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BOOK OF ABSTRACTS

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Theme: Translational research as a catalyst for the acceleration of innovation and sustainable development in Namibia amid COVID-19 uncertainties"

17 - 18 November 2021

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PLENARY SPEAKERS

Electrospray Deposition and its Applications for Liquid Crystal Devices

Electrospray deposition (ESD) is a method of forming thin films using nano-sized fine sprays by means of a high electric field. In this presentation, we introduce the basic principle of the ESD method and its application to the fabrication process of liquid crystal devices, based on our previous studies. We have been proposing a method to control the properties of alignment films, which are important components of liquid crystal devices, by using this method. An alignment film is an organic film used to align the liquid crystal molecules in a specific direction, and polyimide is commonly used. The film is usually formed by applying a precursor solution by flexographic printing or spin coating. It has been known to control parameters such as the pretilt angle by mixing several different materials, but it is difficult to mix several materials due to the difference in specific gravity, and it has been difficult to produce stable films using mixed solutions. Using the ESD method, we have been studying a method to control the properties of alignment films by spraying the solution on a substrate in a nearly dry state and controlling the surface area ratio of multiple materials. Furthermore, liquid crystal devices have recently been attracting attention not only as monitors for TVs and PCs, but also as optical elements. In addition to the ESD method, we would like to introduce visible light communication technology using high-speed light scattering liquid crystal devices with fine fibers spun by electrospinning method, which can be realised by using the same equipment.

Prof. Yukihiro Kudoh holds a Doctor of Philosophy in Electrical Engineering and Electronics, Associate Professors: Department of Information and communications Engineering, Faculty of Informatics, Kogakuin University of Technology & Engineering, Tokyo, Japan

Harmonic Distortion Effects on Power Transformers: Losses, Mitigation Solutions, and Failure Assessment Method

Today's power systems are facing many power quality challenges. Harmonic distortion is one of the power quality challenges that is caused by introducing non-linear loads such as Variable Speed Drives (VSDs), renewable energy (solar and wind), and other electronic devices into the power network. Harmonic distortion has negative effects on the power system equipment such as power transformers. Power transformers are the main assets of the power network; thus, they need to be protected from harsh environments and operating conditions. Most of the power transformers are aging and were not designed to operate in harsh environments with higher harmonic distortion. Power transformers experience an increase in power losses, insulation (core and windings) degradation, and shorten life expectancy. This study aims to determine the effects of harmonic distortion on power losses of the transformers, provide the harmonic mitigation and propose a transformer's (compliance testing procedures, as per ESI code of conduct or practice) failure assessment for the utilities that include the harmonic distortion. DIgSILENT software package was used to model the 220/66kV network with two mining industries (open pit and underground) and the 5MW solar PV farms. Comprehensive modelling of the mining industries loads was done. The transformer's current total harmonic distortion and the voltage total harmonic distortion at the Point of the Common Coupling (PCC) were obtained and compared to the harmonic limits prescribed by the international standards. The harmonic distortion has a negative effect on these power transformers and higher power losses were identified. Harmonic mitigation filters were designed and reduction in individual and total harmonic distortion was noticed. The Power losses were compared after mitigation and it was reduced as well. The utilities need to invest in their harmonic mitigation measures especially when they identify the point in the network where the harmonic distortion is exceeding the harmonic limits. They (utilities) cannot depend on the customer harmonic mitigation as they have no control over them. This led to propose the failure assessment method for the power transformers that include harmonic distortion investigation as root cause analysis of transformer's failure as they are working in a harsh environment. Transformers that fail should not be replaced without identifying the root cause of failure as the new transformers will be exposed to the same challenges and their life expectancy will be shortened. During the design phase, power utilities should inform the power transformers manufacturers of the expected operation condition of the transformers. This will enable manufacturers to optimise their design accordingly.

Dr. Rosalia Sinvula holds a Doctor of Engineering in Electrical Engineering, Engineer: Transmission Capital Projects, NamPower**,**

A Detour in Mathematical Sciences and Financial Modeling

Mathematical Sciences are a group of areas of study that includes Mathematics, Computer science, computational science, data science, quantitative finance, operations research, control theory, cryptology, econometrics, theoretical physics, continuum mechanics, mathematical chemistry, actuarial science, etc. This talk focuses on the presentation of the new, and the modernisations of the well-known methods, as well as their applications in the real economy, business processes and social sciences in their very broad meaning. We adapt stochastic processes to model exacerbated market risks as consequences of the global COVID-19 pandemic. To this end, we discuss what financial mathematics has to offer during global pandemic. Moreover, we will take examples from the world-best universities (e.g., University of Stellenbosch, University of Technology Sydney, Australia) to gain insights of how a programme in Mathematical Sciences should be taught to advance natural science.

Dr. Mesias Alfeus holds a Doctor of Philosophy in Quantitative Finance, University of Technology Sydney (UTS) in Australia, Lecturer: Financial Risk Management Lecturer, Stellenbosch University, South Africa

Rangeland encroacher bush as an innovative and sustainable feed resource for ruminant livestock production in Namibia

Approximately 30 million hectares in Namibia are affected by bush encroachment. Furthermore, a long dry season coupled with frequent drought aggravate the situation by reducing the rangeland carrying capacity. Despite the bush encroachment challenge, the encroacher woody browse plants still remain potential animals feed because they provide considerable amount of biomass from leaves and small twigs as well as pods and maintain their nutrients into the dry season when other feed resources are depleted. The aim of the paper is to present data on the nutritional value of four Namibian encroacher species and the effect of feeding value of bush-based diets on the intake, digestibility and growth performance of Damara weaner lambs. The CP contents of *S. mellifera*, *D. cinerea* and *R. trichotomum* were moderate (70 to 111 g/kg DM) except for *T. sericea* which were below 50 g/kg DM, while fibre contents were high (594 to 734 g/kg DM NDFom and 463 to 580g/kg DM ADFom). The concentration of acid detergent lignin of species ranged from138 to 223 g/kg DM. A moderate proportion (50.9-56.7g/100gCP) of protein in *R. trichotomum* and *S. mellifera* was soluble, while the other species had a high proportion (>70 g/100g CP) of their CP bound to ADF. However, the levels of condensed tannins (CT)) were relatively low (< 55 g CT/kg DM) in all species. Dry matter intakes of 1689.7 – 1796.7 g DM/day and digestibility coefficients of ≥0.70 for all nutrients except for NDFom and ADFom which ranged from 0.40 to 0.60, were obtained on the bush-based diets. Positive nitrogen retention of 45-58% of N intake was also achieved across diets. The bush-based diets could support average daily gains of up to 160 g/day, feed conversion ratio of 7.6 to 9.6 kg feed/kg weight gain, carcass weights of 11.4-12 kg and yielded carcasses with exceptional quality standards of A1 grade, which did not differ (P > 0.05) differ from those of lambs fed the control diet. In conclusion, milled bush from encroacher bush species could be considered of intermediate nutritional quality, because they contained 70 to 111 g/kg DM of CP, which meets the minimum daily requirement for maintenance of ruminants, except for *T. sericea* which had values of ≤50 g/kg DM of CP. Despite some nutritional shortcomings in milled bush from the studied species, such as high fibre fraction, high proportion of their CP bound to ADF and indigestible NDF, the species proved to have high potential to be used as roughage source. It is also concluded that milled bush can fully replace traditional roughage sources such as grass and Lucerne hay at 40% inclusion rate in properly formulated and balanced ruminant diets

Prof. John Mupangwa holds a Doctor of Philosophy in Animal Science, Lecturer at the Department of Animal Production, Agribusiness & Economics, School of Agriculture & Fisheries Sciences, University of Namibia.

GUEST SPEAKERS

Emerging Materials Toward Fabrication of Efficient Solid Oxide Fuel Cells (SOFCs)

Recently, the ever-increasing energy demand and the tightening regulations for emissions control of harmful gases such as carbon dioxide have caused a great interest in developing more efficient and environmentally friendly power generation systems. Fuel cells are candidates for producing clean electricity by utilising green hydrogen as a feedstock. Among various fuel cells, the solid oxide fuel cell (SOFC) is considered one of the most promising alternative techniques for developing prospective portable and stationary power systems. This is mainly because of the high energy conversion efficiency, excellent heat integration capability, acceptable power density, and environmentally friendly operability, to mention a few. Unlike other types of fuel cells, SOFCs do not require precious metals to operate. They can, instead, efficiently work with Ni, Cu, Co, and other cheap and widely available transition metals. Currently, yttria-stabilised zirconia (YSZ) is the state-of-the-art material used in the fabrication of SOFCs as an electrolyte component. It is well known that achieving stable cubic zirconia without any stabiliser such as yttria has been challenging. This study reveals a low-cost method for fabricating stable zirconia thin film without using a stabiliser such as yttria. The molecular precursor solution was electro-sprayed on the substrate, and the subsequent precursor film was annealed at 500°C in the air for one hour. The thin film adheres to the substrate, and surface morphology revealed a crack-free and flat surface. X-ray diffraction and Raman spectra confirmed that the addition of water in the precursor solution only produces a tetragonal phase of zirconia. In contrast, the use of hydrogen peroxide in the precursor solution aids the formation of the cubic phase of zirconia. Thus, the role of ligands to selectively form these stable zirconia crystals will be clarified.

Dr. Natangue Shafudah Holds a Doctor of Philosophy in Engineering: Applied Chemistry and Chemical Engineering, Lecturer at the Department of Physics, Chemistry and Materials Science, School of Science, University of Namibia, Project Lead, Development of Hydrogen Fuel Cells, Namibian Green Hydrogen Research Insititute

An Analytical Glance on Military Aviation Maintenance: A Case of Namibian Air Force

Aviation is a branch of science, business, or technology that deals with any part of the operation of machines that fly through the air. Aviation is further split into Civil Aviation and Military Aviation and the paper is inclined to the latter. The aviation profession requires a constant and continuous update, in order to maintain higher safety and security of a state! By so doing all aviation professionals are constantly being trained and all the flying machines are always being maintained as per the international aviation regulators. The purpose of this paper is therefore to showcase the experiences and the stance of our Air Force members as well as level of safety vis-a-vis maintenance perspective. The analytical study focused more on the maintenance aspects of flying machines in the Namibian Air Force. In order to demonstrate the maintenance experiences and scenarios by the maintenance crew in the Air Force, qualitative approach was adopted. Structured questionnaires to extract meaningful information from the maintenance department officers, were administered. Thirty-three (33) professionals were involved into the study, to express their experiences with the guide of the well formulated questions targeting the rationale of the study. The findings show that, the Namibian Air Force is on par with the level of safety and security within the aviation industry. However, in terms of human factors perspective, much need to be done to improve the status-quo. In terms of the maintenance of flying machines the force relies sometimes on foreign experts and the downtime is observed as worrisome, the study reveals. The paper recommends best practices on maintenance and a regular humans factor training, in order to be abreast the ever changing domain.

Mr. Peter Immanuel holds a Master of Science in Aeronautical Exploitation (USDB, Algeria), Lecturer, School of Military Science, Department of Aeronautics and Astronautics, University of Namibia

Integrating Entrepreneurial Skills into Science Studies; The EBL Model

Although there are no reliable statistics on the extent of science and entrepreneurship integration in Namibia, anecdotal evidence points to the fact that most high education science schools have not incorporated entrepreneurship aspects into their curriculum. Science is about exploration and discovery, and entrepreneurship is about building teams of explorers and discoverers. Science creates new products and ignites innovation and findings. Entrepreneurs make sure what scientists produce is commercialised to create new jobs and make significant contributions to the country's economy. The integration of these two skills is crucial in realising the Namibian dream and Africa we want. Why science schools are not producing entrepreneurial scientists but graduates roaming in the streets searching for opportunities is a question worth in-depth investigation. The first reason that comes to mind is that professors still advise their students to produce many individual articles and specific research projects with no commercial and market value. One wonders, what is a career with no 'commercial value'? Secondly, students are being developed into a culture of "I", i.e., I am the best, I did this…and not "We", yet claiming that is where students' careers are. Thirdly, science schools are ignoring the obvious and inevitable change in times. The difference between the olden day's scientific work and today's is that the problems to be solved are more complex, require collaborations and the 'commercial' value that one can create in those fields by combining science and entrepreneurship skills is high. Angelika Fretzen, a Havard Science PhD graduate, is quoted saying, "being a good scientist is by far not good enough. One has got to be a solid scientist with entrepreneurial etiquettes so that you can produce world-changing experiments, tell compelling stories and discoveries and most importantly establish your credibility with the people you are working with". In this study, we share a snapshot of a business model known as the EBL Model. The model is centred around discovery science, technology (value creation) and financing (value capturing). We will demonstrate how science activities can be turned into a money-generating enterprise or what they call a 'money-making machine' in a flowchart depiction and what levers to pull. The model is based on the timeless principles of "Cause and Effect". Additionally, we share how graduate scientists interested in starting their own companies and creating new industries go about getting those skills and building teams.

Mr Nerson Tjelos holds a Bachelor of Science (Hons) in Geology, Chief Executive Officer at Excel Dynamics Solutions PTY LTD.

SCHOOL OF AGRICULTURE AND FISHERIES SCIENCIES

Growth and yield evaluation of pearl millet varieties under irrigation in Northern Namibia

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Abstract

Pearl millet *(Pennisetum glaucum*) is ranked as sixth most important cereal crop in the World. It can be grown in the wide range of environmental conditions, even in drought-prone regions. Pearl millet provides food for human being, feeds for poultry and livestock. In Namibia pearl millet is grown in regions such as Zambezi, Kavango, Ohangwena, Omusati, Oshana, Oshikoto, and in parts of the Otjozondjupa region, in the Tsumkwe area.There is high food insecurity in Namibia, which is caused by low yield pearl millet in Namibia persistent drought, low yielding varieties, dry spells and infertile soil are one of the factors causing low pearl millet yield .In Namibia, pearl millet grain yield production is low compared to the consumption of pearl millet which is leading to high grain import. Pearl millet yield and adaptation can be maximized by appropriate fertilizer use, timely weeding, high yielding variety, disease and pest control and timely planting. A research was done at Ogongo campus of University of Namibia from January to June 2021 to evaluate the growth and yield of pearl millet varieties under irrigation in Northern Namibia. 25 pearl millet varieties including a local check were evaluated on 5 x5 lattice design with 2 replications. The significant difference of pearl millet was assessed based on the following parameters plant height, grain yield kg/ha, number of tillers, number of panicles, stem diameter and 1000 seeds.

Keywords: persistent drought, dry spells, infertile soil, disease control

Planting Density and Nitrogen Fertilizer Effect on Yield and Yield Components of Pearl Millet (*Pennisetum glaucum* [L.] R. Br.) In North-Central Namibia

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Abstract

Nitrogen fertilizer and planting density are two crucial factors that substantially affect the yield of Pearl millet (*Pennisetum glaucum*). Pearl millet is the most cultivated crop in low-input farming systems by resource-poor smallholder farmers under rainfed agriculture in the world, for human consumption and animal feed, especially in drought-prone agro-ecological areas. Therefore, density optimization and fertilizer application play a pivotal role in crop management practices that is imperative in increasing pearl millet yield. A field experiment was conducted at the University of Namibia Ogongo-Campus during cropping season 2020/2021, to evaluate the response of yield and yield components of pearl millet as influenced by planting densities and nitrogen fertilizer. The experiment was carried out in a factorial randomised complete block design (RCBD) with three replications, which consisted of two fertilizer levels (Nitrogen and Control) and nine planting densities (0.50m x 0.15m, 0.50m x 0.30m, 0.50m x 0.50m, 0.75m x 0.15m, 0.75m x 0.30, 0.75m x 0.50, 0.90m x 0.15m, 0.90m x 0.30m, 0.90m x 0.50m). Statistical analysis of data revealed that the effect of fertilizer was highly significant ($P < 0.001$) on panicle length, panicle weight, and grain yield. Planting densities had a significant ($P < .001$) effect on panicle weight, and grain yield. The interaction between fertilizer x planting density recorded highly significant ($P < 0.001$) on panicle weight. Furthermore, the results noted that planting density 0.50m x 0.15m produced the highest number of panicles/plant (4.40), panicle weight (285.80g), 1000-grain weight (25.10g), and grain yield (195.20g) all under nitrogen fertilizer, respectively. It was observed that an increase in planting densities leads to an increase in the number of panicles/plant, panicle weight, grain weight, and 1000-grain weight. On the other hand, a decrease in density 0.75m x 0.30m brought an increase in panicle length. Conclusively, the results, therefore, indicate that high planting densities (0.50m x 0.15m, 0.50m x 0.30m, 0.50m x 0.50m) with nitrogen fertilizer supplementation increased the yield of pearl millet production.

Keywords: Pearl millet, planting densities, nitrogen, grain yield

The potential invasive impacts of freshwater pet fish traded in Namibia

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Abstract

Alien invasive species are considered the second-largest driver for biodiversity loss in the world. In Namibia, the studies of invasive organisms have been relatively few and have been focused on the distribution of relatively few animal species. The pet trade is one of the recognized invasion pathways, as many exotic pets escape or are intentionally released. Nentwig et al. (2016) have developed a Generic Impact Scoring System (GISS) to identify the potential impacts of invasive species by broadly grouping these into socio-economic (e.g. agricultural, animal and forestry production, human infrastructure and health) and environmental impacts (e.g. competition, herbivory, predation, diseases transmission, hybridization and ecosystems) and ranking each on a scale of 0 – 5. Using the GISS, this study aimed to determine the potential invasive impacts of freshwater pet fish traded in Namibia by conducting pet shop and online surveys. Of the 48 species traded, 32 are recognized as invasive elsewhere in the world. Asia is home to most (n = 18) of the traded species identified, followed by the Americas, while Africa has the least number of traded species (n = 4). Traded species belonged to 20 different families with Cyrinidae and Cichlidae having the most (n = 9) traded species and 14 families only had one species each. As per the GISS protocol, extensive literature searches were conducted and no socio-economic impacts were found, but ecological impacts for 16 fish species were identified. There was a significant difference between the environmental impacts, with competition being significantly higher than all other impacts in this category. Non-native species can out-compete native species for habitat and resources, because they typically lack natural enemies in the novel habitat. This study provides a baseline of information for further studies (such as modelling of environmental suitability for potentially invasive species) and also fills the knowledge gap on the potential invasive impacts of freshwater fish traded in Namibia. Such studies can further play an important part in influencing future trade policies for potentially harmful species.

EVALUATION OF FRUIT, SEED AND SEED OIL YIELD OF KALAHARI MELON (*Citrullus lanatus*) ACCESSIONS IN NORTH-CENTRAL NAMIBIA

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Abstract

Kalahari melon (*Citrullus lanatus*), a creeping cucurbit endemic to Southern Africa's Kalahari Desert zones where it is widely farmed as an intercrop, provides many ecological and socio-economic benefits to Namibia's subsistence farming communities. In famine years, it offers human food, animal feed, cooking and cosmetic oils, as well as financial income to rural women growers. Although Kalahari melon is the only crop that can generate a substantial yield with less than 150 mm of rainfall, it has yet to attract research funding in Namibia. In the absence of a crop development program in the country, farmers continue to rely on their own preserved seeds of unknown genetic quality. A field experiment was conducted at the University of Namibia's Ogongo Campus During the 2020/2021 cropping season to investigate the fruit, seed, and seed oil yield potential of eight local Kalahari melon accessions. A randomized complete block design with four replications was used. Superior genotypes will be recommended for initiating a national crop improvement program and also for cultivation by farmers.

Keywords: Climate change, cucurbits, drought tolerance, Kalahari Desert zones, subsistence farming.

The residual effects of broadleaf herbicides on carrots (Daucus carota) Var. Chantenary karoo rotated with barley (Hordeum vulgare) Var. covered seed under a shade net conditions in North-Central Namibia

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Abstract

Herbicides are chemical substances that kill or inhibit the growth of unwanted crops. The herbicide residual may persist in the soil and affect susceptible crops for one or more years. The herbicide sensitivity depends on the specific herbicide that was used, the type of crops planted, and how often the type of crop is planted yearly. The residual effect of herbicides in the soil on sensitive succeeding crops is known as carryover. However, the carryover can cause injuries in crops; it can further reduce the growth and productivity of plants, compromise the quality of the product and even derail the area for cultivation for years. To examine the residual effects of herbicides on barley and carrot, a field trial was carried out at Ogongo Campus of the University of Namibia during the growing season under the shade net conditions. The pot experiment was laid out following the completely randomized design with eight replications, one treatment, and the control. The broadleaf selective 2-methyl-4-chlorophenoxyacetic acid (M.C.P.A.) herbicide was applied in a 5kg pot and non-treated pots of barley and carrot were used as a control, were by 1 ml of M.C.P.A was be diluted in 150 ml of water and applied over the soil surface 10cm diameter in each pot. The experiment comprises of 64 pots of which 32 were for the first season and 32 for the second season. The data were collected on weed density (30, 45, 60 DAS), chlorophyll content, plant height (30, 45, 60 DAS), and dry weight.
Keyword: carryover, residual, herbicides, injuries.

Feed intake, dry matter digestibility and nitrogen balance in female Boer goats fed with *Senegalia mellifera* (black thorn) bush-based feeds.

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Abstract

Bush thickening by *Acacia mellifera* (black thorn) subsp *detinens* has long been considered an environmental and economic problem in the rangelands of Namibia and in other southern African countries. Recently, value chain addition to harvesting (debushing) and utilising the bush biomass has recently gained popularity. Among different value chains, bush-based feed or bush feed production has gained special interest since it has a potential to enhance livestock feed and food security. The objective of this study was to determine the dry matter intake (DMI), apparent digestibility and nitrogen retention of eight female Boer goats fed with Senegalia mellifera bush based feeds treated with tannin deactivating methods.

Eight female Boer goats, with an average initial body mass of 31.5 ± 2.5 kg were randomly assigned to a total mixed meal ration made of: 40% of browse plant (*Senegalia mellifera*), 25% crushed yellow maize, 25% Marula cake press and 10% minerals. The four treatment ; Wood ash (WA), polyethylene glycol (PEG) biochar (BIO) were evaluated against the control (CNT) diet as tannin deactivation treatment methods The goats were penned individually in metabolic cages where total faecal output and urine output were determined and fed in a 4 x 4 cross over Latin Square Design. Each period lasted for 17 days (10 days of adaptation and 7 days of total collection). The level of dry matter (DM) of feed offered was 4% of body weight.

The study results showed that the apparent digestibility coefficient of DM, organic matter and neutral detergent fibre were not significantly different ($P > 0.05$) among treatments and the control diet. Goats fed BIO treated diet had the highest ($P < 0.05$) nitrogen intake of 13.7 g/d, faecal nitrogen of 8.43 g/d and nitrogen retention of 5.11 g/d, while goats fed the control diet, PEG and WA were similar ($P > 0.05$). All treatments resulted in positive nitrogen retention ($P > 0.05$) with mean values ranging from 3.79 to 5.11 g/d. There was a lower significant difference ($P < 0.05$) in the DMI, and nitrogen balance in Boer goats fed with *S. mellifera* feeds treated with Wood ash (WA), PEG and BIO compared with the control diet. The study concluded that the high protein content of the *S. mellifera* bush based feeds, if treated and mixed with various agricultural by-products can be considered as a suitable supplement for poor quality (low nitrogen content) natural pastures. The study, therefore, recommends that each detannification method should be tested at different rates of inclusion in *S. mellifera* bush based feed resources and more studies should be conducted to explore interventions to degrade the high fibre content of the browse plant.

EVALUATION OF GROWTH AND YIELD OF BAMBARA GROUNDNUT *(VIGNA SUBTERRANEA (L) VERDC*) ACCESSIONS IN NORTH-CENTRAL NAMIBIA

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Abstract

A field experiment to evaluate the growth and yield of Bambara groundnut accessions in North-Central Namibia was carried out in the Ogongo Campus research field University of Namibia. Bambara groundnuts *(Vigna subterranea (L) Verdc.)* is an underutilized African legume crop that belongs to the family *Fabaceae.* It is a drought-tolerant crop and primarily grown for its edible seeds and its high nutritious content. Bambara groundnuts are mainly grown by subsistence farmers. There are currently no improved varieties of Bambara groundnut cultivars in Namibia and the information on the local landraces is scarce in terms of growth habits of variety. Thirty-six (36) accessions of Bambara groundnut obtained locally and outsides were used in the study. The experiment was laid down in an Alpha Lattice Design replicated three times.

Keywords: Alpha Lattice Design, Fabaceae, Landraces, subsistence farmer.

Optimizing the Dosage of Gamma Irradiation (Gy) Mutagenesis of NkR1P3 and NamCp201 cowpea genotypes

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Abstract

Breeding cowpea for biotic and abiotic stress tolerance and improved yield are one of the priorities for arid and semi arid regions of the world including Namibia. However, cowpea has low genetic variability to breed for various characteristics. Mutation breeding is one of the speed breeding method to increase genetic variability in crops in a shorter period of time in comparison with conventional breeding methods. The first step in mutation breeding is to determine the optimum mutagenesis dose to sucessfully induce genetic variability in cowpea. Thus, the objective of this study was to determine the optimum dose of gamma radiation (GY) aiming at LD50 and GR50 in NkR1P3 and NamCp201 cowpea genotypes. Seeds of both cowpea genotypes were treated with 5 GY doses, 75, 150, 300, 450 and 600, and control was used for comparative purposes. Twenty (20) seeds of each genotype were used per Gy dose. The seeds were then planted in seedling trays conisting of Hygromix growing medium in three (3) replications. Data on emergency rate (%E), % seedling survival (%SS), shoot length (SL) and root length (RL) were plotted against Gy dose treatments and fitted in a straight line. The liner equation (Y= ax + b; where Y= Gy Dose, a = slope & b= y intercept) of the fitted line was used to determine optimum dose aiming at LD/GR 50. The effect of GY dose on all parameters was significant at $p \leq 0.001$, while the interaction (genotypex dose) was only significant ($p \leq 0.001$) for %E and %SS. The corelation coeficiency among all parameters were significant at $p \leq 0.01$. All genotypes were similary afected by increasing GY dose notably NamCp201 which had 0% survival rate at 450 and 600. The study used %SS and SL to determine optimum dosage for the two genotypes, while %E and RL was not consideres due to higher GY dose at LD/GR 50 (range 600 – 1600). The optimum dose for NkR1P3 was 400, while that of NamCp201 was 330. These GY doses can be used to sucessfully induce mutation in NkR1P3 and NamCp201, respectively to create genetic variability from the two genotypes. This study provided a potential opportunity for the evaluation for further genetic improvement programe and selection of mutant individuals for biotic and abiotic stress tolerance.

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Abstract

Bambara groundnut *(Vigna subterranea (L.) Verdc.)* is a drought tolerant legume, with a high protein content; which means it has great potential in contribution to food security. In Northern Namibia the legume is a rich source of protein for communal households. Despite its importance and adaptation to local conditions, there has been little research done to access or improve existing varieties. During an experiment carried out at Ogongo Campus University thirty 36 accessions obtained locally and outside of the county were studied to assess the relationship between yield and yield components of Bambara groundnut *(Vigna subterranea (L.) Verdc.)*. Rectangular Alpha Lattice design with 3 replications was used.

Polymorphism of Prolactin (PRL) Gene and its Association to Milk Yield in Holstein Friesian Cattle at Neudamm Farm

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Abstract

The Holstein Friesian breed originated in the province of Friesland in Holland and is one of the oldest dairy breeds. While Holsteins have the highest breed average for milk production, there is still a considerable variation in milk production traits among the cows. Therefore, there is a need to identify gene markers linked to milk production traits. Prolactin is one of the important candidate genes well known to be associated with milk production traits and somatic cell count (SCC) among dairy cattle breeds. Somatic cells are mastitis indicators that can be used for monitoring the level of subclinical mastitis. The main objective of the study was to identify the genetic variation in the Prolactin (PRL) gene and investigate the relationship of the polymorphism of PRL to milk yield and SCC of Holstein Friesian cattle of Neudamm farm. 50 cows were to be included in the study. However, data for Average Daily Milk yield consecutive for two months was only available for 18 cows. The total milk production per cow was estimated through a periodic sampling of two months. Blood samples were collected from the caudal vein of 18 cows using the EDTA vacutainer tubes. Genomic DNA was extracted using Zymo DNA extraction kit. PCR-RFLP method will be used to identify polymorphism in the PRL gene. Two alleles; A and B are expected and genotype frequencies will be calculated. The lactation milk production will be analyzed using the Chi-square test of association at 5% level of significance between the allele frequencies of PRL and milk yield, to verify if the population is in Hardy-Weinberg equilibrium. This study will bring useful information and understanding for improving milk production traits and mastitis resistance in dairy cattle by marker-assisted selection.

Key words: Holstein Friesian, Mastitis, Milk, PCR-RFLP, Polymorphism, Prolactin

COMPARISON OF WATER AND NUTRIENT USE EFFICIENCY FOR DIFFERENT VARIETIES OF MAIZE (*Zea mays*) AND PEARL MILLET (*Pennisetum glaucum*) ON YIELD AND DRY MATTER IN THE NORTHERN PART OF NAMIBIA.

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Abstract

Maize (*Zea may*) and Pearl millet (*Pennisetum glaucum*) are annual summer cereal crops that belongs to the grass family Graminae. These are major staple food crops grown in diverse agro-ecological zones and farming systems and they are ranked one and three respectively in Africa. For many years the crops offers food for people with varying food preferences and socio-economic background, animal feed as well as financial income for individual producers in Sub-Sahara Africa. Although these crops provide varying food preferences the yield is projected to decrease by 50% or more due to the widespread use of traditional varieties, infertile soils and erratic weather conditions. Therefore it is imperative to identify crop genotypes that have a better water and nutrient use efficiency and increased crop yield. A field experiment was carried out at Ogongo Campus of the University of Namibia during the 2020/2021 cropping season to assess and compare the efficiency of water and nutrient use for 60 varieties of maize and 25 pearl millet varieties on grain yield and biomass. A Randomized Complete Block Design with 3 replicates for maize and a 5 x 5 lattice replicated two times for pearl millet was used. Outperforming crop genotypes will be recommended for farming to the farmers.

Keywords: Traditional varieties, Infertile soil, Water use efficiency, Nutrient use efficiency, Agro ecological zones, Sub-Sahara Africa, Staple food.

The effect of Gamma Radiation on yield and yield components of NkR1P3 and NamCp201 cowpea genotypes

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Abstract

Mutation breeding is one of the approaches to increase genetic diversity in cowpea and to create new varieties with desired traits in a shorter time period compared with conventional breeding methods. Notable breeding goals in crop cultivar development include high yield, and tolerance to abiotic and biotic stresses. The objective of this study was to evaluate the effect of mutagenesis with different doses of gamma radiation (GY) on yield (seed setting) of the first mutated generation (M1) of NkR1P3 and NamCp201 genotypes. Seeds of cowpea were treated with GY doses after optimization aiming at LD/GR 40, 50 and 60. Gy doses for NkR1P3 were 340, 400 and 470, while those of NamCp201 were 280, 330 and 380 and were replicated 3 times. Gamma irradiation significantly reduced survival rate, seeding rate, number of pods/plant, number of seeds/pod and seed yield in both genotypes, but not 100 seed weight. Low yield and yield components could be due to the direct effect of GY, not necessarily due to the inherent yield potential of mutants. Individual seeded plants were harvested and designated as new lines. NkR1P3 had 300, 320 and 140 lines from GY doses respectively, while NamCp201 has 32, 27 and 12 lines. Yield potential and stress tolerance ability of new lines will be evaluated from the 2nd mutation generation (M2) and on subsequent generations. This study provided a potential genetic variation in cowpea and created an opportunity for the evaluation for genetic improvement and selection of mutant individuals for biotic and abiotic stress tolerance

Investigation of the Effects of Prebiotics on the Growth Performance And Gastro Intestinal Microflora Modulation in *Oreochromis mossambicus* in Hardap Region, Namibia.

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Abstract

The aim of this study was to investigate the prebiotic effect of dietary inulin and *Termitomyces shimperi* mushrooms incorporated in fish feed on the growth performance and modulation of gastrointestinal microflora in *O. mossambicus*. Three experimental diets; Inulin (I), Inulin+ Mushroom (IM) and Control (C) were made at 1% dry weight of feed, 270 Mozambique tilapia fingerlings were randomly assigned to each experimental diet and distributed into 9 tanks. Initial and final body weights and feed consumption records were used to calculate weight gain rate (WGR), specific growth rate (SGR), feed conversion ratio (FCR) and survival rate (SR). The following proximate composition were analyzed; fat, protein, moisture and ash content. From the intestinal samples an anaerobic plate count was conducted and DNA was extracted and sent for 16S metagenomics sequencing. Data was analyzed using IBM SPSS Statistics version 26 at 95% confidence interval, while sequence analysis was done in Quantitative Insights Into Microbial Ecology 2 (QIIME2) software. WGR and SGR of the C group was significantly higher than in the I group, however was not significantly different from the IM group, similarly the I group was not significantly different from IM group. Furthermore, there was no significant differences between the treatment groups in FCR, SR, Fat content, moisture content, ash content and protein content. The CFU in the I treatment was significantly lower than the C group however there was no significant difference between the I and IM group and the IM and C group. The I group showed higher alpha and beta diversity compared to the other treatments and the major phyla in the samples was *Firmicutes*, *Actinobacteria*, *Proteobacteria* and *Bacteroidetes*. We recommend that the prebiotics be incorporated into the fish feed before extrusion and that fish should be exposed to some stress challenges. As aquaculture develops in Namibia, studies focusing on improving the growth and overall health of farmed fish culminating in improved production are of outmost importance to ensure that aquaculture continues on its projected trajectory.

Polymorphism of Prolactin (PRL) Gene and its Association to Milk Yield in Holstein Friesian Cattle at Neudamm Farm

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Abstract

The Holstein Friesian breed originated in the province of Friesland in Holland and is one of the oldest dairy breeds. While Holsteins have the highest breed average for milk production, there is still a considerable variation in milk production traits among the cows. Therefore, there is a need to identify gene markers linked to milk production traits. Prolactin is one of the important candidate genes well known to be associated with milk production traits and somatic cell count (SCC) among dairy cattle breeds. Prolactin gene is a polypeptide hormone with multiple functions, secreted mainly by the anterior pituitary gland and plays an important role in mammogenesis as well as the activation of maintaining lactation and expression of milk protein genes. Somatic cells are mastitis indicators that can be used for monitoring the level of subclinical mastitis. Mastitis has been known to reduce the milk composition and yield in dairy cattle. The main objective of the study was to identify the genetic variation in the Prolactin (PRL) gene and investigate the relationship of the PRL gene polymorphism to milk yield and SCC in Holstein Friesian cattle at Neudamm farm. 50 cows were to be included in the study. However, data for Average Daily Milk yield consecutive for two months was only available for 18 cows. The total milk production per cow was estimated through a periodic sampling of two months. Blood samples were collected from the caudal vein of 18 cows using the EDTA vacutainer tubes. Genomic DNA was extracted using Zymo DNA extraction kit. PCR-RFLP method will be used to identify polymorphism in the PRL gene. Two alleles; A and B are expected and genotype frequencies will be calculated. The lactation milk production will be analyzed using the Chi-square test of association at 5% level of significance between the allele frequencies of PRL and milk yield, to verify if the population is in Hardy-Weinberg equilibrium. This study will bring useful information and understanding for improving milk production traits and mastitis resistance in dairy cattle by marker-assisted selection.

Key words: Holstein Friesian, Mastitis, Milk, PCR-RFLP, Polymorphism, Prolactin

Assessing farming systems, opportunities, constraints and challenges facing small scale farmers along the calueque-oshakati canal, northern Namibia

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Abstract

The Kunene River in Namibia, has been carrying water from the Calueque reservoir in Angola since 1973 conveying water into the Calueque Canal. The Canal runs over a distance of 160 km from Omusati region to Oshana region in Oshakati. Small scale irrigation farming in Namibia is considered as an adoption strategy for coping with unpredictable rainfall differences by practicing irrigation farming, people who traditionally depend on rain-fed production may become less vulnerable to drought. Agriculture crop production activities remain dormant along the canal despite presence of key factors of production namely water and land and labor. Given the significant role substance farmers play in the Namibian economy documented information regarding farming systems along the canal remain scarce however, there are notable shortages of fresh vegetable produce in most Northern parts of the country. The study seeks to establish possible hindrances to effective vegetable crop production. The main aim of this study was to assess farming systems, constraints and challenges facing small scale crop farmers on the the southern part of the canal from Etunda up to Oshakati stretch. Farmers along the canal in Omusati and Oshana regions were selected at random. A structured questionnaire was administered to the farmers face to face. Key informants will be interviewed informants such as the councilor and Agricultural development center representatives, using an interview guide. Descriptive variability measures and visualizations using appropriated graphical methods will be done as initial data exploration. Cross tabulations and tests of the association will be conducted. Key informant data will be analysed using thematic analysis using the procedure described by Braun &Clerk.

Keywords: Small scale farmer, Calueque, Canal.

The Socio-Economic Impact of Irrigation on the Communities with Irrigated Gardens along the Omusati- Oshakati Cuvelai Canal

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Abstract

Practices of Agriculture in the drylands are limited by environmental factors such as high temperatures, wind, and soil erosion, and the most significant impact that small farmers face is insufficient rainfall to grow crops; however, irrigated agriculture increases crop yields for food security and economic benefits to the community. For the past years, Omusati and Oshana region has been part of the regions that has been experiencing insufficient food production for the majority of its community, particularly in rural areas. This is attributed to climate change, which results in the country facing severe droughts and floods. Irrigation which is most termed as the application of controlled water to the land with the main purpose of supplying moisture which is essential for plant growth. The artificial canal is used as a source of water for irrigation by the majority of the communities surrounding and along the canal. The primary goal of this study was to look into the socioeconomic impacts of irrigation on the farmers who have irrigated gardens along the canal and how their livelihoods have changed. The study specifically seeks to answer the following questions: (i) what is the contribution of irrigated gardens on farmers and communities along them; (ii) the suitability of the various types of irrigation systems that they use; the challenges that the farmers face in the practicing of different irrigation systems, and (iii) to determine whether Covid'19 had an influence on the adoption of irrigated gardens in communities along the canal. A survey of 15 irrigated gardens in each region (Omusati and Oshana) along the canal was carried out. The gardens were chosen using both purposeful and random sampling techniques. Personal interviews were conducted with the help of structured and unstructured questionnaires. Descriptive statistics, frequencies and cross tabulations will be used to profile the respondents according to the socioeconomic impacts of irrigation on communities with irrigated gardens.

Keywords: Oshakati, Omusati, Canal, Communities, Livelihood, Socio-economics, impacts, irrigated gardens, Irrigation

Factor affecting the adoption of conservation agriculture by the smallholder farmers in Ogongo constituency of Namibia

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Abstract

The current research addressed the issue of conservation agriculture adoption in the Ogongo constituency, Omusati region. The objective of the study was to assess factors affecting the adoption of conservation agriculture by the smallholder's farmers in Ogongo constituency the survey research design was employed to collect data, where questionnaires were administered to 130 smallholder farmers in 6 villages of Ogongo constituency by using a random sampling technique. Results will be analysed using descriptive statistics in SPSS and will be presented in tables and charts.

Key words: conservation agriculture, adoption, smallholder farmers

Using beach cast (Kelp) fragments (*Laminaria spp. and Ecklonis spp.*) as fertilizer and soil conditioner to increase leaf yield of Swiss chard (*Beta vulgaris* L.)

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Namibia is one of the driest countries in the Sub-Saharan African region where only less than 1% of the total land is arable and poor soil fertility. Vegetable production in this country is limited to areas with fresh water using costly inorganic fertilizers. Swiss chard production especially in communal areas remains low due to the cost of fertilizer and irrigation water. Low cost organic vegetable production among local poor resource farmers in communal areas could easily be enhanced by introducing the water retaining, nutrient rich which could be collected as beach cast along the 1 500 km long cool coastline. However, information on the effect of using kelp fragments as a soil conditioner to improve soil fertility and increase leaf yield of Swiss chard in Namibia is very limited. The main aim of this study was to evaluate the effect of kelp fragment treatments on yield potential of Swiss chard in the net house in the field. This study used five (5) soil treatments (Control, Manure (20t/ha), NPK (125kgN/ha), Kelp Low dose (LD) (50t/ha) and, Kelp High Dose (HD) (100t/ha)) under well-watered (irrigation everyday) and limited (irrigation every 2nd day) water conditions. The experiment was arranged in a RCBD with three replications. Fresh Leaf yield and leaf number per plant was collected on same plants at three harvest intervals (40, 80 and 120 Days after transplanting) in all treatments. Leaf weight was significantly different among soil treatments under well-watered conditions at all harvest intervals, but not under limited water conditions, except for high dose treatment which was significantly high under both water conditions. On average (harvesting intervals), Kelp treatments had significantly higher fresh leaf yield plant/harvest (HD (220g), LD (182g) than NPK (152g), Manure (149g) and control (123g) under well-watered conditions. Under limited water conditions fresh leaf yield (plant/harvest) was HD (152g), LD (93g), NPK (94g), Manure (85g) and control (82g). Higher leaf yield in kelp-high dose treatment under limited water regime may indicate increased nutrient content in soil, rather than soil moisture retention. The result indicates that kelp treatment increased soil nutrition hence increased leaf yield under well-watered conditions, but higher dose is needed to increase yield under limited water conditions. Number of leaves, SPAD value and plant height were not significantly different among soil treatments at both harvest intervals. This study showed that kelp could be used as a sustainable soil amendment to increase leaf yield and hence enhancing productivity of Swiss chard.

Evaluationof maize (*Zea mays L*) varieties for yield and adaptability under irrigation in the northern Namibia

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Abstract

In Namibia the production of staple crops is low, mainly due to poor adabtabilityof maize varieties and drought phenomena associated with global climate change. A field trial was conducted at Ogongo Campus of University of Namibia during the period January–May 2021 to determine the high yielding varieties with good adaptability to the northern regions.Screening of different maize varieties is therefore required to determine the high yielding varieties with good adaptability to the northern regions.The experiment was led out according to Randomized Complete Block Design (RCBD) with three replications for both early and intermediate cultivars, (EHYB21 and IHYB21). All treatments received the same amount of fertilizer, pesticides, weeding and all the plots were irrigated daily with the same amount of water. Stem and roots lodging and maize pest and diseases were monitored weekly from heading to crop maturity. An LSD was performed to screen different maize varieties and determine the high yielding varieties with good adaptability to the northern regions. Intermediate varieties out yielded early maturing ones with high yield advantage and height. However, early varieties were early in growing and flowering comparing to intermediate.Conclusively, few pests and diseases decreased the production of grains and difference in soil types caused high grain production in both varieties.

Keywords: Maize, adaptability, varieties, yield, grains.

PERFORMANCE EVALUATION OF IRRIGATION METHODS ON THE PRODUCTION OF CABBAGE (*Brassica oleracea var. capitata)* UNDER NORTH-CENTRAL NAMIBIA CONDITIONS

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Abstract

The choice of irrigation method is influenced by factors such as the efficiency of irrigation technology, changes in temperature and precipitation. The proper irrigation system decision and hardware is significant for proficient water utilization. The main drawback to irrigation method selection and utilization in agriculture relates to drainage, waterlogging, mal-distribution, water wastage and poor system pressure. A study was conducted at the University of Namibia (UNAM), Ogongo Campus to compare efficiencies of furrow, drip and sprinkler irrigation methods, normally used by small-scale farmers in the Omusati Region of Namibia, by comparing and assessing yield and growth based on a set of selected performance indicators under the three irrigation systems using cabbage as the crop. A Split Plot arranged in a Randomized Complete Block Design (RCBD) experiment was carried out on a 19.60m x 19.30 m plot. Preliminary results indicate that cabbage performed best under sprinkler irrigation method, followed by drip irrigation and least under furrow irrigation. All the growth-contributing characters in the sprinkler irrigation method were superior over drip and furrow irrigation. The maximum average growth height was obtained by the sprinkler method (26.6 cm) at eight (8) weeks old after transplanting, followed by drip (18.1 cm) and furrow (14.2 cm) method. Cabbage under sprinkler had the highest number of leaves per plant (36), drip (32) and furrow (20).

A comparison of white-browed sparrow-weaver *(Plocepasser mahali)* colonies in urban and natural habitats.

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Abstract

Urban and natural environments primarily differ in the alteration of natural vegetation, to that occupied by anthropogenic infrastructure. Such changes have been shown to benefit, negatively affect or have no effect on species which occupy urban habitats. White-browed sparrow-weavers, *Plocepasser mahali,* are gregarious birds, forming small flocks in both urban and natural environments. This study aimed to compare white-browed sparrow-weaver (*Plocepasser mahali*) colonies in urban and natural habitats. Both habitats were surveyed and colonies identified, of which the total number of nests in each colony was counted. Where colonies nested across neighbouring trees, the number of nests on the main nesting tree within the colony was recorded as well. For each tree sampled, the canopy diameter was measured. The results revealed that the number of nests found in urban (16.00±2.24, mean±SD) and natural habitats (11.600±2.01) differed significantly. The canopy diameter of nest trees between the urban and natural habitats was also significantly different, with natural habitats having bigger trees as compared to urban habitats. There was also a positive relationship between the number of nests and canopy diameter of trees, however, the relationship was not statistically significant. In a previous study done on colonially nesting species, it was found that there were few numbers of colonies in urban as compared to natural habitat causing a lot of birds to share one colony when making their nests, thus it is speculated that this caused the greater colony sizes and high number of nests observed in urban habitats of this study. In addition to this, urban areas have more food sources, which is an advantage for this species because it is a generalist. Larger trees are more preferred by white-browed sparrow-weaver as they are a colonially nesting species. As a result, white-browed sparrow weaver nest site selection is mainly influenced by canopy diameter as they requires more nesting area in one tree.

KRTAP1.1 Polymorphism in Five Half-Sib Families of Swakara Sheep at Gellap-Ost Research Station

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Abstract

Derived from Karakul sheep, the Swakara sheep originates from Central Asia, and is mainly kept for pelt production in Namibia. The Swakara sheep is a fat-tailed sheep breed that was improved through generations of selective breeding from the Karakul breed. The keratin intermediate-filament proteins (KRTs) and keratin intermediate-filament associated proteins (KAPs) are the major proteins that make up the wool fibre. The KRTs form the skeletal structure of the wool fibre and are embedded in a matrix of KAPs. In sheep, KRTAP1.1 (previously B2A) is one of the four genes encoding proteins that make up the KAP1.n family. The main objective of the study was to investigate polymorphism in the KRTAP 1.1 gene of five Half-sib families of Swakara sheep at Gellap-Ost Research Station. The first half-sib consisted of 18 Swakara ewes from sire identified as PJJ5372. The second half-sib family consisted of 15 ewes from sire OM976. The third group consisted of 18 ewes from Sire PJJ5350. The fourth half-sib family consisted of 12 ewes from sire PJJ4786. The last half-sib consisted of 27 ewes from the sire Gellap-Ost 52945. Blood sample was collected in four mL K2E-EDTA anti-coagulant vacutainers tubes via the jugular vein puncture from five half-sib families and immediately placed in a cooler box with ice packs and refrigerated at 4ºC until DNA extraction was performed. Genomic deoxyribonucleic acid (gDNA) was extracted from blood using the Thermo scientific biology kit, as per kit protocol. Genomic DNA quality was assessed by using 1.0% w/v SeaKem® LE agarose gels prepared with 1× TAE buffer (89 mM Tris, 89 mM orthoboric acid, 2 mM Na_2EDTA; pH 8) containing 0.1 mg/L ethidium bromide. The gels were electrophoresed at 90 volts for 30 minutes and visualized by trans-illumination on the UV trans-illuminator (Syngene bio imaging, Cambridge, United Kingdom). The gDNA samples with good quality shown by intact bands were used for further analysis. PCR-Agarose gel electrophoresis was used to identify length polymorphism in the KRTAP1.1 gene. We report three alleles identified in the KRTAP1.1 gene; called A, B and C. The genotype of each of the five sires used in the study will be determined and associations of the KRTAP1.1 alleles to pelt traits will be performed. Although a narrow study, the study may give suggestions of the potential of KRAP1.1 to impact on pelt quality and that further investigation of this gene would be warranted

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Key words: Allele, KAP, Keratin, PCR, Pelt, Polymorphism Swakara

Evaluation and repackaging of climate smart technologies used by small-scale communities in North-Eastern Namibia

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Abstract

Climate change is posing threats to food production and food security in Namibia. For the past years the rise in temperature and variability in rainfall patterns has affected small scale farmers. A change in climate has showed severe risks on crop and livestock production in Namibia, leading to a decline in food production. Climate Smart technologies seemed to be the better way to turn around the situation to more resilience and higher agricultural productivity leading to improved food security status. The objective of this study was to identify and document climate smart technologies used by small scale farmers to mitigate climate change and constraints preventing farmers from using other available climate smart technologies. A survey research design was employed to collect data, where semi-structured questionnaires were administered to 227 selected small scale farmers in Kavango East, Kavango West and Zambezi regions using a two-stage probability sampling and simple random sampling techniques. Data were analyzed using descriptive statistics. The results revealed that farmers are using a variety of climate smart technologies to minimize the risks of climate change and to reduce vulnerabilities. Farmers are diversifying and integrating up to 5 climate smart technologies in one season. Some smart technologies such as drones, hydroponics and seeders were used by very few farmers 5% due to their high initial investment costs, lack of knowledge, lack of funds and unsuitability to the area. The study has a potential towards helping small scale farmers achieve an optimal solution to low food productivity.

Keywords: Climate change, climate smart technologies, mitigate, small-scale farmers, food security.

Effects of dietary inclusion of biochar on feed intake, growth performance and carcass evaluation of broilers

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Abstract

In recent years, there has been a surge of interest in the production and use of biochar as a soil additive and as a feed additive. Biochar is a charcoal like substance made from pyrolysis condition. Although there is lack of natural antibiotic growth promoters to increase the efficiency of feed utilization in poultry, biochar is one of it and farmers need to start using it in broiler diets. Therefore, this study was conducted to determine the feed intake, growth performance and carcass quality of broilers fed a commercial diet supplemented with biochar at different inclusion levels. Eighty unsexed chicks were randomly assigned to four treatments, with 20 chicks per treatment and 4 replicates and 5 birds per pen using a Completely Randomized Design (CRD). The four treatments were the control (T1), free choice (T2), 1% (T3) and 2% (T4) Biochar inclusion levels. Biochar, sourced from Namibia Charcoal Association was milled and incorporated in commercial broiler diets, except in a free choice where it was provided in a separate feeder. All birds were fed a commercial starter diet without biochar for the first 3 weeks prior to assigned treatments. The experiment was conducted for over a period of 7 weeks. Body weights, average daily gain and in slaughter weight were not significantly affected by treatment. However, there was a significant difference among feed intake and average daily intake of T1 was 28.71g followed by 24.54g of T2. The dressing percentage of birds fed T3 and T2 was higher (88.47% and 86.21% respectively) than T1 and T4. The thigh, wing, breast and drumstick weights showed no significant differences among the treatments. The overall conclusion is that birds fed biochar have a lower mortality rate and biochar does not compromise carcass yield and growth performance. However, farmers can use it in chicken diets.

SCHOOL OF ENGINEERING AND THE BUILT ENVIRONMENT

USE VENTILATION ECONOMICS TOOL (VET) TO EVALUATE OPTIONS UNDERTAKEN FOR ROSH-PINAH ZINC MINE, NAMIBIA.

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Abstract

The geological information at Rosh Pinah mine showed that the mine major reserve is hosted toward the Western Orefield. This has increased the demand for fresh air to be delivered to this area. A snapshot of the ventilation survey carried out within the period of three weeks which was done in such a way that each airway was measured on full day schedule revealed that the fresh air was well below the required standards. In order to improve the current challenge, six potential options were evaluated using Ventilation Economics Tool (VET). The best option found was to install booster fans sharing more duty, to increase fresh air in the production area. Simulation revealed that the combined saving in energy consumption would be in the range of 96kW/day to 270kW/day, which represents 22% to 31%. This concludes that at Rosh Pinah mine, the implementation of option 6 would be far more effective and beneficial to ensure a safe and healthy environmental for all employees.

Keywords: Model, Ventilation Economic Tool (VET), booster fan, airflow, option, cost.

PERFORMANCE OF A QUAD-BAND BANDPASS FILTER FOR WIDEBAND COGNITIVE SENSOR.

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Abstract

Modern communication systems are multifunctional and becoming complex to manage as the wireless communication become more popular. In the past, a filter bank technique was used to realize multi-bands. Filter banks refereed to combining several single band filter networks to form a new network that provides multiple states. This approach is undesirable as it increases the physical size of the structure. The number of filters in the traditional filter bank approach is significantly reduced by using a single physical filter to realize multiband, which can include tunability and/or reconfigurability features. Continuous tuning describe tunability which is related to shifting the filter's center frequencies and bandwidths. Discrete tuning describe reconfigurability, the selection between various states. Reconfigurable filters have the ability to change states while in operation. The study focuses on synthesis methods for microwave multi-band bandpass filter. The purpose is to develop a technique for designing a reconfigurable quad-band bandpass filters on lumped element topology based on reactance transformed method. The motivation to consider the proposed Reactance transform method is due to its ability to realize multiple pass bands with symmetrical or asymmetrical characteristics and it is completely analytical and require no optimization. The proposed filter is simulated using Applied Wave Research (AWR) software. Simulation results shows that frequency selectivity is not only influenced by the order of the basis filter but also depends on the spacing between bands as well as the relative bandwidths.

ASSESSMENT OF ATMOSPHERIC DISPERSION OF FLY ASH WITHIN THE ViCINITY OF VAN ECK COAL-FIRED POWER STATION, WINDHOEK, NAMIBIA.

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Abstract

Coal-fired power plants produce an abundant amount of electricity, addressing the ever-increasing electricity demand. Power plants produce fly ash as a result of coal combustion for electric power generation. The Van Eck Power Station is the oldest and only coal-fired plant in Namibia that is located at the outskirts of Windhoek. The power plant produces electricity from the combustion of coal. Van Eck's rehabilitation which began in 2013 included coal feeders which reduce emissions and new grates for boiler units which reduce ash emissions to ensure that the plant is a cleaner coal-fired power plant. Fly ash is produced when coal is pulverised and blown with air into the boiler's combustion chamber where it directly burns and generates heat. Trace elements in coal deposits may contaminate the air, soil and underground water and have an impact on human health. The thesis was aimed at assessing the possible pollutant elements found in fly ash and soil in areas surrounding the Van Eck Power Station. It was also aimed at modelling the distribution and dispersion of those elements at a particular distance in areas around the Van Eck power plant using the Gaussian Plume Model. Soil samples were obtained from sites within the vicinity of Van Eck Power Station, and XRF Analysis was used to determine the concentration of elements in the soil. To obtain samples of fly ash, fall out buckets filled with distilled water were used. The deionised water was analysed using the Inductively Coupled Plasma (ICP-OES) Analysis method for the detection of elements. Gravimetric analysis was also applied to measure the weight of dust or fly ash. The study revealed more concentration of sulphur oxides specifically sulphites and sulphates, as well as Zinc, while the rest of the elements were detected significantly in low amount while others were below the level of detection. Soil sampled near the power plant was detected with a high amount of SOx and Zinc. Fly ash collected showed that areas near the power plant contain more pollutants than areas further from the power plant. Ash captured through the dust-fallout bucket method within the vicinity of the power plant was above the South African dust monitoring criteria. The model illustrated that elements during the day were more absorbed than reflected during the night. Based on the research analysis, it was found that the power plant does not produce an abundant amount of pollution due to off-peak operations. The station may require control efficiency compliance measures for noxious gases and particulate matter (PM) concentrations. These results will be important in the formulation of emission limits, air quality guidelines and control of emission of pollutants. Air quality modelling is essential in baseline reports of projects.

THE IMPACT OF COVID-19 PANDEMIC ON THE TRAFFIC GENERATING CHARACTERISTICS OF SHOPPING CENTRES LAND USES IN NAMIBIA.

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Abstract

This study investigates the impact of COVID-19 pandemic on the traffic generating characteristics of shopping centres land uses in Namibia. During the COVID-19 pandemic, many countries issued various measures and stay-at-home instructions to combat the spread of COVID-19. These measures have had varying impacts on multitudes of land uses and the level of activities, with most people resorting to online consumerism. Traffic counts were conducted at three different shopping centres in the Northern part of Namibia – Oshana mall in Ongwediva, Game and Yetu complex in Oshakati. The study estimated the trip generation rates (trips generated by each shopping centre) of the study sites using the South African Trip Generation Rates and the South African Data manuals. The study found that the trips generated by Yetu complex were higher during the week and Saturday shopping peaks. The study also found that smaller shops and shopping centers generated more trips compared to larger shopping Centre's. The study noted that the smaller shopping centres were mostly closer to residential areas and thus attracted more daily trips compared to the larger centres. On the whole, the COVID-19 pandemic and the imposed movement restrictions have had an impact on the traffic patterns and the trip generation on Shopping centers compared to pre-pandemic times.

SELF-REPAIRING NANOMATERIALS

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Abstract

It has been over 13 years since the first book on the intense research in the development of materials that can spontaneously repair themselves without the assistance of external energy, healing agent, plasticizer or solvent after being mechanically deformed. These materials have shown improved durability and lifespan which are significant properties in the industry. Despite this, there is still a challenge in autonomous repairing of materials, as the need of external influence becomes tedious. Thus, provision of mathematical background, review of past research has been conducted with the consideration of innovative approaches to physical properties, analysis and design techniques and commercial applications.

THE STATE OF NON-MOTORIZED TRANSPORT INFRASTRUCTURE IN ONGWEDIVA, NAMIBIA.

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Abstract

Many people world-over undertake daily travel without using motorized transport. Many towns and cities in developed countries have made provision of safe and convenient transport infrastructures for Non-Motorised Transport. However, the same cannot be said for many developing countries, including Namibia. Non-motorized transport is an essential cornerstone for sustainable living. The characteristics of sustainable transport are safety, comfort, economic efficiency, a minimization of environmental pollution and energy consumption. This study is aimed at determining the current state of non-motorized transport in the town of Ongwediva, Namibia. It identifies the factors contributing towards the lack of provision for proper non-motorized transport and gives ways to quantify whether there is a demand for such infrastructure in the first place. This information was obtained through interviews with the local Town Council and questionnaires targeted at the people most likely to utilize the infrastructure, respectively. This study also provides strategies to improve pedestrian path and cycling lanes/zones to encourage the use of non-motorized travel and reduce motor vehicle travel. This is done not only to provide a safer alternative to the conventional mode of transport in Ongwediva, but a healthier one too by encouraging residents to be more physically active. Observations made during this study concluded that there currently is no existing infrastructure that caters for non-motorized travel in the town of Ongwediva. The results from this study indicated that despite being more environmentally conscious, working adults over the age of thirty expressed that they felt less inclined to make use of the infrastructure if it was to be provided, due to the low socio-economic status associated with riding bicycles for anything other than leisure activities. People between the ages of 13-30, however, presented an overwhelming enthusiasm towards the possible integration of non-motorized transport infrastructure. This study therefore concluded that if such infrastructure was to be implemented into the existing transport network system, it would be best to construct it linking schools to their nearby neighborhoods and other possible activity centers within the vicinity, to encourage more students to cycle, thereby getting the most use out of it.

DETECTION AND CLASSIFICATION USING DEEP NEURAL NETWORKS FOR COGNITIVE SENSOR.

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Abstract

The proliferation of wireless systems with the advent of internet of things (IOT) and fifth-Generation (5G) technologies, there is a higher demand for the Radio frequency (RF) spectrum, which is a limited natural resource and is controlled by regulatory authorities (such as the federal communication commission (FCC) and communications regulatory authority of Namibia (CRAN)). To accommodate a limited spectrum to the monotonically growing new users, next-generation (NEXTGEN) wireless systems should be equipped with a cognitive unit that can explore/characterize Spatio-temporal usage of communication bands. The crucial components to be determined during characterization process are detection and modulation classification of existing/incumbent user's signal. In the recent past, numerous detection algorithms (based on energy, eigenvalues, covariance, compressive sensing, etc.) and modulation classification algorithms (based on wavelet transformation, fractal theory) have been developed independently. However, developing blended algorithm that can detect and recognize simultaneously is crucial to allocate unutilized spectral bands by reconfiguring the impending wireless system's transmission signals according to the features of available spectral bands. Very few authors have investigated blended/joint characterization algorithms using classical methods. Hence, in this work, we have developed an algorithm based on artificial neural networks. The motivation to consider Convolutional neural networks is owing to its ability to detect/recognize with high ratio of successful recognition (RSR) of hidden patterns and correlations under high background noise. The data for this research work considers both simulated and captured data. We have implemented the algorithm using Python software. Simulation results reveal that the overall RSR is up to 96% with detection probability of above 0.99 when the signal to noise ratio (SNR) is less than -5dB. In conclusion, the proposed method outperforms the classical methods and a protype can be developed for NEXTGEN wireless communications.

SCHOOL OF MILITARY SCIENCE

AN EXPLORATORY STUDY OF THE IMPACT OF CORONA VIRUS ON THE CHARTER OPERATORS IN NAMIBIA.

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Abstract

The COVID-19 pandemic has led to a wave of global economic collapse owing to disruption of the travel sector supply and demand chain. The main objective of this research study was to explore the impact of COVID-19 pandemic on the charter operators in Namibia and examined potential recovery pathways for the global aviation industry following the pandemic. The method adopted in this research study is qualitative in nature. This included the use of rigorous procedures in collecting and analyzing data appropriate to qualitative research methods, such as ensuring the appropriate sample size. The use of journal publications, government official documents, health authorities' data and internet materials were part of secondary data collection. Primary data was collected through questionnaires and interviews. Ethical guidelines were strictly adhered to. The findings indicated various negative impacts which included: Significant reductions in passenger numbers resulting in flights being canceled or planes flying empty between airports, reduction in revenues for charter operators, staff layoffs, and bankruptcies among others. However, the positive impacts included: Establishment of remote office work and enhanced information and digital construction of charter operators. The study recommends that as the aviation sector opens up, it needs to do so in a responsible manner, which puts measures that protect travelers, reduce costs, increase efficiency, and ensure a quality customer experience anchored on employees' health and customer safety.

THE IMPACT OF IN-SERVICE TRAINING ON THE PERFORMANCE OF SOLDIERS IN THE ENGINEER REGIMENT: A CASE STUDY OF ASSAULT PIONEERS OTAVI, OTJOZONDJUPA REGION.

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Abstract

The purpose of study was to analyze the impacts of in-service training on the performance of soldiers in the Engineer Regiment: A case study of Assault Pioneers, Otavi, Otjzondjupa Region. The study adopted a descriptive research design whereby a qualitative approach method was employed, involving the collection of both primary and secondary data. Moreover, the total sampled population of 50 soldiers including both Senior and Junior officers were identified through convenience sampling technique. Primary data was collected using Focus Group Discussions and semi-structured open-ended interviews. Secondary data was collected from books and other publications relevant to the research study. Furthermore, a summary of each Focus Group Discussion and semi-structured open-ended interviews was developed, the information was analysed and systemically coded for emergent themes. The findings of the research revealed that assault pioneers receive insufficient in-service training per year, taking into consideration the nature of the assault pioneers' task, therefore diminishing the morale and confidence of assault pioneers. The study recommendend that Namibian Defence Force needs to invest more on in-service training of assault pioneers in order to improve their efficiency and update the techniques and equipment used to be in-line with modern technology and equipment. The research also recommended that in-service training be carried out at-least twice a year and for it to be given to everyone and not just to a certain group.

Keywords: in-service training, assault pioneers, performance.

ASSESSMENT OF THE EFFECTIVENESS OF NAMIBIAN BORDER SECURITY AGAINST ILLICIT CROSS BORDER ACTIVITY: A CASE STUDY OF NGOMA AND KASIKA VILLAGES.

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Abstract

The main objective of the study was to assess the effectiveness of the Namibian border security in Ngoma and Kasika villages following the recent deployment of the Namibian Defence Force (NDF). The study was conducted at Ngoma and Kasika villages, in the South-eastern part of the Zambezi Region, for which a qualitative approach was used. The study had a population consisting of community members from Ngoma and Kasika, members from the Namibian Police Force (NAMPOL) and members of the Namibian Defence Force (NDF) who were deployed in the study areas. The study had a sample size of 46 participants selected using cluster sampling method. Semi-structured interviews and field observation were used as research instruments for collecting data. The data was analysed qualitatively through themes and assigning codes to the various themes. The main results of the study were that the NDF members were not well trained, nor did they possess the necessary skills when it came to partaking in border management duties. It further showed that both the NDF and NAMPOL lacked the necessary resources to best execute their border security duties in the areas of study and that there was low knowledge on border management policies among the members. Furthermore, the study found that there was growing tension amongst Namibians living along the Chobe River due to the harassment of community members by the Botswana Defence Force (BDF). Moreover, smuggling of goods and illegal crossing of persons were reported as the highest occurrence of illicit activities. Following the findings, the study recommended that the Namibian Defence Force needed to train its members who were to be deployed to carry out border security duties in line with border management prior to their deployment and that both the NDF and NAMPOL should equip its members with the necessary resources that would aid them to effectively carry out their border security duties. Another recommendation was for the Namibian government to invest more on securing its borders to avoid tensions between itself and the Botswana government.

THE INFLUENCE OF INFORMATION AND COMMUNICATION TECHNOLOGY ON THE PERFORMANCE OF THE AVIATION INDUSTRY IN NAMIBIA; A CASE OF MINISTRY OF ENVIRONMENT, FORESTRY AND TOURISM.

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Abstract

The purpose of this research is to examine the influence of information and communication technology on the performance of the aviation industry in Namibia. The case study was carried out in the ministry of environment, forestry and tourism. The study investigated how the levels of ICT use, influence performance of the aviation industry in Namibia. The research furthermore identified challenges that hinders the positive influence of ICT on the performance of the aviation industry. Descriptive research deign was used to provide accurate and effective representation of variables under study. From the findings and discussions, it was established that lack of ICT infrastructure as well as leadership characteristics were among the main factors affecting the adoption of ICT in the aviation industry and hence resulting in poor organizational performance. From the study it is recommended for organizations to invest in ICT, to increase their competitive advantage. The study recommends the management of the aviation industry to always make provision of information communication technology applications and infrastructure to ensure customer satisfaction, efficiency in service delivery and to have more self-service enabled services. It is hoped that this study is significant in the generation of new knowledge, providing stake holders in the aviation industry and scholars with information concerning the influence of ICTs on organizational performance in the Namibian aviation sector.

EVALUATING THE QUALITY OF MARITIME EDUCATION AND TRAINING FROM THE PERSPECTIVES OF SAILORS ABOARD THE NAMIBIAN NAVY VESSELS.

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Abstract

The Namibian Navy needs highly qualified sailors to maintain and keep the vessels ready for any operations, hence sailors need to achieve this through maritime education and training (MET) institutions either in the country or abroad. The study purpose was to evaluate the quality of maritime education and training from the perspectives of sailors in the Namibian Navy. The qualitative research design was employed to obtain the objectives of the study. A mixed version of a questionnaire includes both closed-ended questions and open-ended items, was adopted for this study. The population comprised of all officers onboard the three (3) vessels in the Namibian Navy fleet. The sample of the study consisted of 15 officers, selected using a purposive non-probability sampling method. The data was analyzed using Microsoft Excel Data Analysis Tool-pack. The findings of the study have indicated that deficient maritime instruction methods are employed in the MET institutions, Responses from many of the sailors on the methods of instructions they have gone through includes theoretical knowledge, practical training, industrial visits, evaluation exercises, group tasks, and simulation exercises. However, whilst some of the sailors indicate that methods of instruction in their training helped them to develop their competencies, others expressed dissatisfaction on the manner in which they were imparted knowledge. On the issue of shipboard simulation method of instructions, sailors attended in Namibian MET institutions deny that they have undergone some form of shipboard simulation as part of their training. The findings of the study also revealed that sailors attended at South African MET institutions are unable to compete with some of their colleagues from other different MET institutions because of less practical exposure which attributed from numerous challenges such as lack of training vessel and lack of modernization of equipment. The above findings therefore have indicated the low quality in sailors' education and training. The key recommendations proposed from the study is to introduce more MET institutions in the country and to establish Collaborations among national and international institutions so that challenges such as resource constraints can be overcome in MET.

AN ANALYSIS ON THE PRODUCTION OUTPUT OF NDF AGRICULTURAL PROJECTS: A CASE STUDY OF OTAVI AGRICULTURAL PROJECT

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Abstract

The twenty-first century military is not limited to martial activities. It often takes on additional roles, including diplomatic and development functions, Stewart(2014). For a fully operational military, all aspects should be observed, and agriculture is no exemption. There is a need of food security to operate a cost effective professional and highly mobile national defense system that will safeguard Namibia's territory, inhabitants, national interests and contribute to national development and world peace, (Government of the Republic of Namibia, 2010). Therefore, it is required that for the defence to perform its function in an effective and efficiency manner, it should observe all the possibilities contributing to a self-sustainable force. The Namibian defence force like other militaries, established several projects to contribute towards soldier's welfare and self-sustainability. This study analysed the production output of Otavi agricultural project of the Namibian Defence Force. A total of twenty-five (25) questionnaires were administered to the soldiers from Nande Shafombambi barracks who worked directly at the Otavi project. To supplement the data collection process, observations were done to have a practical reality of how the project operates and functions. Moreover, qualitative data collected through questionnaires and observations were analysed by using narrative analysis through themes. The results were, lack of equipment, lack of skilled personnel and most importantly less effort is put in the project. presented in charts, tables and statements derived from narrative analysis. The study reveals that whilst the project is still operational, it is falling behind in its production output due to multiple challenges that it still facing. These challenges ranges from poor management, lack of modern agricultural equipment such as tractors, sowers, weeding tractors to irrigation plants. Other challenges include the limited qualified and experienced personnel with agricultural knowledge. This is deemed to largely contribute to the minimal production outputs that has been experienced in the project over the years. The study recommends for the project to be observed closely for it can yield good products once right management is employed. The study further recommends the deployment of soldiers or stakeholders with agricultural qualifications and experience to be the one to manage and work directly at the project. Further recommendations includes the need to procure the modern and specialised equipment to help the project increase its overall productivity.

Keywords: military, development, agriculture, projects, production, analysis, food security, defence.

ANALYSIS OF THE COMMUNITY OUTLOOK ON THE NAMIBIAN DEFENSE FORCE IN MAINTAINING PEACE AND STABILITY OF THE COUNTRY: CASE STUDY OF THE KHOMAS REGION

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Abstract

According to Moskos (2006), defense forces is defined as the structuring of the armed forces of a country that offer military capability required by the national defense policy. In the recent years the Namibian Defense Force (NDF) has been embarking upon deliberate programs of improving interaction with civil society (Shilumbu, 2019). In doing so, the NDF had participated in joint operations with NAMPOL to enforce law and orders among communities. These operations brought about incidents of assaults of civilians by the members of the defense force that seems to have influenced how the civilians view the NDF (Smit, 2019). The study analyses the nature of the community outlook towards NDF in maintaining peace and stability of the country. It also defines the appropriate measures needed to improve the community outlook of the NDF. Carried out in Khomas region, the qualitative study used a combination of questionnaire and interviews to collect data. A stratified random sampling technique was employed to sample 69 participants who took part in the study. These participants were a combination of community members, Namibian Police (NAMPOL) officers, community leaders and the Namibian Defense Force. The main finding of the study indicates that people still love and respect the defense force and view NDF as a symbol of peace and security in the country. This means that the public's trust in the NDF is still high. However, there are some members of the public who are beginning to see the NDF in a negative spectrum due to the conducts of few members of NDF who took part in the joint operations with NAMPOL. During these joint operations, some communities' members complained of harassments by NDF members. The results show that communities believe that some NDF members lack communication skills or emotional intelligence of dealing with the public because they do not give a chance of one to explain themselves before they arrest or start harassing them. These incidents may have greatly contributed to the negative community outlook of the NDF. The study recommends that the Namibian Defense Force needs to implement awareness programs that educate communities about its activities and thereby improving its perception by community members. Moreover, there is a need for NDF to improve public relations education among its soldiers. Improve soldier's welfare, to ensure that soldiers are psychologically prepared and fit for their duties in maintaining peace and stability of the country. Lastly, the study also recommends that there is a need to introduce soldier's basic training on how to enforce law and

orders in the communities using minimum force, before they are deployed in the joint operations with NAMPOL

CHALLENGES FACED BY THE AIRLINE INDUSTRY IN THE 21ST CENTURY: A CASE STUDY OF TWO SOUTHERN AFRICA AIRLINES (SOUTH AFRICAN AIRWAYS AND WESTAIR AVIATION.

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Abstract

The study focuses on the challenges faced by the airline industry in the 21st century negatively impacting on the performance of the two southern Africa airlines (WestAir Aviation Airline and South African Airways). The study investigated the challenges faced by the two southern Africa airlines (WestAir Aviation Airline and South African Airways) in the 21st century, factors which led to these challenges and the impacts the challenges brought to the airlines. Case study research design was used in order to acquire information and draw conclusions about the challenges faced by the airline industry in the 21st century especially in the Southern African Development Community. The study targeted reported challenges faced by two airlines (SAA and WestAir Aviation) from the year 2015 to the year 2020 and in addition two key informants from each airline complemented the population. The research instrument used for data collection was a laptop. A laptop was used during the data collection method to record the zoom interview meetings between the interviewer and the respondents and the data was analyzed using Statistical Package for Social Sciences (SPSS) software. From the findings and discussions, it was established that a small population, competition from the road transportation, political interference, lack of suitable domestic airports within the country, load factors, travelling demands, travel restrictions and lack of tourist traveling in the country are among the main factors leading to the challenges faced by the two southern Africa airlines. From the study it is recommended that the government (Transport community) needs to give approval as soon as possible when airlines are requesting for new routes. For instance; WestAir Aviation needs to introduce new frequencies and destinations, they need to have their aircraft in the air most of the times and last but no least suitable airports are needed all over the country (Namibia) in strategic locations. For South African Airways it is recommended that privatization is the way forward to have chances overcoming the identified challenges.

Key words: Airline challenges, Transport community, Political interference, Load factors, 21st Century, Domestic Airports.

ANALYSIS ON THE EFFECTS OF AIRCRAFT NOISE POLLUTION TO THE COMMUNITY AROUND EROS AIRPORT AND GROOTFONTEIN AIR BASE.

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Abstract

Aircraft noise pollution is one of the biggest challenges in aviation that can lead to health issues as well as to negative social and economic effects of the community residing in the vicinity of the airports. The study aims to analyze the effects of aircraft noise pollution on the health of the community around Eros airport and Grootfontein airbase. The study was conducted in residential areas within 5 km radius of Eros airport in Windhoek and Grootfontein airbase in Grootfontein. The study investigates the effect of aircraft noise pollution on the quality of life of human community around the two airports and determines how they cope with the effects of aircraft noise pollution. The study also analyzed the effectiveness of the existing noise abatement Acts and regulations. The study utilized a mixed method approach and used convergent parallel design as part of the research design. A sample of 30 respondents were selected, whereby 5 experts from each of the two airports were selected using purposive sampling technique and 10 respondents from the community of Eros airport and Grootfontein airbase were selected using stratified sampling technique. Primary data was collected using semi-structured interviews and questionnaires in order to meet the objectives of the study. Secondary sources such as literatures, internet resources, journals, books and Acts were reviewed to supplement the primary data. Thematic analysis was used to analyze qualitative data. Quantitative part of data was analyzed statistically using MS. Excel version 16 and the results were presented in tables and figures. The results revealed that residents residing in the vicinity of the two airports experience challenges such as sleeping disturbances, difficulties in interpersonal communication, and disturbed relaxation due to aircraft noise pollution. Out of 20 respondents, 45% indicated that they were very much annoyed or disturbed by aircraft noise pollution, and this affect their quality of life. It was discovered during the study that the future increment in air traffic capacity would potentially increase the number of people exposed to aircraft noise pollution. To facilitate the development of a safe and efficient airport system, Federal Aviation Agency in the United States of America developed solutions to reduce aircraft noise at its sources, abate noise through operations and mitigate the effects of noise on communities. Therefore, the study recommends the needs for a review and improved aircraft noise abatement measures in order to reduce the exposure to the high level of aircraft noise pollution at the two airports understudy.

Keywords: Aircraft noise pollution, effects, community, health issues, noise abatement Acts/regulations, Airports.

THE PERCEPTIONS ON THE CHALLENGES IN USING ICT TOOLS IN THE NAMIBIAN DEFENCE FORCE: A CASE STUDY OF DEFENCE HEADQUARTERS

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Abstract

At present, the application of science and technology has produced unprecedented means and methods of warfare, but it faces challenges. This study explored and described the views on the challenges faced by the Namibian Defence Force in using information and communication technology tools to support command, intelligence, control, and communications. The study specifically identified the ICT tools in the Namibian Defence Force, determined the challenges in using ICT tools, described the perceptions on the challenges in using ICT tools and finally determined the implications of ICT tools' absence in NDF activities. An exploratory research design using a qualitative approach was used for NDF members employed at the Directorate of Information and Communications Technology. Population of the study includes Commissioned officers, noncommissioned officers (NCO), and all other staffs employed at this division. Purpose sampling was used to select participants to participate in the study. The results show that the tools used in NDF are geospatial technology tools, such as global positioning systems, remote sensing and geographic information systems, battlefield management systems, and long-range radars. The challenges are in ICT tool's software upgrade and maintenance of systems, limited trained personnel to use the ICT tools, lack of sufficient funds and Systems Vulnerability. The results further show that, the aforementioned challenges have led to reduced improvements in NDF and thus reduced service delivery. The findings revealed that that absence of ICT tools in NDF activities makes NDF's work difficult and data processing take long time. The study concluded that there are challenges faced by the Namibian Defence Force in using information and communication technologies tools. The main recommendation is that security personnel in the areas of using ICT tools should be implemented, Another recommendation is that the government should avail enough budgets for NDF's ICT tool implementation, and the Ministry of Defence and Veteran Affairs must include ICT related course in all military institution curriculums.

EVALUATION OF CYBER SECURITY INFRASTRUCTURE OF THE NAMIBIA NDEFENCE FORCE.

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Abstract

The purpose of the study was to evaluate the cybersecurity infrastructure in the Namibian Defence Force. The study was conducted in Windhoek, Khomas Region and qualitative approach was used. The study had a sample of 38 participants selected through purposive sampling method consisting of members of Directorate of Information Communication and Technology (DICT), Directorate of Defence Intelligence (DDI) and Signal Regiment. Moreover, the study used structured interviews, a summary of each structured interview was developed, information was analyzed and systematically coded for emergent themes. The main findings of the study revealed that the NDF does not have appropriate equipment and infrastructure for cybersecurity. Other findings revealed that NDF does not have any officially recognized national regulation pertaining to cybersecurity, it also does not have any officially approved national (and sector specific) cybersecurity frameworks. Additionally, Namibia does not have an officially recognized agency responsible for implementing a national cybersecurity strategy, policy and roadmap. The study also revealed that the NDF does not have a physical department of cybersecurity and that cybersecurity related activities are operated under DICT. Moreover, the findings revealed that DICT does not have appropriate equipment and infrastructure to carry out cyber security activities due to a lack of funds. In the final analysis, the paper provides recommendations that in order to improve the capabilities necessary for combating cyber threats, the Namibian government should avail funds to the NDF with the purpose of developing cybersecurity. It is further recommended that the NDF needs to adjust the legal framework and develop a cybersecurity policy. Lastly, the NDF should consider promotion of international cooperation in the protection of the infrastructure of critical information.

AN ANALYTICAL GLANCE ON MILITARY AVIATION MAINTENANCE: A CASE OF NAMIBIAN AIR FORCE.

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Abstract

Aviation is a branch of science, business, or technology that deals with any part of the operation of machines that fly through the air. Aviation is further split into Civil Aviation and Military Aviation and the paper is inclined to the latter. The aviation profession requires a constant and continuous updates, in order to maintain higher safety and security of a state! By so doing all aviation professionals are constantly being trained and all the flying machines are always being maintained as per the International aviation regulators. The purpose of this paper is therefore to showcase the experiences and the stance of our Air Force members as well as level of safety vis-a-vis maintenance perspective. The analytical study focused more on the maintenance aspects of flying machines in the Namibian Air Force. In order to demonstrate the maintenance experiences and scenarios by the maintenance crew in the Air Force, qualitative approach was adopted. Structured questionnaires to extract meaningful information from the maintenance department officers, were administered. Thirty-three (33) professionals were involved in to the study, to express their experiences with the guide of the well formulated questions targeting the rationale of the study. The findings show that, the Namibian Air Force is on par with the level of safety and security within the aviation industry. However, in terms of human factors perspective, much need to be done to improve the status-quo. In terms of the maintenance of flying machines the force relies sometimes on foreign experts and the downtime is observed as worrisome, the study reveals. The paper recommends best practices on maintenance and a regular humans factor training, in order to be abreast the ever changing domain.

Keywords: Human factors, military aviation, civil aviation, Namibian Air Force, Flying machines, maintenance aspects, downtime, aviation safety.

ANALYSIS OF LIFE CYCLE COSTS OF A RECONDITIONED VESSEL: A CASE STUDY OF THE NAMIBIAN NAVY.

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Abstract

Maritime vessels have long service life and great costs of building, manning, operating, maintaining, and repairing during their life. The purpose of this research was to analyse the costs involved in the maintenance and repair of a reconditioned vessels in the Navy and hence propose an appropriate maintenance framework to save costs. This involved characterising the maintenance and repair philosophy of the Navy vessel fleet, estimating the life cycle costs of maintaining a reconditioned vessel in the fleet, comparing the life cycle costs of Vessel 1 (new upon acquisition) and Vessel 2 (reconditioned upon acquisition) from 1 year to 20 years, and developing a maintenance and repair life cycle cost framework of reconditioned vessels. Structured questionnaires, interviews and data sheet were used as the research instruments for this research. The data was presented in various formats including graphical presentations, tables, charts, and descriptive narrations. The results indicated that the Navy practices preventive/scheduled maintenance, corrective/breakdown maintenance and conditioned maintenance philosophy for different systems on-board the vessel. The engine, deck machinery and the hull being the most maintained as compared to piping and electricals. Further, the average annual maintenance and repair costs in the navy are estimated to be N$ 5,000,000.00 (for a new acquired vessel) and N$ 16,000,000.00 (for a reconditioned vessel) with N$ 242,221,902.80 and N$ 775,110,088.80 projected for the next 20 years respectively. Research finding indicate that budget limits affects maintenance and repair of the vessels in the Navy. Also, the result indicated that the Navy does not use the Life Cycle Cost Analysis (LCCA) for decision making before acquiring a maritime asset. From the results analysed, it is recommended that the Navy should practice LCCA before acquisition of maritime asset in most cases the reconditioned vessels, they should emphasise the importance of training the personnel in maintenance and repair surveys and costing appraisals. It is worth noting that most of the maintenance and repair works are subcontracted through third parties, thus increasing on the cost of maintenance and repair of reconditioned vessels within the fleet. Thus, this research recommended the construction of a maintenance and repair workshop with appropriate tools and equipment. Finally, sticking to maintenance and repair plan to reduce the costs involved in maintenance and repair of Navy fleet.

Keywords: Life Cycle Cost Analysis (LCCA), Maintenance Costs, Maritime Vessels, Maintenance Framework, Repair Costs.

AN ANALYSIS ON THE IMPORTANCE OF PROFESSIONAL MILITARY EDUCATION TO THE NON-COMISSIONED OFFICER'S CORPS IN THE NAMIBIAN DEFENCE FORCE.

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Abstract

The purpose of this study was to analyse the importance of professional military education to the Non-Commissioned Officers (NCO's) corps and how it affects the performance of NCOs in the Namibian Defence Force (NDF). The study adopted a qualitative research approach. The total sampled population of the study was 48 participants, the researcher arrived at 48 through Snowball and purposive sampling techniques. Data was collected using semi-structured interviews for General officers to Warrant officers and focus group discussion for senior NCOs to privates. Furthermore, a summary of each focus group discussion and semi-structured interviews was developed, the information was analysed and systematically coded for emergent themes. The study revealed that there is a need to develop professional military courses for NCOs and that there are no factors that limit the NDF from offering professional military education to the NCOs. Furthermore, the study discovered that the NCO course curriculums are not reviewed after a set period, furthermore there is no warrant officers or senior NCO's course that prepares them for command and staff duties. In the final analysis, this paper recommends that the NDF introduce courses that are detailed enough for the development of NCOs to ensure that small unit leaders are competent. It also recommends that NCOs be sent to sister countries and countries that have military relations with the NDF for training and expose them to the knowledge that NCOs in other militaries are exposed to.

Keywords: Military, Education, Non-Commissioned, Officers, Leadership.

SCHOOL OF SCIENCE

A study on medicinal plants used for traditional purposes in Namibia and Angola

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Abstract

Plants have been used for traditional medical purposes several thousands of years to date and are generally based on the uses of local and natural products which are related to the indigenous people's perspective and way of life. Rainfall across Namibia varies drastically, increasing from 0 mm in the southwest in the Namib desert to 600 mm to the north east in the Caprivi strip. Despite the abundance of medicinal plants, information about how to use them, are rarely shared among tribes and traditional healers tend to keep their knowledge as secrets. The data for medicinal plants used for medicinal purposes in Namibia and Angola was obtained by a means of a comprehensive review on medicinal plant species in Namibia and Angola and of published works and online databases. By typing in the scientific name of each plant into search engines, Pub Med Central, the United States of America National Library of Medicines digital archive of biomedical and life sciences journal literature Biomed central, Google scholar and Yahoo scholar, I obtained medicinal properties of the plants and the typical ailments related to it's use.

The diseases commonly treated with medicinal plants are Headaches, flu, stomach pains, malaria, epilepsy, wounds/burns. The common parts of the plants used are the roots, bark leaves, fruits and pods. In addition, the common ways of application are steaming, topical application, ingestion. The rich flora found in Namibia and Angola shows the potential for the discovery of new drug lead compound therefore the documentation of these medicinal plants is of utmost importance for the development of healthy and educated communities. The medicinal plant species documented are used to treat a variety of ailments, and some plant species have shown their versatility to treat a number of diseases.

Core-design of mobile agro meteorology application for farmers

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Abstract

Climate services involve the timely production, translation, and delivery of useful climate data, information and knowledge for societal decision making. The study has completed important critical step in developing climate services for farmers that are truly integrated with user-centric design into the development process in an African context. This study aimed to come up with a climate services for farmers that are truly integrated with user-centric design into the development process in an African context. This led to the co-design an IoT based mobile application that provide climate and weather information as well as agricultural information for the main crops such millet, maize and sorghum. The research applied using qualitative research using interview with 3 farmers in the field using random sampling with the approach to inform the study. A survey has been administered to find out how people understand climate services, agro meteorology and help enhance the mobile application's user experience. A Results shows that farmer are determined and ready to use and excited with the application. These innovation helped farmers to reduce the cost, increase crop capacity and profit. A hypothesis was set that there is a need for integrating IOT into a farmer's application for making farming process more progressive and efficient farming. The research proved it to be right based on the information collected and the survey executed. The study aims for the application to become scalable, durable and fault tolerance in the future and make sure farmers can use the application throughout their lifetime.

Keywords: Climate services for farmers, Co design, Mobile application, Africa

Information System Architecture Model for decision-making in Surveillance and Control of Infectious Diseases

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Abstract

Information systems (IS) have drastically increased their importance as decision-making tools in the surveillance and modeling of infectious disease behavior. They are commonly used to represent under which conditions infectious disease cases occur most frequently, to track spread, and also to generate predictions about the causes, patterns, and behavior of the distribution of disease cases. For these purposes, technologies such as Geographic Information Systems (GIS) and Machine Learning (ML) have been used, greatly increasing the speed and precision with which spatial information about cases of these diseases can be collected and integrated with other types of IS to track the spread of cases and clarify the dynamics of transmission. In this work, we propose a general hybrid model of how to use GIS and ML integrated with Mobile Technology that provides relevant elements in infectious disease surveillance. Determine the spread patterns in geographic areas and specific population groups, causal agents, risk levels in space and time and help in prevention and control as a way to increase efficiency in the use of critical resources in the fight against infectious diseases.

Characterization of the gold occurrence in the B2 gold mine, Damara belt, Namibia.

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Abstract

The B2 Gold Namibia is currently exploiting two gold deposits, namely Otjikoto and Wolfshag are hosted within the Damara Orogenic Belt which is part of the system of Pan-African mobile belts. The Damara Belt is a northwest-trending orogenic belt that formed through sequences of spreading, rifting, subduction, and from the continental collision between the Congo, Kalahari, and Rio Delta Plata Cratons between 900 Ma and 45 Ma. Currently, B2 Gold mining operation's annual gold production is far greater than the renowned QKR Navachab Gold Mine. With plans at an advanced stage to start mining the Wolfshag deposit, this could increase gold production even further at the mine. However, little studies have been carried out on its gold mineralization.

Mapping, macroscopic, and petrography were employed in this study coupled mine essay data. These samples were taken from both the Otjikoto and Wolfshag deposits. Gold analyses have indicated gold mineralization ranging from 1.5 g/t to 8.0 g/t, with the Wolfshag showing higher gold mineralization as compared to the Otjikoto deposit.

The Otjikoto ore body is hosted in the Okonguarri Formation. The gold mineralization is associated with sheeted veins hosted in the metamorphosed turbidite units, namely the hornfels and albitite units. The ore body is hosted in bedding parallel sheeted veins which of albitites in the Okonguari Formation in the Otjikoto deposit. The gold at Otjikoto precipitated with pyrrhotite, pyrite, chalcopyrite, and magnetite. The sulfides veins should exhibit massive sulfides texture with pyrite and magnetite cross-cutting the foliation and Quartz penetrating the groundmass. The gold at the Wolfshang is associated with Pyrite – Calcite – Magnetite, with a high grade of gold associated with “Brittle” Vein. Gold is also associated with Pyrite, Calcite, and Magnetite in “Shear replacement” Veins.

THE SMART LEARNING ROBOT USING A NEURAL NETWORK TO TEACH PRE-SCHOOLERS

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Abstract

Communication is critical in today's society, especially in education, the ways of transferring information to the school learners. As the globe moves toward digitalization, so do educational methods. Phone conversations, emails, and text messages, among others, have all become critical modes of communication in today's digital world. The study aims to provide innovative learning services and to make pre-school children's learning more participatory. The proposed system combines object recognition based learning educational Robot system for preschool children thereby making objects in daily life more interesting with projected Text-to-Speech (TTS) to attract children's attention. In this work, we present pre-processing of images and classification algorithms which are pre-trained with a standard dataset intended for Letters and numbers. The Convolution Neural network (CNN) based model with the Tensor flow was used to train and test with the real-time objects and validate against the pre-train data. The recognized object is converted to text by the Optical Character Recognition (OCR) and fed to the Text-to-Speech algorithm that vocals out the object name.

The research methodology used in this study was Experimental Design Science Research (E-DSR), where it involved six steps which are Identifying the problem, Defining Objectives, Designing and developing the artifact, Demonstrating the developed artifact, Evaluating the artifact and Communicating the results achieved by the artifact. The prototype consists of a camera mounted on the Arduino microcontroller embedded with few sensors that act as an eye for the OCR system. The converted text is provided to the TTS system that converts text to voice. The results showed that a Robot that can track an object and an application that could classify an image based on a set of objects it was trained on and determine what the picture is. The proposed system contributes to exploring object recognition as a feasible and attractive method for preschool children. To evaluate the effectiveness of the proposed system, an experiment was conducted. The result showed that the system can improve the learning efficiency of preschoolers in an interactive way.

Termitomyces mushrooms are types of Basidiomycetes mushrooms that belong to the Genus of *Termitomyces*. They are unique mushrooms that are known to form mutualistic symbiotic relationships with termites and are only known to be cultivated by termites. These mushrooms are available during the rainy seasons when conditions are optimum for their fruiting bodies to be visible to the naked eye. *Termitomyces* are collected by people for consumption and sold to earn money by most people in Africa. *Termitomyces* mushrooms are one type of the tasty mushrooms found in Africa and certain parts of Asia. *Termitomyces* mushrooms are not only consumed, but they have been also used as traditional medicine by many people in certain parts of Africa and India to heal various types of diseases, such as cancer, diarrhea, obesity, rheumatism, kwashiorkor and to reduce blood pressure. The objectives of this study were to identify *Termitomyces* mushrooms species occurring in Zambezi, using molecular techniques in order to determine the genetic diversity among *Termitomyces* species occurring in Judea-Lyabboroma in woodlands and in Katima rural areas near the rivers; and to determine the indigenous uses for the *Termitomyces* mushrooms in Zambezi. Face-to-face interviews were conducted to collect data on the indigenous uses of *Termitomyces* mushrooms in form of questionnaires where about 43% of males and 57% of females were interviewed. Thereafter, the data was analysed using SPSS software (2020) and the questionnaires revealed that about 34% of the participants acknowledged the traditional medicinal uses of *Termitomyces* in the form of powder or paste. A total of 7 *Termitomyces* mushrooms were collected and dried, then fungal DNA was extracted and amplified by the process of PCR using ITS1 and ITS2 primers before sequencing. BLAST searches showed that the collected 7 strains were similar to the *Termitomyces* species at mean average of 94%. A phylogenetic tree was constructed using the Maximum Likelihood method in MEGA software version 7. Furthermore, the genetic diversity was calculated using MEGA 7 software. The study revealed that all the collected mushrooms belonged to the Genus *Termitomyces* and the collected *Termitomyces* species were distributed in two clades. The study further revealed that the people of Zambezi use these *Termitomyces* mushrooms traditionally as medicine to heal various diseases. Finally, the study revealed that all the *Termitomyces* mushrooms collected were genetically diverse within the two constituency and the mean genetic diversity between the *Termitomyces* mushrooms from Judea-lyabboroma and those from Katima rural was 0.0550. The pattern among the lineage of the collected *Termitomyces* species was homogeneous and these results are consistent with previous studies carried on genetically relations of *Termitomyces*.

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occurring in Judea-Lyabboroma in woodlands and in Katima rural areas near the rivers; and to determine the indigenous uses for the *Termitomyces* mushrooms in Zambezi. Face-to-face interviews were conducted to collect data on the indigenous uses of *Termitomyces* mushrooms in form of questionnaires where about 43% of males and 57% of females were interviewed. Thereafter, the data was analysed using SPSS software (2020) and the questionnaires revealed that about 34% of the participants acknowledged the traditional medicinal uses of *Termitomyces* in the form of powder or paste. A total of 7 *Termitomyces* mushrooms were collected and dried, then fungal DNA was extracted and amplified by the process of PCR using ITS1 and ITS2 primers before sequencing. BLAST searches showed that the collected 7 strains were similar to the *Termitomyces* species at mean average of 94%. A phylogenetic tree was constructed using the Maximum Likelihood method in MEGA software version 7. Furthermore, the genetic diversity was calculated using MEGA 7 software. The study revealed that all the collected mushrooms belonged to the Genus *Termitomyces* and the collected *Termitomyces* species were distributed in two clades. The study further revealed that the people of Zambezi use these *Termitomyces* mushrooms traditionally as medicine to heal various diseases. Finally, the study revealed that all the *Termitomyces* mushrooms collected were genetically diverse within the two constituency and the mean genetic diversity between the *Termitomyces* mushrooms from Judea-lyabboroma and those from Katima rural was 0.0550. The pattern among the lineage of the collected *Termitomyces* species was homogeneous and these results are consistent with previous studies carried on genetically relations of *Termitomyces*.

Two-dimensional thin layer chromatographic analysis of indigenous seed oils

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Abstract

Indigenous seed oils have been receiving increasing attention in recent times due to a wide range of health benefits, particularly their high fatty acid content, which make them attractive additives for food, cosmetic and medicinal applications. The demand for indigenous seed oils has been increasing both locally and internationally. For any product to be fit for local and export markets, the quality of the products needs to meet the international market standards. Local communities have always been faced with the challenge of developing their products to meet the demands of international export markets. This is mainly due to the high cost involved in setting up local production and analytical facilities. Therefore, there is a need for simple and cost-effective methods for the routine monitoring of the products to ensure that the products are safe and of acceptable and consistent quality. In this study, two-dimensional thin-layer chromatography (2-D TLC) was evaluated in the analysis of three indigenous seed oils, marula, !nara and kalahari melon seed oils, as a simple and cost-effective method that can be used in small scale laboratories in developing countries like Namibia for the routine analysis of seed oils. Initially, one-dimensional (1-D) TLC methods were developed by screening various polar and non-polar solvents on neat and silver nitrate-impregnated silica gel TLC plates to be able to select the best solvent systems providing good and complementary separations for combining in a two-dimensional separation. Four detection methods: UV (at 254 and 365 nm), iodine vapour, 60% aqueous sulphuric acid and 1% ferric chloride spray reagents, were evaluated in order to identify the method that allowed visualization of many compounds. Good 1-D separations were obtained with heptane-ethanol, hexane-diethyl ether-formic acid and petroleum ether-acetone solvent systems, therefore these were selected for use in 2-D TLC analysis. Compounds were more strongly retained on impregnated plates compared to the non-impregnated ones, which could be due to the complexation effect of the zinc metal. Relatively good 2-D separations were obtained with the hexane-diethyl ether-formic acid (1^{st} dimension) and heptane-ethanol (2^{nd} dimension) mobile phase combination, however the separations were highly correlated which resulted in poor usage of the 2-D separation space. It was also noted that all the samples showed a common large single band on the plates, which may possibly indicate unsuccessful separation of poorly-retained (non-polar) compounds. Overall, 2-D TLC provides an inexpensive and simple method for the analysis of seed oils compared to instrument-based analytical techniques such as high-performance liquid

chromatography. Future studies should consider evaluation of other stationary phases to determine whether they would provide better separations than what was obtained on the silica gel stationary phase. Preparative TLC would also be necessary to purify the individual compounds for identification purposes.

Chromatographic evaluation of the effect of cooking on the anthocyanin profiles of beetroot, red onion and red cabbage

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Abstract

Anthocyanins are the largest group of water-soluble pigments in the plant kingdom. Anthocyanins are responsible for most of the red, blue and purple colours of fruits, vegetables, flowers, and other plant tissues or products. These coloured pigments have been used traditionally as natural food colourants. The colour and stability of these pigments are influenced by pH, light, temperature, and structure. In acidic condition, anthocyanins appear as red but turn blue when the pH increases. The analysis of anthocyanins is complex due to their ability to undergo structural transformations and complexation reactions. This study aimed to evaluate the effect of cooking on the anthocyanin profiles of red onion, red cabbage and beetroot using thin-layer chromatography and reversed-phase liquid chromatography. Anthocyanins were extracted from the finely homogenised samples of raw and cooked vegetables using weakly acidified ethanol, followed by concentration under vacuum on a rotary evaporator at 40 °C. Anthocyanins were then separated on silica gel thin-layer chromatography (TLC) plates using solvents of different polarities. Reversed-phase liquid chromatography (RP-LC) method development entailed screening of different acidified mobile phases on a C18 stationary phase. In general, compounds were poorly separated in TLC compared to RP-LC. Best separations of pigments were obtained using solvent systems based on acetone, ethyl acetate, formic acid and water with the TLC method. In RP-LC, the best separations were obtained with a mobile phase consisting of 5% formic acid in water and 5% formic acid in acetonitrile. The colour spectra of the pigments were used to tentatively confirm the elution order as well as the types of compounds present in different vegetables in TLC. In RP-LC, tentative identification of the compounds was based on the UV-visible absorbance spectra and relative retention times of the compounds in comparison with literature reports. No significant differences were evident in the anthocyanin profiles and the elution order of the bands in the raw and cooked samples for all vegetables, both for the TLC and HPLC analyses. However, slight differences were noted in the colour (or peak) intensities of the bands. Cyanidin and peonidin were the main anthocyanins tentatively identified in the extracts of red onion. Cyanidin based anthocyanins were tentatively identified as the main anthocyanins of red cabbage and beetroot extracts. These observations were consistent with literature reports, although definite identities of compounds could not be established using UV data alone. It is therefore recommended that the method developed in this study to be combined with spectroscopic techniques such as mass spectrometry and/or nuclear

magnetic resonance spectroscopy to enable identification of the individual compounds detected in the vegetable extracts, as this could not be performed within the timeframe of this project.

The potential invasive impacts of freshwater pet fish traded in Namibia

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Abstract

Alien invasive species are considered the second-largest driver for biodiversity loss in the world. In Namibia, the studies of invasive organisms have been relatively few and have been focused on the distribution of relatively few animal species. The pet trade is one of the recognized invasion pathways, as many exotic pets escape or are intentionally released. Nentwig et al. (2016) have developed a Generic Impact Scoring System (GISS) to identify the potential impacts of invasive species by broadly grouping these into socio-economic (e.g. agricultural, animal and forestry production, human infrastructure and health) and environmental impacts (e.g. competition, herbivory, predation, diseases transmission, hybridization and ecosystems) and ranking each on a scale of 0 – 5. Using the GISS, this study aimed to determine the potential invasive impacts of freshwater pet fish traded in Namibia by conducting pet shop and online surveys. Of the 48 species traded, 32 are recognized as invasive elsewhere in the world. Asia is home to most (n = 18) of the traded species identified, followed by the Americas, while Africa has the least number of traded species (n = 4). Traded species belonged to 20 different families with Cyrinidae and Cichlidae having the most (n = 9) traded species and 14 families only had one species each. As per the GISS protocol, extensive literature searches were conducted and no socio-economic impacts were found, but ecological impacts for 16 fish species were identified. There was a significant difference between the environmental impacts, with competition being significantly higher than all other impacts in this category. Non-native species can out-compete native species for habitat and resources, because they typically lack natural enemies in the novel habitat. This study provides a baseline of information for further studies (such as modelling of environmental suitability for potentially invasive species) and also fills the knowledge gap on the potential invasive impacts of freshwater fish traded in Namibia. Such studies can further play an important part in influencing future trade policies for potentially harmful species.

Manganese dioxide (MnO_2) catalysed treatment of waste water for removal of contaminants

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Abstract:

Manganese dioxide (MnO_2) and its various allotropes have drawn a lot of interest in the field of wastewater treatment over the years due to their compelling physicochemical characteristics. Its catalytic and adsorbent behaviour accounts for its importance in waste water treatment. $MnFe_2O_4$ (2.5:1 sample B) and MnO (sample A) were prepared by co-precipitation method and characterised by XRD, IR, SEM and TEM. Phenol, sea water, pond water, and groundwater were used as waste water samples in this study. A specified amount of $MnFe_2O_4$ /MnO was placed in a conical flask, followed by a certain amount of waste water and stirring at a specific temperature for a specific duration. Thereafter, the reaction mixture was filtered and a UV spectrophotometer at 700nm was used to analyse it. Different concentrations of phenol water (1000 mg/l, 500 mg/l, 100 mg/l, and 32 mg/l) were tested, as well as two ratios (20 ml and 25 ml) of sea, pond, and groundwater, and amounts (0.05 g and 0.2 g) of $MnFe_2O_4$ and MnO. The effects of pH, conductivity, dissolved oxygen (DO), density, Nephelometric Turbidity Unit (NTU), temperature, and time on the adsorption properties of $MnFe_2O_4$ and MnO were also investigated. Filtration was used to lower the turbidity of water samples. UV spectrophotometry and conductivity data were used to assess the treatment efficiency. The absorbance values of $MnFe_2O_4$ and MnO showed that they performed better in acidic media. The conductivity of the treated water samples reduced as the temperature was increased, indicating that at higher temperatures, $MnFe_2O_4$ and MnO catalyzed and adsorbed contaminants best. An environmentally benevolent approach was developed with $MnFe_2O_4$ and MnO catalysts for waste water treatment.

Removal of pharmaceutical drugs from waste water using activated carbon prepared from banana peels

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Abstract: Contamination of water bodies due to wastewater discharged is becoming a serious problem nowadays. The wastewater from the pharmaceutical manufacturing facilities, and industry contains pollutants such as heavy metals, organic compounds such as phenols and physical compounds like pesticides and plastics to mention a few. These types of contaminants are highly toxic and very dangerous to the mankind and living organism if left untreated. Therefore, the wastewater need to be treated before discharging to the water bodies. This study focusses on a low cost treatment and very environmentally friendly by using activated carbon prepared from banana peels in removing pharmaceuticals drugs from wastewater. The peels of bananas were used as adsorbents by carbonization method at 800^{o}C and 900^{o}C for 1 hour in a muffle furnace. Fresh banana peels were dried, adequately prepared treated with 10% hydrochloric acid and washed with distilled water to have purified activated carbon and the percentage yield obtained after treating was 91.5%. Activated carbon were characterized by SEM and IR. The effect of contact time, pH, conductivity, total dissolved solids and dissolved oxygen in removal of pharmaceuticals drugs present in wastewater was evaluated on UV instrument. This activated carbon was used in filtering. The test is conducted before treated and after treated, to determine the contamination in the sample. Batch experiments were conducted by varying the sample concentration and contact time between 30 – 120 minutes to determine the optimum percentage removal of phenol (colorless) from the wastewater with adsorbent dose of 0.1g. Adsorption percentage was found to be proportional to contact time and concentration of the sample. The percentage removal is due to an adsorption process that occurs in the filter. From the analysis, the activated carbon from banana peels can remove organic compounds and the performance of water quality parameter increased with retention time increased. Therefore, this study has shown the effectiveness using a filter based on banana peels activated carbon for industrial wastewater treatment as ecofriendly approach

RELIABILITY ASSESSMENT OF SYSTEM COMPONENTS FOR PV SYSTEMS IN NAMIBIAN CONDITIONS

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Abstract

Photovoltaic (PV) systems have significantly shifted from stand-alone power generation systems in the past to a large-scale grid-connected generation nowadays. The main components of grid connected systems are the modules and inverter. The main components of a stand-alone system are the modules, batteries and inverter with the batteries being the most expensive component for the stand alone system. All solar modules slowly degrade over time and this results in generation losses. Examples for modules degradation are hot spot, corrosion, discoloration, etc. The reliability of a system is the probability that a system performs during a specific time duration. Reliability of PV systems depend mainly on the modules energy performance and on their different degradation modes. The Study focus on the degradation of different components for PV systems after 6 months or more of exposure in the Namibian climatic condition. Degradation modes that are observed through visual inspection of PV modules include encapsulant discoloration, glass breakage, delamination, burn marks. Degradation of solar modules appears to depend on the type of modules and on the climatic conditions in which they are. The actual current-voltage measurements was taken on the effects of certain type of degradation to attain the current-voltage (I-V) characteristics. Our observation show that encapsulant discoloration and glass breakage were the most common degradation mode, especially in older systems. Our observations also show that most of the PV system components failures happen after 6 months of installation. In grid connected PV systems more frequent than expected failure was observed among inverters. The results of the goodness-of-fit tests on the data we collected indicate that a particular mode of inverter malfunction is a systematic effect rather than a chance occurrence.

Isolation and characterization of microbes in cooked foods from open markets, street markets and super markets

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Abstract

Microbes mostly bacteria and fungi are well-known for causing infections that lead to food-borne diseases. Food provides suitable growth factors for microbes. Food-borne diseases are on the rise due to the consumption of contaminated and raw food. There are specific microbes found in cooked foods and raw foods, vegetables and fruits. This study aims to isolate and characterize the microbes found in cooked foods sold in markets around Windhoek, Namibia and to identify microbes that may cause food-borne diseases. Eleven variety of food samples (chicken, meat, pap, polonies, sausages and potatoes) were collected from super markets and street markets around Windhoek. Initially, the samples were fivefold serially diluted. Nutrient agar was used to isolate bacteria and Potato Dextrose Agar (PDA) to isolate fungi. The identification and characterization of bacteria was done using biochemical tests such as: carbohydrate test, indole production test, methyl red, catalase test, urease test, citrate utilization, hydrogen sulphide production, lactose fermenting test and mannitol salt test. Fungi identification was done by morphology features such as colony growth pattern, conidial morphology and pigmentation. The studies revealed that there were some microbes found in the cooked foods, and there contaminated with high incidence of bacteria low incidence of fungi. Chicken and meat collected from the street market had more microbes, with average CFUs of $9.2x10^6$ and $2.0x10^6$ and pap from the super had less microbes. *Citrobacter, Enterobacter* and *kiebsiella* are some of the bacteria identified. Filamentous, irregular circular shaped fungi were some of the type of fungi isolated. The implications of this findings are: in order to avoid contamination in food proper sanitation must be applied, proper preparation of food, working in a hygienic environment and doing inspections in the working environment.

Key words: food-borne disease, cooked food, isolate, pathogens

The impact of child mortality on fertility in Namibia

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Abstract

Many authors have investigated extensively studies involving fertility and child mortality individually in Namibia. However, the link between them has not been explored. The literature has shown that fertility child mortality rate have been decreasing in Namibia. This decrease may lead to a slow population growth of the country. Child mortality rates are vital indicators of child health and overall national development. In addition, fertility and mortality processes are the driving forces governing population change, so understanding the way they are linked to each other is crucial for the design of policies that influence the course of population change. Therefore assessing the relationship between fertility and child mortality is important in understanding the population dynamics of a country. This study also investigates how the desire for more children is related to fertility in Namibia.

The study used a Poisson regression based on secondary data from Namibia Demographic and Health Survey 2013 to determine the relationship between child mortality and fertility. It also used the Multinomial logistic regression to determine whether the loss of a child leads to a desire for more children.

The results show that the desire to have more children and child death are significantly related. The average of total number of childbirths of the mother who have experienced a high number of child death was high compared to those with a lower number of child death. Overall, the analyses show that child mortality has a significant impact on fertility. The study concluded that less desire for more children and being sterilized were significant factors in determining child fertility in Namibia.

Evaluation of fungal contaminants and mycotoxin levels of spoiled or rotten street vended and supermarkets fresh vegetables and fruits in Windhoek.

Ndemuenda MB and Nafuka

Astract

Responding to the ever-growing concern about the safety of customers consuming fungal contaminated fruits and vegetables from street vendors and supermarkets around the city. These fungi are major contributors to fruit and vegetables spoilage and are responsible for significant financial loses for any segment of the food industry that harvests, stores, processes, or uses fruits or fruit derived ingredients. In addition to the economic implications of their presence, there are toxins that are of concern to human health. Potato Dextrose Agar confirmed the toxins with the number of colonies formed on petri dishes from serial dilution of food items. Fungal contaminants could be seen with naked eyes after inoculated plates were put in a 37°c incubator for 3 days.Mycotoxin accumulation in this fruits and vegetables are measured by the number of CFU found on the plates. Slides prepared with Lactophenol cotton blue stain to diagnose fungal infection and preserve fungal structures. DNA extraction could have preserve specifics with sequences (M. Mbangu, 2021). Mycotoxins producing and inducing diseases such as rhizopus, penicillium are believed to be causing spoilage. Most fruits and vegetables get contaminated during harvest, storage and during whatever time it gets in contact with air because fungi has spores that are carried by air.

Assessment of the Determinants of Grade 12 Leaners' Academic Performance in English Second Language among Secondary Schools in Khomas Region: 2019 Cohort

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Abstract

English language in Namibia plays a major role in learners' education as it is the official language and a language of medium of instruction in primary and secondary schools. The majoring of secondary schools in Khomas region offer English as a second language. Over the years, the country has been experiencing high failure rates in English especially in Grades 10 and 12 examinations. Although some of the learners who failed or performed poorly in English passed other subjects exceptionally well, the failure rate in English at Grade 12 level has prevented many learners from perusing their further studies at institutions of high learning in Namibia and abroad because they could not meet the English minimum requirements at such institutions. Hence, identifying the factors which have a significant bearing on the learners' performance in English secondary schools in Namibia will go a long way in address the challenges faced by the Ministry of Basic Education, Arts and Culture as well as other stakeholders in education relating to poor performance in English. Therefore this study examined the effects of Grade 12 learners' academic performance in English second language among senior secondary schools in Khomas region focusing on 2019 cohort.

The study used secondary data from the Ministry of Basic Education, Arts and Culture for 2019 Grade 12 cohort who wrote English as second language during at high and ordinary levels during the national examination. The ordinal logistic regression was used to model the data and identify the predictor variables that explain changes in English second language performance for learners at Grade 12 ordinary and high levels in Khomas region.

The results suggest that at Grade 12 ordinary level, the social-economic status of the suburb in which the secondary school is located was significant. However, at ordinary level the classification of the school as private or public school was not significantly related to the performance. At high level, the classification of schools and the socio-economic status of the suburbs/locations were found to be significant in the models.

APPLICATION OF SURVIVAL MODELS TO ANALYZE FACTORS CONTRIBUTING TO DURATION OF MARITAL DISSOLUTION IN NAMIBIA

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Abstract

The duration of marriage is defined as the period of time between the day of marriage to date, which is usually expressed in completed years. Studies have shown that the mean duration of marriage has remained constant at 17 years, since the early 1990's in Sub Sahara Africa. This study aims to assess factors related to-time-to-marital dissolution in Namibia using the Namibia Demographic Health Survey (NDHS) 2013 data which includes women of reproductive age (21-49 years) in Namibia. The Kaplan Meier estimator was used to estimate the survival function and Cox proportional Hazard (CPH) models were used to evaluate the effect of several factors on survival models. The study found that women with no education had a higher probability of survival which indicates that they are less likely to go through marriage dissolution than all the other women in other education categories. From the Cox proportional analysis, it is shown that the hazard of divorce (HR=2.556, 95% CI 1.389-4.704, p-value>0.05) was higher in Erongo region compared to Otjozondjupa region and the p-value showed that there was no significant relationship between marriage dissolution survival time and Erongo region related to Otjozondjupa region. While the seventh day Adventist hazard of divorce was (HR=0.178, 95% CI 0.088-0.359, p-value<0.05) higher compared to no religion. The study conluded that the type of residence (HR=1.164, 95% CI 0.312-1.675), region (HR=2.556, 95% CI 1.389-4.704), wealth index (HR=1.630, 95% CI 1.108-2.398) and educational attainment were all determinants of marriage dissolution. The study concluded that, marriage dissolution time was different with regards to region, religion, residence, wealth index and educational attainment.

Synthesis, Partial-Characterization and in Vitro Antimicrobial Activity of Quinoline-Piperazine Derivatives

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Abstract

Antimicrobial resistance is recognized as one of the greatest threats to human health worldwide. more than 700,000 people around the world die annually from diseases caused by bacteria that have developed antimicrobial resistance (AMR). More than 700,000 people around the world die annually from diseases caused by bacteria that have developed antimicrobial resistance (AMR). Existing antimicrobial drugs are becoming less effective due to antimicrobial resistance, this problem is what drives medicinal chemists to critically use chemistry knowledge to discover, research on natural products that could potentially become new drug leads. Medicinal chemistry plays a very significant role in the pharmaceutical industry. The scaffold used in this study is a quinoline, quinoline and its derivatives have shown some biological activity in past studies, among them are antibacterial, antioxidant, anticancer, anti-inflammatory, antimalarial, and antifungal activities. The broad biological activities displayed by the quinoline scaffold is due to its versatility. Another scaffold used is piperazine which according to studies is the third most common nitrogen heterocycle in drug discovery. It is widely distributed in biologically active compounds employed in several different therapeutic fields, including antibacterial, anti-inflammatory, antifungal, and anti-tumor. This research is based on the study to synthesize compounds with the same or better biological profiles than the scaffolds.

The novel series of compounds were synthesized in a four-step reaction that involved substitution reaction, *O*-alkylation of various hydroxybenzaldehyde and nucleophilic substitution reaction. The last step was a Schiff base reaction with thiosermicarbazide to obtain the target compounds. A qualitative silver mirror test was done to determine the presence of the aldehyde function group before Schiff base reaction, the test was positive. All the reactions were monitored by thin layer chromatography and purified by recrystallization and preparatory thin layer chromatography. The yield range for the target compounds was 23.5%-65.2%, the obtained target compounds complied

with the Lipinski's rule of five, the QSAR data showed that the compounds have molecular weight less than 500, Log P values that are below five, hydrogen bond donors not more than five and hydrogen bond acceptor of not more than 10.
The synthesized series will be evaluated for their antimicrobial activity against *Escherichia coli*, *Staphylococcus aureus* and *Candida albicans* and partially characterized using IR and melting point. According to the QSAR data, the target molecules have the chemical and physical properties to be likely orally bioavailable.

The antioxidant potential of the Namibian *Myrothamnus flabellifolius*

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Abstract

MMyrothamnus flabellifolius is a medicinal plant native to the mountainous regions of central and southern regions of Africa. This plant has a variety of traditional uses, including treatment for a wide range of diseases which includes asthma, backaches, kidney problems and microbial infections. This study aimed to investigate the antioxidant potential of the Namibian *M. flabellifolius* plant extracts. The investigation of the antioxidant potential of the *M. flabellifolius* plant was done on methanol-dichloromethane (DCM) (1:1) and water extracts. The quantitative antioxidant potential was evaluated by standard methods of 2,2-diphenyl-β-picrylhydrazyl (DPPH) radical scavenging and reducing power assays. DPPH radical scavenging method is based on electron-transfer, where DPPH is reduced within the presence of an antioxidant particle. The reducing power assay is based on the principle that substances, which have reduction potential, respond with potassium ferricyanide (Fe^{3+}) to make potassium ferrocyanide (Fe^{2+}). The extracts demonstrated exceptional DPPH scavenging activities with low IC50 values. The reducing power of both extracts increased with an increase in concentration. The best reducing power was recorded with the water extract with absorbance reading of ± 0.2 absorbance at lowest concentration of 6.25ug/ml. These results were compared to the absorbance of ascorbic acid, which was the standard control in all the antioxidant assays. The results obtained in this pre study suggest that the *M. flabellifolius* plant has promising antioxidant potential,

making it a natural source of antioxidants.

Keywords: *Myrothamnus Flabellifolius*, DPPH, Reducing power, antioxidant

Molecular surveillance of symptomatic malaria infections in Zambezi region Namibia for identification of *Plasmodium* species and the presence of drug resistance markers for artemisinin, lumefantrine and chloroquine.

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Surveillance and monitoring of antimalarial resistance of *Plasmdoium falciparum* infections is a critical part optimising the choice of antimalarials used in therapy by providing data that informs clinical decision-making. Namibia is a low transmission setting aiming to eliminate malaria by 2022. However, the development of resistance to malaria treatments is one of the greatest threats to malaria control and elimination goals. Artemether-lumefantrine (AL) has been Namibia's first-line treatment against uncomplicated *Plasmodium falciparum* malaria since 2005but there have receently been reports of reduced clearance of parasites following treatment with AL in Angola, north of Namibia's borders. The reduced parasite clearance may be linked to developing drug resistance to AL. *Plasmodium falciparum* accounts for over 90% of infections in Namibia and is treated with AL, *Plasmodium vivax* infections are the second most common and are treated with Primaquine, therefore it is important to know which infecting species is present in an individual, in order to administer the right treatment. This study aimed to identify the different *Plasmodium* species present in blood samples collected in the north western Zambezi region as well as to determine the presence of markers for antimalarial drug resistance polymorphisms in the *pfcrt*, *pfmdr 1* and *Kelch 13* genes. Participants were recruited from health facilities in Zambezi region of Namibia from May to September 2018. Following consent, blood samples were collected for different analysis at the laboratory. A QIAamp DNA kit was used to extract DNA from 118 dried blood spots and multiplex PCR was used to identify the species present. Prevalence of haplotypes at codons 72-76 in the *pfcrt* gene wasanalysed using qPCR and mutations at 25 codons in the Kelch 13 gene were analysed by nested PCR followed by sequencing. *P. falciparum* positive samples were also analysed by PCR-Restriction Fragment Length Polymorphism at codon N86Y in the *pfmdr1* gene. Thirteen samples were identified as *Plasmodium falciparum* by both multiplex and quantitative PCR. For the *pfcrt* gene, 54% (7/13) amplified with the CVMNK probe were wild type without mutations, 31percent (4/13) were wild type for the *pfmdr1*, and no mutations from the sequencing results were observed in the Kelch 13 gene. Overall, there were no apparent signs of drug resistance in the samples from Zambezi region hence AL is stilleffective as the first-line antimalarial drug for the treatment of uncomplicated *P. falciparum* malaria in Namibia. However, continued surveillance is highly recommended with similar studies in other endemic regions

of Namibia to give a better representation of the country. The detection of early signs of resistance can help prevent the reversal in gains made towards malaria elimination in Namibia.

Synthesis and characterization of a maleic phenylhydrazone-based dual colorimetric anion and cation sensor in DMF

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Abstract

A dinitrophenyl hydrazone colorimetric anion sensor, (2E,5E,)-2,5-bis(2-(2,4-dinitrophenyl) hydrazono)-2-5-dihydrofuran referred as **D**, was synthesized and its recognition properties towards various anions were investigated by naked eye observation and spectroscopic methods, namely UV-vis and fluorescence titrations in DMF. The colorimetric sensor was characterized using spectroscopic methods of UV-Vis, Infrared, Fluorescence and ^{1}H NMR techniques. The addition of AcO^-, F^-, OH^- and $H_2PO_4^{2-}$ to **D** resulted in marked red shift spectral changes of the charge-transfer absorbance band, concomitant with a 'naked-eye' detectable colour change, from orange to red-yellow-greenish. Moreover, the addition of cationic salt solutions, resulted in distinctive colour changes upon interacting with **D** in DMF, ascribed to chelating-induced charge transfers between **D** and individual cations. Thus, **D** displayed duality sensing functions towards both anions and cations, in water soluble DMF.

The Metallogenic Evolution of the Matchless Deposit, Namibia.

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Abstract

Matchless deposit, located 30 km southwest of Windhoek, is one of the semi-massive to massive pyritic copper-zinc deposits developed along the Matchless Amphibolite Belt (MAB). The MAB is situated in the Southern Techtonostratigraphic Zone of the Neoproterozoic to Phanerozoic, NE trending Damara Orogenic Belt. The belt is a narrow linear zone of deformed and metamorphosed mafic igneous rocks found within the upper Proterozoic Damara sequence (Klemd et al., 1987). The Matchless Amphibolite Member (MAM) composing the MAB is a 350 km long and 3 km wide, northeast-trending linear feature comprising two less than 500m thick and closely spaced deformed amphibolite sheets). Furthermore, the MAB is associated with several Copper polymetallic deposits. Mining for copper started in 1970 until 2015, the mine is currently set on care and maintenance, plans to reopen are underway due to recent high copper prices. The evolution of these deposits remains controversial

This study focused on the western oreshoot of the Matchless deposit applying surface geological mapping, petrographic studies, and geochemistry to understand the characteristics and the evolution of the deposit in the realm of the Damara Orogeny. The main forms of alteration that are associated with the MW ore shoot are chloritisation, carbonization, silicification, sulfidation, and sericitization. The main metallic minerals of the are pyrite, chalcopyrite, sphalerite pyrrhotite, magnetite, cubanite, covellite, limonite, barite, hematite, and malachite, and they are generally associated with gangue minerals such as quartz, phlogopite, clinochlore, willemseite, covellite, quartz, chlorite.

The supergene period is readily recognizable by the presence of the gossan and secondary ore minerals such as malachite and hematite across mineralizations in the belt. There is an intimate association between the Matchless Member of the Kuiseb Formation and the mineralization in the Matchless deposit. The geochemistry of the Matchless Member at the mine shows a tholeiitic affinity. The Matchless Western oreshoot seems to have been deformed concomitantly with the host rocks namely; sericite-quartz schist, mica schist, and amphibole schist, and Amphibolite. We support the VMS, Beshi-type theory, in which ores were upgraded by the supergene process, where the ore shoots may represent a tilted volcanogenic ore zone. A detailed geological map for the deposit was created. Systematic geochronological work would warrant further insights into the evolution of these deposits.

A WEB SYSTEM TO FACILITATE JOB SEEKING/RECRUITMENT PROCESS AMONGST UNIVERSITY STUDENTS/GRADUATES AT THE UNIVERSITY OF NAMIBIA

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Abstract

Students graduating from universities experience a number of challenges in getting employment after acquiring their qualifications. These challenges could arise from inadequate knowledge of current job vacancies in different organizations. In addition, getting the right candidate with the preferred qualifications to occupy the vacancy is the main goal of any organizations' recruiter. This research examined the importance of a job portal for graduates from the University of Namibia.

Online Job Portals are reported in literature to have facilitated job seeking and searching processes for both job seekers and organizations. Job portals have thus provided required results for recruiters and job seekers to meet and fulfill their requirements. Apart from it being economical, job portals are also perceived to be a convenient and efficient source of matching job opportunities to suitable candidates especially during the COVID-19 pandemic and beyond.

The developed web application 'UNAM Job Portal' provides a portal for graduates to search for their desired jobs and as well for recruiters to contact the right candidates for their vacancies. Job seeking graduates from several backgrounds of studies can search for current job vacancies. Also, they can register and update their profile with their set skills and details. Employers on the other hand can register with the web application and post their current vacancies. They can also view the applicants and screen them to determine suitability as per their organizational demands. The web application was developed on the XAMMP stack platform which contains tools required to develop a web application locally. It uses the PHP programming language and MYSQL for the database. The development methodology used is the Personal Extreme Programming (PXP) having stages as; planning, designing, implementation, and system testing. Further research will examine how the Job Portal can be deployed to give graduates and employers a platform where they can search and advertise for job vacancies, respectively.

Qualitative and quantitative screening of *Hibiscus sabdariffa* plant (Petals and Leaves) for Vitamin A, B, C, Zinc and Iron with relation to preventing COVID-19.

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Abstract

The *hibiscus sabdariffa* continues to excel in medicinal plant diversity, supporting all communities since decades ago. Domesticated 6000 years ago in Sudan and native to west and east Africa, and cultivated for the edible external portion of its flowers and now famous for its roles in medication, food, skincare, ornamentation, and fertility. The big question now being ‘’can the plant be used as a replacement for the commercial immune boosters’’, with the aim of providing better immunity to prevent covid19 as it contains all the needed minerals and vitamins? The gap in literature is due to the fact that the virus is still foreign to science as it recently broke out and no updated work links the plant to the virus. The approach for the research question was deled with by analysis of trace elements by quantitatively evaluating the presence of vitamins and minerals after extraction with diethyl ether, ethyl acetate and methanol simultaneously the concentration of present phytochemicals determined after with the help of absorbance. Anti-microbial activity is also tested as an ice breaker into the comparison between the two. The results proved that indeed the *hibiscus sabdariffa* does contain the vitamins and minerals found in the commercial immune booster. With the overall determination done in comparison to the MVA immune boosters, and considering that the final concentrations differ in the plant and MVA respectively through analysis will need to be done to check which outweighs the other in percentage. For antimicrobial activity the plant did not show some points on inhibition thus meaning the plant doesn’t have the benefit of antimicrobial activity. Along with all the information gathered it is safe to say the take home message is plants and natural products might just be our biggest problem solver when it comes to diseases and most aspects of life a few years from now, with a little help from genetic engineering.

A comparative study of macro invertebrates of sandy shore intertidal zones along the central coastline of Namibia.

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Abstract

The sandy shore intertidal is the area of the ocean between low watermark and high watermark and they are one of the easily accessible marine habitats. The organisms in this zones are robust and diverse and this allows them to acquaint themselves in changing environmental conditions within the zone. Macro invertebrates burrow actively and they have unique adaptations such as mobility, protective coats such hard exoskeletons etc. The composition and abundance of these macro invertebrates are controlled primarily by the abiotic factors and they are represented of many phylla such as the urchins, mussels etc. A comparative study of macro-invertebrates of sandy shore intertidal zones along the Central coastline of Namibia was carried out ranging between Walvis Bay and Henties bay. The aim of the study is to determine the spatial and temporal patterns of macro invertebrates' along intertidal zones off the central coast of Namibia between the two different years (2017 and 2021). The study was carried out in April of each respective year at two different sites (Horing bay and Long beach). At each site, there were two 50m transects laid perpendicular to the shore 10 meters apart. Three samples at each intertidal zone were sampled randomly along the transect. The samples were collected in jars and taken to the lab for laboratory analysis. Specimens were sorted, identified, counted and recorded in excel sheet. SPSS statistical package was used for data analysis, the Shapiro Wilk test was used to test for normality. Man Whitney U test was used to test between the comparison of data. The test concludes that the relative abundance was significant between the years 2017 and 2021 for long beach (P= 0.005) as well as significance for long beach and Horing bay (P=0.000). 0ne way Anova statistical test showed significant difference of Scolepsis squamata between the mid and high zones (P=0.026). In conclusion, the macro faunal group on both beaches was comprised of Polychaete more than crustaceans and arthropods. Meaning the Polychaete abundance was high.

Keywords: Coastlines, species abundance, species composition, Scolepsis squamata,

The Synthesis and Partial Characterization of Novel Curcumin Derivatives and Evaluation of Their Antimicrobial Activity

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Abstract

Medicinal chemistry is a scientific discipline that has progressed rapidly over the last few decades. It plays a crucial role in drug discovery by providing a thorough understanding of a drug mechanism of action, structure-activity relationship (SAR), physicochemical, pharmacodynamics and pharmacokinetic properties. In this study, curcumin is hybridized with an antibacterial agent, 8-hydroxyquinoline.

Curcumin is a natural product that has biological properties ranging from antitumor, antiinflammatory to antibacterial activities. However, curcumin has poor bioavailability due to its poor absorption, rapid metabolism, chemical instability and rapid systematic elimination. 8-Hydroxyquinoline is a natural product, which displays biological activities such as antibacterial, antifungal, antimalarial, anti-inflammatory and analgesic activities.

The aim of this project was to synthesize novel mono-ketone curcumin derivatives using the base-catalyzed aldol condensation reaction, which are then hybridized with the quinoline scaffold, in which the target molecules were obtained in the range of 3-47 %. These synthesized compounds were tested for their physicochemical properties using the Molinspiration software. Amongst the tested compounds, only 10 obeyed Lipinski's Rule of Five. The Lipinski Rule of Five describes the drug ability of a determinate molecule. The rule determines if a biologically active chemical is likely to have chemical and physical properties to be orally bioavailable.

The synthesized compounds will then be partially characterized using melting point and Infrared spectroscopy. All the compounds will be evaluated for their antimicrobial activity against *Candida albicans, Escherichia coli* and *Streptococcus aureus* using the broth dilution method.

AN INTERRUPTED TIME SERIES ANALYSIS OF INFLATION RATE IN NAMIBIA BEFORE AND DURING COVID-19

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Abstract

The CPI is compiled on the basis of expenditure weights that are kept constant within a given year, reflecting the purpose of the index to measure changes in prices only without accounting for adjustments in consumption patterns. The unexpected and profound changes in expenditure patterns can introduce significant biases in the Consumer Price Indices (CPIs) used to measure inflation.
The primary objective of this study was to explore the inflation rate in Namibia before and during covid-19, using the interrupted time series approach.
The study used secondary data collected from Namibia Statistics Agency (NSA) for the period of January 2017 to March 2021. Multiple regression analysis was used on log transformed variables.
The study also found that, the more dummy variables we add to the model, the higher the % of the variation in CPI can be predicted from the independent variables. Furthermore, it was determined from the study that, there is a negative correlation between CPI and GDP, CPI and Import, CPI and Export and a very strong positive relationship between CPI and Money supply.
The study concludes that, inflation rate was different before and after Covid-19. The fourth model is the best measure for the change in inflation during and after Covid-19.
In this regard, relevant authorities in Namibia are encouraged to rely more on tight monetary policy, which should be complimented by a tight fiscal policy stance.

TEMPORAL VARIATIONS IN HERBACEOUS COMPOSITION, DIVERSITY AND COVER ON FARM KIAMSAB WEST 364, KHOMAS REGION

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Abstract

A study was done to compare herbaceous species composition, richness, diversity and cover at Farm Kiamsab West 364 among three years, 2018, 2019 and 2021. The farm is situated in a semi-arid savanna, 100 km south-west of Windhoek in the Khomas Region. A systematic sampling approach was used. A GPS was used to accurately relocate the same quadrats demarcated in 2018 and re-assessed in 2019 and 2021. The quadrats measured 1m x1m and were systematically demarcated at 10m intervals along 50m line transects. In each quadrat all herbaceous plants were identified. Additionally, forbs were counted and the overall herbaceous cover was visually estimated in categories of percentage cover. The Shannon-Weiner Diversity index (H') of each quadrat was calculated and compared among the three years using a Kruskal Wallis test. Species richness and diversity data were tested for normality using a Shapiro-Wilk test, and were found to be not normally distributed, hence a Kruskal Wallis test was also used to compare them over the three years. Herbaceous cover was compared among the three years using a Chi-Square test of Association. A Hierarchical Cluster Analysis (HCA) was used to compare species composition over the 3 years. Species richness and diversity were significantly higher in 2019 than in the other two years, ($H = 28.868$; $p < 0.001$). This was largely due to the higher rainfall received during 2019. Significantly more quadrats had < 25% cover in 2018 while more quadrats had >75% cover in 2019 and 2021. This conforms to the fact that the higher the rainfall (as received in 2019 and 2021), the higher the herbaceous production. Most forb species can tolerate drought and most of them are not easily grazed by livestock, hence the major changes took place in the grass component of the herbaceous layer. HCA indicated a significant difference in species composition among the years with about 25% similarity between 2021 and the other 2 years while similarity between 2019 and 2018 was about 30%. These differences can be explained by variations in rainfall as well as reduction in grazing pressure after de-stocking in 2018.

Key words: Farm Kiamsab West 364, Namibia, herbaceous species, herbaceous cover, Namibia, species composition, species diversity, species richness

DESIGN, SIMULATION AND ECONOMIC ASSESSMENT OF PHOTOVOLTAIC SYSTEM FOR ORANJEMUND.

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Abstract

Photovoltaics (PV) is the conversion of light directly into electricity using solar cells. The most commonly used solar modules today generate electricity only on their front side and they are called monofacial solar modules. A new type of solar modules, called bifacial, that can generate electricity on their front and backsides are increasingly becoming commercially available. Ambient factors such as irradiance, temperature, albedo of the surroundings, affect the amount of energy that can be generated by a PV system. Oranjemund is at the southern Namibian coast and frequently experiences overcast skies and lower irradiance conditions. It was conjectured that bifacial modules that can utilise more of the limited amount of solar radiation, may be a viable alternative to use in the lower irradiance conditions of Oranjemund. The aim of this study is to establish if PV systems are viable options for electricity generation in Oranjemund and if PV systems with bifacial modules are better option for cloudy locations like Oranjemund. Two grid-connected systems of equal capacity were designed and simulated with PVsyst software in Oranjemund - one system with monofacial modules and one system with bifacial modules. The amount of energy generated by each system was obtained through simulation and the energy output of two systems was compared using t-test. The levelised cost of electricity (LCOE) describes the cost of electricity produced by a PV system over a period of time. The current cost of grid electricity in Namibia is 2.09/kWh. The result s of our study for the cost of electricity (LCOE) generated by monofacial modules in Oranjemund is N$0.77/kWh and for the cost of electricity (LCOE) generated by bifacial modules in Oranjemund is N$0.93/kWh. The results obtained from this research showed that the bifacial modules generate more electricity than the monofacial modules but they do it at high cost. It can be concluded that despite the seemingly unfavourable conditions in terms of lower irradiance in Oranjemund, one can use a PV system in Oranjemund to reduce the electricity bill. There is no evidence that bifacial modules will offer substantial advantages in the specific Oranjemund conditions and therefore it can be concluded that PV systems with monofacial modules will be a suitable option for this location.

Comparative Assessment of Photovoltaic System with Different Solar Module Technologies

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Abstract

Photovoltaic (PV) applications where solar radiation is converted directly into electricity are becoming one of the most popular renewable energy applications worldwide. The price of crystalline silicon (c-Si) modules dropped dramatically over the past ten years. Improvements in the historically cheaper thin-film technologies, like Cadmium Telluride (CdTe) solar modules, has improved confidence in their long-term deployment. The purpose of grid-connected PV systems is to displace the electricity that would have been purchased from the grid with electricity from own generation. Naturally, one asks if any one of the PV technologies (c-Si or thin film) offers definite advantages.

Solar modules generate electricity based on the amount of solar radiation received and the temperature of the modules; hotter modules provide less power. Thin film solar modules have a lower temperature coefficient, making their power generation less sensitive to high temperatures. In warm areas, thin film modules are frequently recommended. Our purpose was to compare the performance of PV systems with c-Si modules and with CdTe modules in the warm conditions of Windhoek. We designed and simulated PV systems with c-Si and with CdTe modules, which are intended to replace the shade covers at the parking areas at UNAM's Main campus.

Detailed modelling of the PV systems was done with PVsyst, the industry's most used advanced modeling program. A t-test was used to compare the mean specific yield of the two systems statistically. In the climatic conditions of Windhoek, we found no evidence of larger energy output by any one of the two systems.

The Levelized Cost of Electricity (LCOE) is the cost of generation of unit kilowatt-hour of electricity. We found LCOE of N$ 0.53 for the c-Si PV system and N$ 0.57 for the CdTe system. The LCOE for both systems compare favorably to the cost of electricity from the grid. The LCOE difference between the two systems is small but it appears that c-Si has a slight advantage. The evaluation, based on the energy yield and LCOE, indicates that PV systems with c-Si modules appear to perform marginally better in the Windhoek conditions. We may recommend PV systems with c-Si modules rather than CdTe modules for applications in Windhoek, based on the comparable energy yield and LCOE of the two systems, as well as the fact that CdTe modules have

higher degradation rates and there is little local experience with them

A comparison of flowering times of *Ocimum americanum* L. and *Ocimum filamentosum* Forssk. in Namibia: implications for their survival in a changing climate.

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Abstract

Climate change is considered to be one of the main causes of changes in flowering phenology of many plant species globally. In a world of rapidly changing global climate, most plant species are altering their flowering phenology for adaptation and survival purposes. This study focused on determining the phenological responses of two Namibian *Ocimum* species namely, *Ocimum americanum* L. and *Ocimum filamentosum* Forssk. to climate change. A 54-year data set was used to study the flowering phenology of the two species and their responses to changes in temperature, rainfall, geographical variables (latitude and longitude), as well as to determine the association between the different species and their phenophases. Herbarium specimens from the National Botanical Research Institute (NBRI) were used to extract data on species' phenophases, date of collection (which was later used as day of flowering) and geographical limits (Longitude and Latitude). Simple linear regression was used to determine the relationship between the day of flowering of both species and temperature, rainfall, latitude and longitude. A Chi-square test of association was used to determine the relationship between the selected species and their phenophases. The study revealed a significant shift in flowering phenology of *O. americanum* during the period from 1960 to 2014. The day of flowering of *O. americanum* decreased with 1.66 days per year ($p = 0.0001$), whereas the flowering phenophase of *O. filamentosum* did not show a significant shift during the period of 1960-2014. This study showed that *Ocimum filamentosum* did not significantly respond to changes in rainfall, temperature as well as geographical limits. However, rainfall was effective in altering the day of flowering of *O. americanum* by increasing it with 0.076 days per mm ($p < 0.001$). Furthermore, there was no significant association between flowering phenophases and *O. americanum* and *O. filamentosum*. Among all the predictor variables tested, only rainfall had a significant effect on the day of flowering. This may be an indication that *O. americanum* is adapting to changes in rainfall intensity and temporal patterns. On the other hand, *O.*

filamentosum emerged as a less sensitive species since its day of flowering did not respond to any of the predictor variables used in the study. This study demonstrates that different, but closely related plant species can respond differently to changes in climatic and environmental conditions. Consequently, species-specific conservation efforts need to be employed to ensure survival of our important Namibian plant species.

Hydro-chemical and isotopic characterisation of the groundwater resources within the Kuiseb River Basin.

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Abstract

It is estimated that about -third one of the world's population uses groundwater for drinking while in Namibia about two third of the population depend on groundwater. The Kuiseb River Basin, in the western-central, receives on average 159 mm rainfall per annum and due to high evaporation rates, the rain does not contribute significantly to groundwater recharge. Residents within the Kuiseb River Basin for example the town of Walvis Bay relies mostly on groundwater from this river basin and it's therefore important to understand the groundwater dynamics and process within the Kuiseb River Basin for its management. Hence, this study was aimed at characterising groundwater chemistry, quality and stable isotopic composition changes within the Kuiseb River Basin and determining how they are distributed spatially. A total of 15 samples were collected from 15 NamWater production boreholes and were analysed for major ions as well for stable isotopes. A pH range of 7.54–7.91 was measured in the groundwater samples and temperature was between 25.7°C and 26. 9°C.The TDS values ranges from 271 mg/L to 984 mg/L and they are all below the WHO recommended guideline value of 1000 mg/L. The $\delta^{2}H$ and $\delta^{18}O$ of the groundwater samples are more depleted and plot along the GMWL and the LMWL signifying possible recharge from current rainfall. The findings of this research will contribute to improving the understanding of hydrogeochemistry, recharge paths and spatial variations of the alluvial aquifers within this river basin.

Ore mineralogy and textural characteristic of Cu-Pb-Zn-Ag Tsumeb deposit, Namibia

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Abstract

Located in the Northern part of Namibia, the Cu-Pb-Zn-Ag Tsumeb deposit, is an internationally known polymetallic deposit with a complex and fascinating mineralogical paragenesis. The deposit is located in the Otavi Mountain Land Province and it is hosted by the carbonaceous units of the uppermost part of the Otavi Group of the Damara Belt. Approximately 337 minerals are discovered to date in this deposit with at least 74 of those uniquely associated with the Tsumeb mine. Mineralization types and styles of the deposit are classified as massive, semi-massive peripheral, irregular, manto, stringer and disseminated oxide ores, where rich ore zones occur mostly in collapse breccia pipes cutting through the carbonates of the Hüttenberg Formation, Otavi Group. This paper represents part of PhD work on the different copper deposits of the Otavi Mountain Land, and it focusses on the ore characterization based on ore mineralogy and textures of the main sulphide minerals in the Tsumeb deposit. A petrographic study of historical samples collected from the Schneiderhöhn collection at the Geological Survey of Namibia (Ministry of Mines and Energy) was undertaken using reflected light microscopy. Mineral identification and paragenesis are the base for ore classification and textural characterisation. The principal primary ore minerals comprise galena, tennantite, sphalerite, pyrite, renierite, digenite, chalcopyrite, bornite, with associated supergene minerals such as covellite, cerrusite, smithsonite and chalcocite. Most of the minerals are medium to coarse grained (millimetre-scale) and have subhedral and minor euhedral crystal shapes. A variety of textures and characteristic features were observed in the sections studied, including brecciation, veins/veinlets, pseudomorph replacement, replacement rims, replacements along fractures, triangular pits cleavage among others. Major ore minerals include galena and tennantite, pyrite with minor renierite, bornite, sphalerite and chalcopyrite, while covellite, chalcocite, digenite and cerrusite are identified as minor and trace minerals. Secondary textural features observed in individual minerals indicate that the deposit has been subjected to weathering and deformation. Deformation effects observed includes triangular cleavages in galena, while various kinds of replacement textures are clear indications of weathering processes.

Namibian and German algae to be used as food component

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Abstract

Increase in populations and alteration of the environment due to climate change and human impact, water scarcity and reduction of the available arable land demand search for alternative food sources that can provide basic nutrients for human beings. Therefore there's a need to get resources from the sea and oceans to meet the increase demand for foods or food components that are rich in nutrients. Successful extraction of food nutrients such as proteins and carbohydrates from microalgae might lead to sustainable production of food or food components and supplements that are rich in nutrients. The purpose of this study is to isolate food nutrients from algae that are found in Namibia as well as algae found in German. The extracted nutrients from the two countries will be compared. Simple food tests such as iodine test to test for starch, biuret test to test for protein, Benedict's test to test for reducing sugar, ethanol to test for fat and DCPIP to test for vitamins were used to test for this nutrients in microalgal from Namibia and German respectively. Proximate analysis was done on algae from both countries to calculate the percentage of: moisture content (which shows the taste, texture, weight, appearance and shelf life of the food); Ash content (which determines the amount and type of minerals in food which help us determine the physicochemical properties of foods as well as retard growth of microorganisms) and crude fat (which helps us determine the amount of fatty acids or free lipids contained in food). For proximate results, German algae showed 9.6% crude fat and 90.1% ash content while Namibian algae showed 16.5% and ash content of 89.3%. The results of this study shows that algae from the two countries is rich in nutrients, therefore it's importance to isolate nutrients from this microalgae.

Antioxidant Activity and Phytochemical Screening of *Diospyrosmespiliformis* leaf extract

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Abstract

Medicinal plants play an important role in the treatment and cure of different ailments. Studies have shown that this is because there is a direct link between a plant's bioactive compounds and the various ailments it can treat or heal.

Diospyros mespiliformis, well known as the jackal berry tree has been used traditionally for ailments such as pain relief, fever and wound dressing. The present study was aimed at investigating leaves of Diospyros *mepiliformis* for antioxidant activity. The 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging and Ferric ion reducing antioxidant power(FRAP) assays were used for the antioxidant tests and qualitative phytochemical screening was used to determine the major classes of compounds present in the extracts. Qualitative phytochemical screening of the extracts indicated the presence of tannins, flavonoids, steroids, saponins, glycosides and alkaloids. The results also showed a high concentration in tannins, and this explains why *D. mespiliformis* is used in wound healing. Results of the antioxidant activity indicated a dose-dependent response of sample to scavenge the DPPH radical, with a percent inhibition of 77.76% at the lowest concentration tested (0.20 ug/ml). For FRAP assay, the extracts were able to significantly reduce Fe^{3+} to Fe^{2+}. The findings of this study help validate the traditional uses of *Diospyros mespiliformis* and the data signifies that D. *mespiliformis* is a promising source of natural antioxidant compounds.

Keywords: Antioxidant, Phytochemical screening, Diospyros mespiliformis, Phenolic, Flavonoid

Stiff Systems and Stability

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Abstract

In this paper our attention is directed towards examining stiff linear problems and identify how an ODE solver could obtain stable solutions, using the identified numerical methods that prove better efficiency in solving them. Two Steps Adams – Moulton and Backward Euler method were considered. We would like to identify numerical method which resolve stiff equations accurately with the appropriate time step.

Synthesis and characterization of a highly selective naphthyl-based sensing probe bearing a benz-sulfonic moiety for Fe^{3+} in DMF

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Abstract

A highly selective and sensitive naphthyl-based on a colorimetric sensing probe bearing a benz-sulfonic moiety ((E)-4-(((2-hydroxynaphthalen-1-yl-) methylene)amino) benzenesulfonic acid), termed as **E**, was synthesized via Schiffs' base condensation reaction method, while spectroscopically characterized and analysed, using UV-Vis, Infrared and fluorescence techniques. The molecular recognition properties towards various biologically important ions were investigated through naked eye observation and thereafter spectroscopic methods such as UV-Vis and fluorescence techniques were used, in water soluble dimethylformamide (DMF). The addition of iron ion (Fe^{3+}) as $Fe(NO_3)_3$ solution to receptor **E** in DMF, resulted in marked spectral shift of charge-transfer absorbance band, concomitant with a naked eye detectable colour change. The spectral shifts and colour changes displayed upon **E** interacting with Fe^{3+} were ascribed to the chelating-induced charge transfers between **E** and the analyte (Fe^{3+}). Importantly, the sensor was only selective to Fe^{3+}, thus all anions and cations solutions used did not induce any noticiable changes, even when excess amounts were used. Thus, **E** could be developed into a sensing probe, due to its high selectivity for one cation only (Fe^{3+}).

A COLLECTIVE APPROACH TOWARDS COMMUNITY RESILIENCE IN COMMUNAL LAND RESOURCE MANAGEMENT: A CASE STUDY OF OMAHEKE REGION, NAMIBIA.

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Abstract

Livestock production is the backbone of most communal production systems in Namibia and is critical to the survival of a significant proportion of the country's population. In the past few decades, however, this production has been negatively affected by climatic changes, rapid population increases, as well as changes in communal land legislation and management systems. Such changes are negatively impacting on the pastoralists' economic livelihoods and on the country's economy as the number of livestock produced for sale locally and internationally is decreasing. Against this background, this study sought to develop a community-based resilience approach towards the management of communal land resources in Omaheke Region of Namibia. To collect data, the study utilised a qualitative approach, mainly anchored by in-depth interviews, key-informant interviews and focus group discussions using semi-structured guides. For data analysis, the study followed a deductive data analysis approach, allowing for the creation of a comprehensive set of themes that were explored in-depth. The study findings indicate the centrality of including indigenous knowledge in the adaptation process and in managing communal resources sustainably for the benefit of pastoral farmers. Furthermore, study findings underline the importance of the strategic involvement, participation and representation of pastoral communities in the governance of their resources. Another key finding centred on the importance of traditional authorities in bringing their people to collectively strategize together for improved community resilience. Based on these key findings, the study developed a framework for a collective approach towards the management of communal resources, which when followed would result in the improvement of community resilience in the Omaheke Constituency in general, but also in other communal areas of a similar context.

A comparative analysis of vegetation patterns in the face of possible desertification tipping points

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Abstract

As one of the dryland regions in the world, Namibia faces a myriad of challenges from extreme climatic events to population growth. As such, pressure continues to be aggravated on its limited natural resources, particularly forage resources which are a backbone of rural livelihoods. With continuous stress or disturbance, transition of rangeland ecosystems towards a desertified state becomes highly possible, as the system crosses a threshold beyond which it is difficult or impossible to recover (desertification tipping point). Currently, the mechanisms underlying such transitions, including the sensitivity of semi-arid vegetation to disturbances such as overgrazing which may lead to desertification, are rarely tested. Therefore, this study sought to gain an understanding of the spatial arrangements and demographic patterns of selected grasses that can assist to detect possible desertification tipping points along grazing gradients in the Greater Waterberg Landscape (GWL), central eastern Namibia. Four communal areas and four freehold farms (commercial) were selected as the two main land tenure systems in the region. A comparative space-for-time approach was used for this purpose, where a total of nine plots were laid out along local grazing gradients (transect) radiating away from a water point, starting at the end of the sacrifice zone. Two transects were laid per site giving us a total of 16 transects, eight per land tenure system. At each plot, adult density, basal size and seedling recruitment of key perennial grass species were assessed and compared along grazing gradients and between the two land tenure systems. Preliminary findings show that the freehold farms had significantly higher densities and mean basal sizes of a more palatable grass species in the region, *Stipagrostis uniplumis* (Licht. ex Roem. & Schult.), than communal areas ($p < .001$). The general trend indicates a sudden decrease or displacement of some indicator perennial grass species such as *Aristida stipitata* (Hack.) and *Stipagrostis uniplumis* along the grazing gradients including lack of seedling recruitment particularly in communal areas. A gradual increase away from grazing pressure can be observed in the adult density and seedling recruitment of all grass species combined, per land tenure system.These patterns, particularly the ones observed at species-specific level could be useful hints to detect an approaching desertification tipping point.

Development of a Web-Based Namibia's Covid-19 Vaccine Digital Health Passport: An Approach to Healthcare and Physical Gatherings in Namibia

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Abstract

Little is known about Coronavirus (COVID-19) and its vaccines. Handling of paper-based COVID-19 vaccine passports between health officials and the next person seeking a vaccine has become a concern as far as physical contact is involved. Several systems which include mobile and web applications and other technologies have been developed in other countries to verify individuals' COVID-19 status and give them the privilege of traveling freely. This study aims to develop Namibia's web-based COVID-19 vaccine digital health passport to exercise physical distancing and allow vaccinated individuals in Namibia to present their proof of COVID-19 vaccination digitally when required. The study used a quantitative research method with a descriptive research design that describes the present status of vaccination in the country and analyses existing data and the effect of the experimented application. The study employed an online survey to get individuals' opinions on the administration of vaccines in Namibia. A total of 17 individuals have participated and about 53% of participants were vaccinated or either tested and have however experienced a slow vaccination process, overcrowding, and long queues at designated facilities or clinics. The web-based application developed to digitize COVID-19 vaccine records followed a waterfall model and were pilot tested. The application demonstrated an increase in efficiency and health official productivity as minimizing of physical contacts vaccination centers. It is recommended to develop an application that can also cater to future health pandemics.

Antioxidant potential of the Namibian *Hydnora abyssinica*

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Abstract

Hydnora abyssinica is a parasitic leafless medicinal herb characterized by its rhizomes and flowers. Sudan, Somalia, Angola, Namibia, Botswana, South Africa, and the Arabian Peninsula are among the countries where the plant can be found due to its subterranean nature. Preliminary studies have indicated that *H. abyssinica* has high amount of phenols and tannins present in its rhizomes, which is a contributing factor for its anti-inflammatory and therapeutic qualities i.e. treatment of diarrhea and acne. The aim of this study was to investigate the antioxidant activity of the Namibian *H. abyssinica* using; 2, 2-diphenyl-1-picrylhydrazyl (DPPH) and reducing power assay. A methanol extract was prepared from the root powder of *H. abyssinica* using DCM: Methanol (1:1) and then investigated for antioxidant activity .In the DPPH assay, the extract showed antioxidant activity based on its Inhibitory concentration (IC50); the concentration of an antioxidant at which 50% inhibition of free radical activity is observed. Whereas in the reducing power assay, *H. abyssinica* demonstrated ferric reducing activity as its absorbance values increased with an increase in concentration. The results obtained were compared to the absorbance of the ascorbic acid which was used as a standard control in all the antioxidant assays.The findings revealed that *H. abyssinica* might be a viable source of natural antioxidants, thus expanding scientific knowledge on its antioxidant potential.

Keywords: *Hydnora abyssinica*, antioxidant activity, DPPH, reducing power

Principal Component Analysis (application on Crop Production dataset)

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Abstract

Principal Component Analysis, an old statistical data technique, found in 1901 is a multivariate data, dimension reduction technique for quantitative data, which works with orthogonal transformation, "Eigen spaces". It transforms data into eigenvectors and eigenvalues, which contain different variations within the data. The principal component "eigenvector" with the highest eigenvalue, (which is the standard deviation or variance) is assumed to contain more of the data information. The first two principal components always have the highest eigenvalues, which at least explains about 60 percent of variation contained within the data. Since they contain more information about the data, they are retained while leaving the other Principal Components with lesser eigenvalues. It is visualized by the ggbiplot and scree plots and some other plots not discussed in this report.

Fabrication and characterization of Al-doped TiO_2 thin films by the spray–coating method using aqueous precursors involving Ti^{4+} and Al^{3+} complexes.

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Abstract

Titanium dioxide (TiO_2) is a versatile metal oxide with a diverse set of existing applications. TiO_2 in the form of thin film has been found to be more attractive for a great variety of applications including photocatalytic degradation of organic pollutants in water as well as in air. The photocatalytic response of TiO_2 is weak, owing to its wide band gap, and possesses a high charge carrier recombination issue. Therefore, by doping TiO_2 with various metals such as silver, gold, platinum and aluminum to modify the band structure, which enhances the optical properties of TiO_2 for photocatalytic applications. Aluminum is cheap and abundant metal that peaks at a binding energy of 75.5 eV. The increment of aluminum doping concentration can decrease the resistivity of TiO_2 and increases in charge carrier concentration. The purpose of this study was to fabricate aluminum doped titanium thin films with Al^{3+} mole percentage ranging from 0-6% were prepared, and then spray-coated onto glass substrates preheated to 180°C. The spray-coated glass substrates were heat treated at 500°C for 30 minutes, in air. Structural and optical properties of the thin films were studied and characterized by X-ray diffraction (XRD) and Field emission scanning electron microscope (FE-SEM). The properties of the fabricated thin films will be presented.

Assessment of the potential uptake of chromium by selected plant species and its concentration along the Klein Windhoek River from the Ujams Industrial Wastewater Treatment Plant in Namibia

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Abstract

Chromium occurs in different chemical forms, primarily as chromite (Cr(III)) and chromate (Cr(VI)) in soil and these vary markedly in terms of their biogeochemical behavior. Chromate does not have essential metabolic functions in plants, but a very toxic, powerful epithelial irritant and proven human carcinogen. This study assessed: (i) the uptake of Cr(VI) and its toxicological effects on the total Chlorophyll content of *Rumex lanceolatus* and *Cullen obtusifolia*, exposed to treated industrial effluent from Ujams Wastewater Treatment Plant (UWWTP), (ii) the Cr(VI) concentration in UWWTP effluent discharged into Klein Windhoek River (KWR), its compliance to the Namibian Water Quality Standard for Effluents and its behavior in KWR in relation to increased distance from the discharge point. Comparisons of total chlorophyll and Cr(VI) concentration in leaves were made between plants growing in Cr(VI) exposed and control sites. The total chlorophyll in the plant leaves was determined using a potable meter SPAD 502Plus, validated against a conventional spectrophotometric method. Cr(VI) in leaves was determined by Direct Spectrophotometric Method, leaves were first digested with a mixture of 4 ml nitric acid (HNO_3) and 1 ml hydrochloric acid (HCL) (4:1 v/v). Total chlorophyll was significantly lower in plants exposed to Cr(VI) containing effluent than those from the control site for both *R. lanceolatus* (Mann-Whitney U test, U =396, $p < 0.001$) and *C. obtusifolia* ($t(118) = 4.496$, $p < 0.001$). The study further revealed a significantly higher Cr(VI) in plant leaves of *R. Lanceolatus,* from the exposed site; t-test ($t(118) = 5.692$, $p < 0.001$), conversely, the difference in Cr(VI) between the two groups was not significant for *C. obtusifolia*. Simple linear regression analysis revealed a highly significant negative relationship between Cr(VI) and total chlorophyll in the leaves of *R. lanceolatus* exposed to the effluent from UWWTP ($r(118) = 0.34$, $p < 0.001$). *R. lanceolatus* accumulated more Cr(VI) in its leaves and also appeared to be sensitive to high Cr(VI), as marked by the significant reduction in its chlorophyll. Conversely, there was no significant relationship between Cr(VI) and total chlorophyll in the leaves of *C. obtusifolia* exposed to the effluent from UWWTP. The study showed that *C. obtusifolia* use avoidance as a mechanism against Cr(VI)-induced stress. Both species need to be investigated further to understand their response to Cr(VI)-

induced stress at the root level and determine their bioaccumulation factors. It was further shown that Cr(VI) in the effluent discharged from UWWTP significantly decreased with the increase in distance away from UWWTP discharge point along KWR ($r(5) = 0.88$, $p = 0.02$). This study demonstrated the need for continually assessing UWWTP discharged effluent to ensure that Cr(VI) levels are within the set guidelines as provided by NWQSE and WHO.

Antioxidant activities of endophytes isolated from beans and Bambara groundnuts

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Abstract

Diverse endophytic fungi exist within healthy plant tissues without causing any harm. These endophytes constitute rich bioactive compounds for which they are explored to discover new natural products. Oxidative damage from free radical is linked with various conditions including cancer, inflammation, cardiovascular diseases. Antioxidants prevent formation of radicals or slows down damage to cells caused by unstable molecules that body produces as reaction to the environment. The objectives of this study was to isolate fungal endophytes associated with black-eyed beans and Bambara groundnuts, determine the total phenolic and flavonoid content of the isolated fungal endophytes extracts and lastly, to assess the antioxidant activity.

The aim of the study was to quantify the total phenolic and flavonoid content and evaluate the antioxidant activity produced by endophytic fungi isolated from black-eyed beans and Bambara groundnuts.

Fungal endophytes were grown on the potato dextrose agar. A total of six endophyte fungi were isolated from black-eyed beans and Bambara groundnuts. The isolated fungi were fermented in potato dextrose broth for the production of secondary metabolites. Secondary metabolites were extracted with ethyl acetate and concentrated. Total phenolic content and total flavonoid content were evaluated

using Folin Ciocalteux and aluminium chloride methods respectively. The antioxidant activity was evaluated through reducing power and DPPH free radical scavenging assay.

This study shows that the endophytic fungi isolated from black-eyed beans and Bambara groundnuts can be a potential antioxidant resource and further work is needful to isolate the exact compound which is responsible for antioxidant activity.

Development and validation of a solid-phase microextraction – gas chromatography (SPME-GC) method for the determination of volatile compounds in beers produced in Namibia

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Abstract

Headspace solid-phase microextraction (SPME) is one of the most frequently used extraction techniques for the analysis of volatile organic compounds (VOCs) in complex matrices. Volatile compounds play an important role in the taste of beer. SPME – gas chromatography (GC) has been the method of choice for analysis of food volatile compounds including beer due to its ability to allow the rapid determination of compounds of interest in beer. However, there is currently no laboratory in Namibia that offers this type of analysis as a service to food and beverage manufacturers such as micro-breweries. In addition, the volatile compound profiles of the locally produced craft beer is unknown. Therefore, the aim of this study was to develop and validate an SPME-GC method in our laboratory that can be applied to the analysis of locally produced beer. During the analysis, the analytes are absorbed into a thin fiber coated with absorbing material which comprises a silicon based organic polymer and porous carbon adsorbents and are then desorbed in the heated inlet of the GC instrument. Method development and validation was performed on a lager-style beer and then the method was applied to the analysis of a number of locally produced craft beers. It was found that a number of major volatile compounds are present in the beers in varying concentrations, including hexanoate, 2-phenylethanol, octanoic acid, ethyl octanoate, 2-phenylethyl acetate and 3-methyl-butyl acetate.

3D Seismic Sequence Stratigraphy, Erosional Surfaces, and Implications for Hydrocarbon Prospect Generation in the N'kapa Formation, Douala Sub-Basin, Cameroon.

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Abstract

A precise definition of environment of sediment deposition from seismic signatures is imperative for characterizing and providing measures for enhancing hydrocarbon reservoirs. This study set out to utilize seismic sequence stratigraphic techniques and qualitative seismic attribute analysis to identify various sequences and seismic facies, delineate significant stratigraphic surfaces and establish their implications in hydrocarbon prospect generation in the Douala Basin. 3D SEG normal standard seismic volumes (2800 km^2) together with well log and lithological information were utilized for the seismic stratigraphic studies. Identified bounding surfaces, unconformities and prospective bright spots were mapped as horizons on 3D seismic record. In addition, subsurface time elevation maps were generated, and amplitude variation surface seismic attribute analysis carried out to aid in geometry delineation of depositional channels. Five sequences and seven associated seismic facies were identified, and detailed analysis was focused on Sequences 1 and 2 and Facies SF6 and SF7. SF7 presented semi parallel thick sporadic high amplitude, diagnostic of turbidite reservoirs. Sequence 1 represents the N'kapa Formation characterized by erratic distribution of SF7 within a predominant mesh of SF6. Three seismic surfaces corresponding to reservoir body, major erosional surface and an Eocene Unconformity were identified and their seismic attribute character portray high amplitudes revealing channel sand or levee reservoir bodies distributed on the erosional surface cutting across the N'kapa Formation, signifying a channelized

system that acted as sites for shallow marine aprons or reservoir formation. This study has revealed channel turbiditic stratigraphic plays which should guide future well location.

Key words: seismic stratigraphy, seismic facies, surfaces, channel reservoirs, Douala Basin.

INVESTIGATING POSSIBLE ALLUVIAL GOLD OCCURANCE IN THE OMARURU RIVER SEDIMENTS

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Abstract

Current gold exploration schemes in Namibia more-often focus on deposits in hard-rock that usually require significant time, financial resources and expertise as opposed to alluvial/fluvial projects. It is important that Namibia maximizes its participation in the global gold market by locating more economical gold deposits within its jurisdiction to develop more mines and become a major producer. Prior to 1989, gold had only been mined profitably on a small scale from turbidite-hosted gold veins, and associated alluvial deposits at Ondundu and from alluvial workings. This indicates that there is great potential for more and possibly larger alluvial gold deposits within the central Namibia and elsewhere, and hence more knowledge will be acquired through this research. Given its geological location, the Omaruru River has high potential for alluvial gold occurrence as some of its tributaries are located mainly within the renowned gold-rich province – the Central Zone (CZ) of the Damara Belt. Disintegration process of primary gold host rocks over the years due to weathering and erosion releases the precious metal grains from the host metasedimentary rocks that are (the grains) then gravity-transported by flowing water through the tributaries to the main river stream and accumulate in the traps within the river banks. This study is aimed at (1) developing a target identification and delineation criterion and (2) investigating possible alluvial gold occurrence within the Omaruru River sediments. Desktop studies were conducted through analyzing the preexisting gradient information and geophysical data in order to identify potential sampling sites for investigation. The identified target areas were confirmed in the field and soil samples of 2 to 4kg were collected by manual digging at an average depth of 30cm for visual inspections, sieving (2mm), splitting in the field and preliminary chemical analysis using a portable X-ray fluorescence (XRF) equipment. No gold was detected by visual inspections and portable XRF analysis. Gold grains may be too small to see with a naked eye and too sparse to find with a hand lens whilst its concentration

may be lower than the lower detection limit of the portable XRF in chemical analysis. Since gold usually occurs in very low concentrations, detailed inductively coupled plasma mass spectrometry (ICP MS) chemical analysis which has a capability to detect elements at very low concentration is to be conducted on the second splits of each sample. The final conclusion will thus be deduced once sample results from the ICP MS analysis are reported.

Keywords: Gold Exploration, Alluvial Gold, Central Zone, Damara Belt, Omaruru River

Anti-HIV, anti-inflammatory and AChE Inhibitory activity of *Helichrysum argyrosphaerum* (Wild Everlasting)

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Abstract

Helichrysum argyrosphaerum is one of the *Helichrysum* species that is known for livestock poisoning but it has been used as a traditional medicine in the Southern Africa since 1718 to treat wounds and infections. *Helichrysum argyrosphaerum* is widely distributed in countries like Malawi, Angola, Zambia, Lesotho, Botswana, Mozambique and Namibia. The aim of this research was to study the anti-HIV, anti-inflammatory and AChE Inhibitory activity of *H.argyrosphaerum*. *Helichrysum argyrosphaerum* methanol extract was assayed for anti-HIV reverse transcriptase (RT) using HIV-1 reverse transcriptase colorimetric assay. In vitro anti-inflammatory activity of *H.argyrosphaerum* methanol extract was evaluated using egg albumin denaturation assay. In addition, *H.argyrosphaerum* methanol was evaluated for effects on acetylcholinesterase (AChE) enzyme. *Helichrysum argyrosphaerum* extract gave moderate inhibition against HIV RT with 14% and 47% inhibitions at 500$\mu g/ml$ and 1000$\mu g/ml$ concentrations respectively. In addition, *H.agyrosphaerum* also showed moderate inhibition against inflammatory activity with 44%, 33.5% and 18% at 250$\mu g/ml$, 500$\mu g/ml$ and 1000$\mu g/ml$ respectively. This study revealed that *H.argyrosphaerum* plant has moderate anti-HIV and anti-inflammatory properties aswell as the abitlity to increase AChE enzyme activity, suggesting no new potential uses of this commercial plant on anti-HIV, anti-inflammatory and AChE Inhibitory activity

Keywords: *Helichrysum argyrosphaerum*, HIV Reverse Transcriptase, anti-inflammatory, acetylcholinesterase

A Review of Claim Reserving Model.

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Abstract

This study is aimed at revising the chain ladder method for reserving claims. Chain ladder method allows numerous statistical methods which are normally used for the estimation of outstanding claims in insurance companies and extend range analyzing expected claims development results over past years. We consider the case where a relatively complete set of information on individual claims is available. The main source of data collection was a secondary data used by Seher Vatansever (2011), collected from 2003 to 2009 (from TRAMER). We started by examining the theoretical frame work on CLM in literature review and proceeded with main assumption of CLM. Our results, we found that the estimated values obtained by chain ladder method are closer to actual values from TRAMER. The purpose of this study is to give deep analysis of the results obtained from applying chain ladder method for practice as a way of modeling claim reserves.

Modelling of financial bubbles through vector autoregressive approach: Application in housing market in Namibia

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Abstract

This work uses a Vector Autoregressive (VAR) approach in an effort to forecast financial bubbles. Contributing macroeconomic variables in the fluctuations of housing prices are identified. Assuming the housing market has a Granger Casualty relationship, the relation between the prices of housing and rentals, helps us measure how the house prices are deviated from their actual worth value. As interest rates play a major role to determine the demand for house mortgages, they are an important contributing factor to the house prices. A theoretical approach is used to asses these relations, we take a closer look at the United States housing market data before the 2008-2009 financial crisis for the existence of a bubble. The approach is then applied to the Namibian housing market as we check for the existence of a bubble. The significance of the study is to be able to help identify and forecast the possibilities of financial bubbles and how they can be monitored.

The methodology may also be useful in the monitoring of housing and rental prices. As land prices remain and continue to be high, despite credit mortgages declining, the research would like to ascertain whether Namibia's housing market is faced with a bubble? Can we forecast and model the existence of a bubble?

In vitro inhibitory activity of Cowpea and Bambara groundnuts against pancreatic lipase.

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Abstract

Improper diets and a lack of activity has led to an increase in the amount of obesity cases recorded worldwide. Obesity is the accumulation of fat which is caused by multifaceted lipid metabolic disorder. The inhibition of digestion and absorption of dietary fat, the most intense source of energy, can be useful in managing the accumulation of fat. Legumes naturally contain polyphenols which indicates the presence of antioxidant activity, makes them a healthier and safer approach towards tackling obesity .The study aimed to assess the inhibitory activity of Bambara groundnuts and Cowpea.

Two Bambara groundnuts varieties (S19/3 and LR1) and cowpea sample were extracted in aqueous methanol at room temperature. The extracts were tested for antioxidant activity using DPPH free radical scavenging, nitric oxide scavenging assays as well as reducing power. Total phenolic content and total flavonoids content of the extracts were determined using Folin-Ciocalteu and aluminium chloride methods respectively. The extracts were also analysed by the anti-obesity assay.

The reducing power assay showed dose dependent pattern and showed antioxidant potential of the extracts. DPPH free radical scavenging assay gave an IC_{50} of 1.377± 0.18335 mg/ml, 0.9875± 0.15935 mg/ml and 2.093± 0.3775 mg/ml respectively. The IC_{50} determined by the Nitric Oxide scavenging was 0.08897± 0.02163 mg/ml, 0.08676± 0.00939 mg/ml for LR1 and S19/3 respectively and for the Cowpea was inconclusive. An anti-obesity test will be conducted on all samples to determine which has the inhibition towards the pancreatic lipase, the inhibition will be calculated and used to prove the inhibitory potential of the selected leguminous plant samples.

Obesity has been observed as one of the leading causes of several diseases including several cancers and stroke that eventually lead to mortality. This study thus provides a cheap, natural, healthy and co-effective method that helps take on obesity. The promising results provides prove that with their good results can be exploited to develop products that work against obesity.

Petrography, petrology and mineralogy of eclogite nodules from the Jwaneng Diamond Mine, Botswana. An approach documented by mantle metasomatism, kimberlite emplacement and finally by supersonic uplift of the diamondiferous host rocks

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Abstract

In this study we present a unique and detailed petrographical, petrological and mineralogical dataset applied to these very extraordinary eclogite nodules. The investigated eclogite nodules are between 2-5 cm in diameter. Two generations of garnets could be found. Garnet of the first generation (*Grt I*) is surrounded by garnet of a second generation. Garnets of the first generation are completely free of micro-cracks. In contrast to that, garnets of the second generation are made up of much smaller grains and show plenty of open and totally embedded micro-cracks within the sub-grain boundaries. The fragments of garnets of the second generation showing sharp edges and the whole scenery in micro-scale looks like “blasted”. Garnet of the second generation is encircled by a rim of phlogopite. Microprobe traverses from core (*Grt I*) to the outermost rim of garnet (*Grt II*) close to the rimming phlogopite showing a strong zonation. X_{Mg} varies between 0.64 (core) and 0.84 (rim), X_{Pyp} varies between 0.39 (core) and 0.76 (rim), X_{Alm} between 0.23 (core) and 0.12 (rim) and X_{Grs} between 0.38 (core) and 0.09 (rim), respectively. A dramatic change in □O18 isotope values was additionally observed and is ranging between 4.72 (core) to 6.10 (rim). The strong change in major element chemistry as well as □O18 isotope values is interpreted as an effect of mantle metasomatism. These results are confirmed by the unique pattern of the LREE, HFSE and HREE from core to the rim in the analyzed garnets. The mantle metasomatic effect is also confirmed on OH diffusion profiles around totally embedded cracks in garnet of the second generation. We corroborate this high estimate through velocities expected from viscous laminar flow driven by the pressure gradient. We also evaluate the velocity given by the conversion of gravitational potential energy into kinetic energy, which gives an upper kinetic limit and implies high velocities through the drag coefficients needed to support the dense diamond bearing rock fragment in the melt. This robust evidence for near-accoustic wave speed

velocity challenges our understanding of the basic mechanisms that can generate deep and fast cracks within the Earth.

An analysis of X-ray Photoelectron Spectroscopy (XPS) spectra data for Titania (Tio_2) thin films.

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Abstract

Self-cleaning applications of metal oxide thin films such as Titania, Zirconia and Zinc Oxide with hydrophilic/hydrophobic and photocatalysis properties for applications in energy and environmental areas are highly useful. The self-cleaning properties are often influenced by the chemical state of the thin films. X-ray photoelectron spectroscopy is often employed to analyse the chemical state of this thin films. In this research Titania thin films fabricated by spray method of molecular precursor solution were characterized by X-ray photoelectron spectroscopy. The results obtained from XPS indicates that the thin film contains Titanium, Oxygen, Nitrogen, and small amount of Carbon. That is; the peaks at binding energy values of 458.94 eV, 530.74 eV, 396.94 eV, 285.14 eV, represent the presence of Titanium, Oxygen, Nitrogen and Carbon, respectively. The presence of nitrogen is a strong indicator of O-deficiency, thus the film under study could be ideal for various application such as self-cleaning windows.

LITHOLOGICAL DISCRIMINATION USING SENTINEL-2A AND ASTER OF THE BETHANIE AND GIBEON BLOCKS OF THE NAMA BASIN, NAMIBIA.

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Abstract

The Nama Group, located in central and southern Namibia, comprises a mixed carbonate and siliciclastic ramp succession deposited within a foreland basin on the Kalahari Craton during convergence along two orogenic belts; the Damara belt to the north and the Gariep belt to the southwest. It is divided into upper (Fish River Subgroup) and lower Schwarzrand and Kuibis Subgroups. This study focuses on the lower Nama Group (~550–547 Ma) found within Zebra River Canyon which represents a storm-dominated carbonate ramp developed in a foreland basin of terminal Proterozoic age and the skeletal communities in the Zaris Sub-Basin, and Bethanie Block, Witputs Subbasin. Driedoornvlagte carbonate platform grew in shallow waters where fine-grained carbonate sediment and often shows evidence of early dolomitization. This study made use of multispectral data Sentinel-2A and ASTER which was employed to discriminate lithological units in the semi-arid region of the Nama group. Several image enhancement algorithms, including Band Ratio (BR) and Principal Components Analysis (PCA) were applied to the data for lithological mapping, to achieve a supplemental upgraded geological and lithological map of the blocks (Gibeon and Bethanie) through the use of advanced spatial images. Colour composites based on existing and newly formulated band ratios were used to better enhance lithological units, moreover, newly formulated band combinations for both ASTER and Sentinel-2A were also implemented to the study areas. Other objectives of the study focused on the construction of lithostratigraphic logs based on systematic sampling done at 5-10m intervals in the locations of Zebra River and the Driedoornvlaagte carbonate platform, interpretation of petrographic and geochemical data from Zebra River and Driedoornvlaagte carbonate platform to understand the evolution of the sedimentary facies.

Keywords: Nama Group, Sentinel-2A, ASTER, Image Enhancement Algorithms

FUNGAL ENDOPHYTE ASSOCIATED WITH BAMBARA GROUNDNUTS AND BLACK-EYED PEAS (MAKUNDE) AS BIORESOURCES FOR PANCREATIC LIPASE INHIBITORS.

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Abstract

Obesity is linked to the pancreatic lipase enzyme, which is involved in lipid metabolism. Orlistat is still the only medication authorized for long-term obesity management, and to successfully reduce the incidence and prevalence of obesity, more effective anti-obesity medicines are required. In recent years, fungal endophytes have emerged as a viable source of plant secondary metabolites. Endophytic fungi have produced a plethora of interesting secondary metabolites with antibacterial, antifungal, insecticidal, antioxidant, cytotoxic, and anticancer effects. Inhibition of dietary triglyceride absorption via inhibition of pancreatic lipase (PL) has recently been proposed as a fresh technique for the treatment of obesity, as this is the principal source of extra calories. PL inhibiting action is found in a variety of microbial metabolites. The goal of the project was to isolate and determine the pancreatic lipase inhibitors potentials from the fungal endophytes associated with Bambara groundnuts (*Vigna subterranea*) and Black-eyed peas (*Vigna unguiculata*). The inhibitory effect of endophytes isolated from Bambara groundnuts and Black-eyed peas on pancreatic lipase is demonstrated. The Bambara groundnut and black-eyed peas samples were sterilized and crushed for the growth of fungal endophytes, then isolated and fermented, orlistat and the extracts were prepared respectively and finally, anti-obesity assay was performed for PL activity of fungal endophytes. The current study tends to cover the isolation and identification of different endophyte of Bambara groundnut and black-eyed peas. Lipase inhibitory evaluation was performed in all endophytes. Lipase inhibitory activity was observed in extracts from the different endophytes, with an IC50 of 10 g/ml. The lipase inhibitory activity of Aspergillus sp. extract displayed promising results. The current investigation shows that the endophytic community found in Bambara groundnuts and black-eyed peas has strong lipase inhibitory action. Aspergillus is a potential endophyte and thus it's extract may well be utilized to create a possible obesity treatment medication.

Keywords: Endophytic fungi; Obesity; Orlistat; Pancreatic lipase (PL), Lipase inhibitory activit

A comparative analysis of the abundance and the composition of algae species in the Maturation Ponds at Gammams Waste Water Treatment Plant.

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Abstract

Namibia is the most semi-arid country in Southern Africa, the city's water supply is from reclaimed water and three surface dams which are fed by ephemeral rivers around Windhoek. Polluted water affects different uses such as household water use, recreation and fishing. The city of Windhoek continues to face a number of challenges in providing quality water to the growing population. These challenges include the low recharge and high evaporation in water sources, the scarcity of water sources to support the growing population and also the treatment of high content of algae in the water which makes the treatment process of water to be slow and costly. The raw water for the reclamation plant in Windhoek is a final product of the Gammams wastewater treatment plant and is supplied directly after the final polishing step of the maturation ponds. The purpose of this study was to observe the long-term patterns of the algae species in the maturation ponds over a five-year period. In many parts of the world, health problems and diseases have often been caused by discharging untreated wastewater and have resulted in the spread of diseases, fish kills and destruction of other forms of aquatic life'. The objectives were to compare the relative abundance and the algae species composition in the maturation ponds and in relation to years; as well as to determine if there is an association between the algae species and the selected ponds. Historical water quality data was obtained from the City of Windhoek's laboratory, for the period of January 2016 to December 2020, this was done monthly every year, the filtration method was used to generate the results. The Hierarchical cluster analysis showed that there is no significant difference in the species composition among the selected ponds (2016 = 67%, 2017= 58 %, 2018 = 67 %, 2019 = 69%, 2020 = 84%), the ponds formed similarity clusters, the highest percentage similarity between the ponds was observed in 2020 with the clarifier forming an outlier at 62%, the similarity between the ponds relatively increased over the years. The years formed two clusters (2016 and 2017 =70%; 2018, 2019, 2020 =76 %), there was a change in the similarity of algae species which were observed in 2016 and 2017 compared to the ones in 2018 until 2020, but the difference was not significant. The Kruskal-Wallis test showed that there is a significant difference in species abundance between the species and the ponds (Clarifier, $p = 0.001$, $p < 0.05$; Pond B1 $p=0.006$, $p < 0.05$; Pond B4, $p = 0.03$, $p < 0.05$; Pond B6, $p = 0.000$, $p < 0.05$; Pond B8, $P = 0.001$, $p < 0.05$), it was also revealed that there is a significant difference in abundance of species over the years (2016, $p = 0.000$, $p < 0.05$; 2017, $p = 0.02$, $p < 0.05$; 2018, $p = 0.000$, $p <0.05$; 2019, $p = 0.000$ $p < 0.05$; 2020, $p = 0.000$, $p < 0.05$). The algae species abundance decreased from the Clarifier to Pond B8 and from 2016 to 2020. The Chi-square test revealed that

there is no significant association between the species and the ponds (χ = 98.658, df =192, p = 1, p > 0.05) and between the species and the years (χ = 152.630, df = 232, p = 1, p > 0.05), hence the null hypothesis was retained.

Comparative analysis of gastro-intestinal Fungal and Bacterial communities of two Nguni herds from different geographical locations in Namibia

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Abstract

Nguni cattle are well adapted for the Namibian climate; they have a tolerance to drought and are a very fertile cattle breed (Maciel *et al.*, 2016). Existing literature covers breeding, meat production and genetic makeup of the Nguni cattle (Mapholi *et al.*, 2016; Nesengani *et al.*, 2018; Madilindi *et al.*, 2020; Mkize and Zishiri, 2020). This study is aimed to investigate the differences in bacterial and fungal diversities from two herds of Nguni cattle's dung that are in two different geographic locations.

DNA was extracted directly from the fecal samples using a Zymo quick-DNA midiprep plus kit, as per the manufacturer's instructions. The extracted DNA was then be subjected to PCR amplification using the 16S rRNA universal primers (27F and 1492R) and fungal primers (ITS1 and ITS2). The results for the PCR amplification is still pending.

IMPLEMENTATION OF A GENDER BASED-VIOLENCE REPORTING SYSTEM FOR THE NAMIBIAN POLICE

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Abstract

Rape, domestic violence, sexual harassment and forced marriages are most prevalent forms of gender based violence cases in Namibia. The world statistics is showing an increase in the number of rape and other cases related to violence. The Namibian police has been using the paper-based system for a century. However, the paper-based dockets are easily lost, stolen or placed in the wrong facility. Since, the technology is slowly taking over in Namibia and the transformation of paper-based dockets to electronical dockets is still in the infant stage. The main objective of this study was to design a gender-based violence system that allows people to report cases anonymously which in turn to assist the Namibian police in alleviating gender-based violence in Namibia. Furthermore, the system keeps the reported cases safe for future references. The study used a qualitative design approach. The study used survey monkey to create an online questionnaire, which was for both the public and the Namibian police employees. The aim of the questionnaire was to get a deeper insight and understanding of the affected parties. The results showed that people are not entirely satisfied with how the Namibian police currently handle reported crimes. Moreover, people indicated that they would prefer reporting a case anonymously rather than doing it physically to avoid stigma and discrimination. In conclusion, the public will see this system as a safe and reliable platform. Although, this system may not entirely eliminate gender-based violence in Namibia, but it can be a start. It is recommended for the system to be translated in all the 13 recognized languages of Namibia.

Keywords: *Gender-based violence system, Alleviating, Namibia*

IDENTIFICATION AND QUANTIFICATION OF PLASTIC DEBRIS FROM SEDIMENT: A COMPARATIVE STUDY BETWEEN GOREANGAB AND AVIS DAMS IN WINDHOEK, NAMIBIA.

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Abstract

Plastics are the most widely used materials in modern day life, and equally the most disposed, leading their ubiquitous environmental accumulation. In aquatic environments, plastic debris are found distributed in the sediment as well as in the water body. Given their persistence, accumulation of plastic debris in aquatic environments is known to affect animal health and diversity, and ultimately human health. While the occurrences of plastics debris have been studied in the majority of the marine environment, little is known about the occurrence of plastic debris in fresh water systems of Namibia. This study was aimed at comparatively identifying and quantifying plastic debris in sediments collected from the Goreangab and Avis dams in Windhoek. After sample processing, different plastic debris were recovered from only the Goreangab Dam sediments, and none from the Avis Dam. Plastic debris comprised 13.65% of the total recovered debris. This included of macroplastics (mainly plastic bags, sweets and chips packaging bags), beverage bottle caps (including the plastic material found inside metal cabs), personal care and house hold detergents. This study is important from a socio-ecological point of view since it is the first of its kind to assess the presence of plastic debris in fresh water system of Namibia. The outcome of the study can contribute to environmental policy making.

Key words: Plastic debris, aquatic environment, persistent pollutants, environmental health, fresh water, environmental policy.

OOP Helper: A Gamified Mobile Application for Object-Oriented Programming Concepts

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Abstract

Teaching and learning Object Oriented Programming (OOP) requires appropriate and effective pedagogical approaches. One of the problems that occur while learning OOP concepts is that only fewer students have an interest or are motivated in learning OOP concepts. This leads to most students either dropping out or repeating the OOP module. The university however can embrace mobile technology to complement and support the existing eLearning platform to deliver OOP learning concepts effectively. Based on this background, this study aimed to gamify the OOP concepts through a Gamified mobile application to complement the current OOP teaching practices and improve student performance. This study applied a qualitative research approach with a phenomenological research design that studied the effect and students' experiences, perceptions, and perspectives of the experimented mobile application. A waterfall software development model has been adopted to guide the development of the "OOP Helper". A survey with open and closed questions was administered to computing undergraduate students at UNAM who pilot tested the learning tool and expressed their experiences and opinions. A random sampling technique was used to select from the targeted population. The survey results showed that the OOP Helper game provides a helpful and motivating platform to learn OOP concepts. The study recommends educational institutions consider offering gamified learning to their students for improved results. Future work includes the development of the iOS-based application.

An analysis of X-ray Photoelectron Spectroscopy (XPS) spectra data for Titania (Tio_2) thin films.

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Abstract

Self-cleaning applications of metal oxide thin films such as Titania, Zirconia and Zinc Oxide with hydrophilic/hydrophobic and photocatalysis properties for applications in energy and environmental areas are highly useful. The self-cleaning properties are often influenced by the chemical state of the thin films. X-ray photoelectron spectroscopy is often employed to analyse the chemical state of this thin films. In this research Titania thin films fabricated by spray method of molecular precursor solution were characterized by X-ray photoelectron spectroscopy. The results obtained from XPS indicates that the thin film contains Titanium, Oxygen, Nitrogen, and small amount of Carbon. That is; the peaks at binding energy values of 458.94 eV, 530.74 eV, 396.94 eV, 285.14 eV, represent the presence of Titanium, Oxygen, Nitrogen and Carbon, respectively. The presence of nitrogen is a strong indicator of O-deficiency, thus the film under study could be ideal for various application such as self-cleaning windows.

Isolation and characterization of Actinomycetes from Southern Namibian soil (Oranjemund)

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Abstract

Actinomycetes are the most widely distributed groups of microorganisms in nature, primarily inhabiting the soil environment. They are the most economically and biotechnologically valuable prokaryotes, and have been recognized as sources of several secondary metabolites such as antibiotics. Coastal environments in particular cover almost 40% of the earth surface and are an infinite source of novel microorganisms which have a wide range of biological applications. The main objective of the study was to collect soil samples from Oranjemund in the coastal region of Namibia and to isolate, purify and characterize different soil actinomycetes. The soil samples used were randomly collected from a backyard (15-6th Avenue) in Oranjemund, Southern Coast of Namibia. The collected samples were transferred to the microbiology research laboratory, in the department of biological sciences, UNAM, Windhoek, Namibia. The soil samples were serially diluted and spread on two types of media which were the ½ Zhang' Starch Soil Extract agar (½ ZSSE) and water yeast extract agar which were supplemented with 10mg/L nalidixic acid and 50mg/L cyclohexamide for inhibition of bacteria and fungi, respectively. Four colonies were observed. Two grey colored, powdery textured colonies were observed from the ½ Zhang' Starch Soil Extract agar (½ ZSSE) and two white colored, powdery textured colonies were obtained from Water Yeast Extract agar. DNA was isolated from the obtained colonies and amplified using Polymerase Chain Reaction (PCR). Further, the isolates were subjected to Gram staining. In addition to that, physiological tests were done to further characterize the isolated pure cultures. The PCR product was packed and sent to Inqaba Biotech (Pretoria, South Africa), for sequencing analysis, and the results are currently awaited. However, provisional results most likely show that actinomycetes were isolated and characterized from Oranjemund (Southern Namibia) and that this town should be considered for future researches.

Key words: novel, actinomycetes, Isolation, ½ Zhang's Starch Soil Extract, water yeast extract agar, characteristics, Oranjemund.

Characterization of uraniferous leucogranites in the Husab mine

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Abstract

Namibia, the 6th largest producer of uranium globally, has produced uranium from Pan African granite-hosted (primary) deposits since 1976, and from palaeochannel deposits since 2007; exporting 3 472 tonnes U in 2016. The large granite-hosted deposits at the Husab Mine are expected to add over 5 700 tonnes U/year at peak. Husab mine is situated within the southern Central Zone (sCZ) of the polydeformed (D1-D3) Damara Belt. The sCZ comprises highly deformed Neoproterozoic sediments, unconformably draped over rheologically competent granite-gneiss domes and inliers of a Paleoproterozoic basement. The Leucogranites in this belt are characterized into A, B, C, D, E, and F-types based on the classification scheme of Nex and Kinnaird (1995), which has not been done for the Husab deposit.

In this study, the leucogranites in the Husab deposits are distinguished and characterized. The research techniques applied in the study included a review of historical data, pit wall mapping, lithological logging, thin section petrographic studies, geochemical analyses, and uranium ore mineralogical investigation. The study focused on the primary-hosted uranium deposit concentrating on the zone 1 and 2 of the Husab deposit. In addition, the stratigraphic positions of the leucogranites were established.

At Husab Mine, the B-types are least abundant and are localized to the Kuiseb Formation, the C-types are most abundant and intrude the whole stratigraphic sequence. The D-types are emplaced within the Chuos, Rossing, and Khan Formations and at the Khan-Rossing-Chuos-Karibib Formation boundaries. The B and C- types are post D1- D2 but pre D3 deformation and are barren in uranium. D-types are post D1- D2- D3 deformation, these are uranium enriched and cross-cut the B and C-types making them the youngest of the intrusives. Uranium and thorium and U/Th ratios distinguish and characterize the Husab sheeted leucogranites well. The D-type contain the highest concentrations of uranium (19 ppm to 90 ppm) with a U/Th ratio > 1. The D type is characterized The C-type sheeted leucogranites show the highest thorium concentrations (15ppm to 250ppm) with a U/Th ratio <1.

The B-type sheeted leucogranites have lower concentrations of uranium (0.5ppm to 1ppm), thorium (2ppm to 16ppm), and F has barely contained the Uranium. Therefore, based on the geochemical analysis and the uranium ore mineralogical investigation the uraniferous Leucogranite in the Husab mine is D-type. Exploitation and further exploration in the area should target.

Antioxidant, and antimicrobial properties of *Vachellia erioloba* and *Opuntiastricta*, and chemical characterization of volatile compounds

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Abstract

Vachellia erioloba, commonly known as *Acacia erioloba* belongs to the family Fabaceae, it is native to Namibia, Botswana and South Africa. The plant is used traditionally to treat ear infections, headaches and toothaches. *Opunta stricta* belongs to the family Cactaceae, it is native to America and also found in Namibia. The plant is used in the management of diseases that involves oxidative stress, especially diabetes, obesity and cancer. The present study was designed to investigate the antioxidant and antimicrobial activity of *Vachellia erioloba* and *Opuntia stricta*. The characterizations of the volatile constituents present in these plants were also identified. The radical scavenging capacity of the extracts was estimated using 2,2-diphenyl-1-picrylhydrazyl (DPPH) and the total antioxidant activity was determined using ferric reducing antioxidant power (FRAP) assay. The chemical characterization of the volatile constituents of the extracts was performed using gas chromatography–mass spectrometry (GC–MS). DPPH radical scavenging assay revealed excellent antioxidant potential for the seed pods of *V.* erioloba with IC_{50} of 1.973 ± 0.012 µg/mL. For the seeds of *V. erioloba* IC50 of 972.0 ± 22.3 µg/mL was obtained. The IC_{50} values of 53.74 ± 0.18, 153.8 ± 0.9, 258.7 ± 0.7, and IC50 > 1000 µg/mL for the seeds, flowers, fruits and leaves of *O. stricta*, respectively. The reducing power of both *V. erioloba* and *O. stricta* extracts increased as the concentration of the extract increased, which confirmed the presence of antioxidants in the extracts. The GC-MS analysis of *V. erioloba* seed extracts revealed the presence of steroid, fatty acid, esters and tritepenoids. The results from the study show that *V.*

erioloba and *O. stricta* extracts possess antioxidant properties, making these plant species good antioxidant agents. The findings of this study will add value to the traditional uses of *V. erioloba* and *O. stricta*.

Keywords: *Vachellia erioloba*, *Opuntia stricta*, Antioxidant activity, antimicrobial activity, 2,2-diphenyl-1- picrylhydrazyl (DPPH), gas chromatography–mass spectrometry (GC–MS)

Extraction of Dye Pigments for Dye Sensitizers applications, from Leaves of Omwoolo (*Terminalia Sericea*) using ethanol solvent: Photophysical property Studies

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Abstract

This study focuses on how dye pigments can be extracted from selected plants (*Terminalia sericea*). The dye as extracted using ethanol solvent and the absorption properties were observed studied using UV-Vis and fluorescence spectroscopy. The column chromatography was performed in order to isolate chlorophyll **a** from chlorophyll **b**. The best extracts were carried on ethanol + 1%HCl, where the dyes showed absorption peaks upon UV analysis. In relation to column chromatographic fractions, it was derived that chlorophyll a (dark green) was more present and absorbed, indicating and proving that both chlorophyll a and b do absorb light. Thus, chlorophyll a particulary is highly suitable in capturing light photons, which can potentially be used in the conversion of light energy to chemical energy, for photo electrochemical cells. The ethanolic extract from *Terminalia sericea* has displayed highly fluorescence properties, which is a basic requirement for functional materials, whose applications, apart from solar materials, range from light emitting diodes, paints, aerosols, sensors and many others. Thus, the optical properties displayed by extracts from (*Terminalia sericea*) have a high potential of harnessing dye sensitizer for improved photon capture.

ANALYSIS OF TIMELINESS AND COMPLETENESS OF BIRTH AND BIRTH REGISTRATION IN NAMIBIA EVIDENCE FROM VITAL STATISTICS NAMIBIA (2010 TO 2020)

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Abtract

Timeliness of birth refers to a birth that has been registered within twelve (12) months from the time of occurrence or else that birth will be registered as late birth registration. Completeness of birth as the number of events registered within a year divided by the projected number of births for that particular year. The right to be recognized as a person before the law is a critical step in ensuring lifelong protection and is a prerequisite for exercising all other rights. A birth certificate may also be required to access social service systems, including health, education and justice. United Nations General Assembly in September 2015 placed birth registration firmly on the international development agenda. Under Goal 16: provide legal identity for all, including birth registration. Children without birth certificates are at risk of lifelong exclusion from fundamental benefits and rights, including access to education, health services, conditional cash transfers, and pensions. Links between lack of birth registration and benefits, rights, and vulnerabilities have not been rigorously studied.

The investigation utilized optional information from Namibia Statistics Agency (Namibia Vital Statistics Report). The data for this study is obtained from all the 14 regions. A trend analysis was done using the proportion registered to establish the trend of birth registration completeness over the ten years of review for the entire country and by geopolitical regions. Logistic regression was used to compare the registrations between 2010 and 2020. Child-level predictors of registration include age and gender, as female children had a lower chance of birth registration than their male (being the reference category) counterparts and it appears to be the only statistically significant predictor. These investigations are important given the generally poor quality of census data collected in many developing countries, particularly those in sub-Saharan Africa. Education also plays a significant role on the decision of women whether to have their children's birth registered or not. Some program policies could also be set by the Ministry of home affairs where it includes demographic dynamics of birth registration and completeness, in order to raise awareness on the importance of the birth registration and completeness to parents and upcoming parents in both rural and urban area communities. If one is to do a similar study, one should try to go further to

evaluate even regions by regions to see which region's births data are complete and which ones are not.

The potential of Moringa oleifera leaf extract on the growth and germination of pearl millet.

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Abstract

Moringa oleifera is clasified under the order of Brassicales, class Magnoliopsida and belong to the family of Moringaceae. The Moringa oleifera plants have gained global popularity due to their revered nutritional and medicinal properties. The leaves are used for treatment of a cancers, constipation, stomach pain, high blood pressure's intestinal ulcers, diabetes's and many other. The seeds are important in the management and treatment of ailments such as prostate cancer and improve fertility. There is emerging knowledge on the potential use of Moringa oleifera leaves as growth promoters for important staple crops.
The current study investigated the growth and promoting potential of pulverised Moringa oleifeira aqueous leaf extract on the pearl millet crop (Mahangu) grown under greenhouse conditions at the University of Namibia. Two rows containing 5 replicates of mahangu seedlings were each watered with a different treatment regime of 1:10 (w/v) and 1:20 (w/v) of the aqueous solutions of pulverised Moringa oleifera leaf-extract. The 5 replicates of the control seedlings were only treated with tap water. Measurements of Mahangu seedling heights were taken every 2 days for a period of 40 days. The data were subjected to One way Analysis of Variance (One Way ANOVA) to determine variations in average growth rate of Mahangu seedlings between the control, the 1:10 and 1:20 treatment groups. There was a significant difference at ($p < 0.05$) in the average growth rate of mahangu seedlings between the control seedlings and the two Moringa oleifera treated seedlings, which may suggest that Moringa oleifera leaf extract enhanced the growth of treated pearl millet.

Key words: Growth; *Moringa oleifera*

Estimation of Crystallite size and Optical band gap of zirconia (ZrO_2) thin film.

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Abstract

Zirconia thin films are very useful for various applications depending on the crystal structure and optical properties. There are various factors that influence physical and chemical structure of zirconia including crystallite size and optical band gap. It is well known that the crystallinity of the thin films can be obtained from the X – ray diffraction (XRD) technique and the transmittance of the thin film can be obtained by using UV-Vis. By employing Williamson - Hall Plot, Scherrer equation and Monshi-Scherrer equation, the crystallite size was calculated and compared. It was revealed that the crystallite sizes of the thin films could be determined as 0.12 nm, 7.08 nm, and 8.42 nm from Williamson – Hall method, Scherrer method and Monshi Scherrer method, respectively. The crystallite size determined by the Monshi Scherrer method was the largest and 0.12 nm was the smallest, which was determined by Williamson Hall plot method. The optical band gap of the thin film will also be discussed.

PETROGRAPHIC AND GEOCHEMICAL CHARACTERISTICS OF THE ALTERED UNIT WITHIN THE ROSH PINAH FORMATION: IMPLICATIONS FOR MINERALIZATION AND TECTONIC SETTING

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Abstract

The Rosh Pinah Formation (RPF) falls within the Neoproterozoic Port Nolloth Zone (PNZ) of the Gariep Terrane, a curved belt stretching from Port Nolloth in South Africa to Rosh Pinah in Namibia and the coastal region of Bogenfels and Luderitz. The Formation is classified as a hybrid between Volcanogenic Massive Sulphides (VMS) and Sedimentary exhalative (SEDEX) deposits (sub-seafloor replacement +seafloor). The RPF hosts an economically important sedimentary-exhalative sulphide deposits of the Rosh Pinah-type in restricted sub-basins and by abundant, late-rift, bimodal but predominantly felsic, extrusive rocks. Additionally, the RPF has an altered unit that has been classified differently over the decades. This study was aimed to primarily focus on the geochemical and petrographic characteristics of the altered unit, and its relation to mineralization in the Rosh Pinah mine, as well as to understand the regional tectonic setting. Samples were collected mainly from diamond drill cores for the preparation of 27 thin sections and 18 polished sections to undertake reflected and transmitted optical microscopic analyses. Samples were analysed for major and minor elements with portable X-ray fluorescence (XRF), trace elements with Inductively Coupled Plasma-Mass Spectrometry (ICP-MS) and X-ray diffraction (XRD) to identify significant minerals present. Partial results indicate high Ba, S contents and high Pb concentrations, this can be due to the abundance of feldspars of which could have been a transport media of Pb from solid solution to the hydrothermal fluid by rock-hot-water reaction. This indicates that the minerals were leached, and precipitated from the hydrothermal fluid in response to changes in physio-chemical conditions, and eventually the type of predominant volcanic piles. Moreover, the results potentially indicate the role and extent of mineralization which the hydrothermal fluids played.

Extraction of essential oils from the leaves of *Azadirachta indica, Eucalyptus globulus* and *Mentha piperita*.

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Essential oils are strongly scented, volatile, multifaceted secondary metabolites produced by natural products and generally isolated by steam or hydro-distillation. They are characterized by strong aroma and are produced by aromatic plants as secondary metabolites. Natural products being the main sources of essential oils are compounds or substances that are isolated from living organisms. The Chemistry of natural products includes the biosynthesis, extraction, identification, quantification, and structural elucidation, physical and chemical properties of essential oils. Essential oils are used in a variety of consumer goods such as detergents, soaps and pharmaceuticals. The main objectives of the study were to extract essentials oils from indigenous plants, so as to study their chemical compositions via phytochemical screening, analyze and purify the oil. The study was significant to the society as it contributed to the indigenous knowledge of the plants.

Phytochemical screening was conducted using methods as proposed by Shehaama. Plant extracts were prepared by drying leaves of *Azadirachta indica*, *Eucalyptus globulus* and *Mentha piperita* plants, mixed with 100mL solvent mixture (1 methanol: 1 hexane). The mixture was then stirred for 1 hour and thereafter filtered using the Vacuum filter, which further subjected to several phytochemical testing of bio-active compounds. The extraction of the oil was done by mixing fresh plant leaves in a solvent of hexane and acetone separately. The plants were left to soak for 24 hours, with stirring involved, this allowed the solvents to pull the oils from the leaves. Thereafter the solvent was evaporated by means of a fume hood which allowed the chemical solvent to evaporate and that left the oil. After the phytochemical test was done, the plants all tested positive for the presence of Fats and oils with *Mentha piperita* having the highest yield and *Eucalyptus globulus* having the least Fats and oils content. All plants studied tested positive for the presence of Alkaloids, with *Mentha piperita* having the highest yield, followed by *Eucalyptus globulus* and then *Azadirachta indica*. All the plants studied gave a negative test for the presence of phytosterols.

In conclusion, essential oils were extracted and their phytochemicals were closely studied. It was then found that from the 3 different plants studied, *Azadirachta indica* tested positive for most of the phytochemical tests, excluding sterols. *Eucalyptus globulus* only tested positive for Phenolics,

Fats and oils, Tannins and Alkaloids. *Mentha piperita* indicated the highest presence of all its positive tests compared to the other two plants. *Mentha piperita* only tested positive for Fats and oils, tannins, terpenoids and alkaloids. After the extraction of oil was done, *Mentha piperita* indicated a relatively higher yield of oil, followed *by Azadirachta indica* and *Eucalyptus globulus* gave the least yield of oil.

The Geochemistry of The Garnet-Biotite Granite Gneiss and The Witwater Leucogranite from the Eendoorn Suite, Fish River Canyon, Southern Namibia.

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Abstract

The Eendoorn suite is extensively distributed in the Northern part of South Africa and in the Southern part of Namibia. Eendoorn Suite consists of variably deformed and sheared megacrystic to porphyroclastic granites and granite gneisses that has a compositional range of alkali-feldspar granite through to granodiorite. The members of the Eendoorn Suite include the Pioneer granodiorite (oldest), the Kinderzitt Granite (~1190 Ma), the Beenbreek Granite (~1210 Ma), the Bokkiesbank Granite (~1214 Ma), the Khaais Granitic Gneiss (~1206 Ma) and the Twakputs Gneiss (~1208 Ma). All the six members of the Eendoorn Suite are named granites or granite gneisses even through the geochemical classification shows that some are more granodioritic in composition. The focus of this study is on the Witwater leucogranite and the Garnet-biotite granite gneiss from the Eendoorn suite that are located at the Fish River canyon, Namibia. This Garnet biotite granite gneiss poses some similar characteristics as the Twakputs Gneiss. The Eendoorn Suite is relatively not well studied in Namibia, most of the studies were done in South Africa. The main-objective of this study is to classify the rock forming minerals by the meaning of endmember calculations using an EPMA instrument and modelling of different applicable phase diagrams. REE have been analysed using ICPMS. Chondrite, primitive mantle as well as upper and lower mantle normalized Spider diagrams of the LREE, HFSE and HREE has been plotted and compared with several selected granitoid rock from different geotectonic settings worldwide.

In Vitro Assessment of Cytotoxic activity of medicinal plants used to treat Diabetes Mellitus in Hardap Region, Namibia.

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Abstract

Diabetes Mellitus (DM) is a global health burden, with reported cases of 463 million people in 2019 and further projected increase of 25 % in 2030 and 51 % in 2045. The side effects associated with the available anti-diabetic drugs, have necessitated the need for the development of safer and more effective alternatives. In Namibia, several plants, *C.tridens, S.salmoniflorum, Z.decumbens , H.fruticulosa* and *S.salmoniflorum* have been identified as being used by communities in the Hardap region to manage DM, however, there is little scientific evidence about whether the plants work, are safe for human consumption. The present study was conducted to assess the cytotoxicity of of ethanol, methanol and aqueous extracts of*C.tridens*, S.*salmoniflorum, Z.decumbens* , *H.fruticulosa* and *S.salmoniflorum* , using MTT assay. NIH/3T3 ATCC CCL-92 cell line was used for this study, briefly cells were seeded at $1x10^5$ and 100 µl cell suspension per well for 48 hours. The cells were exposed to various plant extracts at different concentrations (100 µg/ µl -3.125 µg/µl) for a further 48 hours. Thirty µl MTT (5 mg/ml) was added to each well in the dark and incubated at 37 º C for 4 hours. DMSO at 50 µl was used as a solubilizer for 30 minutes at 37 º C and quantified spectrophotometrically at 570 nm. The percentage cell viability was calculated as per the formula; % cell viability = (absorbance of experiment/absorbance of control (untreated cells)) (X 100). IC_{50} revealed no to minimum levels of toxicity with IC_{50} greater than 20 µg/ml except for *C.tridens* methanol extracts with IC_{50} of 0.2359 µg / ml. A statistically significant difference across the different concentrations X^2 (5, N=270) = 48.31, $p < 0.001$ and different plants X^2 (4, N=270) =40.4, $p < 0.01$was revealed. These observations suggest extracts of *C.tridens, S.salmoniflorum, Z.decumbens*, *H.fruticulosa* and *S.salmoniflorum,* plants that have been previously reported to be used by communities in Hardap region to treat DM have no cytotoxic effects in vitro and further studies are being conducted to confirm their anti-diabetic effects.

Keywords: Diabetes Mellitus (DM), Cytotoxicity, Cell-line, MTT, $IC_{50,}$ cell viability

The influence of isolated *Boscia albitrunca* under-canopy environment on herbaceous species composition, richness, diversity and biomass on Farm Judaa, Hardap Region, Namibia.

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Abstract

A study was done to investigate the effects of under-canopy environments of *Boscia albitrunca* on herbaceous species composition, richness, diversity and biomass. The research was conducted at Farm Judaa in the Hardap Region. The farm is located about 100 kilometers south-east of Rehoboth in Mariental District. A stratified systematic sampling procedure was followed. Fifteen isolated trees of *Boscia albitrunca* were randomly selected and under each tree, the area was stratified into that under the tree and that in the open veld. For each tree, two 1m x 1m quadrats were demarcated under the tree canopy while another two were demarcated in the adjacent open area. In each quadrat, forbs and grasses were identified and recorded; the percentage herbaceous cover was also visually estimated. The dominant life form (forbs or grasses) was also recorded. All herbaceous plants in the quadrat were clipped at ground level for the first 10 trees using a pair of secateurs for biomass measurements. A Mann Whitney U test was used to compare species richness and diversity since the data were not normally distributed when tested with a Shapiro-Wilk test. A two-sample T-test was used to test for differences in biomass between the two environments. A Hierarchical Cluster Analysis (HCA) was used to compare species composition between the under-canopy environment and the open veld. Herbaceous biomass, species richness and diversity all did not differ between the two environments ($P>0.05$). Since most of these under-canopy environments still receive sunlight in the mornings and afternoons, they are not completely shaded, leading to the similarities in biomass, diversity and species richness. However, HCA showed a clear difference in species composition between the two environments, with a 50% similarity. These differences can be explained by the effects of livestock use of shade under trees compared to the open veld. Forb species found under trees and those in the open veld were generally different, with the shade-tolerant ones found under the trees.

Key words: *Boscia albitrunca*, Farm Judaa, Herbaceous biomass, Namibia, species composition, species diversity, species richness

USING NEURAL NETWORKS FOR VISUAL DEEPFAKE DETECTION

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Abstract

A deepfake video is defined as an altered video created by manipulating an original video using advanced machine learning techniques (Simranjeet, 2020). To give a brief introduction, this study looked at the rise in deepfake technology, the increased accessibility to the technology that is used to generate deepfake videos and the subsequent ramifications was also be assessed. There has certainly been a remarkable rise in the quality of deepfake videos (Chung, J. et al 2017) and as seen in any technological leap, there is a need to thoroughly investigate exactly what this means for our current understanding. Some deepfake videos have become so indistinguishable from an original that the line between what is real and what is fake has become blurred. This can be a breeding ground for misinformation.This paper proposes an automated method to efficiently detect facial tampering in videos making use of the same artificial intelligence technology behind this latest technological advancement. There have been other methods that were developed to detect deepfakes. This study will evaluate those methods and assess how they can be improved or suggest alternative methods to achieve more accurate outcomes. The methods used to carry out this study were split into two phases. First I conducted an empirical assessment of how well the human eye fared at detecting deepfake videos. The second phases involved developing a system that can detect deepfake videos by using the proposed option of neural networks and assessing how well it fared against the human eye and other pre-existing deepfake detection systems. The results of the study found that the human eye cannot easily distinguish deepfake videos from real ones. It also found the system I developed to be much more efficient at detecting deepfake videos than the human eye and better in some instances than some pre-existing conclusion drawn from the study was that there is an urgent need to come up with counter solutions for the rapidly increasing quality of realistic deepfake videos and that neural networks are a viable and sustainable means to this end.

Keywords: deepfake, neural networks, detect

Identification and antibiogram characterisation of bacteria isolated from randomly selected handwashing water samples among consumers in the Northern Industrial Area of Windhoek

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Abstract

The hands of food consumers, especially those that buy street vended foods, are most likely to be contaminated with various microorganisms from various sources including but not limited to their workplaces, taxi seats, and surfaces they touch while going about their business. The researcher's personal observation is that when such consumers buy fruits from street vendors, most of them wash neither the fruit nor their hands. As a result, they are likely to contaminate the food while they eat, eventually getting infected themselves. This research was carried out to determine the microbiological quality of the hands of customers at the point when they were buying fruits from street vendors in Windhoek, Namibia, and to determine the antibiotic susceptibility profiles of the isolated organisms. Hand wash water samples were randomly obtained from Street food consumers in a sterile polyethylene bag, where they washed their hands in distilled water. The bag was carried in a cool box up until the University of Namibia's laboratory for testing. The isolated bacteria were differentiated according to their colony morphology and were identified as isolate A, B, C, up until isolate J. Subsequently, they subjected to biochemical characterisation as well as antibiotic sensitivity testing using the Kirby Bauer disc diffusion. Biochemical testing showed that some isolates were methyl red negative and others tested against the citrate utilization tests showed positive results, potentially indicating the presence of bacteria such as *Salmonella, Edwardsiella, Citrobacter, Escherichia coli, Shigella, Morganella, Yersinia,* e*nterobacter aerogenes and Klebsiella pneumonia.* The antibiogram result indicated that All isolates were sensitive to chloramphenicol and ciproflaxin. Of the isolates, 66.67% were resistant to penicillin and 33.33% were susceptible. 22.22% of the isolates were susceptible to erythromycin, while 77.78% were resistant and finally all the isolates were susceptible to tetracycline. Taken together, these results indicate that tested, the isolated bacteria are potential pathogens to humans. Their consumption and presence may pose a risk of hand borne diseases, and that good hygienic practices of consumers should be required to ensure public health safety.

Keywords: Handwashing, bacterial hand contamination, antibiogram, microbiological assessment, Namibia

Synthesis of ZnS nanoparticles using *Boscia Albitrunca* plant extracts for the photocatalytic degradation of methylene blue and rhodamine B dyes

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Abstract

Photocatalytic properties play a significant role in the use of ZnS as a photocatalyst and its photocatalytic behaviour is influenced by improving its structural properties. In order to change the structural properties of ZnS, the selection of the synthesis method of ZnS plays a very important role. Biological methods of synthesis have been found to be more suitable for improving the structural and photocatalytic properties of ZnS. The Degradation of dyes can be used to study the photocatalytic activity of photocatalysts. In this study, the first time bio-synthesis of ZnS nanoparticles using *Boscia Albitrunca* plant extracts as a capping agent, is reported for the photocatalytic degradation of methylene blue and rhodamine B dyes**.** Methylene blue and rhodamine B dyes were photo reduced using 10 mL, 20 mL, 30 mL, 40 mL dilutions of the plants extracts in 100 mL of distilled water. The degradation of methylene blue dye was done under UV-light degradation for 4 hours at the maximum wavelength of each dye for each dye respectively. From the results obtained it has been observed that the biosynthesized ZnS nanoparticles decreased the photocatalytic activity of the nanoparticles compared to the pure ZnS nanoparticles for degradation of methylene blue. The photocatalytic degradation of pure ZnS nanoparticles showed improved degradation efficiency compared to biosynthesized ZnS nanoparticles from plant extracts in methylene blue with 20 mL plant extracts giving the highest absorbance and lowest percentage degradation. For the degradation of Rhodamine B, the biosynthesized plant extract showed a slight improvement on the photocatalytic activity of the ZnS nanoparticles where 30mL plant extract gave the highest percentage degradation (17%) compared to the rest of the plant extract concentrations as well as the pure ZnS nanoparticles and the untreated dye showed the highest absorbance and the lowest percentage degradation rate. Overall, the biosynthesized plants extracts degraded rhodamine B dye whereas it has a negative impact on the degradation of methylene blue.

COMPARATIVE STUDY ON VALUE CHAIN, YIELD, AND NUTRITIONAL ASPECT OF NAMIBIAN COMMERCIAL MUSHROOMS CULTIVATED ON POST-HARVEST ENCROACHER BUSHES AS SUBSTRATES.

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Abstract

Mushrooms have numerous medicinal properties, they are used to treat different ailments such as cancer, obesity and high cholesterol. Biomolecules such as proteins lipids, nucleic acids often go through oxidative damage due to excessive presence of free radicals in the body which threatens human health, to prevent this, a balance in free radicals and antioxidants needs to be attained. In addition, mushrooms are rich in antioxidants, polyphenols and numerous biological compounds, thus can be used to supplements human health. As a result, mushrooms have gained interest around the world, not only because mushrooms are easily cultivated or their contribution to employment and reduce food scarcity, but also in resent pandemic years were found to be effective in the battle against COVID-19 pandemic due to their antiviral properties. In Namibia, mushroom cultivation is not commonly practised due to unfavourable climatic conditions, lack of growing substrate and suitable mushroom strains for the dry climate in Namibia. Several projects have been initiated in the country with the effort of the Zero Emissions Research Initiative (ZERI) project at University of Namibia (UNAM) and the Ministry of Agriculture, Water and Land Reform (MAWLR) to promote mushrooms cultivation in Namibia. The RUFORUM funded project came up with an idea to promote mushroom cultivation, while at the same time helping to combat bush encroachment among the farming communities in the areas of Okondjatu constituency in the Otjozondjupa Region where problems of bush encroachment are prevailing. Furthermore, production of mushrooms using available local growing media could contribute to food security, employment creation and sustainable use of natural products. Therefore, different encroacher bushes and other related crop residues can be studied to establish the variation of mushroom nutrition and therapeutic properties that feeds on different substrates. This review aims at investigating the importance of mushrooms cultivated at local levels using available materials as growing substrates.

Keywords*:* Mushrooms, employment creation, nutrition, Bush encroachment, substrates

Water analysis

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Abstract

Surface water is not enough to meet the increasing populace which has led to groundwater use as an alternative source globally. Among the various sources of water, groundwater is considered to be the safest source of drinking water. However, due to rapid industrialization and population growth, the groundwater resources are getting polluted with harmful contaminants. According to the World Health Organization (WHO), about 80 percent of all diseases in the world are directly or indirectly related to the contamination of water and 6.6% of Hardap Region has unsafe drinking water according to WHO guidelines. The aim of this study was to assess the physic-chemical and microbial parameters of groundwater in Hardap region. Two different groundwater samples were collected from Hardap region in order to identify the contamination problems. A number of parameters such as pH, turbidity, conductivity, biochemical oxygen demand, dissolved oxygen, hardness, phosphates and chlorides, sulphates were analysed for each water sample. The parameters were determined using standard procedures. The results showed that the samples were highly chlorinated, hard and phosphate. Hence, for the supply of safe drinking water to the larger number of people in such a rural area, this study recommends suitable treatment to produce safe drinking water depending on the main critical pollutant to reduce illnesses due to water contamination, action should be taken to improve wastewater treatment in rural areas to improve and safeguard groundwater which are sources for drinking needs and systematic monitoring of groundwater quality.

EXTRACELLULAR ENZYMATIC ACTIVITIES OF ENDOPHYTIC FUNGI ASSOCIATED WITH *HOODIA* SPECIES

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Abstract

The *Hoodia* species remains unexplored as a source for enzymes with various potentialities. It is well established that endophytic fungi produce enzymes and secondary metabolites. This study aims to evaluate the extracellular enzymatic activities of endophytic fungi associated with the *Hoodia* species as a potential sustainable source of enzymes with use in different industrial sectors. The production of extracellular enzymes was assessed by growing each endophytic fungus on a solid media containing specific substrates. Further quantification was done for each endophytic fungus that displayed a positive result in the screening process. 58% of isolates were positive for amylase, 16% were positive for phosphatase, 42% were positive for proteose, and 41% were positive for lipase enzymes. Thus, the *Hoodia* species may be considered as a potential renewable source for extracellular enzymes. It is also noteworthy that the study's result is only applicable to one plant species's extracellular enzymatic activity of its fungal endophytes.

Analysis of wind data, at Schlip - Namibia, for wind power production

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Abstract

Wind energy is a good and clean way to produce power, especially for Namibia that has insufficient energy, for electricity production, for its continuously growing energy demand. Although Namibia has high potential for wind power production, research has to be done in order to construct a productive wind farm. This research project focuses on analyzing wind data collected at Schlip, and is an evaluation of whether the site is suitable for wind power production. It determines the most suitable wind turbine for the site, and estimates the minimum and maximum power that may be produced. For this analysis the following important components were evaluated: the air density was calculated using the air density equation, the wind speed probability function was evaluated using the Weibull distribution function, and the Weibull distribution function parameters were found using the empirical method of Lysen, The average power available per unit area of the wind turbine rotor, which is the same as average wind power density, was estimated using the wind power density equation and demonstrated using a graph, from which the possible maximum and minimum wind power production was estimated. The results of the research show a high wind power density, which is suitable for wind power production at Schlip using a horizontal axis wind turbine.

Synthesis, Partial-Characterization and *In vitro* Antimicrobial Activity of 8-Hydroxyquinoline Thiosemicarbazide derivatives

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Abstract

Over the years, some bacteria have developed resistance to commonly used antibiotics and this presents a global public health problem. It is estimated that resistance to antibiotics has caused thousands of deaths, and financial losses that run into billions of dollars annually. This necessitates the search for new and better antimicrobial drugs with new modes of action. In the past few decades, interest has been growing in gaining insight into the properties and transformations of thiosemicarbazide, 8-hydroxyquinoline and their derivatives due to their appreciable pharmacological activities. Quinoline has attracted considerable attention as a privileged heterocyclic scaffold, due to its binging groups.

It is envisaged that 8-hydroxyquinoline can afford potent and specific ligands for diverse biotargets via structural modifications of functional groups. Thiosemicarbazide derivatives display biological activities like antitubercular, fungicidal, anthelmintic, antitumor, antibacterial and antimalarial activity. The biological properties of thiosemicarbazones are often related to metal ion coordination. This project will focus on the synthesis and characterization of novel thiosemicarbazide, 8-hydroxyquinoline derivatives as potential novel antimicrobial agents.

Four target molecules were synthesized using a multistep synthesis comprising chloromethylation of 8-hydroxyquinoline followed by *O*-alkylation of a hydroxybenzaldehyde derivative, using 5-chloromethyl-8-hydroxyquinoline as an alkylating agent. The last step of the synthesis involved Schiff base formation between thiosemicarbazide and the advanced aldehyde intermediate. Yields obtained for the target molecules ranged from 45-89 %. The physicochemical properties of the target compounds were determined using Molinspiration. None of the desired compounds violated

Lipinski's Rule of Five. Molecular weights ranged between 352 and 398, LogP values between 2.83 and 3.53, the number of hydrogen bond donors were between 4-5 and the number of hydrogen bond acceptors were between 6 and 8.

The synthesized compound will be partially characterized using retention factor, melting point and IR spectroscopy. Antimicrobial activity tests against *Escherichia coli*, *Staphylococcus aureus* and *Candida albicans* will be done using the disk diffusion method.

Antioxidants activity of endophytes isolated from *Tapinanthus oleifolius*

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Abstract

Tapinanthus oleifolius is a member of the parasitic mistletoe family. Mistletoes are used by various cultures to treat numerous conditions including inflammatory diseases possibly due to the secondary metabolites produced by endophytes. Endophytes are microorganisms that are found and produce various bioactive compounds in the tissues of most plants including antioxidants. These antioxidants are used for the protection, growth, and overall sustainability of the plants. The objective of this research was to determine the antioxidant activity of bioactive compounds extracted from endophytes isolated from *T. oleifolius*. Endophytes isolated from the leaves of *T. oleifolius* collected from three different *Acacia milifera* hosts, were analyzed. The endophytes were grown on potato dextrose agar and fermented using potato dextrose broth. The majority of the endophytes that were observed were fungal endophytes and only a few bacterial endophytes were observed and isolated, but the study focused mainly on fungal endophytes. Totatl Phenolic content was determined using the Folin-Ciocalteu's method with gallic acid as the standard. Total flavonoid content was determined using aluminum chloride method with quercetin as the standard. Reducing power and DPPH free scavenging assays were conducted and ascorbic acid used as the control. Samples in the DPPH free scavenging assays gave promising results, with IC_{50} values ranging between four and six mg/ml. Although the results are preliminary, *T. Oleifolius* shows great potential as a possible antioxidant.

Determination of Hexavalent Chromium Concentration in the liver & muscle tissue of *Clarias gariepinus* (African sharptooth catfish) from Goreangab Dam, Namibia.

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Abstract

Chromium is a naturally occurring metallic element, Cr II +, Cr III +, Cr V +, & Cr VI are the four states in which the chromium ion can be found. This study focused on hexavalent chromium, often known as Cr VI produced through industrial operations. Hexavalent chromium is carcinogenic, it can be inhaled, ingested in food or water & enter the body through direct contact with the skin. In Namibia food security industry has increased due to the demand of freshwater fish by consumers hence this study was conducted to determine the concentration of heavy metal hexavalent chromium in the liver & muscle tissue of *Clarias gariepinus* (African sharptooth catfish) from Goreangab dam in Windhoek, Namibia. This study showed the current condition of *Clarias gariepinus* (African sharptooth catfish) which is pivotal as the public illegally uses the dam for fish consumption despite restrictions due to the dam being polluted. 18 liver & muscle tissue of *Clarias gariepinus* (African sharptooth catfish) were purchased from fishermen at the Goreangab Dam in Windhoek, Namibia. Dry weight samples of liver & muscle tissue were digested in concentrated NHO_3 & subjected to direct spectroscopic method for hexavalent chromium analysis. The study revealed no significant relationship between the levels of heavy metal concentration of hexavalent chromium accumulated in the liver & muscle tissue of *Clarias gariepinus* (African sharptooth catfish) from Goreangab dam ($r = 0.262$, p value $= 0.294 > 0.05$). The study revealed no significant relationship between the levels of heavy metal concentration of hexavalent chromium accumulated in the liver ($r = 0.200$, p value $= 0.427 > 0.05$) & muscle tissue ($r = -.0.137$, p value $= 0.587 > 0.05$) of *Clarias gariepinus* (African sharptooth catfish) from Goreangab dam in relation to the length. The study revealed no significant relationship between the levels of heavy metal concentration of hexavalent chromium accumulated in the muscle tissue ($r = -0.216$, p value $= 0.389 > 0.05$) & liver ($r = 0.060$, p value $= 0.814 > 0.05$) of *Clarias gariepinus* (African sharptooth catfish) from Goreangab dam in relation to the weight. The study revealed there is a significant difference in the level of heavy metal concentration of hexavalent chromium accumulated in the liver tissue (p value $= 2.86 \times 10^{-7} < 0.05$) & muscle tissue ($p$ value $= 4.11 \times 10^{-6} < 0.05$) of *Clarias gariepinus* (African sharptooth catfish) from Goreangab dam compared to the

World Health Organization & Food and Agriculture Organization of the United Nation fish consumption limit. The study revealed there is no significant difference in the level of heavy metal concentration of hexavalent chromium accumulated in the liver & muscle tissue of *Clarias gariepinus* (African sharptooth catfish) from Goreangab dam (*p* value = 0.57 > 0.05). The findings indicate that the liver of *Clarias gariepinus* (African sharptooth catfish) is more prone to hexavalent chromium compared to the muscle tissue but both are significantly higher than the recommended fish consumption limit standard set by the World Health Organization & Food and Agriculture Organization of the United Nation fish consumption limit therefore the consumption of *Clarias gariepinus* (African sharptooth catfish) by Namibians should be monitored in all water bodies in Namibia & consumption prohibited in the Goreangab dam to avoid detrimental health problems caused by heavy metal hexavalent chromium.

Keywords: African sharptooth catfish, Goreangab dam, Heavy Metals, Hexavalent chromium.

Reductive amination of aldehydes with H_2SO_4-SiO_2-$NaBH_4$ catalysts.

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Abstract

One pot route of reductive amination of aldehyde of different sort under heterogeneous or Homogenous catalysts have been widely studied. A convenient method has been developed for the synthesis of secondary amines by a reductive amination reaction of aldehydes by means of sodium borohydride in the existence of SiO_2-H_2SO_4 as an effective, mild, cheap, and recoverable catalysis system under heterogeneous and solvent-free settings at a room temperature. Heterogeneous catalysts (H_2SO_4 – SiO_2 –$NaBH_4$ catalysts) which is the main focus of this research as it is used in synthesis of secondary amines by the reductive amination reaction with an aldehyde, and to characterize the prepared H_2SO_4/SiO_2 catalysts by IR and SEM, also the characterization of the prepared amines by IR. Preparation of the catalyst was simply carried out by placing SiO_2 gel, methanol and H_2SO_4 (dropwise) into an Erlenmeyer flask respectively and allowed to stir for 20 minutes, then heating of solution was made and controlling the temperature (45 °C -50 °C range). And a white powdery product of H_2SO_4–SiO_2 catalysts was formed. Preparation of amine was carried out by, drying SiO_2-H_2SO_4 catalysts and $NaBH_4$ in an oven for an hour and in a one pot route the aldehyde and aniline was first allowed to stir for 10 minutes in a round bottom flask at room temperature and solvent free, then added SiO_2-H_2SO_4 catalysts, and $NaBH_4$ (slowly until TLC showed complete disappearance of the starting aldehyde and amine), filtered the solution and dried over anhydrous Sodium sulfate (Na_2SO_4), filtered and concentrated it. The crude products obtained were further purified by a column chromatography on silica gel using a suitable eluent. In this procedure a series of Benzaldehyde, p-anisaldehyde, 3-hydroxybenzaldehyde and vanillin underwent the above conversion to form an amine product, approximately 10%, 30%, 55%, and 75% respectively. To conclude this procedure is, rapid, easy and converted to amines which was observed by TLC (Thin Layer Chromatography). Vanillin yielded the best results compared the other three aldehydes namely Benzaldehyde, p-anisaldehyde and 3-hydroxy benzaldehyde. And benzaldehyde being least converted product obtained. Hence, a green method with H_2SO_4-SiO_2 catalytic system have been developed for reductive amination of aldehyde and amines.

EFFECT OF BIOFERTILISERS ON THE GROWTH OF *PISUM SATIVUM* UNDER WATER STRESS CONDITIONS

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Abstract

Changes in global air temperature and climate are expected to result in extremely extended periods of drought. Water scarcity has an impact on germination, plant vigor, and productivity, leading to lower crop yields. Maintenance of plant physiological functions under drought stress is normally considered a positive feature as it indicates sustained plant health and growth. Several adaptations and mitigation strategies are required to cope with drought stress. Plant growth promoting bacteria (PGPB) could play a significant role in alleviation of drought stress in plants. Thus, the goal of this study was to investigate the potential use of consortia of endophytic Plant Growth Promoting Bacteria (PGPB) isolated from a desert adapted plant *Myrothamnus flabellifolia* Welw. Myn to sustain plant growth, physiology, and yield of *Pisum sativum* under water stress conditions. The pea (*Pisum sativum L*.) is a cool-season legume crop grown worldwide. It is commonly used in human diets and contains high levels of the amino acids, lysine and tryptophan, which are uncommon in cereal grains. The experiment was conducted in a completely randomized block design, corresponding to three levels of water irrigation (0.1FC,0.7 FC, 0.4 FC) and the use of seven aqueous suspensions containing a consortium of three (3) PGPB isolates namely (*Kosakonia cowanii*, *Bacillus licheformis* and *Cupriavidus metallidurans*) as bacterial inoculants, with three replications. Seeds were first inoculated with a bacterial treatment before being planted in vermiculite and then subjected to drought stress for seven days to determine the germination rate. Plant height (cm), number of branches, chlorophyll levels, number of pods, pod weight, root length, dry weight, and wet weight were all measured over several weeks to evaluate plant growth and yields. It was observed that the application of mixed biofertilisers promoted increments in all estimated parameters compared to the negative control. We can conclude that the findings of this study will shed light on the use of endophytic PGPB to accelerate crop yield and development in dry and semi-arid environments in response to drought.

Key words: Water-stress, Bacterial endophytes, Pea, Drought tolerance, Growth, Yield

ISOLATION AND CHARACTERIZATION OF BIO-ACTIVE METABOLITES FROM *SALACIA LEUBBERTTI*

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Abstract

Natural products are organic compound that are synthesized by living organism. These are molecules produced natural, including primary and secondary metabolites. They include very small molecules such as urea, and complex structures, such as saponin. *Salacia leubbertti* is one of the famous and important plant in the Northern part of Namibia. It belong to a Celastraceae family group. The indigenous people used *S. leubbertti* as food in the 1800 centuries. Most people use it as food security, human health, nutrition and economic welfare of rural communities. *S. leubbertti* fruits are used by people in rural areas as food (fruits) and the roots and leaves are used for medicinal purposes, such as sicknesses including diarrhea in animals, chest pain and help with wound recovery in humans. This studies focus on the isolation and characterization of phytochemical ingredients, bioactive in herbal preparations to the target plant, *Salacia leubbertti*.

The *S.leubberrti* parts, the roots and leaves were used for the phytochemical screening, extraction, isolation and antimicrobial testing. Phytochemical screening was carried out for the presence of different secondary metabolites. Extraction was done using n-hexane, petroleum ether, DCM, ethyl acetate and methanol for 24 hours. Isolation was done using TLC with different solvent system until a good solvent system is chosen. Antimicrobial testing was done to find the inhibition against provided microorganisms.

The analysis of bioactive compounds for the phytochemical screening from the roots and leaves extracts showed the presence of terpenoids, steroids, saponins, alkaloids, tannis and flavonoids. The ratio 3:1:1 for solvents, n-hexane, ethyl acetate and DCM, respectfully, was the solvent system that gave better separation for developed TLC plates for both the root extracts. For the antimicrobial testing activity, only two roots extracts used for isolation, n-hexane and DCM will be used, by using the agar well diffusion method. They will be evaluated against the provided microorganisms by inoculation and by using the spreading technique. Nutrient agar medium and SDA (Sabouraud Dextrose Agar) plates will be prepared and used for antimicrobial testing. Antimicrobial activity will be evaluated by determining the diameter zone of inhibition against the

provided microorganisms. They should exhibits both antibacterial and antifungal activities against gram-positive bacteria, gram-negative bacteria and fungus.

The higher the concentration of phytochemical screening, the higher the inhibition for the antibacterial and antifungal activities against provided microorganisms will be. The results will suggest that tested plant extracts have moderate to potent antibacterial activity due to the occurrence of steroids and terpenoids.

Socio-economic and demographic factors associated with fertility preferences among women of reproductive age in Namibia: Evidence from the 2013 Demography and Health Survey

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Abstract

Fertility preference is a determinant of fertility. It is referred to as an individual's desire for more children. Fertility desires are significant approaches to determine fertility behaviour and trends. It differs from woman to woman. This difference is influenced by socio-economic and demographic factors. This study aims to evaluate the association between fertility preferences and socio-economic and demographic factors among women of reproductive age in Namibia.

This study followed a quantitative research design using secondary data from the 2013 Namibia Demography and Health Survey. The outcome variable for this study is desire for more children. Explanatory variables are age, wealth index, level of education, partners level of education, work status, contraceptive use, marital status, region, place of residence and religion. Binary logistic regression model was fitted to examine the association between the explanatory variables and the outcome variable.

The studies findings show that the desire for more children decreases as the socio-economic index increases. Women who are working, have a higher level of education and live in urban areas have a less desire for children than those in rural areas. The study concludes that socio-economic and demographic factors are associated with the desire for more children.

ABUNDANCE AND DIVERSITY OF SUSPENSION FEEDERS' BRITTLE STARS ALONG THE CENTRAL COAST OF NAMIBIA.

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Abstract

Brittle stars are most common diverse class in phylum Echinoderms. They are keystone species, and play key roles in the structure and the functioning of many marine ecosystems, and are known for large variations in population density. Rapid and drastic changes in their abundances can have important ecological consequences on the diversity, resilience and functioning of these ecosystems. Brittle stars are the ecosystem engineer and impact population dynamic of other species, they provide food to fish, crab predator and other organism, decline of brittle star will cause the food web to disrupt as they are the base of the food web as some species will be left with no food and die. The causes of such extreme phenomena are still poorly known, but may be of anthropogenic origin, such as the degradation of water quality, the overexploitation of marine resources or even the introduction of invasive species. A study on relative abundance, diversity as well as distribution of the brittle stars found on the rocky shore of the Namibian coastline was conducted between Walvis Bay and Swakopmund. This study aims to determine and compare species relative abundance of brittle stars within the intertidal zones of Dolphin Beach and Long Beach. The study was conducted during spring tide in 2021. Samples were collected from Dolphin Beach and Long Beach, where four 50m line transects were set up from the low water mark (LWM) to high watermark (HWM), 10m apart. All organisms present in the quadrate were collected every 5 m within a 25x 25 cm quadrate. Thereafter, samples were sorted with a 0.5mm wooden sieve in the laboratory. All brittle stars were counted, identified to species level and four different brittle star species were recorded in both Dolphin Beach and Long Beach. Dolphin Beach recorded 847 individuals and Long Beach recorded 285 individuals.

Shapiro- wilks test was used to test for normality. Kruskal Wallis test was used, since the data were not normal distributed (p-value< 0.05) *Ophioderma walhbergii* (p= 0.00), *Ophiolix fragilis* (p=0.00), *Amphiura capensis* (p= 0.00) and *Amphipholis squamata* (p=0.006) showed a significant different within intertidal zones of Dolphin Beach. A significant different between abundance of *Amphiura capensis* (p=0.019), *Ophiolix fragilis* (p= 0.003) and *Amphipholis squamata* (p=0.019) within intertidal zones of Long Beach were displayed. This concludes that Dolphin Beach is more diverse in terms of abundance with 847 individuals.

Key words: Abundance, intertidal zone, *Amphiura capensis, Amphipholis squamata, Ophioderma walhbergii, Ophiolix fragilis*

Iris Recognition System for Driver's License scanning

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Abstract

As the number of motorist in Namibia increases, there is a need to have a suitable and most effective way on scanning driver's licenses in Namibia.

With the evolving technology, Iris recognition will be a more suitable biometric technology for the above mentioned case. Not only because of its perceived accuracy, but the fact that the identification/verification process requires little to no physical contact. Compared to other different methods of driver's license scanning, the iris recognition will be more efficient and can be done effortlessly, making it a convenient solution. The main reason for choosing the Iris recognition as the biometric in this regard is due to its known high level of accuracy. The accuracy is due to the fact that an iris has a unique pattern that can never be the same in different human eyes, not even with identical twins as a matter of fact the same person's both eyes have different (unique) patterns.

The goal of this study is to develop a model that can be trained to read the unique patterns of an iris and assign this to the information of a driver's license from a database, this will help traffic officer with the scanning of driver's licenses in a timely manner with more accurate results and hence reduce risk associated to the manipulation of the current system. I would use the iris scanner to collect data from the iris of the drivers, the model should be able to demonstrate that the data collected from the iris can be used to identify the driver's iris as well as display all relevant driver related information.

The application should be able to keep the data collected as secure and private as possible. And with this solution we looking at being able to solve any other solution in the related field or any other field it may be suitable for.

A COMPERISON OF UNIVIRIATE AND MULTIVARIATE MEASURE ON POVERTY LEVEL IN NAMIBIA

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Abstract

One-dimensional poverty measure, focuses on a well-defined single-dimensional resource variable, such as income being selected as the basis for poverty evaluation process. Whilst, multi-dimensional poverty measure uses multiple dimensional resource variables such as health (Nutrition and Child mortality), education (Years of schooling and School Attendance), and standard of living (Cooking fuel, Sanitation, Water, Electricity, Floor, and Assets), this approach also known as the Multidimensional Poverty Index (PMI) uses multiple dimensions/resources to determine the incidence and intensity of poverty knowledgeable by a population. A consensus exists that a unidimensional measure of poverty is not credible in capturing realistic aspect of poverty. On the other hand, multidimensional poverty measure goes well beyond a headcount ratio to include the intensity of poverty, but it does not measure inequality among the poor, although a separate measure of inequality has been published since 2019.

Thus, this study did a comparison on which of the methods, between one dimensional poverty measure and multi-dimensional poverty measure can best measure the level of poverty in Namibia.

A logistic regression analysis was applied for a secondary data obtain from the Namibia Household Income and Expenditure Survey (NHIES) for 2015/2016, to compare which of the two methods can best measure the poverty level in Namibia, considering the shortcoming of each type of method. Monetary indicators were used for a one-dimensional poverty measure and non-monetary indicators for a multi-dimensional poverty measure.

The results show that, though both methods have shortcomings, the one-dimensional poverty measure, better represents the poverty level in Namibia, compared to the multidimensional poverty measure. In addition, it shows that when non-monetary indicators are used, there is a large coverage of factors being included in the model, thus, the higher the cost and more time and concentration is needed to model it, while one-dimensional poverty measure, focuses on one indicator only (which is monetary).

Antioxidant and phenolic contents of endophytes isolated from *Boscia albitrunca*

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Abstract

Boscia albitrunca (the Shepherd's Tree) is a medicinal plant that belongs to the Capparaceae family and has been widely used as herbal medicine in the reduction of oxidative stress risks as a natural antioxidant. Phenolic compounds are bioactive secondary metabolites which are sourced from endophytes and are similar to their host plant therefore, endophytic fungi could as well serve as a facilitating agent for other useful secondary metabolites such as antioxidant compounds. In this study, the leaves of *B. albitrunca* were investigated and used as the source of fungal endophytes. This was done in order to determine the amount of antioxidant and phenolic content present in the leaves of *B. albitrunca* and correlate the results obtained to their ethnomedicinal uses as antioxidant agents. Firstly, fresh leaves of *B. albitrunca* were collected from Khomas region, University of Namibia. The leaves were washed, crushed and sterile distilled water was added to the crushed leaves, followed by serial dilution from which seven filamentous endophytic fungal isolates associated with *B. albitrunca* leaves were obtained using the Potato dextrose agar (PDA) media. Isolate PDA cuts obtained were transferred to potato dextrose broth (PDB) for two-week fermentation at room temperature. Ethyl acetate extracts of mycelia was combined with PDA culture broth after filtration and concentrated by vacuum rotary evaporator at reduced pressure and a temperature of 40 °C. Concentrated crude extracts were stored at 4 °C to be used for the analysis of antioxidant and phenolic content. Results obtained from this study will add valuable scientific data that will support the use of leaves from *B. albitrunca* as a traditional herbal medicine in the treatment of infectious disorders and accordingly, this plant may find application in the pharmaceutical industries as an antioxidant. Characterization of the active compounds from fractions that demonstrated antioxidant activities will require further scientific investigation.

Keywords: *B. albitrunca*, fungal endophytes, antioxidant activity, phenolic content

A TIME SERIES ANALYSIS of CONFIRMED DEATHS DUE to COVID19 in NAMIBIA

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Abstract

COVID-19 has become as a global threat. The first Covid 19 death was reported on 11 July 2020 in Namibia. At the end of December 2020, Namibia had 196 Covid 19 deaths. By the end of August 2021, Namibia had recorded a total of 3386 Covid 19 deaths. Time series models are useful in predicting and guiding policy on necessary measures to respond to such crises. The aim of this study was to establish the best prediction models for daily confirmed deaths in Namibia. This study was conducted based on daily confirmed Covid 19 deaths secondary data that was collected from the official website of World Health Organisation (WHO) from January 3rd, 2020 to August 31st, 2021. Microsoft Excel 2019 was used for data cleaning. Auto Regressive Integrated Moving Average (ARIMA) models were explored to predict the pattern of confirmed Covid 19 deaths. A *forecast* package in R was employed for model building, forecasting and diagnostics. The study showed that Covid 19 deaths in Namibia followed an ARIMA (4, 1, 5) as the best fit model. The forecasts showed that there is no increase in the number of deaths for the next 4 months that were predicted in the study assuming no major infections occur over the festive period and the vaccination effects are stepped up.

Decolorization of Engine extracts using synthesized activated carbons from Acacia seeds with 10% H_3PO_4

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Abstract

Throughout the years, there's been increasing demand in the refining of engine oil industries. Reasons behind this, are largely due to the fact that waste engine oil may cause pollution to the environment when unloaded into a body of water flowing in a channel such as rivers, lakes etc [3]. After a certain period of constant use, engine oil loses its properties of lubrication, viscosity and density and may no more be as useful in machinery, thus having a need to be replaced with a fresh one [1]. Not only does refining used engine oil reduce friction among the moving parts of equipment and improve the efficiency, but it also reduces a countries dependency on other countries for the importation of engine oil therefore resulting in an increase in the nation's GDP. The main aim of this research was to use activated carbon as an adsorbent in removing the black colour without the help of sulfuric acid. Moreover, the processes that were conducted were as follows, decolorization using bleaching agent of activated carbon prepared from Acacia seed pods with 10% H_3PO_4, Orange peel and impregnated $ZnCl_2$ as an adsorbent, heating the sample of engine oil which was obtained from a car workshop in Katutura at 90°C to decolorize it as well as filtration process to separate the solvents from the recovered engine oil [2]. A comparison was made between using activated carbon and using sulfuric acid in the decolorization of engine oil. A much clearer base oil was recovered when 5 ml sulfuric acid and 20 ml engine oil were heated together, even so, the same results were obtained when 5 ml sulfuric acid, 0.2049g of activated carbon from Acacia seed pods and 20ml engine oil were heated in the same Erlenmeyer flask. However, no separation of the engine oil occurred when 5 ml sulfuric acid, 0.4195g of impregnated $ZnCl_2$ and 15 ml engine oil were heated together. Although Acacia pod activated carbon was also used in combination with sulfuric acid, and yielded positive results, the activated carbon alone with engine oil did not yield any results. The results indicate that the aim of the research was not met as the sulfuric acid seemed to be doing all the decolorizing. In conclusion highly porous Activated carbon needs to be developed for decolorizing engine oil.

Synthesis, Partial-Characterization and *In-Vitro* Antimicrobial Activity of Monocarbonyl Curcumin 8-Hydroxylquinoline Hybrids

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Abstract

According to reports, more than 2.8 million antimicrobial-resistant (AMR) infections occur in the U.S with 35,000 deaths annually. In Africa, AMR has been documented to be a major problem for several infectious diseases, such as tuberculosis. AMR is therefore an emergent health problem, as it threatens the ability to treat common infections. Due to this emergent health problem, this study envisages synthesizing a library of new potential antimicrobial drug candidates from natural products.

This project focuses on natural product scaffolds, curcumin and quinoline. Curcumin has been shown to have diverse pharmacological potential, such as anticancer, antioxidant, antiinflammatory, antibacterial and antifungal activity. However, curcumin's low bioavailability, low aqueous solubility and poor stability limit its ability to reach therapeutic concentration at the target site, hence its failure to enter clinical levels. Quinoline has also been found to display antibacterial, antifungal, antimalarial, anticonvulsant, cardiotonic, antiinflammatory and analgesic activities. Therefore, this project hybridized curcumin-quinoline pharmacophores, as they have previously shown to improve metabolic stability, increase aqueous solubility and overall improve pharmacological profiles.

The curcumin scaffold was synthesized through a base-catalyzed aldol condensation and hybridized with quinoline through an amine alkylation reaction. The hybrids were obtained with a yield range of 49-88 %. The synthesized compounds were analyzed for their physicochemical properties using Molinspiration to predict the druglikeness of a compound. Among the nine compounds analyzed, all five intermediates obey Lipinski's Rule of Five; however, only one of

the target molecules obeys Lipinski's Rule of Five.

These synthesized compounds will then be partially characterized using infrared spectroscopy and melting point techniques. The antimicrobial activity of these compounds will be assessed against gram-positive *Staphylococcus aureus*, gram-negative *Escherichia coli* and fungus *Candida albicans* by disk diffusion method.

Textural and Mineralogical characterization of Helikon 4 Li-Bearing Pegmatite.

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Abstract

Lithium (Li) has become one of the strategic elements in recent years due to its increasing demand in electrical vehicles, rechargeable batteries, and other industrial applications. The limited nature of Lithium sources demands optimized mining and extraction of available Lithium resources. Accurate characterization of Li-bearing minerals is vital for efficient extraction of this limited resource. Lepidico Chemicals Namibia (Pty) Ltd (LCN) plans to develop the Helikon and Rubicon Li-bearing Pegmatite projects in central Namibia. To better understand the Helikon 4 orebody and how the Li-bearing minerals may affect subsequent stages in mineral processing, this study focuses on the mineralogical and textural characterization of the Li-bearing minerals at LCN.

Macroscopic and microscopic analyses of samples through drill core logging and optical microscopy were applied in the textural classification of the Li-bearing rock types at Helikon 4. Additionally, ICP-MS analysis assays were used to establish how Li2O content relates to the different textural classes. Five textural classes of lithium mineralization were established in this study. The first textural class is defined by massive fine-grained purple or grey Lepidolite and massive white Petalite. The second textural class consist of disseminated Lepidolite hosted mainly in Albite-Quartz-Lepidolite Pegmatite. Coarse-grained books of micas make up the third textural class. The mica is mainly made up of muscovite, the source of Lithium in these Pegmatites is unknown. Fine-grained Albite-rich Pegmatites with disseminated micas constitute

the fourth textural class. The fifth textural class is made up of coarse Quartz-Muscovite-Feldspars Pegmatite also with an unknown source of the Lithium signature.

Texture grade comparison revealed that high-grade mineralization occurs in the massive fine-grained Lepidolite and Petalite Pegmatites. Albite-Quartz-Lepidolite Pegmatites host medium grade mineralization whereas classes three to five have low-grade mineralization. Massive Lepidolite zone has grades above 2% Li2O, followed by the disseminated Quartz-Albite-Lepidolite zone with an average grade of 1.2 % Li2O and finally the low-grade zone with an average of 0.35% Li2O.

There is a good correlation between the textures and grades in the Helikon 4 orebody. The study revealed the spatial distribution of textures within the orebody. The findings are useful in establishing the processing response of the different textures to optimize and sustainably extract the Helikon 4 orebody.

Title of the presentation Activated carbon from acacia pods for removal of organic compounds from waste water.

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Abstract

Activated carbon is an adsorption medium, and its application is regarded as a cutting-edge approach for addressing a variety of water quality requirements. It has been utilized in a multi-objective way around the world in various forms (powdered and granular) to remove heterogeneous chemicals that produce color and are precursors to contaminants during disinfection, trace organic and inorganic contaminants, and taste-and-odor compounds. In addition, activated carbon can be used in both adsorption and biological applications. Phenolic and Ibuprofen compounds are organic contaminants that generate a variety of health and environmental issues due to their toxicity even at low concentrations. Acacia pods was examined in this study as a low-cost and environmentally friendly bio-adsorbent for phenol and ibuprofen removal from aqueous solutions. The effect of major operation variables such as the initial phenol and ibuprofen concentration, adsorbent dose in predefined sizes, pH, contact time, temperature, and ionic strength on adsorption was investigated in a batch system. The greatest efficiency capacity for phenol and Ibuprofen adsorption was above 95%, which was observed at a pH of 2, adsorbent dose of 0.2 g, 50µm mesh, contact period of 40 min, temperature of 55°C, and high pollutant concentration (1000mg/L). The Freundlich isotherm equation adequately characterized the equilibrium data, and kinetic analyses revealed that the adsorption process was best represented by pseudo-second order kinetics. The results showed that the adsorbent in question is capable of effectively extracting phenol and Ibuprofen. Lower solute concentrations, smaller Acacia pod shell particle sizes, shorter contact times, lower adsorbent doses, and acidic pH ranges were found to enhance solute removal. An environmentally green methodology have been developed for removal of Organic contaminants from waste water, which can be applicable at large scale.

Green synthesis of ZnO nanoparticles using *Boscia Albitrunca* leaf extracts for the photocatalytic degradation of methylene blue and Rhodamine B dye

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Abstract

ZnO is a non-toxic metal oxide and it can be synthesized by low cost chemical methods at low temperature. The green approach for synthesizing nanoparticles is considered as an eco-friendly and cost effective method compared to other procedures. The properties of ZnO allow it to be used in many different applications such as photodetectors, gas sensors, piezoelectric, lasers, and as a photocatalyst. Green synthesis of nanophotocatalysts using plant extracts as reducing or capping agent has been reported. In this study, *Boscia albitrunca* (*B. albitrunca*) leaf extract was used to synthesize ZnO nanoparticles. Different amounts of the plant extracts (5mL, 25mL, 40 mL and 50 mL) were diluted to 100 ml of distilled water and used in the preparation of ZnO nanoparticles using Zinc acetate dihydrate and NaOH as precursors. Photocatalytic activity was estimated by degrading methylene blue dye (0.5%) and Rhodamine B dye (0.5%) molecules. The results showed that the green synthesized ZnO NPs could degrade all dyes under UV radiation. However, the synthesized ZnO NPs were more effective at degrading methylene blue dye compared to Rhodamine B dye with increased concentrations of plant extracts. When the concentration of leaf extract was increased, the degradation rate also increased under UV light after 240 minutes. Pure ZnO NPs were less effective at degrading methylene blue than the green synthesized NPs. Contrary, the results show that pure ZnO was most effective in degrading rhodamine B dye than nanoparticles synthesized with leaf extracts after 240 minutes. Conclusively the ZnO nanoparticles prepared using leaf extracts of *B. albitrunca* increased slowly increased the degradation of methylene blue up to 19.8% after 240 minutes, whereas the decreased photocatalytic activity was observed with rhodamine B dye.

HYTOCHEMICAL SCREENING AND ANTIOXIDANT ACTIVITY OF THE ROOTS OF XIMENIA AMERICANA

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ABSTRACT

In most parts of Africa, Ximenia americana is used to treat various disorders such as oedema, pain, fever, helminthiasis, diarrhoea, burns among other diseases. The present study was designed to conduct the qualitative and quantitative phytochemical screening of methanolic and water extract of the root and root bark of Ximenia americana plant. Qualitative phytochemical screening was done to evaluate the presence of alkaloids, flavonoids, steroids, saponnins, tannins and phenolics. The antioxidant activity of the extracts was assessed by inhibition of 2,2-diphenyl-1-picrylhydrazil (DPPH) free radical and reducing power assay. Qualitative phytochemical screening showed presence of alkaloids, flavonoids, steroids, saponins, tannins and phenolics in both extracts. Screening the biological activity of methanolic extract of the root and bark showed higher potent antioxidant activity with an IC50 value of 0.33 and 0.066 µg/mL respectively compared to that of the water extract of the bark with an IC50 value of 0.16 µg/mL. Whereas water extract of the root showed IC50 >1mg/mL. A lower IC50 value means higher potency therefore methanolic extracts gave higher potency compared to water extracts for both samples. The study showed that both samples possess potential antioxidant and phytochemical properties.

Key words: *Ximenia Americana*, DPPH, Phytochemicals, Antioxidant Activity

Assessing forb species dynamics as a possible indicator of rangeland degradation in the communal area of the Greater Waterberg landscape, central Namibia

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Abstract

Rangeland degradation continues to accelerate due to climate change and overgrazing, with direct implications on the livelihoods of the people who depend on it for subsistence livestock production. The Greater Waterberg landscape could be faced with degradation as are result of climate change and overgrazing. Although forb species are underutilized, they are sensitive to overgrazing and therefore good indicator of degradation. The overall aim of the study was to assess the rangeland conditions of the forb species dynamics, by looking at species density, diversity, and composition at three villages in the communal area of The Greater Waterberg Landscape. The grazing gradients were established starting from the edge of a village and radiating away, with assumed decreasing livestock pressure. Along five distances, four quadrats were sampled at each distance along the two transects and each forb species discovered in each quadrat was identified. To confirm that the three villages were similar enough to be used as replicates, we tested for differences among them, and found one of the villages to be significantly different from the other two in terms of species density, while all three villages differed in terms of species diversity. As such, differences along the grazing gradient were tested for each village separately. The fact that there was no significant difference along the grazing gradient for both density and diversity, for all three villages, species composition may still differ along the grazing gradient. Therefore, we will have a better picture of rangeland condition along the grazing gradient once we finish analysing the species composition data.

Metabolic profiling of drought exposed and control plants of marama bean using GC-MS

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Abstract

Tylosema esculentum is used traditionally as medicine for diarrhea in children in southern Africa and as a source of food because of its tuberous root. It belongs to the family of Fabaceae.and it is found at the drier parts of Africa (Namibia, South Africa and Botswana). During environmental stress, marama bean is one the few plants that are able to thrive through by producing secondary metabolites that offer protection against herbivores, fungi, bacteria and viruses, offer protection against physical stress and other plants competing for light and water. These metabolites produced by the marama bean during drought seasons, can be profiled to determine pathways and mechanisms that occur during drought season. The purpose of this study was to prepare and fractionate crude extracts from leaves, bark and roots of the marama bean using GC-MS with a goal for a better understanding on how marama bean is able to thrive through harsh environment. Before sample collection, RWC was performed on the leaves of both water deprived plant and well watered plants to confirm whether the plants are indeed wilting, using a disc cutter to cut out discs of about 5 cm in diameter.

Fresh leaves, bark and roots of the marama bean plants were collected from the greenhouse at the University of Namibia and frozen immediately in liquid nitrogen to avoid metabolite degradation. The samples were then crushed using mortar and pestle to powder, from which organic extraction of metabolites was performed using chloroform/methanol mixture as an extraction solvent and alkaline extraction was performed using methanolic KOH and n-hexane or heptane. The derivatization process was carried out using 100 µL of the methoxyamination reagent, methoxyamine hydrochloride (20 mg/ml in pyridine), that was added and incubate for 20 minutes at 80°C, before 80 µL of the BSTFA reagent (1% (20 µL) of TMCS) added for derivatization. The solution was then be incubated at 65 °C for 1 hour.

This study will provide insight into valuable genes that are responsible for gene expression during drought seasons, and these genes can be used to improve drought tolerance of the marama bean through genetic engineering and conventional breeding. The metabolic profile of the marama bean will also provide several opportunities to investigate the changes that occur in plants due to

environmental factors such as temperature and develop crop varieties with increased tolerance to environmental factors to meet food demands during climate change.

Keywords: *T. esculentum*, metabolites profile, GC-MS

Manganese Dioxide (MnO_2) catalyzed treatment of waste water for the removal of contaminants

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Abstract:

Manganese Dioxide (MnO_2) a black compound, is of great importance in treatment of waste water to remove contaminants. The direct use of this compound in the treated water with the help of continuous starring for certain time has been a method of choice for treatment because it's able to remove more contaminants. Contaminants removal from wastewater were achieved with, sample C: calcined $MnFe_2O$ with ratio 2.5:1 and sample E: calcined $MnFe_2O$ with ratio 3:1. The pH of the $MnFe_2O$ can influence the removal efficiency of contaminants. In this research UV spectrometry and titration methods were used in removal of contaminants and to evaluate the clean water after treatment, by checking the characteristic of the treated water. The goal of this study was to develop a framework of sustainable $MnFe_2O$ as a good catalyst. The methods were developed and applied to four different water samples; Sea water, Enyana water, Phenol water and Pond water. It was found that treatment of pond water with MnO_2 turn to have no harness at all and no need for titration with EDTA a complexing agent, the color of the solution changes to sky blue from clear immediately after addition of the indicator, which is the color of the end point for titration with EDTA and this indicates absence of Ca^{2+} and Mg^{2+} ions in the water which causes water hardness. Sea water turn to be containing the most metal ions even after treatment with $MnFe_2O$ because due to the results for titration, the total hardness after treatment is 0.064mol/L as average of both samples, and in all type of methods of treatment, results from the UV spectrometry show that sample E of ratio 3:1 turn to show better treatment than sample C with ratio 2.5:1, which make it a good sample ratio for wastewater treatment and this may conclude to the ratio of the $MnFe_2O$ being a suitable catalysts for treatment of wastewater. In terms of the study of the solvent, with sample C dissolving it in H_2O and in methanol turn to be clear after 30min, 1hour and overnight compare to sample E, and in methanol, after 30min, the one with sample C turn to be light brown color and with sample E its dark brown color. An environmentally green, economic method is developed for treatment of waste water with $MnFe_2O$ samples prepared by co-precipitation method.

Synthesis, Partial-Characterization and *In Vitro* Antimicrobial Activity of Chalcone-Quinoline Hybrids

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Abstract

Antimicrobial resistance (AMR) has become a global health problem and a threat to human life. Therefore, there is a need to synthesize novel compounds with new modes of action as potential antimicrobial agents. Natural products and their structural analogues have made a major contribution to pharmacotherapy, especially for infections caused by bacteria. Chalcone and 8-hydroxyquinoline derivatives are examples of natural products, which display antimicrobial activities against *Escherichia coli, Staphylococcus aureus, Streptococcus pyogenes* as well as *Pseudomonas aeruginosa*. The conjugation of quinoline with chalcones has been a promising approach to design identification of potential antibacterial and antifungal agents. Most of these hybrids showed activity against skin infections as well as urinary tract infections. The use of these analogues is now common and there are continuous efforts by the scientific community to search for newer antimicrobial agents due to AMR shown by these microbes. The hybrid molecule approach of drug design has become popular due to advantages such as delayed resistance, reduced toxicity, ease of treating co-infection and lower cost of preclinical evaluation.

Chalcone derivatives were synthesized via Claisen Schmidt condensation reaction between a ketone and various aromatic aldehydes obtained between 51-89 % yield and colours ranging from yellow to orange. Alkylated chalcone intermediates were synthesized by reaction of the chalcone intermediates with 1,2-dibroethane. The *O*-alkylated chalcones were obtained in yields ranging between 63-92 % as yellow to orange solids. The target ether hybrids were synthesized via nucleophilic substitution reaction. The yields recorded were between 67-84 %.

The synthesized compounds were analyzed for their physicochemical properties using Molinspiration. Among the 12 compounds analyzed, all 8 intermediates obey Lipinski's Rule of Five, however, none of the target molecules obeys Lipinski's Rule of Five. All the synthesized compounds will be partially characterized by melting point, retention factor, Infrared and GC-MS.

All 12 intermediates and target molecules were tested for their antimicrobial activity against *Escherichia coli, Staphylococcus aureus* and *Candida albicans.* Three of the synthesized compounds displayed *in vitro* antimicrobial activity against *Staphylococcus aureus* in the Agar dilution method, with the zone of inhibition ranging from 4-7 mm. However, none of the tested compounds showed *in vitro* antimicrobial activity against *Escherichia coli* and *Candida albicans.*

THE GRANULITE FACIES METAMORPHISM OF GARNET SILLIMANIT K-FELDSPAR CORDIERITE METAPELITE GNEISS FROM THE NARRIES GROUP, FISH RIVER CANYON, SOUTHERN NAMIBIA

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Abstract

At a curvature on 550m along 65km on the South-African plateau, the Fish River Canyon is the world's second largest canyon. The deformation in the canyon is characterised by extension periods which are because of deep mantle mechanics within the inner African continent, however, some believe that the deformation is a result of collision. The Fish River Canyon is comprising sub-horizontal strata of lower Nama group of Late Neoproterozoic, over tilted metamorphic rocks (granites and gneiss) forming the Namaqualand group of Paleoproterozoic, furthermore, it is notable that a main unconformity separates these two formations (Mvondo et al., 2011). This research focuses on the granulite facies metamorphism of garnet sillimanite k-feldspar cordierite metapelite gneiss from the Narries group of the Fish River Canyon in southern Namibia to eradicate the controversial debate among geologists about the nature of the deformation periods. Evidence suggests that deformation in the area was due to both collision and extension but occurring at different geological time frames. A total of seven (7) samples were collected for thin section preparation, bulk rock chemistry analysis and zircon dating. Petrographic analysis revealed that the main minerals are garnet, sillimanite, cordierite with accessory minerals of quarts and plagioclase feldspar. The results of this study will add onto existing literature done on the Kakamas domain as well as aiding in understanding Earth's geotectonic history of the Namaqua belt.

THE GRANULITE FACIES METAMORPHISM OF GARNET SILLIMANIT K-FELDSPAR CORDIERITE METAPELITE GNEISS FROM THE NARRIES GROUP, FISH RIVER CANYON, SOUTHERN NAMIBIA

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Abstract

At a curvature on 550m along 65km on the South-African plateau, the Fish River Canyon is the world's second largest canyon. Field observations indicate at least two deformation phases. The observed phase in the Fish River Canyon is characterised by deformation and in a second stage by extension.

In this study we focus on the granulite facies metamorphism and migmatisation of garnet sillimanite k-feldspar cordierite metapelitic gneisses from the Narries group of the Fish River Canyon in southern Namibia to eradicate the controversial debate among geologists about the nature of the two deformation periods by the means of collision and extension.

We used the following approach to overcome and solve the problem. A total of seven (7) samples were collected for thin section preparation, bulk rock chemistry obtained from ICPMS and mineral chemical analyses measured with EPMA. Major elements obtained with ICPMS are used for the calculation of a P-T pseudosection. Classical geothermobarometry was used for modelling of prograde, retrograde, and peak metamorphic conditions.

The resulting retrograde cooling history is documented in garnet profiles. These garnets are found within the boudinage structure. Core rim relationship of these garnets has been analysed with EPMA. The Arrhenius equation in combination with the Gauss'sche error function has been used to calculate the time of garnet growth. The thermodynamic dataset from Perchuk (1991) was used. We suggest that the time interval (□t) between the peak metamorphic stage and finally the retrograde garnet biotite closure temperature should give a good and valid approximation of the extension period.

Removal of pharmaceutical drugs from waste water using activated carbon prepared from banana peels

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Abstract

Contamination of water bodies due to wastewater discharged is becoming a serious problem nowadays. The wastewater from the pharmaceutical manufacturing facilities, and industry contains pollutants such as heavy metals, organic compounds such as phenols and physical compounds like pesticides and plastics to mention a few. These types of contaminants are highly toxic and very dangerous to the mankind and living organism if left untreated. Therefore, the wastewater need to be treated before discharging to the water bodies. This study focusses on a low cost treatment and very environmentally friendly by using activated carbon prepared from banana peels in removing pharmaceuticals drugs from wastewater. The peels of bananas were used as adsorbents by carbonization method at 800^{o}C and 900^{o}C for 1 hour in a muffle furnace. Fresh banana peels were dried, adequately prepared treated with 10% hydrochloric acid and washed with distilled water to have purified activated carbon and the percentage yield obtained after treating was 91.5%. Activated carbon were characterized by SEM and IR. The effect of contact time, pH, conductivity, total dissolved solids and dissolved oxygen in removal of pharmaceuticals drugs present in wastewater was evaluated on UV instrument. This activated carbon was used in filtering. The test is conducted before treated and after treated, to determine the contamination in the sample. Batch experiments were conducted by varying the sample concentration and contact time between 30 – 120 minutes to determine the optimum percentage removal of phenol (colorless) from the wastewater with adsorbent dose of 0.1g. Adsorption percentage was found to be proportional to contact time and concentration of the sample. The percentage removal is due to an adsorption process that occurs in the filter. From the analysis, the activated carbon from banana peels can remove organic compounds and the performance of water quality parameter increased with retention time increased. Therefore, this study has shown the effectiveness using a filter based on banana peels activated carbon for industrial wastewater treatment as ecofriendly approach.

A MOBILE APPLICATION FOR REPORTING CRIMES IN NAMIBIA ANONYMOUSLY

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Abstract

In Namibia, heinous crimes have grown commonplace. The current technique In Namibia, for public participation in reporting crimes is a manual approach in form of suggestion boxes that are mounted at certain areas in towns. Their lack of presence in rural areas, on the other hand, is a major worry. Surprisingly, even when the suggestion boxes are present, they are difficult to locate. This study looked at how people can use technology to anonymously report crimes in and around Namibia, whether they reside in the city or in the countryside. The study proposed to address in automating the current manual system and increase its availability, flexibility and reliability of fighting crimes with the application of technology. Data was gathered via a survey generated on the Survey Monkey platform, which was also used to evaluate the results. The study's target population are Namibians above the age of 18 years. The findings have revealed that, the majority of citizens are willing to help fight crime in order to keep their towns safe and crime-free. Because so many people have smartphones, there is a greater chance that they will use the app (Suggestion box app) to report crimes, which can be done at any time of day and from anywhere. Additionally, according to the findings, some members of the public would rather report crimes anonymously than become witnesses. Android Studio was used to create the mobile app, and the Xampp server was used on the server-side. User testing correspondences of the app indicates that the app (Suggestion box) has the potential to increase public participation in crime prevention. It was suggested that more thorough research on integrating technology into the policing area be conducted.

Antioxidant Potential of *Commiphora tenuipetiolata*.

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Abstract

The genus *Commiphora* is seen as important for holistic and traditional medicine due to their rich resins and gums. These resins and gums are widely used in the traditional setting as a treatment against inflammatory diseases, trauma, and blood stagnation as well as for their appealing scent. The Opuwo Processing Facility produces a popular essential oil, the Namibian Myrrh from the *Commiphora wildii*, and they are inspecting other indigenous plant species for essential oils that can be produced and commercialized. Thus, there is an interest in the *Commiphora tenuipetiolata*. The gum of the *C. tenuipetiolata* has a sweet, spicy aroma that makes it useful as soaps and fragrances in the Himba communities. The *C. tenuipetiolata* are described as dwarf trees and are commonly mistaken for shrubs. They grow on rocky mountain and hill slopes in the north western part of Namibia and southern Angola. The bark is satiny grey to reddish-brown with a blue-green under-bark. The leaves resemble those of an oak tree with deep lobes on each leaf. During spring the trees produce roundish, bright red berries as fruit. The *C. tenuipetiolata* gum protrudes from the stem and branches, and is crimson to reddish-brown in colour. Two extracts were made from the *C. tenuipetiolata* gum. The first extract, referred to as Extract A, was made by using an extraction solvent mixture of 50:50 water and ethanol. The second extract, referred to as Extract B, was made with 100% ethanol as the extraction solvent. The antioxidant potential of both extracts of the *C. tenuipetiolata* were determined using the DPPH radical scavenging assay and the reducing power assay (FRAP). Ascorbic acid was used as the positive control in both assays. The DPPH radical scavenging assay for the *C. tenuipetiolata* extract A showed an inhibition of 59.96% at 200µg/mL compared with the standard ascorbic acid which showed an inhibition of 96.59% at 200µg/mL. This gives an IC_{50} value of 131.2 ± 7.4 µg/mL for extract A. The *C. tenuipetiolata* extract B showed an inhibition of 68.07% at 200µg/mL compared with the standard ascorbic acid which showed an inhibition of 98.34% at 200µg/mL. This gives an IC_{50} value of 143.6 ± 5.3µg/mL for extract B. The reducing power assay showed an increase in absorbance as concentration increased (directly proportional relationship) for both extract A and B. These findings indicate that the extracts of the *C. tenuipetiolata* gum has antioxidant potential.

Keywords: *Commiphora tenuipetiolata*, Essential oils, DPPH, FRAP

Online Sexual Offender Registry in Namibia

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Abstract

Sexual violence is a major concern in Namibia given the number of reported cases between the years 2016 and 2018, the number of victims who spoke out during the #MeToo movement on social media in 2019 and the #ShutItAllDown movement in 2020 where protesters took it to the streets and demanded for more to be done in regards to sexual violence in Namibia. There exists an increase in sexual violence crimes which is evidently shown by the number of cases reported daily in the media. With advancement of technology, there is a need to use it in combating crime in Namibia particularly sexual violence crimes by developing an online sexual offenders' registry. The objective of the research was to design an interactive website with a search mechanism, counselling resources, chat bot and crowd funding feature for public awareness and assistance of sexual violence victims and to investigate the effect it might have on the occurrence of sexual violence. The use of the chat bot, counselling resources and crowd funding on such a website is beneficial to the sexual violence victims as it will provide them with immediate access to report incidents of sexual violence, resources to help victims access counselling and crowd funding will assist victims with financial aid for good legal representation which they are often deprived due to lack of funds. Qualitative data was collected from 90 participants using a digital survey which was shared on social media, these participants are from Namibia, mostly Windhoek. Results from this study yield opinions that participants would make use of the sexual offender registry and showed support as they shared ideas on the platform that they would make use of. They believe that enacting an online sexual offender registry will help curb occurrence of sexual violence crimes, assist victims of sexual violence with mental health to deal with trauma and financial aid which will encourage more sexual victims to report incidents of sexual violence and help people to feel safer as they are aware of the sexual offenders' presence in the general public. The development life cycle focusing on agile method was used to develop the online sexual offender registry prototype. The prototype was tested by a few participants from whom data was collected and feedback was used for further development.

Keywords: Sexual violence, sexual offender registry, chat bot, crowd funding, interactive website.

COUNT MODELS FOR EXPLORING THE FACTORS CONTRIBUTING TO NEW COVID-19 CASES IN NAMIBIA: A STUDY PERIOD OF MARCH 2020 TO AUGUST 2021

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Abstract

Motivated by the current Coronavirus Disease (COVID-19) global pandemic and with little being known about the contributing factors of COVID-19 in Namibia besides no masking, no sanitizing and no social distancing, there is a need for an in-depth study to be done to explore the factors contributing to the new confirmed cases in Namibia, as well as the identification of a best-fitting count model that can be used for predicting new COVID-19 cases in Namibia. For this reason, this study used a quantitative research approach on the data collected from the COVID-19 database from the Ministry of Health and Social Services' (MoHSS) Facebook page, Worldometer and the World Health Organization webpage. The Poisson and Negative Binomial regression modelling techniques were used with seven different models developed under each technique using variables such as day of the week, event, weather season, vaccination period, deaths, new recoveries, sex and region. Results from this study showed that the Negative Binomial model inclusive of all these study variables (with an Akaike Information Criterion value of 5487.8) was identified as the best fitting model to use in the identification of the contributing factors of confirmed COVID-19 cases in Namibia. In addition, the spring season (p-value< 2e-16), summer season (p-value=9.15e-16), winter season (p-value=1.75e-09), pre-vaccination period (p-value=3.08e-05), new males cases (p-value=0.01258), Omaheke region (p-value=0.00174), Kavango East region (p-value=0.07854) and Omusati region (p-value=0.0631) were identified as significant contributors of confirmed COVID-19 cases in the country. In conclusion, with the weather season, vaccination period, sex and region identified as significant contributors, these findings provide important insights for MoHSS to use with the curbing of the spread of the COVID-19 virus in the country, especially in the event of a potential fourth wave of the deadly virus. Additionally, given the limited variables within the COVID-19 database, it is recommended that more socio-demographic and economic variables such as age, marital status, occupation, type of occupation, place of residence, type of household dwelling and number of household members as well as health indicators such as underlining illnesses and COVID-19 vaccination status need to be captured per COVID-19 confirmed cases by MoHSS within their COVID-19 database. These can further be considered in the exploration

of factors that contribute to new confirmed COVID-19 cases in the country, using advanced statistical modelling techniques.

Keywords: COVID-19, Poisson regression, Negative Binomial regression, Namibia

A density functional study of the interaction of xerantholide, an antigonococcal agent, with *Neisseria gonorrhoeae* carbonic anhydrase and human carbonic anhydrase II

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Abstract

Neisseria gonorrhoeae has proven to have an extraordinary capacity to develop resistance to known antimicrobial agents used for the treatment of gonorrhea. Consequently, the search for drugs with novel mechanisms of action different from the current agents continues to be an active area of research. Studies have shown that *N. gonorrhoeae* carbonic anhydrase (NgCA) is an important enzyme that is needed to maintain CO_2 and pH homeostasis in the bacteria. Further, it has been suggested that *N. gonorrhoeae* is vulnerable to carbonic anhydrase inhibitors, establishing a three-way link between NgCA, its inhibitors and the gonorrhea causing bacteria. This study reports on the interaction of xerantholide with NgCA using a density functional theoretical approach. Xerantholide, a newly established antigonococcal molecule is a sesquiterpene lactone that was isolated from the leaves of *Pechuel-loeschea leubnitzia*e found in Namibia. The potential of xerantholide and its analogue to bind the active site of human CA II (hCA II) and NgCA, competitively, was investigated using the AutoDock Vina program. The ligand-enzyme complexes resulting from eighty-three xerantholide analogues selected from the literature were analyzed. The target enzymes were retrieved from protein data bank with code 2ILI for human CA II and 1KOQ for the bacteria. *In-silico* antibacterial activity screening was done with a cut-off value of $P_a \geq 0.5$. Based on docking scores, the affinity value of xerantholide was -7.3 kcal/mol and -6.8 kcal/mol to hCA II and NgCA, respectively. These latter values may be compared to corresponding values for acetazolamide (AZM) (-6.3 kcal/mol and -5.7 kcal/mol)

and ethoxzolamide (EZM) (-6.2 kcal/mol and -5.3 kcal/mol), which are classic carbonic anhydrase inhibitors. About 87% of the analogues showed higher affinities for hCA II and 99% exhibited higher affinity for NgCA when compared to AZM and EZM. Xerantholide exhibited relatively the same affinity for hCA II and NgCA (~ -7.0 kcal/mol) while AZM and EZM had lower affinity to NgCA compared to hCA II. Our results demonstrate that xerantholide putatively binds to both the host and bacterial receptors as a potential drug for gonorrhea. To ascertain activity of these compounds, *in vitro* studies should be explored.

Determination of calcium and magnesium content in beer using Atomic Absorption Spectroscopy (AAS)

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Abstract

The mineral composition of beer is vital for the enhancement of the product's taste. Two of the most important elements of interest in the brewing industry is calcium and magnesium. However, the micro-breweries in Namibia do not have the capabilities of performing the analysis of these substances in their products themselves. Therefore, this study aimed to develop and validate a suitable atomic absorption spectroscopy (AAS) method that can be used for the analysis of calcium and magnesium in the locally produced craft beer.

First two methods were compared for the analysis of a regular lager-style beer, namely a calibration curve (external standard) method and a standard addition method. The results of the two methods differed significantly which indicated that there is some interference from the sample matrix. Hence all remaining experiments were performed using the standard addition method. Subsequently the method was validated and applied to the analysis of a number of locally produced craft beers. The study showed that the validated AAS method is sensitive enough for the determination of calcium and magnesium in beer and that it can be used for the analysis of locally produced beer.

Analysis of visible underemployment in Namibia using the 2018 Namibia labour force survey data

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Abstract

Visible underemployment is a condition in which an individual works fewer hours than is necessary for a full-time job in their chosen field. Due to the reduced hours, they work two or more part-time jobs in order to make ends. This research study addresses the challenges of the growing rate of visible underemployment and its socio-economic factors in Namibia. The aim of the research paper was to analyse socio-economic factors of employed individuals that determine visible underemployment in Namibia and to check if there is a relationship between the dependent variable (Actual hours an individual worked) and independent variables (Occupation and Industry). The study used secondary data provided by the Namibian Statistics Agency, which is the Namibia labour force survey of 2018, thus, it adopted all sampling and data collection methods. Binary logistic regression was performed to test for association between independent variables ;(occupation and industries) with respectively to the dependent variable total actual number of hours, with 35 hours as the cut-off point. There were 12 238 cases used in the analysis.The results revealed that there was a significant relationship at 95% confidence level between actual number of hours, occupation and industry. Industry with a (Chi square value = 423.334, DF= 13, p=0.000) and occupation with a (Chi square value = 399.32, DF=8, p <.0021). Industry was found to reduce the number of hours as it increases while occupation behaves in the opposite direction toward actual number of hours. This implies that employees actually work fewer hours than are supposed to do. This would require the promotion of policies that not only support the provision of quality employment but also the expansion of opportunities for occupation for all. The study also recommends the government and policy makers to strengthen the laws and regulation relating to job opportunities in the job market to give equal chances to all Namibians.

ASSESSMENT OF THE ANTIBACTERIAL ACTIVITIES OF SOME FUNGI Isolated FROM THE FLOOR DRAINS AT NAMDairies IN WINDHOEK

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Abstract

Microorganisms produce antimicrobials, a survival mechanism, especially in nutrient-limited environments or in extreme environments. Fungi's survival in energy-limited extreme conditions forces fungal communities to either adjust their metabolism to outcompete competitors or create novel antimicrobials to prevent competition, microorganisms adapted to living in severe settings have been found to be a rich source of new specialized metabolites in the last decade. The search for antimicrobials has therefore largely been confined to natural extreme environments, with less attention given to artificial extreme environments such as those created by the dumping of pollution. This research was therefore aimed at investigating the antibiotic producing potential of some fungi isolates from the floor drains of Namdairies. The guiding hypothesis was that those floor drains represent an artificial mildly extreme environment owing to its fluctuating cycles of (pollutants (milk) and cleaning detergents, and a potential presence of competing bacterial species. In this research fungal strains were isolated from swab samples obtained from Namdaries floor drains. The swabs were used to streak the surfaces of Potato dextrose Dextrose agar Agar (PDA) which were subsequently incubated at 25°C for 7 days. The developing fungi were subcultured for purity and subsequently grown in an Saboraud Dextrose Broth for 14 days for production of extracellular secondary metabolites. After incubation, the broths were centrifuged to remove cell mass and the supernatants were subsequently used as crude antibiotic against a panel of test bacteria isolated from the same environment as the fungi, using the disc diffusion method. The obtained zones of inhibition ranged in diameter between (0.2cm to 2.1cm). Thus, the study concludes that fungi from mildly artificial extreme environments do possess antibacterial activity, even though the zones of inhibition obtained in this study were insignificant compared to zones reported in other studies. This study recommends that other, extremely polluted environments be assessed for antibiotic producing fungi.

Keywords: artificial extreme environment, fungal species, secondary metabolites, antibacterial activity, disc diffusion test

COMPARISON OF STARCH, PHENOLIC CONTENT AND ANTIOXIDANT ACTIVITY OF SELECTED VARIETIES OF TIGER NUTS

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Abstract

Tiger nut (Cyperus esculentus L.), locally known *as eengeshu*, *okatjako or !hanni is* a perennial weed of the Cyperaceae family. Tiger nut (Cyperus esculentus) is a tuber that can be consumed raw or processed into beverages. Tiger nut (Cyperus esculentus) is a tropical and Mediterranean weed plant (yellow nut sedge). This delicious almond-like tubers are prized for their nutritional worth and health advantages, with high fibre, protein, and sugar content. They're high in oleic acid, glucose, phosphorus, potassium, and vitamins C and E, as well as phosphorus and potassium. The health benefits of tiger nut have been attributed to presence of phytochemicals and their antioxidant potential. The objective of this study was to determine the starch content, total phenolic content (Folin-Ciocalteu method) , total flavonoid content (Aluminium chloride method) ,total tannins content(vanillin HCL method) and free radical scavenging activity by 2,2-diphenyl-2-picryhydrazyl (DPPH).The total phenolic content was 43.77 GAE/100g, flavonoid content was 220.68 CAE/100g, tannins content 15.20 mg/100 g and Antioxidant activity of the extracts reached at least 50% inhibition of DPPH. The results indicate that the edible tubers which are used for non-alcoholic local beverage formulation, in medicine and cosmetic industry can be utilized to scavenge free-radicals generated by essential metabolic body reactions.

Keywords: Tiger nuts; starch; phenolics; flavonoids; tannins; antioxidant activity

Synthesis, Partial-Characterisation and *In Vitro* Antimicrobial Activity of Quinoline-Hydrazone Derivatives

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Abstract

Infectious diseases have become a global health hazard due to drug resistance. Medicinal chemistry has played an important role in the design and synthesis of novel drugs to combat drug resistance. Quinoline-hydrazone derivatives are well known for displaying a broad spectrum of biological activities that makes them relevant and worth exploring when designing drugs to combat antimicrobial resistance. Biological activities recorded for these derivatives ranges from antibacterial, antifungal, anti-inflammatory, antimalarial to anticancer properties. This study aimed to synthesise, partially characterize and conduct *in vitro* antimicrobial testing on quinoline-hydrazone derivatives.

Synthesis of the hydrazones was done using reported procedures. Reaction progress was monitored using analytical TLC and advanced intermediates and quinoline-hydrazone derivatives were purified using prep-TLC. These quinoline-hydrazone derivatives were obtained in yields ranging from 26.6 - 99.9%. Molinspiration was used to analyze the physicochemical properties of the synthesized compounds and 11 compounds obeyed Lipinski's Rule of Five that is indicative that most of the synthesized compounds have the physicochemical properties necessary to be orally bioavailable.

The hydrazones and their intermediates will be tested for antimicrobial activity against *Escherichia coli*, *Staphylococcus aureus* and *Candida albicans* using the disk diffusion and broth dilution methods. Partially characterized using GC-MS, IR and melting point.

Effects of different pre-sowing seed treatments on the germination of woody selected species to be used in restoration

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Abstract

Restoration of degraded lands remains a challenge locally, nationally, and internationally. Insufficient knowledge of the germination ecology of local species is one of the main constraints to the restoration of degraded lands. Seed dormancy is a global problem in agricultural systems and rangelands, resulting in poor germination, particularly in legume seeds. Understanding the ecology of seeds and the potential pre-treatments to enhance germination is essential for the successful use of native species in restoration projects. This study aimed to determine the best seed pre-treatment methods that are suitable to break seed dormancy of three (3) selected woody species to be used in restoration projects, namely *Faidherbia albida* (Delile) A.Chev, *Senegalia galpinii* (Burtt Davy) Seigler & Ebinger and *Vachellia erioloba* (E.Mey.) P.J.H.Hurter. Germination is the first critical phase of plant establishment, and it can be delayed or hampered by various factors, including seed dormancy. The seeds of the species used in this study were obtained from the study area (Kunene region, Namibia) and were treated with hot water, sulphuric acid (98%), acetone, and cold water (the control), for different periods (10 minutes, 30 minutes and 60 minutes). The seeds were grown in a nursery at the University of Namibia, main campus. A Kruskal Wallis test revealed a significant difference in actual germination of *Faidherbia albida* (H=34,875, P<0.01), *Senegalia galpinii* (H=30,055, P<0.01) and *Vachellia erioloba* (H=33,044, P<0.01) among the pre-treatments. Treating the seeds in different soaking periods (10 minutes, 30 minutes and 60 minutes) of sulphuric acid (98%) significantly improved germination in all the species. However, treating the seeds with acetone and hot water did not significantly improve the germination of the seeds. A kruskal Wallis test revealed a significant difference in the germination rate (Peak Value) of *Faidherbia albida* (H=31.220, P<0.01), *Senegalia galpinii* (H=30.062, P<0.01) and *Vachellia erioloba* (H=31.289, P<0.01). A Chi-square test of association revealed a relationship between plant species and the pre-treatment methods ($\chi 2$=76.036, df=14, P<0.01). This study concluded that the species used in this project possess seed dormancy; hence the seeds require pre-sowing treatments to enhance germination for use in restoration projects. Sulphuric acid (98%) is recommended to enhance seed germination of all three species.

Fabrication and Characterization of Copper-Cobalt oxide thin films from precursors involving Cu^{2+} and Co^{2+} complexes, using the spray-coating method

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Abstract

With technological advances every day, thin films are a significant component in the fields of electronic and magnetic devices. There have been developments on transition metal oxide-based thin-film coatings due to their solar selective absorbance that can be used for light-harvesting, power conservation, and optical properties. They are often used for their promising commercialization prospects and lower costs. In the present study, Copper-Cobalt oxide thin films, have been prepared onto a glass substrate by the spray-coating method. The spray-coating method is capable of fabricating good-quality thin films of various metal oxides. It is an inexpensive and easy instrumentation setup method. Using copper acetate and cobalt acetate, the copper-cobalt oxide precursor solution was obtained by mixing the two individual solutions. The precursor film formed onto the glass substrate at 180°C in air and was heat-treated at 500°C for 30 minutes. Various thin films were obtained by altering the precursor solution volumes to investigate the effects of composition changes. The crystal structure of the thin films coating was characterized by X-ray diffraction (XRD) and the optical properties were investigated by ultraviolet-visible (UV-Vis) spectroscopy. The properties of the fabricated thin films will be presented.

Keywords: thin-film; copper-cobalt oxide

Anti-HIV and Anti-Inflammatory Potential of *Trachyandra laxa*

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Abstract

Trachyandra laxa is a member of the Asphodelaceae family of plants and is commonly found in South Africa, Namibia and Botswana. It is known to cause many ailments in animals, including paralysis, hypersensitivity, and/or tremors. This study investigated the anti-HIV and anti-inflammatory potential of *T. laxa* through the inhibition of the HIV-1 reverse transcriptase enzyme as well as its anti-denaturation capabilities on egg albumin protein respectively. Methanol and dichloromehane extracts were assayed for in-vitro anti-HIV-1 reverse transcriptase activity with doxorubicin hydrochloride as the standard control. The extracts were evaluated at concentrations of 500 and 1000 µg/mL for their inhibition potential against the HIV-1 reverse transcriptase enzyme. The extracts were further tested for their anti-inflammatory activity by in-vitro egg albumin protein denaturation assay in which aspirin was used as the standard control. The egg albumin protein denaturation assay for both extracts was carried out at concentrations of 50, 100, 250 and 500 µg/mL with the percentage inhibitions of the methanol extract ranging between 0-100% and that of dichloromethane between 0-38%. Furthermore, the percentage inhibitions obtained for the methanol extract against the HIV-1 reverse transcriptase enzyme were in the range of 2-46% while the percentage inhibitions obtained from the dichloromethane extract ranged between 5-38%. The obtained data suggests that *T. laxa* has moderate in vitro inhibition against HIV-1 reverse transcriptase enzyme but good anti-inflammatory activity suggesting new potential uses for this plant.

Keywords: *Trachyandra laxa*, HIV-1 reverse transcriptase, Egg albumin protein,

Genetic identification of Zambezi water lilies

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Abstract

Water lilies are from a family of flowering plants that belong to the order Nymphaeales. Water lilies belong to the family Nymphaeaceae, this family has at least 53 species that can be found all over the world, they are then further classified into 3 genera belonging to the order Nymphaeales. Zambezi water lilies are found in the Zambezi region which is located in the far north-eastern part of Namibia. Zambezi water lilies belong to the order Nymphaeales. One of the water lilies found in the Zambezi region is the purple water lily which belongs to the species *Nymphaea nouchali*. The objective of this experiment is to identify the different type of water lilies in the Zambezi region, in which specific area they are found and also how they are related to each other. The genetic information and location in which the lilies are found is important as it might shed light on why only certain water lilies are able to grow there. This study will focus on how genetic information of water lilies influence the variation of characteristics exhibited in certain water lilies and how those characteristics have helped them to survive in the area in which they are found. The samples were collected from the Zambezi region and kept at Namibia University of Science and Technology. DNA was extracted from the samples using a protocol adopted from the ZYMO RESEARCH Quick-DNA Plant/Seed Miniprep kit with a few modifications. A trial run was done on a few samples to determine if the method being used would yield the desired results. The samples were kept frozen until analysis. During DNA isolation the samples were kept at 4˚c and the remaining sample were immediately frozen to preserve their DNA. Agarose gel was used for the quantification of DNA which was then viewed under the ultra-violet transilluminator indicating the presence of genome in the samples as well as indicating that the method used was appropriate. The same method was then used on all the other samples to isolate and quantify the genome. A few setbacks were encountered but did not deter the progression of the research; further procedures will have to be completed in order to achieve the objective of the study.

Green Hydrogen generation and Valorization options in Namibia

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Abstract

The production of green hydrogen is identified as an option towards environmentally sustainable energy provision to meet humans 'ever increasing demand for energy'. Hydrogen is the most abundant chemical element in nature, but it is never found alone. It is always found combined with other elements, such as oxygen, fossil fuels, and organic matter. An appropriate amount and form of energy, from a variety of energy sources (renewable and non-renewable), is required to produce Hydrogen. This study describes various hydrogen production methods, and the hydrogen value chain, from production to end use, with the view of encouraging Namibia, to utilize the opportunities availed by its natural endowment with renewable energy sources such as sustainable winds, and intense solar radiation in a virtually cloudless environment. Green hydrogen is produced from processes powered by renewable energy this include biomass gasification, direct water splitting and electrolysis. Water (H2O) is split into Hydrogen and Oxygen through the process called electrolysis. Hydrogen is also extracted from other natural materials such as organic matters, plant and wood using different hydrogen production methods. The extracted hydrogen will then be used in hydrogen cells to produce electricity, or it may be used in appropriately modified internal combustion engines. Hydrogen cells produce only pure water as waste. The cycle then repeats itself again and again. Green hydrogen is considered a clean and sustainable energy source because the supply of cheap low-carbon electricity from green hydrogen is limitless and will fill the world's energy needs that won't be met with wind, solar power or by battery. While trying to solve the energy problem, global green hydrogen use could replace fossil fuel use and thus help in decarbonizing the earth's atmosphere.

In pursuit of preserving Namibian Indigenous languages: The development of an Oshikwanyama learning game

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Abstract

Namibia has over 10 indigenous languages, which include Oshindonga, Rukwangali, Otjiherero, Rugciriku, Thimbukushu, Silozi, Rumanyo, Setswana and Oshikwanyama, among others. With English being Namibia's first official language, most native languages have taken a backseat in terms of technological advancements and usage. The constant use of English as the form of communication in the native communities has caused a loss of touch with their roots, and most community members can barely communicate in their native languages, especially amongst millennials and generation Z. It is with this background that this paper focuses on the development of an Oshikwanyama interactive games application that is aimed at increasing enthusiasm amongst the Oshikwanyama speaking community. The study is focused on the Oshikwanyama speaking population, with primary data being collected and analyzed through the Survey monkey platform. The game is developed using Unity gaming engine and can run on both android and IOS. It gives users a choice to learn common Oshikwanyama words, phrases, proverbs and sentence format through a word search game, a crossword puzzle and a quiz. The game has proven to be useful to the target audience when it comes to learning words and testing their Oshikwanyama skills.

Student Record: A mobile app for student assessment capture

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Abstract

Student assessment capture has become an issue for lecturers in institutions of Higher education with increasing numbers of students. Suppose a certain subject/module has more than 200 students enrolled, and has a paper based test. Lecturers have to mark all these tests and then fill the total scores in their score sheets. This manual process take a lot of time and may sometimes be stressful to the responsible lecturers. It turns out you can make the process less stressful for the lecturer recording grade scores. In this study, we employ the recognition with artificial neural network to automatically identify the student identification number and scores of all questions from a scanned image of the cover page. This process involves recognizing the student number, student name, and total score from the sheet with an Android application. Both the total score and the student identification number are exported into excel format making it simple, useful and practical for subjects with a large number of registered students. In conclusion, the main improvements made by this designed system are: (i) the automatic capture of students' scores and (ii) the exporting of the scores to an excel format. This system could prove to reduce the time taken for the assessment capture and thus be more efficient in that it yields more accurate grade score recording.

Activity patterns of insectivorous bats (*Mammalia: Chiroptera*) occurring in the Mukwe Constituency of the Kavango East region, Namibia

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Abstract

The conservation status of bats has received increasing attention because of their key role in biodiversity in general. Bats assist with agricultural production mainly through ecosystem services: insect pest control and pollination. Although bats are deemed to be important aspects of agriculture, bat species are threatened by intensification of agriculture, thus leading to a drastic decrease in bat populations and eventually an extinction of some bat species. This study focuses on understanding the habitat preferences of bats and seasonal activity patterns. It is through understanding these aspects that the importance of bats in an ecosystem is understood, especially in agriculture as a biological pest control method. Insectivorous bats forage on most crop pests especially in areas where agriculture is the primary source of income, thus their conservation is in essence of great importance in reducing insect pests and the usage of chemical pesticides which are expensive especially to subsistence farmers in the area and later become detrimental to the ecosystem. The type of habitat bats occupy can be used to in restoration purposes by reforesting degraded areas to create a suitable habit for them which is of great importance in cases of insect pests' outbreaks. Fully understanding their habitat use and seasonal foraging activities aids in their conservation by ensuring little destruction and damage to their natural habitats. A preliminary acoustic survey of insectivorous bat activity was conducted in the Mukwe Constituency of the Kavango East Region, Namibia. Bat foraging activities were quantified in two sites, from the 26th March 2016 – 27th March 2016, representing the cluttered (Diyogha Village) and the uncluttered (Frans Dimbare Youth Center) environment. Bat acoustics were recorded using the wildlife acoustics bat detectors and the Maxim iButtton DS1923 data loggers (Fairbridge Tech, Sandton, Gauteng, South Africa) were used to measure temperature and relative humidity at each sampling site. Detectors were programmed to record bat calls from 19h00-06h00 for five consecutive days at each sampling site. In the sampling session, over 1000 bat calls were recorded in the two sites with the cluttered habitat recording much activity compared to the uncluttered habitat. The data was normally distributed with the normality of p=0.514. There is a significant difference in the variation of bat foraging and flight activities between the two sites sampled (p=0.05), this is because bats preferred a much cluttered habitat than a disturbed or much patchy and uncluttered habitat. Cluttered habitats near water bodies have a great diversity of insects foraged upon by insectivorous bats; this is because most insects are herbivorous while others thrive in wet habitats

such as mosquitos. There was a positive correlation between abiotic factors (temperature and relative humidity) and bat foraging and flight activities ($p=0.0342$), this is because the availability of prey species preyed upon by insectivorous bats is highly influenced by weather elements primarily temperature, relative humidity and precipitation, therefore having an impact on the foraging activities of bats. Therefore concluding that abiotic factors such as temperature and relative humidity have a great impact on the foraging activities of insectivorous bats and that the availability of clutter in a habitat determines the availability and foraging activities of insectivorous bats.

Anti-HIV and Anti-inflammatory potential of the Namibian *Hydnora abyssinica*

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Abstract

The Namibian *Hydnora abyssinica* is an African plant found primarily in Namibia, South Africa, Sudan, Mozambique and some other African countries. It is used traditionally to treat conditions associated with inflammation, however there is no current research conducted on its potential anti-inflammatory activity. While there is research on its antimicrobial activity, none are specific to its potential to exhibit anti-HIV activity. Thus, an egg albumin denaturation assay was conducted to determine the anti-inflammatory potential of *H. abyssinica* as the inhibition of protein denaturation is a property associated with anti-inflammation. Aspirin was used as a standard drug. In addition, a colorimetric HIV reverse transcriptase (RT) assay was performed to determine the anti-HIV potential of *H. abyssinica* using doxorubicin as the standard drug. Different concentrations of *H. abyssinica* dichloromethane: methanol (1:1) root extract were tested. *H. abyssinica* exhibited moderate inhibition against the HIV RT enzyme with the highest percent inhibition being 3.6% at 1mg/ml. In the protein denaturation assay, *H. abyssinica* inhibited protein denaturation in an interesting way. The percent inhibition increased as concentration decreased, with 1mg/ml exhibiting a percent inhibition of 0%, while concentrations from 100µg/ml and below exhibited percent inhibition in the range of 30-80%. This data suggests that *H. abyssinica* dichloromethane: methanol (1:1) root extract shows moderate inhibition against the HIV RT enzyme; and good inhibition of protein denaturation at low concentrations. Thus, *H. abyssinica* could be a good candidate for anti-inflammatory drug discovery.

Keywords: *Hydnora abyssinica*, HIV reverse transcriptase, anti-inflammatory

Investigation of the Dependence of Sheet Resistance on the Thickness of Spin Coated Poly (3-hexylthiophene) Thin Films

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Abstract

Poly (3-hexylthiophene)(P3HT) is a conductive polymer with many applications in electronics, organic photovoltaics(OPV) & thin films. Conductive polymers have the potential to replace silicon-based semiconductors in photovoltaic because they are cheaper to make. This means cheaper renewable energy can be available. In the thesis, P3HT thin films were fabricated, annealed and then the sheet resistance of each thin film was measured, together with their thickness. Commercially available P3HT was purchased. P3HT was dissolved in Chloroform ($CHCl_3$) at specific concentrations (and temperatures), to vary the possible thickness when the films are fabricated. Microscope glass slides were cleaned using alcohols, in the ultrasonic bath, followed by cleaning in distilled water. Dry, cleaned microscope glass slides were used as substrates for the organic thin film. The thickness of films was also varied by varying the spin speed of the spin coater. The resistivity of the films was determined for each thin film using the four-point probe method. The thickness of the thin films was determined by measuring the mass of the glass substrate before the film deposition and then after the film deposition and annealing using the microbalance to obtain the deposited film mass and the thickness is calculated. The results showed that there is indeed a correlation between the sheet resistance and the thin film thickness. Annealing also reduced the sheet resistance. P3HT thin films show more electrical properties than bulk material. P3HT thin films are good for OPV.

EXTRACELLULAR ENZYMATIC ACTIVITY OF ENDOPHYTIC FUNGI ISOLATED FROM *MORINGA OLEIFERA* AND *MORINGA OVALIFOLIA*

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Abstract

Endophytic fungi are relatively unexplored while they may represent a new rich source of unique bioactive compounds with a broad array of potentialities. To simplify the processing of raw material, fungal enzymes have been used in food, beverages, confectionaries, textiles and leather industries. They are often more stable than enzymes derived from other sources. The presence of endophytic fungi from *Moringa oleifera* and *Moringa ovalifolia* as biotechnological sources of industrially relevant enzymes has also not been explored. The focus of this study was to isolate endophytic fungi from *Moringa oleifera* and *Moringa ovalifolia* plants as new sources of different enzymes with potential applications in industry. This study adopted a qualitative and quantitative research approach and the *Moringa ovalifolia* parts of the plant were provided by the University of Namibia microbiology department while the *Moringa oleifera* were collected from the National Botanic Garden of Namibia in Windhoek, Namibia. All of the endophytic isolates were assessed for their potential role in producing extracellular enzymes, including amylase, lipase, pectinase, protease, laccase and phosphatase on solid media. The functional role of extracellular enzymes by fungal endophytes was assessed after incubation and the zone of enzyme activity surrounding the fungal colony was measured. In addition, the diameter of hydrolysis and fungal colony was measured from three isolate with the highest inhibition zone for the different enzymes plates and their enzyme index were also calculated. The experiment was performed in triplicates and the means of the enzyme index were then analyzed statistically the significant differences between the means was determined through Duncan's multiple range Test. The findings of the research show that protease was the most abundant enzyme produced by the isolated endophytes followed by amylase, lipase, laccase, pectinase, and phosphatase. Out of the eighteen isolated fungus screened, the highest production of the amylase enzyme was from isolate 18, isolate 17 showed greater production of lipase, isolate 13 showed greater production of pectinase and laccase, isolate 14 showed greater production in protease, and isolate 2 showed greater production the phosphatase enzyme. Based on the results presented, the strong enzymatic activities of the endophytic extracts of *Moringa oleifera* and *Moringa ovalifolia* plants shows a high potential as biotechnological sources of industrially relevant enzymes and will have variable important applications in industry.

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 (NMC) is a 1800km long and 400km wide belt that 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 (ranging from peridotite to pegmatite-granites) of the Vioolsdrif Intrusive Suite (VIS). Parts of these plutonic rocks are exposed in the Lüderitz area but have not been characterized. 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 of the study area and samples were collected for petrographic studies and geochemical analysis using X-ray Fluorescence (XRF) for major element analysis. The three gabbroic rocks observed in the Lüderitz area are meta-gabbro, olivine gabbro and pyroxenite. These mafic rocks intrude the supracrustal rocks and the biotite-quartz-feldspar migmatite gneiss which are in turn intruded by the augen gneiss, granodiorite gneiss, light grey equigranular granite, foliated granite, pink granite, pegmatites and dolerite dykes. Based on dominant minerals present, the gabbroic rocks have been metamorphosed to lower amphibolite facies with the mineral assemblage: plagioclase – hornblende – epidote – serpentine – biotite – sphene, however, remnant primary pyroxenes and olivines are common. Additionally, minor minerals include biotite, quartz and k-feldspar are present. Intrusive rocks in the Luderitz area range in composition from the mafic meta-gabbro to the intermediate diorite with SiO_2 (46.22-60.99 wt. %) and MgO (4.3-25.81 wt. %). Furthermore, there is an increase in SiO2 as MgO decreases, which is evidence of fractionation (fractional crystallization) and the negative Eu anomaly on the REE diagrams suggests plagioclase fractionation. The rocks show trends low in TiO_2 (0.19-0.88 wt. %) and P_2O_5 (0.01-0.32 wt. %) which represents a high-K calc-alkaline series. On the TiO_2-MnO-P_2O_5 discriminant diagram, the mafic rocks from Lüderitz plot well in the field of calc-alkaline basalts and on the TiO_2-K_2O-P_2O_5 discriminant diagram, they plot well in the field of continental suggesting that the rocks were formed in an active continental margin setting. Comparing the plots of the geochemical data from

the two areas of interest shows that the rocks have coherent trends and this shows that the co-magmatic. Similarly, based on the mineralogy and metamorphic grade of the Luderitz meta-gabbro, it suggests that it belongs to the Vioolsdrif domain. However, on a regional scale, a penetrative gneissic foliation and medium to high grades of metamorphism are observed which is characteristic of the Pella domain. Therefore, although the regional facies points to the Pella domain, however, there is a need to clearly characterize this.

A comparison of responses of flowering phenology of *Acrotome inflata* Benth. and *Acrotome fleckii* (Gürke) Launert species to climate change in Namibia

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Abstract

Phenology is one of the most sensitive indicators of climate change and has been used in recent years to track climate change. Plants respond to changing climate in different ways due to differences in their sensitivity to these changes. Additionally, some plants are more sensitive to some environmental variables than others. Consequently, their development and reproduction may be advanced or delayed depending on the conditions they are exposed to. Shifts in phenological phases, such as flowering time, fruiting or budding can lead to phenological mismatches in essential ecological relationships such as plant-pollinator interactions resulting in reproductive failure. Predicting plant phenological shifts due to climate change may provide some valuable insight into how ecological interactions and structure may change in the future. In this study, 113 *Acrotome* herbarium specimens were analyzed to establish if flowering phenology has shifted over the years, and to determine the extent to which these shifts could be linked to changes in temperature, rainfall, or geographical limits (latitude and longitude). Simple Linear regression was used to determine the relationships between the day of flowering and day of collection, rainfall, temperature, and geographical limits (latitude and longitude). A chi-square of association was used to establish whether there was a relationship between different phenological phases and the two *Acrotome* species. Simple Linear regression showed a delay in the day of flowering of *A. fleckii* by 6.68 days per decade during the period from 1949 to 2014. Additionally, the linear regression shows a significant relationship with *A. fleckii* (P-value <0.05), and rainfall delayed flowering day by 0.103 days per mm. Moreover, they were a significant shift in day of flowering and longitude of A. *inflata*, the day of flowering

was advanced by 3.7 days per degree rise in longitude. However, minimum temperature, maximum temperature, and latitude did not have a significant effect on the flowering phenology of *Acrotome inflata* and *Acrotome fleckii* (P-value >0.05). Furthermore, chi-square of association revealed that there was no association between flowering phenophases of the two species. The study concluded that the two *Acrotome* species are responding differently to the change in climate, with *A. fleckii* being more sensitive to shifts in rainfall.

Keywords: *Acrotome*, Climate change, Flowering phenology, Herbarium, Rainfall, Temperature

Isolation, characterization and biological activity of phenolic compounds from *Tapinanthus oleifolius*

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Abstract

Tapinanthus oleifolius (mistletoe) is a well-known semi-parasitic shrub that grows on other plants and is depended on their hosts for nutrients and water. The mistletoe can be found and thrive on host trees such as Acacia and Aloe species all over Namibia. *Tapinanthus oleifoluis* is used as a medicinal plant for treatment of various ailments possibly due to its phytochemical content. However, little is known about polyphenols from *T. oleifolius* warranting further investigations. Therefore, the purpose of this study was to isolate and characterize phenolic compounds from the leaves of *T. oleifolius* and also evaluate the phenolic compounds biological activity using antioxidants assays. The powdered leaves of *T. oleifoluis* were suspended in in 80% methanol and the resulting concentrated extract was used for further analysis. The anti-oxidative activities of the extracts were determined by means of ferric reducing antioxidant power (Fe^{3+} - Fe^{2+}), phosphomolybdenum reduction and 2,2-diphenyl-1-picrylhydrazyl (DPPH). The plant extracts demonstrated good antioxidant activity in both the phosphomolybdenum reduction, iron (III) reduction and 2,2-diphenyl-1-picrylhydrazyl radical scavenging assays. These results suggest that *T. oleifolius* may possess secondary compounds that can inhibit oxidation in the cells of the body. To obtain the TLC profile, the crude extract was spotted on analytical TLC and Folin-Coicalteu

spray reagent was used to detect the presence of phenolics. Serial exhaustive extraction was used to extract the active phenolic compounds, which were subsequently isolated using bioassay-guided fractionation and purified using thin layer chromatography and prepTLC. On the EMW mobile phase, different fluorescing chemicals were detected. Vanallin-sulphuric acid and DPPH spray reagent were used to detect non-fluorescing chemicals, indicating that *T.oleifolius* contains polar molecules with antioxidant potential. Overall, this study revealed that the *T.oleifolius* has some biological activity. In order to support their usage in conventional medicine, more research, including in vivo testing, is required.

Keywords: Antioxidant assays, Biological activity, Chromatography, Mistletoe, Phenolic compounds, Phytochemical, *Tapinanthus oleifolius*,

A statistical analysis of the prevalence of mental illness incidences and their associated sociodemographic factors in Namibia

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There is little in-depth research done in the prevalence of mental health in Namibia. This study aims to examine the prevalence of mental health and identify its associated socio-demographic factors. The socio-demographic factors studied included age of first admittance, region where patient was diagnosed, ethnicity, language, employment status, highest level of education, marital status, gender and substance use. A sample of 204 patients were randomly selected, data was collected and data was analyzed using IBM SPSS Statistics 28.0. Data was collected at the Windhoek Health Centre. Statistical analysis was done using the chi squared test (to determine association between diagnosis and its associated socio-demographic variables) and multinomial logistic regression (used to determine influencing socio-demographic factors). Mood disorders (41.2%) were the highest occurring group of disorders followed closing by psychotic disorders (40.2%), other disorder collectively were 18.6%. The mode variables in each factors were age group of 20-29 consisting of 40.2% of all age groups, 70.6% of patients were referred from the Khomas region, 48% were unemployed, 34.3% were Oshiwambo speaking, 79.4% were black, 20.1% had grade 12 as their highest level of education, 80.4% were single and 73% were not

substance users. Age, gender, employment, ethnicity and substance use all had a p-value of less than 0.0.5, showing association between these variables and diagnosis. These variable were used for the multinomial logistic regression

This paper looks deeper in the prevalence of the mental disorder groups in Namibia with their socio-demographic variables.

The Importance of Fish Protected Areas on the Zambezi River with Reference to the Kalimbeza Channel, Namibia

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Abstract

Fish protected areas are clearly defined as aquatic areas devoted to protect spawning areas and spawning periods, nursery sites where juveniles can mature and disperse from, thus the freshwater fish protected are such areas that are set aside for the protection of fish in fresh aquatic areas. Importance of fish protected areas is not well understood thus this study will determine the importance of fish protected areas on the Zambezi River with reference to the Kalimbeza Channel, Namibia. Fish samples were collected from the Kalimbeza Channel, with the nets being set overnight and taken out in the morning at sunrise. The fish species were identified to the species level, with weight and length measurements taken and recorded accordingly. The data collected for the Kalimbeza Channel were then compared with data from the Buffer zone and Lisikili both non-protected areas using Kuskal-Wallis test to determine the differences between the sites and this was done against a 95 % significance level. The Shannon-Wiener diversity index (H') was used to calculate the diversity indexes for the three study sites and a Kruskal-Wallis test used to determine the differences between species diversity in the protected and non-protected areas. The study showed that there is a significant difference in fish abundance for CPUE in number between the fish protected areas and non-protected areas (t-statistic = 23.47; *p*-value < 0.05; df = 2). Differences between the sites were determined using a Post Hoc test, there is however no significant difference in fish abundance for Catch Per Unit Effort (CPUE) in number found between Lisikili and the Buffer zone (t-statistic = 6.23; *p*-value = 0.887 > 0.05; df = 2), there is a

significant difference in fish abundance for CPUE in number found between Lisikili and Kalimbeza Channel (protected area) (t-statistic = 26.27; *p*-value < 0.05; df = 2) and a significant difference in fish abundance for CPUE in number found between the Buffer zone and the Kalimbeza Channel (t-statistic = 20.04; *p*-value < 0.05; df = 2). The study further found that there is a significant difference in CPUE for weight between the fish protected and non-protected areas (t-statistic = 29.30; *p*-value < 0.05; df = 2). There is no significant difference in CPUE for weight found between Lisikili and the Buffer zone (t-statistic = 5.79; *p*-value = 0.994 > 0.05; df = 2), there is a significant difference in CPUE for weight found between Lisikili and Kalimbeza Channel (t-statistic = 28.88; *p*-value < 0.05; df = 2) and a significant difference in CPUE for weight found between the Buffer zone and the Kalimbeza Channel (t-statistic = 23.08; *p*-value < 0.05; df = 2). The study also found that there is a significant difference in species diversity between the fish protected area and non-protected areas (t-statistic = 21.76; *p*-value < 0.05; df = 2). The study found no significant difference in species diversity between Lisikili and the Buffer zone (t-statistic = 6.68; *p*-value = 0.225 > 0.05; df = 2), there is a significant difference in species diversity between Lisikili and the Kalimbeza Channel (t-statistic = 25.24; *p*-value < 0.05; df = 2) and a significant difference in species diversity between the Buffer zone and the Kalimbeza Channel (t-statistic = 18.56; *p*-value < 0.05; df = 2). Understanding the benefits that are associated with having fish protected areas in a river such as increased species diversity, healthy weight distribution and fish abundance will equip area managers in helping the local community understand the importance of these fish protected areas on the Zambezi River, and hence enable them to practice sustainable ways of fishing to protect the fish populations that are decreasing thus enabling the community to benefit from fish for longer periods of time.

Keywords: Buffer zone, CPUE, Fish Protected Area, Lisikili, Kalimbeza Channel, Non-Protected Area, Zambezi River.

ISOLATION OF ACTINOMYCETES FROM DOROP NATIONAL PARK

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Abstract

In recent years, actinomycetes have been studied in different environments, niche and extreme habitats in various regions around the world. However, due to increase antibiotics resistance around the world, there is a need for new bioactive compounds This study was conducted to investigate Actinomycetes that inhabit in the soil. The soil samples were collected from Dorop National -park found in the Namib desert and cultivated in various means to isolate and identify actinomycetes. To isolate actinomycetes, three isolation-media were used, namely the Zhang' Starch Extract agar (ZSSE), Water-Yeast Extract and Yeast –Extract Malt-Extract Agar (YEME). Prior to that, 10mg/L of nalidixic acid and 50mg/L of nystatin were added to the three culture mediums, ZSSE YEME and WYE, to inhibit the growth of other bacteria and fungi, respectively. A total of three actinomycetes were isolated and characterized. The selected colonies were gram stained, different Physiological tests were done these colonies, they were then gel electrophoresed after DNA extraction and Polymerase Chain Reaction (PCR) was done. The PCR results obtained will then be sent to South Africa for further sequencing. These results show that a number of actinomycetes can be isolated from the Namib desert, Dorop National- park to be specific. These isolates may have antibacterial potential and can be investigated for future development

Keywords: Actinomycetes, Identification, Isolation, Dorop National-park, Soil samples, Characterization

Evaluation of alternative solvents for the simultaneous HILIC analysis of compounds of a wide polarity range.

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Abstract

Hydrophilic interaction liquid chromatography (HILIC) is an alternative high-performance liquid chromatography (HPLC) mode used for the efficient separation of polar compounds. HILIC has become established as a complimentary Liquid Chromatography approach that is particularly suited to the analysis of polar or charged solutes that are difficult to retain by the widely used reversed-phase liquid chromatography (RPLC). In HILIC a polar stationary phase is used in combination with an aqueous-organic mobile phase, typically with acetonitrile (ACN) as the organic modifier. A number of studies have focused on finding alternatives to ACN for HPLC analysis, for reasons including ACN's toxicity or simply to find solvents with improved selectivity. However, a number of uncommon, less polar solvents, methyl formate and methyl acetate have not been investigated as alternatives to ACN yet. It is expected that in HILIC the use of less polar mobile phases enhances retention as in normal phase chromatography and therefore, in this study the effectiveness of using these alternative solvents was evaluated.

Acetonitrile mobile phase was compared to alternative solvents such as methyl acetate. The chromatographic performance of mobile phases containing the alternative solvents, methyl formate and methyl acetate was compared to that of ACN containing mobile phase for the isocratic separation of compounds by HILIC using an Agilent 1100 HPLC consisting of a pump, autosampler and a UV detector and also equipped with a column oven. A mixture of selected compounds, including acids, cytosine and benzyl alcohol was used for the evaluations. Preliminary experiments revealed that methyl formate seems to have a high UV cut-off wavelength and hence all remaining experiments were performed using methyl acetate.

It was found that of the two solvents used, acetonitrile was the most efficient as compared to methyl acetate. On the other hand, a great increase in retention was observed with methyl acetate, and it enabled higher detection limits. Subsequently, the HILIC method with the methyl acetate mobile phase was successfully applied to the determination of aspirin in commercially available tablets.

This study showed that whilst acetonitrile provided the highest column efficiencies and lowest detection limits, methyl acetate also performed well and could be used to resolve the same number of analytes as was possible with acetonitrile. In addition, using methyl acetate for the separation is a "greener" approach, since it is less toxic and more environment friendly, compared to methanol and acetonitrile.

Evaluation of the effect of cooking on the pigment composition of indigenous leafy vegetables using thin-layer chromatography and high performance liquid chromatography

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Abstract

Plant pigments have been a subject of extensive research due to a wide range of health benefits associated with them such as antioxidant, anti-inflammatory and anticancer activities, to mention a few. This study investigated the effects of cooking on the pigment composition of three indigenous leafy vegetables, *Brassica Spinaceae, Amaranthus spp* and *Covo Chomolia* were studied. The three vegetables were boiled at 100 °C for 10 minutes in the same way as you would when cooking these vegetables. Raw and cooked vegetables were finely homogenised in a blender and pigments were extracted using acetone. Different polar and apolar solvent mixtures were evaluated on silica gel thin-layer plates to be able to identify the solvent system that provides the best separation of the pigments. The same extracts were also analysed on a C18 stationary phase using solvents of different polarities. In thin-layer chromatography, good separations of compounds were obtained using solvent systems based on hexane-acetone and acetone-petroleum ether combinations, which could indicate that the separated pigments are of medium polarity to non-polar nature. Bands were characterized by yellow and green colours. No obvious changes were noted in the chemical composition of the pigments as both raw and cooked samples showed the same number and colour of spots in thin-layer chromatography. In reversed-phase liquid chromatography (RP-LC), best separations were obtained with the mobile phase 80% Methanol: 20 Water and stationary phase Ethyl Acetate solvent system. The detected compounds showed UV absorption maxima around 240, 320, 440 and 645 nm. This absorption pattern is typical of these classes of compounds Chlorophyll of spinach, therefore it can be tentatively said that the pigments detected in the extracts of the vegetables under study belong to these classes, although individual compounds could not be identified using the TLC and UV data alone. Notable differences, in terms of the

number of peaks and/or peak intensities, were seen in the profiles of raw and cooked vegetables, which indicate that cooking somewhat has an effect on the pigment profiles of these vegetables. It is therefore highly recommended that the methods developed in this study be combined with other spectroscopic techniques such as the mass spectrometry and/or nuclear magnetic resonance to be able to characterize the individual compounds present in these samples and assess the effect of cooking on the chemical composition of the vegetables.

Determinants of Severity of Household Poverty: Empirical Evidence from Namibia

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Abstract

Poverty continues to be one of the major concerns of global economies. Developing countries in particular have placed poverty eradication in their development agenda because poverty negatively affects economic growth and development of nations. Namibia is not an exception because over 10% of its population still live in severe poverty. This study is aimed at identifying the socio-economic and demographic factors that contribute to the severity of household poverty in Namibia using a probit model approach. This study used data from the 2015/2016 Namibia Household Income and Expenditure Survey (NHIES). The findings of the study showed that the likelihood of severity of household poverty was determined by the head of household's age, location of a household (rural or urban), main source of income of the household, and region where the household was located. They also showed that households in regions such as Erongo, Khomas and Oshana had relatively low likelihoods of experiencing severe poverty. Furthermore, the households in urban areas were less likely to experience a severe poverty.

Since households whose main source of income is old age pension were more likely to experience poverty, the study recommends that the government promotes locally innovated businesses by the government to create an environment conducive to the establishment and growth of small and medium enterprises to generate income for the local communities, especially the youth. The study further recommends a formulation of an effective employment policy conducive to the creation of new employment opportunities especially among economically active population, namely those between the ages of 20 to 40 year.

Designing of Concentrated Solar Power Plant for Green Hydrogen production for Namibia

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Abstract

This study designed, and analysed the feasibility of, a Concentrated Solar Power (CSP) plant for the production of Green Hydrogen using Namibia's vast irradiation, in response to the rising global warming due to fossil fuel emissions, Namibia's rising energy demands as well as its dependence on imported electrical energy. Economic and environmental benefits of a local green hydrogen plant, were analysed, as well as the costs involved in establishing such a plant. The study estimated the possible Green Hydrogen output, in relation to the amount of heat energy possible from a CSP plant, given the yearly and daily amounts of Direct Normal Irradiance (DNI) that Namibia receives as obtained from the Global Solar Atlas. The study found that with the amount of DNI Namibia is exposed to, selected sites like Hochland, Skorpion Mine, Ausnek, Kokerboom and Gerus with land area ranging from 370 000m^2 to 778 000m^2 which, assuming just 50% efficient electrolyzers, could produce Hydrogen at $2 \times 10^6 kg$/day for a CSP system connected directly to the Hydrogen producing facility, running for 12 hours per day. While using more efficient electrolyzers, say 75% efficient, even more Hydrogen gas could be yielded. Cost as well as water was found to be the greatest challenge especially, in the case of water, in dry seasons since approximately 8 litres were shown to be needed per 1kg of Hydrogen produced. In conclusion, it is possible for Namibia to be a competitive producer of both CSP and green Hydrogen.

Tree species, number of trees and tree size nested in by White-Browed Sparrow-Weavers colonies (*Plocepasser mahali*) in natural and urban habitats, Khomas region, Namibia

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Abstract

The white-browed sparrow-weavers habitats are important for building their nests. A limited number of studies on the number of trees, tree species and tree size nested in by White-Browed Sparrow-Weavers (*Plocepasser mahali*) have been conducted in Namibia. The aim of this study was to determine and compare the number of trees, tree species and tree size nested in by white-browed sparrow-weavers colonies in urban (Daan Viljoen Game Reserve) and natural (University of Namibia main campus) habitats. In each habitat, 15 colonies of white-browed sparrow-wears were randomly selected. The tree species, number of trees per colony, stem diameter and canopy diameter were determined each colony. The stem and canopy diameter for both natural and urban habitats were associated. The mean number of trees in natural habitat was 1.6 and the standard deviation was 0.73, while the mean number of trees in urban habitat was 1.53 and the standard deviation was 0.83. This showed that there was no significant difference in the number of trees between the natural and urban habitats. The stem diameter mean in the natural habitat was 0.32 and the standard deviation was 0.15, while the stem diameter mean in the urban habitat was 0.23 and the standard deviation was 0.11. This showed that there was no significant difference in the stem diameter between the natural and urban habitats. This means that the stem dimeter varies between the two habitats, hence the natural habitat had high stem diameter than the urban habitat. The tree species that were nested in by white-browed sparrow-weavers in the natural habitats were *Vachellia erioloba* and *Vachellia reficiens,* while in the urban habitat were *Senegalia mellifera, Vachellia erioloba*, *Vachellia reficiens*, *Vachellia hebeclada* and *Vachellia xanthophloea*. This showed that there was a significant difference in the tree species between the natural and urban habitats. s. The urban habitat had more trees species than the natural habitat. The natural habitat was dominated by *Vachellia erioloba*, while the urban habitat was dominated by *Senegalia mellifera*. The number of trees was similar in both habitats. The stem diameter differs in the natural and urban habitats. The tree species were not similar in natural and urban habitats and the two habitats were dominated by different tree species. Finally, this study will contribute to a better understanding of white-browed sparrow-weavers nesting sites and breeding behaviors in urban and natural habitats in Namibia.

Activity patterns of insectivorous bats (*Mammalia: Chiroptera*) occurring in the Mukwe Constituency of the Kavango East region, Namibia

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Abstract

The conservation status of bats has received increasing attention because of their key role in biodiversity in general. Bats assist with agricultural production mainly through ecosystem services: insect pest control and pollination. Although bats are deemed to be important aspects of agriculture, bat species are threatened by intensification of agriculture, thus leading to a drastic decrease in bat populations and eventually an extinction of some bat species. This study focuses on understanding the habitat preferences of bats and seasonal activity patterns. It is through understanding these aspects that the importance of bats in an ecosystem is understood, especially in agriculture as a biological pest control method. Insectivorous bats forage on most crop pests especially in areas where agriculture is the primary source of income, thus their conservation is in essence of great importance in reducing insect pests and the usage of chemical pesticides which are expensive especially to subsistence farmers in the area and later become detrimental to the ecosystem. The type of habitat bats occupy can be used to in restoration purposes by reforesting degraded areas to create a suitable habit for them which is of great importance in cases of insect pests' outbreaks. Fully understanding their habitat use and seasonal foraging activities aids in their conservation by ensuring little destruction and damage to their natural habitats. A preliminary acoustic survey of insectivorous bat activity was conducted in the Mukwe Constituency of the Kavango East Region, Namibia. Bat foraging activities were quantified in two sites, from the 26th March 2016 – 27th March 2016, representing the cluttered (Diyogha Village) and the uncluttered (Frans Dimbare Youth Center) environment. Bat acoustics were recorded using the wildlife acoustics bat detectors and the Maxim iButtton DS1923 data loggers (Fairbridge Tech, Sandton, Gauteng, South Africa) were used to measure temperature and relative humidity at each sampling site. Detectors were programmed to record bat calls from 19h00-06h00 for five consecutive days at each sampling site. In the sampling session, over 1000 bat calls were recorded in the two sites with the cluttered habitat recording much activity compared to the uncluttered habitat. The data was normally distributed with the normality of p=0.514. There is a significant difference in the variation of bat foraging and flight activities between the two sites sampled (p=0.05), this is because bats preferred a much cluttered habitat than a disturbed or much patchy and uncluttered habitat. Cluttered habitats near water bodies have a great diversity of insects foraged upon by

insectivorous bats; this is because most insects are herbivorous while others thrive in wet habitats such as mosquitos. There was a positive correlation between abiotic factors (temperature and relative humidity) and bat foraging and flight activities ($p=0.0342$), this is because the availability of prey species preyed upon by insectivorous bats is highly influenced by weather elements primarily temperature, relative humidity and precipitation, therefore having an impact on the foraging activities of bats. Therefore concluding that abiotic factors such as temperature and relative humidity have a great impact on the foraging activities of insectivorous bats and that the availability of clutter in a habitat determines the availability and foraging activities of insectivorous bats.

Developing a Mobile Application to Assist in Finding Missing People in Namibia

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Abstract

Living in a country with a small population of 2,574,219 there is difficulty in finding a loved one after they have gone missing. They have been many reported cases of people missing in different parts of Namibia which some have been successful after the search has gone for a short period and others after a prolonged duration, some searches have turned out to be unsuccessful.

There are numerous reasons why people go missing from their loved ones such as; abduction, suicide in a remote location, physiological problems, criminal offense, accidents or peer pressure, voluntary disappearance, and many others. The current methods being used to search for missing people seem to be not efficient and effective enough because people who go missing are either found after a long period or are not found at all. With technology evolving, using newspapers, and sharing posts on social media for those who have access to social media and they sometimes cause confusion because of lack of control in how the reports are circulated, registering cases with the police seem to be also not enough, and more needs to be done.

The aim of the study, therefore, was to investigate weaknesses in the current system of searching for missing people in Namibia, with the interest to offer a more efficient and effective solution. A study was conducted on Namibian Police and the members of the public on their experience and the current manual system being used. An investigation of the current methods used for searching for missing people was done and the results proved that as much as technology keeps evolving in Namibia and other parts of the world, we need technology to solve problems, speed up processes and make our lives easier.

The results indicate that most of the respondents do not have much faith in the current methods of searching for missing people. The results show that the current system is not efficient and effective enough, because most of the people reported missing are either found after a long period of search or they are not found at all. A mobile application was designed, developed, and tested to solve the lack of efficacy in reporting missing people in Namibia. The agile methodology was used to

develop the application.

Keywords: Missing person, Mobile application, Reporting

TEMPERATURE VARIABILITY OVER NAMIBIA IN RELATION TO THE ATMOSPHERIC CIRCULATION

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Abstract

Temporal and spatial variability of temperature trend and the effect of SST on air temperature over Namibia at 3 synoptic stations were investigated for the period 1985 to 2020. The stations with the data sets as complete as possible were chosen and those which were not being moved for the study period. The non-parametric Mann-Kendall (MK) trend test and Sen's slope estimate were used to assess the nature of the temperature trend and significant level. The result shows an upward and significant trend in annual minimum, maximum and mean temperatures at almost all stations, except one station with annual minimum temperature which is not significant. Time series for summer shows an upward trend and significant but not significant at two station's minimum temperature. For summer season upward and significant with one station not significant in maximum temperature and two stations in minimum temperature. Pearson correlation and simple linear regression were used to assess the relationship and determine the effect of SST to the air temperatures. Weak to moderate relationships were found at all stations, and only a few percent of total variation in temperatures was explained by SST. Temperature over Namibia is slightly increasing as the global temperature increases. Global SST has not much influence on Namibian temperature, due to the limited observational station data available; analysis was only done for three stations. Further study/research is recommended using reanalysis/gridded data to cater for the sparse observational data coverage over Namibia, using outgoing long wave radiation as one of the variables and correlating SST from all basins with every station to determine basins which

correlate better with our station data. I further recommend determining cold/hot nights/days and effect of atmospheric circulation on temperature over Namibia for further research.

ANALYSIS OF TIMELINESS OF BIRTH REGISTRATION IN NAMIBIA EVIDENCE FROM VITAL STATISTICS NAMIBIA (2013 TO 2017)

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Abstract

Timeliness of birth refers to a birth that has been registered within twelve (12) months from the time of occurrence or else that birth will be registered as late birth registration. The right to be recognized as a person before the law is a critical step in ensuring lifelong protection and is a prerequisite for exercising all other rights. A birth certificate may also be required to access social service systems, including health, education and justice. United Nations General Assembly in September 2015 placed birth registration firmly on the international development agenda. Under Goal 16: provide legal identity for all, including birth registration. Children without birth certificates are at risk of lifelong exclusion from fundamental benefits and rights, including access to education, health services, conditional cash transfers, and pensions. Links between lack of birth registration and benefits, rights, and vulnerabilities have not been rigorously studied.

The investigation utilized optional information from Namibia Statistics Agency (Namibia Vital Statistics Report). The data for this study is obtained from all the 14 regions. A trend analysis was done using the proportion registered birth over the five years of review for the entire country and by geopolitical regions. Logistic regression was used to compare the registrations between 2013 and 2017. Chi square test was done to test for association. Child-level predictors of registration include age and sex, as female children had a lower chance of birth registration than their male (being the reference category) counterparts and it appears to be the only statistically significant predictor. These investigations are important given the generally poor quality of census data collected in many developing countries, particularly those in sub-Saharan Africa. Education also plays a significant role on the decision of women whether to have their children's birth registered or not. Some program policies could also be set by the Ministry of home affairs where it includes demographic dynamics of birth registration in order to raise awareness on the importance of the birth registration. If one is to do a similar study, one should try to go further to evaluate even regions by regions to see which region's births data are registered and which ones are not

A STATISTICAL ANALYSIS OF FACTORS INFLUENCING YOUTHS ENGANGEMENT IN AGRICULTURE INDUSTRY IN NAMIBIA

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Abstract

This paper analyses the factors that influence youths' engagement in the agricultural industry in Namibia. The objectives of the study were to describe the patterns of youth participation in Agriculture; identify the variables which are strongly correlated with youth participations using Chi-square tests of association; and to establish the determinants of youth participation in Namibia, using logistic regression analysis.

Results indicated that youth with at least (certificate, diploma, or degree), males, youth aged 16-25, and youth from northeast regions, northwest regions and central regions are less likely to engage in agricultural activities ($p<0.05$).

Statistical Analysis of Prevalence and Risk Factors of Childhood Anemia in Khomas, Namibia

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Abstract

Anemia is a common problem in children and people of all age group in developing countries and taking steps to tackle it is one of the major public health challenges for Namibia. The objective of this the study was to investigate the prevalence and risk factors of anemia among all age group in Windhoek, Khomas region.

Data was taken from a NDHS 2013 with a sample of 1,942 Namibian children aged from 6–59 months. The Chi-square test was used to determine the bivariate relationship between the selected variables and childhood anemia and a multilevel logistic regression model with a random intercept at household and community level was used to pick out the important determinants of this kind of anemia.

We investigated the prevalence of childhood anemia in 1942 households. We found out that the overall prevalence of anemia of both any level of anemia (<11.0 gm/dl) and moderate to severe anemia were significantly higher among children aged less than 11 months (71.6% were anemic and 43.3% were moderate to severe anemic) and children of uneducated mothers (57.3% were anemic and 29.8% were moderate to severe anemic).

Our results suggest that the residence status of the family, traditional eating habits of the region, the fear of gaining weight and irregular eating habits are of great importance in the development of anemia in Namibia.

Demographic and Socio-Economic Determinants of Age at First Birth: An Analysis of Namibia Demographic Health Survey (NDHS) 2013

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Abstract

Age at first birth refers to the age at which women begin child childbearing. It is considered as the most important event in a woman's life as it is a transition period into womanhood, and signifies her taking on the roles and responsibilities of a mother. Studies showed that age factors such as residence, contraception use, education, respondent's working status affects the age at first birth. The study aimed to assess the determinants of age at first birth and determined the effects of demographic and socioeconomic on age at first birth in Namibia.

This study followed a quantitative research design using the 2013 Namibia Demographic Health Survey (NDHS) data, 2013. After the data cleaning, 18090 females were considered in this study.

The Chi-square testing and an Ordinal logistic regression model were employed to examine the association and the effect of and/or between the study variables. The outcome variable was age at first birth (<16, 16-19, 20-24, 25-29, 30-34, and 35+) in years, the explanatory variables were; contraception use, region, residence, wealth index, education attainment and employment status.

The findings of the study revealed that educational level, wealth index, contraception, region and employment were statistically significant age at first birth among the female in Namibia. At a 5% level of significance, the model results showed that the odds of age at first birth for females in the Kavango region was 0.685 lower compared to the odds of age at first birth for females in Otjondjozupa (reference category) region 95% CI 0.594, 0.790. The odds of age at first birth for females in the Kunene region was 0.755 lower compared to the odds of age at first birth for females in the Otjozondjupa (95% CI 0.653, 0.872) region.

A Comparative Study of Species Diversity and Abundance of Macroalgae along the Intertidal Zonation of Dolphin and Long Beach off the Central Coast of Namibia

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Abstract

Macroalgae are multicellular, macroscopic plant-like organisms that are found in coastal areas, especially the rocky intertidal communities. The rocky intertidal is a transition zone between land and the sea. Biota inhabiting these zones have adapted distinctive physiological traits to survive in their particular zones. Desiccation, competition, habitat characteristics, and ecological niches are all recognized as important structuring mechanisms in intertidal communities and have effects on population dynamics. Climate change is a rising concern for the health and survival of biodiversity and intertidal communities as they are highly sensitive to extreme fluctuations, the goal of the study is to see if there were any notable changes in macroalgae distribution patterns between the zones of each study area in terms of species richness, diversity, species composition, or abundance. The research was carried out in late March 2021 at two different intertidal sites along Namibia's coast, The Dolphin and Long Beach. Systematic sampling design with 50m transects going from the low zone to the high zone of each site were used to collect data. The samples were then sifted through mesh sieves, identified with multiple guides, dried in an Oven for 1 to 2 days at 60°C, and weighed to the nearest gram (g).

The findings analyzed through Kruskal Wallis implies that the distribution of species richness between zones at both locations is not the same {p-value 0.000 and 0.007< 0.05}, indicating a significant difference between zones for both sites. The distribution of species diversity (H') between the zones of Dolphin Beach is not the same, but it is the same throughout the zones of Long Beach because the p-value {0,645} is greater than {0.05}, therefore the null hypothesis is retained. The proportion of species varies by zone and location. In comparison to Long Beach, which is highly diversified with lower proportions of most species throughout all zones, Dolphin Beach has a higher proportion of species. Green algae such as *Ulva intestinalis* and *Ulva nematoidea* are the most prevalent species in the low zone and middle zone of Dolphin Beach, with *Caulacanthus ustulatus* dominating the high zone. The low zone of Long Beach has a higher proportion of brown algae, *Laminaria pallida*, followed by green algae, *Ulva rigida* and *Ulva fasciata* which are similarly dominant in the middle and high zones of Long Beach. Species

composition and richness differs across sites and along the intertidal zones due to varies factors that determine and influence their population dynamics.

Keywords: distribution, Shannon index (*H*'), species composition, richness.

Gamifying the NSSC AS-Level Mathematics Syllabus for Grade 12 in Namibia

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Abstract

Mathematics, in Namibia, is considered as one of the most difficult subjects to learn amongst school learners. Concepts, such as Algebra or the use of the Quadratic Formula can be very tricky to explain to learners, therefore a fun, creative but educational way should be introduced in Namibian schools. Gaming environments, namely, Serious Games, have been successfully used in schools abroad, and will be the main focus point in this research paper. By using gamification techniques, teachers can help learners to study mathematical concepts by using a repetitive technique in the form of quizzes. The aim of this study is to develop a serious mobile game (FUNdaMaths 4 AS) that uses a "rewarding system" to motivate learners to progress further in the game. FUNdaMaths is a bit different to other applications by using a Teaching Method that uses color-coding that aids learners to differentiate, retain and transfer knowledge by paying attention to critical information for meaningful learning. As there are few such applications available already, FUNdaMaths 4 AS focuses on the new Namibian curriculum and can be used to not only help learners, but teachers simultaneously, due to some topics being new to a few teachers. FUNdaMaths, in the future, can be expanded to other grades as well, and potentially used in the classroom for integrated teaching/learning. With the COVID-19 pandemic, schools were forced to introduce online teaching, thus making FUNdaMaths a virtual tutoring system and an ideal platform to teach learners while in either lockdown, isolation or quarantine to avoid falling behind with the syllabus. The application was tested at a local high school, Windhoek Technical High School (HTS). 25 Learners participated in the testing process and the feedback was positive. 70% of the learners found the application very helpful, due to the user-friendliness and sufficient materials provided in the application. The study adopted the Game Development Life Cycle (GDLC) methodology, which consists of the Initiation, Pre-Production, Production, Testing and Release Phases. The Random Sampling Technique was

used throughout the research, firstly to find out which types of phones the users/learners use by selecting a random population. The findings of this study show sufficient evidence that serious games can increase academic performance amongst Grade 12 AS Mathematics learners in Namibia.

Synthesis, Partial-Characterisation of 8-Hydroxyquinoline-Hydrazones and Evaluation of their *In Vitro* Antimicrobial Activity

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Abstract

The antibiotic resistance epidemic currently poses a serious threat to public health; as a result, the development of more potent drugs that exert their activity through new modes of action is crucial. The privileged scaffold that was targeted in this study is the planar aromatic 8-hydroxyquinoline, this small structure has a lipophilic effect and metal chelating ability with a broad range of pharmacological potential.

The wide range of medicinal properties of 8-hydroxyquinoline includes anticancer, antioxidant, antifungal, antibacterial, anti-inflammatory and antidiabetic activities. This wide range of biological activities has prompted medicinal chemistry to do structural-activity relations on the scaffold with the hope of generating new drugs candidates.

The objective of this study is therefore to synthesise 8-hydroxyquinoline-hydrazones and evaluate them for their antimicrobial activity. Synthesis of the hydrazone derivatives was done by chloromethylation of the 8-hydroxyquinoline at position 5 to make 5-chloromethyl-8-

hydroxyquinoline which was then reacted with various hydrazones, whereby the hydrazones were prepared by reacting various aldehydes with hydrazine. The 8-hydroxyquinolin-4-yl hydrazones to be synthesised were analysed for their physicochemical properties using Molinspiration and all of the 11 compounds were found to obey Lipinski's Rule of Five.

Partial characterisation of these 8-hydroxyquinolin-4-yl hydrazones, as well as the intermediates, will be done using melting point, IR and GC-MS analysis. *In vitro* tests for all compounds will be done for antimicrobial activity against a fungus *Candida albicans*, gram-negative bacteria *Escherichia coli* and gram-positive bacteria, *Staphylococcus aureus* using the disk plate method.

Automated Cash Flow Recording System for Bar Tenders

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Abstract

The main objective of this study is focused on how an automated system can be designed and implemented to assist bartenders with automatic calculation and recording of their daily cash. According to this research, I found out that bartenders use paper-based system to record their daily cash sales. This system is less reliable due to the fact that it encounter problems like time consumption, miscalculations and exposure to damage, the system is also behind in technology wise. Due to the above mentioned, this study is done in order to design an automated cash recording system for the mentioned group of population (bar tenders). The purpose of the automated system is to reduce the problems encountered with the paper based system. The study will also contribute to the development of the country by involving IT in small-medium business enterprises. For this study's methodology, a critical literature review from different sources was used, whereby it stated that it is very likely that electronic records will become the main format in which financial records will be preserved in future. A mixed research methodology was used for this study, which is both quantitative and qualitative methods. A clustered sampling technique was used for sampling among Namibian bartenders, whereby 5 bar tenders were randomly selected from Windhoek (Urban) and also 5 from Eenyika village (rural). Questionnaires in hard copies were distributed to the sample population of bartenders. With the results that the questionnaires brought, the study found out that most of the bartenders recommend using automated cash recording system which they currently do not use. They recommend this system because it is more secure and reliable than books/papers. The automated system will help them with keeping track of their business performance and cash flow anywhere at any time, hence it is stored in cloud. The results showed that bar tenders use paper-based system since it is easier to use and it is cheaper than automated systems. Although some bar tenders use Microsoft office to record their daily cash, they still recommend a system that would store their data on cloud than being stored in one machine. I strongly believe that an automated system will be of great benefit to their businesses.

Electronic structures of neutral and anionic $(TiO_2)_2$ clusters doped with Tungsten (W), Chromium (Cr), Molybdenum (Mo).

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Abstract

Titanium dioxide (TiO_2) has a wide band gap, 3.0 eV for rutile and 3.2 eV for anatase. Consequently, the oxide can only absorb UV light that makes up roughly 4.5% of the solar energy. The TiO_2 band gap can be narrowed, in order to enhance absorption in the visible light region that makes about 45% of solar spectrum. Transition metal doping is one of the several processes that can be used to achieve narrowing of the band gap in TiO_2. In this conference, preliminary results obtained by doping $(TiO_2)_2$, with tungsten (W), chromium (Cr) and molybdenum (Mo) are presented. The B3LYP variant of density functional theory was used in conjunction with the 6-31+G(d) basis set for the oxygen atom and the valence regions of Ti, Cr, Mo, and W transition metals (TM)., The Stuttgart-Dresden effective core potential (sdd) was used for the core regions of the transition metals. The structures of $(TiO_2)_2$ and corresponding W, Cr and Mo doped clusters were fully optimized without symmetry constraints and the stationary points characterized as minima or transition states via frequency calculations. The optical properties of the doped clusters were investigated using time dependent B3LYP while the vertical and adiabatic electron detachment energies, VEDE and AEDE, respectively, were computed from the energies of the anionic and neutral species. The reorganisation energy was calculated as a function of the electron affinity (EA), ionization potential energy (IE), AEDE and VEDE. W, Cr and Mo doped clusters all have higher hole transfer than electron, thus have lower electron mobility. The ground state W-doped-$(TiO_2)_2$ has the lowest reorganisation energy of 1.94 eV, Cr doped-$(TiO_2)_2$ has 4.96 eV and Mo doped-$(TiO_2)_2$ has the highest reorganisation energy of 8.05 eV. The HOMO-LUMO gap of the doped clusters will be computed, and as an approximation compared to the band gap of W-doped TiO_2, Cr- doped TiO_2, and Mo-doped TiO_2 .

Using Neural Networks For Visual Deepfake Detection

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Abstract

A deepfake video is defined as an altered video created by manipulating an original video using advanced machine learning techniques. This study looked at the rise in deepfake technology, the increased accessibility to the technology that is used to generate deepfake videos and the subsequent ramifications was also addressed. There has certainly been a remarkable rise in the quality of deepfake videos and as seen in any technological leap, there is a need to thoroughly investigate exactly what this means for our current understanding. Some deepfake videos have become so indistinguishable from an original that the line between what is real and what is fake has become blurred. This study proposed an automated method to efficiently detect facial tampering in videos making use of the same artificial intelligence technology behind this latest technological advancement. There have been other methods that were developed to detect deepfakes. This study evaluated those methods and assess how they can be improved or suggest alternative methods to achieve more accurate outcomes. The methods used to carry out this study were split into two phases. First an empirical assessment was conducted of how well the human eye fared at detecting deepfake videos. The second phases involved developing a system that detects deepfake videos by using the proposed option of neural networks and assessing how well it fared against the human eye and other pre-existing deepfake detection systems. The study found that the human eye cannot easily distinguish deepfake videos from real ones. It also found the system developed to be much more efficient at detecting deepfake videos than the human eye and better in some instances than some pre-existing systems. The main takeaway from the study was that there is an urgent need to come up with counter solutions for the rapidly increasing quality of realistic deepfake videos and that neural networks are a viable and sustainable means to this end.

Keyword: Deepfake Videos, Machine Learning, Artificial Intelligence

Preparation of plant *Chenopodium amboanum (Murr)* to study the antioxidant activities of the plant and the fungal endophytes of *Chenopodium amboanum (Murr)*

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Abstract

Reactive oxygen species (ROS) are highly reactive molecules that are by-products of oxygen metabolism. These reactive oxygen species or free radicals can cause oxidative stress which is an imbalance between the excess ROS and the cells ability to have an effective antioxidant response. Antioxidants is used as a medicinal compound to counter these reactive oxygen species. This study aims to determine if *Chenopodium amboanum (murr)* has antioxidant activity, specifically, it investigates and compares the antioxidant activity of the plant extract, fungal endophytes and isolated bacterial samples. The total phenolic content was analyzed using the Folin-Ciocalteau assay and Gallic acid as the positive control at different concentrations. The total flavonoids were analyzed using Aluminium chloride assay and Quercetin as a positive control. The antioxidant activity of the plant was determined by the Reducing power assay using Ferric Chloride ($FeCl_3$). 2,2-diphenyl-1-picrylhydrazyl (DPPH) free radical scavenging assay was used to determine the inhibition of the free radicals in DPPH using the plant extract. The reducing power assay and DPPH free radical scavenging assay made use of ascorbic acid as a positive control.

The antioxidant activity of the plant and its fungal endophytes was tested for the total phenolic content, total flavonoid content, reducing power and DPPH free radical scavenging assay. Total phenolic content ranged from 0.0094 ± 0.0048 mg GAE/g to 0.0926 ± 0.0376 mg GAE/g. Total flavonoid content ranged from 0.009 ± 0.002 mg QE/g to 0.262 ± 0.273 mg QE/g. The reducing power assay showed a dose dependent pattern. And DPPH free radical scavenging assay gave good IC_{50} ranging from 0.12 ± 0.01 mg/ml to 0.48 ± 0.011 mg/ml. It can be concluded that the results suggests that the plant exerts some antioxidant activity by having a dose dependent pattern on the graph of the reducing power assay, and the concentration at which the plant inhibits 50% of the free radicals in DPPH, shows that that plant can exert antioxidant activity. Total phenolic

content and total flavonoid content indicates a presence of secondary metabolites, phenols and flavonoids, respectively.

Antibacterial activity and phytochemical screening of *Diospyros mespiliformis*

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Abstract

Medicinal plants are used to treat and cure diseases due to the presence of bioactive pharmacological compounds present in them. *Diospyros mespiliformis* is traditionally used by local communities in treating arthritis, tumor related diseases, leprosy, pneumonia, syphilis, fever, malaria. The aim of the present study was to determine pre-liminary phytochemical and antibacterial activity of *Diospyros mespiliformis* ethanol leaf extracts. The antibacterial activity was conducted using ATCC strains of *Streptococcus mutans, Pseudomonas aeruginosa* and *staphylococcus aureus.* The results from phytochemical screening indicated the presence of alkaloids, flavonoids, tannins, phenols, glycosides, saponins, diterpenes and anthraquinones in the leaf extract. The antibacterial activity of *Diospyros mespiliformis* was conducted using disc diffusion method while minimum inhibitory concentration (MIC) was determined using the streak plate technique. *Streptococcus mutans and staphylococcus aureus* were completely inhibited at all concentrations of the leaf extract while *Pseudomonas aeruginosa* was not completely inhibited by *Diospyros mespiliformis* extract due to the presence of few bacterial colonies that had grown on the agar. *Streptococcus mutans and staphylococcus aureus* were completely inhibited at the lowest concentration of 0.625 mg/mL. *Pseudomonas aeruginosa* had a minimum inhibitory concentration observed at 10.00 mg/mL with mean inhibition of 22.00 ± 1.79 mm and at 5.00 mg/mL, 0.625 mg/mL with a mean inhibition of 16.00 ± 1.60 mm for each concentration. The results of this study signify the importance *Diospyros mespiliformis* and its potential use in Drug research and development, the study also proved the importance of its traditional use.

Keywords: *Diospyros mespiliformis*, Antibacterial activity, Phytochemical screening, Total Flavonoid content, Total Phenolic content

DETERMINING THE PARAMETERS THAT REQUIRE OPTIMIZATION FOR THE GROWTH OF ACTINOMYCETES FROM DESERT SOIL

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Abstract

Actinomycetes are ubiquitously distributed groups of microorganisms in natural ecosystems. They are the source of about 75% of all the known antibiotic products, 50% of which, are derived from *Streptomyces spp*. Antibiotics produced from actinomycetes have been instrumental in the treatment of human and veterinary diseases. However, studies still estimate that only about 1% of microorganisms have so far been studied owing to difficulties encountered in growing them in artificial culture media. Even more difficult to culture are actinomycetes and other microorganisms from harsh natural environments such as the Namibian desert soil. The purpose of this study was to develop or formulate culture media culture that may potentially grow more actinomycetes or previously even unculturable actinomycetes and develop a selective culture media for actinomycetes. The study was premised on the hypothesis that such optimized media may result in the recovery of novel actinomycetes species with the potential to that produce novel antibiotics. Soil samples were collected from the Dorob National Park in Namibia. For plating purposes, serial dilutions were made. Four different existing media namely Soil Extract Agar (SEA), Water- Yeast Extract Agar (WYE), Yet Extract Malt Extract Agar (YEME) and the Starch Casein Agar Medium (SCA) were used, each supplemented with cycloheximide (50 g/mL) and nalidixic acid (10 g/mL) to suppress the growth of bacteria and fungi respectively. These media were used to develop a baseline to see how many actinomycetes can grow. They were each modified in order to improve the capability to culture actinomycetes. The average colony count of actinobacteria grown on a plate was evaluated using three replicates for each dilution. The medium that showed signs of the greatest growth capacity to accommodate the most actinomycetes was then put into more focus. From this data, statistical analyses such as ANOVA was performed. There was no significant improvement in the modified media.

Keywords: Desert soil, isolation, actinomycetes, culture media, optimization, antibiotics

Preliminary screening for Probiotic characteristics of locally isolated Lactic Acid bacteria from fermented olives

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Abstract

Table olives *(Olea europaea*) are the most widespread fermented vegetables in the Mediterranean countries, have a great economic significance as a food commodity. They are highly nutritious with special content of bioactive compounds, dietary fibers, fatty acid composition and antioxidants activity makes table olives a valuable functional food. During processing, debittering of olive fruits take place to obtain edible table olives with an enhanced sensory features, physicochemical and microbial stability. It is well known that (LAB) originated from olive natural microbiota are the dominant microorganisms in natural fermentations and considered as the key motive to investigate their probiotic potential. Past and present researches have only focused on isolating LAB from various food matrices, fermented dairies and meat products but not from fermented table olives. The lesser known fermented product in Namibia is table olives (*olea europaea*). However, there is a gap of knowledge on olive fermentation with only a small degree of research and scientific data available for future table olives research and development for this industry in Namibia. Three table olive samples were obtained from different origins and lactic acid bacteria were isolated from the table olives using general selective media. Probiotics test on the pure cultures were conducted using pure colonies from MRS agar whereby, they were tested for bile salts (0.3 % oxgall and Hydrochloric acid) tolerance ranged from less acidic to more acidity. Bacteriocin production test gave an inhibitory zone formation towards the produced bacteria

produced (Lactic Acid Bacteria) Nevertheless, more other significant properties of table olives are worth to be investigated in future research.

Keywords: bacteriocins, lactic acid bacteria, *Olea europaea*, Table olives.

Seasonal variations in the nutritional content of selected common grasses in the greater Waterberg communal area.

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Abstract

Namibia is an arid country characterized by seasonal variations in climatic conditions, which may have significant effects on the vegetation's nutrient contents from one season to the next. The Greater Waterberg Landscape is one of the areas dominated by communal farmers, mainly livestock farmers. Farmers however keeps too many livestock that the area won't be able to support, snd this mainly leads to land degradation and bush encroachment, a phenomenon where the woody species takes over and replaces the grass species, which reduces livestock production due to the absence of high quality forage. Therefore, studying the changes in the nutritive content of different grass species will help in better understanding important dynamics in the system, leading to improved rangeland management and in turn, livestock production.

This study was conducted to determine the changes in the nutrient content of three common grass species (*Urochloa brachyura, Eragrostis rigidior and Stipagrostis uniplumis)* in the communal area of the Greater Waterberg Landscape during the early growing, late growing season and the dry season.Collected grass samples were analyzed for Crude protein, phosphorus, Acid Detergent Fiber (ADF) and Neutral Detergent Fiber (NDF) contents for the different seasons. Our prelimnary findings show that Crude protein, ADF and NDF contents differred in all three seasons. However, the late growing season and the dry seasons had no statistical significant differences in Crude protein, ADF and NDF contents, while the wet and dry seasons had significant differences in Crude

protein, ADF and NDF contents. The Crude protein content decreased from the wet season to the dry season, ADF content increased from the wet season towards the dry season, while NDF content increased from the wet season towards the peak growing season, then slightly decreased towards the dry season.
(The result analysis for phosphorus is missing because we are still busy analysing the data.).

The role that Electric Vehicles (EVs) can play in Namibia's energy transition

Sesilia Ileka

Abstract

As the world work to promote sustainable and environment-friendly energy use, the mobility sector is playing its role, preparing for this transition. Electric Vehicles have gained a large global interest, and Namibia is not left behind due to their beneficial characteristics. These characteristics include low cost of travel, high energy efficiency, and savings on harmful emissions when run on green energy fuels. EVs, battery EVs specifically, provide a distributed energy storage solution, assisting with intermittent renewable energy sources. The review unpacks where Namibia is currently at on this journey and presents possible opportunities and barriers related to different types of EVs regarding the transition to green energy.

In pursuit of preserving Namibian languages: The development of an Oshiwambo songs, poems and stories children Android APP

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Abstract

Indigenous languages are often at risk of going into extinction, when they are not well preserved, and when their native speakers are seldom practicing it. Also, the fact that children start school at an early age, and most often, due to the fact that they are from various tribes, especially in cities, they normally communicate in English., The medium of instruction is also English, hence it is the official language used in Namibia schools. As children grow, they tend to become resistant to using home languages and exhibit an increasing desire to conform to the majority language speakers. Many recent studies have focused on the importance of preserving languages through teaching of children songs, poems and stories. The purpose of this research was to collect Oshiwambo language children's songs, poems and stories and designing and developing an android application to host them.

This was a randomized study. Children from 3 to 15 years of age fluent in speaking any of Oshiwambo languages were eligible for participation. As such, 50 children from 5 villages located in Omusati and Ohangwena regions (Ongungila, Oshivanda, Okambebe, Omunghete and Omungwelume) were eligible for the study. Final analyses included primary data from 28 children across a six-month period. Participants were randomly selected and through structured interviews they were asked to sing any song in any of Oshiwambo languages or tell the story or a poem and they were audio/video recorded. Two books were analyzed and used, for the collection of secondary data.

As a result, 18 songs were recorded from 16 participants. Only 10 songs were used in an application due to one of the following issues: 1). Either there was a duplicate, 2). It included people's names or 3). The audio recorded was of poor quality. Seven stories were collected from 5 participants and one from the book Nongonona Elaka Ondodo 7. In addition, four poems from 4 participants and 3 from a book Omatevelo 4 were used in the application.

The designed application which hosts Oshiwambo languages children's songs, poems and stories will help in the language's preservation. The catchy poems, stories and songs collected and implemented in the application are suitable for children and they will enjoy learning them.

Fabrication and Characterization of Sn-doped ZnO Thin Films by Spray-coating method using aqueous precursors involving Zn^{2+} and Sn^{2+} complexes.

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Abstract

A thin film can be defined as a material measuring less than 1 μm in thickness, fabricated on a supporting substrate by intensifying, one-by-one, and ionic/molecular/atomic species of matter. The structural, electrical and optical properties of the ZnO thin films have been widely investigated, while the doping effect on its properties is still under investigation. The present study attempted the fabrication of tin (Sn)-doped thin films of ZnO using the spray-coating technique. Spray-coating is a cost-effective coating technique, and it minimizes loss of materials, requires a simple set-up, and is therefore applied to present study. Up to date, there are no reports on fabrication and characterization of Sn-doped ZnO thin films by the spray-coating method using aqueous precursors involving Zn^{2+} and Sn^{2+} complexes.

An aqueous precursor solution involving only Zn^{2+} and the Sn-doped aqueous precursor solutions involving Zn^{2+} and Sn^{2+} complexes, with different tin mole percentages (1-4%), were prepared. The prepared precursor solutions were used to fabricate corresponding thin films *via* spray-coating onto a pre-heated glass substrate at 180°C, followed by heat-treating at 500°C for 30 minutes. The crystal structures of the resultant films were investigated by X-ray diffraction (XRD) and their optical properties by UV-Vis spectroscopy. The properties of the fabricated films will be presented.

Isolation and characterization of bio active metabolites from the leaves and seeds of *Psidium guajava* (Guava) and their evaluation for biological activity.

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Abstract

For decades, medicinal plants found a very important place in medical systems and have been used traditionally to manage and treat various diseases. Medicinal plants are known to synthesis natural products that in broadest sense include any substance produced by life [1]. *Psidium guajava* commonly known as guava, is an evergreen shrub like tree, which is grown for its fruit. *Psidium guajava* has a long history of being used for medicinal purposes due to its pharmacological activities [2]. It contains high content of organic and inorganic compounds. This plant is used in the treatment of diarrhea, pain relief, cough, hypertension and diabetes, just to mention a few. The purpose of this research is to extract the leaves and seeds of Psidium guajava, in order to evaluate the biological activity that the bio active metabolite of this plant has. The methods that have been used were very simple and straight forward. The plants leaves and seeds sample were collected, dried and crushed into fine powder. This sample was then used for the extraction process. Maceration was the technique used for extraction, basically the sample was dissolved in five different solvents namely hexane, diethyl ether, chloroform, DCM and Ethyl acetate. The extraction was performed for a period for 24hrs, for each solvent and was done sequentially. The next method was isolation which was carried out using thin layer chromatography, three different solvent systems were used, hexane, diethyl ether and ethyl acetate. Then, the extract was subjected to phytochemical screening using different tests to test for secondary metabolites. Lastly, antimicrobial testing is the last method, which is yet to be carried out. The hexane extract is more in quantity followed ethyl acetate, chloroform, DCM and then diethyl ether respectively. The phytochemical screening showed that most bioactive metabolites such as flavonoids, steroids, alkaloids and terpenoids are found in the hexane extract seeds part of the plant and a few such as tannins and saponins are found in the DCM and chloroform extract in the leave parts of the plant. The anticipated results of the antimicrobial investigation are that the ethyl

acetate extract showed a broad spectrum of activity against all gram positive and gram positive bacteria used in this research. The present study strengthens earlier research reports and is in agreement with the claims of traditional healers that this plant does help in managing and curing various diseases.

Behavioral activity patterns of Ground squirrel (Xerus inuaris) in winter and summer.

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Abstract

The summer and winter climatic conditions have a vital role on the behaviors of small mamals. This research was based on the effects of winter and summer on the diurnal activity partterns of Ground squirrels (*X. inuaris*). Ground squirrels are found around a wide latitudinal range in the North and the Southern hemisphere in a variety of habitats. As a result, they're an excellent group of small mammals to study behavioural adaptations to both low winter and high summer temperatures. Observations were made in winter and summer at two sites for a period of 16 days per season at the University of Namibia main campus sports fields. By means of video recordings the activity partterns of the ground squirrels were recorded and an analysis was made using the four most occurring behavioural activities which are feeding, vigilance, walking and running performed by the observed individuals. The ground squirrels showed different behavioural partterns for winter and summer, the ground squirrels spent longer periodsof time observed feeding. The daily activities of the groung squirrels began about an hour earlier in winter than in summer. The animals showed constant activities throught out the day with less resting during winter and had burrowing periods in summer. The results show evidence that summer and winter have different effects on the behavioural activity partterns of the squirrels, the results also show that there are differences in the activity partterns of the ground squirrels at three different times of the day and that there is a difference in the proportion of time allocated to the different behavioural activities in winter and summer as well as at three different times of the day.

DETERMINING THE UNCERTAINTY OF UAVs TRANSMISSION PROPAGATION ON CROSS CALIBRATION OF CHERENKOV TELESCOPE ARRAY

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Abstract

The designed study is to determine the uncertainty of light transmission propagation at an astronomical facility with emerging new technology the Unmanned Aerial Vehicles (UAVs). A previous feasibility on cross-calibration of different telescope size classes, achieved a systematic uncertainty of 8 − 10%. The airborne calibration platform based on the High Energy Stereoscopic System (H.E.S.S.) Cherenkov telescopes a generation of ground-based gamma-ray instruments in the photon energy range extending from 0.03 to 100 TeV. On a clear astronomical night with low atmospheric dust content and an appropriate thermal protection for the calibration, a light source transmission simulation was created by elevating the UAV with onboard photodiode to monitor absolute light intensity at height of 1000 m above the aging generation telescopes were the beam of different wavelength spread across. A light source equipped on the UAV is a multi-wavelength calibration for monitoring the wavelength-dependent degradation of telescopes' optical system; it accurately accounts for the effect on the cross-calibration by techniques of images of air showers and local muons. Another component onboard are sensors that allows us to minimise the systematic uncertainty associated with the atmospheric transmission of the calibration signal and map the dust content above. Correctional factors are important, in particular to light attenuation due to atmospheric transmission coefficient which depends on the air mass penetrated by rays, as well as on the amount of water vapor and dust in the air. The atmospheric concentration is highly variable, so that the aerosol attenuation needs to be evaluated periodically for the best achievement of clear data. Rayleigh scattering cross section is the fraction of light scattered by scattering particles over the unit travel length which is the number of particles per unit volume N times the cross-section. This scattering cross section forms part of the molecular transmission factor. Simulation for light transmission, absorption and amount of scattering due to aerosol and molecular light scattering will be determined with different atmospheric conditions, by analyzing the sky temperature data which was recorded between 2004 to 2019 from equipment present at the H.E.S.S. site, namely the CT

radiometer, NASA AERONET station and an ATMOSCOPE recording temperature, humidity and pressure, respectively and will be presented.

Keywords: UAVs, light transmission, telescope, light scattering, atmospheric attenuation

An analysis of Aluminium (Al), Manganese (Mn) concentrations in the water of Goreangab dam.

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Abstract

The purposes of this study were (a) to compare the concentrations of Aluminium (Al) and Manganese (Mn) between different sites at Goreangab dam, (b) to determine and compare the changes in the concentrations of Al and Mn over the past five years. The water samples were digested by adding 1 ml of concentrated Nitric Acid (HNO_3) to 50 ml of water sample, heated using a micro digester in a fumefood until all yellowish fumes stoped, cooled down to room temperature , filtered to remove any insoluble materials, then the filterate was diluted diluted with distilled water . The samples were then analysed for Al and Mn with the Atomic Absorption Spectrophotometer (AAS). The metals were analyzed seperately. The actual or raw data used in this study was obtained from City of Windhoek, Water Division. The result for Aluminium (Al) there is a significant difference in the levels or concentration across all 6 points (sites) its highest at point 1 and lowest at point 5 (Kruskal test, $p = 0.293 > 0.05$) and as for Manganese (Mn) there is no significant difference in the concentration/levels between the sites (Anova, $p = 0.135 > 0.05$), meaning that the concentration or levels of Mn are more or less the same at all points. A one sample t-test was done for both Aluminium and Manganese in order to see if there was a significant difference between the metals over the past few years and their standard permissible limit (for Manganese the limit is 2 mg/l ,one sample t – test, $t(65) = 15.03$, $p = 0.00 < 0.05$), meaning that there is a significant difference between the Manganese levels over the past few years and its standard permissible limit, whereas for Aluminium the limit is 1 mg/l, one sample t-test, $t(52) = 13.57$, $p = 0.00 < 0.05$) which states that there is a significant difference. Aluminium and Manganese are discharged or enter the dam at different concentration at different points. At each and every point where Mn is high, Al is low and vice-versa meaning that their relationship is not directly propotional

Title of the presentation: Extraction of bio-active metabolites from the leaves and roots *of Marsdenia macrantha* and evaluation for their biological activity.

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Abstract

Throughout history, plants have supplied the human race with food, clothing, shelter and medicines. Plants have played a big role in traditional systems of medicine for prevention and treatment of diseases all over the world. Naturally derived compounds have made considerable contributions to human health and well-being and have been a source of inspiration for novel drug development. A source of new and effective antimicrobial agents is needed because of the development of multi-drug resistance in bacteria, new pathogens emerging and reduction of new antimicrobial drugs in the pharmaceutical pipeline. *Marsedernia Macrantha* is a medicinal plant belongs to the *Apocynaceae* family, a very large and well represented family in a wide range of latitudes of Africa including Namibia.

This study was conducted in order to validate the reported ethno-medicinal uses of *Marsdenia macrantha* leaves and roots by screening for antimicrobial activity. Extraction, Phytochemical Screening and Antimicrobial activity test were carried out to yield both qualitative and quantitative results to achieve the aim of the study. The aims and objectives of the study was to phytochemical screen the presence of bio-active chemical constituents in leaves and roots, Extraction and fractionation of the leaves and roots as well as evaluation for their antimicrobial activity.
The extraction of the plant samples was done sequentially from the least Polar to the most polar, started with Hexane, DCM, Acetone, Ethyl Acetate and lastly Methanol which is the most polar solvent. The plant samples were also screened to test for flavonoids, alkaloids, Saponins, Tannins, proteins and Tepernoids. The extracts of the solvents for both leaves and roots plant samples, were also tested for Biological activity.

The findings of this study showed that *Marsdenia Macrantha* contains some bio-active compounds namely terponoids, steroids, Flavanoids, proteins and some little amount of Tannins and phenolic compound, they were in large amounts in Hexane and DCM extracts for both leaves and roots

plant samples, in most polar solvent like Methanol they were found to be present in little amounts. It revealed that both plant samples did not show any presence of Saponins. The information is sufficient to conclude that the reported ethno-medicinal uses are valid, *Marsdenia macrantha* leaves and roots have antimicrobial activity as reported for it traditional uses for medical purposes.

Title of the presentation: Innovative pottery: Promote clay pots artistry.

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Abstract

Inclusive innovation seeks to comprehend how new technologies can be used by poor and developing nations in uplifting their economies. In rural Zimbabwe women use clay they collect from rivers to make clay pots, of different sizes. These clay pots can be used to for different purposes from cooking daily meals to storing beverages. They then take this pots to sale at local markets. This research paper investigates how these innovative technologies can be used to better the lives of the women who do pottery artistry in rural Mount Darwin. The technology implemented in this study is a mobile application with the main objective of promoting clay pottery in Mount Darwin to Zimbabweans. The mobile application also serves a function of providing these women access to micro-loans. The study used Human-Centred design methodology, which centres its focus on the end-user of the system being developed. This methodology employs the use of involving end users in the development of the application. Therefore from the beginning of the product creation, pottery artist will be involved in every iteration of the product to ensure the product stratifies their requirements. The Random Sampling technique was used during this study, it was used in selecting a random group of Mount Darwin women who design clay pots. The findings of this study evidently show that the use of an electronic platform to sell clay pots and also to borrow money can make pottery artists' business more profitable and increase efficiency, within the rural Mount Darwin community. Furthermore the study finds that by using a mobile wallet, pottery artist make more money than those who strictly accept only cash. With the micro-loan feature in the application, the study finds that easy access to loan for these women, makes starting out or scaling up much easier. In conclusion, using a mobile e-commerce application to

help Mount Darwin women to sale their pottery will be beneficial for uplifting these marginalised women

Decolorization of used engine extracts using synthesized activated carbon.

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Abstract

Used Engine oil contains contaminants (makes the engine oil dark in colour) that are harmful to the environment. The good news however is that most of these contaminants can be removed through adsorption by activated carbon. The aim of this research was to test the activity of 15% H_3PO_4 Activated carbon synthesized from acacia seed pods as well as other synthesized activated carbon from other materials like orange peels on the adsorption of contaminants in used engine oil extracts causing the dark colour (to decolourize it). Previous studies carried out do not account for Activated carbon prepared from acacia seeds, orange peel and banana peel. They also failed to look at decolorizing the engine oil at lower temperatures, higher temperature may cause the engine oil to damage. The aim of this research was to use activated carbon synthesized in our lab with a little help of either an acid (acetic acid) or a base (sodium hydroxide) if necessary to decolorize the engine oil at the lowest possible temperature. A series of experiments were carried out using different types of synthesized activated carbon samples, activated carbon from acacia pods, activated carbon from orange peels, non-impregnated activated carbon prepared at 800°C for 4 hours and $ZnCl_2$ impregnated activated carbon, but keeping the temperature constant. In conclusion of this project, the synthesized activated carbon alone is not effective to decolorize the engine oil it was used on. That could be due to inactivity of pores of the synthesized activated carbon i.e., large pore sizes are responsible for decolouration of engine oil. It can however decolorize with the aid of acetic acid which was used for this research project. I recommend an increase in porosity will show better activity of the activated carbon to engine oil ratio. I also recommend the use of other acids as well as any other component to develop more active activated carbon.

A comparison of white-browed sparrow-weaver *(Plocepasser mahali)* colonies in urban and natural habitats

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Abstract

Urban and natural environments primarily differ in the alteration of natural vegetation, to that occupied by anthropogenic infrastructure. Such changes have been shown to benefit, negatively affect or have no effect on some species which occupy urban habitat. Typically, generalist species benefit while specialist species are more negatively affected by land use transformation. White-browed sparrow-weavers, *Plocepasser mahali,* are gregarious birds with broad diets, forming colonies in both urban and natural environments in Namibia. This study aimed to compare white-browed sparrow-weaver colony sizes in urban and natural habitats. Fifteen colonies in each habitat were surveyed and the total number of nests in each colony counted. Where colonies nested across neighbouring trees, the number of nests on the main nesting tree within the colony was recorded. For each tree sampled, the canopy diameter was measured. The results revealed that the number of nests in colonies found in urban (16.00±2.24, mean±SE) and natural habitats (11.60±2.01, mean±SE) differed significantly. Urban habitat had more nests compared to the natural habitat. The canopy diameter of nest trees between the urban and natural habitats was also significantly different, with natural habitats (1077.33±120.52, mean±SE) having bigger trees as compared to urban habitats (1036.33±93.58, mean±SE). Furthermore, there was a positive relationship between the number of nests and canopy diameter of trees, however, the relationship was not statistically significant. In a previous study on colonially nesting species, it was found that there were fewer colonies in urban as compared to natural habitats; causing birds to share one colony when making their nests. It is thus speculated that this could cause the greater colony sizes and higher number of nests observed in urban habitats of this study; although further research on the number of colonies in these habitats is needed. While it has been shown that larger trees are preferred by white-browed sparrow-weavers; these results show that other factors, especially in urban habitats, may influence colony size. For example urban areas can have more food sources (particularly for species with broad diets), and thus support more individuals. Results from this study suggest that urban habitats may benefit white-browed sparrow-weavers and warrants further investigation into identifying which factors may be important in supporting this and similar species in transformed landscapes.

FISH SPECIES DYNAMICS, GROWTH AND DIVERSITY IN THE KAMUTJONGA FLOODPLAIN, KAVANGO RIVER, NAMIBIA.

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Abstract

Floodplains are amongst the most species rich and productive aquatic environments on earth providing valuable ecosystem services to communities such as being a valuable protein source for marginalized communities. The fish species composition and relative abundance were assessed in the Kamutjonga floodplain along the Kavango River between February and April 2017, February to June 2018 and February to April 2020. The objectives of the study were to assess the fish species dynamics, fish diversity and fish growth in the Kamutjonga floodplain. The aim was to provide information on the annual variation in fish species composition and diversity in the Kavango River's Kamutjonga floodplain as a basis to provide management advice to ensure the sustainable use of the fisheries. Effective management is important to sustain livelihoods of riparian human communities especially women and children. Fish sampling was carried out once weekly using a seine net. A total of 2924 fishes were collected in 2017, 1678 fishes in 2018 and 4461 in 2020. The catch per unit effort by number was higher in 2017, followed by 2018 and lastly 2020. Thirty-one fish species from 10 families, 37 species from 11 families and 31 species from 9 families were identified in 2017, 2018 and 2020 respectively. The Cyprinidae family was the most prominent family in the catches in 2017 and 2020, whereas the Cichlidae family dominated the catches in 2018. According to the index of relative importance the most important species according to number in 2017, 2018 and 2020 were *Oreochromis andersonii* comprising of 47.7%, 27.1% and 49.6% of the total catches, respectively. The total weight of fishes collected in 2017, 2018 and 2020 were 6.404 kg, 5.963 kg and 11.456 kg respectively. The two most important fish species according to weight throughout the sampling period were *O. andersonii* followed *by Hydrocynus vittatus*. The highest weight of fish were found in 2020, however the catch per unit effort by weight was highest for 2018, followed by 2017 and then 2020. The minimum growth length of important fish species in this study such as *Oreochromis andersonii, Tilapia sparrmanii, Coptodon rendalli* and *Hydrocynus vittatus* were 19 mm, 20 mm, 23 mm and 20 mm respectively. Whereas the

Maximum length of the same fish species were 132 mm, 84 mm, 100 and 195 mm respectively. There were significance differences in the sizes of *Oreochromis andersonii*, *Tilapia sparrmanii* and *Hydrocynus vittatus* in all years. However for *Coptodon rendalli*, there was no significant difference in the sizes obtained in 2018. It was also discovered that there was no significant difference in fish species diversity between years. Temperature had no significant difference on the CPUE whereas Water depth and CPUE by number and weight had an Inverse relationship.

Assessment of Aflatoxin M1 levels in marketed fresh and fermented milk in Windhoek

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Abstract

The fungal species *Aspergillus flavus, Aspergillus pasiticus, and Aspergillus nominus* produce aflatoxins, which are poisonous and carcinogenic. Aflatoxin B1 is the most poisonous of the four subtypes of aflatoxin: B1, B2, G1 and G2. Aflatoxin B1 is transformed to Aflatoxin M1(AFM1) by hydroxylation. This is due to tainted feed being fed to cows, which is then secreted in the milk of lactation cows. Aflatoxin has been linked to detrimental effects on the liver, kidneys, and human health issues such as aflatoxicosis, Reyes syndrome, and cancer. The goal of the study was to determine the prevalence of AFM1 in commercial milk using the ELISA technique, due to the importance of AFM1 in milk and its effects on health. The absence of surveillance in the occurrence of AFM1 in Namibia poses a possible health concern to the country's consumers, therefore this study can help to fill in the gaps in Namibia's knowledge. A total of 29 samples were purchased from supermarkets, with 21 processed fresh milk and 8 fermented milk samples. The Aflatoxin M1 ULTRA ELISA quantitative kit from Helica Bio Systems was used to detect and quantify AFM1 via immunoassay method.

AFM1 was detected in 100% of the fermented milk samples, with levels ranging from 0.227µg/L to 0.322µg/L. No AFM1 was detected in the fresh milk samples. Detection and quantification of AFM1 in fermented milk may be due to contamination of the milk by aflatoxigenic fungi during

processing. The quantity of AFM1 in all fermented milk samples was above the EU limit of 0.05µg/L, therefore caution needs to be directed at potential chronic toxicity depending on consumption levels among consumers.

Although most regulatory government agencies have set limits on the tolerable levels of aflatoxins in human food and animal feed, regulation is lacking in Namibia. Further analytical surveillance is required to identify the principal sources of AFM1 and, as a result, to develop AFM1 regulations.

Demographic Determinants of Death by Cause in Khomas Region: An Analysis of the 2017 Civil Registration and Vital Statistics Data.

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Mortality refers to the deaths recorded in a particular population due to a specific cause and at a specific period of time. Mortality studies are important indicators for wellbeing of the people and is essential for providing evidence on the progress toward achieving Sustainable Development Goals (SDGs).

This study followed a quantitative research design using the 2017 Civil Registration Statistics and Vital from Ministry of Home Affairs, Immigration, Safety and Security, the Department of Civil Registration. A total of 3 793 deaths in 2017 were recorded in Khomas Region, representing the study population. The cause of death is grouped in three broad categories of cause of death namely; Communicable diseases (CDs), Non-Communicable diseases (NCDs) and Injuries.

The Chi-square testing and Multinomial Regression Model was employed to examine the association and effect of the explanatory variables (Age, Sex, Marital Status, Constituency, Nationality) on the cause of death. The findings of the study show deaths caused by NCD in 2017 were the highest with 66%, while 21% were caused by CD and Injuries 13%. The results further showed there is significant association between Cause of Death and Age, Sex, Marital Status, Constituency, Nationality. The model results shows that at a significance level of 5% the odds of death caused by CD for Age group 0 – 4 is 3.068 higher compared to the odds of death caused by NCD (reference group) deaths and the Age group 45 – 59 had the lowest odds with 1.766 higher compared to NCD (reference group) deaths. The odds of death by CD for Females is 0.864 lower compared to NCD (reference group) deaths. The odds of death by CD for Non-Namibians is 0.438 lower compared to NCD (reference group) deaths. The odds of death by Injuries for Age group 15 - 29 is 41.549 higher compared to the odds for NCD deaths and the Age group 0 – 4 lowest odds with 3.574 higher compared to NCD (reference group) deaths. The odds of death by Injuries for Females is 0.330 lower compared to NCD (reference group) deaths.

VIRTUAL SYSTEM FOR ART GALLERY EXHIBITION USING AUGMENTED REALITY

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Abstract

Art forms and mediums kept developing with the evolution of human civilization, thereby from time to time, the way artists presented their arts have also changed, From the paintings on the cave wall to the virtual life we have now with the help of electronic media, the sole purpose was to present the artworks effectively. With the world currently being stricken by Covid-19, restricting movements, and gatherings and to a larger extent halting business activities globally, technology right now is on a pick, I felt the necessity to present the classic arts in a modern form, which can be parallel to the era we are living in. This study intended to explore a virtual system that can be used by art galleries to exhibit their arts through an interactive manner amid the covid19 pandemic. A large body of research shows that humans learn better when information is visualized, therefore Augmented Reality was used in this study for academic purposes. Augmented Reality can be understood as a technology that involves the overlay of computer graphics on the real world allowing users to access the physical and the digital world.

The study began by interviewing stuff members of Henry Tayali art gallery at one of their art exhibition in Lusaka, aiming to ascertain information about the art works and how challenging it has been for exhibitions amid covid-19. This study adapted extreme programming methodology which include the planning phase that included the functionalities needed to develop the application; design phase where the interface and functionality of the application was designed. During the coding and testing phase the application was always evaluated. Little information was obtained on the painting artists and how art galleries conduct exhibitions because the people running the galleries deemed it as private information. However the little information gathered was documented in a requirements document of the application. The plan of the gallery and its functionality was drawn in flowcharts first, then with the help of several software, (e.g. Adobe Photoshop, Adobe after Effects, Autodesk 3ds Max, Unity and Vuforia) the application was

developed through several challenging steps. A System Usability Scale (SUS) questionnaire was used in this study to test the usability of the application. The results showed that the SUS score is 60.1 which means that the system was perceived as above average. In conclusion, the final version of the application deployed, will consist of the functions to walk through a virtual gallery, see the paintings and gather information about them in both texts and voice over, also to know about the artist and contact information.

PROFILING ENDOPHYTIC POPULATION IN SELECTED PLANT SPECIES GROWING IN GOREANGAB DAM AND DETERMINING THEIR TOLERANCE TO HEAVY METALS TOXICITY

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Abstract

Phytoremediation is an emerging technology that uses plants and their associated microbes to clean up pollutants from the soil, water and air. In recent years, phytoremediation assisted by bacterial endophytes has been highly recommended for cleaning up of metal polluted soils and water since endophytic bacteria can alleviate metal toxicity in plant through their own metal resistance system and facilitate plant growth under metal stress. Heavy metals can become a severe health hazard when their concentrations exceed optimal values in the environment. The Goreangab dam was once used as a water source for the city of Windhoek. However, after decades of excessive pollutant effluent flowing into the dam, it has become characterised with pollutants such as excess amounts of heavy metals. The aim of this study is to isolate and screen heavy metal-tolerant fungi from three selected plants occurring in Goreangab dam and to evaluate their efficiency to remove heavy metals from solid and semi-solid media under laboratory conditions. Three healthy plants (per species), being at least 30 m apart within one sampling site, were collected. Two stem segments (6cm), two root segments (6cm) and leaves were randomly selected, surface-sterilized, macerated and plated on Potato Dextrose Agar (PDA). Plates were incubated at 26°C for 45 days. The 28 pure fungal endophytes were obtained and plated on PDA plates containing dissolved target heavy metals, namely zinc metal powder, cobalt nitrate, iron sulfate, lead nitrate and copper sulfate at a concentration of 50mg/mL. The findings of the study prove that Goreangab dam has plants that Harbour highly heavy metal resistant endophytic fungi. The first steps toward bioremedial efforts at Goreangab dam had been taken by the findings of this study.

Keywords: Bioremedial efforts, biomagnification, Endophytic fungi, heavy metals resistance

ISOLATION AND CHARACTERIZATION OF BIO-ACTIVE METABOLITES FROM THE LEAVES AND SEEDS OF *AZADIRACHTA INDICA* (NEEM TREE) AND THEIR EVALUATION FOR BIOLOGICAL ACTIVITY

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Abstract

Neem (*Azadirachta indica*) is a well-known tree with immense medicinal properties and is the most versatile medicinal plant having a wide spectrum of biological activity. Neem is an evergreen tree that grows mostly in Southeast Asia and West Africa and was classified in early 1830 by De Jussieu that it belongs to family Maliaceae. Recently, every part of the tree has been used as traditional medicine to heal diseases such as diabetes and tuberculosis. In addition, some were also used to reduce fever as well as used as insecticide. Therefore, it was identified as one of the richest sources of biologically active secondary metabolites, particularly flavonoids, polyphenols, isoprenoids, and polysaccharides, terpenoids. Moreover, the compound shows therapeutic properties like antimalarial activity, antibacterial activity, and anti-oxidant.

Phytochemical tests were conducted using standard procedures to find the presence of the bio-active chemical constituents such as flavonoids, saponins, alkaloid, reducing sugars, flavonoids, steroids and polyphenols. The powdered leaves and seeds were sequentially extracted with hexane, diethyl ether, chloroform, ethyl acetate and methanol. The isolation of the bio-active compounds was done using an analytical and Preparative TLC using solvent system of hexane: ethyl acetate in their ratio of 4:2 v/v. As it reveal good separation of compounds. The antimicrobial activity of the leaves and seeds extracts was determined by using agar well diffusion method while the antibacterial activity was determined by cup diffusion method and both activities evaluated by determining the diameter of zone of inhibition against the microorganisms.

From the phytochemical analysis, *Azadirachta indica* extracts showed the presence of alkaloids, flavonoids, terpenoids and tannin and but there was absence of steroids and saponin. Seven fractions were isolated from chloroform and ethyl acetate leaves extract. The purity of fractions was revealed by running a TLC consisting of the extract and seven fractions isolated in which fraction 2 and 4 for chloroform extract identified to be pure as well as fraction 1, 6 and 7 for the ethyl acetate extract because they form a single spot against their specific spot of the extract.

The study has proved why *Azadirachta indica* was identified as one of the richest sources of biologically active secondary metabolites and its ability to be used medically as its bio-active

constituents were successfully isolated and have shown several therapeutic properties against microorganisms. However, further studies can be made on the seed as well as on the identified bio-active compounds in leaves for their effectiveness or side effects on their biological activity.

EFFECTS OF PLANT GROWTH-PROMOTING ENDOPHYTIC BACTERIA INOCULANTS ON GROWTH AND YIELD OF GARDEN PEAS (*Pisum sativum*) UNDER CONTROLLED CONDITIONS

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Abstract

With the current population increase, rising food prices coupled with erratic rain patterns, farmers have resorted to the extensive and uncontrolled use of synthetic fertilizers, pesticides and intense irrigation that has led to serious hazards to the sustainability of agriculture and stability of an ecosystem. It is expected to continue to contribute through research to the development of new products that could improve the agricultural productivity. Hence, the need to introduce the use of biofertilisers containing living plant growth promoting bacteria in conjunction with hydroponics techniques which are more rational, environmentally friendly and efficient agricultural practices. In southern Africa occur a desert plant *Myrothamnus flabellifolius* also known as the resurrection plant that possess the ability to survive for a year or more in a dry quiescent state, rehydrating only after summer rainfall. The use of hydroponics means production of winter crops such as peas (*Pisum sativum*) can be used in Namibia where climatic and soil conditions are not favourable for traditional crop production throughout the year. Thus, the aim of this study was to investigate the potential of PGPB isolated from a Desert plant *Myrothamnus flabellifolius* with the hypothesis that they could also promote peas (*Pisum sativum*) germination, health and growth when applied as an inoculum on pea seeds and grown under hydroponic conditions. Three bacterial strains, namely, (*Kosakonia cowanii* (A), *Bacillus licheniformis* (B), and *Cupriavidus metallidurans* (C)) isolated from a Desert plant *Myrothamnus flabellifolius* were chosen as treatments for the hydroponics experiment based on their plant growth promoting traits. The experiment was carried out in the greenhouse and was laid out in a randomized block design, with four surrogate plants per pot, replicated five times and eight treatments. To prepare the endophytic bacteria inoculant, the three strains of bacterial endophytes were used in a singular and consortia form to treat the pea seeds. In comparison to the control groups, there was a statistically significant difference for seed germination, plant height, shoot wet and dry mass, root wet and dry mass and the number of pods and pod mass in the microbial experimental group. This indicated that the PGPEB treatments had

an effect on growth and yield parameters. According to the findings of this study, endophytic bacteria have plant growth promoting traits that can improve seed germination, plant growth, and yield, and have the potential to be used as inoculants (biofertilizers) to establish sustainable crop production.

Key Words: Crop production, Hydroponics, Plant growth promoting endophytic bacteria (PGPEB) and Peas (*Pisum sativum*)

The potential invasive impacts of freshwater pet fish traded in Namibia

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Abstract

Alien invasive species are considered the second-largest driver for biodiversity loss in the world. In Namibia, the studies of invasive organisms have been relatively few and have been focused on the distribution of relatively few animal species. The pet trade is one of the recognized invasion pathways, as many exotic pets escape or are intentionally released. Nentwig et al. (2016) have developed a Generic Impact Scoring System (GISS) to identify the potential impacts of invasive species by broadly grouping these into socio-economic (e.g. agricultural, animal and forestry production, human infrastructure and health) and environmental impacts (e.g. competition, herbivory, predation, diseases transmission, hybridization and ecosystems) and ranking each on a scale of 0 – 5. Using the GISS system, this study aimed to determine the potential invasive impacts of freshwater pet fish traded in Namibia by conducting pet shop and online surveys. Of the 48 species traded, 32 are recognized as invasive elsewhere in the world. Asia is home to most (18) (X number) of the traded species identified, followed by the Americas, while Africa has the least number of traded species (4) (X number). Traded species belonged to 20 different families with Cyrinidae and Cichlidae having the most (nine) traded species and 14 families only had one species each. We used the Generic Impact Scoring System (as described by Nentwig et al. 2016) to identify the potential impacts that the 48 freshwater fish species traded in Namibia may have. After extensive literature searches, no socio-economic impacts were found, but ecological impacts for

16 fish species were identified. There was a significant difference between the environmental impacts, with competition being significantly higher than all other impacts. Non-native species can out-compete native species for habitat and resources, because they typically lack natural enemies in the novel habitat. This study provides information for further studies and also fills the knowledge gap on the potential invasive impacts of freshwater fish traded in Namibia.

A Review of Photocurrent Generation in Antimony Selenide (Sb2se3) Thin Film Solar Cells Using Alternative Non-Toxic Buffer Layer Materials

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Abstract

Antimony Selenide (Sb_2Se_3) is a potential light absorber material for photovoltaic cells because of its excellent electrical and optical properties, favourable bandgap of 1.7 eV, high absorption coefficient ($> 10^5$ cm^{-1}), carrier mobility ($\sim 10^5 cm^{-2}$ V^{-1} s^{-1}), non-toxicity, low-cost fabrication, and abundancy on earth. A record certified power conversion efficiency of 9.2% has, very recently, been demonstrated for antimony Selenide thin film solar cells, which is significantly lower than that of Cu(In,Ga)Se (23.35%) and CdTe (22.1%) thin-film solar cells. The inferior performance in Antimony Selenide thin film solar cells is mainly owing to a large open-circuit voltage deficit, resulted from defect and interface-assisted, recombination). This article provides an overview of the material properties of Sb_2Se_3 thin films and the recent scientific progress made on the efficiency, and understanding of Sb2Se3-based thin film solar cells. Analysis of Sb_2Se_3-based thin-film solar cells has shown that the devices have relatively good light management due to their suitable bandgap and high absorption coefficient, whereas carrier management (collection efficiency) of photo-generated carriers needs significant improvement. Overall, the review provides background knowledge on material properties and device performance, and suggests main research directions to overcome the limiting factors of solar cell performance.

Keywords*:* Antimony Selenide, *Carrier Management, Photovoltaics, Recombination, Solar-cell, Thin-film.*

Detection of bacterial antigens: *Camphylobacter jejuni* and *Listeria monocytogenes*, using IgY antibodies isolated from the yolks of immunized hens

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Abstract

C. jejuni and *L. monocytogenes* are some of the most common opportunistic enteric pathogens, associated with acute diarrhea, vomiting, and systemic illnesses, among others in patients. Antibiotics have been used as a common treatment against bacterial infections however, there has been an increase in antibiotic resistant bacteria, rendering antibiotics inefficient in treating these bacterial infections. This study therefore aims to explore the potential use of chicken IgY as an alternative treatment and diagnostic option against *C. jejuni* and *L. monocytogenes*. IgY was isolated from the egg yolks of chickens initially immunized with an antiserum containing a killed form of the pathogen, using Polyethylene Glycol (PEG) precipitation method. Subsequently, the isolated IgY was tested for specificity against their respective bacterial antigens using an indirect slide agglutination assay. Through observation of clumps, the isolated antibody demonstrated ability to detect its target antigen in all serial dilutions. This suggests that IgY is a potential diagnostic method against bacterial antigens, and could as well serve as a possible treatment option. Further research on IgY technology is therefore encouraged as it will remarkably contribute to immunodiagnostics and immunotherapy.

Keywords: Hen egg yolk, immunotherapy, IgY isolation, PEG, indirect agglutination

Patterns and determinants of modern contraceptive choice among married women in Namibia

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The study analyses patterns and determinants of modern contraceptive choice among married women in Namibia. The study draws on largely quantitative data provided by the 2013 Namibian Demographic and Health Survey (NDHS). The logistic regression method has been applied to establish patterns and determinants of modern contraceptive use among married women of reproductive age in Namibia. The findings show that there is an association between age, education, residence, region and the preferred contraceptive method. Also shows that there is no association between religion, wealth index and preferred contraceptive method.

Determining the effects of seed size on the seed germination and early growth of selected woody species to be used in the restoration of a degraded habitat in Kunene region, Namibia

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Abstract

The quality of seeds has an impact on the quality of the seedlings and thus on the success of restoring degraded areas. Size is an important characteristic of seed quality because larger seeds contain more resources and are likely to exhibit greater vigor than smaller seeds. Seed size could, therefore, significantly affect the success of seedling establishment and survival in the early stages of growth. This is especially true for drylands. This project aimed to examine the effects of seed size on the germination and early growth of seedlings of five selected woody species, namely: *Senegalia galpinii*, *Vachellia erioloba*, *Senegalia senegal*, *Vachellia reficiens and Senegalia erubescens*. For all the species, seed size was determined by multiplying the length, width, and thickness of each seed, and the seeds were classified into three categories (small, medium, and big). All the seeds were pre-treated by soaking them in sulphuric acid for 20 minutes. For each seed size category, 20 polythene bags were used, and five seeds were sown in each bag. A total of 100 seeds in each seed size category were used, but the size was only measured for 20 seeds per category. These were marked with a stick inserted in the soil where they were sown. Results of the simple linear regression indicated a significant positive relationship between seed size and germination ($F(1, 138) = 82.3$, $p < 0.001$, $R^2 = 0.37$), and between seed size and initial growth ($F(1, 138) = 35.9$, $p < 0.001$, $R2 = 0.207$) across all species. For seeds compared within the same species, a significant positive relationship ($F(1, 38) = 5.9$, $p = 0.020$, $R2 = 0.135$) was obtained between seed size and germination for *Vachellia erioloba*, but no significant relationship ($F(1, 38) = 0.22$, $p = 0.64$, $R2 = 0.006$) between growth and seed size. For *Senegalia galpinii* a significant positive relationship ($F(1, 38) = 5.6$, $p = 0.023$, $R^2 = 0.13$) was also obtained between seed size and germination but not between seed size and growth ($F(1, 38) = 2.85$, $p = 0.09$, $R2 = 0.07$). The Kruskal Wallis test revealed a significant difference in germination $H (2) = 47.33$, $P < 0.001$) and height $H (2) = 32.34$, $P < 0.001$) between different

seed categories across all species. Our results suggest that larger seeds resulted in the highest germination and growth across all species. This study, therefore, recommends using large seeds for successful propagation of the study species, especially when used in restoration projects.

Antibacterial Activity and Phytochemical Screening of *Asparagus nelsii*

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Abstract

Evidence from archeological excavations show that plants have been used as a source of medicine as early as 60 000 years ago. *Asparagus nelsii* is a species that has a native range from Zamibia to South Africa (Angola, Botswana, Cape Provinces, Namibia, Northern Provinces, Zambia) and is said to have much medicinal properties. The aim of this study was to investigate the antibacterial activity of *Asparagus nelsii* as well as the phytochemicals present in *Asparagus nelsii*. Literature reports that many natives use this species to help with flu, colds and eczema. For the antibacterial activity assay, the disc diffusion method was employed to measure the diameter of bacteria that was inhibited, as well as utilizing the spread plate technique to investigate the miniumum inhibirory concentration (MIC) of *Asparagus nelsii* against *staphylococcus aureus, enterococcus faecalis* and *pseudomonas aeruginosa*. The ATCC strength of *staphylococcus aureus, enterococcus faecalis* and *pseudomonas aeruginosa* was 25923, 29212 and 27853 respectively. The positive control used to inhibit both *staphylococcus aureus* and *enterococcus faecalis* was Ampicillin and the positive control used to inhibit *pseudomonas aeruginosa* was Imipenem. For the phytochemical screening, the total flavonoid content, total phenolic content and total tannin content of *Asparagus nelsii* was determined using Quercetin, Gallic acid and Tannic acid as the standards respectively. The preliminary phytochemical screening revealed the presence of alkaloids, flavonoids, tannins, saponins, terpenoids and Diterpenes. The total phenolic, total flavonoid and total tannin content were 1.10 ± 0.47 mg GAE/g fresh mass, 1.26 ± 0.18 mg QEE/g fresh mass and 134.07 ± 48.242mg TAE/g fresh mass respectively. During the minimum inhibitory concentration investigation, the study has shown that *Asparagus nelsii* was able to inhibit the growth of *Staphylococcus aureus* and *Pseudomonas aeruginosa* at a concentration of 1.25mg/ml and was able to inhibit the growth of *Enterococcus faecalis* at a concentration of 0.625mg/ml. From all test microbes, the growth of *Staphylococcus aureus* and *Pseudomonas aeruginosa* was

inhibited the least, and the growth of *Enterococcus faecalis* was inhibited the most. This study was necessary to have a scientific view on the medicinal properties of *Asparagus nelsii* and will add much value in the conservation of this plant.

ANTIBIOGRAM CHARACTERIZATION OF BACTERIA ISOLATED FROM READY TO EAT FRUITS SOLD BY VENDORS IN THE NORTHERN INDUSTRIAL AREA OF WINDHOEK

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Abstract

Street vended fruits are fruits sold in the streets by merchants for consumption at the location or later without further preparation. However, street vended fruits are usually under unhygienic condition and are displayed openly to high degrees of contamination, hence their microbial safety is not always known. Likely, sources of contamination include environmental elements like wind and dust, vectors like flies, and handling with dirty hands, all of which may potentially transfer pathogens onto the fruits. This study was carried out to determine the presence of bacterial contaminants on the fruit surfaces, and to determine their antibiogram profiles against the following antibiotics: chloramphenicol (C30), erythromycin (E15), and tetracycline (T30). Fruit samples comprising of apple, pear, peach, grapes, and plums were bought from various vendor stalls and transported to the laboratory at the University of Namibia in sterile polyethylene bags. Culturing was done by simply rolling the fruits on nutrient agar and incubated at 37 degrees Celsius. Results were read the following day, after 18 to 24 hours of incubation. Pure cultures were obtained by a four-corner streaking method. Obtained bacterial isolates were differentiated on the basis of their morphological characteristics, and were duly named as follows; B1PCV1, B2PCV1, B1AV3, B2AV3, B1GRV1, B2GRV1, B1PLV2, B2PLV2, B1PRV1, and B2PRV1. Gram stain results demonstrated that B1PCV1, B2PCV1, B2AV3, and B2PRV1 were Gram negative, while the rest of the bacterial isolates were classified as Gram positive bacteria. B1PCV1, B2PCV1, B1GRV1, B2GRV1, and B1AV3 had cocci shapes, while B2AV3, B1PRV1, B1PLV2, B2PLV2, and B2PRV1 had rod shapes.

Antibiogram analyses showed that all of the bacterial isolates were susceptible to all the antibiotics tested, with the exception of isolate B2PCV1 that showed resistance against erythromycin. This showed that the isolate B2PCV1 has the potential of being a pathogen.

Keywords: Fruits, Antibiotics, Street Vendors, Bacteria, Pathogens, and Contamination.

The fabrication and characterization of copper oxide thin film using molecular precursor method.

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Abstract

The objectives of this study were to fabricate copper oxide thin films, determine the optical properties of the fabricated thin films and to investigate their changes in band gap values. The procedures employed in the experiment were to first synthesize a copper (II) ethylenediaminetetraacetic acid (EDTA) complex from copper acetate monohydrate, EDTA and water, refluxed at 75°C for 2 hours. The complex was then used to synthesize the copper (II) EDTA precursor solution by refluxing the complex with ethanol and diethylamine for an hour. Finally, using the spin coating method, the precursor solution was spread of quartz glass substrates to fabricate the thin films. Each of the thin films were heat treated at temperatures of 400°C, 500C, and 600°C, respectively.

Using UV-Vis analysis of the thin films were analyzed. It was observed that the thin films had different absorption values based on the different temperatures at which each of the thin films were heat treated. The thin film which was treated at 300°C showed a band at a wavelength of around 312 nm. The thin film which was treated at 600°C had an absorbance band of around 565 nm. As such, it was overall observed that the thin films which were treated at lower temperatures had a higher absorbance. Therefore, it was proposed that due to the presence of organic elements such as C and Nitrogen that are still present in the films due to incomplete combustion, C and N atoms behave as dopants in the copper oxide matrix. It can be concluded that the absorbance is inversely proportional to the temperature because at a lower temperature, the absorbance of the thin film was higher, and it was lower at a higher temperature

Co-Design of an IoT & AI-Based System for Theft Prevention & Intrusion Detection for Farmers in Namibia

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Abstract

Smart farming, although provides interconnectivity of how modern farming is conducted, does not address the rise in theft of livestock and intrusion of perpetrators. Previous efforts has primarily relied on securing the perimeter and thus has been unable to disentangle changes in the new methods perpetrators use and changes in the evolution of emerging technologies – a potential key mechanism given the dramatic rise in livestock theft and intrusion of perimeters of farms. This study aims to design and develop an IoT and AI-based system with different components that interdepend on each other, borrowing from paradigms of machine learning from the artificial intelligence discipline and sensor networks from the Internet of Things, to help prevent theft of livestock and intrusion detection for farmers in Namibia. A qualitative approach has been applied with a stratified sampling method and a phenomenological research design. The iterative and incremental development model is used to develop the system. An interview with 20 participants helped gather data to be used, not only to provide insight into how and why the rise in livestock has been so alarming, but also to assess the role and effect of IoT and AI automation on farm protection. Data analysis through descriptive statistics and thematic text analysis is applied in this research paper. The research findings and conclusions are included and represented respectively. It was concluded that an IoT & AI-based system has the potential to increase countermeasures for theft and intrusion for farms in Namibia.

Isolation of flavonoid glycosides of Wild Everlasting *HELICHRYSUM ARGYROSPHAERUM*.

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Abstract

Helichrysum argyrosphaerum belongs to the daisy family under the genus *Helichyrysum*, which encompasses of 1699 species. The plant is commonly known as the wild everlasting, Silver head or Sewejaartie. Species of the genus *Helichrysum* are widely used in Southern African traditional medicine. Indeed, most *Helichrysum* species display antifungal and antibacterial activities. Flavonoids are an extensive family of phytochemicals and they are the most common and widely distributed group of plant phenolic compounds with a wide range of biological functions that include antioxidants, antibacterial, anticancer, anti- inflammatory activities etc. In a previous study in our laboratory it was found that the methanol extracts of the flowers of *Helichrysum argyrosphaerum* contains a number of interesting phenolic compounds. However, some of the compounds could not be fully characterized. Therefore, the main aim of this study was to isolate the major constituents of a methanol extract of the flowers of *H. argyrosphaerum* using semi-preparative high pressure liquid chromatography (semi-prep HPLC). This will form the first step towards further characterization and biological activity determinations of the isolated compounds in future studies.

A methanol extract of the finely ground flowers of the plant was prepared. The extract was first analyzed with an analytical scale HPLC method to detect the compounds of interest. Subsequently the analytical scale method was translated to suitable semi-prep HPLC method utilising an Ascentis C18 column (25cm length, 10mm diameter packed with 5µm particles) with a flow rate of 4 mL/min. The two mobile phase solutions, 5% MeOH with 0.1% formic acid and 0.1% formic acid in MeOH was mixed online using the following gradient: 0 % → 64% B (0-45 min), 64 % → 100 % B (45-46 min), 100 % B (46-50 min), 100 % → 0 % B (50-51 min), 0 % B 951-55 min). A concentrated solution of the extract was prepared and numerous portions of the solution was fractionated using semi-prep HPLC method, by manually collecting the individual fractions into separate flask during each separation. Using this method, four compounds could be isolated from the extract. The fractions were subsequently analyzed using the analytical scale HPLC method which revealed that the fractions ranged from partially pure to highly pure. This study showed that semi-prep HPLC can be used effectively to isolate individual compounds from the MeOH extract of *H. argyrosphaerum* flowers. In addition, the method that was developed can now be used in our

laboratory for similar projects in future.

The green synthesis of CuS nanoparticles using *Boscia albitrunca* for the photocatalytic degradation of Methylene blue and Rhodamine B dye

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Abstract

There is an increasing interest in green synthesis of nanoparticles as an environmentally friendly, sustainable and a cost effective way of minimizing pollution in waste water through the photocatalytic degradation of organic pollutants. According to previous research plants extracts have been used as capping and reducing agents; and showed enhanced photo degradation of dyes. In this study, copper (II) sulfide nanoparticles were synthesized using cupric sulfide and Thiourea as copper and sulfur sources respectively. *Boscia albitrunca* leaf extracts with different concentrations of 10 mL, 20 mL, 30 mL and 40 mL of the plant extracts in 90 mL, 80 mL, 70 mL and 60 mL of distilled water were to prepare the CuS nanoparticles. The synthesized nanoparticles were used to study the photocatalytic degradation of methylene blue and rhodamine B dyes under UV irradiation for different time durations. The graphs of the absorbance (C/C_0) for both dyes display an observable trend of decrease in absorbance with increase in time. The results showed that the photodegradation of methylene blue dye using CuS nanoparticles after 240 minutes obtained for the control, 10 mL, 20 mL, 30 mL and 40 mL plant extract were 25.60%, 16.14%, 21.35%, 21.88% and 28.12% respectively. The CuS nanoparticles obtained from 40 ml of plant extracts gave the lowest absorbance and highest degradation percentage (28%). The results for the rhodamine B dye displayed a similar trend with a degradation rate of 18.80%, 18.35%, 28.26% and 29.38% when using CuS nanoparticles obtained for the control, 10ml, 20 ml, 30ml and 40 ml plant extracts respectively. The sample with the 40 ml of the plants extracts also had the lowest absorbance and the highest percentage degradation (29%). For both dyes green synthesized CuS nanoparticles showed a slow degradation of the dye after 240 minutes the highest degradation percentage was 29%.

ANALYSING THE ROLE OF CLIMATE VARIABLES SUITABLE FOR MALARIA TRANSMISSION IN RUNDU DISTRICT, KAVANGO EAST

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Abstract

The vulnerability of vector-borne diseases like malaria to climate change continues to raise concerns about the impacts of climate change on disease dynamics in the future. Therefore there is insufficient information on the correlation between climatic variability and the risk of malaria transmission in Rundu district. This study aimed to determine the relationship between prevalence of malaria incidence and weather variables. The data consisted of monthly time series of malaria cases reported from hospital records in Rundu district: Kavango East region. And considered the local temperature, rainfall and humidity time series from meteorological station in Rundu from the year 2015 to 2019. All the data were entered and analysed using SPSS and R Programming language software. Pearson correlation and Multiple Linear Regression (MLR) analysis were used to asses association between the variables. On the effect of climatic conditions on malaria incidence, Bayesian and traditional estimating approaches were used and compared. The comparison technique used credible and confidence intervals from a negative binomial model derived using Bayesian estimation and maximum likelihood estimation, respectively. At 5% level of significance ($P \geq 0.05$), the result of the statistical test demonstrated that there is no significance difference in the occurrence of the disease between the rainy and dry seasons. The occurrence trend was found to be escalating annually, with the highest incidence of 45.91% in 2017, followed by 27.21% and 12.48% in 2018 and 2015, respectively. Based on Pearson's correlation, rainfall ($R^2 = 3.1$) and humidity ($R^2 = 25.6$) were found to be positively correlated to malaria incidence. At lag 1 month to lag 5, there was a significant positive effect of rainfall on malaria incidence, while maximum temperature had a positive effect on malaria from a month lag of 3 to 7. Based on traditional methods, Poisson regression indicated that the distribution of malaria cases was over-dispersed with a mean of 610.28 and variance of 922.944. Both methods used in this study affirmed rainfall to be the most variable to influence malaria incidence, followed by humidity. As a result,

priority should be given to vector control strategy and raising public knowledge about the effective use of intervention methods such as indoor residual sprays to limit the epidemic, particularly during peak seasons when weather conditions are favourable.

Synthesis and Characterization of a Naphthionic Based Organic Dye Sensitizer for Solar cells and its Photoresponse Properties in Different Solvents

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Abstract

A highly fluorescent naphthionic-based organic dye snsitizer bearing a thiophenyl moiety ((Z)-4-((1,1,1-trifluoro-4-oxo-4-(thiophen-2-yl), referred as **V**, was synthesized via a single-step synthetic Schiffs' base condensation reaction method, and spectroscopically characterized and analysed, using UV-Vis, Infrared and fluorescence spectrophotometers. The photoresponse/optical properties of **V** were studied through UV-Vis spectroscopy and fluorescence. The main absorption peak of the dye displayed was centered within the ultraviolet region, different solvents induced significant spectral shifts, mostly towards the red region. Consequently, solvatochromism studies were conducted over a range of solvents of different polarities. Among the solvents used, **V** displayed enhanced molar extinction coefficient (ε) and a simultaneously extended absorption range in acetone, which is normally a good indication for potential dye sensitizers for solar cells. Thus, with judicious construction, the molecular structure of **Y** can be tuned further to harness the dye sensitizing properties for solar cells. Thus, **V** displayed promising dye sensitising properties in acetone, followed by dichloromethane, which was suspectedly influenced by the polarity of these solvents.

Dimension Reduction for Qualitative data: an application on Nobel price data 1901- 2016

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Abstract

CA (correspondence analysis) is a geometric method for displaying the relationship between two variables the rows and columns of a two-way contingency table as points in a low-dimensional space graphically. Data table known as a contingency table was formed, which was used to assess frequencies. Chi-square analysis was applied to recognize the relationship between rows and columns. SVD was used in the computational approach to obtain row and column profile coordinates with respect to primary axes. Dimensionality of a data matrix of the Nobel prizes between two variables rows "born Country" and columns "categories" and summarized and visualized the dataset in a low-dimensional subspace in two-dimensional. Dimensions were formed by identifying axes for which the distance between the profiles and axes. Each dimension had an eigenvalue, which represented its relative importance and how much of the inertia it explained. Finally, we went over how to do and analyze the CA map.

Keywords: Correspondence analysis; categorical data; SVD; inertia; Dimension; data matrix; visualization; low-dimensional; two-dimensional graphs; Chi-square.

Determinants of wage differentials in Namibia: An analysis of the 2018 Namibia Labour Force Survey

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Abstract

Although several programme are put in place to ensure equal pay for work of equal value in the United Nations Goal 8 of the 2030 Sustainable Development Agenda which seeks to achieve equal pay for men and women, differential/inequality still remains and continues to be a matter of concern around the globe. While classified as an economically strong and upper-middle income country, Namibia still suffers from one of the highest income inequality levels worldwide, primarily attributed to the country's colonial past. For this reason, this study was aimed at examining the determinants of wage differentials in Namibia using an ordered probit regression modelling technique on data obtained from the 2018 Namibia labour force survey. Results from this study showed that majority of the respondents were in the lower income range of N$300-N$4999, employed in elementary occupations, resided in the rural areas and were not in a union nor have social security. In addition, this study showed that the head of household's gender (p-value= 0.0501), union membership (p-value < 0.001), social security (p-value < 0.001), sector (p-value <0.001), education (p-value< 0.001), residence (p-value <0.001) as well as their occupation (p-value <0.001) were significantly associated with their income levels. Furthermore, the household heads having secondary and tertiary education levels, who were registered for social security and belonged to a union were more likely to have an income of more than N$20000 and less likely to have an income of N$300 to 4999. However, household heads working as armed forces, clerks, craft and related trade, elementary occupation, technicians and associate professionals, who resided in rural areas and were females were less likely to have an income of more than N$20000 and more likely to have an income of N$300 to 4999.

It is therefore recommended that the Namibian government invest more into education by providing free and quality education at secondary and tertiary levels that will equip people to take up higher paying jobs especially among women. Additionally, since the disparity of income between the urban and rural areas tends to drive people from rural to urban areas, there is an urgent need to develop the rural areas and create more opportunities for rural dwellers.

Keywords: ordered probit, inequality, wage differentials, Namibia

Anti-inflammatory properties of medicinal plants used to manage diabetes in Hardap region, Namibia

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Abstract

Diabetes mellitus is a non-communicable disease which is on the increase in Namibia, it is linked to genetic disposition but is exacerbated by lifestyle choices relating to dietary choices and lack of physical activity. Indigenous knowledge of medicinal plants has been used by communities in Southern Namibia to manage diabetes although it is not fully known how they achieve their therapeutic effect. An improved understanding of the biochemical mechanisms that link inflammation to diabetes mellitus and related complications has stimulated interest in focusing on inflammatory pathways as a strategy to prevent or manage diabetes mellitus and its resulting complications. Extracts from ethno-medicinal plants used to manage diabetes, namely *Ocimum americanum, Ocimum gratissimum, Harpagophytum procumbens, and Harpagophytum zeyheri* were studied in order to understand their antidiabetic potential and the role they play in managing diabetes related inflammation.

The plants were extracted using a mixture of organic solvents dichloromethane and methanol in a 1:1 (v/v) ratio and an aqueous extraction method. Thin-layer chromatography was used to identify the phytochemical compounds in each extract. As a means to determine whether the plant extracts were able to prevent the oxidation of cells, the plant extracts were subjected to an antioxidant assay using 2,2-dipheyl-1-picrylhydrazyl (DPPH) and the reducing power assay using ferric chloride and potassium ferricyanide. Finally, in order to test the anti-inflammation activity of the plant extracts, the albumin denaturation test was used.

This study showed that *Ocimum* and *Harpagophytum* extreacts were rich in phytochemical constituents, specifically flavonoids, terpenoids and alkaloids, which contributed to their medicinal uses. The aerial parts of *O. gratissimum* and *O. americanum*, and the tubers of the *H. procumbens* and *H. zeyheri* have antioxidant properties based on the DPPH assay and anti-

inflammatory properties based on the albumin denaturation test, which may be an indication of potential antidiabetic properties. These results form a basis for further studies on the safety and efficacy of these plant extracts for their potential mainstreaming as treatments for management of diabetes and other inflammatory diseases.

L-ASPARAGINASE ACTIVITY OF FUNGAL ENDOPHYTES ISOLATED FROM BEANS AND BAMBARA GROUNDNUTS

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Abstract

Endophytes are microorganisms (fungi and bacteria) that reside within plant tissues for all or part of their life cycle. Fungal endophytes produce various bioactive compounds in the tissues of most plants which are known to enhance their host tolerance to biotic and abiotic stress, nutrients acquisition, growth and biomass accumulation. These compounds can also function as potential candidates for antimicrobial, anti-insect, anticancer, anti-inflammatory as well as antioxidant agents. L-asparaginase is an enzyme that is normally employed in the chemotherapy particularly for cancerous tumours of white blood cells.

The aim of this research was to screen and quantify the production of L-asparaginase by fungal endophytes from seeds of *Vigna subterranea* and *Phaseolus vulgaris.*

The endophytes were grown on the potato dextrose agar and the screening of L-asparaginase producing endophytes was performed by qualitative plate assay on modified Czapex dox's agar medium. L-Asparaginase-producing endophytes were identified by the formation of pink zones on Czapex dox's agar medium, a result of hydrolyzes of asparagine into aspartic acid and ammonia that converts the phenol red dye indicator from yellow(acidic condition) to pink (alkaline condition). L-asparaginase activity of fungal endophytes was quantified by nesslerization method.

The results showed a total of six isolates, of which two were able to produce L-asparaginase and their enzyme activities were between 0.253 µM mL^{-1} min^{-1} and 0.261 µM mL^{-1} min^{-1}. Although the results showed less positive L-asparaginase producing endophytes, it showed a good enzyme activities. Based on the results of enzyme activities obtained, fungal endophytes from seeds of *Vigna subterranea* and *Phaseolus vulgaris* shows a great potential of catalysing the breakdown of L-asparagine.

Fabrication and Characterization of Al-doped ZnO thin films by the spray-coating method using aqueous precursors involving Zn^{2+} and Al^{3+} complexes

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Abstract

A thin film is a layer of material ranging from one of a nanometer to one micrometers in thickness. The advantages of fabricating thin films are that they replace expensive and in short-supply materials. Zinc Oxide thin films are important in technology, but they have inferiorities in terms of optical and structural properties. Doping ZnO thin films with Aluminium improves their optical and structural properties and these properties make them suitable for applications in solar cells, flat panel display, gas sensors. This study is important as it leads to the development of a simple and effective method for fabricating Al-doped ZnO thin films. The spray-coating method was used to fabricate thin films, because it is inexpensive and has simple instrumentation set up. Aqueous precursors solutions involving Zn^{2+} only and involving Zn^{2+} and Al^{3+} complexes with different aluminium mole percentages (2-8%) were prepared and used to fabricate precursor films and thin films. The aqueous precursors solutions were spray-coated onto glass substrates preheated to 180°C. The sprayed films were heat-treated at 500°C, in air for 30 minutes. Various thin films undoped and doped were obtained. The properties of the resultant films will be discussed.

Keywords: thin films, spray coating, ZnO thin films.

LINEAR MIXED EFFECTS MODELS AS A COMPARISON TO LINEAR REGRESSION MODELS AN APPLICATION TO THE NUMBER OF HIV AND TB PATIENTS IN THE ERONGO REGION

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Abstract

This research paper aimed to compare two models, namely the linear mixed effects models and the linear regression models where the linear mixed models were defined as models that have datasets that are usually longitudinal, in the sense that multiple measurements are made on the same subject's overtime. Linear mixed models are known to have both random effects and fixed effects as predictor variables whilst linear regression models were defined as the analysis of relationships between the dependent variable of y and one or more independent variables of x and only has fixed effects. In theory it is said that the linear mixed models are more significant than linear regression models but fewer research studies have been done to compare and test these two models to prove or disprove this notion, hence the reason to test and measure which model has greater explanatory or predictive power with reference to the same dataset.

In this study a quantitative approach was used in relation to the methodology. The research instrument that was used was the R Foundation for Statistical Computing. A Secondary dataset on the number of HIV and TB patients in the Erongo region was used. The descriptive and multivariate statistics were used to compare the two models using three statistical approaches, the Akaike's information criterion (AIC), coefficient of determination (R^2) and the log likelihood.

There are two common types of linear regression, simple linear regression and multiple linear regression for this study the multiple linear regression was used. The regression model had 4 models and the best model was selected from each regression model using the Akaike's information criterion (AIC). Model2 from the multiple linear regression models was selected with an AIC of 22713.86 as the better model and model2 from the linear mixed models was selected as the better model with an AIC of 22667.72 then the log likelihood of these two models from each regression model were compared and it showed that model2 from the multiple linear regression models had a log likelihood of -11331.93 while model2 from the linear mixed model had a log likelihood of -11304.86 and was the better and most significant model among the 2 models. Therefore, this paper recommends the use of linear mixed effects models than linear regression models because linear mixed effects models are more significant compared to linear regression models.

Synthesis and Characterization of a Naphthyl Based Organic Dye Sensitizer for Solar cells and its Photoresponse Properties in Different Solvents.

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Abstract

A highly fluorescent naphthyl-based organic dye sensitizer bearing a naphthionic moiety ((E)-4-(((2-hydroxynaphthalen-1-yl) methylene)), referred as **Y**, was synthesized via a one-step synthetic Schiffs' base method, and spectroscopically characterized and analysed, using UV-Vis, Infrared and fluorescence spectrophotometers. The photoresponse properties of **Y** were studied through UV-Vis spectroscopy and fluorescence. The dye displayed optical responses within the visible light region, with absorption maxima varying in different solvents. As a result, solvatochromic effect studies on the photoresponse of **Y** were studied over a range of solvents of different polarities. Among the solvents used, **Y** displayed enhanced molar extinction coefficient (ε) and extended absorption ranges in DMF and THF solvents, which is a good indication of potential dye sensitizers for solar cells. In addition, the dye displayed a high fluorescence emission response at 450 nm in DMF when excited at 350 nm. The visible light-occuring fluorescence emission displays excellent properties of **Y**, in the field of functional materials. Thus, the optical (photoresponse) properties of **Y** in DMF reveals that solvatochromic effect plays a significant role in tuning

molecular materials towards optimized photon absorption, and eventually improve their potentials towards photovoltaic properties. Thus, with judicious construction, **Y** can be a potential dye sensitizer for solar cells, given especially when DMF or THF is used as solvent environment. The high fluorescence emission displayed by **Y** is significantly indicating that the dye is a highly functional material, which can be applied as solar materials or light emitting materials.

Phytochemical Screening and Antioxidant Activities of Water Lilies (*Nymphaea* sp.) from Zambezi Region, Namibia

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Abstract

The Zambezi Region is a tropical region, located in the south-western African country of Namibia, that is home to a number of different plants creating flora endemic to Namibia. Water Lilies just happen to be one of these amazing plants, it is an aquatic perennial plant in the genera *Nymphaea.* The *Nymphaea* sp., like all plants, are rich in secondary metabolites a large group of chemical compounds that are thought to be produced by the majority of plant species in order to cope with biotic and abiotic stresses. Phytochemicals fall into this classification and are largely sought after for their antioxidant activity which contributes to the benefits that they exude to some of the most devastating diseases like coronary heart disease and cancer. The aim of this paper is to screen and determine the phytochemical and antioxidant activities of the *Nymphaea* sp. located here as done for the same species in other parts of the world. The tubers form these plants were selected and ground into a fine power and the extracts were macerated using the following three solvents; Methanol, Ethanol and Water. Phytochemicals screening for the tubers' extracts indicated the presence of polyphenols with total flavonoids content (TFC) of 0.1581 ± 0.0262 (AA/g). The antioxidant activities was assessed using DPPH radical scavenging assay with the highest scavenging activity in water extracts of 87.37% when compared to the ascorbic acid, the positive control, with 78.70% .The *Nymphaea* sp is a good source of phytochemicals with the potential of antioxidant activity enabling them to be sourced as ingredients for food-grade supplements with future health benefits.

Keywords: *Nymphaea* sp., Water Lilies, Phytochemicals, Antioxidant Activity, Zambezi region, Namibia

Synthesis and characterization of a naphthyl-based dual sensing probe bearing a naphthionic moiety, for anions (F^- & OH^-) and cations (Co^{2+}, Ni^{2+}, Cu^{2+} & Zn^{2+}) in DMF

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Abstract

A highly selective and sensitive naphthyl-based based dual sensing probe bearing a naphthionic moiety, for anions (F^- & OH^-) and cations (Co^{2+}, Ni^{2+}, Cu^{2+} & Zn^{2+}) ((E)-4-(((2-hydroxynaphthalen-1-yl)methylene)), termed as **Z**, was synthesized via a one-step synthetic Schiffs' base method, and spectroscopically characterized and analysed, using UV-Vis, Infrared and fluorescence spectrophotometers. The anion recognition properties towards various biologically important anions were investigated through naked eye observation and thereafter spectroscopic methods such as UV-vis in water soluble dimethylformamide (DMF). The addition of fluoride (F^-) and hydroxide (OH^-) ions as tetrabutylammonium salts to receptor **Z** in DMF, resulted in marked spectral shift of the charge-transfer absorbance band, concomitant with a naked eye detectable colour change, attributed to intermolecular charge transfer (ICT) as a result of hydrogen bonding driven activities. Moreover, the addition of cationic salt solutions (Co^{2+}, Ni^{2+}, Cu^{2+} & Zn^{2+}), resulted in distinctive colour changes upon interacting with **Z** in DMF, ascribed to chelating-induced charge transfers between **Z** and individual cations. Thus, **Z** displayed duality sensing functions towards both anions and cations, however, selective to only ionic species which are complementary to the structure and chemistry environment of **Z**.

OTHER FACULTIES, CENTRES, AGENCIES AND INTERNATIONAL INSTITUTIONS

NAMIBIAN MEDICINAL PLANT EXTRACTS HAVE POTENTIAL FOR USE AS COMPLEMENTARY AND ALTERNATIVE MEDICINES FOR TREATMENT OF MULTIDRUG RESISTANT CLINICAL *SALMONELLA* AND *VEROTOXIGENIC ESCHERICHIA COLI* 157:H7

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Abstract

Acute gastroenteritis is a major global health concern in pediatrics, annually accounting for over 1.3 million mortality cases in children under the age of 5 globally. Moreover, there is a rapid emergence of resistance to antidiarrheal antibiotics used to manage gastroenteritis. This has resulted in an increased interest in searching for novel phytomedicine in plants that are used traditionally to treat gastroenteritis. However, the efficacy and safety of medicinal plants should be determined before adoption for mainstream use as complementary or alternatives medicines (CAM). This study aimed to evaluate the antibacterial properties of methanol and aqueous extracts of *Terminalia sericea, Lantana camara, Corchorus tridens, Grewia tenax,* and *Albizia anthelmintica,* against clinical *Salmonella* and *Verotoxigenic Escherichia coli* 157:H7, as well as reference strains of *Salmonella typhurium* ACCT 13311 and *Escherichia coli* ATCC 25922. The study also determined the *in vitro* cytotoxicity of methanol plant extracts. The agar disc diffusion was used to determine the antibacterial activity of 500 µg/ ml, methanol, and aqueous extracts; the antigram assay was used to determine the susceptibility of clinical and reference gastrointestinal pathogens to 11 antibiotics, on Muller Hinton agar; the minimum inhibitory concentration of extracts was determined by resazurin-based microtiter dilution assay in 96 well plates. *In vitro* cytotoxicity of methanol plant extracts against NiH/3T3 normal mouse embryo fibroblast cells was determined using the 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyl-2H-tetrazolium bromide (MTT) assay. *L. camara* methanol seed extracts showed potent activity against both clinical and reference strains of *E. coli* (20.67± 1.53 mm and 22.00± 1.00 mm) and *Salmonella* species (21.67± 0.58 mm and 20.33± 0.58 mm) respectively, with the MIC values ranging between 31.25 and 125 µg/ml. Multidrug resistance was observed among clinical isolates of *Salmonella* and *Verotoxigenic Escherichia coli* 157:H7 with pathogens showing sensitivity to only 3/11 standard antibiotics. The values for cell viability with methanol extracts at 100µg/mL were between 38.78± 0.58% for *G. tenax* and 63.08± 0.52 % for *T. sericea*. These values were higher than the negative control 10% Triton-X (29.81± 0.50 % cell viability). At 1.56 µg/mL methanol extracts showed the percentage

viability was between 80.05±0.06% for *L. camara* and 97.63±0.14% for *G. tenax*. Among the four studied extracts, *G. tenax* showed the highest average half-maximal inhibitory concentration (IC50) values of 77.1±0.14 µg/mL after 48 hours. Meanwhile, *T. sericea* extract showed a lower IC50 of 54.2±0.07 µg/mL. In conclusion, methanol extracts of *L. camara, C. tridens,* and *T. sericea* have potent antibacterial activity against multidrug-resistant clinical and reference strains of *Salmonella* and *E. coli*, mild toxicity to 3t3 cells was also detected. These medicinal plant extracts have potential use as antidiarrheal CAM but only after a safe dosage regimen is validated *in vivo*.

Serpentinization of Ophiolitic Rocks, Metasomatism and Gold Precipitation: Examples from the Eastern Desert, Egypt

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Abstract

New EPMA and LA-ICP-MS data of pyroxene and chromite are used to assess the so far published tectonic setting of Wadi Ghadir Ophiolite in the CED of Egypt. The low contents of TiO2 (< 0.46 wt. %) and high MgO (13.39-15.17 wt. %) concentrations in the analyzed clinopyroxene suggest a depleted residual mantle source material. The trace element composition and REE patterns reflect transitional IAT-boninitic geochemical affinities in a supra-subduction zone setting. Chromite, on the other hand, shows high Cr# (Cr/ (Cr+Al)) (0.83-0.88 mol) and relatively constant Mg# (Mg/ (Mg+Fe+2)) (0.66-0.70 mol), indicating a high degree of partial melting of the upper mantle source. These features are typical for supra-subduction zone in a back-arc or inter-arc basin setting. The electron microprobe analysis (EPMA) of chromite is used to assess the so far published tectonic setting of Abu Dahr Ophiolite in the SED of Egypt show the very low content of TiO2 ranges from 0.02 to 0.16 wt.% and Al2O3 ranges from 0.1 to 8.5 wt.%. The chromite compositions have both high Cr#>83 mol% and low Cr# ranges from 5.5 to 29.5 mol% whereas, Mg# show content varies from 14-93 Mol %. The coexistence of low Cr# chromites from ultramafic of the Abu Dhar ophiolites with high Cr# chromites indicating that the low Cr# chromites have been formed in an earlier stage in a mid-ocean ridge setting and a later generation of the high Cr# type in a mantle wedge of a mature subduction system. The micro-analytical data of relict magmatic mineral phases in the Wadi Ghadir, Abu Dahr ophiolite, and other ophiolitic rocks in the Arabian-Nubian Shield can help in interpreting their precise tectonic setting as far as data of the immobile, incompatible elements are used.

Based on and geochemical studies, the hydrothermal alteration assemblages associated with serpentinites of Wadi Ghadir revealed that the serpentinites host silica-carbonate assemblages and

listvenite. The hydrothermal-metasomatic products associated with the mantle rocks of Abu Dahr area dominated by birbirites with minor amounts of talc carbonates and listvenite

This study reveals that ophiolites can serve as a gold source in gold –endowed provinces, despite the different tectonic setting of the parental peridotites, although SSZ ophiolites are more enriched in LILE and other mobile and semi-mobile elements. The ore microscopy and SEM along with the electron microprobe data of sulfides disseminated in serpentinized ultramafic rocks (peridotites) from the Wadi Ghadir and Gebel Abu Dahr indicate the predominance of Ni-Fe sulfides, mainly pentlandite and millerite. Measurable gold contents in these sulfides are two or three orders magnitude higher than known clack concentrations in ultramafic rocks from the oceanic crust. This may imply the fertility of these sulfides as a potential source for the metal Au. The uneven and variable concentration of gold in the same grain and in different grains from the same sample reflects variable degrees of metasomatism and leaching. The latter suggests how Au was mobile during metasomatic processes of these rocks and demonstrated on these rocks as source for gold under conditions of ocean floor and post-emplacement metasomatism.

More comprehensive micro chemical and isotope data are still needed to define how gold was excreted from these sulfides, and other cumulate phases are to be included to construct a non-sceptic model.

Engineering Geological Mapping of Port Harcourt, Southeastern Nigeria.

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Abstract

One hundred and forty-seven soil reports across Port Harcourt and Obio-Akpor L.G. A, in Rivers State, Nigeria were collated. Geotechnical data were extracted and analyzed for geotechnical properties description and map production. The aim was to prepare these maps as a quick guide to land use planning and a guide to the design and construction of civil engineering structures. The results obtained showed that the allowable bearing capacities of soils in Port Harcourt obtained from undrained Triaxial tests increased with depth with average values of 154.74 kPa, 197.52 kPa and 753.78 kPa at 1.5m, 3m, and 6m respectively. An allowable pressure of 75 kPa to 175 kPa can be born easily by the Clay Soil. The average values of cu at depths of 3 to 10m, 11 to 15m and 16 to 20m were 3.68, 2.83 and 3.56 respectively. According to USCS Classification scheme, the soils are classified as poorly Graded Sands (SP). At depths of 3 to 10m, 11 to 15m, and 16 to 20m average permeability values ranges were 4×10^{-4} m/sec, 3.72×10^{-4} m/sec and 9.30×10^{-4} m/sec respectively. These values show the soil as having low Permeability, indicating poor drainage conditions. The minimum and maximum value for settlement at shallow foundation (1.5m) ranged between 10mm and 850mm with an average value of 87mm. For foundations on clay, design limits for total settlements are given as 65mm, and 65mm to 100mm for rafts. The Natural Moisture Content at 1.5m, 3m, and 6m ranged from 11.40 to 66 %, 10.50 to 69 %, and 9.0 to 55.0 % with averages of 17.88 %, 18.31 % and 17.62 % respectively. The insitu moisture content of soils are controlled by season, clay, organic content and drainage parameters. The soils were categorized according to USCS soil classification scheme as CI, CL, and CH with a few places possessing MH-OH indicating that the clays within Port Harcourt areas are mostly inorganic clays of medium to high plasticity. These engineering geological maps were produced to guide decision makers and planners in the land use allocation of the areas for sustainability.

Immunomodulatory effects of some Namibian plants traditionally used for treating inflammatory diseases

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Abstract

Acanthosicyos naudininus, *Gomphocarpus fruticosus*, and *Cryptolepis decidua* are, according to the knowledge of traditional healers, used in Namibia to treat inflammatory disorders such as pain, fever and skin rashes. The present study was conducted to evaluate the immunomodulatory effects and the possible underlying mechanisms of action of the plant extracts on peripheral blood mononuclear cells (PBMCs) such as T-lymphocytes. Methanolic and EtOAc extracts of *A. naudinianus*, *G. fruticosus* and *C. decidua* were analysed for their immunomodulatory potential. PBMCs were isolated from the blood of healthy donors and incubated with the plant extracts at concentrations 100, 30, 10, 3, 1 and 0.3 µg/mL. Effects on proliferation and viability of activated human lymphocytes were assessed in comparison to ciclosporin A by flow cytometry using carboxyfluorescein succinimidyl ester (CFSE) and WST-1 assay. Flow cytometry by annexin V/propidium iodide (PI) staining was performed to investigate the necrotic/apoptotic effect of the plant extracts on mitogen-activated human lymphocytes. In addition, analysis of the influence of plant extracts on the regulatory mechanisms of T-lymphocytes was performed using activation marker and cytokine production assays. An HPLC-PDA-ELSDESIMS profile was recorded for each of the extracts. T-lymphocyte proliferation was inhibited in a dose-dependent manner by the extracts of *A. naudinianus*, *G. fruticosus*, and *C. decidua* in concentrations not causing apoptosis or necrosis. This effect was mediated by inhibition of lymphocyte activation, specifically the suppression of CD25 and CD69 surface receptor expression. Moreover, the extracts suppressed effector functions, as indicated by reduced production of IFN-γ and IL-2. Based on the HPLC profile, possible responsible compound classes could be identified for the extracts of *A. naudinianus* (cucurbitacins) and *C. decidua* (indole alkaloids), but not for *G. fruticosus*. The data show that the extracts of A. naudinianus, G. fruticosus and C. decidua have in vitro

immunomodulatory activity and they interfere with the function of immunocompetent cells, suggesting an anti-inflammatory mode-of-action. The present chemical determination and pattern recognition results explain the therapeutic potency. However, further studies to investigate the therapeutic potential of the plants in inflammatory disorders should be done.

MAPPING THE HUMAN IMMUNODEFICIENCY VIRUS/ACQUIRED IMMUNODEFICIENCY SYNDROME EPIDEMIC IN NAMIBIA USING BAYESIAN SPATIAL MODELLING

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Abstract

A greater understanding of the dynamics of the Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome (HIV/AIDS) epidemic is essential in order to build an effective prevention response in a specific area. In order to devise suitable interventions, disease mapping is usually used to assess the spatial distribution of a disease's prevalence and risk factors in a given area. Although maps of HIV transmission are generally used for planning, resources allocation, and monitoring and evaluation, such maps were not available in Namibia prior to this study.

This study developed a spatial model of HIV/AIDS epidemic in Namibia based on Bayesian methods (spatially unstructured and structured random effects) using the 2013 Namibia Demographic and Health Survey data. Furthermore, the study identified socio-economic demographic characteristics and sexual behavior that were associated with HIV/AIDS prevalence in Namibia. Specifically, spatial regression models were fitted using BayesX 3.0.2 to adjust for spatial random effects and non-random effects, and the Moran's I statistic was calculated to test for the significance of autocorrelation between neighboring regions to show if they tend to cluster.

The Moran's I statistic (0.120) was significant (p-value = 0.003) with a variance of 0.002 which stipulated that values that determine the strength of spatial dependence in neighboring regions tend to cluster. After adjusting for spatial random effects and non-random effects, results shows significant structured spatial effects with posterior mean lying in the interval (-0.423, 0.759) at regional level and (-0.687, 0.995) at constituency level. The socio-economic,

demographic and cultural factors like non - condom use, wealth index (poor, middle, richer), marital status (living with partner) and sex (male) were significant in explaining the HIV prevalence in Namibia. Spatial clustering was observed in Khomas, Erongo, Oshana and Ohangwena regions.

The study recommends that the modelling of relative risk (as a function of spatial structure and spatial instructed random effects) in Namibia using Bayesian multi-scale models should be based on census data in order to identify definite spatial structures which would be exceedingly critical for both illustrative as well as policy implementation purposes.

UNDERSTANDING THE EXTENT TO WHICH ARTIFICIAL INTELLIGENCE SHAPING PUBLIC SECTOR LABOUR PRACTICES IN NAMIBIA

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Abstract

The study explores the expedition for Artificial Intelligence (AI) starts with dreams - as all quests do. Some people have an extensive imagination about machines with human capabilities. In other words, devices that can move and reason. Human-like machines are well defined in many stories and are pictured in sculptures, paintings, and drawings (Nilsson, 2009). This is outrageous, not to mention that we have technologies such as Siri, Alexa, Google Assistant, and Cortana that can be employed to serve us in everyday routines, from turning on lights to ordering food (Valterri Kaartemo, 2018). Moreover, when it comes to compiling and sorting various public sector data in an orderly manner, AI comes on top of the task. Although rapid progress has been made in related neurosciences and AI in recent years, the concept has come a long way. John McCarthy first coined the term artificial Intelligence in 1956 when he held the first academic conference on the subject. The research will lean more on gathering qualitative evidence using unstructured instruments with an explorative approach, as explained later in this design.The journey to understand if machines could accurately think like humans began much earlier. In addition, Vannevar Bush's seminal work 'As we May Think' recommended a system that magnifies people's own knowledge and understanding. Five years later (the exact year was unfortunately not mentioned) Alan Turing wrote a paper on machines encouraging human beings and the ability to do intelligent things, such as play Chess (Chris Smith, 2009). Overall, AI is not a settled science; it belongs to a frontier of a dynamic field, not to the textbook (Yudowsky, 2008). Without a doubt, the greatest danger of AI is that people conclude too early that they understand it. Monod (1973) Yudowsky (2008) concur on the view that many people think they understand and know far more about it than they do. At many times some of the companies and ministries are facing challenges using technology. This study is based on understanding the extent to which artificial intelligence is shaping public sector labour practices in Namibia. In addition to that, it also adds value to the body of knowledge. This is not because AI is hard per say. However, it is imperative to note that the field of AI has a reputation for making massive promises than it can deliver. In the end, our Intelligence is what makes us human, and AI is only here to augment it. The question is, to what extent?

Ethnobotanical knowledge of medicinal plants used to manage female Endogenous infections in the Sibbinda constituency, Zambezi Region, Namibia.

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Abstract

Many communities who are living in rural areas in Namibia and other parts of Africa rely on medicinal plants for their primary healthcare for the treatment of communicable diseases in their communities because lack of accessibility to health facilities which are either far or expensive. The reliance on medicinal plants is based on indigenous knowledge which is embedded in the local culture. This knowledge is very rich in Zambezi region but it is not well documented as it is shared orally by knowledge holders who are experts in this area, with their apprentices. However, current scientific data and ethnobotanical knowledge of medicinal plants is limited. In this study an ethnobotanical survey was conducted to identify and document indigenous medicinal plants used to treat endogenous infections in women of child-bearing age in the Sibbinda constituency, Zambezi Region. Snowball sampling was used to collect ethnobotanical information from five community members in different villages from the Sibbinda constituency who were willing to share their knowledge. A total of ten plant specimens identified by the knowledge holders, were taken to the National Herbarium of Namibia (WIND) for identification. Only three Medicinal plants plant species were scientifically identified, these were Pavetta zeyheri sond (Mulyatangobe/Muchokela), Abrus precucatorius (Musatisati), and *Baikiae plurijuga* (Mukusi). The plant parts mostly used were leaves and roots whilst the bark was the part that was used least. Leaves and roots of these medicinal plants are administered orally in tea or porridge while barks are used as a topical treatment. In conclusion, the study showed that medicinal plants are used as primary health care to treatment for endogenous infections in rural areas as these plants were identified and there is no documentation of this indigenous knowledge as all the information was orally relied. However, further studies are still needed to characterize the plants' chemical compounds, determine the minimum inhibitory concentration, biological activities, and toxicity.

ASSESSMENT OF AFLATOXIN LEVELS IN OPEN MARKET VENDED SPICES IN WINDHOEK

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Abstract

Aflatoxins are a group of mycotoxins produced by the fungus *Aspergillus* and are potent hepatotoxins and carcinogens in the liver. There have not been any studies on aflatoxin levels in spices in Namibia although there could be a possibility of correlation between the levels of aflatoxins in these condiments and liver related complications. Spices are used for various purposes which include their use for medicinal purposes. Thus safety of spices from toxic microbial contaminants is important. The study aimed to analyse aflatoxin content in various spices using ELISA analysis, to determine variation in aflatoxin levels in different condiments sourced from various vendors and to assess the compliance of condiments with international aflatoxin regulation. This study finding may provide evidence which can be fostered in management guidelines for aflatoxin levels in traditional condiments.

Aflatoxin levels were evaluated on 41 samples of different dried spices such as chillies, turmeric, spice for fish, and traditional garlic spice *(Elume Linyiko)* from Single quarters and Havana open markets collected in August 2021. Aflatoxin levels were determined by comparing with the standard concentrations of the ELISA (enzyme linked immunosorbent assay) test kit.

Total aflatoxins were detected in all samples, ranging from 0.48ng/mL to 9.40ng/ml. Although the highest concentration of 9.40ng/ml was recorded in a chilli sample purchased from Single quarters open market. Chilli samples from Havana open market had significantly higher levels of aflatoxins as compared to the samples collected from Single quarters market. Garlic and the traditional spice (*Elume linyika*) had the lowest concentration of aflatoxin of less than 0.5ng/ml. All samples had aflatoxin concentration above the limit of detection of 0.1ng/ml and below the regulatory limit of 10ng/ml. 13 samples (31.7%) had levels of aflatoxins above 4ng/ml and 6 (46.2%) of the samples were chilli. The other 53.8% were from different spices namely; Paprika, Worcester sauce, mixed herbs, beef spice, black pepper and spice for fish.

Aflatoxins were detected and quantified in all sampled spices, with chillies having the highest aflatoxin levels and *Elume linyika* having the lowest. Also, samples from Havana market had higher concentration of aflatoxin in the chillies compared to the samples from Single quarters market. Chronic consumption of spices may be a concern for long term effects of aflatoxin toxicity and health related complications.

Concentration and Mobility of Contaminants in a Hydrocarbon Impacted Site In the Niger Delta, Nigeria.

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Abstract

This study aimed to evaluate the the concentration and mobility of contaminants in soils and groundwater and establish contaminant sources, migration pathways and receptor linkages in the intertidal flats of Bodo area which has experienced several cycles of oil spills without clean up andremediation.1-D and 2-D electrical resistivity surveys were carried out to infer contaminant plumes and spread. Soil drilling to maximum of 10m was used to obtain soil and water samples to determine the subsurface stratification, hydrocarbon concentrations and to validate the electrical resistivity results. Analysis of two hundred and forty (240) soil and ninety nine (99) water samples for hydrocarbon fractions was achieved with Gas Chromatography-Mass Spectrometry (GC-MS).Electrical resistivity surveys achieved maximum depth of 45.0m and resistivity anomalies identified in topsoil, clay, coarse, gravelly sand layers and hydrocarbon plumes observed between 1.83m -15.87m depths. The soil recovered from the boreholes comprised of 92.2% sand 5.26% fines (silts/clays) and 2.36% gravel with permeability values of $7.26x10^{-4}$ cm/sec to 1.35 $x10^{-3}$ cm/sec. Ninety six (96) of the samples showed values above the regulatory thresholds of 5,000mg/kg, 40mg/kg and 1mg/kg for various hydrocarbon fractions in soil. Forty eight (48) water samples recorded hydrocarbon contaminant concentrations above the regulatory Intervention limit. The resistivity and laboratory results corroborate the depth of contaminant infiltration at10.0m.Conceptual site model show significant risk exposures by the complete source-pathway-receptor linkages with groundwater flow velocity of 3.7 $x10^{-4}$m/day. Contaminant trends and spill volumes decrease with depth and a decline in spill volumes over the past decade. Contaminant concentrations. This data will be very useful the design and implementation of mitigation measures in the environmental remediation and restoration of the impacted environment.

Assessing the prospect of grain and fodder crops cultivation under irrigation–fed farming in Kunene Region, Namibia

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Abstract

Subsistence food and fodder crops production under rain – fed farming predominates in the Kunene Region of Namibia. However, grain and fodder productions under rain–fed farming in the Kunene Region are negatively affected by the persistent adverse drought condition and have always produced very low crop yields. Consequently, the local farmers now face serious food insecurity, prompting the need for alternative methods of crop production such as irrigation–fed farming in the area. Thus, this experimental study assesses the prospect of growing grain and fodder crops using perennial water irrigation cropping method in the Kunene Region. The field experiment was conducted for two consecutive cropping seasons (2017/2018 and 2018/2019) at two different locations: Otuzemba and Swartbooisdrift. The following selected grain and fodder crops: maize, sorghum, lucerne, cowpea, rice (varieties: IRGA 418 and SUPA), pearl millet (varieties: kangara and okashana) were assessed for their performances in specific agronomic parameters namely, germination rate, crop establishment, plant height, biomass yield, and grain yields. The results obtained showed the crops' germination rate varied from 51% to 94%, crop establishment ranged from 46% to 93%, and number of days to maturity varied between 75 to 120 days. The crops attained mean grain yield of 1.8 – 3.3 tons/ha and biomass yield of 2.4 – 7.6 tons/ha. While lucerne and the two rice varieties (IRGA 418 and SUPA) performed very high and moderately on germination rate with 81% and 51% respectively, they failed to reach maturity and wilted at crop establishment growth stage in both cropping seasons. However, the other crops performance results generally suggest positive prospect for their cultivations as grain and fodder crops under irrigation–fed farming in the study area.

Keywords: Grain and fodder crops, production, drought, irrigation, Kunene Region

Effect of veld fire intensity on tree species diversity, abundance and recruitment in Mudumu National Park

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Abstract

With the increasing effects of climate change resulting in very hot and dry weather conditions, veld fires have become common and some are frequently occurring over the same areas with the same or different intensities. Veld fires are large and destructive fires that spread quickly over bushes or forests. These fires have huge impacts on wild flora and fauna affecting their diversity, abundance and recruitment. Protected areas in Namibia are prone to veld fires. Remote sensing is used to capture these events through Fire Information for Resource Management System (FIRMS). In this study we assessed the effect of veld fire intensity on tree species diversity, abundance and recruitment in Mudumu National Park. Specific objectives were to (1) To map veld fire intensity in Mudumu National Park, (2) To assess the effect of veld fire intensity on tree species diversity, (3) To assess the effect of veld fire intensity on tree species abundance and (4) To assess the effect of veld fire intensity on tree species recruitment. Fire data was downloaded from FIRMS and loaded into ArcGIS. Kinging interpolation was used to map fire intensity hotspot using fire brightness temperature and fire radiative power as attributes of fire intensity (FBT and FRP). Twenty two (22) line transects (near or far from the Kwando River) were used to sample vegetation. Along each transect four sites were systematically selected 1.3 km apart. At each site 4 plots (20m × 20m) were sampled. The results show that there was an association between fire intensity and plant species diversity as well as abundance. Fire intensity reduced diversity, abundance and recruitment when high and near Kwando River, but there were no association far away from the river ($P < 0.05$ for both diversity and abundance). Saplings that were near the river were most abundant than saplings far from the river. Both shrubs and trees were abundant in low fire intensity areas both close and far from the river (61.4% and 67.2%, respectively). Big trees were most abundant in areas with low fire intensity close to the river (73.3%). Generally, the results show that as one move away from the river there was not much effects caused by fire. This might be attributed to high intensity (hotspots) of fire far away from the river, leading to homogeneous patches.

Assessment of different feed types on the growth performance of *Oreochromis andersonii* in a controlled environment at the ministry of fisheries and marine resources, Zambezi Region, Namibia

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Abstract

Inland fisheries in Africa are very important in creating jobs and providing protein rich food for the locals. The importance of inland fisheries as a source of animal protein is evident from a number of countries in Southern Africa, fish provides more than 40% of the animal protein consumed by the population, and in almost half of the countries in Africa fish contributes at least 25%. The inland aquaculture is promoted by the Namibian Government; the initial promotion of freshwater aquaculture was mainly to enhance food security by facilitating the provision of fingerling production to farmers and rural communities for fish farming, but this approach is shifting towards encouraging economic activity in freshwater aquafarming. Though there are economic benefits, local farmers are failing to grow fish due to the cost of feeds. The biggest problem faced by aquaculture farmers is the cost of the feeds. In intensive aquaculture the feed accounts for 60-80 percent of operational costs. Feed comprises the biggest cost in intensive fish farming and the quality of feed is therefore important. A vast body of research has been carried out in order to investigate nutritional quality of alternative and cheaper ingredients. The aim of this study was to examine the effect of different feed types on the growth performance of *Oreochromis andersonii* in order to ascertain a cheaper alternative for the commercial fish pellets. Three (3) feed types were used, which were namely commercial fish pellets, chicken feed and pig feed. A three (3) by three (3) study design was used (Three treatment by three replicas) where nine (9) circular tanks were used in a fish nursery. 270 fish from the same cohort were randomly selected and the water was well aerated and oxygen saturation above 60%. Temperature was maintained at an average of maintained at 27±1°C throughout the experiment. Mean weight by sampling days showed that the chicken feed (15.14g) outperformed the commercial fish pellets (12.49g) and the pig feed (10.85g), however there was no significant difference in mean weight ($p.>0.05$). It was further investigated using the length and it is clearly evident that *O. andersonii* fed with chicken feed grows faster than those fed with commercial pellets and pig feed. The mortalities in of fingerlings fed with chicken feed were consider

Assessment of human wildlife conflict incidences in Torra Conservancy from 2018 to 2020 in the Kunene Region, Namibia

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Abstract

Human-wildlife interactions are on the rise driven by, among other factors, growth of human and wildlife population and frequent drought. A consequence of these increments is the likely increase in conflict (HWC). This study was set to assess patterns in HWC incidents from 2018 to 2020 in Torra Conservancy, Kunene Region of Namibia. The study's specific objectives were to determine fluctuations in species-specific damages, determine the level of fluctuations, if any, in specific damages, and compare the monthly frequency of incidents among different guilds. Leopard (15%), cheetah (3%), jackal (15%), caracal (0.3%), hyena (13%) and baboon (0.6%) were identified as proprietors of HWC, with elephants (34%) and lions (17%) being the biggest problem causing animals. The damage class with the highest incidents were livestock predation (442 incidents, approximately N$ 353,600), followed by crop-raiding (82 incidents), destruction of infrastructure (2 incidents) and human attacks (1 incident). Large carnivores and elephants have a random pattern to incidents. The months of July and August have the most incidents (20) in the conservancy. HWC incidents seem to be a continuous challenge to Torra conservancy. This may be due to a lack of effective and efficient, area-specific mitigation schemes. Furthermore, the incidents may be influenced by the interaction among socio-ecological and climate factors with wildlife behaviour. This study can be used to develop an area-specific human-wildlife management strategy for Torra Conservancy. Mitigation schemes can be targeted at the major problem causing species. The study can be a reference point towards a harmonious coexistence between humans and wildlife.

Diet of Southern Carmine Bee-eaters (*Merops nubicoides*)

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Abstract

The lack of knowledge of the migratory Southern Carmine Bee-eaters (*Merops nubicoides*) has generated increased interest in research on how to monitor, manage and conserve them. The diet of the Southern Carmine bee-eater was studied in order to understand their feeding ecology throughout the breeding season at Sikunga Conservancy. Data was collected twice a month for four (4) months from September-December 2020, on nests constructed on the flat ground at Sikunga Conservancy.

Identification of insect orders using mouthparts was done to order level and was based on visible mouthparts which were directly compared and identified using a Guide for Identification of food items in droppings and regurgitated samples of birds. For examination, samples were places under a microscope for magnification of samples. A total of 643 insect mouthparts were collected, 307 in the dry season and 336 in the wet season. Insect mouthparts were extracted by washing the feaces and isolating the exoskeletons and mouthparts from other prey remains.

A total of seven (7) orders were recorded in the dry season and five (5) insect orders were recorded in the wet season. Insects in the order Hymenoptera were the most occurring insect order in the diet of the Southern Carne Bee-eaters in both seasons with (32.57%) in the wet season and (41.37%) in the dry season followed by Neuroptera with (10.42%) in the dry season and (35.60%) in the wet season. However, there was a decrease in other insect orders such as Coleoptera (7.49%) in the dry season and (4.76%) in the wet season and Odonata deceased with (10.09%) in the dry season and (3.87%) in the wet season. Orders such as Diptera (7.17%), Homoptera (6.51%) and Spirobolida (o.33%) were recorded/observed in the dry season but were absent in the wet season. There was a significant difference between insect orders in the dry and wet season which could be associated to the seasonal vegetation changes which may lead to some insects being scarce or abundant. Results in this study point to the importance of basic field studies to understand the needs of a species as well as the community that supports the species. Therefore, efforts by the conservancy and the Ministry of Environment, Forestry and Tourism to employ advanced protection of the breeding sites and the prevention of human intervention during breeding.

Functional diversity of large mammal herbivores in Mudumu National Park, Zambezi Region, Namibia

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Abstract

Functional diversity is a component of biodiversity that generally includes the range of things that organisms do in communities and ecosystems, as a result, it can explain and predict the impact of organisms on ecosystems. This study looks at functional diversity of large mammal herbivores in Mudumu National Park by determining large mammal herbivore species contribution to total large mammal herbivore biomass; dominant species' functional similarities; and whether increasing distance from Kwando River has an effect on functional diversity. Twenty two (22) road transects laid across the entirety of the national park were selected and surveyed using the line transect distance sampling method. A total of seventeen large mammal herbivore species were recorded in the park over. The Renyi index of diversity and the Morisita index of overlap were used to compare diversity between different areas in the park and to measure the similarity between those areas. We was found that only a small number of "dominant" species contributed more in terms of numbers and biomass of large mammal herbivores. Dominant species were in general, functionally distinct and when functional diversity changed along the river inland gradient, some minor species took over from dominant species that lost their dominance.

Diet assessment of the African Wild Dog population in the Greater Waterberg Landscape Conservation Area, Northern Central Namibia

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Abstract

African wild dogs are one of many species classified as endangered by IUCN. The population's decline has been attributed to human activities which led to habitat fragmentation forcing them to prey on livestock. This resulted in farmers killing wild dogs. The population in the GW-LCA is at high risk and is being persecuted for livestock predation. The aim of this study was to determine the diet composition and preference of an African wild dog population in the GW-LCA. We used the cuticle hair patterns of hair sample to identify prey species of this population. Frequency of occurrence and Percentage of Occurrence were used to determine preference. Findings suggested that they feed on 7 species, preferred species were adult kudu and duiker. There were differences amongst readers but generally, the same conclusion was drawn using a concordance test.

Piscivorous waterbirds community composition and diversity in Freshwater Tributaries of Zambezi River, Namibia

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Abstract

Piscivorous waterbirds have been reported to enhance wetlands diversities, control pests, bio-indicators of ecological conditions, and act as indicators of potential disease outbreaks. They also provide important ecosystem services to indigenous communities residing along wetlands. Regardless of their importance, global waterbird populations are declining. Despite their ecological contribution to wetlands functions and ecosystem services, piscivore waterbirds have been reported to compete with piscivorous fish and fishermen. The aim of this study was to compare piscivorous waterbirds species and functional diversity at fish protected areas (FPA) and non-fish protected area (NFPA) in two tributaries of Zambezi River in Namibia. We also measured the degree to which patterns of guild structure between piscivore waterbirds and fish were similar between FPA and non-FPA. Species diversities were determined by calculating the Shannon Diversity Index and Renyi diversity profiles. We calculated both community-based and trait based functional diversity indices to determine functional diversity of the two sites. To determine the degree of concordance between piscivore waterbirds and fishes we calculated the Kendell coefficient of concordance. Generally, species diversities were not significantly different between FPA and NFPA ($P > 0.05$). However, all functional diversities indices calculated were significantly different between FPA an NFPA ($P < 0.05$ for all comparisons). This was partly due to some traits that were associated with each site. The Kendell coefficient of concordance was very low (0.084) suggesting that the degree of concordance between piscivore waterbirds and fishes guild structure was not positively correlated.

"Thoughts become Things" – John Kehoe