LIFE & EARTH SCIENCES INSTITUTE

PAN AFRICAN UNIVERSITY

UNIVERSITY OF IBADAN

BOOK OF ABSTRACTS

Director's Note

This collection represents the concerted efforts of the 2021 batches of the 7th Cohort of Masters and contributions from the 5th batch of Ph.D students of the Pan African University Life and Earth Sciences (including Health and Agriculture), University of Ibadan, Ibadan. This is their contribution towards fulfilling mandate of PAULESI as an academic Institution for capacity building and in fulfilling the Educational Strategy of the African Union Commission agenda 2063. The contributions are from the seven programmes within the Institute who have graduated students mainly:

i. Reproductive Health Sciences with Reproductive Health and Reproductive Biology options
ii. Geosciences with Petroleum Geoscience and Mineral Exploration options
iii. Plant Breeding
iv. Environmental Management
v. Veterinary Medicine (Avian Medicine and Vaccine Production and Quality Control)
vi. Medicinal Plant Research and Drug Development
vii. Sport Management and Policy Development

These research contributions represent highly robust research efforts targeting major primary areas of need of the African continent. The contributions are from the research activities of the Masters/Ph.D students. A number of research outputs have been published from these studies. Sincere appreciation goes to the African Union Commission who have recognised the importance of Higher Education and research and have in various dimensions motivated the students. Similarly, the African Development Bank has provided the financial muscle to encourage the students and stimulate them to make a difference within the African scientific and technical community within the continent and the Diaspora. The progression in this humble beginning will in future spiral the students into significant scientific and research breakthrough and will engender global competitiveness in the research arena.

PAULESI Management Team

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Introduction

The Pan African University (PAU) is the culmination of continental initiatives of the commission of the African Union to revitalize higher education and research in Africa. It is a project that will exemplify excellence, enhance the attractiveness and global competitiveness of African higher education and research and establish the African university at the core of Africa's development. The PAU will greatly boost the population and retention of high-level human resources and quality knowledge outputs and be able to attract the best intellectual capacity from all over the world.

It is noteworthy that this momentous project is being launched as African Union (AU) undertakes the modern evaluation of the Second Decade Education for Africa. Clearly, Africa has awoken to the fact that social and economic development is not possible without substantive investment in a robust higher education and research. The Institute of Life and Earth Sciences (including Health and Agriculture). University of Ibadan, Ibadan, Nigeria offers Masters and PhD degree in seven thematic areas namely:

Master's Degree (MSc)

Master in Environmental Management

Master in Geosciences (Mineral Exploration and Petroleum Geosciences options)

Master in Reproductive Health Sciences (Reproductive Health and Reproductive Biology options)

Master in Plant Breeding

Master in Medicinal Plants Research and Drug Development

Master in Sport Management and Policy Development

Master in Veterinary Medicine (Avian Medicine; Vaccine Production and Quality Control options)

Doctoral Degree (PhD)

Ph.D in Environmental Management

Ph.D in Geosciences (Mineral Exploration and Petroleum Geosciences options)

Ph.D in Reproductive Health Sciences (Reproductive Health and Reproductive Biology options)

Ph.D in Plant Breeding

Vision

The strategic vision of the Pan African University is to develop institutions of excellence in science, technology, innovation, social sciences and governance, which would constitute the bedrock for an African pool of higher education and research. This would usher in a new generation of leaders properly trained to take the best advantage of African human and material resources, imbued with a common vision of a peaceful, prosperous and integrated Africa.

Mission

To realise the strategic vision, six missions have been defined for the Pan-African University:

1. Develop continental-wide and world-class graduate and post-graduate programmes in science, technology, innovation, human and social sciences;
2. Stimulate collaborative, internationally competitive, cutting-edge fundamental and development oriented research, in areas having a direct bearing on the technical, economic and social development of Africa;
3. Enhance the mobility of students, lecturers, researchers and administrative staff between African universities to improve on teaching, leadership, and collaborative research;
4. Contribute to the capacity building of present and future African Union stakeholders;
5. Enhance the attractiveness of African higher education and research institutions for effective development and retention of young African talent, while attracting the best intellectual capital from across the globe, including the African Diaspora;
6. Invigorate dynamic and productive partnership with public and private sectors

Regional Institutes

The thematic institutes that constitute the PAU are distributed in five geographic African regions. They are as follows:

- The Institute for Basic Sciences, Technology and Innovation (PAUSTI), hosted by the Jomo Kenyatta University of Agriculture and Technology in Kenya (Eastern Africa);
- The Institute for Life and Earth Sciences (including Health and Agriculture (PAULESI), hosted by the University of Ibadan in Nigeria (Western Africa);
- The Institute for Governance, Humanities and Social Sciences (PAUGHSS), hosted by the University of YaoundeII in Cameroon (Central Africa);
- The Institute for Water and Energy Sciences (including Climate Change (PAUWES), hosted by the University of Tlemcen in Algeria (Northern Africa); and
- The Institute for Space Sciences (PAUSS) to be hosted by a University in the Republic of South Africa (Southern Africa).

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Master of Science in Environmental Management

Environmental and Socioeconomic Impact of Quarrying Activities in Border Ii Sub-Location, Nyando Sub-County, Kisumu County, Kenya

Erick Oluoch OPONDO(PAU-UI-0469)

Human population growth and technological advancement have influenced an increase in the demand and utilization of natural resources. Consequently, these have attributed to environmental ramification and modification. This study assessed the impacts of quarrying on the environment and livelihoods of people in the Border II sub-location. The study utilized both secondary and primary data sources. Moreover, qualitative and quantitative data were collected through questionnaires, key informant interviews, focus group discussions, laboratory analysis, observations, satellite images and literature review of journals, articles, books, government and companies' reports. The primary data from administered questionnaires were analyzed using Statistical Package for the Social Sciences (SPSS) version 21.0 software and Chi-square was used to test hypothesis. Land sat satellite images were analyzed using Arc GIS version 10.8. The analyzed data was presented in tables and figures for easy understanding. The study revealed that quarrying in the area is perceived to have both positive and negative impacts. The positive impacts include; employment opportunities, improvement of roads, provision of clean water, security improvements, corporate social responsibility, availability of building materials, business opportunities, among others. Whereas, negative effects were air pollution emissions, noise, vibration, water pollution, land degradation, abandoned mines, human health problems, human displacement, road damage, land use and land cover changes, immorality, and low agricultural production. For sustainable quarrying in the area, the study recommended fair compensation, development of human resettlement plans, mitigation of environmental pollution, adequate community involvement and participation, effective rehabilitation and restoration of exhausted mines, and adequate compliance with relevant policies and regulations.

Assessment of Water Supply and Factor Influencing Pollution of Groundwater Quality use for Drinking and other Purposes in The National Transit Authority Community, Gardnerville Township, Monrovia, Liberia

Abenego Dweh MANSTON (PAU-UI-0473)

The absence of upgraded water infrastructure in the National Transit Authority (NTA) Community in Monrovia has caused residents to rely on unimproved sources of drinking water. However, with the continued increase in urbanization and the negligence exhibited towards waste management, groundwater now tends to suffer from the threat of pollution. Hence, the focus of this study was to collaborate with residents of the NTA Community to establish groundwater safety and its effect, investigate underlying factors that may predispose to groundwater pollution and initiate a short-term solution through a planned intervention. From the 17th of May to the 6th of June 2021, cross-sectional research involving water sample analysis from well sources, spot-check observation, questionnaire, and a mini-intervention involving 36 participants and water sampling was conducted. Microbial and physicochemical characteristics such as pH, Color, Turbidity, TDS, Conductivity, Ammonia, Copper, Fluoride, Iron, Nitrate, Nitrite, and Total Coliforms were measured in each water sample. The results of each parameter were examined and compared to WHO standard values and the Environmental Protection Agency of Liberia (EPAL) Water Quality Index. According to the community survey, 44.4% of residents preferred a private well over a private (11.1%) or public (30%) hand pump, both of which are scarce in the area. For drinking, 13.9 % rely on sachet water. About half of the participants do not treat their water before consuming. For other purposes, well water was the most common source of water. The findings of the water study revealed that pH (57%), Fluoride (56%), Total Coliforms (89%), Nitrate (78% & 100%), and Nitrite (78% & 100%) did not match the WHO/ EPAL standards. The only metric that felt inside WHO/EPAL was 100% Nitrate and Ammonia, and 97% TDS. Copper (58%) did not meet the EPAL limit, however it did meet the WHO norm with a percentage of 64%. Other parameters, such as iron (100%) and turbidity (78%), passed EPAL standards but fell short of WHO by a percentage of 72% and 69%. The community's sanitation was typically poor. Open defecation was reported by 23% of respondents, with 47.2% utilizing an unimproved pit latrine. 50% of the households visited had children's faeces decorating their houses, according to the results of the observation. All the wells visited revealed one or two pollution input risk factors.

The understanding of community residents who attended the intervention training program improved significantly to promote sanitation among chosen members of the community. To conclude, the water in the NTA community is extremely polluted for drinking. It is suggested that the public be warned about drinking water from any test source.

The Impact of City Settlement Expansion on Land Use Change in The Peripheries of Kigali City, Rwanda

Alphonse Abizeye NDAGIJIMANA(PAU–UI–0475)

Rwanda, despite being a predominantly rural country, has remarkably performed in the post-conflict (late 1990s) period on the socio-economic fronts. Urban sprawl has been a major challenge in Rwanda's capital city, Kigali. This sprawl accelerated the rapid loss of agricultural land use to settlement use (built up) in the city of Kigali boundary and its districts periphery. The study analysed the spatiotemporal pattern of urban sprawl in the Kigali metropolis between the year 1990 and 2020. Quantitative and qualitative research techniques, Geographic information system and remote sensing; focused group discussions and observations were the data collection methods used. Satellite imagery such Landsat images of 1990, 2000, 2010 and 2020 were used to evaluate changes in the amount of agricultural land loss and built-up land in the peripheries of the city. The study revealed that population growth, affordable plot and housing demand, and roads ostensibly for residential and recreational purposes were major land development players that contributed to expansion (sprawl) of the city of Kigali between 1990 and 2020. The city of Kigali experienced an increasing urban expansion trend from 1990 to 2020 with decade 2014 to 2020 experiencing highest rates of urban expansion followed by the 1990 to 2010 decade. The study results demonstrate that horizontal expansion of city of Kigali led to the loss of agricultural land and farmlands at the districts periphery. The study recommends that city of Kigali council should take cognisance of the provisions of the environmental management act especially on protection of agricultural land, green spaces and wetland ecosystems in the peripheries when drawing its development plans to guard against deterioration and loss of both green spaces and wetlands within the city of Kigali. The study concludes that sustainable development of the city of Kigali can only be achieved if all developments take place according to the approved city development plan and districts plans.

Impact Of Locally Cultured Effective Microorganisms On Organic Waste Composting In Juba County, Central Equatoria State, South Sudan.

Josephine Nackeny Augustino ATILLIO (PAU-UI-0474)

In recent years developing countries have experienced a rapid expansion of cities largely due to the massive migration of people from rural to urban centres leading to generation of Municipal Solid Waste (MSW) (Sharholy et al., 2008). Open dumping in Juba County calls for waste management techniques that could eliminate the risks, and possibly promote profitability to its communities. Composting is one of techniques that can minimize this problem.

This study aimed at production of locally cultured Effective Microorganisms (EM) at household level, apply it on organic wastes for composting, monitor its influence on organic wastes composting by observation and measuring the temperature of the compost, evaluate the duration of composting and convert organic waste into value-added bio-product such as bio- fertilizer or compost. EM were locally cultured at the household for 13 days and applied on the organic waste for composting and its impact was monitored for a period of one month while the other buckets controlled. Temperature measured on daily basis using DIGITAL COMPOST THERMOMETER TP 101 brand for all the composting bins showed three phases: mesophilic phase (27-41^{o}C), thermophilic phase (42-58^{o}C), and maturation phase (26-48^{o}C). The duration of the compost process varied, those with EM took two months, while the controlled ones took more than three months.

In Juba county, 18 farmers were engaged and trained on how to make their own EM and how to compost organic waste at the household level in order to minimize the quantities of Municipal Waste, improve sustainability of urban agriculture using organic compost, raise awareness, and build capacity towards sustainable farming practices. The trained farmers were exited to acquire innovative knowledge that can help them and reduce the cost of buying chemical fertilizer.

Using EM in composting organic waste is one of the fastest way of minimizing the municipal solid waste and should be encouraged to help men and women minimize the quantity of organic waste produced at the household level on daily basis.

Health Worker's Knowledge, Awareness and Practice of Healthcare Wastes Management in Public Hospitals in Hargeisa, Somalia.

Amin Ahmed JAMA(PAU-UI-0470)

Bio-medical waste (BMW) means any solid and/or liquid waste including its container and any intermediate product, which is generated during the diagnosis, treatment or immunization of human beings or animals. Due to lack of working policy, controlling HCW in Somalia is a serious public health concern. Healthcare workers throw some of the hazardous wastes around the hospital buildings. Most ofhospital wastes get mixed with domestic wastes and disposed all together without any considerable segregation at all. This study is demand-driven as there is a strong need for researches on assessing HCW and management practices. The study aimed to Health worker's knowledge, awareness and practice about healthcare wastes management in public hospitals in Hargeisa, Somalia.

The cross-sectional study design was conducted to assess the health workers KAP about healthcare wastemanagement. The study area was Hargeisa, Somalia. The sample size was determined by simple randomsampling technique. Data was collected using qualitative and quantitative techniques. Data was entered byEXCEL and analyzed by SPSS for Window version 23.

The findings revealed that majority of the respondents 82.5% (198) of healthcare workers segregate or sort out medical wastes, whereas 17.5% of health workers do not segregate or sort out MW, among healthworkers that segregate MW, 71.25% (171) know reasons behind sorting medical wastes, knowing why medical waste is separated It aids and assists the prevention of any risks associated with the improper disposal of medical waste. On the other hand 11.25% (27) were not familiar with the reasons behind sorting MW, this may expose risks to healthcare workers. Majority 75% (180) of healthcare workers know and practice about the different color coded bags, while 25% (60) do not know and practice the different color coded bags. Practice towards healthcare workers 88.3% respondents believe sharp materials are kept in a safe container (hard container) designed for such services,

This study the level of knowledge, awareness and practice were satisfactory, and further studies should be conducted at a wide scale by including different public and private hospitals and regions in

the country.The study also looked at the disposal of medical wastes and it was identified that final disposal of the three public hospitals was bad.

Insurgency, Counterinsurgency and Land Use Land Cover Change in Borno State, Nigeria.

Abdulmalik Mustapha ABATCHA(PAU-UI-0471)

The study is expected contribute to the existing knowledge on issues of insurgency and counterinsurgency operations, as its publication would to be utilized by researchers, tertiary institutions, Military and security agencies, government officials, Non-Governmental Organizations. It would also create awareness to the general public and stakeholders on the current situation of the affected communities of the Local Government Areas (LGA's) in question, making void some of the myths that people have as with situations of insurgency and counterinsurgency operations. As justification for the study, it determined the nature and current condition of the study territories (Maiduguri, Jere, Konduga and Gwoza LGA's), as this would assist the Federal Government and its country neighbors, the Multinational Joint Task Force and Civilian Joint Task Force to come up with sustainable counterinsurgency operation plans that would have less effect on the environment, improve environmental development, provide navigation for successful counter insurgency operations, and also assist in surveillances remote counter operations. Motivation for the study was as a result of remote assessment of the case study area just with the researcher's prior knowledge, owing to nature of insecurity of the location. The main objective of the research, assessment and evaluation of changes to Land use Land cover as a result of insurgency and counterinsurgency activities in the state of Borno (North-Eastern Nigeria) between periods 1991, 2009 and 2021 respectively.

Landsat images (Landsat 5 Thematic Mapper and Landsat 8 Operational Land Imager) with 30m spatial resolution were used for identifying variations by means of supervised classification. The images for the three periods were downloaded, layer arranged and modified prior to the main processing work. For data processing and analysis, ArcGIS 10.5, Google Earth Engine and excel application of Microsoft office 2007 were used. The outcomes were shown in atlases (maps), tables and charts. For the supervised classification five land cover collections (i.e. vegetation, agricultural land, bare land, Settlement and water body) were used for the grouping.

The results revealed that agricultural land and bare land had declined within the study period. Vegetation, water body and Settlement had all improved. Notably in Maiduguri Metropolitan Council, there is an upsurge in settlement and this has been ascribed to impact of the crisis making the city host the largest number of IDP's camps and also existence of greater security forces which resulted to a relatively peaceful location, seen as a safe haven by most inhabitants of the state. Additionally, the high vegetation growth detected was as a result of farmlands that were abandoned after ten years which have replenished. Fortunately, lately this year (2021), successes recorded by the security forces and vigilante groups has allowed for resettlement and resumption of Farming activities in a good number of insurgency and counterinsurgency operations affected locations in the region.

It can be concluded that insurgency and counterinsurgency operations in Borno State has led to substantial changes in Land Use (bare land, agricultural land, settlement and water bodies) and also in Land Cover (vegetation).

An Assessment of Municipal Solid Waste Management System: A Case Study in Conakry, Capital City of Guinea Republic

Traore Alpha MAMADOU (PAU – UI-0472)

In Conakry, focus has been on the physical components of SWM which has led to the lack of buy-in and ownership among beneficiaries and the local community. With virtually non-existent recycling and composting facilities, the large majority of waste produced in the city is illegally dumped or burnt. The only landfill in the city is bordered by numerous settlements with an estimated population of 130,000 people. The informal sector workers work efficiently but under poor working conditions and without recognition; they are generally both ignored and denied. The recommendations provide during the SWM planning process do not take into account local knowledge and context. Despite the aid provided by financial partners, the budget allocated to waste management is totally insignificant compared to the needs expressed. The responsibilities of all the institutions involved in waste management process are further blurred because of overlap of mandates between them. Another factor that affects waste management at households' level is

the lack of knowledge of the citizens about both environmental and health impact of improper waste disposal.

In this article, the city waste management system was assessed by using UN-Habitat city profile approach. With a total of 272,924 households within the city, 242 households participated in this study. The combination of qualitative and quantitative methods of data collection was used. Standard deviation (SD) determined the distribution of the data set. In addition, at a significant threshold of $p < 0.05$, the Study of Variance (ANOVA) test was performed to evaluate the effect that independent variables had on the dependent variable in a regression analysis.

The study recommends recycling in order to make the system financially sustainable by raising public awareness and to foster the informal sector.

Master of Science in Geoscience (Mineral Exploration)

Mineralogical and Geochemical Characterization of Yomboyeli Iron Ore Deposit, Republic of Guinea, West Africa

Massa SAKOUVOGUI (PAU-UI-0463)

Mineralogical and geochemical characterization of Yomboyeli iron ore deposit around Forécariah Region of the Republic of Guinea, West Africa was carried out to investigate the mineralogical and geochemical characteristics of the deposit.

The Forécariah Region is mainly comprised of Archaean and Proterozoic granitoids and the prospective Kambui Series. The Series of a specific interest economically are the Kasila and Marampa series. The Kasila series is Late Archaean in age and includes schists and amphibolites (of volcano sedimentary and mafic/ultramafic precursors) with local concentrations of disseminated and massive magnetite. The surface expression of these rocks in laterite is polymineral iron oxide concentrations in variable proportions. The Kasila series is overlain by schists. The Marampa series rocks at Forécariah are an extension of the Marampa Group rocks and Marampa iron ore deposit near Lunsar, Sierra Leone (87km SSE of Yomboyeli) which contain schist of variable iron grade.

Thin sections of rocks were prepared for petrographic studies and, mineralogical studies were performed on three samples using the X-Ray Diffractometer (XRD) techniques and the results of analysis revealed that the mineralogical composition of Yomboyeli iron ore deposit was: Hematite (79.9 - 96.4 wt %), Quartz (3.6 - 20.1 wt %) as the major minerals, and Goethite (3.4 wt %) as the minor mineral with presence of Kaolinite.

Geochemical analysis was performed on fourteen (14) representative samples of the Yomboyeli iron deposit collected randomly were sent for chemical analyses using (FUS-ICP techniques) at Activation laboratories, Ancaster, Ontario Canada.

The results showed that the Yomboyeli iron deposit is geochemically characterised by: Fe_2O_3 (42.97 – 90.54 wt %) with average = 74.58%, SiO_2 (3.39 – 51.31 wt %) and with relative low content of Al_2O_3 (0.48 – 6.94 wt %), these three major oxides are the most important components in the Yomboyeli iron ore and they represent almost 96 % of the whole rock composition.

The results have showed that iron content increases with decreasing silica (Strong negative correlation r = -0.98).

Trace elements analyses showed enrichment in large ion lithophile elements like Ba that showing high concentration. The ratios (La/Yb) N (3.69 - 13.33) and (La/Sm) N (2.69 - 4.37) which are

fractionation indices of LREE/HREE showed enrichment in LREE, depletion in HREE, negative Eu anomaly (Eu/ Eu* 0.62 – 0.71), and relative positive Ce anomaly.

On one hand, the presence of minerals such as goethite and kaolinite in the Yomboyeli iron ore deposit suggests its supergene origin. On the other hand, from observations, and previous work, it is suggested that the iron was remobilised from the underlying Kasila Group schist that contains primary, disseminated to massive magnetite around the perimeter of the specularite schist on Yomboyeli. In this scenario, the iron would have remobilised under metamorphic/hydrothermal conditions, gathered in a relatively oxidised fluid, and deposited nearby at favourable structural sites in the quartz-mica schist by replacement and growth of specular hematite upon cooling. Alternatively, the specularite schist was originally a magnetite-rich sedimentary sequence that has been metamorphosed/oxidised to specularite/hematite schist.

Petrographic and Geochemical Studies of Gold Bearing Rocks Around Pessoulou Area, Northern Benin Republic

Allake Yasminan MAGUIDI(PAU-UI-0462)

The Pessoulou area in the northern part of Benin Republic belongs to the internal zone of the Pan African Dahomeyides belt. The previous work in the area helped to identify this area as one of the areas with gold mineralization potential in Benin. This study was aimed to determine the petrographical and geochemical properties of gold-bearing rocks around the area in order to provide relevant information for gold exploration.

Geological mapping was carried out at a scale of 1:100,000. Petrographic studies were carried out while major, trace and rare earth elements (REEs) contents of fifteen representative samples were analysed using inductively coupled plasma-mass spectrometry. Fire assay and gravimetric methods were also used. Data obtained were subjected to descriptive statistics.

The area consists of migmatite, calc silicate gneiss, and some Neoproterozoic intrusion such as meta granite, medium-grained granite, and porphyritic granite. Gneisses and migmatites deformed into mylonite were found in the area. Petrographical analysis of the granitoids revealed mineral assemblages of mainly microcline, quartz, plagioclase, and biotite. Alteration minerals such as chlorite were indicated in the medium-grained granite and myrmerkite are present in the meta granite with an orientation of the minerals. Three deformational episodes were distinguished: D1, D2 and D3 in the area. The foliations, fractures and quartz veins trending in the N-S and NE-SW

corresponding to the D1 deformational phase. While the D2 deformation produces NW-SE fractures, strike-slip faults, quartz veins and pegmatite veins intersecting the N-S trending structures. Few E-W trending fractures signified the D3 deformational episode. The geochemical results of granitoids revealed variation of SiO_2 from 68.93-75.01wt.% and Al_2O_3 from 13.65-15.33 wt.%. Other major oxides, such as Fe_2O_3 (1.9 to 3.02 wt.%), CaO (0.47-1.99 wt.%) Na_2O (4.32-4.7 wt.%), and K_2O (3.51-3.55 wt.%) were generally low. Based on various interpretation, the granitoids are weakly metaluminous to peraluminous, possibly derived from the partial melting of the continental crust. The calc silicate gneiss, and migmatite gneiss plotted in the destructive plate margin within the Calc-alkaline Basalt field (CAB). This implies the rocks have calc-alkaline and tholeiitic basalt affinity and have evolved in a volcanic arc setting. The concentration of gold in some of the rocks and saprolites varies from 4- 385 ppb. The gold content in granitoids, calc silicate gneiss, and migmatite is below the detection limit (<2 ppb). The concentration of gold in the quartz vein (124-385 ppb) indicated gold transportation through a hydrothermal fluid. It involved alteration phenomenon, such as chloritization, carbonation, and sericitization of feldspars. Gold is concentrated more in the quartz veins (124, 385 ppb), the mylonite (71 ppb), and the saprolites (4-69 ppb). Metals association, hydrothermal alteration patterns help to identify the mixed origin (magmatic/ metamorphic) related to Pan African orogeny. The Pessoulou area falls within the Pan African mobile belt characterised with metamorphic rocks and Neoproterozoic intrusions. Economic prospect of primary gold deposits exists within the quartz veins. Gold associated elements could serve as pathfinders for future gold mineralization probe in the area.

Assessment Of Rare Metal Mineralisation Potentials In Residual Soils Of Parts Of Ibadan Sheet 261, Southwestern Nigeria

Chrisfanel Eurode KIANGUEBENE – KOUSSINGOUNINA (PAU – UI – 0461)

The demand for rare metals has increased in recent times due to the advances in technological, aeronautical, and information communication technology sectors, which use them as raw materials. Additional sources of these metals, especially those other than pegmatites with which they are commonly associated, are being sought. The search has incorporated soil geochemical surveys to identify more potential mineralisation zones, especially for blind deposits and in areas with sparse rock exposures. An evaluation of the residual soils of Ajegunle-Awa and Ita-Egba environs was conducted to determine the concentration and distribution of rare metals to identify possible mineralization zones.

Geological mapping of the area was conducted to determine the host lithologies and their relationships, while residual soils (n=39) were sampled from the B-horizon (30-50 cm depth). Thin sections of the rocks were cut and studied under the petrological microscope to determine their textures and modal compositions. The soil samples were air-dried, disaggregated, and sieved to <75 microns before geochemical analyses with Inductively Coupled Plasma Mass Spectrometry (ICPMS). The results of the geochemical analyses were evaluated using Correlation Matrix and Factor Analysis to determine elemental associations. Geochemical distribution maps were generated for the elements of interest, using calculated threshold values and Abundance Crustal Value (ACV) to determine elements having anomalous values.

Lithological units in the area are biotite granite gneiss, biotite gneiss, granite gneiss, quartzite/quartz schist, and pegmatite; with a predominant NNE-SSW orientation. The petrography showed that the mineral assemblages of the sampling site composed mainly of quartz, biotite, muscovite, plagioclase, hornblende, pyroxene, and accessory garnet.

Concentration (ppm) of rare metal in the soils were: Be, 0.20 – 1.90; Nb, 0.10 – 1.48; Sn, 0.50 – 3.70; Cs, 0.56 – 11.24; Ba, 37.30 – 466.50; Tl, 0.09 – 0.68; Bi, 0.07 – 2.45; Li, 1.10 – 36.20; Ga, 3.40 – 18.60; Ni, 3.50 – 60.50; Co, 3.80 – 107.60 and Cr, 11.60 – 203.60. A comparison of the concentrations with calculated threshold values and average crustal values (ACV) revealed elevated concentrations of Sn, Cs, Bi, Co, and Cr. Factor analysis classified the elements into three factors: Factor 1 comprising Cr which made up 40.1% of total variance; Factor 2 with Sn-Bi-Cs,

which made up 28.4% of the total variance and Factor 3 containing Co, which made up 15.3% of the total variance. The Sn-Bi-Cs elemental association is believed to be a result of the late-stage fluids that formed the pegmatites. The elevated concentrations of Cr and Co are believed to have resulted from the weathering of amphiboles, pyroxenes, and biotite, which were detected in the gneisses and pegmatite in the study area.

The evaluation of the residual soils of the area indicated elevated concentrations of Sn, Co, Bi, Cs, and Cr, which mainly coincided with locations underlain by biotite granite gneiss, intruded by pegmatite veins, and are a pointer to possible mineralisation.

Mineralogical, Geochemical And Geotechnical Assessments Of Clay Deposit At Ikere-Ekiti, Southwestern Nigeria

Oluwafemi Matthew OGUNSANYA (PAU – UI-0460)

The clay deposit at Araromi, Ikere-Ekiti, Southwestern Nigeria was studied to assess its physical, mineralogical and chemical properties and determine its industrial applications. Physical properties which include natural moisture content, particle size distribution, plasticity, density and linear shrinkage were determined in order to know its industrial potentials. The mineralogy of the clay samples was determined using X-Ray Diffraction (XRD), while their chemical composition of the clay samples was investigated using Inductively Coupled Plasma-Optical Emission Spectroscopy (ICP-OES) and Inductively Coupled Plasma-Mass Spectroscopy method (ICP-MS). Field examination revealed the prominence of two main lithologic units in the study area namely-porphyritic granites and quartz schists. Petrography revealed the dominance of quartz and feldspars (plagioclase and microcline), biotite and muscovite with significant amounts of hornblende and opaque minerals. The samples were dominated by sandy-silty clay particles with a linear shrinkage that ranged from 2.1% to 7.1%, specific gravity (2.61 – 2.66) and natural moisture content (3% - 26%). Kaolinite was the major clay mineral with illite occurring in small quantity. There was a dominance of SiO_2 (46.28 – 47.63) % and Al_2O_3 (34.84 – 37.79) %. Other oxides were Fe_2O_3 (0.7 – 2.48) %, TiO_2 (0.661 – 1.654) % and Loss on Ignition (12.95 – 13.91) %. Oxides such as CaO, MgO, K_2O, Na_2O, MnO and P_2O_5 contribute less than 1% of the total elemental composition. The molar ratio of SiO_2/Al_2O_3 ranges from 1.24 to 1.37 showing high silica. K_2O/Al_2O_3 ratio is low

(0.003-0.018), an indication of low K-bearing mineral contents. K_2O/Na_2O ratio ranged between 11 and 34.5 supporting the high contents of K-Na bearing minerals indicating that K-bearing minerals are more than Na-plagioclases. Al_2O_3/TiO_2 ratio varies from 21.7 to 57.2 indicating high alumina relative to titanium oxide. The high chemical index of alteration (98.06 - 99.59) values probably indicate the complete weathering of feldspars to kaolinite. High concentration of Zr (1248.4ppm) was followed by Ba (1082.6ppm), Ce (483ppm), Sr (313 ppm) and La (288ppm) which support felsic source.

The studied clay deposit is of good quality, massive and can be used as industrial raw materials for the manufacture of ceramics, refractory bricks, papers, paints and pharmaceutical.

Master of Science in Petroleum Geoscience

Seismic Stratigraphy and Petroleum Systems of Block 18, Nogal Rift Basin, Somalia

Abdihakim Muse MOHAMED (PAU-UI-0465)

This study was conducted in Block 18, of the Nogal Rift Basin, which is one of the extensional rift basins located in northern Somalia. It aimed at defining the stratigraphy and petroleum systems in Block 18 of this basin, as well as deducing the related structures and tectonic events, for which little or no information abound.

2D seismic data comprising thirteen (13) seismic lines and three (3) exploratory wells were used in this study. Seismic profiles were interpreted by systematic picking of faults and mapping of horizons across seismic lines and extraction of seismic attributes using Petrel software.

The seismic data revealed that the Nogal Rift branch extended to Block18. Five (5) stratigraphic horizons have been defined overlying the Basement Complex namely; Bihendula Group, Gumburo, Jesomma, Auradu, and Taleh Formations. Seismic lines associated with the study area such as; CS-280 and CS-130, showed half grabens, with less sedimentary cover than the main Nogal Rift Basin as imaged by CS-155, which seemed to have developed similarly and oriented parallel to the main Nogal Rift Basin. Correlation and mapping of these units deduced three rift phases notably; Kimmeridgian, Cenomanian-Maastrichtian and Oligocene-Miocene phases. Two source rocks made up of the Bihendula Group and the lower Gumburo Formation, two main reservoirs, namely; the Gumburo and Jesomma sandstones, were revealed, in addition to a likelihood of Jurassic reservoirs in the graben areas. Interbedded carbonates and shales, within different formations, were considered as the main seals while drag folds, associated with tilted fault blocks, represented the main traps in the area. Exploration risks include; absence of Upper Jurassic source and reservoirs rocks, uncertainties of maturity of the Upper Cretaceous Gumburo and Jesomma shales, and the Oligocene-Miocene rift-related deformations that have resulted in trap breachment and reactivation of the main Nogal Rift Basin Cretaceous faults. This study further revealed that Block 18, is an additional branch of the main Nogal Rift Basin.

Characterizing Permeability from Geological and Geochemical Data in The Olkaria Domes Field in Kenya

Nkatha Harriet ACHINI (PAU-UI-0464)

Olkaria Domes field is one of the seven fields in the Olkaria geothermal area. The geothermal field continues to be associated with a high geothermal gradient that arises from shallow magmatic activities which are ongoing in the enormous igneous province. Productivity of the drilled wells is influenced by factors such as subsurface permeability. Permeability is also one of the parameters used for characterization of geothermal fields. This study makes use of geological data from drilled wells and radon gas survey from Olkaria Domes field to characterize its permeability. The research involved studying rock types in the area by analyzing drill cuttings obtained from six drilled wells OW 919, OW 918, OW 917, OW 916, OW 912B and OW 905 in the Olkaria Domes field. Correlation of the main lithologies and zones for loss of circulation in the field was done as well as creation of mineralogical maps to capture distribution of the calcite and pyrite minerals using Petrel Software. Analysis of soil gas survey using radon as a geochemical tool in the Domes field was also carried out and a contour map showing its distribution created using ArcGIS.

The main lithologies in the field was found to be pyroclastics, rhyolites, tuffs, basalts, trachytes and minor intrusions. The hydrothermal alteration facies in the field were grouped into three: argillic facies, phyllic facies and prophyllic facies. The secondary minerals distribution maps created showed that pyrite and calcite are concentrated on the South East in zones B, C, and D, in the North West in zones B, C, D, and E, and in the South West in zones B, C, and D. The occurrence of these secondary hydrothermal alteration minerals and their infilling of the vesicles and veins showed that the permeability of the Domes field is lithologically controlled, with pore spaces that were formed in the rocks from magma as it cooled. The contour map for Radon concentration was plotted and it shows the areas with high anomalies. From the soil gas survey, the highest concentration of radon counts was 507 while the lowest was 10 counts. The trends for the anomalies are: West-southwest where Drill OW 905, Drill OW 916, Drill OW 917 and Drill OW 912B are found. It continues towards the East-southeast direction. From the radon map, the areas that show high concentrations of radon gas are several with most of them forming lines with each other. The alignment of the high anomaly zones is characterizing appearance of faults and or fractures which confirms that some of the permeability in the domes field is structurally controlled by fractures, cracks and faults in the field.

The permeability of the Olkaria Domes field was found to be both structurally controlled as well as lithologically controlled.

Structural And Stratigraphic Modeling Of The Nganzi, Ndunda, Yema and Matamba-Mankazi Blocks, Onshore Coastal Basin, Democratic Republic Of Congo (DRC).

Kabelenga Emmanuella MPANDE (PAU-UI-0468)

Three-dimensional modeling is the art of constructing structural and stratigraphic models from analyses and interpretations of available data at a low cost. This work aimed at generating the 3D models of four blocks in the Onshore DRC Coastal Basin.

Petrophysical analysis, stratigraphic, structural interpretation and 3D modeling were carried out by integrating the well logs and seismic data of the study area using Crystal, FracPredictor, Interactive petrophysics and Petrel 2015 software.

The 3D models of the four blocks allowed the understanding of the structural and stratigraphic features of the onshore DRC Coastal Basin.

Indeed, the stratigraphy varies from one block to another. The pre-salt formations are observable throughout the basin, but the post-salt formations are not (Nganzi and Ndunda blocks). That influences the petroleum geology of the blocks. Concerning the targeted reservoirs: the chela thickness varies from 3 to 74 meters. It is thickening from South to North and from East to the West. But, the Kinkasi thickness is from 29 to 419 meters and thickening from the East to the West.

The structural setting also varies from one block to another. The basement uplift had different consequences throughout the basin. In the Nganzi block, it had exposed some of the post-saliferous formations, which were subsequently eroded causing, the hydrocarbons to seep in the Eastern part and their accumulation in the sands identified as the Mavuma Asphaltic. The Chela formation is faulted in the Nganzi and Ndunda Blocks but not in the YMM Blocks showing that it was deposited after the rifting. This can define the Chela as a pipe for hydrocarbons from the onshore to offshore (Traces of oil in the Lindu-2 and Lindu-3). The chela reservoir set an angular discordance with the Syn-rift in the Ndunda Block.

The various interpretations revealed the reasons for the dry wells: The YMM-1 well was drilled between two faults but did not intersect any hydrocarbon accumulation and, the Lindu-2 well was drilled on a small anticline. The Lindu-1 well was drilled at the left flank of an anticline targeted but, the Lindu-3 missed the structure much more.

In addition, the Chela and Kinkasi maps allowed identifying closures favourable to the trapping of hydrocarbons. For which the salt formation can play the role of seal for the pre-saliferous reservoir. But, the post-saliferous do not present any proper cover rock. According to the acoustic impedance, the Kinkasi prospects are covered by the carbonate sequences (dolomitic limestones) and compact shaly Liawenda formation in the YMM and Ndunda blocks.

From the above, the more interesting prospects are those in the YMM and Ndunda blocks because even though the chela reservoir is thin, it could produce Hydrocarbons from the Lindu-1 well. Also, the Kinkasi formation is thicker and well spread, and the proximity of these blocks to the Perenco concession.

Reservoir Characterization And Paleoenvironmental Reconstruction Of Chad Basin, Northeastern, Nigeria Using 3dSeismic Data And Well Logs.

Chinenye Cynthia OGBU (PAU – UI-0467)

Production of hydrocarbon from structurally related contiguous Chad basin in Cameroon, Chad and the Niger republic has necessitated a detail systematic study and analysis of available geoscientific data of the Chad basin in Northeastern, Nigeria. This study is therefore aimed at reviewing the seismic data and reservoir properties of sand units penetrated by 3 wells in the Nigerian end of the Chad Basin to ascertain their hydrocarbon accumulation, reconstruct the depositional environment and investigate the development of its petroleum system and hydrocarbon prospectivity.

Wireline logs from three wells (Bulte-1, Kasade-1 and Herwa-1) and 3-D seismic data in Chad basin were acquired and analyzed in this study. Gamma ray, Density, Sonic, and Resistivity logs were used in identifying the facies and reservoir zones across the wells. The reservoirs' tops were mapped across the wells and the petrophysical parameters were also calculated for the identified reservoirs. The presence of hydrocarbon or water was inferred from the resistivity log

reading in the absence of neutron log; where high deep resistivity reading corresponds to hydrocarbon bearing sand units and low deep resistivity reading indicated water bearing zones. Facies associations identified from the logs were used in interpreting the depositional environments for the different formations in the basin. Reflection patterns and terminations of different kinds were identified from seismic sections. Log shapes from gamma rays in combination with seismic facies analysis of reflection patterns and terminations were interpreted to delineate the lithology, sequence stratigraphy and depositional environments. Seismic attributes were also extracted and draped on gridded surfaces from the interpreted seismic horizons. These were integrated with structure maps to obtain structural and stratigraphic trends, and possible presence of reservoir sands.

The three reservoirs identified across the wells (reservoirs 1, 2 and 3) have excellent permeability values ranging from 8300 to 46600 mD. Reservoir 2 has the best porosity values (average porosity value of 0.9). For hydrocarbon saturation, all reservoirs across the 3 wells contained mostly water and traces of hydrocarbon. However, reservoirs 2 and 3 in Kasade-1 well, have hydrocarbon saturation of 36% and 20%, respectively. On the basis of the identified facies association in the studied wells, the following environment of deposition were recognized; Chad and Keri Kerri formations (continental), Fika Shale (shallow marine), Gongila Formation (marine and transitional) and Bima Formation (continental).

This study has shown that the properties of the reservoirs across the 3 wells studied in the Nigerian end of the Chad basin and are within the limits required for hydrocarbon accumulation and preservation but only a few reservoirs contain hydrocarbon which may not be of commercial quantity. The depositional environment of the study area in the Chad Basin as confirmed from the facies association ranges from continental to marine environment.

Pore and Fracture Pressure Prediction Using Well Logs And Seismic Data, Cobalt Field, Offshore Niger Delta

Carine Bongka MPARA (PAU-UI-0466)

Pore pressure prediction and fracture pressure estimation is a critical step in well planning and design which can help avoid pressure-related challenges such as nonproductive time, kicks, stock pipes and avoid unexpected related situations. Pore pressure prediction helps to design accurate mud weight for drilling while fracture pressure aids casings design. In this light, the aim of this study is to predict shale pore pressures to identify the different pore pressures zones. An estimate of fracture pressures and their effects on wellbore stability in COBALT Field, Niger Delta.

To achieve this, a geoscientific software was used to analyze the well log data where the data was quality checked and true vertical depth computation carried out to facilitate overburden stress estimation. The extrapolation method was used to compute for overburden stress using bulk density log by merging bulk density log and synthetic bulk density that was generated. Mechanical stratigraphy for lithology delineation was carried to delineate shales from sands using a gamma ray log. Normal compaction trendline was applied on sonic and resistivity log using Eaton's method together with Bower's sonic method to predict pore pressures. Mathews and Kelly empirical method was applied to vertical stress and pore pressures obtained to estimate fracture pressures. Also, Petrel was used for seismic interpretation after which time and depths maps were generated. The top of overpressure wells was incorporated on structural maps to show the distribution of the top of overpressures.

It was observed that wells 01 and 06 are normal pressure well with the highest pressure values of 8.61 and 8.67 ppg, respectively. While wells 02, 03, 04, and 05 were over-pressured with values 10.9, 9.5, 10.5, and 10.01 ppg respectively with corresponding depths 1288, 12057, 9674, and 1019 FTTVD, respectively. The fracture pressure for each well was also estimated from the pore pressures. The main mechanisms responsible for overpressure in the COBALT field are loading and unloading and small contribution as fault related lateral pressure transfer. The results observed from the depth map shows that top of overpressure wells is distributed or compartmentalized into different faults blocks.

It can be concluded that, pore and fracture pressures were predicted for COBALT field in Niger Delta Nigeria using well log and seismic data. This information can facilitate proper planning and drilling of future wells in the field.

Master of Science in Medicinal Plants and Drug Development

Evaluation Of The Antimicrobial Activity Of Host Defence Peptides From Plants Families Euphorbiaceae, Rubiaceae, And Apocynaceae

Emmanuel Ayodeji AGBEBI (PAU–UI-0487)

Host defence peptides (HDPs) from plants are generally positively charged and low molecular weight group of peptides. In recent times, HDPs have gained wide recognition as a potential source of antimicrobial agents because of their abundance in nature, low incidence of reported resistance, in addition to their immunomodulatory properties. The presence of bioactive peptides and their antimicrobial activities were investigated in seven selected plants from Rubiaceae, Apocynaceae, and Euphorbiaceae families in this study.

The reverse-phase solid-phase extraction was used to obtain the partially purified peptide fractions from the crude extracts of the seven plants, and the circular peptides were chemically detected by a modified G-250 spray on a developed TLC plate. The peptide fraction and crude extracts were then screened for their antimicrobial activities on Gram-positive and Gram-negative bacteria, and fungal strain using the broth microdilution method. The rate of kill study was conducted for the *Euphorbia hirta* and *Nauclea diderichii* peptide fractions on *Staphylococcus aureus* using concentrations equal to the MIC, 2x MIC, and 4x MIC. The CFU/mL at each time interval was used to construct the time-kill curve.

The study revealed *Nauclea diderichii* peptide fraction as the most potent on the tested strains of Gram-positive and Gram-negative bacteria and fungi (MIC = 7.8, 15.63-62.5, and 7.8 µg/mL respectively). *Euphorbia hirta* and *Nauclea diderichii* peptide fractions exhibit bactericidal activity (MIC index ≤4, and >3Log10 reduction of initial inoculum in the rate of kill assay) and have a broad spectrum of activity, which further validates their ethnomedicinal use in the management of diverse infectious diseases, including enteric diseases, as well as respiratory tract infections. Generally, the peptide fractions of all the plants were found to be more potent than the crude extracts.

This study established the antimicrobial (bacterial and fungal) potentials of the peptide fractions from these plant species. It also provides evidence for the anti-infective use of these plants in traditional medicine, and the basis for further investigation to isolate and characterize the bioactive peptides responsible for their antimicrobial activities.

Comparative Study Of Antimicrobial Activity Of The Bioactive Fraction And Phytofabricated Silver Nanoparticles Of *Pterocarpus santalinoides* DC.

Amarachukwu Loveth NWADIMKPA (PAU-UI-0491)

Many studies have investigated the antimicrobial activities of various part of *Pterocarpus santaliniodes* DC. but there is limited knowledge about the activity of phytofabricated silver nanoparticles of the leaf extract. Therefore, this study is aimed at comparing the antimicrobial activities of a hexane fraction and the phytofabricated silver nanoparticles leaf of *Pterocarpus santaliniodes* DC.

The fresh leaves of *Pterocarpus santaliniodes* DC. were dried and pulverized. n-hexane (HE), dichloromethane (DE) and methanol (ME) extracts were obtained from 1.5 kg of the pulverized leaves through Soxhlet extraction. Phytochemical screening of the extracts were done according to standard laboratory methods. Antimicrobial activities of 250 mg/mL of each of the extract were carried through agar well diffusion method on *Salmonella typhi, Staphylococcus aureus, klebsiella pneumonia, Escherichia coli, Pseudomonas aeruginosa, Bacillus subtilis* and *Candida albican*. The HE was purified to obtain hexane fractions (HFs). The antimicrobial activities of the HFs were determined using agar diffusion method. Silver nanoparticles were biosynthesized from the most active fraction (HF5) and characterized using colour change, UV-Vis spectroscopy, scanning electron microscopy, fourier transform infrared, energy dispersive spectroscopy. The percent inhibition, minimum inhibitory concentrations (MICs), minimum bactericidal concentrations (MBCs) and minimum fungicidal concentrations (MFCs) of PsAgNPs and HF5 were determined by standard methods. Compounds present in the extracts and HF5 were identified using gas chromatography-mass spectrometry, GC-MS. The binding affinities of selected compounds from the HF5 and reference drugs on the receptor sites of selected bacterial enzymes using Vina dock software were determined.

The qualitative phytochemical screening indicated the presence of terpenoids, saponins, tannins, resins, steroids and fats and oil in the three extracts while flavonoids, carbohydrates and acidic compounds are present both in the ME and DE and reducing sugar, glycosides and proteins present only in ME. The inhibition zone diameter (IZD) of the extracts on selected microorganisms were within 9-12 mm with HE having the better activity (12 mm). The IZD of HFs were in the range 8.5-18 mm with only HF5 exhibiting antimicrobial activity against *S. typhi* (11.5 mm). The brown

colour and UV-Vis spectroscopy at 273 nm and 70.41% relative abundance confirmed the formation of silver ions. The nanoparticles are spherical in shape and of 100 µm in size while the biomolecules present there in are O-H, O=C=O, C=H, C=O, C=C, N-H. The PsAgNPs exhibited a higher percent inhibition (76.98%) compared to HF5 (49.66%), thus, has better antimicrobial activity than HF5 at 1.25 mg/mL. The MIC of PsAgNPs and HF5 on the three organisms are 0.16 mg/mL and MBC/MFCs are >1.25 mg/mL. The binding affinity of isolated compounds like [2-Benzoylamino-3-(4-fluoro-phenyl)-acryloylamino]-acetic acid and Acetamide, 2-phenoxy-N-(4-benzoylaminophenyl) are within the range of -10.4 to -8.4 Kcal/mol which were comparable to the amoxillicin (-10.8 to -8.2 Kcal/mol), clavulanic acid (-7.1 to -6.4 Kcal/mol) and ciprofloxacin (-10.1 to -7.5 Kcal/mol) at drug target sites.

The phytofabricated silver nanoparticles of *Pterocarpus santaliniodes* DC. could be a template for more effective antimicrobial drug discovery.

Phytochemical Analysis, Antioxidant And Antimicrobial Properties Of Two Ipomoea Species Growing In Kajiado County, Kenya

John Ndala WALIAULA (PAU – UI-0490)

The rise in antibiotic resistance has resulted in decreasing number of effective antimicrobial agents available to treat infections caused by a multidrug resistant bacterium thus, necessitating a search for new antimicrobial agents. Among the important medicinal plants in Kajiado County, Kenya, *Ipomoea hildebrandtii* Vatke and *Ipomoea jaegeri* Pilg have proven to be of value especially to local indigenous communities. This study was aimed at evaluating antimicrobial and antioxidant properties of selected the Ipomoea species and characterizing their phytochemical constituents.

The leaves of *Ipomoea hildebrandtii* (IhL), WJN–JKUATBH/001/B–2021 and the roots of *Ipomoea jaegeri* (IjR), WJN–JKUATBH/002/B–2021 selected based on the ethnobotanical survey were macerated separately in *n*-hexane, ethyl acetate and methanol successively at room temperature (19-25^{o}C) and evaluated for *in vitro* antimicrobial activity using disk diffusion assay against *Escherichia coli*, *Salmonella typhi*, *Pseudomonus aeruginosa*, *Staphylococcus aureus*, *Bacillus subtilis*, *Streptococcus mutans* and *Candida albicans*. Norfloxacin, ofloxacin, ceftriaxone, sulphamethoxazole, amoxylclav, nitrofuractoin, nalidixic acid and gentamicin were used as

positive controls while Dimethyl sulfoxide (DMSO) was used as a negative control. DPPH Radical Scavenging assay was used to evaluate the antioxidant activity of the two plants with ascorbic acid as the standard. All the crude extracts were then subjected to phytochemical screening and quantitative estimation, FT-IR analysis and GC-MS analysis for characterization of the bioactive phytoconstituents. Data were analyzed using one-way ANOVA at $\alpha_{0.05}$.

The crude extracts of both the *I. hildebrandtii* leaves and *I. jaegeri* roots showed significant antimicrobial activity. The methanol extract of *I. hildebrandtii* had the best activity with zone inhibition of 15.00±1.00mm, 18.33±0.58mm, 11.33±1.53mm and 12.00±1.00mm against *S. aureus*, *S. typhi*, *C. albicans* and *S. mutans* respectively at 1000mg/mL concentration. The *n*-hexane extract of *I. hildebrandtii* had the best antimicrobial activity against *E. coli* with an inhibition zone of 28.33±0.58mm at 1000mg/mL while the *n*-hexane and ethyl acetate extracts of I. jaegeri had the best activity against *B. subtilis* (20.00±1.00mm) and *P. aueruginosa* (16.00±1.00mm) respectively at a concentration of 1000mg/mL. The ethyl acetate extract of IhL showed the best antioxidant activity against DPPH at IC_{50} of 48.70±1.54µg/mL followed by methanol extract of *I. hildebrandtii* (IC_{50} = 49.77±1.97µg/mL) and then ethyl acetate extract of *I. jaegeri* (IC_{50} of 62.21±1.06µg/mL) which were very good activity when compared with ascorbic acid (IC_{50} = 21.24±0.12µg/mL). With GC-MS, the major compounds identified in hexane, ethyl acetate and methanol extracts of *I. hildebrandtii* were tetratetracontane (73.14%), 9-octadecanamide, (Z)- (30.99%) and 9-octadecanamide, (Z)- (43.09%) respectively while in *I. jaegeri* it was, the 9,12 octadecadienic acid, methyl ester (52.99%), 9,12 octadecadienic acid, methyl ester (16.96%) and 9-octadecanamide, (Z)- (18.79%) for hexane, ethylacetate and methanol extracs resectively. The IR spectroscopy revealed various functional groups such as C=O, C=C, -OH and –COOR which are common to the identified compounds.

Ipomoea hildebrandtii leaves and *Ipomoea jaegeri* roots exhibited significant antibacterial, antifungal and antioxidant properties. Tetratetracontane, 9-octadecanamide, (Z)- identified from *Ipomoea hildebrandtii* and 9,12 octadecadienic acid, methyl ester, eucalyptol identified from *Ipomoea jaegeri* could sever as leads in antimicrobial and antioxidant drug discovery.

Master of Science in Plant Breeding

Effects Of Drought Stress On Growth, Yield, Seed Oil And Protein Contents Of Bambara Groundnut [*Vigna subterranea* (L.) Verdc]

Victor Adelodun DIEKADE (PAU-UI-0458)

Bambara groundnut (BG) is an underutilised leguminous crop grown for its protein and oil rich edible seeds. Although BG is known for its drought tolerance, limited information is available on the critical stage of water deficit and the effects of water stress (WS) on its seed oil and protein contents. This study was conducted to determine the most critical stage of water stress, and assess the effects of water stress on growth, seed yield, and oil and protein contents of BG. Ten accessions of BG with similar flowering dates were evaluated under WS and well-watered (WW) conditions using a split-plot design with three replicates. Water stress was imposed at the vegetative (26 days after sowing -DAS), flowering (37 DAS) and pod filling (58 DAS) stages. Data were collected on growth and seed yield. Seed oil and protein contents were determined using standard methods. Data were analysed using descriptive statistics, correlation and ANOVA. Seven drought indices were estimated from seed yield (SY) and used to classify accessions for drought tolerance. Accessions differed significantly for all traits under the two water regimes at all stages. At all stages, WS had no significant effect on plant height. Across stages, plant height ranged from 15.6 cm (TVSu-2090) to 21.0 cm (TVSu-2). Number of leaves was reduced by 7.5% due to WS imposed at flowering. Imposition of WS at vegetative and flowering stages reduced SY, with the greater effects when imposed at flowering. Seed yield was reduced by 13.8% and 23.0% due to WS at vegetative and flowering stages, respectively. Across the stages, SY ranged from 91.0 kg/ha (TVSu-2093) to 326.9 kg/ha (TVSu-2094) and 95.3 kg/ha (TVSu-2091) to 308.8 kg/ha (TVSu-2094) under WW and WS conditions, respectively. Water stress reduced seed oil content (SOC) by 1.8% and 0.4% at the vegetative and pod filling stages, respectively but an increase of 15.4% at flowering stage. Oil content ranged from 4.7% (TVSu-8) to 7.8% (TVSu-2091) across the stages. At all stages, WS increased seed protein content (SPC), with the highest increase (26.5%) due to WS at the pod filling. Protein content ranged from 16.1% (TVSu-11) to 24.2% (TVSu-2093) across the stages. Accessions TVSu-9, TVSu-2091, TVSu-10, and TVSu-2093 were susceptible, while TVSu-2089, TVSu-2090, TVSu-2, TVSu-2094, TVSu-11 and TVSu-8 were tolerant. Seed yield had significant positive correlation with number of leaves, negative correlation with SOC but not significantly correlated with plant height and SPC under WS conditions. A wide variation exists among the accessions under the water regimes across the stages. Accessions TVSu-

2, TVSu-2094, TVSu-8, TVSu-11, and TVSu-8 had desirable attributes for SY while TVSu-2090, TVSu-2093, TVSu-2091, and TVSu-2 had desirable features for SOC and SPC under WS and are therefore recommended for further improvement programmes. Flowering stage was the critical period of drought stress for growth and seed yield while pod filling was critical for seed oil and protein contents of BG and should be targeted for drought stress evaluation of genotypes.

Validation Of *Striga Hermonthica* Resistance Markers And Identification Of Candidate Genes For Striga Resistance In Selected *Zea Mays* Populations

Efrance NAJJUMA (PAU – UI-0455)

Striga hermonthica is a major biotic constraint to maize production, causing a yield loss as high as 100% under severe infestation. Integration of other control measures with host resistance is an efficient approach for striga management. The use of molecular tools to complement conventional breeding is a promising approach to rapid and cost-effective deployment of striga resistance in maize. The objective of this study was to validate *S. hermonthica* resistance markers previously identified in a GWAS study and identify candidate genes for striga resistance in selected *Z. mays* populations.

A rhizotron experiment using a completely randomized design was carried out in Ibadan, Nigeria in 2021 to screen F_3 genotypes from two populations viz; population 246 and population 247 for striga resistance. The genotypes were phenotyped for striga count, host damage, and plant height and genotyped using 14 SNP markers converted to KASP assay. Single marker analysis using ANOVA, Tukey's HSD, and t-test were used to establish marker-trait association using R software version 4.1.1.

Three markers that were polymorphic between the parents were used for the validation study. Marker S7_173626143 segregated into AA and GG genotypes, however, analysis of the effect of this marker on striga count, host damage, and plant height did not indicate any significant effects. Markers S5_216138908 and S10_4274477 segregated into three genotypes for each marker and the makers differentiated the F_3 progenies based on striga count and host damage.

The results indicate the usefulness of S5_216138908 and S10_4274477 in selecting for striga resistance. For population 246, striga count for haplotypes GGCCCC, GGCCCG, AAAAGG, and GGAAGG were significantly different from the resistant parent thus not useful in striga resistance

selection. For population 247, the striga count for haplotype AAAA was significantly different from that of the susceptible parent and not different from that of the resistant parent, indicating its usefulness in striga resistance selection using striga count indices. Two genes; GRMZM2G113418 and GRMZM2G003762 were associated with markers S5_216138908 and S10_4274477 respectively. GRMZM2G113418 is a regulator protein involved in adaptability to stress whereas GRMZM2G003762 is a stress-related transcription factor in maize. These may be putative candidate genes for striga resistance.

Assessment And Optimisation Of *In Vitro* Culture Techniques For Cleaning Cassava Mosaic Virus From Infected Cassava (*Manihot Esculenta* Crantz) Genotypes

Judith Atieno OBARE (PAU-UI-0457)

Cassava is a staple crop in Sub-Saharan Africa. However, its production is constrained by pests and diseases specifically, cassava mosaic disease (CMD) caused by cassava geminiviruses such as Cassava mosaic virus (CMV). CMV causes yield losses and constraints germplasm exchange between and among countries. Different *In vitro* techniques have been used independently to clean CMV-infected germplasm. However, these techniques have not been optimised for a diverse cassava accession. Heat treatment combined with meristem culture is one of the most widely used techniques because meristems are generally virus-free and high temperatures also inhibit virus replication, thus lowering virus levels in plants. This study assessed and optimised the *in vitro* culture techniques for cleaning cassava mosaic virus from infected cassava genotypes. The experiment was carried out at IITA Ibadan Nigeria from March-August 2021. Visual scoring of CMV was carried out in the cassava field accessions using a scoring scale of 1(no symptom)–5 (severe mosaic symptoms in the entire leaf). Also, molecular virus indexing was carried out using multiplex PCR and RT-PCR to ascertain the presence of virus. CMV-infected cassava accessions from the field were subjected to five *in vitro* techniques for virus cleaning, which included field meristem and nodal culture, screen house meristem and nodal culture, and meristem culture from heat-treated stem cutting at 28 ℃ (6 hours dark) / 38 ℃ (18 hours light) for 2–4 weeks. Data were collected on the number of leaves, roots, internodes per plantlet, plant height (cm), and the number of virus-free *in vitro* regenerated explants. Descriptive statistics were applied to all variables and data were subjected to analysis of variance (ANOVA) using R software version 4.1.0. Significantly

different means were separated using Duncan's New Multiple Range Test at 5 % and 1 % probability levels. After molecular indexing of the field cassava accessions, 46.7 % were CMV-positive while 53.3 % were CMV- negative. A mixed infection of EACMV and CMV was also detected in some of the accessions. The cultured explants regeneration rate reduced across the weeks of culture in all the treatments. However, after molecular indexing of the *in vitro* regenerated explants, heat treatment combined with meristem culture resulted in 100 % CMV-free and 91.7 % EACMV-free plantlets. The *in vitro* regenerated plantlets from the meristems excised from the screen-house plants were 100 % CMV and EACMV free. Plantlets regenerated from the field-nodal culture were 62.7 % CMV and 64.0 % EACMV free. Meristem culture combined with heat treatment cleaning the CMV both in single and mixed infection. Hence, it is more favourable for the production of virus-free cassava plant materials. However, further studies should be conducted to ascertain the survival and regeneration rate of different cassava accessions using a wide array of temperature regimes when subjected to heat treatment.

Genetic Diversity For Hydrocyanide, Carotenoids And Dry Matter Contents And Validation Of Single Nucleotide Polymorphism Markers Associated With The Traits In Cassava (*Manihot Esculenta* Crantz)

Bismark ANOKYE (PAU-UI-0454)

Cassava is the fourth most important crop in the world, playing a key role in food security and income generation, especially in sub-Saharan Africa (SSA). However, most cassava clones cultivated in the region are deficient in micronutrients, most specifically Provitamin A Carotenoids (pVAC) and conventional breeding for new varieties takes about ten years. Application of high-throughput genetic marker screening systems could fast-track the improvement of cassava for desired traits. Therefore, the objectives of this study were to assess the genetic diversity for Total Carotenoid Content (TCC), Dry Matter Content (DMC), and Hydrogen Cyanide Potential (HCN), validate Single Nucleotide Polymorphism (SNP) markers associated with the traits; select genotypes with combined traits. Nine SNPs linked with TCC, DMC and HCN were validated in two cassava populations: HarvestPlus seedling nursery (SN, n=261) and their progenitors (n=23), and University of Ibadan Cassava (UIC) population at the Advanced yield trial stage (AYT, n=76).

Storage roots of the genotypes were evaluated for TCC, DMC, and HCN in the laboratory using standard procedures at 8 (SN) and 12 (AYT) months after planting. Data collected were subjected to marker (Minor Allele Frequency-MAF; Gene Diversity-GD; Heterozygosity-He; and Polymorphic Information Content-PIC) descriptive, correlation, regression, and principal components (PCA) analyses as well as ANOVA at $\alpha_{0.05}$. A high call rate of 96 to 100% was observed across the populations. The MAF ranged from 0.11 to 0.45, 0.00 to 0.41 and 0.00 to 0.50 with averages of 0.25, 0.28 and 0.29 in the AYT, SN and among the progenitors, respectively. The GD varied from 0.19 to 0.50, 0.00 to 0.49 and 0.00 to 0.50 with mean values of 0.36, 0.36 and 0.35 in the AYT, SN and progenitors, respectively. The mean He observed in the AYT, SN and progenitors were 0.41, 0.42 and 0.43, respectively. The PIC ranged from 0.17 to 0.37, 0.00 to 0.37 with averages of 0.29 and 0.27 in the AYT and both SN and Progenitors, respectively. Discriminate analysis of PCA and hierarchical cluster dendrogram using the SNP markers categorized the genotypes into three clusters with 257, 88 and 15 genotypes in clusters 1, 2, and 3, respectively. Variation explained by the first two PCs was 39.1%. Broad-sense heritability estimates were 0.93 (TCC), 0.66 (HCN) and 0.24 (DMC) using BLUE values from the AYT. Of the nine SNPs, significant differences were observed for only markers S1_24155522 and S8_25598183 linked to TCC. 12. While in the AYT favourable allele “A” (S1_24155522) and unfavorable allele “T” (S1_24197219) are segregating, “A” and “T” appear to be fixed for pVAC and DMC, respectively, in the SN population. This explains the negative correlation between DMC and pVAC. Significant marker-trait regression revealed consistent performance of loci S1_24155522 (TCC), S14_6050078 and S16_773999 (HCN), and S1_24197294 (DMC). The level of genetic diversity observed indicates sufficient variation in the two populations thereby revealing the availability of useful and unique alleles that could be exploited in cassava improvement programme. Genotypes that combined high TCC and DMC in the seedling nursery are promising for pyramiding of genes for the two traits.

Evaluation Of *In Vitro* Protocols For Effective Regeneration Of West African *Theobroma Cacao (L)*

Wrojay Bardee POTTER, JR. (PAU–UI-0459)

Cacao is a perennial tree crop from the Malvaceae family and made up of twenty-one species, with *Theobroma cacao* being the commonest and one of the most economically important agricultural commodities globally. West Africa is the largest producing region globally. Lack of availability of healthy planting materials all year round has been a major factor besetting cocoa production in West Africa and has led to a drastic reduction and continue to follow such a trend globally. Also, seedlings obtained *in vitro* can directly be used but the heterozygote nature of cacao seeds produce a high variation among cocoa seedlings. Most local farmers and industries produce their planting materials through conventional nursery practices, which takes longer time for seedlings to reach transplanting stage. Any technique that will help produce large and healthy planting materials within the shortest possible time frame and promote sustainable supply, will go a long way to further boost cocoa production within the region and increase the availability of planting materials. The objective of the study was to determine an effective *in vitro* protocol for the germination of zygote embryos of local West African cocoa varieties using three explant types, including seed with mucilage (SWM), seeds without mucilage (SWtM) and embryo axis (EA). Four West African local varieties of *Theobroma cacao* in the three explant types were cultured on both Driver and Kuniyaki Walnut (DKW) basal salts and Murashige and Skoog (MS) culture media for twenty days. Both media types were supplemented by 30 g/L of sucrose, 0.1 g/L of Myo-inositol, with no growth regulators. Each media was adjusted to pH of 5.7 before adding 7.518 g/L of agar and then sterilized in an autoclave at 15 psi and 121 ℃ for 15 minutes. Cultured plants were kept in a growth room with a temperature of 25 ℃ ±1, relative humidity of 85% and each explant types responded differently. The results of the study showed that SWtM sprouted earlier followed by EA. The lowest mean germination percentage was observed among SWM. The germination inducement by both media varied as DKW induced earlier germination on all explant types than MS, but MS induced the optimal growth performance for mean germination time, final germination percentage, and development of parts of the plantlets. Many of the SWM were contaminated by fungus followed by EA. Also, explants on DKW contaminated faster by fungus than those in MS. Germination continuation after fungus contamination was shown to be possible in the study with

SWtM on DKW performing better than other explants types. Also, DKW supported explant growth regardless of fungus contamination compared to MS media. Seedlings obtained from SWtM (unknown variety) in DKW continued growth even after fungus contaminations were observed. This study suggests that the media for *in vitro* culture of *T. cacao* and the source of explant produces dissimilar effects on the germination of zygotic embryos of *Theobroma cacao* varieties. Overall MS is preferred for lower MGT and development of plant parts, while DKW is preferred for early sprouting.

Master of Science in Reproductive Health

Awareness, Perception And Factors Associated With Antenatal Care Use Among Adolescent Mothers In Ngozi Province, Burundi

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Pregnancy and childbirth complications are the leading causes of death among girls aged 15–19 years globally. Research based evidence has shown that antenatal care (ANC) constitutes one of the best strategies to reverse pregnancy related complications. In Burundi, despite various effort to reduce early and unintended pregnancies among youth and adolescents, the birth rate among the latter remains high. In addition, the maternal mortality among young Burundian girls aged 15 to 24 is one of the highest representing about the quarter (24.1%) of the overall maternal mortality. While ANC is a strong determinant of maternal mortality, there is limited information on the extent to which pregnant adolescents utilize ANC services and factors associated to its use. The aim of this study was to assess awareness, perception and factors associated with ANC use among adolescent mothers in Ngozi, Burundi.

This was a cross-sectional, health facility-based study among 216 adolescent mothers who had given birth within two years preceding this study, using structured questionnaires and notes from previous ANC booklets. Data was analyzed using SPSS version 25.

Only 23.6% adolescent mothers had good awareness while 59.3% had good perception regarding ANC. Regarding ANC use, 64.8% initiated ANC services timely within the first trimester while 57.8% attained the minimum of four recommended ANC visits. Marital status (p=0.001), geographical location (p=0.007), occupation of the partner (p=0.002), type of the index pregnancy (p=0.011), household head (p=0.013), perception (p=0.001) were associated with ANC initiation within the first trimester while marital status (p=0.000), respondent's employment (p=0.007), type of the last pregnancy (p=0.000) and household head (p=0.005) were associated with appropriate ANC frequency (at least four ANC visits). Majority of adolescent mothers had poor awareness about ANC and its importance and this reveals the need for health education to raise awareness about ANC. Provision of health education would focus on creating awareness about the overall importance and benefits of ANC services amongst all women including adolescent girls and mothers. Besides, timely initiation of ANC is important for good maternal health and allows appropriate ANC frequency. Therefore, interventions should focus on addressing other underlying issues associated with late ANC attendance. This could include promoting social support towards adolescent mothers both in the community and health facilities. In addition, future studies focusing

on ANC utilization among adolescent mothers should include adolescent mothers based in the community.

Perception, Attitude And Factors Associated With The Intention To Utilize Cervical Cancer Prevention Strategies Among Pregnant Women In Ibadan

Odinaka Benardette ANI (PAU-UI-0444)

Introduction: Cervical cancer is the second commonest cancer among women in Nigeria, with an age standardized incidence rate (ASR) of 29.0 per 100,000. One-third of all cervical carcinomas occur during the reproductive period. Cervical cancer can be largely prevented with adequate human papillomavirus vaccination, efficient screening methods as well as capacity to treat premalignant and early malignant lesions. Though, studies have investigated different aspects of prevention methods of cervical cancer in Nigeria, but only few of them attempted to investigate the spectrum of preventive strategies within a cohort of women. This study attempts to investigate the perceptions, attitude and factors affecting intention to utilize preventive methods of cervical cancer.

Method: A mixed method study consisting of quantitative cross-sectional and qualitative designs was used to assess perception, attitude and factors associated with intention to utilize cervical cancer prevention strategies among pregnant women and their partners in three facilities in Ibadan, Nigeria. An interviewer administered questionnaire made up of five sections and an in-depth interview guide were used to collect data. Descriptive quantitative statistics were summarized and presented in frequency distribution table, mean, standard deviation, charts and figures. Multinomial logistics regression, Odds ratio and confidence interval were used to investigate association between variables. Quantitative data were entered, and analysed with Statistical package for social sciences, SPSS version 20.0. Statistical significance level was set at $p < 0.05$. Thematic analysis was used to analyze the qualitative data manually.

Results: Of 344 pregnant women that participated in the cross-sectional study, a third (34.3%) were aged 25-29 years; 35.8 of the respondents had a poor knowledge of HPV, while 61.1% had a poor knowledge of cervical cancer; 43.3% of the participants had never heard of HPV and 83.3% of the women do not think cervical cancer is preventable. Further, only 41.3% stated they may be willing to take HPV vaccination while 52.9% stated they plan to do a cervical cancer screening. In

addition, 82.6% have not taken or had anyone take vaccination in their family. The highest proportion of the participants (76.2%) stated that detection of body non-functionality will influence their intention to utilize secondary cervical cancer screening or prevention strategies while 47.7% of the participants stated that distance to the healthcare facility will deter them from utilizing cervical cancer preventive strategies. The multinomial logistic regression showed a significant association between awareness of HPV Vaccination and plan for HPV vaccination aOR 0.32 CI (0.14 – 0.76); willingness to pay for HPV vaccination aOR 0.44 CI(0.21 – 0.96); willingness to encourage a family members uptake of HPV aOR 0.22 CI (0.10 – 0.46); plan for cervical cancer screening aOR 0.24 CI (0.11 – 0.53); willingness to pay for pap smear aOR 0.26 CI (0.12 – 0.56) and willingness to encourage family member to take pap smear aOR 0.38 CI (0.19 – 0.79).

Conclusion: Knowledge and awareness of cervical cancer and HPV was found to be generally low among respondents, with diverse factors mitigating against utilization of preventive measures, hence the need to increase awareness and knowledge of cervical cancer preventive measures.

The Impact Of Wartime Sexual Violence On Women In The Kasai Central Democratic Republic Of Congo

Ruth LUABEYA (PAU-UI-0448)

Sexual violence remains a global concern from low- and middle-income countries, with the highest occurrences in Africa. In conflict situations, sexual violence is used as a weapon to conquer and destroy the community or to achieve a particular political purpose such as land exploitation. The damage to cultural and community life wrought by the use of sexual violence in warfare can persist for generations. Long-term psychological damage and ongoing suffering mean that such violence affects not only the immediate victim but also her children and grandchildren, family, extended family, and community life. For the last 25 years, systematic rapes and punitive violence against women in the Democratic Republic of the Congo were used as weapons of war and a control strategy. This study aimed to investigate the impacts of physical and psychosocial determinants of sexual violence against women during the *KamuinaNsampu*war in Kasai Central province of DRC. Descriptive mixed-methods sequential explanatory design involving recorded data at the complex hospital and interview of female victims of rape during kamuinaNsampu war in the Kananga. Descriptive and inferential statistics were performed using Chi-squared and logistic regression test

for quantitative analysis and the grounded theory for qualitative data. A total of 463 recorded cases were retrieved for analysis with a prevalence of 2.9 in 2017 with 62.4% of the victims being from Nganza while laceration or vaginal tear (52.3%) and haemorrhage (30.7%) were the common complications. A smaller percentage of women reached the hospital at the right time and the delay was justified by ignorance of treatment (56.6%). Most of the participants were rejected by their husbands as well as their family members.

This study highlighted the problems experienced by women victims of rape during the war period and these victims were adversely affected both physically and psychologically. The women victims were also marginalized and no longer have any dignity or place in the society but live under very difficult conditions. Hence the urgent need to support them.

Master of Science in Reproductive Biology

The Association of Seminal Parameters with Seminal Plasma Copper and Magnesium Levels in Adult Males in Ibadan Oyo State, Nigeria.

Qozeem Ojo UTHMAN (PAU-UI-0452)

Infertility has been confirmed to be the disease of reproductive system characterized by the inability to achieve a clinical pregnancy after a year of unprotected sexual activity. Infertility has been documented to have a high prevalence throughout the world, that male factor infertility accounts for about 30-55% of infertile couples. Human seminal fluid consists of high concentration of some trace elements such as sodium, magnesium zinc and copper in ionic form and bound form. These elements play some important roles in affecting various semen parameters. They are required to meet up the physiologic balance of organism, they could also act as cofactors in enzymatic reactions. Several reports have documented the association of seminal plasma of trace elements with semen parameters but with conflicting data. The aim of this study is to investigate the associations of seminal parameters with seminal plasma copper and magnesium levels in adult males in Ibadan Oyo state Nigeria.

In this case control study there are two groups, the control group (normal semen parameters) and the case group (abnormal semen parameters), fresh semen samples were used from 94 men recruited (both abnormal and normal semen groups in totals) and referred to the Seminology Laboratory in UCH for routine infertility evaluation. Semen analyses were performed according to the World Health Organization 2010 (WHO) guidelines. The seminal plasma magnesium and copper were detected using atomic absorption spectrometer. A total of 94 subjects participated in this case control clinical study. Among the participants, 47 had records of normal semen parameters and 47 had one or more abnormal sperm parameters. This data also revealed there was an association between seminal plasma copper and magnesium with normal and abnormal semen parameters ($p = 0.00$). low level of copper and magnesium were detected in client with abnormal semen parameters while normal levels of copper and magnesium were recorded in control group being referred to UCH for seminal fluid analysis (SFA) Meanwhile, this study did establish an association between the seminal plasma magnesium and copper levels and semen quality.

Seminal Plasma Fructose And Citric Acid Concentrations Relative To Sperm Parameters Among Men For Fertility Evaluation In Yaounde, Cameroon

Bih TANNI (PAU-UI-0451)

BACKGROUND: Concerning infertility amongst couples, the male factor contributes to almost half of the reported cases and given its pluri-etiological nature, thorough examinations are needed for its evaluation. Fructose and citric acid are simple biomolecules, easy to assay, which provide reliable information on the seminal vesicles and prostate, respectively: key organs for male fertility. This study aimed to compare the fructose and citric acid levels in men undergoing fertility evaluation and determine the relation between these markers and sperm parameters.

MATERIALS AND METHODS: We conducted a prospective cross-sectional study where 79 consenting adult (≥21years) participants were recruited consecutively among those presenting for semen analysis at Laboratoire d'Excellence. The recruitment began on the 1st of July 2021 till 21st of August 2021. After collection, spermogram test and sperm cytogram analysis were performed according to WHO's 2010 Recommendations, after which semen samples were stored at -20°C. Seminal fructose and citric acid levels were later determined by colorimetric absorbance technic using the Fructose-Sperm 360®, Citric acid-sperm® respectively and an absorbance microplate reader. Statistical analyses were performed using IBM SPSS-24.0 software where variables were compared using the Mann Whitney test and Spearman correlation. Significant statistical difference was considered at $p < 0.05$.

RESULTS: There was no statistically significant difference between fructose and citric acid levels in men with normal and abnormal sperm parameters ($p > 0.05$). No statistically significant difference was obtained between the biomarkers and primary and secondary infertile men with abnormal sperm parameters. However, relatively lower fructose and citric acid levels were observed amongst asthenozoospermic (5.3mg/ml) and cryptozoospermic (5.7mg/ml) men respectively. A significant positive relationship was observed between both fructose and citric acid levels, and volume ($r= 0.663$, $p= 0.001$ and $r=0.319$, $p= 0.004$ respectively).

CONCLUSION: These biomarkers secretions can serve as markers of the state of their respective glands and hence play a vital role in the investigation of male infertility.

Prevalence Of Genital Chlamydia Infection Among Women Of Reproductive Age Attending Outpatient Clinics At Kisumu County Referral Hospital, Kisumu, Kenya, 2021

Martha Nyairabu NYAKAMBI (PAU-UI-0450)

Chlamydia trachomatis is one of the most prevalent bacterial sexually transmitted infections (STIs) in the world. Genital chlamydia infection is undetectable because it is asymptomatic. The disease is not well characterized among women, 18 to 49 years old, in Kenyan population. In women, the disease causes infertility, ectopic pregnancy and Pelvic Inflammatory diseases (PID) if left untreated. This study was conducted at Kisumu County Referral Hospital, Kenya. A total of 385 women met the eligibility criteria, and filled the electronic questionnaire after consenting. The women then provided vaginal swab samples which were tested for *Chlamydia trachomatis* using Chlamydia rapid diagnostic test kit (RDT).

A total of 29 (7.5%) patients tested positive for the disease, and they were given medication. Out of 385 participants, 65.2% were 18-25 years, with a prevalence of 5.7%. Self-collection of the vaginal swab was the most acceptable form of sample collection (99.7%) compared to the collection by the health worker (0.3%). The predisposing risk factors included multiple sexual partners, Upper Tract Infections (UTIs) and coinfection with other Sexually Transmitted Infections (HIV, Gonorrhea and syphilis). There was a considerable knowledge gap about genital Chlamydia infection among the women. It was recommended to use Chlamydia rapid test kits as a diagnostic tool since it uses invasively acquired samples, and can be used to screen a large number of participants with the provision of a-same-day result and treatment if required.

Master of Science in Sport Management and Policy Development

Personality Typology As Predictor Of Sports Performance Among Senior Secondary School Football Players In Selected Schools In Lagos State, Nigeria

Ebubechukwu Assumpta ORJI(PAU-UI-0494)

This study explored personality typology as predictor of sports performance among senior secondary school football players in selected schools in Lagos state, Nigeria.

The study utilized a descriptive research design of the correlation type and involved 150 senior secondary school football players between 15 to 20 years and 15 coaches in 15 schools. Multistage sampling method of simple random, purposive, and cluster sampling techniques were used in selecting the football players from each school. Myer-Briggs personality type questionnaire was administered to the players to obtain their personality types, while the performance rating scale was administered to the coaches to obtain the football performance of the players. Descriptive statistics of frequencies and percentages and inferential statistics of Pearson product moment correlation, multiple regression, and independent t-test were employed.

It was found that majority of the high school football players had dominance of extroversion, intuition, feeling, and judging personality types. Moreover, energy personality types of introversion (r=0.495, $p<0.05$) and extroversion (r=0.441, $p<0.05$), nature personality type of sensing (r=0.236, $p<0.05$), mind personality type of thinking (r=0.448, $p<0.05$) and feeling (r=0.216, $p<0.05$), and tactics personality type of perceiving (r=0.221, $p<0.05$) independently tested significant on the football performance of the players, while intuition (r=0.043, $p>0.05$) and judging (r=0.140, $p>0.05$) for nature and tactics personality types respectively did not. In addition, there were joint and relative predictions of energy personality types of introversion and extroversion on football performance. Sensing and intuition of nature personality types had joint prediction but only sensing had significant relative prediction on football performance. Thinking and feeling of mind personality types had joint prediction but only thinking had a significant relative prediction on football performance. Tactics personality types of judging and perceiving had a joint prediction, but only perceiving had a significant relative prediction on football performance. It was further found that, there was no significant difference in personality types between male and female secondary school football players.

In conclusion, most of the secondary school football players had combination of extroversion, intuition, feeling and perceiving personality types. Also, the personality types of introversion,

extroversion, sensing, thinking, feeling, and perceiving are respectively the predictors of sports performance among secondary school football players.

Socio-Cultural And Administrative Factors As Determinants Of Sports Participation Among Female Undergraduates In Abuja Universities

Helen Soala TOBIN-WEST (PAU–UI–0492)

Sports participation provides many positive physiological and physical outcomes for girls and young women. However, there are several significant barriers that discourage them from participating in sports and physical activities. The promotion of female sports participation can help create a context for women to live healthier and productive lives. This idea can only be realized at universities if they had a proper understanding about the constraints that impede the female students participation in campus-based sports and physical activity. Thus, the objective of this study was to assess the level of sports participation among the female undergraduates in Abuja universities and to identify the socio-cultural and administrative factors that determine their participation in campus-based sports and physical activity.

The study utilized the descriptive survey research design of correlational type. The study involved one thousand two hundred and fifty-two (1252) Nigerian female undergraduates residing in halls of residence within the universities used for the study. A self-developed questionnaire titled "Socio-cultural and Administrative Factors Questionnaire on Sports Participation" was used to collect relevant data for the study. To establish the reliability of the instrument, the test re-test method was employed whereby copies of the questionnaire were administered to thirty (30) female undergraduates who were not part of the study at an interval of two weeks. The results obtained from the two tests were correlated using Cronbach alpha and a reliability coefficient of 0.77 for socio-cultural factors and 0.86 for administrative factors was obtained which was considered high enough for the study. Descriptive statistics of frequency count, percentages, graphs, and charts and inferential statistics of chi-square and logistic regression was used to determine the relationship between the socio-cultural and administrative factors and sports participation of the female undergraduates and to highlight their sports participation level. The Statistical Package for the Social Sciences (SPSS) program version 26.0 for Windows was used for all analyses.

For the level of sports participation, the study results revealed that majority of the female undergraduates in Abuja universities participate in sports and physical activity. Additionally, significant difference exists in sports participation among female undergraduates within and between the universities in Abuja and between Muslims and Christians, but no difference was found in terms of Level of study. However, the differences within each university and religion were driven by differences that showed up at the levels of study. This was attributed to the administrative structures in each university and the restrictions religion place on sports practice for females.

Furthermore, the study results revealed that administrative factors determine the sports participation of female undergraduates in Abuja universities. Among the administrative factors, time allocated for sports programs was a good predictor of sports participation, $\chi^2(1) = 3.871$, $p = .049$, whereas campus environment and availability/suitability of sports facilities were not good for predicting their sports participation, $\chi^2(1) = 1.364$, $p = .243$. The results also indicated that none of the socio-cultural factors were determinants of sports participation. Therefore, socio-cultural factors alone do not determine sports participation of female undergraduates in Abuja universities. However, assessing socio-cultural and administrative factors together as a single construct showed that both factors significantly determine the optimal sports participation of female undergraduates in Abuja universities because they help to differentiate (by about 5.5%) between female undergraduates who participate in campus-based sports and those who do not participate.

Based on these findings, it was recommended that comprehensive review should be done on the school calendar for better scheduling to accommodate sporting activities. There is also a need for more female sports administrators in the universities to take care of women sports.

Socio-Economic Factors, Nutritional Knowledge And Dietary Habits Of Athletes In Ghana

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Nutrition is an essential component in achieving optimum sports performance as well as athletes' good health. There is, therefore, a need to make deliberate efforts to understand and provide appropriate and accurate nutritional information to enable athletes make suitable dietary choices for long-term health and achievement of sports goals regardless of their socio-economic status. Thus, the objective for this study was to examine the relationship between socio-economic factors, nutritional knowledge, and dietary habits of athletes in Ghana.

A quantitative method and description survey of the correlational type was used to investigate the socio-economic factors, nutritional knowledge, and dietary habits of 219 athletes participating in football, hockey and basketball across three (3) regions in Ghana. An adapted Dietary Habits and Nutritional Knowledge Questionnaire (Paugh, 2005) was used for data collection. Data collection was carried out in strict adherence to COVID-19 guidelines. The relationship between socio-economic factors, nutritional knowledge and the dietary habits of athletes was tested at 0.05 level of significance. Tests for correlations were used to determine the relationship each of the factors and the dietary habits of athletes. The Statistical Package for the Social Sciences (SPSS) program version 21.0 for Windows was used for all analysis.

The study results revealed the mean score of athletes for nutritional knowledge was 80.52±16.02 (69.42%) and 37.11±4.44 (66.26%) for dietary habits, which are classified as fair on the score chart for both indices. Undergraduate (n=117, 62.2%) was the average level of education of the athletes; only 1 athlete had no form of education. Most of the athletes (73.5%) earned less than GHS 1000 (<USD 200) as their monthly income. A significant positive relationship was found between the type of sport and dietary habits ($p = 0.002 < 0.05$), with basketball players having the best scores for dietary habits. Athletes BMI correlated positively with their dietary habits ($p = 0.009 < 0.05$). There also existed a positive relationship ($p = 0.003 < 0.05$) between gender and dietary habits. However, neither socio-economic level nor the athletes' level of nutritional knowledge had a significant relationship with the dietary habits of the athletes. Additionally, assessing Socio-Economic Status (SES) and Nutritional Knowledge together as a single construct did not explain dietary habits, showing no significant relationship with the dietary habits of the athletes.

In conclusion, the study findings suggest that possessing nutritional knowledge did not necessarily translate into good dietary practices and that the current athletes' dietary habits is influenced by the interaction of many demographic and environmental factors. Thus, further exploratory studies on the motivators for adoption and practice of good dietary habits are needed in help improve the dietary habits of Ghanaian based athletes.

Master of Science in Veterinary Medicine (Vaccine Production and Quality Control)

Pre - And Post-Vaccination Detection And Qualitative Assessment Of Rabies Virus Antibody Among Domestic Dogs In Some Communities In Plateau State, Nigeria

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Rabies is a vaccine preventable zoonotic viral disease which can be 100% fatal at the onset of clinical sign. Rabies is caused by neurotropic viruses of the genus Lyssavirus. Rabies virus is a single stranded, negative sense RNA virus which infects most warm-blooded animals, including humans while dogs, wild carnivores and bats are the known natural reservoirs. Although rabies is prevalent worldwide and endemic in Asia and Africa accounting for about 56% and 44% of human death respectively, the disease is poorly reported. The WHO recommends 70% vaccine coverage for effective control of dog rabies. The determination of antibody status of dog pre and post vaccination is important for monitoring success of vaccination programmes. The aim of this project was therefore to conduct the pre-and post-vaccination detection and qualitative assessment of Rabies virus antibody among domesticated dogs in some communities in Plateau State, Nigeria. In this study, 45 domesticated dogs from eight communities within Jos South and East were sampled. 90 sera samples were collected, 45 pre-vaccinations, while 45 was collected 2 weeks post-vaccination from the same set of dogs. Serology was carried out using commercially acquired IgG (Dog) ELISA kit from Demeditec® Diagnostics GmbH, Germany for the determination of IgG antibodies against rabies virus in the samples.

The result revealed that, 80% (36) positive rabies IgG and 20% (9) negative rabies IgG were detected in pre-vaccinated serum sample across the communities. It also revealed a significant increase in the positive rabies IgG post vaccination by 96 % (43) while 4% (2) were negative. Out of the 8 LGAs, dogs in 7 LGAs (90%) showed significant ($p \leq 0.05$) increase in positive (≥ 0.34) rabies antibody titre while 1 LG (10 %) showed level of antibody titre below < 0.34 and was considered negative.

There should be thorough rabies investigation and strengthening of surveillance systems, with focus on early detection especially in the rural areas where the disease could potentially spread. Public enlightenment and vaccination programmes should be conducted periodically with the aim of mitigating the spread of rabies virus. In conclusion, rabies virus is still endemic and circulating within Jos South local government area and this further indicates that there is a potential risk of spread to human population and to rabies-free dogs. Thus, continuous rabies surveillance and

regular rabies vaccination in dogs is an effective preventive and control measures to mitigate the spread of the disease.

Assessment Of The Antigenic Relatedness Of Six Foot And Mouth Disease Virus Strains Isolated From Cattle In South Africa Compared To A Vaccine Reference Strain

Oluwatobi Esther AGBETUNSIN (PAU – UI-0483)

Foot-and-mouth-disease (FMD) is an extremely contagious transboundary animal disease of cloven-hoofed animals, which reduces productivity of livestock and causes significant economic losses. There is no cross protection between FMD serotypes and protection conferred by vaccines even of the same serotype is sometimes limited. Therefore, determining the antigenic relatedness or vaccine match of the post-vaccinal sera and selected FMD strains that caused the 2019 outbreak in South Africa will provide an indication of whether the new FMD vaccine produced at the Agricultural Research Council, Onderstepoort veterinary research (ARC-OVR), South Africa will provide sufficient protection against the prevalent FMD SAT 2 strains. The objective of this study was to determine the efficacy of the homologous FMD vaccine produced at the ARC-OVR, against the recent FMD SAT2 field strains.

All FMD strains used were retrieved from the FMD virus repository of the OIE Reference Laboratory at the Transboundary Animal Disease Facility of the ARC-OVR. The FMD virus strains of interest, SAR1/01/2, SAR15/13/2, SAR1/03/2, ZIM2/13/2, KNP12/08/2, and SAR1/13/2, were propagated on BHK 21 strain 38 suspension cells, and the pentavalent FMD vaccine produced by the ARC-OVR was used for this study. The 146S particle for each of the individual antigens was determined using sucrose gradients. Solid phase competition ELISA and Reverse transcriptase PCR were performed, PCR products were sequenced, and phylogenetic trees were constructed to determine the antigenic relatedness and suitability of the ARC-produced FMD vaccine against the prevalent FMD SAT 2 field strains.

Based on the phylogenetic trees in this study the, SAR 15/13/2 and SAR 1/13/2 are the closest to the ARC-OVR vaccine strain followed by SAR 01/01/2, KNP 12/08/2, ZIM 02/12/2, and SAR 01/03/2 in that order. The SAR 01/03/2 is the least related to the ARC-OVR vaccine strain; however, the ARC-OVR vaccine still confers protection since its r1-value is between 0.4 and 1 based on the OIE cut-off.

In conclusion, the FMD virus vaccine produced by the ARC-OVR is highly genetically related to the six FMD virus field strains used in this study and is thus protective against them. This would in turn allow timeous distribution of an effective vaccine (the ARC-OVR vaccine) for disease control in an outbreak situation involving any of these six FMD virus strains. Further studies on more FMD SAT2 strains are

required to help control and combat FMD in the event of an outbreak with FMD virus strains other than those in this study.

Evaluation of PPR Monoclonal Antibodies in Immunofluorescence For Rapid Quality Control of Peste Des Petits Ruminants (PPR) Vaccine

Habeeb Ayinde OYEDELE (PAU-UI-0484)

Peste des petits ruminants (PPR) is an acute viral disease of small ruminants with morbidity and mortality rates as high as 90% and 100% respectively. Vaccination using a homologous live-attenuated vaccine is the main control strategy available in endemic countries, and ensuring the quality of these vaccines is of utmost importance for PPR control. Currently, the quality control test to determine vaccine potency is the tissue culture infectious dose ($TCID_{50}$) assay, which involves titration on Vero cell line and reading the cytopathic effect (CPE) using light microscopy. The final reading of CPE takes as long as 2 weeks, which is quite time-consuming. In this study, an indirect immune-fluorescent antibody test (IFAT) was evaluated for PPR vaccines potency testing. Accuracy and repeatability of the IFAT were also determined. Six PPR vaccine batches were produced and tested simultaneously by CPE reading and the IFAT. Vero cells were seeded in 96-well plates, and infected with 10-fold serial dilutions of the vaccines. Cytopathic effects were read continuously from day 3 to 14 after infection, and titers expressed in $TCID_{50}$/ml. From 3 to 7 days post-infection, cells were fixed, incubated with anti-N and anti-H monoclonal antibodies, and stained with a secondary antibody labeled with a fluorescent tag. Fluorescent foci of infection were detected using a fluorescence microscope, and titers were calculated as $TCID_{50}$/ml. From day 4, the IFAT gave similar results to CPE readings of day 14 (intraclass correlation coefficient = 0.957, $P<0.0001$). Also, no differences were observed in the results for the two monoclonal antibodies (intraclass correlation coefficient = 0.910, $P<0.0001$) indicating that both are equally sensitive and rapid.

The IFAT is well-suited for potency testing of PPR vaccines as it saves time and minimizes analyst-related variability associated with observation of CPE. This is a significant three-fold reduction in time and can used for rapid PPR vaccine potency evaluation.

Master of Science in Veterinary Medicine (Avian Medicine)

Antimicrobial Resistance of *Escherichia Coli* Isolates from Chickens in Northern Province of Rwanda.

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E.coli, a commensal facultative microflora in animals and human. Antimicrobial resistance (AMR) is a global public health concern due to inappropriate antimicrobial-use in humans and animals including poultry. Enormous economic losses due to reduced productivity of animals that have infectious diseases caused by bacteria that are resistant to antibiotic leading to negative impact on food insecurity. However, data on AMR are limited in Rwanda. *Escherichia coli* have been proposed as one of the pathogens to be used for AMR surveillance. The goal of current study was to determine the antimicrobial resistance of *E. coli* in chickens in Northern Province of Rwanda.

A cross-sectional study was conducted between June and August 2021; the chickens were randomly selected in each the twenty farms that were included in the study. The target was farmers with more than ten chickens. The samples were collected from cloaca and from farm environment. *E.coli* was isolated and identified and antimicrobial susceptibility testing was done using disc diffusion method. The results were defined as resistance(R), susceptible(S) and intermediate (I). After Data processing, they were entered in Microsoft Excel for analysis. The data were presented as frequencies and percentages.

In total, 384 samples were collected (139 in Gakenke, 114 in Rulindo and 131 in Musanze Districts). *E.coli* was isolated from 162(42.18%) among which 40 (24.7%) were from Musanze District, 57(35.2%) from Gakenke District and 65 (40.1%) were from Rulindo District. The highest resistance was observed for tetracycline (69.8%) followed by cotrimoxazole (39.5%). The highest susceptibility was observed for gentamycin (100%) followed by ciprofloxacin (96.9%) and amoxicillin (66%).

This study indicated the presence of *E. coli* in chickens of Northern Province of Rwanda and a large number of antibiotic resistant *E. coli* were isolated. Therefore, the government should set policies to control the use of antibiotics in farms.

Prevalance and Antimicrobial Resistance of *Escherichia coli O157:H7* Isolated from Local Chicken in Live Bird Markets in Marodi-jeh Region, Somalia

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Poultry production is a major and fast growing source of food in the world today. Escherichia coli are considered as a member of the normal micro flora of all warm blooded animals including poultry. Escherichia coli has been identified as a food borne pathogen. The use of antimicrobials in poultry production for growth promotion, largely contributes to high resistance to antimicrobial agents. In Somalia, particularly Maroodi-Jeh region there are no records on the prevalence and antimicrobial susceptibility of E.coli. The aim of this study was to determine the prevalence of E.coli and its antimicrobial susceptibility pattern in local chickens.

A Cross sectional study was undertaken from February to August, 2021. A total of 384 cloaca swab samples were collected chickens, Standard cultural, biochemical, and serological (latex agglutination) methods were used to isolate E. coli. Out of the 384 cloacal swabs examined, 112 (29.2%) were positive for E. coli, thus, the overall prevalence of E. coli in Moradijeh was 112 (29.2%). Out of the 29 growers sampled, nine (31%) were positive for E. coli and out of the 355 adults, 103 (29%) were positive. Also, out of the 103 males sampled, 11 (10.7%) were positive while out of the 281 females, 101 (35.9%) were positive. the source of the chickens, out of the 191 sampled in Xisbi market, 31 (16.2%) were positive, while out of the 193 sampled in State haw market, 81 (42%) were positive. The results indicates that out of the 112 E. coli isolates, 69 (61.6%) were positive for E. coli O157:H7. The 69 E. coli O157: H7 isolates obtained in this study were subjected to antibiotic susceptibility test using ten different antibiotics.

Sixty-six isolates demonstrated resistance to various combinations of the antibiotics. The antibiotics to which the isolates demonstrated resistance the most are chloramphenicol (48 isolates) and tetracycline (29 isolates) while three of the isolates were sensitive to all antibiotics used. In conclusion the study showed 29.2% prevalence of E. coli and 17.97% prevalence of E. coli O157:H7 in Marodi-Jeh region of Somaliland. Also, revealed the presence of antimicrobial resistant isolates of E. coli O157:H7. It recommended that Antibacterial sensitivity test should be carried out before treatment due to expected emerging resistance and to avoid economic losses due to improper treatment.

Seroprevalence and Molecular Detection of Infectious Laryngotracheitis Among Poultry Western Amhara Region, Ethiopia

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Introduction: Ethiopia has a huge avian population both domestic and wild birds distributed throughout the countryside which upholding 60% of the total chicken population in East Africa. However in Ethiopia, only *Gallus domesticus*, or domestic fowl domesticated with the chicken population breed profile 94.3%, 3.21% and 2.49% of the poultry population to be indigenous, hybrid and exotic, respectively. The aim of the current study was to estimate the seroprevalence and molecular detection of infectious Laryngotracheitis (ILT) virus of poultry population in North, central and West Gondar zones, Ethiopia.

Methods and materials: Therefore, a cross sectional study was conducted from January 2021 to July 2021. In total 360 blood samples were collected for seroprevalence with random sampling. And for molecular detection 64 duplicated tracheal swab samples were collected with purposive sampling technique from intensive farms and individual house of yard chicken on the selected district of each zone. Serological exanimation was conducted with ID.vet innovative diagnostic indirect ELISA kit, whereas molecular detection was done using convectional PCR on larynigotrachea swab samples.

Results: The overall prevalence of ILT in this research was 10.27% and based on each of indigenous breed of chicken recorded 11.7% and in exotic breed showed 8.9%. Among six different districts, the indigenous breed showed maximum result of ELISA (20%) at Maksegnit and Buhona. Also in exotic breed detected the highest prevalence (13.3%) was in Metema and Chilga. The molecular detection indicated from 32 samples of molecular analysis, six (18.1%) were positive. Generally, the current study revealed that ILT virus exists in Ethiopia. The ILT molecularly detected for the first time and it confer the ELISA result the current and the previous research work.

Conclusion: There for based on the molecular and seroprevalence result this disease is found in Ethiopia. Finally, I suggest that further molecular sequencing of DNA for ILT virus and identifying virus strain in the field to develop vaccination protocol in the country.

Ameliorative Effects Of Naringin On Experimentally Lead Induced Toxicity In Cockerel Chicks.

Chinomso Gift EBIRIM (PAU-UI-0478)

Lead is a ubiquitous environmental contaminants found in the air, water, and soil in both urban and rural environments, and consequently wild birds get exposed either by ingesting lead pellets or by preying on dead birds killed by lead ammunitions. Main sources of lead are the environment and these gets to domestic birds mainly due to anthropogenic activities, wind carrying dust and water runoffs and erosions. Lead contamination is usually transferred to food animals through direct or indirect exposures, and mostly through the deposition of contaminants in soil and aquatic environment from emissions and human activities. Naringin a flavonoid is a medicinal plant that has been documented to have metal chelating properties and also has antioxidant, anti-inflammatory, anti-apoptotic, hepatoprotective, and nephroprotective properties. The ameliorative effect of naringin on lead induced toxicity in cockerel chicks was investigated. Thirty-six-day old chicks were grouped into six groups. Group A was the control group in which poultry feed and water was given *ad libitum* only, Group B was exposed to Lead acetate (3.00ppm) only via drinking water. Groups C and D were exposed to Lead acetate via drinking water and were treated with Naringin at 80mg/kg and 160mg/kg, respectively, via oral gavage for 8 weeks. Groups E and F were administered on only naringin at 80mg/kg and 160mg/kg respectively. They were all exposed and treated for a period of 8 weeks. Also, blood was collected for hematology, weight, blood pressure and ECG was recorded. In the Lead exposed group, there was evidence of increased oxidative stress markers as, significant increases in the content of lipid peroxidation product (malondialdehyde; MDA) and hydrogen peroxide (H_2O_2) generation, myeloperoxidase (MPO) activity, together with significant decreases in the activities of glutathione peroxidase (GPx), glutathione S-transferase (GST), Superoxide dismutase (SOD), and the content of reduced glutathione (GSH). Also, we observed decrease in serum total protein (TP) and nitric oxide (NO) in Lead exposed group (Group B). However, there was significant improvement in cellular activity of the antioxidant defense enzymes with concomitant decrease in markers of oxidative stress in chicks co-treated with naringin (80 mg/kg and 160 mg/kg), in a dose-dependent fashion. Furthermore, marked decrease in body weight and hematology parameters that's the RBC, Hb, PCV, was observed in the Lead exposed group (Group B), which indicates anemia which is one of the major effects of Pb toxicity, also using the MCV, MCH and MCHC the anemia was

classified as microcytic, hypochromic meanwhile appreciable improvement was observed in birds co-treated with naringin which suggests that Naringin was able to restore the hematological anomaly. Additionally, in the Lead exposed group, there were significant increase in systolic, diastolic, and mean arterial pressure in comparison to birds co-treated naringin, furthermore the ECG showed increase in heart rate in the lead exposed group though not significant. The recorded high blood pressure parameters were normalized relative to the control group (normotensive birds). Immunohistochemistry showed higher expression of TNFα, Caspase3, NGAL, cardiac troponin, and angiotensin converting enzyme (ACE) in Lead exposed group. This is indicative of inflammation, apoptosis and cellular injury, renal and cardiac damage, together with hypertension. Furthermore, hepatic necrosis and testicular was also evidence as revealed by immunostaining of the liver and testes, respectively. However, the aforementioned immuno-positive reactions were modulated and ameliorated following naringin co-administration. Therefore, the present study highlighted the protective effect, ameliorative potentials and antioxidant properties of Naringin in Lead-induced toxicity and its associated organ damage. Taking together, naringin as a metal chelating agent could be as a toxicant binder in poultry feed, antioxidant, and anti-stress in drinking water.

Doctor of Philosophy in Petroleum Geoscience

Joint Inversion and 3D Modeling of Gravity, Magnetic and Borehole Data for Hydrocarbon Potential Evaluation of the Nigerian Sector of the Dahomey Basin

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The petroleum prospect of the Nigerian sector of the Dahomey Basin has been well defined in terms of availability of source and reservoir rocks. However, there is dearth of information regarding the basement architecture and structural framework that could support hydrocarbon generation and preservation within the reservoirs. This study aims to generate 3D subsurface model (consistent with a priori geological information) of the basin using integration of geophysical and geological data to evaluate the hydrocarbon prospect of the basin.

Bouguer anomaly data acquired from the Bureau Gravimetric International (BGI), aeromagnetic and borehole data from the Nigerian Geological Survey Agency (NGSA), laboratory measured magnetic susceptibility and density data from rock samples and other geological data were analyzed, integrated and jointly inverted to generate 3D subsurface model. The gravity and aeromagnetic data were filtered, transformed, enhanced, jointly inverted and modeled using Interactive Geophysical Modeling Assistant (IGMAS+) and other geophysical application algorithms hosted within Oasis Montaj. Radially averaged power spectrum apt at delineating noise-signal amplitude-frequency range of the data aided noise attenuation and Butterworth band-pass filter was used to remove noise and unwanted regional fields. Reduction to the pole filter helped transformed and focus anomalies over their corresponding geological sources. Analytic signal, vertical and horizontal derivatives, power spectra and 3D Euler depth analyses identified boundaries, extracted linear structures and determined depth to basement rocks at different parts of the basin.

Filtered, transformed and enhanced gravity and magnetic data present anomalies distributions which generally range in value from -34 to 34 mGal and -300 to 500 nT, respectively. Short wavelength anomalies, with minimum anomaly width of 3 km characterize the northern basement terrain while the southern sedimentary terrain is dominated by long wavelength anomalies, with minimum anomaly width of 10 km. Horizontal and vertical derivatives highlight centrally placed NNE-SSW and south-eastern NE-SW trending lineaments that coincide with the Iwaraja-Zungeru fault as well as the Chain Fracture Zone, respectively. Depth estimates from the power spectra analysis range from less than 1 km to 12 km for the magnetic data and up to 27 km for the gravity data, with the amplitude of the component fields increasing with depth. Euler solutions of the magnetic data show that depth to basement rocks range from < 500 m in the northern part of the study area to 6000 m in the southern region. The generated 3D geologic model confirms the existence of the Okitipupa ridge, which separate the Dahomey Basin from the Niger Delta and the depth to anomaly source exceeding 4000 m obtained from the gravity data suggest it is a deep earth structure.

The occurrence of adequate sedimentary thickness required for hydrocarbon generation from source rock, especially in the southern part of the Nigerian sector of the Dahomey Basin as well as the existence of linear structures whose reactivation could support generation of structural traps within the sediments suggest the possibility of untapped hydrocarbon resource locked in the unexplored part of the basin.

Integrated Geological, Geochemical, Geophysical and Remote Sensing Study of Mineralised Zones Around Lolgorien Area, Narok County, Kenya

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Even though Lolgorien is one of the major contributors of gold production in Kenya, it remains one of the most geologically understudied areas in Kenya. Past studies never covered sedimentary and volcano-sedimentary rocks despite the fact that gold which is the major mineral extracted in the area is hosted in banded iron formation (BIF). Additionally, recent mineral exploration techniques such as remote sensing have never been applied in the study area nor has any attempt been made to discover newer ore bodies or newer structural features which could prove essential in the discovery of newer ore bodies. The study, therefore, aimed at studying lithological and structural parameters as well as trends controlling mineralised zones; delineating mineralised zones using remote sensing and geophysical survey; and determining geochemical characteristics of assorted rocks in Lolgorien.

To accomplish this, Landsat 8 and Shuttle Radar Topography Mission (SRTM) data were obtained from the United States Geological Survey website. Landsat data was then analysed using band rationing, band compositing and principle composite analysis to map zones of possible hydrothermal alteration. SRTM data was analysed using hillshade analysis to map structural features and trends that may be controlling the mineralization. This was followed by geophysical survey where zones of possible mineralization were subjected to induced polarisation (IP) and resistivity surveys. Finally, a number of rock representative samples were collected, and geochemically analysed for their major, trace and rare earth elements associations.

The band rationing, band compositing and principle component analysis identified two zones of possible hydrothermal alteration: the central and southern parts of Lolgorien. The hillshade analysis showed that these zones are also associated with high density of NW-SE trending fault lines indicating that this mineralisation may be controlled by these faults. Hill shade analysis also identified a new fault line that is not mapped in the current geological map. IP and resistivity surveys revealed that these zones are associated with two types of disseminated mineralisation: disseminated minerals hosted in low electrical resistance rocks such as BIFs, and disseminated

minerals hosted in high electrical resistance rocks such as quartz veins. Geochemical and petrographic surveys indicated that mineralisation associated with these rocks are gold, iron oxide and sulphide minerals which are hosted within BIF bands as strata bound minerals. Geochemical data showed anomalous concentration of gold (1.2 to 320 ppb Au), and Fe_2O_3 (upto 56.78%) in some BIFs. This data also indicated that Lolgorien BIFs are of Algoma type and were formed as result of mixing of hydrothermal solutions and seawater in an oxidising environment. Geochemical analysis also indicated that there are two types of sandstones in Lolgorien: lithic sandstones and greywackes. These sandstones are of felsic origins.

The research found that even though gold mining in Lolgorien has been continuing for many years, there are some virgin locations such as central part of the study area which can be exploited for gold. A new fault line and lithic sandstones were also delineated to produce a new updated geological map.

Doctor of Philosophy in Plant Breeding

Physiological And Genetic Improvement Of Lowland Rice (oryza sp.) Resistance To Rice Yellow Mottle Virus (Rymv): Beneficial Response To Silicon Fertilization

Kouessi Sixte Vital ANATO (PAU-UI-0189)

Rice (*Oryza* sp.) is consumed every day by half of the world's population and is a staple food in Sub-Saharan Africa (SSA). It constitutes a strategic food security crop of several countries in the SSA region. However, SSA experiences huge rice yield losses every year because of biotic stresses. Rice Yellow Mottle Virus (RYMV) disease, reported in Kenya 52 years ago, is a major biotic factor affecting rice production and continues to be an important viral disease in SSA. Strengthening rice varietal resilience to RYMV in Benin through the beneficial role of silicon and the genetic selection of intraspecific *O. glaberrima* lowland rice progenies was conducted to improve rice productivity in West Africa.

Here, I updated the geographical distribution of RYMV disease and accessed 102 rice farmers' perceptions on main rice production constraints in Benin. Through field inspection, I recorded disease incidence and collected rice leaf samples for serological test. Later, I screened 79 improved aromatic and non-aromatic genotypes developed and introduced in Benin. These genotypes include the susceptible IR64 (*O. sativa*) and the resistant TOG5681 (*O. glaberrima*) as checks. I have used RBe24 isolate, the most pathogenic strain of RYMV in Benin, to investigate rice genotype responses to RBe24 and evaluate the effects of silicon on the response of host plants to this virus. The experiment was a three-factor factorial consisting of genotypes, inoculation level (inoculated vs. non-inoculated), and silicon dose (0, 5, and 10g/plant) applied as $CaSiO_3$ with two replications and carried out twice in the screen house. Then, an update on the yield potential of 42 rice genotypes and responses to $CaSiO_3$ for yield and yield-related traits across Abomey-Calavi and Zogbodomey districts was performed in a split-plot design, with $CaSiO_3$ as the main factor. I used Fast-Genotyping-By-Sequencing (Fast-GBS) and Sanger Sequencing technics to genotype the 48 intraspecific rice varieties fixed lines derived from TOG5681, TOG5672 and TOG7291 that carried the two resistance genes RYMV1 and RYMV2. Finally, I selected intraspecific genotypes for resistance to RYMV with markers specific to the different alleles of the RYMV1 and RYMV2. First, this study confirmed that RYMV is present in Benin districts viz; Malanville, N'Dali, Covè, and Glazoué but prevalent in Malanville. In all visited districts, farmers estimated the magnitude of yield loss ranging from 50 to 100% on affected farms. In prevailing districts, farmers controlled

RYMV disease mostly with fertilizer application (38.5%), chemical insecticide (19.2%), ash application (7.7%), and combination of two or more physical and chemical, but they rarely use improved varieties. However, farmers that used improved varieties as means of controlling reported it to be efficient. Across the district, IR841 was the most popular and preferred variety adopted by farmers. Rice farmer's in Benin reported that challenged access to inputs (44.4%) such as fertilizer and chemicals was their principal constraint, followed by soil fertility exhaustion (18.1%), diseases (16.2%), and discontinued rainfall in the season (11.7%).

Second, $CaSiO_3$ application did not affect disease incidence and severity at 21 and 42 DAI. The $CaSiO_3$ however, significantly increased plant height of inoculated (3.6% for 5 g $CaSiO_3$/plant and 6.3% for 10 g $CaSiO_3$/plant) and non-inoculated (1.9% for 5 g $CaSiO_3$/plant and 4.9% for 10 g $CaSiO_3$/plant) plants at 42 DAI, with a reduction in the number of tillers (12.3% for both 5 and 10 g $CaSiO_3$/plant) and leaves (26.8% for 5 g $CaSiO_3$/plant and 28% for 10 g $CaSiO_3$/plant) under both inoculation treatments.

Third, evaluation of yield potential of rice genotypes and responses to silicon for yield and yield-related traits across Abomey-Calavi and Zogbodomey districts showed that on average grain yields are respectively 4 metric tonnes per hectare for all silicon level viz. the dose of Si : 0 g/m²; Si :100 g/m², and Si : 200 g/m². Si did not show significant effect. The five best yielding genotypes are respectively in order viz. S2-5 (1.3 kg/m²), PL67-1 (0.53 kg/m²), TOG7291 (0.50 kg/m²), PL49-7 (0.50 kg/m²), and TOG5681 (0.48 kg/m²).

Finally, I select base on genetic marker three genotypes including a heterozygote S19-4 combining different recessive but resistance alleles (rymv1-3 and rymv1-4) of the same gene RYMV1 and two homozygotes: PL85-2 and PL55-7 combining different resistance and recessive alleles (*rymv1-3* and *rymv2*) of the two studied genes RYMV1 and RYMV2.

Our results confirm *O. glaberrima* germplasm as an important source of resistance to RYMV, and critical in developing a comprehensive strategy for the control of RYMV in West Africa. These results are also available knowledge that will guide policymaking in lowland rice production and food security improvement in Benin. These varieties with good genetic and agronomic interests, will be used for genes pyramiding to ensure a durable resistance against the various isolates of the virus on rice farmers' fields, but also will be used as heads of lines for new varietal improvement programs including aromatic rice. My research contribute greatly to the advance of the knowledge in rice virology and search for cost effective solution in management rice plant viral disease.