NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY

Faculty of Health, Natural Resources and Applied Sciences

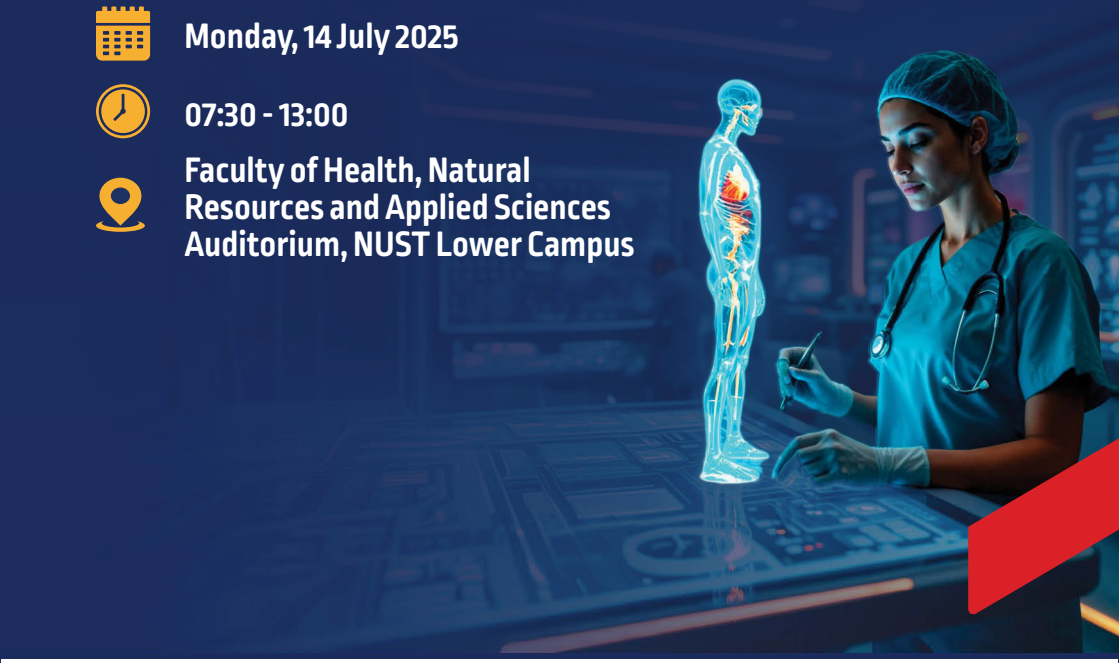
Research Day 2025 Programme

Theme: A Decade of Eminence: Celebrating Education, Science and Technology for Development

Monday, 14 July 2025

07:30 - 13:00

Faculty of Health, Natural Resources and Applied Sciences Auditorium, NUST Lower Campus



ONGAVA
RESEARCH CENTRE

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Summary of Academic and Research Activities

The Faculty of Health, Natural Resources and Applied Sciences at NUST provides a substantial contribution to national development through its diverse academic programmes, applied scientific research, and community-focused innovations. Over the past decade, the Faculty has significantly strengthened its multidisciplinary approach in teaching and research, contributing to both regional knowledge generation and global scientific discourse.

Academic Programmes

The Faculty offers a comprehensive suite of academic programmes designed to address Namibia's developmental priorities and global scientific trends. Structured across three schools; Health Sciences, Natural and Applied Sciences, and Agriculture and Natural Resource Sciences. Furthermore, the Faculty provides a diverse range of qualifications from undergraduate to doctoral levels.

In the School of Health Sciences, the Department of Clinical Health Sciences offers programmes such as the Bachelor of Medical Laboratory Science and the Bachelor of Emergency Medical Care, which are designed to equip students with the necessary skills for clinical diagnostics and emergency response. The Department of Preventative Health Sciences provides degrees like the Bachelor of Environmental Health Sciences and the Bachelor of Science in Health Information Systems Management, focusing on public health and the integration of information systems in healthcare. Additionally, the Bachelor of Human Nutrition programme addresses the critical area of dietary health and nutrition science.

The School of Natural and Applied Sciences encompasses the Department of Mathematics, Statistics and Actuarial Science, offering the Bachelor of Science in Applied Mathematics and Statistics, which provides students with a good foundation in the fundamental concepts, theories and frameworks of applied mathematics and statistics that will enable the graduates of the programme to communicate and present scientific data and solutions on a wide range of identified mathematical and statistical problems.

The Department of Biology, Chemistry and Physics provides a foundational Bachelor of Science degree with specialisations in Biology, Chemistry and Physics, fostering a strong scientific base for further study or professional application. Within the School of Agriculture and Natural Resource Sciences, the Department of Agricultural Sciences and Agribusiness offers programmes such as the Bachelor of Science in Agriculture and the Bachelor of Science in Horticulture, focusing on crop production, agribusiness management, and sustainable farming practices. The Department of Natural Resource Sciences provides the Bachelor of Natural Resource Management degree, aimed at equipping students with the skills to manage and conserve natural ecosystems effectively.

The faculty also offers honours degrees including the Bachelor of Emergency Medical Care Honours, Bachelor of Science Honours in Applied Mathematics, Bachelor of Science Honours in Applied Statistics, Bachelor of Science Honours (Chemistry, Biology or Physics) and Bachelor of Science in Agriculture Honours. At postgraduate level, the Faculty also provides specialised master's and PhD programmes in fields such as Health Sciences, Applied Mathematics, Applied Statistics, Natural and Applied Sciences, and Natural Resource Management, supporting the development of high-level competencies and research capabilities.

Through its diverse academic offerings, the Faculty plays a pivotal role in developing skilled professionals and researchers who contribute to the health, environmental sustainability, and economic development of Namibia and the broader region.

Key Research and Thematic Focus Areas

The Faculty stands at the forefront of applied, interdisciplinary research. Guided by Namibia's development priorities and global scientific imperatives, the Faculty's research is organised into key thematic areas that ensure both academic rigour and societal impact. In recent years, the Faculty has produced a steady output of peer-reviewed articles, books, chapters, and conference proceedings, supported by competitive national and international grants.

1. Environmental and Human Health

This thematic area represents a convergence of ecological sustainability and public health priorities. Research focuses on environmental risk assessment, including natural radioactivity in soils, pollution exposure, and toxicological studies relevant to agriculture and settlement planning. In parallel, health-oriented studies address water quality, waste management, and the surveillance of microbial pathogens in both urban and rural environments. The Faculty has also engaged in studies linking environmental factors to disease burden, particularly in vulnerable communities. These outputs support evidence-based policy on health and the environment, directly informing the Sustainable Development Goals.

2. Health Systems, Diagnostics, and Informatics

The Faculty has made significant contributions to health diagnostics, disease epidemiology, and clinical research. Research in this area encompasses the development of molecular diagnostic tools for tuberculosis and antimicrobial resistance surveillance, clinical trials on oxidative stress and metabolic disorders, as well as assessments of health informatics systems. Furthermore, academic staff have contributed to the development of clinical practice guidelines and evidence-based emergency medical protocols. In line with the digital transformation of healthcare, some studies also evaluate eHealth technologies and data systems aimed at improving health service delivery in Namibia.

3. Indigenous Knowledge and Biotechnology

Recognising the wealth of indigenous biodiversity and traditional medicinal knowledge, the Faculty has promoted bio-prospecting and genomics research focused on Namibian flora. Investigations into the medicinal properties of local plants, food crop domestication, and microbial symbiosis in legume agriculture reflect a strong biotechnology research agenda. Studies have examined the biochemical, genetic, and ecological basis of plant-microbe interactions, contributing to improved crop resilience and soil health. Research into genetically modified foods and biosafety also falls within this thematic area, supporting informed public policy and food security.

4. Aquatic and Coastal Ecosystem Studies

Aquatic and marine research has emerged as a critical pillar, especially in light of Namibia's growing blue economy agenda. Studies have focused on the biodiversity of coastal ecosystems, marine microbial ecology, nutrient dynamics in estuarine systems, and aquatic pollution monitoring. Researchers within the Faculty use biological and chemical indicators to assess ecosystem health, with applications in fisheries management, conservation, and aquaculture development. These outputs are essential for the sustainable use of Namibia's aquatic resources and inform national marine policy.

5. Natural Resource Management and Climate Resilience

This thematic area supports Namibia's broader environmental management goals, including sustainable land use, water conservation, and climate adaptation strategies. Research includes studies on arid agriculture, integrated water resource management (IWRM), and conservation of biodiversity in terrestrial habitats. Applied research outputs support farmer decision-making, land restoration, and drought mitigation efforts. These contributions enhance community resilience to climate change while promoting environmental stewardship.

6. Sustainable Energy and Green Technologies

The Faculty is also actively engaged in renewable energy and environmental chemistry research. Solar energy utilisation, photocatalysis for water purification, and sustainable chemical production using locally available biomass are key focus areas. Innovations such as plant-based filtration systems and solar-powered environmental sensors demonstrate the Faculty's commitment to sustainable technologies. Publications in this domain have highlighted low-cost, scalable solutions suited to the Namibian and broader Southern African context.

7. Statistical and Mathematical Modelling

This thematic area focuses on the development of advanced analytical theoretical frameworks in mathematics and statistics. Key focus areas include spatial and spatiotemporal modelling, which address dependencies across space and time by incorporating spatial correlation and data heterogeneity; survival modelling, focusing on the development and applications of methods for modelling time-to-event data; and Bayesian statistics, which enhance predictive modelling and inference under uncertainty through probabilistic frameworks.

Computational mathematics and statistics, operations research, optimisation and financial mathematics, as well as queuing theory, are also key focus areas. Research in this area supports interdisciplinary applications across various fields, including health sciences, engineering, environmental studies, and economics, contributing to the modelling and solving of problems that face the public and private sectors in Namibia and the world at large.

Through these thematic research clusters, the Faculty not only advances academic inquiry but also contributes solutions to some of Namibia's most urgent socio-economic and environmental challenges. The Faculty remains committed to expanding its research portfolio, strengthening postgraduate supervision, and enhancing its contributions to national and international development agendas.

Infrastructure and Collaborations

The Faculty supports its research agenda through state-of-the-art laboratories, data analysis tools, and access to diagnostic platforms. It maintains active partnerships with local, regional, and international institutions, enabling research mobility, joint projects, and knowledge transfer. Capacity building for postgraduate researchers is a central goal.

Community Engagement and Societal Impact

The Faculty is deeply involved in translating research into community-based interventions. Examples include improving water and food security through the adoption of technology, offering public education on health and environmental safety, and engaging in participatory science with schools and rural communities. These activities directly support Namibia's development goals and the UN Sustainable Development Goals (SDGs).

Strategic Outlook

The Faculty of Health, Natural Resources and Applied Sciences will continue to lead in education, applied science, and innovation. Future efforts will emphasise interdisciplinary collaboration in biotechnology, environmental resilience, clinical research, and aquatic systems management, ensuring that academic outputs are relevant, responsive, and globally competitive.

Programme

Time	Activities/Topics	Presenter
Director of Ceremonies: **Prof Percy Chimwamurombe**, *Department of Biology, Chemistry and Physics*		
08:00	Arrival and Registration	**Ms Muriel Mouton** *Secretary: Executive Dean: Faculty of Health, Natural Resources and Applied Science (FHNRAS)*
08:30	Welcome Remarks	**Dr Onesmus Shuungula** *Executive Dean: FHNRAS*
08:35	Opening Statement	**Dr Anna Matros-Goreses** *Executive Director: Directorate of Research, Innovation and Partnerships (DRIP)*
08:50	Remarks	**Prof Erold Naomab** *Vice-Chancellor*
09:00	Keynote Address	**Prof Anicia Peters** *Chief Executive Officer, National Commission on Research, Science and Technology (NCRST)*
09:20	Tea Break / Group Photos	
Faculty Presentation Chairperson/Rapporteur: **Prof Sunday Reju**, *Department of Mathematics, Statistics and Actuarial Science*		
10:00	Guest Speaker	**Dr Hilma Nangombe** *Deputy Director: Directorate of Health Information and Research, Ministry of Health and Social Services*
10:20	IRPC Funding Videos	**Recipients of IRPC Funds**
10:30	Making Space: An Introduction to Ongava Research Centre	**Dr Frowin Becker** *Researcher: Ongava Research Centre*

10:50	Data Rich, Research Poor: Operational Research Mobilisation for Evidence-Based Intervention	**Taime Sylvester* and Iyaloo Konstantinus**
11:05	Spatial Modelling and Mapping of Crime Data in Namibia	**Mutaleninohenda Shivute*, Dibaba Bayisa Gemechu and Dismas Ntirampeba**
11:20	Qualitative and Quantitative Estimations of Potassium Solubilized by Two Potassium-Solubilizing Rhizobacteria Isolated from Maize Rhizosphere	**Uchenna Nwokeh*, Soretire, A. A., Babalola, O. A. and Akintokun, A. K**
11:35	Optimization of Biomass-Derived Activated Charcoal Supporting Titanium Oxide Nanoparticles as Potential Photocatalyst	**Justine Auene*, V Uahengo, Habauka Kwaambwa, T Plessing and A Gradel**
11:50	Characterisation of Factors Controlling the Speciation of Zinc, Cadmium and Lead in an Environmental Compartment Impacted by Mining Activities	**Festus Shafodino1*, Marius K. Mutorwa1 & Julien M. Lusilao**
12:05	Exhibitions and Posters' Presentation	**Mathematics Tutorial Centre**
12:35	Judges Remarks: Best 1st, 2nd, 3rd Poster Presentation and Token of Appreciation to all Presenters	**Dr Onesmus Shuungula** **Prof Habauka Kwaambwa**
12:55	Closing Remarks	**Prof Edosa Omoregie** *Chairperson: 2025 FHNRAS Research Day Planning Committee*
13:00	Lunch	

About the Keynote Speaker

Prof Dr Anicia Peters is the CEO of the National Commission of Research, Science and Technology (NCRST) and the Co-Chair of the 4IR Working Group of the Africa Union's Africa Scientific, Research and Innovation Council (ASRIC). She also serves on the Association of Computing Machinery (ACM) 4.0/4.1 Presidential Task Force on Regional Offices and is the founder of the successful Africa Human Computer Interaction Conference series (AfriCHI). She serves internationally also on the E.V.E. AI Network Advisory Committee. She was also the Chairperson of the Namibia Presidential Task Force on the Fourth Industrial Revolution (2021-2022) established by the late President Dr Hage Geingob of Namibia. In 2021, she served on Namibia's inaugural green hydrogen technical committee under the Office of the President in Namibia in 2021-2022.

Prof Peters previously held the position of Pro-Vice Chancellor for Research, Innovation and Development at the University of Namibia up to 2023 where she had co-established the Namibia Green Hydrogen Research Institute at UNAM. Prior to that, she served as a Faculty Dean for Computing and Informatics at the Namibia University of Science and Technology where she co-established the Namibia-India Center of Excellence in Information Technology. She co-authored the National e-Health Strategy under WHO and the National e-Government Procurement Strategy under World Bank.

Her PhD and MSc in Human Computer Interaction (HCI) were completed at Iowa State University, while her two undergraduate degrees are from the Namibia University of Science and Technology. She also completed a Post-Doc at Oregon State University and worked in Silicon Valley in the United States.

She has over 30 years of academic, industry, managerial and directorship experience in Namibia and internationally which includes developing large scale government systems in Namibia, industry experience in Silicon Valley and Namibia, and several years in academia with visiting professorships in different countries.

She is passionate about Human Computer Interaction as well as human-centered and responsible Artificial Intelligence and received multiple awards and accolades for her work and research in various countries which includes among others Boeing, Google, awards India and Poland, several awards from different African institutions, a Namibia Business Hall of Fame Award and a 2025 Special Recognition Award from ACM SIGCHI.

Biographies and Abstracts

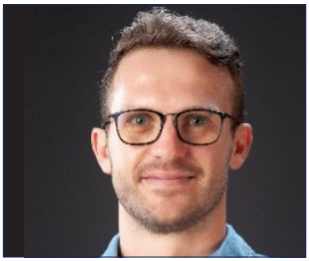
8 Cancer Genomics and Antimicrobial Resistance focusing on the genetic and molecular drivers of cancer and the emergence of antimicrobial resistance in clinical settings, using high-throughput sequencing, bioinformatics, and translational approaches to identify biomarkers, therapeutic targets, and enhance antimicrobial resistance surveillance using whole-genome sequencing.

Hilma Nangombe holds a. PhD in Public Health, Master of Public Health, Master of Development Studies, SMDP and GIS certificates. She is a Deputy Director and currently heading the Research Ethics and Coordination Division in the Directorate of Health Information and Research in Ministry of Health and Social Services.

She is experienced and proficient in health research bioethics, ethics, proposal appraisal, focusing mainly in ensuring ethically and technically sound research project and clinical trial implementation in the country. Currently, Hilma is the EDCPT country representative. She served as a Commissioner on the National Research Science and Technology Commission (NCRST. She served as a member of the National Research Ethics Committee (NREC) on the National Research, Science and Technology Commission (NCRST), a Member of the National Emergency Management Committee, and a Chair of the National Bioethics Technical Working Group. She also served as the National Incident Manager for Covid 19 spearheading the country's response to the outbreak as well as a National Malaria Incident Manager. In her career in the ethics and bioethics sphere she had undergone several international good clinical practice trainings at different levels. Hilma mentored and supervised research projects of national and international students at different levels i.e. Honours, Masters and PhD

Making Space: An Introduction to Ongava Research Centre

Dr Frowin Becker
Researcher, Ongava Research Centre



Dr Frowin Becker is a researcher at the Ongava Research Centre and the editor of the Namibian Journal of Environment. While he is a conservation scientist by training, he has developed a strong penchant for interdisciplinarity. Over the years, his research foci have diversified and now range from functional ecology and land-use to political ecology and quantitative geography.

Frowin has participated in ecological research across southern Africa, but now largely focuses on the multidimensionality of conservation on private farmland in Namibia.

Data Rich, Research Poor: Operational Research Mobilization for Evidence-Based Intervention

Taime Sylvester[1] and Iyaloo Konstantinus[2]
[1]Department of Clinical Health Sciences, Namibia University of Science and Technology.
[2]Namibia Institute of Pathology

Dr Taime Sylvester is a Senior Lecturer in the Department of Health Sciences at the Namibia University of Science and Technology (NUST), where she teaches Anatomy and Physiology and Research Methods in the Biomedical Sciences program. A molecular biologist and biomedical scientist with over a decade of experience, her expertise spans operational research, immunology, infectious disease genomics, and health systems strengthening.

Dr Sylvester also chairs TB Free Namibia, a civil society organization committed to patient advocacy and equitable access to care, and is part of the Women in AI Namibia inaugural committee. Her research is driven by a commitment to transforming routine health data into actionable insights and to strengthening Namibia's research ecosystem for evidence-informed decision-making.

Abstract

This study aims to investigate the disparity between the abundance of operational research conducted in healthcare and the relatively low publication rate and capacity enhancement in Namibia. The research also seeks to address the significant issue of inadequate mentorship of local Namibians into leadership positions that could drive the country's research agenda and healthcare improvements. A mixed-methods approach is being employed, including a systematic review of existing literature on operational research outputs and mentorship programs in developing countries. Data is being collected through interviews with healthcare professionals, academic researchers, and policy-makers in Namibia. Comparative analysis will be performed with countries that have successfully enhanced their research capacity and publication rates, such as Rwanda and Kenya. Preliminary findings suggest a significant gap between the operational research conducted and the published outputs in Namibia. Initial data indicates that despite numerous health-related studies and data collection initiatives, the translation into published research and policy impact remains minimal. The ongoing analysis points to the lack of structured mentorship programs for local researchers as a key barrier. Comparative data from countries like Rwanda show that investment in mentorship and capacity-building programs correlates with higher publication rates and more robust research outputs.

Although the study is still in progress, early indications suggest that for Namibia to harness the full potential of its operational research and move towards evidence-based interventions, there is a critical need to invest in mentorship programs that empower local researchers. Establishing a culture of mentorship and capacity-building is anticipated to lead to increased publication rates and the development of a sustainable research agenda driven by local experts. The final results will aim to provide detailed recommendations on enhancing research capacity and setting a robust health research agenda for Namibia.

Spatial Modelling and Mapping of Crime Data in Namibia

Mutaleninohenda Vistorina Shivute, Dibaba Bayisa Gemechu and Dismas Ntirampeba
Department of Mathematics and Statistics, Faculty of Health and Applied Science, Namibia University of Science and Technology, Windhoek, Namibia

Ms Mutaleninohenda V Shivute is a Senior Statistician at the Namibian Correctional Service (NCS), where she works on turning complex data into practical insights for improving institutional planning and operations. She holds a Master's degree in Applied Statistics from the Namibia University of Science and Technology (NUST) and an Honours degree in Applied Statistics from the University of Namibia (UNAM).

Her postgraduate research focused on mapping and modelling crime patterns across Namibia using spatial and statistical techniques. At NCS, Mutaleninohenda helps analyse sentenced crime trends, track inmate population dynamics, and support rehabilitation and reintegration efforts through data. Her work contributes to strategic planning, resource allocation, and program evaluation within correctional facilities. She is passionate about using data to support decisions that improve justice systems and public services.

Abstract

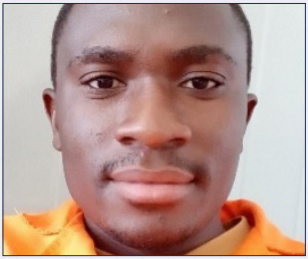
Crime in Namibia shows notable spatial heterogeneity, with variation in both committed and convicted cases across regions/constituencies and over time. Between 2019 and 2021, a total of 90,868 crimes were reported, alongside 2,127 convictions, prompting a spatial analytical investigation into the underlying demographic and socio-economic risk factors. While national efforts to improve policing and rehabilitation have been ongoing, crime remains a persistent challenge especially in regions such as Khomas, Otjozondjupa, Oshana, Erongo, and Omusati.

The main objective of this study was to model the spatial patterns of committed and convicted crimes in Namibia and identify their socio-economic correlates. Crime data were obtained from the Namibian Police Force and the Namibian Correctional Service, while demographic and socio-economic indicators were sourced from the Namibia Statistics Agency.

Variables such as unemployment, literacy, orphan hood, and female-headed households were considered across Namibia's constituencies. To account for overdispersion and spatial heterogeneity, both non-spatial and spatial models were employed. Generalized Linear Models (Poisson and Negative Binomial) were used initially, followed by Geographically Weighted Poisson Regression (GWPR) and Geographically Weighted Negative Binomial Regression (GWNBR).

GWNBR provided the best model fit, capturing local variations in crime determinants. Furthermore, the Besag-York-Mollié (BYM) model was used to examine spatial random effects and clustering. Spatial autocorrelation was assessed using Global and Local Moran's I, while Getis-Ord Gi* statistic identified significant hotspots. Results indicated a high spatial concentration of committed crimes in urban and economically strained areas. Higher crime rates were strongly associated with unemployment, orphan hood, and literacy, suggesting that areas with increased educational access may also see higher crime reporting. In contrast, female-headed households were linked with lower crime levels. Conviction patterns showed less intense clustering but were similarly associated with unemployment and age group distribution, especially in constituencies with a higher proportion of young adults. Despite limitations related to data completeness and aggregation bias, this study provides critical insight into the geography of crime in Namibia. It offers a foundation for spatially targeted interventions, resource allocation, and informed criminal justice policy that responds to localized socio-economic realities.

Keywords: Spatial Analysis; Crime Mapping; Geographically Weighted Regression; Socio-economic Determinants; Negative Binomial Regression.



Mr Festus Shafodino is competent chemist with a commendable research acumen and key transferable skills that are necessary to impart knowledge. He holds a Master of Science in Natural and Applied Sciences (Applied Chemistry) from the Namibia University of Science and Technology (NUST).

As an active research scholar, he has authored or co-authored six research articles and has co-supervised fascinating applied research projects at honours level (i.e. based on phytochemical analysis, garden or field soils testing, assessment of the quality of borehole water, adsorption studies and heavy metal pollution). His dedication to the practical application of scientific knowledge is driven by a passion for addressing local challenges while contributing to the global scientific discourse. His primary research interests lie in the field of Environmental Analytical Chemistry. His recent research has focused on heavy metal pollution particularly in mining-impacted areas, characterisation of heavy metal speciation and ecological risk assessments.

Optimisation of Biomass-Derived Activated Charcoal Supporting Titanium Dioxide Nanoparticles as Potential Photocatalyst.

JN Auene[1,2]*, V Uahengo[1], HM Kwaambwa[2], T Plessing[3], A Gradel[3]

[1]Dept of Physics, Chemistry and Materials Science, University of Namibia, Namibia
[2]Dept of Biology, Chemistry and Physics, Namibia University of Science and Technology
[3]Institut für Wasserstoff-und Energietechnik der Hochschule HOF

Ms Justine Auene is a dedicated and accomplished chemist with a strong academic foundation, holding two cum laude degrees in Applied Chemistry, and recently completing a Master of Science at the University of Namibia. Her professional background spans academia and applied research, with roles including Laboratory Technician at the Namibia University of Science and Technology and Guest Scientist at Hochschule Hof in Germany.

Proficient in advanced analytical instrumentation such as ICP-OES, FT-IR, HPLC, and BET, Justine is committed to precision, innovation and continuous learning. Known for her attention to detail, strong interpersonal skills and well-developed communication skills, she has presented her work at international conferences on sustainable chemistry and energy. Beyond her academic and professional pursuits, Justine enjoys exploring the world through traveling and capturing moments in photography. Justine's dynamic blend of technical expertise and creative interests defines her as a well-rounded and forward-thinking professional.

Abstract

Titanium dioxide (TiO2) is a widely recognised photocatalyst. However, the photocatalytic performance of TiO2 is constrained by its low surface area, wide band gap, and high electron-hole pair recombination rates. TiO2 was synthesised using the precipitation process. Bush biomass samples were collected using selective sampling. Activated charcoal was synthesised using both chemical and physical activation techniques. The as-prepared activated charcoal samples were impregnated with TiO2 NPs using the wet impregnation method. This study aimed to optimise the effectiveness of biomass-derived activated charcoal supporting TiO2 NPs as a potential photocatalyst for the production of green hydrogen. The objective was to address the limitations of TiO2, particularly its low photocatalytic efficiency caused by a wide band gap, low surface area and high electron-hole recombination rates. By incorporating TiO2 NPs onto activated charcoal synthesized from the biomass of the invasive Senegalia mellifera bush, this research pursued a sustainable and efficient solution to enhance TiO2's photocatalytic activity.

Qualitative and Quantitative Estimations of Potassium Solubilised by Two Potassium - Solubilising Rhizobacteria Isolated from Maize Rhizosphere.

[1]Nwokeh, U. J., [2]Soretire, A. A., [2]Babalola, O. A. and [3]Akintokun, A. K

[1]Department of Soil Science and Land Resources Management, Michael Okpara University of Agriculture, Umudike, Abia State.

[2]Department of Soil Science and Land Management, Federal University of Agriculture, Abeokuta, Ogun State.

[3]Department of Microbiology, Federal University of Agriculture, Abeokuta, Ogun State.

Mr Uchenna J Nwokeh is a PhD student in the Department of Soil Science and Land Management at the Federal University of Agriculture, Abeokuta in Ogun State, Nigeria and has completed his research activities in Soil Microbiology and Biochemistry. He is a lecturer at the Michael Okpara University of Agriculture, Umudike, Abia State, Nigeria. He has made significant contributions in the field of Soil Science.

Currently, he was sponsored by the International Centre of Genetic Engineering and Biotechnology to develop biofertilizers from bacterial origin to enhance crop yield at the Namibia University of Science and Technology. He has authored several scientific publications in the area of soil microbiology. Uchenna Jonathan Nwokeh's work is relevant to the Faculty Research Day event, because it reveals the potential of potassium-solubilising rhizbacteria (KSR) in enhancing soil fertility and improving crop yield.

Abstract

Presently, decline in soil fertility has become a crucial concern to crop farmers in Nigeria. Only about a few percent of farmers can afford the use of chemical fertilizers to substitute for nutrient deficient soils. A study was conducted to isolate potassium-solubilising rhizosphere (KSR), a group of plant-growth promoting bacteria, from maize rhizosphere. Rhizosphere soil and root samples were collected from an existing maize plant. Aleksandrov medium was used for the isolation of KSR by serial dilution method. Bacteria colonies observed on Aleksandrov plate were isolated and pure cultures obtained by streak plate method. The results obtained from the molecular analysis, showed that both potassium-solubilising rhizobacteria were identified as Lysinibacillus fusiformis and Providencia rettgeri. Solubilisation parameters were determined on colonies which exhibited clear zones of solubilisation. The Gram reactions of both bacteria showed that Lysinibacillus fusiformis was Gram positive while Providencia rettgeri appeared negative. The zones of solubilisation of Lysinibacillus fusiform recorded higher solubilisation diameter (5.37 cm) and solubilisation efficiency (1400.56 %) than Providencia rettgeri (5.17 cm, 1291.67 % respectively).

Also, the solubilization index was higher in Lysinibacillus fusiformis (2.87) than in Providencia rettgeri (2.17).

Keywords: Bacteria, Potassium, Qualitative, Quantitative, Rhizosphere, Solubilisation

Vegetation influences on soil microbial functional potential in the hyper-arid Namib Desert, Namibia

EN Nghalipo1, HL Throop1,2, PH Lebre3, DA Cowan3, RW Becker4

[1]Department of Natural Resource Sciences, Namibia University of Science and Technology,
[2]School of Earth and Space Exploration, Arizona State University, USA
[3]Centre for Microbial Ecology and Genomics, University of Pretoria, South Africa
[4]Ongava Research Centre, Namibia

Dr Elise Nghalipo is a passionate Microbial Ecologist who is obsessed with invisible biodiversity (soil microbes) and seeks to raise awareness on soils, particularly the ecological role of soil microbes and how these may be affected by climate change and subsequently impact livelihoods. She is an advocate for soil biodiversity because while the natural environment is complex with components interacting to form a functioning ecosystem, often the soil biodiversity component is overlooked and not given the prominence it deserves, relative to more visually apparent life forms such as plants and animals.

Elise's PhD research focused on evaluating the soil microbiome in the coastal Namib Desert by investigating microbial communities associated with plant hummocks and their functional roles in this hyper-arid ecosystem. This research allowed us an opportunity for a deeper exploration of relevant biological questions in microbial ecology, such as "who are the members of the community? What are their functional roles in the community, and how are they doing it?"

Abstract

Soil microorganisms are the functional backbones of dryland environments, particularly hyper-arid ecosystems, as they are often referred to as the predominant ecosystem drivers underpinning crucial ecosystem functions and services that support human life. Given the important roles of soil microbes in hyper-arid systems, it is critical to understand how vegetation influences the soil microbiome to predict how ecological functions may be altered under future climate-change projections. This study evaluates the soil microbiome in vegetated hummocks in the coastal Namib Desert by 1) establishing the functional potential for microbial communities and how they compare between vegetated hummock and bare soils (unvegetated: windward slope and gravel plains) and 2) investigating metabolic strategies that underlie the ability of these soil microbes to thrive and perform ecosystem functions in this hyper-arid ecosystem. Here, shotgun metagenomics sequencing technology were used to evaluate the microbial functional potential in three soil samples collected from three sampling locations: vegetated hummock, unvegetated windward slope, and gravel plains.

Our metagenomic analyses revealed functions related to carbon (C) fixation, C degradation, ammonium oxidation, methane metabolism, and sulfur assimilation. The vegetated hummock soils had more enrichment of microbial functions relative to bare soils, suggesting that vegetation influences the microbial functional potential. Moreover, our findings revealed diverse taxa with unique metabolic strategies to tolerate and thrive in hyper-arid environments. For instance, the detection of marker genes such as NiFe hydrogenase Hyd-1 and norBC suggests metabolic pathways involved in atmospheric H_2 oxidation to fix CO_2 and the adaptation to environmental stress in hyper-arid environments. Overall, this study highlights the influence of vegetation in shaping the microbial communities and their functional dynamics, which ultimately contribute to the overall ecosystem's functioning. Furthermore, the study provides insights into metabolic strategies that enable soil microbial communities to thrive in these extreme desert environments.

Keywords: Microbiome · Functional potential · Shotgun metagenomics · Vegetated hummocks Namib Desert

Notes

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Research Day 2025 Programme

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