu this proved the synthesised MP is dual sensor. Colorimetric activitys and spectral changes by bathochromic shift or hyporchromic shift cornfirming the presence of these anions and cations.

Antimicrobial Activity and Anti-Biofilms Analysis of *Moringa oleifera Lam* Leaves, Flowers and Bark Extracts

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Abstract

Infectious diseases are responsible for many deaths especially in developing counties such as Africa. Finding new anti-microbial agents is a very important step to overcome this issue. Studying medicinal plants can lead to the discovery of new drugs such as antibiotics since there is an increase in antibiotic resistance and there is also new diseases being discovered every time. *Moringa oleifera* which is the medicinal under study is used to cure or treat different conditions traditionally and is used as basic food. This plant contains nutrients as well as antioxidant properties. This study focuses on the antimicrobial and anti-biofilm activity of this particular plant. The plant parts extracts were tested against four microbial strains which were *Escherichia coli, Candida albicans, Staphylococcus aureus* and *Klebsiella pneumonia*.

The plant parts extracts were first screened for antimicrobial activity against four microbial strains using agar disc diffusion method and then the MIC of the plant parts extracts were determined. Biofilm analysis was done using crystal violet (0.1%) stain assay and both inhibition and reduction of *S. aureus* by plant extracts were determined.

The screening of the plant parts extracts gave positive results against four strains of microbes. The MICs for the bark and leaves were less than 1mg/ml for all the strains, while flower extract had an MIC of 2 mg/ml for three strains except for *C. albicans* where the MIC was less than 1 mg/ml. Bark and flower extracts showed a 37% and 24% biofilm inhibition respectively, while leaves extract showed no inhibition. All plant extracts however, had no biofilm reduction properties.

These results showed that the plant extracts have antimicrobial activity although anti-biofilm activity is limited. This information can be useful to medicinal chemists that are trying to discover new and better antimicrobial agents.

Characterization of sediment samples from Avis dam, Windhoek, using Gamma-ray spectroscopy

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Abstract

This study aimed to measure the naturally occurring radionuclide content, activity concentration and distribution in sediment samples from Avis dam bed. The activity concentration was then used to calculate the radiation dose rates and other hazard parameters due to the radionuclides of interest in the sediment samples and the calculated values compared to acceptable levels. The radiological parameters calculated are absorbed dose rate, annual effective dose rate, radium equivalent activity and hazard index.

A calibrated gamma ray spectrometer was used to measure the activity concentration of the radionuclide in the sediment samples. This was done by obtaining gamma-ray spectra and the spectra analyzed for radionuclides of interest with Genie 2000 peak analysis software. The radionuclides of interest in this study were ^{238}U, ^{40}K and ^{232}Th.

The Handheld Niton X-Ray Fluorescence (XRF) Analyzer was used to give chemical composition and approximate concentration of the elements present in the sediment samples.

High radionuclide activity concentrations may pose a radiological hazard. Thus measuring the radionuclide activity concentrations in sediments at the popular recreational dam and potential source of drinking water in Windhoek may provide baseline information about the radiological hazard at this site.

Key words**: Radionuclide, XRF, Radioactivity, Gamma ray Spectroscopy, radiological hazards, activity concentration**

Development of a fast hydrophilic interaction liquid chromatography method for the analysis of ascorbic acid in fruit juice

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Abstract

Determination of organic acids in food and beverages is of a primary concern in the food industries for quality control. Organic acids play a crucial role in the quality maintenance and nutritional value of foodstuff, hence there is a need to determine their quantities in food and beverages. Ascorbic acid is an organic acid that plays a role as an antioxidant and acidulant in the food industry. In this study a hydrophilic interaction liquid chromatography

(HILIC) method for the rapid analysis of ascorbic acid in fruit juice was developed. The goal of the study was to develop a fast HILIC method and to validate and apply the method for the analysis of ascorbic acid in fruit juice. A Waters BEH amide column was used for all the experiments and the most important parameters that were optimized were the column temperature and mobile phase flowrate. This was achieved by constructing Van Deemter curves at a number of different column temperatures (40, 60 and 80°C) and using the data to choose the optimal method. In the optimised method a mobile phase containing 85% acetonitrile and 5 mM ammonium formate (pH 9) is used in combination with a mobile phase flowrate of 2 mL/min and column temperature of 60°C. The resulting method had an analysis time of less than three minutes, which is four times faster than working at the optimum flow rate, but without a great loss in separation efficiency. The limit of detection was found to be 5 µg/ml and the method displayed acceptable precision and accuracy when applied to the analysis of ascorbic acid in commercially available fruit juice.

Comparison of Composites from Namibian *Ulva lactuca* and German *Arthrospira platensis* and their Antimicrobial Activity

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Abstract

Algae have been one of the richest and most promising sources of bioactive primary and secondary metabolites. The aim of the present research is to evaluate the phytochemicals, and antimicrobial activity of two algae species namely, *Ulva lactuca* and *Arthrospira platensis*. *Ulva lactuca*, commonly known as sea lettuce, is an edible algae that grows or attaches on exposed rocks and shores as well as in shallow sea water. *Arthrospira platensis* commonly known as *spirulina* is a biomass of cyanobacteria which is a type of blue-green algae that grow in fresh water lakes, rivers and ponds, and can be consumed by humans and animals. Both algae were extracted with methanol:Dichloromethane mixture (1:1) and qualitative phytochemical analysis was done on them. Crude extracts were tested for antimicrobial activity using the disk diffusion method. The phytochemical profile of the two algae species was similar revealing the presence of biochemical compounds such as terpenoids, saponins, steroids, alkaloids, and carbohydrates in both. The *spirulina* extract showed a great inhibition growth against all tested microbes with inhibition zone of 10 mm, while *Ulva lactuca* extract showed an inhibition zone of 8 mm. The lowest MIC (0.6 mg/ml) was observed for *Ulva lactuca* extract. Isolation of pure compounds should be done for this species in future.

DPPH radical scavenging and anti-HIV-1 reverse transcriptase activities of selected Napthalic anhydride and Isatin based commpounds

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Abstract

HIV-1 reverse transcriptase is the enzyme resposinble for the third step in the HIV-1 life cycle. It is responsible for the conversion of viral RNA to viral DNA which is why it is the most targeted step in drug discovery. The proliferation of HIV is directly proportional to the presence of free radicals meaning the higher the oxidative stress the high the rate of viral multiplication. In this study the aim was to find a compound that scavenges for free radicals and also inhibit reverse transcriptase. This study focused on radical scavenging and HIV-1 reverse transcriptase (RT) inhibition activities of naphthalic anhydride and isatin derivatives. In literature, these two classes of compounds were mostly evaluated for antimicrobial activities with isatin derivatives showing a broad microbial inhibiton sprectrum compared to napthalic anhydride derivatives. The naphthalic anhydride derivatives under investigation in this study were (1) methyl N-(1,3-dioxobenzo[δ]isoquinolin-2-yl)carbamodithioate and (2) 2-thiazol-2-yl-3α,4-dihydrobenzo[δ]isoquinoline-1,3-dione and the isatin derivative was 3-(1H-indol-3-yl)-2-[(E)-(2-oxoindolin-3-ylidene)amino]propanoic acid (3).

The DPPH assay was used to evaluate radical scavenging activity. The principle of the DPPH assay is discoloration of DPPH, a purple free radical, via proton donation. The activity of DPPH was noted after incubation with the compounds. The Reverse Transcriptase Assay, colorimetric was used to evaluate the anti-HIV-1 RT activity of the compounds. In this assay the activity of the enzyme was monitored using ABTS after treatment with the compounds.

The compounds 1 and 3 showed good activity in radical scavenging while compound 2 had extremely low radical scavenging activity. The inhibition of the HIV-1 reverse transcriptase results were the opposite of the radical scavenging activity for all the compounds with the naphthalic anhydride derivative 2 showing greater activity compared to the other two compounds.

In the end none of the compounds showed high activity in both assays. The compounds that had high radical scavenging activity showed less than fifty percent in the RT assay. The compounds 1 and 3 included proton donating groups hence neutralized DPPH. The compound that showed high enzyme inhibition, the radical scavenging activity was low as it lacked a proton donating group.

Synthesis and Characterization of a Selective Chemosensor for the Detection of Heavy Metals

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Abstract

The development of chemosensors that are capable of rapidly recognizing and sensing anions and cations has grown into one of the leading expanding areas of interests of supramolecular chemistry ever since the first chemosensor was synthesized in the early 1960's. Chemosensor have received great attention in the last two decades, possibly because of the great importance of the complexation of cations and anions in areas such as chemistry, biology, pharmaceutics, environment, and industry. The synthesis of chemosensors for the recognition of harmful and toxic ions is very important challenge, nowadays. Chemosensors are based on molecules that can bind selectively and reversibly with an anion or a cation. In this study, a chemonsensor was synthesized using 1-napthaldehyde and 2-aminophenol via Schiff base mechanism. The sensor was characterized by elemental analyses, infrared, UV-visible spectroscopy, and florescence machine. A 100 ml solution of 1.0×10^{-3} M of the chemosensor was prepared with DMSO in ratio with H_2O (9:1) as a best solvent and was tested on different cations and anions using naked eyes to observed colours changed. The chemosensor showed visual changes towards anions, such as OH^- orange in colour ,F^- red in colur , AcO^- red in colour, PO_3- red in colour, CN^- yellow in colour, and Br^- orange in colour, and towards cations, such as Zn^{2+} orange in colour, Cu^{2+} green in colour, Ni^{2+} light in colour , Co^{2+} red in colour, Fe^{2+} brown in colour, and Cr^{2+} green in colour. In order to investigate whether the chemonsensor can detect those cations and anions, another 100 ml solution of 1.0×10^{-5} M of the chemonsensor was prepared with DMSO using a UV/vis spectrometer where all above cations and anions were senses. Adding to that, fluorescence was also conducted for the interactions with promising results being obtained. The Job's method was then utilized to investigate or determine the binding ratios of the chemosensor with the different anions and cations.

Removal of Ampicillin from Water Using Sepiolite Clay

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Abstract

Contaminants of emerging concern(CECs) are pollutants of growing health and environmental concern. CECs range from pharmaceuticals and personal care products to persistent organic used in many industrial and agricultural processes. Advanced wastewater treatment is necessary to effectively remove (CECs) with chronic toxicity, endocrine disrupting effects, and the capability to induce the proliferation of highly resistant microbial strains in the environment from wastewater disposal or reuse. The presence of antibiotics in the aquatic environment is a serious concern, because it may lead to the emergence of antibiotic resistance, thus lowering the therapeutic effect of antibiotics. Adsorption is a promising method worldwide for CECs removal, its low initial cost, highly-efficient and has simple operating design. The retention capabilities of this process are shown through this research which intended to investigate adsorption efficiency of sepiolite clay for the removal of ampicillin from water.

Keywords: Adsorption, Ampicillin, Antibiotics, Contaminants of emerging concerns, Sepiolite Clay, Wastewater

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Extraction of endogenous metabolites from the leaves and roots of *Fockea multiflora*, and their evaluation for antimicrobial activity

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Abstract

The *Fockea multiflora* is a large succulent liane with milky latex, which may be poisonous if ingested. It is traditionally used in treatment of diseases such as cancer, diabetes, swollen joints in old age people, wounds, infertility, and also for immunization purposes. Even so, there is limited information available on the chemical composition and antimicrobial properties of the plants under study. Therefore, the objectives of this study were to extract endogenous metabolites from the leaves and roots of *F. multiflora*, and evaluate them for antimicrobial

activity. The leaves and roots of *F. multiflora* samples were sequentially extracted using diethyl ether, chloroform, ethyl acetate, methanol, and distilled water. The plant material was subjected to qualitative phytochemical screening to detect the presence of secondary metabolites such as flavonoids, tannins, polyphenols, and saponins. Also, the endogenous metabolites extracted were evaluated against *Candida albicans*, *Saccharomyces cerevisiae*, *Staphylococcus aureus*, *Bacillus cereus*, *Escherichia coli* and *Salmonella typhimurium* using disc diffusion assay and minimum inhibitory concentration (MIC). Phytochemical screen tests revealed the presence of the following secondary metabolites in the leaves and roots of *F. multiflora*: flavonoids, tannins, polyphenols, and saponins. The chloroform leaves extract showed a strong inhibition zone of 22 mm at concentration of 10 mg/ml against *S. typhimurium* in comparison to *A. candida* which showed the lowest inhibition of 8 mm at.10 mg/ml. The methanol roots extract had the lowest MIC of 2.5 mg/ml against *B. cereus*, *C. albicans*, and *S. cerevisiae.* Our results demonstrated the presence of phytochemical compounds and antimicrobial activity in the leaves and roots of *F. multiflora*. It is recommended for isolation of pure compounds for the plant under study and subject them to anticancer testing.

Keywords: *Fockea multiflora*, antimicrobial activity, endogenous metabolites, disc diffusion assay, minimum inhibitory concentration

Antioxidant Analysis of *Sclerocarya birrea* Traditional Drink

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Abstract

Plants have a long history of treating human diseases traditionally. This has therefore encouraged research on medicinal plants in hope of discovering new drugs. Medicinal plants are plants that produce a variety of compounds that function to fight insects, fungi and diseases in nature in order for the plant to thrive. *Sclerocarya birrea*, commonly known as marula, is a plant native to African that belongs to the genus *Sclerocarya*. This species have multifunctional uses which are recognized commercially, medicinally (traditionally and modernly) as well as culturally in Africa. The antioxidant activity of the *S. birrea* traditional drink was analyzed by means of 2,2-diphenyl-1-picrylhydrazyl (DPPH) and Ferric reducing antioxidant power (FRAP) as well as the presence of the major classes of phytochemicals was also determined. Phytochemical screening revealed that the *S. birrea* traditional drink contains phenols, flavonoids, saponnins as well as glycosides. The total phenolic and flavonoid content was measured using the Folin Ciocalteu method and the Quercitin method, respectively.The traditional drink was tested for antioxidant activity and it demonstrated an antioxidant activity with an IC_{50} value of 39.73 $\pm$ 2.075 mg/ml. This is a very good IC_{50} value exhibited by the *S.birrea* traditional drink.

The synthesis and characterization of a colorimetric sensor and its application to detecting cations and anions

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Abstract

The designing and synthesis of new organic colorimetric chemosensors which are eco-friendly, highly sensitive and selective towards metals, are currently of great attention. A Chemosensor was synthesized by Schiff base condensation with a reaction of Di (2-Pyridyl) Ketone and hydrazine carbodithioic acid in a 1:1 ratio to produce the chemosensor with DMSO as a solvent. Chemo receptor is additionally referred to as chemosensor, which is a sensory receptor that transduces a chemical signal into action potential. The chemosensor solution was prepared with a concentration 1x 10^{-3} M of the product (ligand) in DMSO:H_2O (9:1) as the solvent, this solution was later used to test small portions of cations and anions. There were 15 cations that were analyzed and 12 cations were

sensed by the colorimetric sensor, due to the fact that there was color change and 4 cations were not sensed because the color remained unchanged, and 10 Anions were tested of which 7 were sensed and the other 3 there was no color change observed. This chemosensor changed color when it came in contact with selected cations (Zn^{2+}, Cu^{2+}, Ni^{2+}, Co^{2+}, Fe^{2+}, Fe^{3+}, Pb^{2+}, Ag^{+}, Al^{3+}, Hg^{2+} and Cr^{3+}) and anions (OH^{-}, F^{-}, AcO^{-}, O_3N^{-}, $H_2SO_4^{-}$, PO_3^{-}, N_3^{-} and Br^{-}). The chemical interaction between the receptors and ions was monitored by the UV-vis spectroscopy, the absorption bands of the bases were observed at 360 nm to 400 nm. There was no absorption past the 400 nm mark. It was easy to identify the bands of ions and the receptor in comparison with DMSO on the UV-vis spectra. The job's plot was drawn from the UV-vis spectral information to determine the binding event between the sensor and the ions. The heavy metals seemed to interact more with the chemosensor than anions in the colorimetric analysis and the UV-vis spectra, this is illustrated in the results section of the study. The spectroscopic information correlated with the chemical structure of the chemosensor.

Characterisation of UV-active constituents of *Acanthosicyos horridus* (!Nara) seed oil using high performance liquid chromatography

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Acanthosicyos horridus, locally known as !nara, is an unusual melon-bearing plant that grows in very dry areas, most prevalently in the Namib Desert. The plant is treasured by the Topnaar people as it serves as a source of food, fuel, medicine and cosmetics. !Nara seed oil has been receiving increasing attention from both the local and international communities due to its good skin rejuvenating properties and high content of antioxidants, omega-6 essential fatty acids and vitamins. Despite this, there is limited information on the chemical composition of the oil. For any plant to be recognized for its value, their physico-chemical properties need to be known in order to establish possible applications. The objectives of this study was to characterize UV-active constituents of *A. horridus* by using high performance liquid chromatography (HPLC). The HPLC method was developed by screening different columns and solvents (polar or non-polar) in order to identify the one that provides the best separation. The best results were obtained using a mobile phase based on acetonitrile, methanol and isopropanol on a C18 column. Looking at the chromatograms obtained for the oil sample, a number of compounds were detected in the oil samples at different wavelengths. Different profiles were obtained at different wavelengths which is an indication that the oil contain different classes of compounds. UV spectral data were used to tentatively assign the separated compounds to different lipid classes, however positive identification of the individual compounds could not be established in the absence of additional spectroscopic information. It is therefore necessary to further analyse the samples using LC-MS and/or nuclear magnetic resonance in order to establish the identities of individual compounds as this could not be done within the timeframe of this project.

Nano CoFe Hydrotalcite catalayst for the removal of contaminants from waste water.

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Abstract

Water is life and therefore when tempered with through contamination, people, animals and plants are also affected negatively. Shortage of clean water results in an outbreak of diseases such as cholera, malaria and dengue fever etc. In this present work the project focuses on the application of Nano CoFe LDH as a catalyst to remove different contaminants such as colour and organic matter from waste water. Hydrotalcites have a brucite-like structure Mg $(OH)_2$ with the general formula of $[M^{2+}_{1-x}M^{3+}_{x}(OH)^{2-}]_x+ (A^{n-})_{x/n}.mH_2O$, where M^{2+} and M^{3+} are divalent and trivalent cations and An^- is an anion. The Calcination of LDH to a high temperature lead to the formation of a calcined LDH. LDHs are important due to their potential applications as adsorbents, catalysts, catalyst supports, medicine, ceramic industry and polymer additives. Co Fe hydrotalcite was prepared through co-precipitation method at pH 10-12 at 0°C. The catalyst was prepared using three different ratio of 2:1, 3:1 and 3,5:1. Various applications were executed with the uncalcined and calcined hydrotalcite. Fe contaminated water, sea water, Cobalt(II) acetate solution and Okamanya water were treated with Nano CoFe LDHs to remove the contaminants. Methylene blue was treated with the hydrotalcites to remove the colour. Nano CoFe LDHs were characterized by SEM,TEM, and FT-IR to determine the structural function relationship for the prepared catalysts. The dispersion study that showed high transparency in the initial sample and of the lower phase once the sample that showed clear dispersion was acetone, showing that it was not intact with the catalyst. P^H of Nano CoFe LDHs was conducted at various temperatures to check the colour and crystallinity of the samples. The density of the samples was also determined by using the tapping method at various taps from 50 to 100. The morphology of nano CoFe LDHs was characterized by SEM and TEM instruments suggest Nano-particles and others with hexagonal-shaped particles were observed. It was also observed that sea water has a higher conductivity then tap water. Hence nano CoFe LDHs was synthesized at low temperature which is a ecofriendly, and economic process for waste water treatment.

Antioxidant Analysis and Phenolic Content of Flower, Leaf and Bark extracts from *Moringa oleifera*

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Moringa oleifera is the most widely cultivated species of family Moringaceae. It has been given several names including, horseradish tree, benzoil tree, kelor, marango,mlonge, moonga, saijhan, saijna and ben oil tree. *Moringa oleifera* is considered one of the world's most useful trees, as almost every part of the tree has some medicinal, nutritional and other beneficial properties. This study aims at the antioxidant analysis and phenolic content of flower, leaf and bark extracts from *Moringa oleifera*.

Powdered material of the leaf, flower and bark was extracted in 80 % methanol at room temperature for 24 hours. The solvent was removed under pressure using a rotary vapor and extracts was stored in the fridge until analysis These extracts were tested for antioxidant activity using reducing power, 2, 2-diphenyl-1-picrylhydrazyl (DPPH) free radical scavenging assay and ABTS assay and results expressed as IC_{50}. The phenolic and flavonoid content of these extracts were evaluated using Folin-Ciocalteu's method with gallic acid as standard and aluminium chloride method with quercetin as standard, respectively.

The results for DPPH radical scavenging was determined by the IC_{50} values of the *Moringa oleifera* extracts. The IC_{50} values obtained was 65.7 µg/ml, 216 µmg/ml and 0.5543 µg/ml for the leave flower and bark extracts respectively as compared to ascorbic acid which was found to be 0.02341 µg/ml. This is an indication that the bark showed good activity. For reducing power, the higher the absorbance of the extract, the greater the reducing power, bark showed good activity as the results are in similar proximity as the ascorbic acid. Result obtained for total antioxidant capacity showed good activity for all the extracts which was found to be 0.2649 mg AAE/g DW, 0.1952 mg AAE/g and 0.4382 mg AAE/g DW for the leave, flower and bark. For the total phenolic content the results obtained was 2.0707 mg GAE/g, 1.8607 mg GAE/g and 5.6215 mg GAE/g for the flower, leave and bark respectively and for the total flavonoid content it was found to be 2.7538 mg QE/g, 7.5051 mg QE/g and 0. mg QE/g for the flower, leave and bark respectively which also is also an indication of good activity.

This study shows that the extracts from *Moringa oleifera* especially the bark contain good antioxidant properties. Further studies could be carried out to test for the toxicity of these extracts for human consumption as well as additional research can be done on the roots *of M.oleifera* to test if it also contain antioxidant properties.

Antimicrobial activity and antibiofilm activity of the leaves extracts of *Ziziphus mucronata* and *Tachonanthus comphoratus.*

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Abstract

Microbial diseases in Namibia are a very big public health due to their ongoing increase in antibiotic resistance as well as the lack of antimicrobial agents to treat the newly emerging and existing disease. Biofilm is a complex microbial community highly resistant to antimicrobials. The formation of biofilms on surfaces (can either be living or nonliving surfaces) is associated with high rates of chronic disease which eventually lead to death in patients. New approaches for handling infections have been introduced focusing on the therapeutic properties of ethno medicine and their antimicrobial activity.

In Namibia very little research has been done on the antimicrobial activity of the plant extracts *Ziziphus mucronata* (Omukaru) and *Tanchonanthus comphoratus (*omuteatupa), thus in the present study, antimicrobial and anti-biofilm activity of these plant extracts were evaluated against *Escherichia* coli (Gram negative), *Staphylococcus aureus (*Gram positive) , *Candida albicans (*fungi) *and Klebsiella pneumonia (*Gram negative) and anti-biofilm activity against *staphylococcus aureus*.

Plant leaves were extracted separately with 80% methanol and the extracts were first screened against the bacteria using the disc diffusion method then zone of inhibition was measured and MIC recorded. Biofilm staining assay was used to evaluate the anti-biofilm activity of the extracts with crystal violet as the staining agent. Optical density was measured and % inhibition and % reduction was recorded for each plant extract.

Zones of inhibition observed for E.coli and *Staphylococcus aureus* was 8mm, *Candida albicans and Klebsiella pneumonia* was 7mm for Omukaru extracts and 8mm zone of inhibition for *Candida albicans, Staphylococcus aureus* and *Escherichia coli* whereas *Klebsiella pneumonia* had 7 mm zone of inhibition for Omuteatupa extracts . The antimicrobial activity of the plant extracts used have been found to be noteworthy for all the microbes they were tested of which more activity was discovered against *E.coli* and *Candida* with their MIC of 0.4 mg/ml as compared to *Staphylococcus* and *Klebsiella* with the MIC of 0.8 mg/ml. Both extracts could not inhibit or reduce biofilm formation of *Staphylococcus aureus* as the % inhibition and reduction were zero for both Omukaru and Omuteatupa.

The plant extracts have potential antimicrobial activity for both bacterial and fungal strains but no biofilm activity for *Staphylococcus aureus*. Further studies on the mode of action should be looked at

Fabrication of TiO_2/Ag Composite Thin Films from Aqueous Precursors Involving Ti^{4+} and Ag^+, via the Spray-Coating Method

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Abstract

The concept of nanotechnology is becoming more and more popular every year in the fields of science and engineering, due to its production of nanoparticles. Thin films have attracted enormous attention due to their noticeable performance in nanotechnology devices. The advantages of thin film fabrication include reduced cost, miniaturization effect, and enhanced performance. TiO_2 is a very important metal oxide benefiting from its non-toxicity, corrosion resistivity, and photocatalytic activities and, thin films of TiO_2 have found applications in self-cleaning coatings and electronics. Although TiO_2 has many applicable properties in nanotechnology, its photocatalytic properties are limited to the UV region of the electromagnetic spectrum which is only about 4-5% of the sunlight. In addition, the high electrical resistivity of TiO_2 (> 10^6 Ω cm) limits its application in electronics. In order to enhance the photo-response of TiO_2 in the visible region and also reduce its electrical resistivity, many researchers have investigated the fabrication of composite thin films by doping TiO_2 with various noble metals.

The molecular precursor method (MPM) represents a simple and effective wet chemical method for the fabrication of nano-crystalline thin films of metals and various metal oxides and phosphates and it's based on the designing of metal complexes in coating solutions. In this study, aqueous precursor solutions involving complexes of Ti^{4+} and Ag^+ were prepared and used to fabricate TiO_2/Ag composite thin films via spray-coating. Spray-coating is a cost-effective method benefiting from a minimized loss of materials and simple set-up. The ammonium titanium oxalate monohydrate complex, $(NH4)_2Ti(O)(C_2O_4)_2{\cdot}H_2O$ was synthesized via a modified method utilizing titanium butoxide and an ammoniacal solution of oxalic acid. UV-Vis analysis of the solution confirmed that the obtained powder was indeed a complex of Titanium. Since an absorbance peak could be observed at 385 nm. An attempt to prepare an aqueous solution involving silver by reacting to the complex $(NH4)_2Ti(O)(C_2O_4)_2{\cdot}H_2O$ with Ag acetate in a mixture of water and hydrogen peroxide. However, no clear solution could be obtained. The aqueous precursor solutions were spray-coated onto glass-substrates preheated to 180℃. The as-sprayed films were heat-treated at 500℃ in air for 30 minutes. The properties of the various coatings obtained will be discussed.

Bioremediation:The Rate of Microbial Degradation of used Lubricant Oil from selected Garages in Katutura.

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Abstract

Used lubricant oils have become a major cause of pollution in the many parts of the world including the Namibian country. The used lubricating oils (ULO) are not easily degraded, they take a long time to be fully degraded into harmless compounds. Land and water sources (e. g rivers, lakes) have become polluted because of used lubricant oils. These used lubricant oils are so toxic to both the environment and human beings, because they contain harmful contaminants, such as heavy metals, polychlorinated biphenyls (PCBs) and polycyclic aromatic hydrocarbons (PAHs). Thus the main objective of this research is to use bioremediation in solving the problem caused by pollution of used lubricant oils. Bioremediation is the process of using microorganism to breakdown harmful toxic substances into less harmful compounds, such as carbon dioxide, water and other inorganic compounds. Four different areas in Katutura were visited, such as shandumbala, Evelyn street, Shipena, Golgotha and also the university of Namibia as the fifth location. About five soil samples were collected from these areas, one soil sample was collected from the surface and the other 1 cm deep, this was done in all locations. The nutrient broths were used as the pre-culturing medium, then the microorganisms were inoculated on nutrient agar which acted as a growth medium for them. From the results obtained it was noticed that the morphology for all the microorganism was the same, they were all whitish yellow. The gram staining technique was also used, it was observed that they are all gram positive bacteria and they are bacillus. The obtained pure cultures from the agar was inoculated in nutrient broths. The pure cultures were used to see if they can degrade used diesel, which was mixed with soil and positive results were obtained. The rate of how these microorganisms degrade the used lubricant was experimented for seven days, it was noticed that these microorganisms degrade used lubricant oils at a slow rate. It was observed that the concentration of the microorganisms also affects the rate of the microorganisms, the more concentrated they are the more their rate increases in breaking down the diesel (ULO). It can be concluded that bioremediation can be used in cleaning our environments that are polluted with the ULO, in order to make them more efficient they will need to be genetically engineered and mix the different types of bacteria that have the ability to degrade these oils.

Isolation and characterization of the major constituents of the toxic plant, *Trachyandra laxa*.

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Abstract

All plants produce metabolites for their survival. Some plants produce metabolites for their protection and as deterant of feed animals and insects that regard them as food. These metabolites are mostly toxic to animals. Toxic plants have been found to contain different types of toxic compounds, including lectins, coumarins, oxalates, glycosides, saponins, carotenoids and terpenoids. Toxic metabolites such as α,β-unsaturated sesquiterpene lactones have been studied extensively and are known to elicit their toxicity due to their promiscuous reactivity, through Michael addition type reactions. *Trachyandra laxa* is a plant species that causes livestock deaths in Namibia and other countries in the Southern Africa. In previous studies conducted in our laboratory potentially toxic α,β-unsaturated lactones were tentatively identified in the dichloromethane extracts of *T. laxa* plant material. Hence, this study focused on the isolation and characterization of the major constituents in extracts of *T. laxa* plant material and any other potentially toxic compounds. The dichloromethane (DCM) extract of *T. laxa* leaves was fractionated using column chromatography, with silica as stationary phase and different mixtures of hexane and ethyl acetate as mobile phase. The resulting fractions and isolated compounds were characterized using gas chromatography – mass spectrometry (GC-MS). Three compounds were tentatively identified as long chain alkynes based on their MS and retention index data. Alkynes are unsaturated hydrocarbons that are very rarely found in nature due to their high reactivity. It is also due to their reactivity that they may elicit toxic effects. Similarly, two constituents were tentatively identified as α,β-unsaturated lactones, which supported the findings from the previous studies on *T. laxa*.

Isolation and Molecular Identification of Engine Oil Degrading Microorganisms from contaminated soil in Windhoek city

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Abstract

The dominant microorganisms present in soils, contaminated with hydrocarbon fractions in engine oils (used and unused) at various automobile workshops in five locations in the city of Lagos were isolated. Engine oil dumping has become a big problem in Windhoek due to illegal dumping and careless handlings of spent lube oil in mechanic workshops have been the significant source of environmental pollution due to the predominantly

unstructured practice of automobile vehicles repair services, contaminations of soil have been imminent from the continuous disposal of used engine oil, which could lead to great health problems. The purpose of the study was to isolate and identify microorganisms capable of degrading lubricant oil from the contaminated soil around Katutura. DNA isolation was perfomerd using the was performed using the bio-101 protocol adopted from Andrew Binns' lab protocol, using phenol /chloroform solvents to purify genomic DNA . The identification was done through running a PCR then sequencing targeting the S16 5'TCCGTAGGTGAACCTGCGC3' and 5'1TCCTCCGCTTATTGATATGC 3' of the Bacteria and the sequence were aligned using BLAST algorithm of National Centre for Biotechnology Information (NCBI) database for percentage similarity. Pseudomonas species were found in all 5 of the sites including the uncontaminated cite (UNAM). This means that these microorganisms are from the soil contaminated or uncontaminated, with this results the micorrganisms can be grown on a lager scale to improve the quality of the contaminated soil.

Investigation for the Quality of the Water Treated using *Moringa Oleifera* Seed's Crude Protein Extract in comparison with ddH_2O

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Abstract

The availability of clean and safe water in its pure is amongst the increasing problematic factors worldwide. This is largely due to factors such as extensive cost on the different water treatment methods yet no specific and effective method identified that is sufficient enough to cater for the needs of entire world. Namibia is known to be a dry and arid country and water contamination does not make the matter at hand any easy. Thus, the study is aimed at investigating the quality of water treated using of *Moringa oleifera* crude seed's protein extract. Though not analyzed on a large scale, *M. oleifera* crude's protein extract could successfully remove a variety of contaminates such as organic waste, salt, bacteria and color dyes from dirty/ waste water from gammams dam. One of the advantages that *Moringa* seeds exhibited over other water treatment methods is that it exhibits high efficiency in the reduction and prevention of the bacterial growth in waste water. Initially, contaminated samples were analyzed for color, temperature, pH, ions, hardness turbidity and anti- bacteria. Protein was extracted from seed powder. Waste water was treated by dissolving 150mg of the crude protein in small volume of clean water in a beaker (well mixed) and then transferred to 1 liter of the contaminated water with stirring. This was stirred for 1 hour at room temperature. Based on the results obtained for the test conducted treated gammas water had a much lower turbidity of 85.3 mg/L compared to the untreated which was three times more. The same can be said for the treated sea water. The treated gammams water had several ions present such as nitrate (0.905 mg/L), Fe^{2+} (1.4 mg/L) and chloride (1775 mg/L) while, on the other hand the treated sea water only had Fe^{2+} (0.48 mg/L) present. A comparison of the treated water samples to that of double distilled water and tap water it's evident that all the

water samples had Fe^{2+} present. All the treated water samples tested negative for hardness. Lastly, the pH's of all the water samples were in the same range of 4.98-5.02, with the treated sea water having the lowest pH. Thus, in a nutshell the treatment and investigation of contaminated water will benefit the Namibian community at large, and it will also improve the performance of drinking water systems by providing proper hygiene and reduce the spread of common diseases such as cholera and dysentery.

GEOLOGY

The Characteristics and Use of Calcrete as a Sample Medium for Gold Exploration in the Karibib Area.

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Abstract

Calcrete are secondary carbonates dominantly composed of calcite and dolomite formed as a result of climatic fluctuations in semi-arid and arid regions. Several studies in Australia have shown significant occurrences of gold in calcrete which have proven calcrete sampling to be applicable in exploration. In Namibia the use of calcrete as a sample medium for gold exploration has never been applied before and only now its being tested by Osino Resources Corp in the Karibib area. The Karibib area is covered by extensive calcrete cover and using calcrete to find gold deposits can be a potential method to establish the gold occurrences.

Through geophysical anomalies, Osino Resources discovered a new gold trend, now termed as the Karibib Fault, located south west of Twin Hills prospect, one of Osino Resource's gold prospects. Gold mineralization at Twin Hills prospect is hosted in the Kuiseb Formation schist. Several methods have been proposed to guide in exploration of tracing gold along this gold trend. The methods include soil sampling which revealed a gold anomaly and this was followed up by a calcrete sampling programme and results showed presence of gold concentrations within the calcrete. Nonetheless, the occurrence if gold in the calcrete along the newly discovered Karibib Fault is not well understood and more studies are required to establish the controlling factors of gold mineralization in this area.

This project is aimed to show how sampling calcrete as an exploration technique can be used to facilitate the discovery of gold deposits in calcrete covered terrains and to establish how gold values vary with each type of calcrete. Classification of calcrete is necessary in order to interpret the occurrences of gold in calcrete. As part of this study field work was carried out and this includes pit mapping and sampling, which was necessary to map out the types of calcrete and compare the gold values in each type of calcrete. Mapping of surface calcrete outcrops was used to identify the different types in the area and come up with a conclusion on the environment of formation. Drill core logging and sampling was employed to identify the different types of calcrete and see how gold values vary with depth and with each type of calcrete.

Mineralization and microstructures of a brittle shear zone within the Ondundu area, in Namibia

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Abstract

The Ondundu turbidite-hosted Orogenic Gold deposit, located on the Neo-Proterozoic Kuiseb Formation of the Upper Swakop Group, is currently undergoing detailed exploration to define the mineralization boundaries. Shear zones are of importance in the mineralization model of the Ondundu deposit. This is because the main mineralized zone, comprises of a shear zone trending NNE-SSW within a tight parasitic anticline-syncline system, with the common limb overprinted by the structure. The gold appears to be confined to conformable quartz veins formed during the D2 event of the Damara orogeny. A structure parallel to the mineralised shear zone was observed on the south western part of the main mineralized zone. The study aims to conduct a detailed structural and geochemical analysis of this structure through detailed mapping; microscopic studies, gold fire assaying and trace element analysis of lithologies.

The structure is confined to a common limb of the tight parasitic fold, with the anticline fold hinge zone almost completely removed. The country rocks in close proximity exhibit crystalline textures, which could be a result of the heat from the structure. Two episodes of fluid injections have been observed in this zone, a quartz rich and a later carbonate rich, subjected to brittle shear deformation. The structural data indicates that the structure was formed during the D3 event. The content of useful indicators or pathfinders for the presence of gold, As, Cu, Bi, Pb, Se, Mo, W, Cd and Ag, indicate that the brittle shear structure is mineralized. Fire assaying has infact detected some gold concentrates between 0.002 to 0.023 g/t.

Seismic Stratigraphy for source and reservoir prediction in the Luderitz Basin.

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Abstract

The Lüderitz Basin is located at the passive continental margin offshore southern Namibia adjacent north to the Orange Basin. Selected 2D seismic dip lines have been interpreted using OpendTect software. Following a sequence stratigraphic approach lithofacies for various stratigraphic levels have been predicted. Herewith a prognosis for the extent and location of potential reservoir and seal rocks as critical petroleum system elements was made. The seismic stratigraphic surfaces were identified on the basis of stratal terminations which include

downlaps, onlaps, toplaps and erosional truncations. Subsequently the defined surfaces were classified as sequence boundaries, transgressive surfaces and maximum flooding surfaces. The seismic stratigraphic analyses revealed four major tectonostratigraphic units separated by three major unconformities. The main units are identified as Pre-rift (Carboniferous to early Permian), Syn-rift (late Jurassic to Hauveterivian), Early drift (Barremian to Cenomanian) and Late Cretaceous-Tertiary (Turonian to recent). At least one potential source rock, and several potential reservoir zones were identified in the Lüderitz Basin.

A Geochemical and Petrographical Investigation of the Vanadium-Lead-Zinc Carbonates at the Abenab Mine

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Abstract

The Abenab Mine is located within the Otavi Mountain Land metallogenic province on the northeastern margin of the Neoproterozoic Damara belt. The Abenab vanadium deposit is situated on the ENE-WSW trending Abenab fault and occurs as an irregular pipe body associated with collapse breccias and faults. The study area is primarily made up of rocks of the basal Tsumeb Subgroup and the upper Abenab Subgroup of the Neoproterezoic Otavi Group. This study aims at determining the mineralogical, petrographical and geochemical characteristics of the supergene mineral assemblages inorder to provide new insights on the occurrance and distribution of vanadium mineralization at the Abenab Mine.

In this work, the geology and unique mineralization of the mine is described based on whole rock geochemistry, field observations and petrographical analysis. Vanadium, lead and zinc concentrations were analysed by using Multi(4 acid) digestion mass spectroscopy, portable X-Ray Fluorescence, whereas rock forming and ore mineralogy were estasblished by using outcrop and drill core observations, thin sections and polished blocks under refected and transmitted light microscopes. Petrographic studies as well as core logging indicate that ore mineralization at the Abenab Farm is characterized by three zones of mineralization. The upper zone consisting of pyrite and galena mineralization which is known as the Karuchas Zone. This is underlain by a middle vanadate zone of mineralization which consists of descloizite, mottramite, and vanadinite rich muds. The lower most zone consists of willemite mineralization. The focus of this project is on the vanadate middle zone of mineralization that is established on the brecciated contact of the T3 dolomite hanging wall and the T2 limestone foot wall of the Maieberg Formation. Petrographic studies showed that the rocks have undergone major alteration dominated by hematitic alteration. Descloizite and Mottramite mineralization occurs mainly as a breccia infill within calcite and mud matrix, although it also occurs along fracture planes, veins and as a druse filling.

The Geochemical and Petrological characterization of the Lüderitz meta-gabbro (1.9 Ga) in comparison with the Vuurdood gabbro in the Richtersveld Magmatic Arc, South West, Namibia.

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Abstract

The Namaqua Metamorphic Complex is a 1800km long and 400km wide belt which consists of the Richtersveld Magmatic Arc (RMA). The RMA is made up of volcanic and volcano-sedimentary rocks of the Orange River Group (ORG) that are intruded by the plutonic rocks of the Vioolsdrif Intrusive Suite (VIS). Parts of these plutonic rocks are exposed in the Lüderitz area. This research focuses on the geochemical and petrographic characterization of the Lüderitz meta-gabbro that will be correlated to the well studied intrusive rocks of the RMA, specifically the Vuurdood gabbro. Field mapping was conducted in order to produce a geological map and collect samples that were used for petrographic studies and geochemical analysis using XRF and ICP-MS for whole-rock and trace element analysis. There are three gabbroic rocks observed in the area; meta-gabbro, olivine gabbro and pyroxenite that are associated with biotite-quartz-feldspar migmatitic gneiss, granodiorite ortho-gneiss, light grey equigranular granite, foliated granite and dolerite dykes. The gabbros are dominated by plagioclase, hornblende, pyroxene, biotite and minor quartz, olivine and epidote. Additionally, alterations of epidote and sericite are highly associated with the gabbros in the study area.

Geological Mapping, Geochemistry and Petrographic characterization of metapelites of the Garub Group rocks, South-Eastern Lüderitz, Namibia.

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Abstract

In the Gordonia Subprovince of the Namaqua Metamorphic Complex, the rocks of the Garub group of the Aus-Luderitz area are dominated by aluminous rocks, amphibolites, metapelites, quartzite, and carbonate rocks. These metapelitic units have well-preserved geochemical signatures and perfect homogenization therefore offering reliable constraints for this study.

A detailed geological map to depict the distribution of the metapelites and associated rocks was achieved by producing a digitized map of the study area using LandSAT image and QGIS software. The metapelites found within the prograde amphibolite-granulite transition zone of the Garub Group are found in close association with amphibolites and intruded by leucogranites. Petrographic characterization of these reddish-brown metapelites shows that they usually contain garnet, cordierite, sillimanite, biotite, K-feldspar, plagioclase and quartz. The outcrops are typically fine- to medium-grained, with garnet forming large porphyroblasts, and have well-developed fabrics defined by aligned biotite and sillimanite. Amphibolites are particularly abundant in the study area, occur throughout the area interbedded with metasedimentary rocks in layers from 5 mm to 100 m thick.
To shed light on the implications on regional tectonostratigraphy, the metapelites from the study were compared geochemically to those found in two well-studied areas of the Namaqua Metamorphic Complex, the Narries metapelitic granulites of the Kakamas Domain and the pelitic-psammitic granulites of the Arus Gneiss. Additionally, whole-rock geochemistry of the metapelites was performed to decipher the provenance characteristics, likely tectonic environment, and paleoweathering processes.

Geological mapping, mineralogical and geochemical study of the Tschaukaib granitic Suite in comparison to the Komsberg Suite, South West Namibia.

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Abstract

Ongoing studies in the Namaqua Sector situated in the Namaqua-Natal Metamorphic Province (NNMP) have been vital to understanding the geological activities that occurred during the Rodinia Supercontinent assembly. The Gordonia Thrust Stack (GTS) which was introduced to replace terms like “Gordonia Subprovince” and “Kakamas Domain” constitute the largest proportion of granitoids in the Namaqua Sector of the NNMP, including the Tschaukaib granitic. The geological mapping and structural analysis of the Tschaukaib granitic suite area within the GTS shows a NW-SE trending regional foliation in the granodioritic augen gneiss which corresponds to the main D2 metamorphic event which took place at 1240 Ma. The augen gneiss has been intruded by E-W trending granitic veins which occur as dykes and as batholiths. The study area runs parallel to the Pofadder Shear Zone which results in a number of shear zones running in the NW-SE and E-W direction. Petrographic analysis observed mymerkite textures and alterations of plagioclase to sericite, indicating high grade metamorphism in the rocks. These textures can be correlated to the Komsberg Suite in the Warmbad area. Geochemical data will further warrant a comparison of the two granitic suites to help determine the position of the Tschaukaib granitic suite in the lithotectonostratigraphy of the NNMP.

A chemostratigraphic correlation of a Diamictite-Cap Carbonate Succession in the Port Nolloth Zone, northern Sperrgebiet.

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Abstract

A key practical application of chemostratigraphy, as a tool, is correlation on a basinal to global scale. Examination of $\delta^{13}C$ and $\delta^{18}O$ levels in carbonate rocks such as Limestone and Dolomite, can assist in the identification and classification of lithologies that formed during a similar time. This particular study focuses on the stable isotope levels ($\delta^{13}C$ and $\delta^{18}O$) of a Dolomite unit located in the Nama basin, northern Sperrgebiet, south of Lüderitz. The study section had been previously correlated to the Kaigas Formation (Frimmel, 2008).

A total of 17 samples were taken from the carbonate section, with a sampling distance of approximately 1.5m from the base moving upwards, avoiding highly altered beds. The values for $\delta^{13}C_{VPDB}$ range from -0.44‰ to 0.81 ‰, which coincide with results of the Holgat Formation, Bloeddrif member carbonate sampled at different sections in the region (Fölling and Frimmel, 2002).

The Bloeddrif member is dated at around 555 ± 28 Ma (Fölling et al., 1998; 2000) and generally, overlies the Numees Formation diamictite in the Sperrgebiet. The Holgat Formation is almost contemporaneous with the lower, Ediacaran-bearing units of the Nama Group (von Veh, 1993). This particular section can thus generally be correlated to the Numees glacial unit in southern Namibia, the Egan glacial unit in north western Australia and the Moelv glacial unit in southern Norway.

MATHEMATICS

A Study of Distributive Lattices

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Abstract

Although lattice theory is a broad field, our study is a quick overview of the well-known properties of distributive lattices, with the view to highlighting some topological connections.

We are going to establish how one can view infinite distributive lattices as generalized topologies in the category of frames. In the dualized category of locales, one is led to doing topology with generalized topological spaces.

Is Housing Wealth Really a Wealth in Namibia

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Abstract

Housing wealth makes up a significant portion of household net worth, with consumption being a considerable fraction of Gross Domestic Product (GDP) in Namibia. At the aggregate level, housing wealth measures the market value of all the residential assets .Empirically, movements in housing wealth are associated with movements in consumption in the same direction. We Investigate the presences of a "wealth effect" on consumptions as a result of housing wealth, examining the degree to which household prices affect consumption/consumer spending .We employ and approximate Regression Models in stages, first differences and in error correction form relating consumption to income and housing wealth .

Modeling the dynamics of the spread of cholera: A numerical analysis approach.

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Abstract

Cholera has been the cynosure of immense study since the nineteenth (19th) century when its endemic was first linked to contaminated water supply. Although cholera has been an acknowledged disease for two centuries, controlling outbreaks is still a problem in developing countries.

In this project, we investigate the dynamics of the spread of cholera. First, we formulate a system of nonlinear ordinary differential equations modeling the spread of cholera and prove that it is well-posed. We then perform the stability analysis of the equilibrium points by means of the Routh-Hurwitz criterion and solve the system numerically using the Matlab Runge-Kutta order 4 (RK4) solver.

The analysis of the disease free and endemic equilibria lead to the conclusion that implementing measures to control the rate at which one ingests contaminated water may be an effective way to control the spread of cholera. However, maximal impact in controlling the spread can be reached by also controlling the rate at which an individual contributes to the concentration of Vibrios in the aquatic reservoir.

Modelling the diffusion of cadaveric fluids within a porous medium to predict post-mortem.

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Abstract

A body of a departed soul is known as a cadaver. A cadaver decomposes by the process of autolysis, which is the breaking down of cells or tissue by their own enzymes, and the end product is known as the cadaveric fluid. Since there is no vessel to contain the fluid, it spreads out and stains the immediate environment around the cadaver, the stain is known as the cadaver decomposition island. This model predicts the flow of incompressible fluids within a porous medium and assesses its viability to predict the postmortem from the measurements of the cadaver decomposition island.

SCHOOL OF MILITARY SCIENCE

Accommodation of Non-Commissioned Officers (NCOs) and Privates (Ptes) in relation to work performance in the Namibian Defence Force (NDF): A case study of 211 Motorized Infantry Battalion.

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Abstract

The Namibian Defence Force has grown and transformed for the past three decades. In the early 90s the NDF consisted of an Army which organized in Battalion, Air Wing and Maritime Wing. Hence, accommodation were not an issue at that time as the force was still relatively new and small compare to today. The purpose of the study was to investigate how accommodation of Non-Commissioned Officers (NCOs) and Privates (Ptes) affects soldiers work performance in the Namibian Defence Force and suggests some recommendations. The adopted descriptive qualitative methods and data collected during the survey were analyzed qualitatively. The study collected data from 211 Motorized Infantry Battalion residing in Suiderhof, Windhoek. Moreover, the total sampled population comprised of 60 Non-commissioned Officers and Privates. Furthermore, the sampling was selected using purposive sampling technique for data collection. The target group consisted mainly of Non-Commissioned Officers and Privates who were mostly affected by accommodation. In addition, NCOs and Ptes from the previously mentioned 211 Mot Inf Bn were the key informants for the study to provide information as to how NCOs and Ptes accommodations have effected soldier work performance. The study used questionnaire as research instrument that contained both closed ended questions that provided ordinal data which can be ranked and open ended questions which allowed freedom of respondents. Furthermore, the data findings were analyzed using Microsoft Excel. The findings of the research revealed that NCOs and Privates living in Suiderhof depend on accommodation provided in the base. The study revealed that the states of accommodation where soldiers are accommodated are not conducive. Furthermore, the study revealed that some barracks are manufactured from prefabricated materials which are falling apart. Moreover, the results indicate that the accommodation of NCOs and Private are occupied beyond the capacity which cause the accommodation to be overcrowded thus it effect on soldiers morale and work performance. Furthermore, the study findings revealed that overcrowding could expose soldiers to communicable diseases for which they have fear of being infected and further affect their work performance. In addition, lack of suitable accommodation affects performance of active duty soldier. Moreover, the results indicate that some blocks have no hot shower, barrack and tents are freezing, this makes them to have low morale. From the data analyzed and finding, it is recommended that the NDF need to construct better accommodation for NCOs and Ptes so as to boost their morale towards work.

ASSESSING CONTROLLING MEASURES ON WIDESPREAD OPERATION OF UAVs IN RESTRICTED AND CONTROLLED AIRSPACE : CASE STUDY OF NAMIBIA

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Abstract

Unmanned Aerial Vehicles (UAVs) at all levels of technological sophistication are becoming increasingly accessible, affordable as well as available to both responsible and disruptive actors. It is therefore, of paramount importance that air security custodians especially the Namibian Civil Aviation Authority (NCAA) consider the implications of these new technological challenges. The study targeted at gauging the efficacy of controlling measures and regulations that are currently in place to control and manage the operations of the UAVs in restricted or controlled airspaces for national safety and security reasons. This was achieved through investigating the possible threats that are posed by unauthorized drones in the controlled and or restricted airspace, how drones can affect the national security of people and their sense of privacy and safety, and by looking at the possible loop holes in the existing controlling measures of the NCAA in regulating UAVs. This is also against the background of a recent surge in aviation cyber-attack occurring around the world that require better preparedness efforts to reduce disaster damage especially in restricted or controlled airspace. The study design was a qualitative methodological approach, whereby, data was collected via open-ended questionnaires, open-ended, semi-structured and structured interviews as well as secondary resources. The study sample consisted of 50 respondents. Data were analysed through mixed method approach. The study divulged that there are regulations which serve as a guidance of how drones are supposed to operate. Although, there are regulations on the operation of drones in Namibia; the study revealed that controlling measures are not sufficient enough to ensure that the regulations are adhered to. It further finds that there is a lack of awareness among the people especially on the danger posed by the operation of unauthorized drones in national controlled and restricted airspace. Thus, the study proposes the need for awareness campaigns on the operation of drones. All in all, there is a need for a technical counter-drone security system to counter UAVs operations in controlled and restricted airspace.

EVALUATING THE POSSIBLE IMPACT OF MARITIME SIMULATORS ON MARITIME EDUCATION AND TRAINING: NAMIBIAN CASE STUDY

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ABSTRACT

Education and training are vital to the development and success of today's knowledge society and economy. Maritime education and training is one of them as it contribute to Namibian economy in terms of fishing industry sector. On the other hands it also reduces the unemployment rate. Namibian maritime education institutions are tasked with the responsibility of equipping maritime students with relevant knowledge, therefore Namibian maritime institutions need to provide quality education in order to produce well-trained and competitive students globally. This study aimed to determine the impact of maritime simulators on maritime education and training in order to improve the education and training. To gather these data, the study conducted open-ended and semi structured interview, questionnaires and on-site observations. The results showed that the impacts were more beneficial to maritime education and training as compared to challenges faced. Some key findings about the significance of maritime simulators are, involving learners and motivating them, improving the capability to connect learning to real-life scenarios, freedom to experiment with new behaviours in risk-free environment and there are no damages sustained and no expenses incurred due to making mistakes. The study found the majority of the respondent felt the need of maritime simulators in maritime education and training. Simulation training does not only test the acquisition of knowledge but also assesses the attainment of competences and abilities required by students. About 95% of students and instructors indicated the need of maritime simulators for the students for better understanding the course and improves confidence when one gets into a real life situations. Research furthermore found out that the majority of students enjoy learning by simulators rather than theoretical. All the Nautical science students from school of military science respondent indicated that they have never used a simulator, however they have expressed the need and important of simulators training at school. However, it was estimated that the engine simulator at NAMFI cost about $10 million dollar and $4 million dollar for the software maintenance, this indicates how expensive simulators in terms of acquisition and maintenance. From the findings it is recommended that government and maritime institution should invest more on maritime simulators to produce competitive and well-trained student. Government should also implement more maritime institution since there is no institution that offers maritime field at bachelor or postgraduate degree level.

DOWNTIME OF WIDE AREA MULTILATERATION, SECONDARY AND PRIMARY RADAR SYSTEMS AND THEIR IMPACT ON AIR TRAFFIC CONTROL OPERATION IN NAMIBIA

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Abstract

The study investigated the impacts of the downtime of the Primary Radar System (PRS), Secondary Radar System (SRS), and the Wide Area Multilateration system (WAM) on Air Traffic Control (ATC) operations within the Namibian airspace. PRS, SRS and WAM systems act as the main eyes of ATC services in maintaining airspace safety. Literally, in Namibia, ATC uses these services to monitor and vector the movement of air traffic within the controlled airspace. The issues of air traffic control in maintaining airspace safety as global aviation operations increase make the complexity of the ATC operations to increase. The research approaches is field research, whereby questionnaires were administered to respondents, and the interviews conducted with the respondents at Eros airport. The findings indicated that PRS, SRS and WAM downtime was influenced by various factors like power outage, maintenance, systems failure, faults, and others. The downtime of these systems impacts the operations of ATC depending on the duration of the downtime. Among the three systems, the WAM system downtime posed more problems to ATC operations since system covered the entire country. The findings indicated that the procedural control was the only ATC alternative method in place during the downtime that enhanced airspace safety. Even though there are no recorded accidents and incidents due to the downtime of the PRS, SRS and WAM system, it recommended for Namibian Civil Aviation Authority (NCAA) to engage in the advancement of Surveillance (CNS) system.

PASSENGERS SATISFACTION ANALYSIS ON AIRPORT SAFETY AND SECURITY (A CASE STUDY OF KHOMAS REGION)

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Abstract

The study is concerned with the analysis of the level of passenger satisfaction with the services offered at Hosea Kutako International Airport (FYWH) and Eros Airport (FYWE). Quantitative research was conducted and primary data was collected with a questionnaire instrument through simple random and stratified sampling techniques. Seventy (70) questionnaires were distributed to passengers departing from FYWH and twenty-five (25) were distributed to passengers departing from FYWE and were returned valid for data analysis and reporting.

Therefore, the findings of this study are based on the analysis of a sample of 95 respondents. The study reveals that there is a need to improve the service quality offered at both airports. The respondents were satisfied with the overall services offered at both airports; however, some were not satisfied with some services. This shows that there are high expectations from passengers, meaning what passengers have perceived is less than what they expected. Also, it was found that passengers' perceptions and expectations of the services offered at the two airports differ according to passengers' age, gender, exploitation, and occupation.

Impact of Corrosion on the Namibian Navy Fleets and Equipment

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ABSTRACT

Corrosion is a major problem at the Namibian Navy Fleets and Equipment, such as weapons, communication systems etc, at the navy base at Walvis Bay often experience severe corrosion due to aggressive ions within the marine environment. At times, the effects of corrosion lead to lots corrosion problems, such as breaking down of equipment, frequent replacement of parts, down-time and maintenance. It was estimated that the cost as a result of corrosion attack is within a range of N$ 200 000.00 to a million annually. Therefore, this study was to carry out a corrosion investigation on these select equipment and fleets that were vulnerable to the corrosive environment at the Namibian Navy, and understand their corrosion mechanisms and suggest ways to reduce the rate of corrosion on materials at the Namibian navy. For this, a case study, employed with questionnaires and semi-structured interviews, was used to collect data from respondents with the base. Macrographical observation of corrosion products on the materials was also done. Data collected were analyzed and the results were presented by means of graphs, tables, figures and reports in the Microsoft Excel and Word. The study identified localized, general and pitting corrosion as major types of corrosion of the materials studied, which were mostly observed in fleets than in the equipment. Possible solutions to this problem may include indoor parking areas, regular maintenance, and proper materials selection and apply marine coatings to the materials.

The study recommends that there is a need for training programmes within the Namibian Navy community to share knowledge on corrosion prevention and control, and well as corrosion rate measurements.

Keywords: Aggressive ions, marine environment, maintenance, corrosion prevention and control

Evaluating the current maritime methods/technologies for coast guarding/ search and rescue operation. (A case study of the Namibian coastline).

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Abstract

The paper reviews the need for improvement in methods and technologies of coast guarding/search and rescue operations by the Namibian navy. Most developing African countries have their resources depleted and Namibia is not exempted from this if nothing is done on time, hence the findings in this paper can give much-needed information moving forward. The findings in this paper are limited to the cost guarding/search and rescue operations performed by the Namibian navy. It does not include other organizations with similar responsibilities. Data were collected from 15 Navy personals directly involved in coast guarding search and rescue operations 5 from three different vessels Ns Elephant, Ns Brukkaros, and Ns Daures respectively. Quantitative and qualitative data were collected. Quantitative data justified the cost of operation and radius of operation while qualitative identified user needs, behavior, attitude, and opinions on the technologies and method available. The data collected was analyzed and some findings were identified. There are only 2 Naval bases Walvis Bay and Lüderitz which are both situated in the south along the Namibian coast which runs approximately 1300km from Kunene river to the Orange river and 200 Nautical miles from shore to International waters. Results indicate that fishers are the main exploiters of Namibian resources at sea. It was also brought to light that the only method available for guarding the Namibian coast is by patrol boats. It costs Ns Elephant almost N$700 000 and around N$ 400 000 for Ns Brukaros and Ns Daures for one successful sea voyage from Walvis bay to Angola borders which is a relatively huge amount of money. This turned out to be one of the factors that dictate how often the Namibian Navy go on patrolling and the radius of operation. To establish a sufficient presence at sea, It is recommendable that the Namibian Navy need a naval base on the North Coast of the country. There is a need of patrolling Drones to provide air surveillance to the Namibian coast. For search and rescue operations the Namibian Navy needs at least two helicopters to speed up operations.

Estimation of Cooling Loads and Air Conditioning Units: Naval Auxiliary Transport Vessel

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Abstract

HVAC is an active, fast growing technology. In the modern era, the Navy transport vessels work under very harsh conditions. When there are at sea thus there is a need for good comfort. This can only be done if the vessel has the right HVAC system in terms of matching the loads and its size. There are a lot of variables that affect cooling load calculations such as the temperature difference between the outside and inside temperature, number of occupants, sizes of the rooms, materials used for constructions, amount of lighting and appliances, activities and equipment in a vessel, infiltration etc. and they are always varying within a short time. Since this loads are always fluctuating, each must analysed to determine the resulting maximum cooling or heating load in a room. However, if they are not properly sized it can lead to oversizing which can impact the cooling and heating equipment costs as well as the duct sizes. Therefore, the purpose of this study was to estimate the cooling loads of the various rooms on the naval auxiliary transport vessel that required HVAC and recommending a suitable HVAC system. The research was carried out using a quantitative research design. Questionnaires where used to collect data from the correspondents. From the data collected, it showed at least 80 people were on board the vessel. Average temperature of summer and winter were recorded respectively (21℃ and 17℃). Measurements of windows, ceilings and doors were recoded. Shell platting thickness of the vessel ranged from $7.8mm - 14mm$. Areas of different rooms that required HVAC were measure. On-board vessel there were various machinery whose ratings were recorded. The data collected was used to estimate the loads. Sizing estimates of HVAC systems indicates that the naval auxiliary transport vessel needs an estimated load of 459 111 BTU/hr to meet the various demands. Due to the huge estimates loads it is proposed that a chilled water system must be used. This is because it may only require small parts of the air conditioning system to be working when only the crew are on the vessel. Various rooms can also benefit from having several small air handlers rather than one big one. This provides a much better cooling environment with absolute control. The study was limited to only estimating the cooling and heating loads of a navy auxiliary vessel.

An experimental analysis of marine pipe corrosion: A Namibian navy study.

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Abstract

Deterioration of pipes in the marine environment is high. As a result of chemical reactions between pipes and the surrounding environment, leaves majority of pipes to corrode. Most marine environments are characterized by sea conditions with both a salty and humid environment. Corrosion happens to be faster in the marine environment due to the chloride ions present in the salty water. An experimental analysis on the Namibian Navy's marine pipes was carried out in connection to corrosion. The purpose of the study was to identify the causes of pipe corrosion, characterization of the type of marine pipes and comparison of the elements contained in each marine pipe sample. A portable XRF analysis which is a non-destructive analytical technique was used to determine the element composition of materials. This enabled the determination of the chemistry of a sample by measured by X-ray emitted from a specimen. Both questionnaires and interview guides were used to collect data related to maintenance practices of the pipes. Three specimens were collected from the Namibian Navy vessel NS Brukkaros, whereby two were exposed to sea conditions and one was not. Specimens 1 and 2 were corroded while 3 weren't. XRF analysis was carried out on all specimens at Ministry of mines laboratory. According to the XRF analysis, with the three-specimen collected, specimen 1 showed 93.88 % of copper and specimen 3, 23.85% copper. With the specimen 2, it showed 72.09% of iron. Specimen 1 and 3 contained a higher percentage of copper. Specimen 1 was used to convey compressed air and specimen 3 lubricating oil. This explains the reason as to why more copper is used for specimen 1 and 3, is due to their corrosion resistance. Specimen 2, contained more iron was used to convey sewage water. The research was limited to the availability of specimens at the Namibian Navy, and most of the specimens collected were from the engine department and none was collected from the deck department. The study concluded that more of copper-nickel alloys and aluminum bronzes pipes should be preferred in sea water environment. Reason being copper nickel alloys specifically have high resistance to chloride pitting, crevice corrosion and stress corrosion cracking. According to the data collected, chloride pitting, crevice corrosion and stress corrosion cracking are the major corrosions experienced at the Navy. Copper-nickel-aluminum alloys are good for resistance to hydrogen embrittlement, as for bronze it's used due to its superior resistance to ammonia stress corrosion. The most maintenance aspect used for corrosion in the Navy is coating. The Namibian Navy should take Nano coating into consideration as it offers numerous advantages including improved long-termed corrosion protection.

PHYSICS

MCGEO: A PYTHON SOFTWARE FOR FITTING RADIOMETRIC DATA USING BAYESIAN INFERENTIAL TECHNIQUES

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Abstract

In this thesis, we present MCGeology (MCGeo) – a python software for fitting and extracting parameters of interest from radiometric data using Bayesian Statistical Inference, specifically Markov Chain Monte Carlo (MCMC) algorithms. MCGeo fits for several parameters in the radiometric data, including the activity concentration and density of the radionuclides detected and uses the Metropolis-Hastings algorithm in the fitting. MCMC is a common class of procedures that uses simulations to estimate a variety of numerical models. Bayesian models generate estimates and interpretations that fully account for uncertainty in the estimated parameter values, which is what MCGeo also does, as opposed to existing algorthims that fit for parameters in radiometric data. MCGeo is written in the Python programming language and uses a Python package called PYMC3 in performing the fitting. MCGeo was rigorously tested on simulated gravity data and successfully recovered all input parameters for the model that was specified. It was then run on real radiometric data and reproduced quite accurately parameters that were fitted with an existing software called Gamman. The thesis presents such results and plans for future work.

Determination of stability limits for intermittent solar photovoltaics penetration capacity on Namibia electricity grid

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Abstract

The ever growing global energy needs and the need for an environment friendly sustainable growth have attracted focus on renewable energy sources, especially wind and solar. However, these renewable energy resources when implemented in large scale without any specialized controls are found to impact negatively on the integrity, reliability, security and stability of the electricity grid. This project focused on impact of the increasing capacity of grid connected solar photovoltaic electricity, specifically on the stability of the Namibian electricity grid. Solar PV power penetration into the grid is on a continuous rise and plants of orders of tens and hundreds of

MW are being constructed not only in Namibia but also at global level. Solar PV electricity is intermittent, and till now in Namibia, the problem this may cause to the country's grid is not known, since its limit has not been determined yet. This will soon severely impact the grid when the size and scale of the solar PV plant becomes too large. It is essential to determine the stability limits for intermittent PV systems penetration capacity of Namibian electricity grid. The effects of high penetration level of PV systems and how these influence the overall dynamics of the grid are discussed in detail.

Observations of globular clusters to determine the properties of their stars

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Abstract

Globular star clusters are relatively rare, as only a little over 200 of them have been discovered in the Milky Way thus far. Understanding them is of great importance as they allow astronomers to observe models of stellar evolution and the ages of stars. This research looks at the properties of the globular cluster Messier 30 (M30), a globular cluster in the southern constellation of Capricornus. The observations were conducted on the 24th of August when the globular cluster being observed transited close to mid-night, in order to obtain the clearest images possible. Images of the cluster were obtained using the Cuno Hoffmeinster Memorial Observatory's 36-cm telescope and an SBIG CCD camera. These images were taken using the Sloan g',r', i' and z' filters, and a Johnson-Cousins B filter with a total of 100 images for each filter and an exposure time of 20s per image, with a camera temperature of -10^{o}C.

These images were then reduced using the Image Reduction and Analysis Facility (IRAF) software. The images in this report are visualized using the visualization application ds9. The resulting data of the reduced images were then plotted on a Hertzsprung-Russell (HR) diagram that depicts the apparent brightness of individual cluster stars against their respective color indices.

CHARACTERIZATION OF THE TEMPERATURE AND EXPOSURE TIME DEPENDENCE OF THE STF-8300 SBIG CAMERA

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Abstract

Charged Coupled Devices (CCDs) are sensors used in digital cameras to record still or moving images. Fundamentally, a CCD is an integrated circuit etched onto a silicon surface forming light sensitive elements called pixels. The purpose of this study is to characterize the STF-8300 SBIG CCD camera used at the Cuno Hofmeister Memorial Observatory. The properties of this camera will be characterized, including how its performance varies as a function of the exposure time being used and how its performance varies as a function of (sensor) temperature. Dark frames were taken at different exposure times, (15 secs, 30secs, 60secs, 180secs, 300secs, 600secs) at seven different temperatures (15°C, 10°C, 5°C, 0°C, -5°C, -10°C, -15°C) for each exposure time. Dark frames are images taken with the cap over the aperture of the telescope so that no light can get in. In this case you have a picture of what black should look like. Dark frames contain the hot pixels, thermal signal and other non-random signals. When taking bias frames, the exposure time is set to the fastest shutter speed the camera does support, in our case 0.09 seconds and the same number of images were taken at the same temperatures. A bias frame is an image obtained from an opto-electronic image sensor with no actual exposure time. The image so obtained only contains unwanted signal due to the electronics that elaborate the sensor data, and not unwanted signal from charge accumulation within the sensor itself. Using the Ubuntu operating system, the astronomical image processing software, Image Reduction and Analyses Facility (IRAF) was used for the data reduction of the collected images. IRAF is a collection of software written at National Optical Astronomy Observation (NOAO) geared towards the reduction of astronomical images in pixel array form. PyRAF, a command language for running IRAF tasks was used to deduce the graphs presented in the project.

Determination of the performance of Solar (Photovoltaic) panel under solar radiation conditions in Namibia

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Abstract

Photovoltaic (PV) panel is a system made up of many solar cells arranged in series or parallel form. They are becoming an increasingly common way to generate power around the world for many applications, based on the fact that the solar panel is environmental friendly and its use to a secure energy source, the sun. Photovoltaic can bring electricity to a rural home that is many kilometres away from a town electric grid connections in Namibia. However the reliability to the PV panel efficiency strongly depends on the solar irradiance, ambient conditions and other local variations in the atmosphere such as water vapour, clouds and air pollution. In this study only one factor (solar radiation) that affect the performance of the solar panel was analysed. The efficiency of the photovoltaic panel under the solar radiation in Windhoek was measured and the results were used to estimate the performance of the solar panel in different areas in Namibia considering the latitude at those areas. Uncertainty in the solar radiation input leads to uncertainty in the forecast energy production and affects reliability. The outcome of this study shows that locations in the south of the country receive less radiation than in the central and northern parts, therefore output is reduced in the south, for the same installed capacity.

Observations of the Evil Eye Galaxy to determine its properties

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Abstract

Messier 64 (M64) is a distinctive spiral galaxy with a dark dust lane structure to the north-east of its nucleus. This prominent dust lane is responsible for its nicknames (The Evil Eye Galaxy, The Black Eye Galaxy). This study aims to determine the properties of the Evil Eye galaxy and see how its appearance varies as a function of wavelength. Observations of M64 were taken on two nights (26th April and 03rd May 2019) using the Cuno Hoffmeister Memorial Observatory's 36-cm telescope with an SBIG CCD camera, through the Johnson-Cousins B-band filter and Sloan g'(green), r' (red), i' (infrared) and z' (standard filter for infrared) filters, for a total integration time of 2000 seconds in each filter. These filter bands span from the blue end of the visible spectrum (shorter wavelengths) through the visible part of the spectrum to the near- infrared (longer wavelengths). Data

have been reduced and analyzed using the standard astronomical data reduction software IRAF, in order to determine how much light is absorbed by the dust lane as a function of wavelength.

SCHOOL OF COMPUTING

UNAM AutoTime: A web-based timetable system for the university of Namibia

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Abstract

Timetabling is an inevitable component in the education sector, however, a manual scheduling system comes with numerous challenges such as time consumption, misinterpretation of existing system, cost of rescheduling, resource printing costs amongst many. The current system was analysed, in order to create a requirement definition for the improved timetable system. Literature review was done to understand the different approaches taken by researchers to eliminate some of the problems faced during timetabling. The best solution for scheduling is yet to be found but numerous solutions presented have much more advantages than a complete manual system. The population of the study were students of the school of computing and staff members of the science faculty. A survey as well as interviews were conducted to understand how the system functions and test the initial assumptions and observations made, also to understand the user experience with the current system and amongst many findings the automation of the timetable was highly favoured by the students, in comparison to scrolling through a booklet consisting of numerous courses, modules, venues, and time slots, a process proven to be cumbersome. Getting the prepared timetable with the modules for a respective course is recommended. Therefore, an online timetable was developed. This research proposed a web-based mobile friendly application to eliminate part of the manual system used at the University of Namibia. The system allows users to view their respective timetable in a few clicks, also propagate changes made at admin end. PHP 7, HTML5, JavaScript (and jQuery), programming language were used to develop the web solution, CSS3 for styling, the back-end solution uses MySQL database. For reporting purpose mPDF Library for PDF and Excel reporting is used, AJAX requests for reporting and filtering.

Oshiwambo Shetu: A language learning web application for Children aged 5 to 13

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Abstract

We live in an era were children are exposed to technology, were they are comfortable using the internet on a daily basis. Children use technological devices to play games and watch cartoons. Oshiwambo Shetu is a language learning web application for children aged to 5 to 13. It includes learning activities, for the children to be able to learn the Oshiwambo language. The application also allows one to be able to test their progress. The purpose of the application is to educate children while at the same time making it a fun, challenging and enjoyable experience for them. The application was motivated by the fact that Namibian children are now more exposed to the formal language, English and this limits their communication skills in their mother tongues. For data collection, the study included observations, semi-constructed interviews and questionnaires. The questionnaires were handed out to three different schools in Windhoek. A qualitative research design was used in this study; reason being that qualitative research design focuses more on human behavior. In this research, Stratified sampling was used. It is used when a researcher wants to examine a subgroup of a population. Like in this case the study only focused on children between the ages of 5 to 13. And the study was also sub divided into one group which was the Oshiwambo speakers. C# is used for coding of the program and Microsoft SQL Server Management Studio was used for the database. The Agile methodology was used in this study because it allows for change, process adaptability and customer satisfaction. Children use the internet for various reasons. According to this study, children rely on the internet for homework and school projects. They rely more on finding their information on different websites than asking for help from teachers or their parents. And most acknowledge that browsing the internet has helped them academically. Due to the evolution of technology, this study focuses on the use of technology to promote language learning. Gaming is a fun way for children to learn; hence incorporating education in a game like environment is highly attractive for children and encourages teaching. Oshiwambo shetu is the platform that children will enjoy using while learning a language.

An implementation of a web application for hostel reservations at UNAM

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Abstract

Technology has become one of the most effective and efficient solution for most of our day to day activities in both homes and workplaces. One of the problems faced by the University of Namibia is the way in which hostel accommodation is being allocated to students. The manual way that the University is currently using is very tedious and includes a load of paperwork. This is time-consuming and requires a lot of effort. This research dealt with the problems of managing and allocating hostel accommodation to students at the University of Namibia. The aim of the research system, "UNAM Online Allocation System", is to mostly help the UNAM Management to work better and efficiently when allocating students a hostel room. In addition to that, the system should; Store hostel student's information as well as hostel information, View student's and hostel information on request, Allocate student a room starting with first priority students and view students already allocated a room. All the important information of both students and the hostel will be stored in the database and any changes made will be updated in the database as well. The research was qualitative research and the methodology that was used for this research was an Agile Software Development. The Agile Methodology framework that was used was the Extreme Programming (XP) approach since the system was developed entirely by the researcher. Interviews and questionnaires were conducted and undertaken . The sample size was very small; it consists of the UNAM Management responsible for hostel accommodation and 20 hostel students. The system has two main parts which are the administration side and the student side. On the Administration side, UNAM staff member in hostel management are able to log in and view all students who have applied as well as all hostel rooms which are occupied and those that are not occupied. They are also able to filter out students to view first priority students as well as randomize students and assign them a hostel room. On the student side, students are able to login with their student numbers and apply for hostel accommodation by which the information will be stored in the database. The UNAM Online Allocation System was implemented mainly using PHP and MySQL database. This research has resulted in a UNAM Online Allocation System which the researcher is confident to say that this system will remove the problems previously experienced by UNAM Hostel Management. The UNAM Online Accommodation System will save a lot of time and loads of paperwork for UNAM Hostel Management stuff. The objective of the research was successfully met.

A desktop application for recording attendance and calculating the University of Namibias libarary and computer centre student assistant salaries

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Abstract

The recording of staff attendance is a critical operation for every organization, that assists in paying employees' salaries and enrolments accurately. Managing people is a difficult task for most organizations and maintaining the attendance record is an important factor in people management and for payroll systems. The idea of taking control of employees pay calculations are quite tendious if done manually and require more effort, especially for big organizations. The objective of this research is to develop a system that monitors the punctuality and absenteeism of student assistants at the UNAM library and computer centre, for the purpose of ensuring that student assistants are only paid for the hours worked. The system also accurately stores student assistant data and retrieves history when needed. A computerized attendance and payroll system is designed and developed, whereby the process of payroll is automated. The system requires less time to process the salaries of the student assistants. Semi-probing questions in a questionnaire were used as the data collection instrument. Agile methodology was used for software development, because it promotes continuous iteration, values human communication and feedback, adapting to changes and produce working results. C# is used for the coding of the actual program and Microsoft SQL Server Management Studio used for the database to store records. Results have shown that this system can be implemented in academic institutions and other organizations for better results regarding the management of attendance and calculations of the payroll. Most participants of the questionnaires and interviews prefered the Automated attendance and payroll system because it saves time and reduces the amount of work the administration has to do and it replaces the stationeary materials used in the manual system. It can then be concluded that a reliable and efficient sytem with expected results has been developed.

The development of a Bilingual (English -Oshikwanyama) dictionary in the preservation of the Oshikwanyama indigenous language.

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Abstract

A significant number of indigenous communities in most parts of Africa are struggling to maintain communication and traditions amongst themselves and others in a system that is still dominated by a western world view. Just like the rest of Africa, Namibians are finding it hard to keep to their roots in terms of the usage of their indigenous languages in their day to day communication. With the increase in the usage of the official language, most Oshikwanyama speaking individuals have lost touch with their native language and cannot fully communicate using only their native language, especially children, who normally learn all subjects in English. With the loss of the use of a native language, the future generation might not have knowledge of the language and they will be unable to relate to their heritage, hence, there is a possibility of the language going extinct. It is against this background that this paper focuses on the development of an English – Oshikwanyama dictionary in the preservation of the Oshikwanyama language. The dictionary is developed in android studio using java language. It takes in users' choice of word(s) and views the words usage in both languages. The dictionary also gives an option to hear the pronunciations of the word in both languages. In conclusion, the dictionary has proven to be useful to the target individuals when it comes to the learning of words in Oshikwanyama and has significantly improved communication and translation of words from English to Oshikwanyama.

PRO INMATE, An Android Application for Easy Booking and Convenient Visitations to Ameliorate Recidivism at Correctional Facilities: *A Case Study of Windhoek Central Prison*

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Abstract

Geographic separation from family might be one consequence of imprisonment. Depending on the town, prisons are often located in remote, urban and suburban areas that are far from the rural cores many prisoners come from.

It is an exhausting, resource-intensive process for a family member to make one visit at a prison. Understanding how families decide how much of their resources to devote to maintaining their relationship with the prisoner is of utmost importance. Scant research has addressed whether this is, in fact, an impediment to visiting or how families who do visit manage this process. A total of 60 participants (30 inmates and 30 visitors) was considered as the population of the study. A combination of both qualitative and quantitative research methodology, using data collected through questionnaires, observations and interviews was the approach used for this study. Likert scales, pie charts, bar charts, tables and line charts to mention but a few were used to record all the data collected in a formal, neat and understandable manner. Android studio with integrated software development kit (SDK) as the environment and coding tool, Kotlin as a programming language in android studio, Firebase as the real-time database environment were used for implementing the app. The paper's primary focus has been on the schedule for a visit in advance and receives a notification on a mobile application including strategies and ways of ameliorating frequent recidivism of offenders. The paper has also addressed and focused on the ease and convenient visitation of inmates, psychological support techniques for both the inmates and visitors and the monitoring of inmates at the correctional facilities in Namibia to ameliorate recidivism. It is against this background that this research was conducted to ascertain the impact of fewer visitations as a cause of recidivism and how a booking and scheduling system will help for easy and convenient visitations at the correctional facilities. A system described herein facilitates easy scheduling and conducting of prison visitations. The system provides a remotely accessible means on a mobile application for visitors to authenticate themselves and schedule a visit with that individual inmate. The paper further recommends studies and research in the field of telecommunications to implement telephone systems within correctional facilities in Namibia where inmates upload money to an account that enables them to call locally and internationally catering for nationals and foreign inmates, similar to the old Flexi call cards.

AN AGRICULTURAL MANAGEMENT ANDROID SYSTEM FOR SMALL SCALE/GRASS-ROOT FA RMERS, TACKLING THE GROWTH OF CROPS (TOMATOES, ONIONS, CABBAGE, MAIZE AND C ARROTS)

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Abstract

Driven by a vast population development and land shortage, most African farm homesteads are seeing the steady sub-division of their land which has thereby, in recent years, shed more light on small scale farming. With that in mind, rural areas are poised to be significant economic drivers in developing countries in Africa thereby exposing untapped potential smart farming systems. Technologies in the agricultural realm is expected to advance this development of smart farming in the coming years. Therefore this project aims at highlighting the solutions and

importance of information and farming systems that provide farming techniques to small scale and/or grass-root farmers for their farming activities. These particular crops are crops plus least affected by certain variables, namely; Tomatoes, Onions, Maize, Carrots and Cabbage. Data collection methods used for the foundation of this project included a qualitative approach in the sense that observations were done through the work of other researchers taking part in the related field as well as first hand observation of farmers. A critical analysis of descriptive statistics was also done in order to accurately come up with results of the research. The analysis was focused primarily on small scale and grass-root farmers. Data collection methods included questionnaires for target audience to establish efficient service requirements of the application. Distribution of questionnaires were mainly online techniques thereby providing coverage for participants who are physically inaccessible. The results of the study were satisfying as the responses provided efficient information to develop a smart farming android application for small scale farmers. The results indicated that majority of the target audience are familiar with android mobile devices, therefore, the android application developed provided a sense of understanding during user testing. A standout feature amongst the target audience is the ability of the application to keep track of certain time frames which are significantly important to the average small scale farmer. Another satisfying feature pointed out by majority of the target audience is the ability of the application to provide methods of efficient record keeping. In conclusion, the results indicated that the target audience were satisfied with what the application has to offer. The general services of the application appeared to be clear and user friendly, with the steps of the services overcoming the overwhelming feeling most general users would come across when using a new application especially for a procedure with significant importance such as farming.

A SMART REMOTELY AUTOMATED GEYSER SYSTEM FOR ENERGY SAVING

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Abstract

A Geyser system is one of the household appliances which consumes much of Electrical Energy especially since the system relies on the manual turning the system on and off. However, most of the time we find or have a problem with the geyser been on for too long in the house and there is no one to turn it off or on when needed. Therefore, the main purpose of this research as mentioned earlier is to create a remotely controlled geyser system that can be used to be able to turn on and off of the geyser system to be able to control the times and how long the geyser should be on at home in the event that you are not home to make sure the geyser is off. This form of automation can be done by implementing Internet of Things (IoT) by using a Mobile Application created using the Blynk Application that will be connected to a unit(Arduino) that enable users to control the On and Off state and schedule of the Geyser unit remotely using the Internet. The method used in this study for the collection of data

was more of a qualitative approach in the sense that observations of some houses in the area taking the information of the geyser systems on how much power they may have consumed while they were On and where being used by the people. A convenience sampling method was one that was used because some of the people were not always available or not willing to take place but a few agreed and we were able to do the data collection. The results helped understand the need for the project and how it would help people around, be in control of there geyser system and be able to control when it is needed to be turned On or Off.

The geyser system gave the users a sense of how to use it and how it works in the testing stage. Inconclusion the geyser system appeared to be clear and was able to be understood by the user, the app was able to carry out it's required functions and put the control of the geyser in the power of their hands with only a press of a button or switch.

A UNAM android App to help in managing students' academic accomplishment.

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Abstract

This study aims to develop an application that will help students in their day to day academic life and help the student enhance their performance. Applications are often called productivity programs or end-user programs since they enable users to complete tasks such as creating documents, spreadsheets, databases, and publications. The application will be used by students with academic work. To get more perception on the user side of the application, which is the University of Namibia students. The study used a questionnaire to ask the students about what do they need from the application. For more user testing the study deployed the application through sharing the application and furthermore, it has been hosted on google play store, which will remove any security issues that the user might have. The research will help produce information on how to construct the application to fit the user demand, the participants took part by filling in a questionnaire on what they want to see from the application. From user design experience and the combined information collected from the target population has been used as the foundation of the application when during development. The target population of the research was mainly the students at the main campus of the University of Namibia since they are easy to reach and to conduct a high-quality survey without the limitations of a financial burden. In this study, we have applied qualitative as a research methodology. In terms of the target audience. The research targeted students at the University of Namibia's main campus. Since it is impossible to conduct everyone on campus, we have used sampling as a technique. the finding of this research is that many students indicated that the application is useful and believed that it can help to improve their performance in the future, in conclusion, we strongly believe that this application is a necessity to the university at large it has the possibility of changing how student work and performance while at school. All in all, students are in favor and got pleased with the prototype.

Development of an online shopping website to enable individual & business to Buy/Sell products online: (Buy&Sell Namibia).

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Abstract

A few years back Namibia was a laggard in e-commerce for many reasons, including lack of internet access, poverty, illiteracy, and logistical inefficiencies. Some of these problems persist but we in the right footsteps towards technology- notably smartphones — have given a lot more Namibia access to the internet and mobile payment systems Buy&Sell Namibia (BSN). Buy&Sell Namibia is an electronic application planned for online retailers and entrepreneurs. The primary goal of this application is to make it intuitive and its convenience. It would make seeking, survey and choice of an item simpler or pitching your item from your business a lot simpler. The researcher performed quantitative research where he appeared clarifications and predication that will sum up to different people and places. The researcher primary members were Student & Working class from 4 different regions in Namibia who utilize the web on a postponement because the entire research rotates around these sorts of members. The main sample technique the researcher utilized was a random sampling technique. Online survey and interviews were utilized as research instruments. The overviews and online surveys were finished by inquiring as to whether there is a requirement for this sort of framework and why they suspect as much. While the interview comprehends why Namibia doesn't have a purchase and sale sites like Olx or Amazon. The researcher discovered that 80% of Namibians find it difficult to buy online because of skepticism on the utilization of Credit cards for online transactions and payments. But according to the Namibian government they have set a bill that will further aim to develop a safe, secure and effective environment for the consumer, business and public agencies or bodies to conduct and use electronic transfers. The lack of a national street address system in parts of Namibia is a major obstacle. The delivery person and the customer often have to stay in constant touch by mobile phone on the day of delivery. Practically all participant in the research methodology notice the convenience of BSN and its helpful because there are no lines to wait in or assistants to track down to help you with your purchases, and you can do your shopping in minutes. Buy&Sell Namibia enables individuals to shop day in and day out, and furthermore compensate us with a 'no pollution' shopping experience. Buy&Sell Namibia or E-commerce industry is a force that no investor or person can ignore and will dramatically change the way brands reach out to customers.

An android application to assist fire fighter to locate fire incidence in the informal settlement, Windhoek

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Abstract

Urbanization occurs when people move to cities to seek for better opportunities (Gebreselassie, 2006). Over the year, there has been an increase in the number of people moving from smaller towns in Namibia to Windhoek, the capital city. Namibia has however not responded through appropriate strategies to facilitate this change in the human geography of the country, resulting in an increase of poorly serviced informal settlements. This informal settlement congested with shacks, which built with cheaper material, and the houses in the informal settlement are close to each other. Thus, creating a high fire hazard severity vicinity zone. The City of Windhoek currently has four fire stations in operations but during some fire outbreaks, the fire station response is delayed Although the fire abridge department have an emergency number, most calls first go through the city police call center (Toll free number). Thereafter, the city police call center informs the fire abridge call center before passing on the message to the fire stations. This study aims to assist fire fighters to locate fire outbreaks faster by enabling users to send their location to the nearest fire station. Hence, increase the alert and response time. An android application namely the Fire Extinguisher developed using android studio with fire base database. Rapid Application Development Methodology was adapted in this study. Firstly, data collected from 5 fire fighters from the four fire stations in Windhoek and 30 residents from informal settlement though a phone interview. The data then analyzed to obtain the necessary system requirements. Secondly, low fidelity prototype of the application system developed to further incorporate the requirements then the development of the Fire Extinguisher mobile application followed. Lastly, the application tested using two android devices. A quantitative research methodology used to collect data amongst 30 participants from different informal settlements around Windhoek using a simple random sampling technique. Results show that 60% of the participants are not satisfied with the current method used by the fire fighters and welcomed the idea to implement such a system. Future work will include accommodating other emergency reports such as criminal activity and natural disasters let users make videos calls directly with the office in duty, for the office to have an idea of the severity of the situation.

AN INTERNET OF THINGS (IOT) BASED SOLID WASTE MONITORING SYSTEM FOR UNIVERSITY OF NAMIBIA MAIN CAMPUS

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ABSTRACT

The population growth in Windhoek has led to an increase in the number of people sharing resources around institutions and as well as habitational areas. This has led to difficulties in managing solid waste around these areas. The University of Namibia (UNAM), main campus, is not an exception in the management of solid waste. It is noticed that, UNAM, like many other entities makes use of manual ways of collecting waste. In this case, a waste management company employed by the university collects garbage on a specific day of the week. This, in turn, leads to overflowing of some of the main bins around the university premises, as people still tend to use the garbage bins despite being full. Overflowing of the waste bins might have a significant impact on the health and comfortability of the individuals around the area. This is due to the production of bad odor and air pollution from the toxic gases produced. This research proposes the development of an Internet of Things (IoT) based 'Solid Waste Monitoring' prototype. This detects the level of the garbage in the bin in real-time and notifies relevant authorities with the bin location when the garbage is full. An Arduino microcontroller is placed on the bin together with a sensor that monitors the garbage level in the bin, a Global Positioning System (GPS) module to identify the bin location and a Short Message Service (SMS) module to aid in sending an SMS. A webpage to monitor the real-time garbage bin levels can be accessed remotely by an authorized user. The Design Science Research Methodology (DSRM) aids the development of the proposed prototype. This therefore, suggests a smart way of monitoring solid waste around the institution and providing notifications if the bins are ready for collection and the location. The solution in turn, prevents the overflowing of bins, therefore, maintaining a clean and safe environment for the UNAM community.

WEB BASED KNOWLEDGE MANAGEMENT SYTEM FOR SCHOOL OF COMPUTING UNAM STUDENTS.

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ABSTRACT

The research examined the importance of knowledge management system for the school of computing University of Namibia (UNAM) students. Students at UNAM experienced a number of challenges due to the way data is stored and retrieved affecting the effectiveness and efficiency of data. The major challenge school of computing at UNAM, students faced relates to the difficulties of sharing notes and articles or study materials. Additionally, retrieving information amongst themselves is a mammoth task. The internet was identified as a very broad platform in searching specific information which could be very overwhelming and tedious, when the information provided on the internet is irrelevant to the UNAM students search, becoming time consuming and inefficient. The UNAM library system's main facilitators are the lectures which have full control of the content that gets posted and deleted. With the students they cannot post material but can post or reply on the posts that a lecturer has posted and they can only access the modules that they are currently studying for that specific semester and not any other modules. Furthermore, there is a feature on the UNAM digital library system called common space. It is a platform that allows students to post anything with no control of the content they will post. Knowledge is an important source for value creation in an organization and needs to be carefully managed. Knowledge within the university system such as UNAM is a vibrant force which rapidly changes according to the use information technology (IT) (Testa (2009).Therefore, the main objective was to design and develop a knowledge management system for the school of computing students with the aim to understand how the knowledge management system contributes to learning and what its practice and potential are in the school of computing at UNAM. A web-based knowledge management system (kms) for information technology education was identified as an appropriate tool to utilize within the university system to improve the learning curve of students. The application was developed using XAMP stack which is a platform that contains tools necessary to develop a web application an PHP was used as a programming language and Maria DB for the database. A user of the system can browse through the available service categories, post material, comment, retrieve and upvote or like the posts that other students posted. The development methodology that was used is known as Personal Extreme Programming (PXP) with stages in planning, designing, implementation and system testing. The knowledge management system will allow the students to have a platform to share their knowledge and collaborate the most effective and efficient way.

Design and implementation of online bus ticket reservation system: a case study Silas Ndapuka heavy transport

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Abstract

Information systems are now part of individual's daily activities. It has increased the efficiency and decreased the time for process. With the help of an online booking system companies like hotels, bus transportation companies are now able to connect with both existing and prospective customers online. This is the fastest and efficient way to interact with customers compared to manual reservations. This project presents the design and implementation of online bus ticket reservation system as should be used in a bus transportation system, a facility which is used to reserve seats, cancellation of reservation and different types of route enquiries used on securing quick reservations. It is built for managing and computerizing the traditional database, ticket booking and travel enquiry made. It maintains all customer details, bus details, reservation details. In order to achieve the design, Silas Ndapuka Heavy Transport was chosen as a case study because it is one of the major domestic transportation company in Namibia. This application is set up on xampp server with apache and phpmyAdmin. This research includes the development of a prototype Online Bus Reservation System to support the research objectives. This system is designed in an appropriate and flexible way that tests and validated any input provided by customers earlier. A database is created to record each customer details and any transaction. This project discussed the tool and technology used in developing the reservation system. It has a front end by using html, Css, JavaScript to display the content structure and a back end of database using MySQL and PHP. Observations and interviews were grounded to articulate functional and non-functional requirements. The study used a waterfall with prototyping model software methodology. The prototyping sub model was added to ensure that the drawback of the waterfall model are resolved. End users of this system were given an opportunity to explore the system and suggestions were made that the system will be of great because they can book at their comfort time.

Interactive cultural dances book: Preserving Ovambo cultural dances using augmented reality

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Abstract

African cultural dances enhance cultural identity which is a sense of belonging to a certain culture (Bartle, 2012). Moreover, it has captured the spirit of life events and spiritual beliefs (Kassing, 2014). The meanings behind these dances are slowly being forgotten as elders pass on without teaching the youth. Internet access, games, music and reading books are all incorporated on mobile devices (Vaidya, 2016) thus its interest to the youth. The youth believes that mobile phones are essential because it is the key to social life, entertainment, gives them freedom and some sense of security (Shekaing, n.d.) With the proliferation of mobile phones amongst the youth, mobile phones could be used to educate the youth on culture. This study aims at investigating how ovambo youth could be educated about their cultural dances. Research shows that humans learn better when information is visualized (Franza, Sudana, & Wibawa, 2016) therefore Augmented Reality was used in this study for educational purposes. Augmented Reality is a technology that allows overlaid digital content into a person's view of the real world through the camera of a smartphone or a tablet (Villarejo, Gonzalez, Miralbell, & Gomis, 2014). An Augmented Reality application, namely Oudano Wetu was developed for android mobile phones. Oudano Wetu was embedded in a book and displays videos of the following dances: Omupembe, Oudano or Uudhano dance, Okankula and Okandeka and the traditional wedding dance, when the application projects on the pictures in the book. The book describes the dances, stating the event were a specific dance is performed and the gender that performs that dance. The study began by interviewing a lecturer in the department of Language and Literature studies at the University of Namibia (UNAM), aiming to ascertain information about these dances. This study adapted the ADDIE methodology which include the analysis that included finding the need to develop the application; design, where the interface and functionality of the application was designed. During the development and implementation phase the application was always evaluated. Little Information was obtained on these dances because these dances are in literature, but not enough research was conducted on them. The information gathered was embedded in the Oudano Wetu AR application that was developed using Unity and Vuforia. System Usability Scale (SUS) questionnaire was used in this study to test the usability of Oudano Wetu AR application. The results showed that the SUS score is 71.12 which means that the system was perceived as good. Future works will involve a study with the elders to ascertain the meaning behind these dances and improve the application to show the movements of these dances in 3D.

AN ADOPTION OF VPN (Virtual Private Network) USAGE BY UNAM STUDENTS TO ACCESS STUDY MATERIALS.

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Abstract

In the last decade, in order for communication to be established from one network to the other, this was done via telephone lines which were usually called lease lines and one of their major downfalls was their cost. This is a study of a VPN, which basically means in simple words being able to use the internet but from any location in a secure manner, which also means it is widely used in network security. With the implementation of a VPN service type which will be in the form of Remote VPN will allow students to access study materials from any remote location in a safe and secure manner without having to be physically on campus and also allow lectures to provide the materials early without having to worry about security restrictions all available with connection to the network and your personal authentication details. The purpose of this study is to bring about the term evolution which combines security and Bandwidth into one system. With the current system having so many faults, this usually affects new, and current lectures ranging from full time to part-time on how they will give students access to the study materials so by finding other ways of doing this, they usually tend to give notes via dropbox, google drive, WhatsApp, etc. and plus giving video links to videos on the knowledge and usually based on YouTube by doing this students will be forced to connect to the campus network to access this sites but most of the sites are blocked for bandwidth reasons. This study used a mixed-method, qualitative and quantitative. The results indicate that students are not well accustomed to the term VPN but they are very eager for the change of the current system being utilized, as well as the successful results obtained from the lectures show that the Unam Pupils are eager for change and ready to quickly move to a new secure system. The study shows that the university will benefit from implementing this infrastructure because of the security and controlled bandwidth it comes with. Implementation of this type of service at the university will brighten up the futures of many students which will allow students to access study materials at the comfort of their homes, workplaces, etc. in a secure manner.

Development of a Shared Tool Online Application To Study How It Can Affect The Farming Production: A Case Study Of Oshondo Village, Omusati Region

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ABSTRACT

Farming equipment forms a fundamental quota of agricultural production and in the absence of the right tools, the production normally gets a big knockback. Around 75% of farmers (small non-commercial that is) opted to hire some machinery to work on their properties reason that it's almost impossible to own all the equipment required for the farming season. Oshondo village, in the northern part of the country, was a place used for the research. Technology has been introduced to reduce the human working influence and improve efficiency as well as the effectiveness in producing the final products. Websites have bridged the gap between industries or people as they act as a communicating platform for different parties to sell their ideas. Due to its success, it has been reckoned for the usage of online applications in the agricultural world to enable farmers to strengthen their cooperativeness. Therefore an online application where users can exchange tools would ease pressure on many to fund required tools. Hence, the residents could well use the website to the state to the tool they have and the tool they would like to borrow. The system provides farmers a chance to request from the greater community that offers a better probability to find the right tool. This leads us to the problem statement of this research. Currently, farmers work with what they have, which in most cases it's not always enough. A form of fair sharing of the available equipment could reduce the problems that farmers go through in the current system. This research is a model to solve this problem by implementing an online application that allows farmers to interconnect. Simply the existing equipment would be used within the village, residents helping each other and this also encourages cooperative partnership. Qualitative Research was used as an appropriate methodology because it allows an investigation of the contemporary phenomenon within its real-life context and it also gives space to investigate and focus in more. The data was collected from the questionnaire that was handed out to the residents and the finding are presented in forms of graphs and charts. Although it was a success, there were challenges and constraints but, in the end, it all came together. Some residents were not willing to take part because there was no farming season this year and they found the questions bothersome. A chunk number has voted in favour of the proposed application and they believe it will make difference. Lastly, a mobile application and different dialects can be future system improvements.

THE IMPLEMENTATION OF A USSD SYSTEM TO ENHANCE PARENT-TEACHER COLLABORATION IN PRIMARY SCHOOLS: A CASE STUDY OF THE FIVE RAND PRIMARY SCHOOL IN OKAHANDJA, OTJOZONDJUPA REGION.

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Abstract

Studies have indicated that there is a growing recognition of the importance of engaging parents and families in raising the educational aspirations and attainment of young people. There is a wealth of evidence which highlights that parental engagement in schooling positively influences pupil achievement. Current research has shown that among the most important factors that prevent the realization of parent-teacher collaboration is the shortage of time amongst parents. Currently, in Namibian schools, be it in private or public schools, we don't have a way of providing parents/guardians with real-time data of how their children are performing in school. It is under that background that this paper investigated the implementation of an Unstructured Supplementary Services Data (USSD) system at the five rand primary school in Okahandja and the effects it could have on not only the performances of learners in various subjects but also on bridging the gap between parent-teacher collaboration. Unstructured Supplementary Services Data (USSD) is a session-based, real-time communication technology for supplementary services. USSD's are used in a variety of systems, cell phone banking, and network configuration to name a few. A quantitative approach was used in the undertaking of this project with the population of the study being made up of employed teachers and parents/guardians with children currently enrolled in school. A stratified sampling technique was deemed as the best-suited sampling technique and a questionnaire was used to collect data from the teachers and parents. Two different questionnaires were used in this study, with teachers having their own questionnaires and parents having their own different questionnaires as well. The data collected was then analyzed using Statistical Package for the Social Sciences (SPSS), with a series of graphs and charts used to represent the findings. One of the most important findings made was that 100% of the parents and teachers that participated in the study had already been familiar with USSD and how it worked. The study also found that 85% of the participants strongly agreed that there is a direct correlation between parent-teacher collaboration and the performance of learners during the term. In conclusion, the study found that the majority of the parents and teachers that participated in the study not only agreed that learner's performances would improve if parents and teachers improved communications amongst each other but also that USSD would provide the perfect platform to improve said communications.

Key terms: USSD, GSM, Parent-teacher collaboration, SMS

Booking and Management System for Driving Schools in Windhoek

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Abstract

Online appointment management systems have been around for a few years now. Many different types of businesses use some type of Web-based online appointment management system to help make the appointment setting process more efficient and easier. Namibia has been rated as one of the countries with the highest car crashes and road deaths globally. In Windhoek there has never been an online platform which allowed Windhoek residents and Windhoek driving schools to interact with each other, people always had to waste a lot of time and money on transport to go looking for proper driving schools, whereby in most cases they end up going home empty handed because it was already fully booked or moved to go practice at another location. This paper reports on the development of a web-based appointment reservation and booking management system that is aimed at creating a single application where Windhoek residents will be able to make reservations online in the comfort of their homes with the driving schools which are located near them. Hence, the importance of this system is to; help users view and make appointments with driving schools, help users see the locations where the driving school practice on google maps, help users view the type of car that will be used and the prices and discounts the different driving schools offer. The system will be able to add or delete driving schools and specific driving schools will be able to edit their profiles. The system will also help driving schools manage their clients. The proposed study only entailed the qualitative approach. The population is only limited to people who reside in Windhoek. A Non-Probability Sampling Method called Convenience sampling was used. Convenience sampling was used, because participants were selected based on availability and willingness to take part. The software development method used is the personal extreme programming methodology because it takes advantage of both an incremental and iterative development approach. The system has three main parts which is the administration part where the admin adds or deletes driving schools, the driving school part where driving schools can accept or decline appointment requests, and the user side where users can view the driving schools and make appointments. The system is implemented mainly using html5, PHP, JavaScript and the MySQL database. In conclusion, the proposed study has resulted into a web-based appointment and reservation system that greatly benefits the driving schools and the Windhoek residents who wish to find proper driving schools for themselves or the family.

Develop a help-desk inquiry chatbot for the university of Namibia

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Abstract

According to research, at the times of registration at the University of Namibia's main campus, students form long queues for help. From observations, a student can stand in wrong long queues for a little while before realizing that he or she joined a wrong queue. Therefore, forcing him or her to go join another long queue which seemed right. In many cases, students don't know which queue or which place is the right one due to a lack of information. The University's website is generally unmaintained and contains redundant information, so a user might spend time surfing through un-useful pages on the site without any success. Developing an inquiry chatbot can give information seamlessly in one go. The developed chatbot has multiple user interfaces Through which the user interacts with it. The chatbot automatically detects the intent of the queries received from the users and accordingly parses the website to find the related information. The main goal of this project is to ease access to appropriate information all in one place, without being on campus or visiting any office. This reduces transport costs for people who were due to travel to the institution in person for this information. For conducting user evaluation, A survey has been conducted using a questionnaire as a research instrument for data collection. Also, direct observation and semi-structured interviews have been used to gather both primary and secondary data. Our population was all staff members and students from the university, and we used a simple random sampling technique to obtain our sample. Using a quantitative approach, data analysis has been performed using various techniques and analytic software such as spss and survey monkey. Results have been presented in various formats such as words, charts, and graphs. The results reveal that users find no difficulties with interacting with the chatbot system. Users are overall satisfied with the system as it had performed exceptionally well throughout their interactions. These findings show the significant importance of the chatbot system and its advantages over traditional customer support mediums or methods. This chatbot system improves the overall user or customer experience.

The Implementation of a Communication Platform for the Dissemination of Information to UNAM students

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Abstract

Information is an important aspect of any organization and firms perform better when they ensure crucial information is communicated on time and to the right audience. Making sure that all included parties get that information timely makes processes work better, therefore, enabling efficiency in an organization. The University of Namibia is the largest university in Namibia which consists of 12 Campuses nationwide, 11 Regional Centres and about 30144 registered students. The current UNAM information-sharing methods has a fatal flaw of disseminating information that reaches only a few of the students out of all the 30144 students.

The main purpose of this study was to design and implement a system that enables UNAM academic and administrative staff to disseminate information to its students. Furthermore, the study also reviewed the current existing UNAM information sharing systems and identified other information-sharing methods used in UNAM and other organizations. The proposed system allows students to have one main platform where they receive UNAM academic and administrative information from the UNAM staff while avoiding information overload. Each logged-in user can only view the information that was posted for all students and the information of the group of which the user is signed up for. In this research, both qualitative and quantitative has been applied as a research methodology. Target population was the UNAM community. Non probability convenience sampling techniques such as questionnaires, documents, observations, and interviews were used to collect data. Results of the data collected showed that above 70% UNAM students are affected by the communication problem in UNAM, of which almost 50% are the distance and part time students. Questionnaires and interviews were done on students who used the proposed system and their replies show a positive response to the proposed system as it enables students from all campuses to be informed on the same platform, whether it is a distant, fulltime, part-time or online registered student. They will all see the information posted. The system has the potential to make student life easier with regard to students always being informed and updated on UNAM events, functions, due dates, administration information, financial information, etc.

Mobile Voting Application to Enhance Voter Turnout for Student Council Elections: A Case Study of the University of Namibia (Main Campus)

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Abstract

Voting is a form of choice expressed by people through the ballot or by any other electoral schemes with the aim of setting up a democratically elected leadership. Over the years, voting systems have evolved from counting hands to the conventional paper-based voting system, and recently to electronic voting schemes such as Direct-Recording Electronic (DRE) voting systems and systems including optical machines. Electronic voting is a modern voting technology in which the votes cast by voters of a specific electronic medium can be retrieved, tallied and stored electronically. At the University of Namibia (UNAM), the Student Representative Council (SRC) elections have always been a yearly activity wherein students vote for their leaders who will fill the vacant positions in the student council. In order to accomplish this, the students go to the voting booth on election day, queue up and cast their votes. However, the existing voting system is inconvenient for most students as they may have to suspend their activities on the day just to go vote. The purpose of this study is to ensure maximum participation from all students so that the results of these elections are a true reflection of the voice of the student board. A mobile voting application was developed to help improve campus voting services through fast and convenient voting without constraints of time and place. The application runs on android and provides an admin interface module that enables the administrator to log in, register voters and candidates, set various elections and monitor all voting activities from the admin dashboard. The app also provides a voter interface module which allows voters to log in and cast their votes. The descriptive quantitative research design was adopted as the research methodology to help provide the answers as to the current issues hindering maximum voter turnout at the University of Namibia student council elections. The data was collected through a self-administered questionnaire from the respondents selected using a simple random sampling technique. Despite the restraints of time, and the challenges finding an appropriate sample of participants to partake in the survey, the data collection process was a success and the findings were documented and represented using charts, graphs, and tables. The study found that a greater percentage of students chose not to vote due to lesson commitments, and long queues during voting time. The data attained also gives a clear indication that the prospect of a mobile voting system presents a great opportunity to attract students to participate in the SRC elections which in turn enhances voter turnout. The study recommends future work to focus on creating an application that allows voters to change and set their passwords, and can operate on the iOS platform.

Enhancing Student Lecture communication at the University of Namibia (UNAM) via an electronic forum

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Abstract

The University of Namibia (UNAM) currently has a student-lecture forum, which is a platform that allows students to lay complaints around issues on campus and receive feedback from the lecturers and respective staff members. Currently, this forum requires both students and staff members to physically attend the dedicated forum venues, however, due to the low student turn up, there is a need to investigate different means to host the forum. Universities worldwide are moving towards online forums (Mitra, 2003). Hence, research distinguishes two types of forums that are categorized as structured or non-structured forums (Ismail, Singh, & Abu, 2013, p3). In structured forums, complaints are placed into respective categorical hierarchies, whereas all the complaints are placed into one general category in unstructured forums (Xenakis, 2010). This study aims to investigate the use of online forum to enhance student participation. A quantitative data collection approach via online questionnaires was used in this study. The online questionnaire was randomly distributed to the students through a web link from survey monkey. Forty five students responded to the questionnaire that aimed at identifying the main challenges students faced with the current traditional forum. Lack of time for all students to raise their issues and poor response time feedback were amongst the challenges identified by the students. Therefore, the allocated time is insufficient while requiring a faster response rate for complaints that need further consultation amongst other staff members. The respondents also indicated a high preference to lay complaints remotely. Therefore, the study developed a semi-structured online system namely, UNAM E-forum. UNAM E-forum was developed using the agile methodology on a client server architecture. The following technologies: Hypertext Markup Language (HTML), Hypertext Preprocessor (PHP), Cascading Style Sheets (CSS), Bootstrap, JavaScript, and MySQL database were used to develop the UNAM E-forum. The UNAM E-forum allows users to add complaints into respective categorical hierarchies, where viewing and replying to complaints can be done by both students and lecturers since each username is unique. The replies from lecturers are distinguished from student replies by having bold text. After the development phase, a System Usability Scale (SUS) was adapted to measure the usability of the UNAM E-Forum. Fifteen students from the School of Computing at UNAM were randomly selected. The SUS questionnaire averaged a score of 85 on its scale, which means it has an adjective rating perceived as excellent. Hence, future research will investigate integrating Artificial Intelligence chatbox into the UNAM E-forum to resolve student problems based on past solutions and present data complaints. In addition, extend the UNAM E-forum to other faculties.

DEVELOPMENT OF A WEB BALLOT SYSTEM FOR THE UNAM SRC ELECTIONS

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Abstract

In a world were digitalization has taken over and everything or almost everything is either done on your computer or smartphone and remotely for that matter of fact, it would only be fitting for The University of Namibia to follow that trend and incorporate a web ballot system for its SRC elections, this system involves procedures such as registration of voters, vote casting, vote counting, and declaration of results. The development of this system constituted a good solution to the system that is currently in place. Therefore this research aimed to review the current voting system being used at The University of Namibia to find out its effectiveness and efficiency and how the newly proposed system reduces all the hassles when it comes to the SRC elections. The proposed system offers the voters the chance to cast their votes remotely at their own time without having to worry about the long queues or missing out on class. This system will also benefit the candidates as it will allow them to log in to their candidate profiles and upload all their details including their previous milestones and manifesto slides just to mention a few. The Incremental process plan was adopted in the design of the web ballot system as it combines elements of the waterfall model in an iterative manner. In addition, the prototyping model was adopted as the methodology for designing the application. In designing the Online Voting System, Flowcharts, Use Case Diagrams and Data Flow Diagrams (DFD) were also employed. Data collection methods used were both qualitative and quantitative mainly because some of the data that was collected was based on words, descriptions, and other non-numerical elements that answered the questions in the research questions to prove why the current system wasn't efficient and sufficient enough. The results of the study were satisfying as the responses provided a positive response to develop a web ballot system for the UNAM SRC elections. The results indicated that the majority of the target audience would prefer the option of remote voting. To conclude, the results indicated that the target assemblages were satisfied with what the system has to offer. The general services of the system appeared to be clear and concise to the target audience and they indicated sound knowledge of what to expect from the web ballot system.

Visualization Tool for Data Structures and Algorithms Course to Support Learning Students.

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Abstract

Datastructures and Algorithms is an important course for Computer Science students at the University of Namibia, because it provides the students with fundamental skills and knowledge which can be used for modeling real-world tasks. However, many students find understanding data structures and algorithms difficult because it requires abstract thinking (Chen, Sonh & Tibrewal (2003)). The main objective of this study is to help students better understand Datastructures and algorithms with the use of visualizations and animations, which is the use of images, graphics, and animations to illustrate computer algorithms, programs and processes. The application was developed using Java, using the JavaFX software development platform to design the interface. An Iterative and Incremental approach was used in the software development process. When the application starts running, the end user can select from a variety of data structures such as binary search trees, red black trees, etc., as well as certain sorting algorithms such as selection, bubble and merge sort to name a few in order to see how they work. Convenience sampling technique was used to collect data from 15 3rd year Computer Science students from the University of Namibia (UNAM). A questionnaire was used to collect data in order to understand the views and perceptions the students have of the application developed in this research. The results of these questionnaires showed that students find it easier to learn about how various data structures and sorting algorithms when they can visually see how they work. Further research can be done to accommodate the possible addition of more data structures and algorithms in the application aside from the ones in the UNAM curriculum.

Educating the Aambo Youth on their Cultural Rituals using a Mobile Game

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Abstract

Mobile games are a great and effective way of increasing interest amongst the youth and preserving indigenous knowledge is no exception (Hasibuan, Isal, Anggun, Ahmad, & Selviandro, 2011). Until recent, mobile games were used for entertainment purposes only, but their fun and exciting nature has made them an innovative way of teaching (Hasibuan et al, 2011). This has paved the way for gamification, a concept which makes use of games to

increase interest and engagement (Sailer, Hense, Mayr, & Mandl, 2017). In this case, the need for culture and the ubiquitous use of mobile phones amongst the youth are the motivation for this study. The aim of the study was to develop a mobile game application that would entice the youth and teach them more about their culture rituals. The study began by conducting a survey on 22 Univeristy of Nambia (UNAM) Ovambo students using Random sampling technique. The aim of the questionnaire was to ascertain the youth's interest in learning about their culture. In addition, to find out the aspect that the youth are interested in learning about. Results of the study showed that the youth were more interested in learning about rituals than any other cultural aspect. Hence, the game was developed with a specific focus on cultural rituals. Game Development Lifecycle methodology (GDLC) approach was adapted for the development of the game. Therefore, in accordance with GDLC, the game was developed using android studio, evaluated against design requirements and then eventually tested. The game created begins by informing the player about an Ovambo ritual through a series of pictures before the user is given the option to play a quiz-style game to test their knowledge of the ritual. A Convenience sampling technique was employed and a pre and post game questionnaire were used to compare the knowledge of 12 fourth year Information Technology Ovambo students at UNAM before and after playing the game. The purpose of the questionnaires was to test whether their scores before playing the game would change after they played the game. This determined whether they had learnt anything from the game. The results of these questionnaire's revealed that the students had learnt more about their cultural rituals after playing the game as there was a variance in their scores. The students obtained higher scores in the post-game questionnaire after playing the game. Further research can be done to investigate the possible application of mobile games in other areas such as languages for learning and the incorporation of multi-player functionality in the game.

Code-colab: A responsive web application for programming students

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Abstract

The advancement in technology has revolutionized how various individuals interact with each other. The same can be said about the impact of technology on how students learn and acquire knowledge in different fields of study at the University. The computing students at the University of Namibia raise a great concern on how they learn and understand programming concepts that lectures deliver. Lecturers pay great attention to this situation which is overwhelming due to the number of students they must attend to. Computer science students need support in tackling some of the programming concepts that hinder their capacity to apply practically and lecturers need support on how they can deliver the content in a much more effective way. The University currently does not provide a platform where students can help each other solve or learn more about programming as a team. This research proposes a responsive web application that enables students to learn, gain understanding and easily share

computer programming knowledge to increase their competence in their respective courses. It also incorporates collaboration between students and lecturers. This proposed project idea aims to enhance students programming knowledge and to make them become better programmers. An applied research methodology was used to carry out the research. A survey was conducted to gain information on the negative impact on students and lecturers using the existing methods and on improvements that can be incorporated. The findings from the survey lead to the development of the application based on the requirements and features recommended by students and lecturers.

UNAM Assistance: A rule-based chatbot

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Abstract

Chatbots have played a big role in handling monotonous tasks such as answering frequently asked questions. The University of Namibia is dedicated in serving students and the general public's queries posed to the University. An observed situation that has given rise to a great concern among the served parties often occurs during registration were long queues prevail. Queries that the public may have are not easily attended to as the university does not provide a 'frequently asked questions' (FAQ) webpage on which some of the related questions and answers can be looked up, which rather requires them to go the University to enquirer. The aim of this research is to develop a rule-based chatbot to handle the enquires. To achieve the task at hand, this research adapted an action research. A short survey was conducted to gather the often-asked questions and corresponding answers. A custom matching algorithm was developed to enable the chatbot to match user queries to the correct answers. Participants that used the application gave positive feedback on the reliability and quick-response of the application. The findings obtained show a positive inclination towards adapting the chatbot.

AUGMENTED REALITY APPLICATION TO SUPPORT TEACHING COMPUTER NETWORK DEVICES

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Abstract

Different technologies have been introduced to support teaching and improve teaching quality, such as video-conferencing and e-learning. Information Technology students at the University of Namibia are provided only with 2-dimensional pictures of most networking devices in their computer networking classes, they fail to identify the devices when they see them in real life environment. Augmented Reality is one of the technologies used to improve contend delivery in education. Computer networks are highly complex structures with a lot of different devices such as routers, switches, modems etc. If all device figures used are visually presented in a realistic and highly resembles the real life networking devices, the students will be more likely to understand the devices and their functions. This will help students to have a better understanding of computer networks devices. This research aims to improve the visual presentation of networking devices to students. It will be done by developing an augmented reality application that will provide good quality, highly realistic objects resembling the real life network devices. The visual presentation of the computer network devices will be in 3D, interactive in real time and the application will combine real and virtual world.

Mobile Application for Student Awareness on Violence Against Women (VAW)

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Abstract

Violence against Women (VAW) is one of Namibias most pervasive social problems. VAW happens both in the private and public sphere of women's lives, and it is recognized to be a crime against humanity and not merely a crime against a person (Balahadia & Bawica, 2013). In many societies, it is difficult for a woman to report violence and pursue legal action because of different number of reasons. University students suffer most from lack of knowledge about what constitute gender based violence (GBV) and VAW and the shame that follows. This study aims to investigate how ICTs could be leveraged to enable University of Namibia (UNAM) students to report violent cases. The current study explores the use of mobile phones as a means to curb violience against women, specifically victims of domestic violence and sexual harassment incidents. A mobile application namely

(NAMVAW) that enables students to report gender-based violence was developed. NAMVAW runs on android and enables users to send incident report to the related response agency, shows different laws regarding VAWs to educate the users, list different government agency help lines and also has the added benefit of sending notification to the families or response team if emergency occurs with corresponding location through GPS . This study adapted the Scum Methodology, and began by first establishing system requirements and the duration of sprints. Thereafter, followed with the creation of sprints, Sprints are periods of time when software development is actually done (Balahadia & Bawica, 2013. The goal of each sprint was to create a testable feature(Preven, 2010), the sprints underwent iterations and continued until the end of the project. The technologies used include java is the primary programming language and bootstrap as the main frame work and Black Box which was used for Testing after every completed sprint. A survey was conducted amoungst 30 female students to get the perceptions and experiences of the Participants on Gender-Based Violence at UNAM. The result from the survey found that 95% of the respondents experienced physical violence either as primary victims or secondary victims. However, this study has been conducted with a small sample because of unwillingness of particpants as 44 participants were approached and only 30 accepted to carry out he survey. The study recommends using the digital story telling initiative and creation as in this context, digital storytelling is being tactically utilized by the women survivors of violence to develop digital stories based on their life experiences and share their voices with global community to undermine gender based violence across the globe (Shams,2012).

Taxi booking mobile application.

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Abstract

The growth crime in taxis has, over the past few years, reached an alarming rate in Namibia. The general public, including students and women that use taxis, have become a target of robbery. Some are rapped and others are robbed of their valuable belongings. Currently, users make use of social media platforms like Facebook and WhatsApp to warn and notify others about dangerous taxis.

The use of social media platforms as a notification system is, however, less effective, as not all taxi users are on social media. In addition, those that are on social media sometimes miss out on those critical posts and messages due to information overload from inbox and other notifications on these platforms. Therefore, not all warning notifications on unreliable taxis reach all intended taxi users.

This study aimed to find how a mobile application can be developed to allow users to share information and alert each other about dangerous taxis to curb crime in the taxis as well as improve safety of the taxi users. In

determining the requirements of the application, the study investigated the cause and effect of crimes in taxis, using a combination of both quantitative and qualitative approaches.

The outcome of this study made a good answer to the purpose. It was shown that the majority of the population sample drawn for this study recommended the feature to share alerts of dangerous taxis to be incorporated. Their response implied that notifications would reach almost everyone that use taxis as long as they have the mobile application.

In this regard, the application was achieved using the Java programming language. For generating the graphical interface HTML and CSS language was used and for communication with the server JSON language was used. The development environment used was Ionic Framework. The developed application described in this paper has 6 activities: 1)Login(existing users); 2)Register(new users); 3)Main Activity(main screen); 4)Scan number plate(to check if the taxi is registered); 5)Share new alert; 6)Search Taxi number(for direct contact with the Taxi driver of your choice).This project involved the completion of all steps related to the development of a software product, from planning the application structure to its implementation including user testing.

In overall, the study revealed that commuters are willing to use the application since it guides them to safe ones apart from informing them about the dangerous ones. It is more so recommended for commuters to own a smart phone in order to get notifications about dangerous taxis. However, this application requires mobile data to work which is a major challenge to those who cannot afford data.

EVALUATION OF MACHINE LEARNING CLASSIFICATION OF HAM AND ELECTRONIC FUND TRANSFERS SCAM SMSes

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ABSTRACT

The last decade saw the emergence of mobile banking and a pervasive transcendence of spams from email to SMS communications. M-banking offer users an ability to execute EFT transactions using mobile devices and allow them to receive SMS notifications acknowledging their transactions. While this offers convenience to normal m-banking users, in the age of SMS spams it present prospects that spammers leverage to scam money and goods from them. To execute these scams, spammers send forget EFT (e.g. e-wallet) deposit notification SMSes to unsuspecting users' mobile numbers, then contact them and request for reverse transfers of the supposed erroneous deposits acknowledged by the bogus notifications. When contacting the users, spammers often only request back a portion of the purported deposited amounts and at times use socially engineered stories to entice and lure users to fall for the scams. Similarly, during goods exchanges, scammers use forged deposit notification SMSes to trick sellers to believe that they paid for goods. The high affordability for Namibia's mobile operators SIM cards and the readily access to m-banking accounts such as e-wallet to anyone with valid SIM numbers

provides a favorable operating environment for the EFT SMS scammers. This work was inspired by the pervasive reporting of EFT SMS scams in local media, which mostly involves FNB Namibia, the country's largest bank by market share and the observed lack of dedicated IT solutions to address the problem especially on the users' side. Drawing key inferences from literatures on novel spam filtering techniques, this study's work draws out a roadmap of research methods essential to aid a successful employment of machine learning classification to address the EFT SMS scam problem. The study collected ham (or legitimate) and EFT scam SMS datasets from FNB Namibia m-banking users, extract features for classification from the datasets and optimized them. The features were then used to build and evaluate Support Vector Machine, Naïve Bayes and Random Forest SMS classifier models following a 10-fold cross validation technique. The study results suggests that if guided by appropriate research to warrant noble efficacy, machine learning based SMS classification could be implemented into effective practical mobile applications for detecting EFT scam SMSes. The envisaged future works extension to this study would look toward realization of such implementation.

WIRELESS NETWORKS SECURITY IMPROVEMENT: UNIVERSITY OF NAMIBIA MAIN CAMPUS

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Abstract

In today's generation, the wireless networks have been on the increase since they provide the liberty to gain access to the network without physically bonded. Many communication devices today support Wireless Fidelity (Wi-Fi) and its risks on security have become a major concern. The liberty to gain access to the network without being physically linked, the mobility, increased reliability and flexibility are factors driving the wireless network technology. It is reported in a study done by Deloitte that Namibia is one of the top most vulnerable countries in the world to cybercrime, due to the lack of security in place to protect the country against attacks. This means that access to valuable information has been compromised. Nevertheless, with this comes a greater concern for security risks within this network due to the nature of transmission which is air, thus regarded as inherently insecure. As a result, wireless networks have become more vulnerable, less resilient and agile. The aim of this study was to assess the current Wi-Fi used at University of Namibia (UNAM), on the type of security attacks users can perform and at the same time, are exposed to when on this network. To identify the risk of threats on this network, it is therefore essential to assess the security risks associated with this Wi-Fi by conducting a network penetration test. The experimental results have shown and confirms security vulnerabilities in relation to confidentiality and authentication. This study finally identified the vulnerabilities and the recommends defence strategies to secure the data traffic between clients and the trusted network, which mitigates the risks of an open network usage.

STATISTICS AND POPULATION STUDIES

A study on the effects of mothers demographic and socio-economic factors on childhood stunting of under five in Namibia

Alfons Tangani Abisia

Abstract

Malnutrition is a chronic problem in developing countries (Roy et al, 2015). Under nutrition particularly stunting is a public health problem in Namibia and affects under five children in many parts of the country. Stunting is as a result of long standing nutritional inadequacy (INICEF-WHO-World Bank, 2015), and a study by the UN found that 1 in 4 children in Namibia experiences stunted growth due to malnutrition. Namibia stands with a 12% of the population extremely food insecure that they need humanitarian assistance the year 2019 and this is how serious under nutrition is turning out to be. According to latest Namibia demographic and health Survey data of 2013, stunting was reported the highest among other forms of under nutrition with a 24%, followed by underweight which stands at 13% and lastly, wasted at 6% of under five children. Stunting, underweight and wasted are associated with demographic and socio-economic factors. The study have used cross-sectional research design to determine whether a child is stunt or not using the anthropometric data collected by Namibia Demographic and Health Survey in 2013 of children and mothers demographic and socio-economic factors. A number of 5046 children were screened to check for stunting hood. Both chi-square and logistic regression were used to check for association and a p-value of 0.05 was used to check for significance. The boy child is likely to be stunt then a girl child, also the study found out that there is wide rural urban gap with the majority of children who are stunt found in rural areas. There are a number of regions with high odds of stunting. Children who come from low income families are more likely to be stunt than those who are not. Equally, Age of child in months, Body mass and Educational level have a negative contribution to stunting in binary logistic regression, but some lost statistical significance. Child stunting is a serious form of under nutrition in Namibia. This study has found influential factors that lead to an increase in stunting in Namibia. Regions and areas with high odds of stunting should receive the most attentions in terms of implementing policies on well-being of children. Mothers are encouraged to have a better nutritional behaviour and give their children a rich diet that will help them grow well.

Evaluation of the Completeness and Accuracy of Fertility Data in Namibia.

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Abstract

The evaluation of the completeness and accuracy of fertility data is crucial to obtain data of high quality that could be readily available to users. For data to be of high quality it has to be complete, common data problems must have

been cleaned up and it has to be timely available. Birth histories has become a major source of data on births in most developing countries since the 1970s. The collection of full birth histories on some issues may be sensitive to respondents and this may result in respondents providing inaccurate data. This study focused on evaluating the quality and completeness of fertility data in Namibia, using information from 2000, 2006 and 2013 Demographic Health Survey data. The main objective of the study was to assess the completeness of birth recordings among women of reproductive ages. The objectives were achieved by applying some demographic methods of analysis. The Whipple's index and the Myer's blended method were used to evaluate the quality of age data reported by women of reproductive ages. The results showed no evidence of age heaping over the years, hence age data were found to be accurately reported. The Brass P/F ratio method was also used to evaluate the completeness of birth recordings. The adjustment factor was computed to estimate the complete number of births. The complete number of births after adjustment were reported as over-complete. The results of the demographic methods used showed no evidence of age misreporting by women of reproductive ages in the 2000, 2006 and 2013 Demographic Health Survey data. These results can be used to estimate the levels of fertility in the country, thus fertility estimates could be reliable. More demographic methods could be used to evaluate the accuracy and quality of fertility data in Namibia.

Prevalence and psychological experiences in men living with prostate cancer.

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Abstract

The incidence of prostate cancer has risen sharply in the last decade, yet knowledge about the psychological health of men with this disease is still limited. This study was therefore undertaken to investigate the prevalence and psychological experiences of men living with prostate cancer. Examining the relationship between socio-demographic characteristics psychological distress, anxiety and depression in men living with prostate cancer. Participants (N=48) were conveniently sampled from Dr. A. Bernard May Cancer Care Centre and from the Namibian Oncology Centre (NOC). A self-designed socio-demographic questionnaire, the Hospital Anxiety and Depression Subscale and three emotional thermometer were used. Data was analyzed using R package. Frequencies and descriptive summary were obtained. This study used Pearson correlation to examine the relationship between the variables of distress anxiety, depression. Multiple linear regression was used to model the relationship of independent variables to psychological distress (dependent variable). From the results obtained, a total of 32 men reported to be depressed and 28 men were assessed to be anxious. Using a cut off of 15 as indicative of overall distress, a total of 68.8% who participated in this study reported to be significantly distressed. Findings reported a high incidence in black men. Prostate cancer has its highest prevalence in older man (65+). There was generally high distress level among respondents. Younger men reported to be more distressed

compared to elderly man. Respondents with low education level (No formal and early childhood education) reported to be more distressed compared to respondent with secondary education level. Psychological experiences in oncology population is have overwhelming impact on the treatment adherence, self-care and individual capacity to cope with treatment. It is recommended that future studies should be of qualitative nature in order to accommodate some of the experiences faced by men living with prostate cancer that are not assessed by instruments.

Absteact TS Namando

Namando Teofelus Shiweda

Abstract

Malaria is a major public health problem in the world causing an enormous burden to health and economy. The disease is responsible for more than one-third of deaths among children under the age of 5 years and for up to one-fifth of deaths among pregnant women (WHO). In Namibia Malaria transmission varies geographically from moderate to risk free areas (Nghipumbwa, Ade, Kizito, Takarinda, Uusiku, Mumbengegwi, 2018). Hence this study will be to assess the current level of knowledge, attitude and practice of the community towards malaria prevention in Namibia, to specific; Examine the association between Malaria knowledge with socio-economic status of individuals, to explore the association between malaria attitudes and social-economic statues of individuals and finally, to analyze the association between malaria practices and socio-economic statues of individuals. Descriptive Statistics for univariate analysis is done to present the socio-demographic information of respondents, this gave an overview of data used to assess malaria knowledge in Namibia. Bivariate statistics such as Pearson Chi-Square test for association are performed to assess the association between knowledge of malaria, malaria attitude and malaria practice (dependent variables) and other variables such as age, sex, place of residence region, educational level, income, wealthy quintile, mosquito spray and use of mosquitoes' net (independent variables). Despite the epidemicity of Malaria, majority of the respondents had adequate knowledge, encouraging attitudes and good practices related to Malaria prevention and control. However those with low educational background was detected as major drawback for effective control. There is also a need for health personnel to improve the availability of information about Malaria through rural dispensaries and primary health centers.

Women empowerment in terms of education and employment status in Namibia

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Abstract

Women's low status and empowerment prevents them from a good quality of education and employment. This study aimed to identify the percentage of women empowered through education and employment under different socio-economic and demographic factors. This research used a cross sectional quantitative design that used the Namibia Demographic and Health Survey (NDHS) data of 2013. A total of 13 variables were used across different dimensions of socio-economic and demographic factors were used to characterize women's empowerment. Univariate was used to present sample characteristics. Bivariate and a backward binary logistic model were used to determine the significant predictor variables for women's education and employment status. Findings of the study show that education status play significant role in women empowerment and if women's empowerment is to be effected, it can be carried out only through the medium of education. Hence, it is of foremost importance to raise the level of education amongst women. The odds of women employed in the Oshikoto region is 6.5 times more compared to women employed in the Caprivi region, while the odds of women having a secondary and higher education in the Omusati region is 4.0 times more compared to women having secondary and higher education in the Caprivi region. The odds of women employed in the aged group 20-24 is 6.4 times higher compared to women employed in the age groups 15-19, hence the odds of women having secondary and higher education in the aged group 20-24 is 6.4 times higher compared to women having secondary and higher education in the age groups 15-19. Women from rich and middle socio-economic groups had an odds ratio of 2.0 and 2.2 more compared to women to women from a poor socio-economic group, while women from a rich socio-economic group had an odds ratio of 6.2 higher compared to women from a poor socio-economic group who have secondary and higher education. The study managed to reveal that more than 50% of women in Namibia had secondary and higher education and 50.3% of women are employed. Undeniably the study gives a brief understanding about to empower women in Namibia

An application of survival analysis on hiv patients to determine the contributing risk factors in erongo region

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Abstract

Even though Namibia made an effort to reduce HIV/AIDS-related mortality by distributing antiretroviral therapy treatment, HIV patients in poor-resource setting are still dying even if they are on ART treatment. This study intent was to examine the factors associated with high HIV/AIDS mortality in Erongo region. A quantitative research design used the secondary data (HIV/TB) from the Ministry of Health and Social services, for years 2006-2017 to explore the factors associated with the high death rate amongst HIV patients. Data analysis involved both descriptive and inferential statistics. Descriptive statistics focused on the characteristic factors of patients such as socio-demographic factors and medicine related factors. Analytical statistics in terms of Confidence Intervals (CI), chi-square and P-value were presented to show associations between different variables and treatment outcomes. A best-fit model (Cox regression) was chosen for the survival data. SPSS (Statistical Packages for Social Sciences) software was used for all the analysis. The population consisted of 3145 medical records of HIV/AIDS patients aged from 1 year and older. 1433 (45.6%) were male and 1712 (54.4%) were female. 1467 (46.7%), 358 (11.4%), 1013 (32.2%) and 307 (9.8%) patients were in stage 1, stage 2, stage 3 and stage 4 respectively. The common HIV-related causes of death were WHO (World Health Organization) clinical stages, CD4 cell category and Age group category. Furthermore, there is urgent need for the MoHSS and other agencies working on reducing HIV/AIDS-related mortality to make sure that before treating HIV patients, age, CD4 cell counts and WHO clinical stages are the most important covariates that need to be verified to help reduce the high death rate.

Statistical analysis of prevalence and risks factors of diabetes in khomas region Namibia.

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Abstract

Diabetes has become epidemic diseases for many years in Namibia and it is expected to increase by 2% by 2045.The purpose of this study was to examined the relationship between the risks factors of diabetes among people that are diagnosed with diabetes in Khomas region, Namibia. The study used a quantitative cross sectional design. The study population included all people in Khomas region diagnosed with diabetes and the sample

population was composed of 100 participants. Statistical Package for the Social Science (SPSS) version 25 was used for the data analysis. The study employed chi-square statistic for testing the relationships between categorical variables of risks factors for diabetes. The study made use of Binary logistic regression to determine the effects of X variables on Y variable. The data was collected from the Ministry of Health and Social Services database. A P-value<0.05 was regarded as statistically significant. Results from the analysis of diabetes prevalence between males and females showed that an estimate of 33% in total was diagnosed with diabetes while the rest were not (67%).The study findings revealed that, majority of the patients who did not smoke (50%) were undiagnosed with diabetes and those who smoked 22% were diagnosed with diabetes. The p-value obtained (0.000) was significant and therefore there was a statistical relationship between smoking and diabetes status. The study investigated the relationship between age and diabetes. It was found that the percentages of diabetic patients was very low within the age groups 15-25 and 26-35 that is 1% and 3% respectively. Results from the study showed that there was a statistical relationship between age and diabetes status (p-value=0.026). Results from the present study found that blood pressure was associated with diabetes. A p-value of 0.003 was obtained and this showed that relationship between blood pressure and diabetes status was significant. The first conclusion based on the dominance of diabetes was that more females than males tend to be diagnosed with diabetes .The conclusion was reached from the present's study results which showed that females constituted 17 % of the affected population by diabetes and males constituted 16%.The second conclusion, based on the risky factors of diabetes was that, blood pressure, age and smoking were associated with diabetes and also good predictors of diabetes in the logistic regression model.

A Statistical Analysis of the Effects of the Namibian Economy on Agriculture in Namibia.

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Abstract

Agriculture is considered the backbone of any economy and it is also the most important sector of Namibia's economy. Namibia, being an arid country, is heavily reliant on surface water irrigation and underground water resources. Low yields, both in terms of quality and quantity, have a damaging impact on income earned by the farmers. The purpose of this research is to analyse how the state of the economy at a certain period in time can affect the agricultural outputs in Namibia. This study will help identify the economy related variables in the agricultural sector, and also highlights possible solutions that can be recommended to reduce the effects of the economy on the agricultural outputs in Namibia. Time-series data is used in this paper and data is collected from the Namibia Statistics Agency (NSA). The agriculture sectors; crops, and livestock are studied in this research paper. The variables outputs, Agricultural population, Machinery, Country GDP, value added GDP and Price were tested for association using multiple linear correlation analysis and multiple linear regression was used as a forecast model to predict the behaviour of the outputs variable i.e.; maize, millet, sorghum, cattle, sheep and goats

under various circumstances of the economy. The findings shows that there is a very strong and positive relationship between the linear models for maize, millet, goat, sheep and cattle and the output variable. There is a medium and positive relationship between the sorghum variable and the output variable. The correlation model concluded that the cattle model was the strongest while the sorghum model was the weakest. It was also found that agriculture was positively related to the economy, and may be expected to increase and decrease due to fluctuations in Namibia's economic growth in Gross Domestic Product (GDP).

Male involvement in maternal healthcare in Namibia

Uamenguavi Tjizembisa

Abstract

Globally, men play a vital role in women capability to pursue their well-being upkeep, including reproductive healthcare. However men are lacking knowledge about women's reproductive health needs. Male participation in maternal health has shown to produce extensive inspiration in decision-making and health outcomes in other numerous areas of reproductive care as well as induced abortion and breastfeeding. Moreover the level of male involvement in maternal health issues is generally affected by traditional and cultural restrictions and ill-informed of women reproductive issues. Therefore this study examined the contributing factors to low involvement of male participation in maternal health needs in Namibia. This study was conducted to examine the level of participation of male in women's reproductive issues during antenatal, delivery and postnatal periods in Namibia as well as to ascertain features that encourage and challenges that limit such male involvement. A cross-sectional study, covering 690 men whose partners were currently pregnant, had children or had ever a child before the survey (2013) was carried out. Data were analysed using Statistical Package for Social Science (SPSS) version 25. Descriptive analysis were used to provide summary information of explanatory variables, chi-square test was performed to examine the association between dependent variable (male involvement in reproductive care) and independent variables and finally a logistic regression was used to determine the significance between respondents characteristics and their involvement in maternal health. The results shown that the median age of respondents was 37 years. More than five out of seven participants (or 70%) had low male involvement, though a high proportion (85%) claimed to accompany their partners to the facilities offering services. The level of male participation in reproductive health was found to be below the par in Namibia. According to the result men supported their spouses financially, however they insufficiently supported their partners emotionally and physically during antenatal, delivery and postnatal periods in Namibia.

A statistical analysis of socio-economic and demographic effects on poverty in Namibia using the 2015/2016 Namibia Household Income and Expenditure Survey

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Abstract

Poverty has been a major recurrent challenge in the world and Namibia is not excluded from this challenge. It is the scarcity or the lack of a certain amount of material possessions or money. Despite the intervention strategies that have been put in place to fight poverty, Namibia continue to experience high incidence of poverty with large numbers of people living in poverty conditions and unable to afford the minimum daily essentials for a decent life. Thus, this study aimed at identifying the socio-economic and demographic factors that contribute to poverty using the 2015/2016 Namibia Household Income and Expenditure Survey. A chi-square test for association was used to test for possible associations between the respondent's socio-economic & demographic variables (Main source of income, Marital status, Highest level of education obtained, Health (disability), Household indebtedness, Age, Orphan hood, Urban/Rural and Region) and poverty status. Furthermore, to identify the determinants of poverty and their effects, a probit regression model was used. Results from this study showed that the respondents' socio-economic & demographic variables were related to their poverty status with a p-value $<2.2e^{-16}$. Moreover, poverty was the highest in rural areas (OR: 0.74, p-value: $2e^{-16}$) than in urban areas. Mostly rural regions of Kavango, Zambezi, Oshikoto, Otjozondjupa, Omaheke, Ohangwena and Kunene regions had poverty levels that were higher than the national average while poverty in Khomas and Erongo regions which are more urbanized was low. Younger respondents (05-09 years) are poorer than the elderly (90-94 years). Individuals who are consensually united (OR: 1.21, p-value: 0.0007) are poorer than individuals who are too young for marriage. Respondents with low levels of education attainment had a higher poverty rate (OR: 0.58, p-value: $2e^{-16}$) compared to those who had primary, secondary or tertiary education. A household that was not indebted has a higher poverty rate (OR:0.38, p-value: 0.0002) than those who are indebted. Moreover, households whose main source of income was pension had a higher poverty rate (OR: 1.29, p-value: $1.54e^{-15}$) than those who have business income. It is therefore recommended that the Namibian Government and policy makers need to focus more on the socio-economic and demographic factors that affect poverty and continue strengthening the poverty eradication measures to achieve the national objectives of the Harambee Prosperity plan.

Assessing the Effects of Proximate and Non-Proximate Determinants of Fertility in Namibia: A Structural Equation Modelling Approach

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Over the years total fertility rate has been declined across Namibia, and there are number of studies that have been done to investigate socio-economic and physiological factors that influence fertility. The current study aim to model the direct, indirect, and the joint effect of various selected socio-economic and proximate determinants of fertility on Namibian women.

The study used data from the Namibia Demographic Health Survey (NDHS) 2010. The sample comprised of a total of 9 176 women in reproductive age groups (15-49 years) that were interviewed during the survey. The number of children ever born (CEB) was used as dependent variable. Whereas as the following variables were used as predicting variables: place of residence, religion, working status, wealth index, exposure to mass media(Television, Newspaper and Radio), fertility preference, age at first marriage, contraceptive us, age at first sex, educational attainment, age at first birth and marital status. Confirmatory Factor Analysis (CFA) was used to test the theorised model of proximate and non-proximate determinants of fertility. Further, Structural Equation Modelling (SEM) technique was used to assess the effects of selected socio-economic and physiological attributes on fertility. The results of CFA showed that proximate determinants had a direct negative impact (β=-0.023) on the number of children ever born, this implies that for every unit increase in proximate determinants, the number of children ever born decreases by 0.023 children. Further, the findings sows that non-proximate determinants has a positive significant indirect effect (β=0.053), this signifies that for every unit increase in non-proximate determinants, the number of children ever born will increase by 0.053 children. Moreover, the study found age at first birth to have a highest significant positive effect on the number of children ever born, this implies that, for every unit increase in age at first birth, the number of children ever born will increase by 0.78 children. However, contraceptive use was found to have a minor significant positive effect on the number of children ever born.

A Statistical Analysis of the Impacting Factors of Household Consumption using the 2009/2010 Namibia Household Income and Expenditure Survey

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Abstract

Household consumption is a key element of economic growth in both developing and developed nations and it affects most economies if not all economies in the world. Business closures, high unemployment rate, reduced disposable income, high price levels, and the increase in demand of imported goods can result in the decline of consumer spending. Moreover, a rapid rise in the unemployment rate can become problematic and Namibia is not immune to this problem. Many studies on the determinants of household consumption in developing countries were from a macroeconomic perspective. For this reason, this study through a statistical analysis investigated the impacting factors of household consumption in Namibia and evaluated the extent of their effect on households' level of consumption. A Multivariate Regression Analysis was performed to evaluate the effects of the impacting factors on household consumption. The data used for this study was obtained from the 2009/2010 Namibia Household Income and Expenditure Survey (NHIES). Results from this study showed that highest education attainment, household size, age of head of household, dwelling groups, employed household members, main source of income, types of household, orphan-hood group and tenure (mortgage ownership) houses had significant association with household consumption. On average, household consumption for households with no spouse decreased by N$147.23 (p-value: 3.38e-10) compared to those with spouses, while for households with no adult working it was N$75.11 less (p-value: 0.009974) compared to those where at least one adult was working. In addition, for every increase in the household sizes, average household consumption increased by N$41.86 (p-value: < 2e-16), while for every increase in the age of heads of household, it increased by N$5.45 (p-value: 3.67e-12). Furthermore, household consumption for households whose head had tertiary education was N$738.27 (p-value: < 2e-16) compared to those with no formal education, while households whose head had primary and secondary education had a consumption of N$108.92 (p-value: 0.000233) and N$324.98 (p-value: < 2e-16) respectively, on average. The average household consumption for households whose main source of income were commercial farming, interest from savings investment and state old pension were N$1418.86 (p-value: 4.79e-15), N$513.41 (p-value: 0.034018) and N$309.70 (p-value: 0.04463) respectively compared to those whose main source were alimonies and similar allowances. It is therefore recommended that the Namibian government and policymakers should explore measures of relieving the pressure on disposable income by addressing unemployment or adjusting the policy on minimum wage, or introduce more business-friendly government policies to stimulate higher consumption. Furthermore, Government can collaborate with Non-Governmental Organizations for financial education that promotes a culture of savings and investments to increase consumption as it could have a positive relation with the GDP.

A Statistical Analysis on the effect of Export and Import on Economic Growth in Namibia

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Abstract

Exporting and Importing is fast becoming a daily activity in developing countries and Namibia is no exception. The main objective of this study was to examine the impact exports and imports have on economic growth in Namibia and to determine if there is a relationship between the variables. The target population relevant to the study was annual data of exports, imports, consumer price index (CPI) and real GDP of Namibia for the period 1980 to 2018. The study employed secondary data collection obtained from Namibia Statistics Agency (NSA). Using Augmented Dickey-Fuller (ADF) stationarity test, the time series data proved to be stationary of the order one 1(1) at first difference. Ordinary Least Squares (OLS) regression was employed to test for the significance of the variables on economic growth and correlation analysis was used to test for the relationship between the variables. The findings revealed that exports, imports and CPI led to economic growth. From the correlation analysis there was a strong positive or direct relationship between exports, imports, CPI and economic growth. From the regression analysis, there was evidence to suggest that imports and consumer price index (CPI) were significant in explaining economic growth at 5% level of significance. On the other hand, exports were only significant at 10% level of significance in explaining economic growth in Namibia. For this case, it would mean that imports had a greater impact than exports on economic growth in Namibia. The study also recommends the government to come up with better policies that encourage trade (both imports and exports) especially exports since some may argue that relying on exports is more beneficial since exports make profits for the country.

Namibia Labour Force 2018: Demographic and Statistical Analysis of Youth Employment in Namibia

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Abstract

In this paper, youth was defined as a person aged between 15-34 years, the definition employed by the Namibian Statistics Agency (NSA) which conforms to International Labour Organisations (ILO). Employment refers to work, which is most commonly defined as when you work to get paid. Worldwide young people are without work, meaning that they are unemployed with no training and not in school and young workers live in poverty. Employment is people's main route out of poverty. Therefore, looking at employment with a focus on youth is a very prominent topic to understand the position of youth in the labour market. The aim of the study was to

examine the demographic and socio-economic factors which determine youth employment in Namibia. The information on the determinants of youth employment given the current economic and social country context is very important to the government, policy makers and development planners to rationally devise interventions directed towards improving the plight of the youth. The study used secondary data provided by the Namibian Statistics Agency (NSA) which is the Namibia labour force survey (NLFS) of 2018.The study used Multinomial Logistics Regression Model (MLM) to analyze the determinant of youth employment in Namibia. The findings of the study shows that region, sex, location, marital status and educational level are all significant factors in explaining the difference in youth employment status in Namibia. From the findings the study recommends that the government and policy makers should review job market laws and regulation in order to promote a smooth transition of youth from education to job market. The government should also create specific interventions especially in the creation of more formal jobs and strengthening job market regulations related to youth. Lastly, development planners should ensure that all the youth with education realize their investments in education and contribute to the country development.

Trend Analysis of Financial Inclusion in Namibia by Sociodemographic characteristics: a review of three FIS (2007, 2011 & 2017).

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Abstract

"Financial inclusion is the process that ensures the ease of access, availability, and usage of formal financial system for all members of an economy" (Park and Mercado, 2015, p. 1). This research study set out to determine the degree of financial inclusion in Namibia from 2007 to 2017; the specific objectives included determining financial inclusivity with respect to sociodemographic characteristics, determining saving and borrowing with respect to sociodemographic characteristics and identifying what could be deemed as barriers to financial inclusion. Thus by determining the degree or trend of financial inclusion and finding sociodemographic determinants of financial inclusion will help with the formulation of policies and programmes to help enhance the degree of financial inclusion in the country. This study used secondary data from the Namibian Financial Inclusion Surveys (NFIS) of 2007, 2011 and 2017 that was obtained from the Namibia Statistics Agency. Descriptive statistics was used to compare access to financial services and products (for the financially included Population) and to describe the trend of financial inclusivity overtime. In addition, binary logistics regression was used to inspect financial inclusion with relation to sex, age, marital status, educational attainment, survey year and area (urban/rural). Using the analytical techniques outlined above the study revealed that females are more likely to be financially included than males and that rural inhabitants are less likely to be financially included than individuals who reside in urban areas. Also those aged 70-74 years are reported to have the highest odds in been financially

included. Furthermore those married with a certificate were found to have the highest odds of been financially included, with those married traditionally having the lowest odds. Those with no formal education had the lowest odds of been financially included, with those with tertiary education having the highest odds. Lastly the model reported that the odds of been financially included are highest in year 2017 followed by year 2011, indicating that the odds of been financially included have been increasing from year 2007 to 2017. The study found that the biggest barrier to financial inclusion is people not having money or enough money to use financial services. This study recommends that the Namibian government and policy makers should redirect efforts and funds to less developed rural areas and put policies in place to improve or introduce employment creation projects targeted especially in rural areas. Introduction of stable communication networks to make it easy for people that cannot reach banks to use internet banking instead and bringing banking services closer to the people by introducing mobile banks that can reach remote areas.

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Abstract

Students find several difficulties when it comes to deciding their career choice to take after high school, each individual responsibility is influenced by numerous factors. This study investigates the factors that influence career choices.In particular it examines factors that have the most influence among first years students in the Science department at the University of Namibia (main campus).These factors are mainly parental influence ,lack of knowledge, availability of course, career counselling, access marks, availability of finance, skills/talents and job opportunity. The study used primary data, with an analytic approach seeking to quantify attitudes, opinions and behaviours that associate choice making, a simple random sampling was performed acquiring 73 participates using interview–questionnaire .Based on the results the main considered factor for career choice was job opportunity, financial aid /scholarship, advice from parents and availability of the course with 36%, 33%, 30%, 29% and the least influenced being high school teacher with 2%, respectively. Most students surveyed spend more time evaluating on the question if they choose a certain career does it secure them a better job opportunities after university which seem to have no association with the availability of the course . this implies that students don't decide their career choice due to skills/talents, desire or knowledge but what brings in better job opportunites.

The prevalence and associated factors of TB/HIV co-infection in Erongo Region, Namibia: 2003-2017.

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Abstract

Tuberculosis is one of the world's most common causes of death in the era of Human immunodeficiency virus. Namibia is one of the Sub-Saharan African countries with a high prevalence and burden of TB and HIV co-infection in the world. The interaction of TB and HIV makes it difficult for the diagnosis and management of the co-infection to be achieved. The purpose of this study is to identify the prevalence and associated factors of TB and HIV co-infection. The specific objectives included, determining the relationship between each covariate and status of patient still on care and assessing the association between the independent variable and TB/HIV co-infection. Thus, by determining the relational associations between socio-demographic and clinical related factors and status of patient still on care will allow the government to articulate and monitor regional and national development planning; through policies (that are based on the findings of the study) directed to the allocation of resources and for development and implementation of projects and programmes to further enhance and even dissemination of TB and HIV information to the Namibian society. The dependent variable for this study was status of patient still on care and the independent variables included age (in ten-year age groups), sex, CD4 category, marital status, facility level, name of health district, WHO clinical stage and functional status of patient. Hospital based retrospective studies were conducted from 2003-2017, a total of 3145 patients were enrolled at 16 health facilities providing ART and TB management in Erongo Region, Namibia. Descriptive statistics, crosstabulation and multinomial logistic regression model were used to analyze the data and present the findings thus, achieving the objectives set out for the study. Of 3145 patients, 1008 (32.1%) defaulted treatment including those who stopped treatment or transferred out, 464 (14.8%) were reported dead and 1673 (53.2%) were alive at the end of the study period. Only sex was found not to be significant with the status of patient still on care in the crosstabulation analysis with a p-value of 0.097. The odds of a patient still on care for age group 30-39 years, is 0.397 times less likely to be dead as compared to those in the clustered age group 60 years and above. Whereas, being a patient still on care for age group 30-39 and 40-49 years makes a patient significantly more likely to default treatment as compared to those aged 60 years and above.

A statistical analysis of factors impacting viral load outcome in adults on antiretroviral treatment in Nankudu health district of Kavango west region

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Abstract

Viral load suppression is a critical component in the application of Human Immune-deficiency Virus (HIV) treatment as a prevention in combating new HIV infections. The third 90 in the 90-90-90 UNAIDS HIV goals requires that adults living with HIV on the AntiRetroviral Therapy (ART) should reach an undetectable viral load suppression rate of 40 copies of HIV per mL of blood by 2020. Namibia is one of the hard-hit countries in Sub Saharan Africa with a 12.6% prevalence of HIV among adults aged 15-64 years with Nankudu Health district, found in the Kavango West region of Namibia, still having a 12.1% prevalence of HIV infection. Hence, this study aimed at examining the factors impacting viral load outcome in the Nankudu health district using the Ministry of Health and Social Services (MoHSS) ART database of 666 patients who have been on treatment for at least six months from January 2003 to December 2018. Based on the viral load count, ART patients were classified as undetectable viral load (if <40 copies of HIV per mL of blood), low level viremia (if 41-999 copies of HIV per mL of blood) and virologic failure (if >1000 copies of HIV per mL of blood). A Multinomial Logistic Regression model was fitted to examine the effect of the factors on viral load outcome. Results from this study showed that there were more females (70.1%) than males (29.9%) on the ART programme and out of the 666 patients, 53.9% achieved an undetectable viral load outcome, 24.9% had low-level viremia while 21.2% had virologic failure. Viral load suppression was most prevalent in males (57%) than females (47%). The odds of a virologic failure for young adults (aged <20 years) was 18.816 times more (p-value: 0.003) compared to adult patients who were older than 60 years. Furthemore, patients who had been on HIV treatment for longer duration (in years) had higher odds of experiencing a low level viremia (OR: 0.698 p-value: 0.204) and a virologic failure (OR:0.671, p-value: 0.173). It is therefore recommended that there is a need to develop HIV treatment plans for young adults. Likewse, the district must accelerate the implementation of treatment models that are patient-friendly and service-focused to retain adult patients who have been on treatment for a longer duration. In addition, the intensification of viral load monitoring to avoid progression from low-level viremia to virologic failure is needed.

An application of survival analysis on tb and associated risk factors: erongo region (2003-2017)

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Abstract

Tuberculosis remains a major public health problem in the world and Namibia is among the SubSahara countries with high burden of TB which is ranked as the second leading cause of death. The purpose of this study is to examine the prevalence and identify the associated risk factors on the survival time of TB patients in Erongo Region, using the data obtained from Ministry of Health and Social Services (MoHSS). A retrospective cohort study was based on the secondary data consisting of 3145 patients who initiated treatment from the time period 2003 to 2017 at all 16 health facility providing ART and TB management from in Erongo region, Namibia. Survival analysis techniques were used, firstly Kaplan-Meier to construct the survival curves and Log Rank test to determine differences in survival between groups. Finally Cox Proportional Hazard to model and identify risk factors associated with the survival time of the patients on TB treatments. Of the 3145 patients, about 464 (14.8%) patients experienced event of interest which death during the study period and 2681 (85.2%) patients were alive at the end of the end of the study. Factors that were significantly associated with death were sex and marital status with pvalue of 0.068 and 0.304 respectively. Death was higher in Usakos district as compared to the other health district in the region. It further showed that TB survival was influenced by CD4 category, WHO clinical stage, Facility level and Function. It is there recommended that there is a need of a greater focus on the early TB screening and awareness campaigns upon diagnosis to reduce the death rate among TB patients. Since the study was based only on Erongo region, further studies to be conducted in other regions to determine if there are other different factors that are associated with the survival of TB patients.

Trend Analysis of House pricing in Windhoek.

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Abstract

The housing factor is often described as a major contributor to the national economy. The trend patterns of purchase prices are not only restricted to the city of Windhoek but affects the entire country. A major concern of the trend of purchase prices is that it mostly affects people who belong in the low to middle income class. The

National Planning Commission (NPC) classifies housing in Namibia into three different classes of ultra-low and low income, middle income and upper income class. This study was limited to three locations, Okuryangava which represented the low income class, Khomasdal the middle income class and Kleine Kuppe the upper income class. The results of this study will specifically benefit those from the low to middle income class by identifying the main factors that influence purchase prices. The study employs a quantitative approach, using the time series analysis. A combination of an Autoregressive Integrated Moving Average (ARIMA) forecasting method was used to capture differences between the data sets of historical data and current data spanning an observation period of 6 years (2012-2018) and one hedonic specification linear regression were used to study the impact of a number of factors that affect housing prices in the three locations. Using descriptive statistics and time series plots it was discovered that majority of the houses were purchased in 2013 and this was because of the drop in purchases prices. From the linear regression model we found that purchase prices are mostly affected by the area and for the ARIMA model we found that the forecast predicted that purchase prices will decrease in the next two years. Results showed that the Namibian government has managed to cater houses for the low and middle income individuals. However, even though the results showed that majority of the houses were purchased in Khomasdal and Okuryangava from the low to middle earners, the analysis still shows that despite the purchase prices decreasing people still can't afford houses due to other factors such as interest rates, income taxation, availability of serviced land and education levels.

Analysis of the effect of interest rates on inflation rates in Namibia:20082018).

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Abstract

The stability of economies all over the world over is largely a function of inflation and interest rates. Over the past two decades, Namibia's economy experienced increasing inflation and interest rates, inflation is the persistent increase in the level of consumer prices or persistent decline in the purchasing power of money. An interest rate is the rate at which interest is paid by a borrower for the use of money that they borrow from a lender. This study determines the effect of interest rate on inflation rate in Namibia. A multiple linear regression model was used to determine the effect of interest rate on inflation rate, using annual secondary data obtained from Namibia Statistics Agency and Bank of Namibia for the period of 2008 to 20018. The model estimated with interest rate as the dependent variable and inflation rate as the independent variable. The results showed that interest rate did not have a significant effect on inflation rate at 5% significance level between 2008 to 2018. The results further reveal that the there is a 0.283 negative correlation between inflation rate and interest rate; this concludes that if interest rate are lowered, inflation rate will increase. Recommendations were that, government of Namibia should set up a policy toward increasing short term interest rates to reduce inflation rate.

An analysis of the quality/condition of housing in Windhoek, Namibia

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Abstract

This study examined the housing characteristics that characterize the housing quality in Windhoek Namibia. The study used the United Nations definition of housing quality. A constructed housing quality index which employ the United States Department of Housing and Urban Development's definition of housing quality, which classifies buildings as adequate, moderately inadequate, and severely inadequate was adopted. Multinomial logistic regression was employed to analyze the relationship between housing quality and housing characteristics in Windhoek. The constructed housing quality index identifies key factors related to housing quality in Namibia such as water source, sanitation, access to electricity, housing durability and security of tenure. The main findings of the analysis show that physical adequacy or structuretype indicators such as drinking water, highest grade completed, tenure status, lighting energy, type of employer, housing type, wall material and waste disposal significantly predict housing quality at 5% level of significance. The dependent variable, housing quality, had three categories '0'-adequate '1'-moderately inadequate and '2'- severely inadequate. The results show that 59.3 percent of Windhoek households are adequate and more than a third of Windhoek population are living in inadequate households of which 17% are severely inadequate households. A one sample test of proportion was performed on the results and the test showed that the results are significant at 5% level of significance. In order to design and implement appropriate policies and programs to respond to the housing challenges in Windhoek, it is important to identify and quantify the proportion of the population that lives in inadequate housing, those living in informal settlements or those who have severely inadequate housing. The Namibian government should come up with a standard definition of housing quality that researchers can use to measure and analyze housing quality.

Analysis of visible underemployment in Namibia

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Abstract

When we're talking about visible underemployment we refer to the condition in which people in a labor force they don't use their skills, education qualification and does not work full time or takes a job that does not reflect their actual training and financial needs. The main aim of this research is to study, is to analyze the socio-economic factors of employed individuals that lead to visible underemployment in Namibia and also to educate people on

the difference between unemployment and underemployment. The overall time-related underemployment rate is 7.8 percent. Compared to the 2014 LFS, the rate has increased by 2.9 percentage point from 4.9 percent reported in 2014 (NSA, 2016) In this research we used binary logistic regression to determine the underlying factors that influence visible underemployment in Namibia, the study will use models that understand the relationships of more than two variables and also some various statistical tests which understand the dispersion and graphs to do our descriptive statistics. This research will also use graph such as histogram to show the relationship between dependent variables and independent variables. According to LFS, 2016 it is indicated that 34% out of the underemployed persons have main job in private household and the least main job entry is in non-profit organization with about 1% of underemployed persons. We have a huge proportion of people being employed in private household due to the financial crisis that our country is experiencing lately these years. The study examines the people who are employed by others and the relationship between number of hours worked during the reference period and the economic activities that they engage in. It is understood that visible underemployed reveals that 74% of employees usually work less hours than the threshold.

Investigating the socio-demographic factors of Intimate Partner Violence against Women in Namibia.

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Abstract

Intimate Partner Violence (IPV) is a worldwide concern with adverse effects and is mostly borne by women. This study sought to examine the prevalence and the socio-demographic factors of IPV against women in Namibia. An understanding of the predictors of Intimate Partner Violence may help with finding possible solutions. The study was based on cross sectional study from the 2013 Namibia Demographic and Health Survey (NDHS) with a sample of Namibian women who were selected and interviewed. A chi-square test was performed to investigate the relationship between predictors and dependent variables being Intimate Partner Violence (IPV) and Physical Violence (PV). A binary logistic regression was also performed to assess the relationship of the predictors with IPV & PV. Findings showed that young adult women are more susceptible to IPV, but married couples were less likely to experience IPV & PV. It also showed that husbands or partners who had controlling behaviors (finances, limits contact with family and outings) was a very influential factor to IPV & PV. Predictors such as wealth index, religion, women's attitudes towards wife beating and husband/partner drinks alcohol showed a significant relationship to both IPV and PV. This showed the socio-economic disadvantages they face as well as the religious and cultural norms faced by women. Interventions on IPV against women should be set up especially on the grounds cultural norms that encourage male superiority, thus encouraging women's status.

The effect of households characteristics on educational attainment of household members in Namibia.

Ndapewa Mwenyo

Abstract

Namibia Statistics Agency, (2011) defined educational attainment as the highest standard, grade or years completed at the highest level of school, college or university attended. There are numerous important factors that affect the educational attainment of household's members. This research study head off to investigates the effect of household's characteristics on educational attainment of household's members in Namibia. The main objective of the study was to examine the effect of household characteristics on the educational attainment of household members in Namibia. The specific objectives comprised of determining the distribution of households in terms of educational attainment in Namibia and to explore the relationship between household characteristics and educational attainment of household members. The study variables used household's characteristic as its independent variable and educational attainment as its dependent variable. The study used data from the 2013Namibia Demographic Health Survey. The Statistical Package of Social Science (SPSS) version 25 was used to analyze the data. Descriptive statistics, cross tabulations, Pearson chi-square test and multinomial logistic regression were used to accomplished the objectives of the study. Based on the result, it was discovered that area of residence, sex of household's head, age-group of household's head, educational level of household's head and wealth index were found to be statistically significant in influencing education attainment of household's members. Furthermore, in terms of wealth index, educational attainment of household's members from high income head of households had a better educational level than from low income head of households. Moreover, household's members from houses that is headed by someone with a good educational background stand more chances of obtaining a better educational attainment. This study therefore recommends that the Namibian government and educational planner should try to build hostel accommodations at secondary schools specifically for schools that are based in the rural areas, to cut long distance that some leaners walk, thus will encourage them to no longer dropout of school. The government must provide grants (income) to the low income head of households, that will cater school expenses for the learners.

A retrospective study of cancer in Namibia: 2010-2017

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Abstract

The objectives of this study were to study if there is an association between cancer sites and the selected demographic factors as well as to establish the change in diagnostic rates over the years. Secondary data was available from the Namibia Cancer Association Registry for all cancers from 2010-2017. The cancers were

grouped into sites according International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10)-WHO Version for ;2016 and the groups were as follows : lip, oral cavity and pharynx, digestive organs, respiratory and intrathoracic organs, bone and skin, breast, female genital organs, male genital organs and others. A Chi-square test found an association between the different cancer sites and marital status, ethnicity, region, tobacco, sex, age groups, basis of diagnosis and alcohol consumption. Multinomial logistic regression was applied to further analyse the relationship between these independent variables and the group of cancer sites. For the regression analysis, others as the reference category. Results showed that for lip, oral cavity and pharynx, the San, Bushman, Damara, Herero, Coloured and Nama as well as males were more prone to this type of cancer. For the digestive organs males were more likely as well as those of White and Baster ethnicity. Bone and skin cancer site also had males at a higher risk as well as Whites, Basters and Coloureds. For respiratory organs males were at a higher risk as well as Basters. Breast cancer had those aged 20-59 at a higher risk of this diagnosis, as well as those of Damara, Herero, Kavango, Coloured and Nama ethnicity. Cancers of the female genital organs were more likely to be diagnosed among the White, Baster, Damara, Herero and Coloured ethnic groups. For male genital cancers, the Whites and Kavango ethnic groups were at the highest risk. The frequency of cancer diagnosis varies across each ethnic group, sex and region, depending on the associated social and life style factors like marital status, alcohol consumption and tobacco use.

Time Series Analysis of Gender Based Violence Cases Reported in Namibia (2009-2019)

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Abstract

Gender-based violence is a phenomenon deeply rooted in gender inequality, and continues to be one of the most notable human rights violations across the world and Namibia is not exempted. The aim of the study is to analyse cases of gender based violence using time series and to come up with the model as well as to forecast the number of gender based violence cases that will be reported in the future. Number of gender based violence cases reported in Namibia on a monthly basis was extracted for statistical analysis and modelling. The quantitative data of 123(10 years and 3 months) was analysed using R statistical software. The study follows the Box-Jenkins methodology and it adopted Autogressive Moving Average (ARIMA) Model. Time series plot and decomposition was done to extract the components. An auto-arima in the forecast package of R was used to come up with the best model that fits the dataset of GBV. The analysis results indicates that the minimum number of 1446 cases was reported between January 2009 and March 2019 in Namibia and the maximum of 2542 cases with a mean of 1970 cases. The ARIMA model (0,1,1)(0,1,1)[12] was selected as the best model that fits the dataset and it is given by: . From the predicted samples of GBV cases it was revealed that GBV cases will continue to be on increase in Namibia if the situation remains the same. Gender based violence remained a matter of concern in Namibia which

requires a serious intervention, it is therefore recommended that; more studies should be conducted in order to monitor the trends and patterns of GBV cases and implement necessary measures to decrease the trend. Due to an increase of gender based violence, the Namibia government should continue to strength, and develop certain institutions and service provider involved in gender based violence matters, through government police and financial support.

An analysis of the mismatch between education and employment (job)

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Abstract

Education-Job mismatch among the graduates is a major problem, caused by the lack communication between the stakeholders involved in education to employment transition. A mismatch between training systems and labour market is the most challenging cause of graduate's employment crisis in Namibia. The Namibia Statistical Agency reported that only 14.6 % of the whole labour force participants are university graduates. The study used the data from the Labour force survey done in 2018 by the Namibia Statistics Agency. The total population used in the study was 40993 people, 19377 male, 21616 females and 33611 were reported that they attend school, 29546 have completed highest grade and only about half the number of highest grade completed were in some sort of occupation amounting to 11490. The study ran a logistic regression with employment as the dependent variable and Attend School, Highest Grade Completed (Major), Duration of Employment as the independent variables. The model picked up that the highest completed grade (major) is the most significant variable of the 3 independent variables. A chi-square was carried out, to check for relationship between employed and highest grade complete. The Pearson chi-square states that there is no association between the two variables at a significant level of 0.000 at a 6 degrees of freedom. This clearly points out that the highest grade completed in Namibia has no effect or relationship with someone getting employed. The findings of the study have led to a few recommendations, especially in two main areas namely human resource and educational institutes. Stakeholders have to come together and agree on a certain standard of education required in the labour force and the institutions would have to align their curriculum in a way that would yield the most high employability graduates. Secondly is very pivotal for the government to invest in ALL promising students as from the secondary level of education up until they reach and complete tertiary education. Finally there is a need to improve the LFS questionnaire for skill assessment, labour market opportunities and job mismatches.

The association of factors which influence infant mortality rate in Namibia: analysis of Namibian Demographic and Health Survey of 2013

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Abstract

Infant mortality rate (IMR) is defined as the number of deaths of infants under age 1 per 1,000 live births in a given year. Globally, approximately 10 million infants die each year, and more than 90% of these infant deaths occur in the developing countries (WHO, 2017). In Namibia, infant mortality rate has declined by 19 percent over the past 20 years (UNDP, 2013). Infant mortality rate is considered a sensitive indicator of the living standard and socio-economic conditions of a country. It remains a huge challenge for the Namibian Government due to the high infant mortality rate to achieve the Sustainable Development Goals (SDGs). This paper examined and identified the important determinants of infant mortality in Namibia. This study used Logistic regression analysis in order to evaluate the independent effect of each variable on infant mortality. The results from the logistic regression model indicated that maternal age, number of household members and birth order number were significantly associated with infant mortality in Namibia. Infant in the 5+/24 months birth order/preceding birth interval were found to be 0.53 times more likely to die than those in 2-4/24 months birth order/preceding birth interval category. Households with more than 7 members have a 0.54 higher chance of reporting infant deaths when comparing to those with fewer household members. Appropriate policies and measures that aim at educating and empowering women are recommended in order to reduce the overall infant mortality rate. Given changes in facilities and awareness levels daily, there is need to carry out a similar study using current data set so as to identify population segments that require strengthened programs. In addition, current data set is needed to evaluate the government intervention.

Anemia and associated factors among infants of 0-6 months old in Namibia

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Abstract

This research aimed to determine the prevalence of anemia and associated factors among infants of 0-6 months old in Namibia and the level of hemoglobin that define anemia in infants of 0-6 months old in Namibia. This is important to a lot of parents who already have infants diagnosed with anemia. This research will provide the information on how to prevent anemia to infants of 0-6 months old, the effects that anemia can have to the child's growing problem, how much iron do children need, the importance of iron in children, signs and symptoms of iron

deficiency anemia, risk factors for iron deficiency in children and how it increase susceptibility to infections. The study used multinomial logistic regression to determine the effects of independent variables on dependent variable and chi-square test to determine the relationship between categorical data of risk factors of anemia with the sample size of 4747 from the population of the whole Namibian country. To gather the needed data, the researcher collected data from the Ministry of Health and social services (DHS, 2013). All information gathered shows that anemia poses more health risks on the part of the diagnosed because of its effects on infants' body. Infants diagnosed with anemia are more prone to growing process problem. It is concluded that being diagnosed with anemia can never have good effects on the human body, specifically to infants of 0-6 months old. Thus, it is recommended that parents should initiate at six months with continuous breastfeeding up to two years or more.

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