THE NIGERIAN ACADEMY OF SCIENCE

1ST SCIENTIFIC CONFERENCE

Theme:

The Role of Science in Attaining the Sustainable Development Goals (SDGs)

BOOK OF ABSTRACTS

February 4th - 5th, 2020 *8.30am daily*

Multipurpose Hall A & B, University of Lagos

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About the Nigerian Academy of Science

The Nigerian Academy of Science (NAS) is the foremost independent scientific body in Nigeria which was established in 1977 and incorporated in 1986. NAS is uniquely positioned to bring scientific knowledge to bear on the policies/strategic direction of the country and is also dedicated to the development and advancement of science, technology, and innovation (STI) in Nigeria. The aims and objectives of the Academy are to promote the growth, acquisition, and dissemination of scientific knowledge, and to facilitate its use in solving problems of national interest. The Academy strives to do this by:

- Providing advice on specific problems of scientific or technological nature presented to it by the government and its agencies, as well as private organizations

- Bringing to the attention of the government and its agencies problems of national interest that science and technology can help solve

- Establishing and maintaining the highest standards of scientific endeavours and achievements in Nigeria, through the publication of journals, organization of conferences, seminars, workshops, and symposia, recognition of outstanding contributions to science in Nigeria, and the development of a working relationship with other national and international scientific bodies and academies

As with national academies in other countries, NAS is a not-for-profit organization with a total membership (since inception) comprising 249 Fellows elected through a highly competitive process who have distinguished themselves in their fields both locally and internationally. Some of her members have served as vice-chancellors of universities, directors-general of government parastatals, and ministers in federal ministries. The Academy, given its clout, also has the ability to attract other experts from around the country and internationally when needed. NAS is Nigeria's national representative on such bodies as the International Science Council (ISC) – the umbrella body for all science associations and unions, and the InterAcademy Partnership (IAP) – the umbrella body for all national science academies globally. The Academy is also a member of the Executive Committees of IAP for Science, IAP for Policy, and IAP for Health

About the 1st NAS Scientific Conference

The Sustainable Development Goals (SDGs) - projected to be achieved by year 2030, provide guidelines for nations around the world to ensure that their citizens are assured of sustained socioeconomic growth and a better future. Many of these goals –including poverty eradication, quality education, food security, health, energy, - are entrenched in science and innovation.

The Nigerian Academy of Science (NAS) -Nigeria's foremost scientific body, is committed to the promotion of science, technology, and innovation in the country. The Academy seeks to promote original research, and disseminate scientific information concerning issues of national relevance. To this end, the Academy convened relevant stakeholders for its maiden scientific conference focused on the role that Science, Technology and Innovation (STI) should play if Nigeria is to achieve the SDGs. This scientific conference was framed around five sub-themes: science for poverty reduction; revitalizing Science, Technology, Engineering, and Mathematics (STEM) education; innovations for health; energy solution and environmental sustainability; and ensuring food security in Nigeria. These subthemes touch on areas that are germane to Nigeria's growth and development.

The conference showcased discoveries and innovations while disseminating scientific information; as well as fostering networking and collaboration among Nigerian scientists.

Conference Agenda

Time	Activity
Day 1: Tuesday 4th February, 2020	
8:00	Arrival and Registration
Opening Ceremony Session Chair: Prof. Mosto Onuoha FAS – President, the Nigerian Academy of Science	
9:00	Welcome/Introduction of Special Guests Dr. M. Oladoyin Odubanjo – Executive Secretary, NAS
9:10	Opening remarks Prof. Mosto Onuoha FAS
9:20	Goodwill messages Dr. Ogbonnaya Onu – Honourable Minister, Federal Ministry of Science and Technology Mr. Yao Ydo - Director, United Nations Educational, Scientific and Cultural Organization UNESCO Regional Office, Abuja Prof. Oluwatoyin Ogundipe FAS – Vice Chancellor, University of Lagos Dr. Bamidele Makanjuola – Chairman, Vitafoam Nigeria Plc. Mr. Hakeem Fahm – Honourable Commissioner, Lagos State Ministry of Science and Technology Mr. Tunji Bello - Honourable Commissioner, Lagos State Ministry of Environment and Water Resources Prof. Mojisola Adeyeye FAS – Director-General, National Agency for Food and Drug Administration and Control Prof. Yakubu Aboki Ochefu – Secretary General, Committee of Vice -Chancellors of Nigerian Universities Dr. Omokhudu Idogho – Managing Director, Society for Family Health Dr. Sunday Udo – National Director, The Leprosy Mission, Nigeria Mr. Adejuwon Soyinka – Regional Editor (West Africa), The Conversation Africa
9:40	Keynote Address - The Role of Science in Attaining the Sustainable Development Goals Prof. Suleiman Bogoro FAS – Executive Secretary, Tertiary Education Trust Fund (TETFUND)
10:10	Group Photographs
10:30	Tea break and Networking
Sub-theme 1: Science for Poverty Reduction Moderator: Prof. Ekanem Braide FAS – Vice President, NAS	
11:00	Lead Presentation Prof. Charles Esimone FAS - Vice-Chancellor, Nnamdi Azikiwe University
11:30	Oral Presentation 1 Science as a Strategic Tool for Poverty Alleviation in Nigeria Uwakwe Ezechinyere - Alvan Ikoku Federal College of Education, Owerri
11:45	Oral Presentation 2 Are You being Served? Governance and Deprivation in Nigeria

	Melvin Ayogu – Centre for Public Policy Alternatives
12:00	Oral Presentati on 3 Scientific and Innovative Exploration of Underutilized Tropical Seeds for Greener Environment, Sustainable Health and Rural Poverty Reduction Olubunmi Atolani - University of Ilorin
12:15	Discussion
Sub-theme 2: Revitalizing Science, Technology, Engineering, and Mathematics (STEM) Education Moderator: Prof. Oluwole Familoni FAS – Deputy Vice -Chancellor (Academics), University of Lagos	
12:45	Lead Presentation Dr. Olatunde Adekola – Senior Education Specialist, W orld Bank (Africa Region)
1:15	Oral Presentation 1 Aggrandizing the Quality of Information Literacy Instruction for Sustainable Development in Nigeria Hawwau Moruf - Federal University Dutsin -Ma, Katsina
1:30	Oral Presentation 2 On the Development of UJ-MaGT Scientific Calculator Mabur Mafuyai – University of Jos
1:45	Oral Presentation 3 Compliance of Scientific Research Captions with Scientific Names to the Rules of Binomial Nomenclature while Maintaining Visual Appeal Ime Udotong - University of Uyo
2:00	Discussion
2:30	Speed Poster Presentations: Abdullahi Magaji, Emmanuel Ekpa, Etuh Emmanuel
2:35	Lunch
3:35	Poster Break
Sub-theme 3: Innovations for Health Moderator: Prof. Timothy Obi FAS - Academic Secretary (Biological Sciences), NAS	
4:00	Lead Presentation Prof. Adesola Ogunniyi FAS - Professor of Medicine, University College Hospital, Ibadan
4:30	Oral Presentation 1 Outcome of Multi -faceted Interventions for Improving the Quality of Antenatal Care in Nigerian Referral Hospitals: A Quasi -experimental Research Design Loretta Ntoimo - Women's Health and Action Research Centre
4:45	Oral Presentation 2 Body Heat Storage and Entropy in Sickle Cell Anaemia Stephen Ogungbemi – College of Medicine, University of Lagos
5:00	Oral Presentation 3 Impact of Larva Source Reduction Activities of Trained School -aged Children on Malaria Control in Nigeria Idris Otun - Federal University of Agriculture, Abeokuta.
5:15	Discussion
5:45	Speed Poster Presentations: Chinenye Ugwah -Oguejiofor, Olusoga Sofola FAS, Joshua Gandi, Adegbegi Ademuyiwa, Sunday Udo, Akinyinka Omigbodun FAS
5:55	Closing remarks for Day One
	Prof. Timothy Obi FAS

Day 2: Wednesday 5th February, 2020	
8:30	Arrival
Sub-theme 4: Energy solutions and environmental sustainability Moderator: Prof. Olatunde Farombi FAS – Public Affairs Secretary, NAS	
9:00	Lead Presentation Prof. Abubakar Sambo FAS - Former Director-General, Energy Commission of Nigeria
9:30	Oral Presentation 1 Synthesis and Characterization of SNO:Zn^{2+} And SNO:Dye of Tectona grandis thin films Deposited using Spray Pyrolysis Agbo Ekuma - Ebonyi State University
9:45	Oral Presentation 2 Effect of Complexing Agent Concentration on the Optical Properties of chemically deposited Manganese Selenide Thin Films Egwunyenga Nkechi – Delta State Polytechnic
10:00	Oral Presentation 3 Hydro-Geophysical Appraisal of Shallow Unconfined Aquifers of Ikeduru/Mbaitoli Area, Southeastern Nigeria, using Surficial Resistivity Data Joseph Chinaka – Imo State University
10:15	Discussion
10:45	Speed Poster Presentations: Iyadunni Anuoluwa, Balogun Lekan, Ibrahim Tijani, Itodo Udoji Adams, Oyeniran Daniel
10:50	Academic Rigour and the Best of Journalism Mr. Adejuwon Soyinka – Regional Editor (West Africa), The Conversation Africa
10:55	Tea Break
11:25	Poster Break
Sub-theme 5: Ensuring Food Security in Nigeria Moderator: Prof. Kayode Adebowale FAS - Deputy Vice-Chancellor (Administration), University of Ibadan	
11:55	Lead Presentation Dr. Sam Ajala – Commodity Breeder, Consultative Group for International Agricultural Research (CGIAR)
12:25	Oral Presentation 1 Assessing the Effect of Fertility on Household Food Security and Child Malnutrition Outcomes in Nigeria Nkechi Owoo – University of Ghana
12:40	Oral Presentation 2 Development of a Novel Legume Blended Instant Porridges from Low Grade Broken Rice Fractions Danbaba Nahemiah - National Cereals Research Institute
12:55	Oral Presentation 3 Determinants of Households' Food Security among Fulani Women Milk Processors in Oyo State Moshood Popoola - Federal College of Animal Health and Production Technology, Ibadan
1:10	Discussion
1:40	Speed Poster Presentations: Immaculate Nwajagu, Onyinyechi Akomah, Aroyeun S. O., Monday Adiaha, Adetoun Akintoye
1:45	Closing Remarks/Vote of Thanks Prof. Mosto Onuoha FAS
1:55	Lunch and End of Scientific Conference

Abstracts

Lead Presentations

Energy Solutions and Environmental Sustainability

Abubakar Sambo FAS, OON, NPOM
Faculty of Engineering and Environmental Design, Usmanu Danfodiyo University, Sokoto

The major economic sectors of industry, transport, services and households are still greatly restrained from the expected growth due to grossly inadequate energy supplies. Electrical power of about 4,500 MW is grossly inadequate for a population of more than 200 Million people. Recent energy demand and supply projections show that for a GDP growth rate of 7% the required electrical power will be about 31,000 MW in 2020; 63,000 MW in 2030; and 152,000 MW in 2050. This can be achieved by significant expansion of the energy mix for electricity generation from the current mix of gas and hydro to also include coal, nuclear, solar, wind and biofuels. There is the need to also significantly expand and strengthen the transmission and distribution networks throughout the country.

Entrenchment of energy efficiency and conservation is very much needed as a practical strategy to reduce energy demand. The liberalization of the Nigerian Electricity Supply Industry, through the Electricity Sector Power Reform Act (ESPRA) 2005, enabled the sale of 6 power generation and 11 distribution units to the private sector. There is the urgent need for ensuring that all members of the Nigerian Electricity Supply Industry (NESI) perform in line with the provisions of their operating licences and significantly strengthen their respective systems. There is also the need to regionalize and privatize the transmission systems.

The advent of electric vehicles has created a new paradigm shift on oil and gas in the world as a whole. And this is because several nations have already decided that in the next 20-30 years oil-based transport fuels, that currently constitute 60-70% of their oil and gas consumptions, will be replaced by electric vehicles. This will lead to a significant reduction of the Nigeria's foreign exchange earnings. On the other hand the nation can now deploy more oil and gas for internal consumption for electricity generation, in the provision of industrial process heat, in the production of fertilizers, in petro-chemicals and in road construction where coal-tar is heavily required.

The Petroleum Industry Bill 2012, if passed into law, will ensure that the management and allocation of petroleum resources in the country and their derivatives are conducted in accordance with the principles of good governance, transparency, and sustainable development. Apart from ending the importation of refined petroleum products through ensuring that the four refineries are operating close to installed capacities, the bill will also ensure that licences for private refineries, including modular ones, are granted to groups that meet the set requirements.

On environmental sustainability, it should be recalled that the overwhelming majority of nations approved the Sustainable Development Goals (SDGs), though the United Nations, in September 2015. The SDGs were subsequently adopted at the December 2015 Paris Climate Change Talks (COP 21). Goal number 7 of the SDGs requires that by 2030 all nations should:

a. Ensure universal access to affordable and reliable modern energy services
b. Substantially increase the share of renewable energy in the global energy mix
c. Double the rate of improvement of energy efficiency.

With the ratification of the resolutions of COP 21 by the Federal Government in 2018, there is the urgent need for the Government to set-up an inter-ministerial task force to recommend an all-encompassing set of pathways for the implementation of the SDGs to ensure that Nigeria attains the goals by 2030.

Another environmental matter with energy implication is desert encroachment, loss of soil fertility

and soil erosion that is being exacerbated by the indiscriminate felling of trees to provide fuelwood. A number of studies have shown that the use of fuelwood as a cooking fuel is done by 65 % of Nigerians in the rural and peri-urban areas and that it will take several decades before more sustainable cooking fuel can available. In the interim there is need to promote the development of plantations of quick growing tree species to provide the needed fuelwood to be used with efficient wood burning stoves. In this way the natural forests will be left untouched.

Enhancing the Competitiveness of Maize for Food Security in Nigeria

Sam Ajala
International Institute of Tropical Agriculture (IITA), Ibadan Nigeria

Almost half of the estimated population of 180 million people in Nigeria live in rural areas and rely predominantly on agriculture for their livelihood. The sector is dominated by smallholder farmers and poverty is prevalent with 80% of them living below the poverty line of USD 1.25/day (AGRA Nigeria Business Plan, 2017). That translates to poverty level of 48% for Nigeria. Both Ethiopia and Kenya that depend more on agricultural have rates of 24% and 16%, respectively. The Food and Agricultural Organization's (FAO) survey of 146 countries in 2014–2015 found that 50 per cent of urban populations in least developed countries were food-insecure, compared with 43 per cent in rural areas. Enhancing productivity otherwise known as the 'productionist' approach to food security is still at the core of policies to reduce food insecurity.

Maize is the most important cereal crop in Nigeria and is being used as a poverty reduction tool in the hands of small holder farmers in the country. The multiplicity of its uses, the ease of processing and its nutritional quality and widespread adaptation across the country has enabled it to become a cereal crop of first choice to many. Average maize yield is low due to inadequate input use and inappropriate agronomic practices including low plant density as well as prevalent stresses such as drought, low soil nitrogen, Striga parasitism and stem borers. Production has increased from 438,000 ha in 1981 to 5,849,660 ha in 2015 with associated increase in production from 720,000 tons in 1981 to 10, 478, 400 tons in 2015 with grain yield increases from 1.6 t/ha to 2.0 t/ha during the same period (FAOSTAT, NAERLS and FDAE, 2015)

Maize value chain development will rely on three interlinked pillars namely enhancing levels of competitiveness which is a function of market and yield. Yield itself is dependent on quality input use and good agronomic practises. Reducing the demand-supply deficit requires the development of key interventions along the crop value chain. Thus, the ABP of CBN that rely on linking small-holder farmers to quality input and output markets, is a bold attempt to enhancing food security in the country. Such integration of small-holders farmers into organized entities to fit into national and international value chains through membership of commodity associations or cooperatives and pulling together their resources, especially their fragmented land holdings to establish cooperative large scale production enterprises will enhance their negotiating power and improve

I. Access to quality inputs, mechanization and financial services, significantly raising the potential for technology adoption and grain yield outputs. This in turn, will enable other value chain actors perceive smallholders as credible business partners.
ii. Creation of an effective 'pull' mechanism spearheaded by large commercial buyers seeking to get quality grains that are competitively priced with grain imports.
iii. Linkages with financial institutions and end markets.

All the above will require policies that refocuses the agricultural sector.

Innovations for Health

Adesola Ogunniyi FAS
Department of Medicine, College of Medicine, University of Ibadan

Innovation in health refers to introduction of new methods of caring for patients, new diagnostic procedures, application of new technology for better health outcomes. Innovation can bring about more cost effective care, better time utilization and improved health indices. Innovation in any region of the world affects practice globally either in the form of technology transfer, drug development or the application of such knowledge in training. The major innovations in health will be highlighted in the first part of the presentation before focusing on developments in health in Nigeria.

Communicable diseases namely: malaria, human immunodeficiency virus infection (HIV/AIDS), tuberculosis, diarrhoeal diseases and neglected tropical diseases constitute the main health challenges in Nigeria. However, non-communicable diseases (NCDs) have become very prevalent and result in high morbidity and mortality. The NCDs include mental illness, malnutrition and its consequences, cancer, uncontrolled hypertension and diabetes mellitus which are major risk factors for stroke and ischemic heart disease. Traumatic brain injury from domestic, occupational and vehicular accidents due to flagrant disobedience of traffic regulations lead to cognitive and behavioural problems, epilepsy and neurosurgical emergencies.

The second part of the presentation will highlight the following innovations: malaria and tuberculosis (multi-drug-resistant types) diagnoses, reduction of maternal mortality from post-partum hemorrhage, facilitating smooth labour progression with the use of misoprostol, use of tranexamic acid to reduce blood loss in surgery, use of mannitol to reduce cerebral oedema in children with cerebral malaria, the development of thermal bed for heat conservation during neonatal surgery; stroke units for specialized management of acute stroke patients and thrombolysis/thrombectomy, computerized algorithm for analyzing images in patients with stroke for international data comparison, development of computer apps for early identification of dementia cases in the community; use of cognitive stimulation therapy for managing mild to moderate dementia in low resource settings and use of mobile technology for hospital appointments and follow up of practice.

The health indices for Nigeria at the moment are not the best for our financial and human resources. The National Health Insurance Scheme which was introduced for affordable and easily accessed health care has only about 5% coverage. There is need for public enlightenment of the benefits and the modus operandi of the scheme. Budgetary allocation to the health sector must be increased substantially. Obsolete equipment need to be replaced or upgraded for improved diagnosis while collaboration between clinical, basic and public health scientists must be encouraged for cutting-edge research that will address our peculiar health challenges. Researchers must understand the benefit of intellectual property rights so that many innovations can be patented for local dissemination, financial rewards and direct application to our patients.

Revitalizing STEM Education

Olatunde Adekola
Senior Education Specialist, World Bank (Africa Region)

Knowledge and advanced skills especially in Science, Technology, Engineering and Mathematics (STEM) are critical determinants of a country's economic growth and standard of living as learning outcomes are transformed into goods and services, greater institutional capacity, a more effective public sector, a stronger civil society, and a better investment climate. Good quality STEM education and research are essential parts of this transformation.

The STEM skills, knowledge and training that students receive at many Nigeria universities do not prepare them adequately to meet the requirements of industry and the job market. This mismatch between what students learn and what industry needs - coupled with under-training in the critical skills of problem-solving, analytical thinking and communication - is blamed, at least in part, for the emerging high graduate unemployment and under-employment. Improved and accessible STEM education and effective national innovations systems can help a developing country progress toward sustainable achievements in the SDG Agenda particularly those goals related to all levels of education, health, and gender equity.

We need partnership initiatives for increased access and quality, and relevance of STEM education. The World need like-minded people at all levels, STEM education based faculties and universities, stakeholders, and inter-governmental organizations to tackle specific SDG agenda and issues together, specifying the results to achieve and the resources to contribute, and these should be based on broad guidance for policy-makers on improving policy coherence and integration for the pursuit of the sustainable development goal for STEM education.

STEM Education for the knowledge economy and with appropriate Research & Development (R&D) can accelerate production of new and economically relevant knowledge, improve the competitiveness and policy making capacity.

The existing expertise at the university provides a solid foundation for a concerted effort to make this happen – to generate knowledge through new ways of developing and combining theories, methods and empirical evidence across multiple disciplines., innovative and applied research to the benefit of all. Universities need to strengthen its STEM education capacity in development policy, policy planning and analysis, impact evaluation and advocacy for evidenced based policy making supported activities through partnership, collaboration and cooperation with international and national universities, private sector and industry, civil society and non-government organization such as professional and academic association etc.

Institutional capacity strengthening is also an element of the co-operation between the STEM Faculties and ministries/relevant agency; the co-operation might involve joint research on pertinent issues affecting economic growth in small and medium size enterprises and rural households. The STEM education Faculties could have strategic partnership agreement with other institutions on institutional capacity strengthening. Why can't the STEM Faculties be a leading member in the consortia of partners aimed at building the research and institutional capacity at MDAs?

Among the focal points of this strategy will be to ensure the high quality of the STEM educational program, e-learning and the establishment of joint programs with strategic partners at universities. Joint programs – designed to meet the needs of Nigeria – will be developed together with partner universities. Joint programs enable the academic stakeholders to develop common curricula,

learning and teaching methods. E-learning is also a focal point of this strategy. E-learning holds the potential for a revolution within knowledge sharing in and with developing countries. Developing high STEM quality, research-based e-learning programs and teaching to developing Nigeria students without physically moving the lecturer or the students should be a priority for the Universities in the coming years.

STEM education makes the difference between poverty and wealth and directly influences global competitiveness. Nations must tap into this global STEM knowledge, then disseminate and use it. This means a constant need for new skills which both public and private sectors should be harnessed. Much better co-ordination is required between all the main stakeholders to overcome the financing, equity and governance challenges this presents. Retraining and widening access to STEM education are at the heart of the solution. STEM education providers must improve equitable access and quality, and their efficiency.

There is also need for improved partnership, collaboration and cooperation within and between STEM programs in tertiary institutions, leverage on ICT for capacity building network and connect to global knowledge and information. This is necessary for value added improvement to improve poverty and vulnerability indices in Nigeria, strengthening the national building and innovation system. It could also determine the significance of improvement or otherwise especially the quality of life our people.

Science for Poverty Reduction

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Poverty is the state or condition in which a person lacks the capacity or the resources to afford the basic standard of living. According to the UNDP, a poor person is someone living on less than $1.25 per day. About 736 million people, (10% of the world's population) live in extreme poverty globally. It has been estimated that 12.5% of this number (or 91.8 million people) live in Nigeria. This has made Nigeria the capital of extreme poverty in the world. Demographically, a great percentage of this number live in the Northern part of Nigeria with the North West leading the pack with over 80% of its inhabitants living in abject poverty followed by the North East ravaged by insurgency. The contribution to this number in the South is quite minimal compared to the North except for Ebonyi state where the poverty rate is over 56%. Extreme poverty leads to crime, social exclusion, incessant unrest and insurgency as it is evident in the North. Eradication of extreme poverty is very important for social development, humanitarian reasons, national security and world peace. Eradication of extreme poverty by 2030 is the number one goal of the sustainable development programme which highlights it importance to the global community. One of the common characteristics of the countries that have low poverty indices is that they have prioritized science and technology. We shall discuss the place and role of science in poverty eradication. According to NASA, "Science is curiosity in thoughtful action about the world and how it behaves. It consists of observing the world by watching, listening, observing, and recording". The application of science is called technology.

Let's take a look at the world economic powers in terms of their gross domestic product in descending order: United States, China, Japan, Germany, India, France, and United Kingdom. In terms of technological expertise, the ranking is Japan, USA, South Korea, China, Germany, UK, and Singapore. The presence of almost the same countries in both lists suggests a strong correlation between economic development and technological advancement.

The reason is very simple. We are faced with survival challenges in a dynamic world. Our problems are getting more complex needing complex solutions. The solutions we seek are provided by applying science. The countries that pay more attention to life and survival invest their efforts in science to understand observations and discover solutions. The outcome of their discoveries is translated to products for their citizens at affordable rate which eradicates poverty. The forex they earn increases their GDP and provides funding for frontier science. The level of translational science in the Nigeria is very low, which is the reason why we are still largely a consuming nation. The scientists in Nigeria should wake up. Science is not all about getting publications. Nigerian scientists should engage in translational science which leads to the commercialization of outcomes which in turn improves the economy and reduces poverty. The government should increase funding for applied research and encourage those genuinely interested in research by creating the enabling environment for research. They should advance custom tariff waivers to research materials imported by research institutions and students. They should create Science/technology/Industrial parks where convergent innovation will create homegrown and affordable products. This is how science eradicates poverty.

Oral Presentations

Aggrandizing the Quality of Information Literacy Instruction for Sustainable Development in Nigeria

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Information literacy is the ability to identify information needs, seek out resources to meet those needs, and then analyze, evaluate, synthesize, and communicate the resulting knowledge. An information-literate individual is able to determine the extent of information needed, access the needed information effectively and efficiently, evaluate information and its sources critically, incorporate selected information into his or her knowledge base, use information effectively to accomplish a specific purpose and understand the economic, legal, and social issues surrounding the use of information. Information literacy instruction is offered through library education programmes in Nigeria by different tertiary institutions. This paper discusses the need to improve on the quality of information literacy instruction for sustainable development in Nigeria. It examines the state of library education quality in Nigeria; the role of information literacy instruction in sustainable development in Nigeria; issues militating against quality education and ways of enhancing Information literacy instruction in Nigeria. Findings from the review indicate that the state of information literacy instruction in Nigeria is already hitting the rock with information-users fallen in the hands of commercial database providers and search engines like Google. In conclusion, the realization of sustainable development can only be viable through the enhancement of information literacy instruction in Nigeria.

Keywords: Library professional, Information Literacy instruction, sustainable development

Are You Being Served? Governance and Deprivation in Nigeria

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This study argues that of the varieties of inequality, deprivation through poor governance is the most disconcerting because of its pervasive role in perpetuating wealth inequality. Health is wealth. Using standardized UNDP data on education and health—two strategic factors for growth and human development—we benchmark Nigeria's long-term governance record on citizen-care. Africa's largest oil producer, having the largest market potential, the largest GDP and a generous endowment of natural-resource diversity ranks 36 out of 46 countries in the sample, locating at the cusp of the lowest quintile of the quality of governance rank ordering, above Gabon but below Chad, Cameroon and very far below Togo. Why?

Assessing the Effect of Fertility on Household Food Security and Child Malnutrition Outcomes in Nigeria

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People should not have to suffer from food shortages. Food security is a growing concern in Nigeria- although the rate of malnutrition is decreasing over time, the absolute number of

malnourished people, including children, is growing. Recent figures indicate that close to 14 million people in Nigeria, including children, are malnourished. I hypothesize that larger families and children that live in these households are at a higher risk for experiencing food shortages in Nigerian households. Using data from the 2011, 2013 and 2016 waves of the World Bank's Living Standard Measurement Survey (LSMS) for Nigeria, I demonstrate that by some measures, food security has been worsening over time in the country. I also illustrate spatial patterns of food security in Nigeria between 2011 and 2016, to show areas across the country where food security is prevalent and where it is not, and if/how these spatial patterns have changed over time. Finally, using various measures of food security (direct/indirect and qualitative/quantitative) and different proxies for fertility (total number of household members, dependency ratio, own children, all children under 5 years, all children under 15 years), with a disaggregation for urban households, I employ panel data techniques to examine the link between fertility and food security in Nigeria. I find that consistently, larger households have worse food security outcomes and are more likely to report being food insecure. Additionally, children from larger households suffer food shortages and have long-term adverse health outcomes, likely as a result of resource dilution. These findings suggest that a demand-side approach aimed increasing contraceptives uptake could contribute to lower fertility and family sizes (e.g. through reductions in mis-timed births and unwanted fertility), with positive implications for food security in the country. Currently, only 1-in-10 married women in Nigeria uses a modern family planning method; this shows that there is come scope for improvement. The research results indicate that despite the unwavering focus on supply-side factors for the resolution of the country's food security issues, a demand-side approach may also be complementary. The study also makes an argument for the development of urban policy that includes demographic considerations, given that the observed negative link between fertility and food security is also observed for urban Nigeria. The eleventh sustainability goal aims at, among other things, the creation of sustainable cities. A city is unlikely to be sustainable if it is food insecure. Deliberate efforts should therefore be made to link both population projections and food security issues in the country, particularly given that Nigeria has some of the largest cities in the world.

Keywords: food security, child malnutrition, fertility, Nigeria

Body Heat Storage and Entropy in Sickle Cell Anaemia

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Sickle cell anaemia patients (SCAP) have been reported to live with higher basal metabolic rate (BMR) than their non-sickle cell counterparts (NSCP). This higher BMR has been attributed to higher cardiac work load and erythropoietic activity among other causes. The study evaluated and compared oxygen consumption rate (VO_2), metabolic heat production rate (M), basal metabolic rate (BMR), resting energy expenditure –estimated (REEp), heat losses by radiation (Lr), convection (C), evaporation (E) and respiration (Res), in order to estimate and compare the change in heat storage (ΔH) and entropy change (ΔS) in SCAP and NSCP. Forty-two (42) adult male SCAP and NSCP were studied. Their physical and blood pressure parameters, arterial pulse oxygen saturation (SPO_2), mean skin temperature (Tsk) and VO_2 were measured. M, BMR, REEp, E, C, Lr, Res, ΔH and ΔS were calculated. Full blood count, serum malondialdehyde ([MDA]) and triiodothyronine ($[T_3]$) concentrations were also measured. Haemoglobin concentration ([Hb]), $[T_3]$, mean arterial pressure (MAP) and SPO_2 were lower in SCAP than in NSCP ($p < 0.01$ or $p < 0.001$). Conversely, WBC count, [MDA], HR, PP, rate-pressure product (RPP), Tsk, VO_2, M, BMR, REEp, ΔH and ΔS were higher in SCAP than in NSCP ($p < 0.05$, $p < 0.01$ and $p < 0.001$). There were greater heat losses via Lr, C and Res in SCAP than in NSCP ($p < 0.05$). ΔH correlated

positively with RPP ($p < 0.01$), WBC ($p < 0.05$), MDA ($p < 0.001$), but correlated negatively with [Hb] ($p < 0.001$), SPO_2 ($p < 0.05$), and [T3] ($p < 0.05$) in SCAP. SCAP had higher ΔH, ΔS, VO_2, M, BMR, REEp, Tsk, Lr, C and Res than the NSCP. The positive correlation of ΔH with HR, RPP, WBC, [MDA] and the negative correlation of ΔH with [Hb], SPO_2 and [T_3] obtained in SCAP show cardiovascular, haematological and metabolic bases for the higher ΔH with ΔS, VO_2, M, BMR and REEp obtained in them.

Keywords: sickle cell anaemia, metabolic heat production, heat loss, heat storage, entropy change

Compliance of Scientific Research Captions with *Scientific Names* to the Rules of *Binomial Nomenclature* while Maintaining Visual Appeal

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The rules of binomial nomenclature which was first introduced by Caroli Linnaeus in 1751 helped to standardize scientific communications globally. However, in most research publications with scientific names, these rules are ignored or flouted or where they are adhered to, the outcome is repugnant to the eye with no visual appeal. This paper presents a survey of scientific research captions of students' research projects at all levels (B.Sc; M.Sc & Ph.D) as well as research captions in some journals and their compliance with the rules while still retaining their expected visual appeal. Research captions containing scientific names on final research project copies submitted for the award of B.Sc; M.Sc & Ph.D in Departments that cut across all science disciplines were surveyed for their compliance with the rules of binomial nomenclature and visual appeal. Research captions bearing scientific names in some journals were also surveyed. A total of ten thousand and fifty (10,050) publications, made up of 6000 students' research projects at all levels and 4050 journal publications, were reviewed. Data generated from this study were subjected to analyses using descriptive statistics. Results showed that 82% of the research captions bearing scientific names in both students' project copies and scientific journals complied with the rules but looked odd to the eyes because all the words of the captions were in upper cases (capital letters) and only the scientific names were in lower case, except the generic names that were in title cases. For example: "**COMPLIANCE OF SCIENTIFIC RESEARCH CAPTIONS WITH *Scientific names* TO THE RULES OF B*inomial nomenclature* WHILE MAINTAINING VISUAL APPEAL".** The other 18% were variants that neither complied with the rules nor appealed to the eye. For example, "**COMPLIANCE OF SCIENTIFIC RESEARCH CAPTIONS WITH *SCIENTIFIC NAMES* TO THE RULES OF B*INOMIAL NOMENCLATURE* WHILE MAINTAINING VISUAL APPEAL".** Here, the scientific names (***SCIENTIFIC NAMES* and B*INOMIAL NOMENCLATURE***) are written in capital letters and italicized. Other variants are herein documented. The authors therefore propose that research captions bearing scientific names should be written with bold title cases. For example: **"Compliance of Scientific Research Captions with *Scientific names* to the Rules of B*inomial nomenclature* while maintaining visual appeal".** This way, the research captions will comply with the rules of binomial nomenclature as well as give visual appeal. If this proposal is adopted, it will not only help to further popularize the rules of Binomial nomenclature even amongst the non-science colleagues but will also revitalize science education in Nigeria and beyond.

Keywords: Scientific names, Binomial nomenclature, Research captions, Visual appeal

Determinants of Households' Food Security among Fulani Women Milk Processors in Oyo State

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The study was conducted to assess the contribution of dairy milk processing to household food security among Fulani Women in Oyo State in nine local government areas where dairy cattle farmers are predominant. A total of one hundred and twenty-three respondents were selected for the study. Data were collected on their socio-ecomomic characteristics, dairy cattle production enterprises, constraints of dairy processing and contribution of dairy to their income. To estimate food security of the households, food security index was used to classify the households to food secured and food insecured. Data were subjected to descriptive statistics and Logit Regression. Result revealed that most (62.6%) of the respondents were above 25 years old, were married, had no formal education, had household size of 11-20 members, earned between N18, 000 - N22, 000. The result also revealed that 30.9% of the respondents had 9-12years of dairy processing experience, had between 31- 40 herds of cattle, most of them possessed White Fulani cattle, and they opined that poor storage poor storage facilities was the major constraint faced in dairy processing. It was also revealed that most of the respondents realized between 100-250 litres of milk daily though this depends on the number of their cattle, majority of the respondents consumed between 16-25 litres of milk daily, they sold between 80- 160 litres of milk daily, most of the respondents used between N5001- N10000 from sales of milk, 45.5% of the respondents spent between N 15001- N 20000 on education, most of the respondents spent more than N 5000 on medical services, 55.3% of them spent between N 5001- N 10000 on social and cultural expenses. The result further revealed that most of the dairy processors' households were food secured. The result showed that age, household size, income, years of dairy experience, sources of cattle, herd size, breed of cattle, milk obtained daily, milk sold daily, amount used from milk sales had directive positive effect (coefficient) on households' food security. The adjusted R^2 was 0.294 which implies that 29.4% of the food security status was explained by the influence of the independent variables selected for this study. Based on the result of this study, it was concluded that most of the households were food secured; marital status, household size, years of experience, amount of milk obtained daily, amount of milk sold daily herd size, breed of cattle and purpose of production were significant determinants of food security among the dairy processors.
Keywords: food security, dairy cattle, households, milk, processing

Development of a Novel Legume Blended Instant Porridges from Low Grade Broken Rice Fractions

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Protein-energy-malnutrition (PEM), stunted growth and gut inflammation are some of the major nutritional childhood related challenges in sub-Sahara Africa, including Nigeria. This is compounded by poor access to energy for cooking and conflicts. The introduction of grain legumes into cereal-based complementary diets using processing technique that is environmentally sustainable with minimal impacts on the nutritional composition of the legumes has been shown to

have huge potential in improving child growth and development. However, legumes are relatively underutilized in complementary diets in developing countries, mainly due to long processing time, high energy requirement for processing and flatulence effects. Effective and innovative techniques for the incorporation of legumes into cereal-based complementary diet are critically needed with minimal effects on chemical and sensory qualities. In the present study, low grade broken rice fractions were blended with different levels of three common legumes cultivated in Africa (soybean, cowpea and bambra groundnut) to produce instant complementary porridges using extrusion cooking technology. A 5-level ($-\alpha, -1, 0, +1, +\alpha$) 3-factor (moisture level X_1, blend ratio X_2 & barrel temperature X_3) central composite design in a response surface methodology was used for the formulation of different blends and the assessment of the optimal extrusion conditions. Results indicated that, apart from the production of satisfactory instant porridge, the optimal extrusion parameters for X_1, X_2 & X_3 were 20%, 24% and 120°C, 20%, 22.4% and 120°C and 20%, 23% and 130°C for cowpea, bambara groundnut and soybean blended porridges respectively. At this conditions, the extrudate expansion index of 126.14 – 130.11, porridge dispensability (97.10-99.02%), water absorption index (6.11-6.83), Protein (21.66-26.26), lysine (4.68-5.5.02mg/g protein), calorie (388.82-412.14kcal/100g), Fe (10.10-12.14mg/100g), Mg (13.13-15.15mg/100g), and Ca (25.81-30.11mg/100g) at a combined desirability function of 0.9942 were recorded. Weaning mothers and caregivers rated the porridge highly acceptable (8.39, 8.41 and 8.32) and principal component analysis (PCA) of sensory data shows that the first-five principal components (PCs) contributed 99.23% to the total likeness observed, with PC1 contributing 34.06%, PC2 (23.86%), PC3 (17.45%), PC4 (15.55%) and PC5 (8.31%). These results demonstrate that legumes blended with broken rice fractions at the optimal levels and processed using extrusion cooking could provide novel instant complementary porridges that will contribute significantly to improving childhood feeding in sub-Saharan Africa.

Keywords: legumes, rice, extrusion cooking, response surface methodology, complementary feeding, protein-energy malnutrition, sub-Saharan Africa

Effect of Complexing Agent Concentration on the Optical Properties of Chemically Deposited Manganese Selenide Thin Films

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Thin films of manganese selenide (MnSe) had been deposited successfully on a microscopic glass substrates of dimension (25.4 mm x 76.2 mm x 1.2 mm) using chemical bath method in alkaline medium. The bath composed of molar solution of manganese chloride as source of Mn^{2+} ion, freshly refluxed sodium selenosulphate as source of Se^{2+} ion, ammonium hydroxide as pH moderator and EDTA as complexing agent. Five samples of MnSe thin films were fabricated to determine the effect of EDTA concentration by varying the molar concentration from 0.00 to 0.08 M with an increasing interval of 0.02 M. Film thickness obtained by gravimetric method ranged from 267.82 nm to 688.40

nm. Film thickness was found to decrease as EDTA concentration increases. Optical properties measured with Spectrophotometer showed that the absorbance is high within UV region but decreases as wavelength increases. Transmittance of the films is found to be low within UV region but increases as wavelength increase. Reflectance of the films is low which is useful in antireflective coating. Absorbance was found to decrease as EDTA concentration increases while transmittance was found to increase as EDTA concentration increases. The energy band gap result obtained ranged between 3.0 eV – 2.86. We observed that the energy band gap increase as EDTA concentration increase. Refractive index ranged between 1.10 and 2.64. The optical results obtained show that MnSe thin films could be used for solar energy application and optoelectronics devices.

Keywords: CBD, Manganese selenide, Optical properties, Complexing agent

Hydro-Geophysical Appraisal of Shallow Unconfined Aquifers of Ikeduru/Mbaitoli Area, Southeastern Nigeria, using Surficial Resistivity Data

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The hydro-geophysical appraisal of shallow unconfined aquifers of Ikeduru/Mbaitoli area using surficial resistivity data was done. Twenty-three (23) vertical electrical sounding (VES) data with a maximum electrode spacing of AB/2 = 400m were acquired using the Schlumberger electrode array. The interpretation of VES data were done using the partial curve matching technique to obtain initial model parameters which were used as input for computer modeling using the OFFIX software. The study revealed three to eight geo-electric layers. Curve types identified ranges from simple A, K, AK, HK, HA, KH to complex HAK, KHK types. The iso-resistivity models, geo-electric cross sections and lithological log data revealed a sandy clay at very shallow depths with a thick layer of shale/clay extending to about 400m within the western part. Finally, this study has been used to appraise the shallow unconfined aquifers of the study area. Results of the research showed that the aquifer resistivity in the area varies from 20.10 at Umuowa Obokpo Ubomiri (VES 7) to 25.300Ωm at Umuduru Uba Ifeakala (VES 3), with a mean value of 1352.54.96Ωm. The depth to water table varies from 75 at Afara (VES 21) to 169m at Umuduru Uba Ifeakala (VES 3). Also, the area is highly variable in thickness with Umuowa Obokpo Ubomiri (VES 7) having the least thickness of 24.90m, while Odumara Obi Orodo (VES 5) has the highest thickness of 73.90m. The findings of this study clearly shows a very prolific aquifer system that is however susceptible to surficial contamination from anthropogenic sources. Appropriate recommendations were made for the good management and protection of the aquifer.

Impact of Larva Source Reduction Activities of Trained School-Aged Children on Malaria Control in Nigeria

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Malaria control is included under the Goal 3 Target 3.3 of the Sustainable Development Goals (SDGs) which aims to end the epidemics by 2030. Nevertheless, malaria still remains a huge global health burden with more than 90% fatalities in Africa where Nigeria has a larger percentage. There is a clear need to develop an innovative malaria control strategy that could be sustained and also address the vector before emergence. Therefore, this study was carried out to measure the impact of Larval Source Reduction activities (LSR) on the abundance of adult mosquitoes and malaria parasite prevalence using trained School-aged children of a rural community in Nigeria. An intervention community and a control community (both rural) were selected from different wards of Odeda Local Government Area (LGA) in Nigeria. A total of 24 school-aged children were selected, trained and engaged for LSR activities (intervention community). Pre and post intervention assessment included; mosquito survey (Pyrethroid Spray Catch) and blood sample collections (for malaria microscopy) from consented respondents in the control (152 respondents) and intervention communities (155 respondents). Chi-Square was used for the statistical analysis to measure any pre and post- test differences. There was no statistically significant differences observed between the respondents in the experimental and control communities in terms of sociodemographic characteristics such as age ,gender, education and occupation ($p<0.05$). A total of 373 (36.7% anopheles) and 294 (41.8% anopheles) indoor resting mosquitoes were collected from the intervention and control community respectively (pre-intervention).The LSR activities of the trained children was observed to significantly ($p<0.05$) reduce indoor resting anopheles mosquitoes by 67.2% in the intervention community while a significant ($P<0.05$) increase (45.5%) was recorded for the control community. Indoor resting density of malaria vector reduced from 3.8 to 1.3 in the intervention community. Overall malaria parasite prevalence reduced significantly in the intervention community from 40.8% to 23.0% ($P<0.05$) while a reduction from 44.5% to 37.4% ($P>0.05$) was recorded for the control community. This study has revealed that involving children in health interventions like LSR is efficacious in the reduction of malaria vector and malaria parasite prevalence.

On the Development of UJ-MaGT Scientific Calculator

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Graphing is an important skill/knowledge required by almost every scientist, engineer and other professionals that require analysis of data to make sense of phenomena, relationships, etc. This important knowledge is learned right from secondary school through to advanced level of education and it is developed through the study of functions in mathematics and lab exercises in sciences, etc. At the secondary school level, learning to graph by hand is the most preferred and common practice

in most countries in the African continent and other parts of the world. However, studies have shown that graphing by hand present numerous difficulties to science students due to its high "procedural load". To reduce the procedural load, an algorithm called UJ-MaGT was developed and tested for effectiveness. Excellent result in time management, simplification and pedagogical change in graph plotting process was achieved with the help of UJ-MaGT. Currently, the algorithm has been incorporated into a scientific calculator.

Keywords: Graphing, Graphing Difficulties, Graphing Calculator, Science Education, and Graphing Pedagogy

Outcome of Multi-Faceted Interventions for Improving the Quality of Antenatal Care in Nigerian Referral Hospitals: A Quasi-Experimental Research Design

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Several published reports from the early 1980s to date indicate that a large proportion of maternal deaths in Nigeria occur in women who did not receive antenatal care in orthodox clinical settings. However, increasingly worrisome is the equally high number of maternal deaths that occur in women who had received antenatal care in orthodox clinics and hospitals. We posit that the high rate of maternal deaths in women receiving antenatal care is most likely attributable to poor quality antenatal care offered in those settings. The objective of this paper is to report the results of a quasi-experimental research whereby specific interventions were carried out in two referral hospitals (one in southern Nigerian and the other in northern Nigeria), while two referral hospitals in comparable locations in southern and northern parts of the country served as control hospitals. Over 21 months period, we collected data prospectively on quality of antenatal care from the four hospitals using questions on 18 items that assessed the content and experience of care during the current and previous visits. The items were categorized as quality indicators for maternal and fetal assessment management, disease testing and management, and counseling and information sharing. From the overall sample of antenatal attendees we randomly selected 30 women per month in both intervention and control hospitals to be interviewed on their experiences of antenatal care in the hospitals. The exit interviews were conducted immediately after the women left the antenatal clinic locations, and by an interviewer who was not part of the clinical team that managed the patient. Permission was individually obtained from the women to conduct the interview. In all, 777 interviews were successfully achieved. The primary outcome of the intervention was to improve the quality of antenatal care. Hence, the analysis compared reported eighteen quality indicators (QIs) at intervention hospitals with the control hospitals. We assessed the QIs in two ways, as the count of reported QIs and each QI separately. The generalized linear model (GLM), Poisson regression was used to assess whether the counts of QIs at intervention hospitals were significantly higher than at control hospitals. GLM estimates were converted to odds ratios. All models were adjusted for socio-demographic characteristics and number of visits. Alpha was set at 0.05, and all p values were two-sided. SAS version 9.4 and JMP 14 Pro were used for the analyses. There was a 11% odds of reporting higher count of all QIs (OR 1.11, 95% CI 1.06 to 1.17) and 32% odds of

reporting counseling and information sharing QIs (OR 1.32, 95% CI 1.23 to 1.41) at intervention hospitals compared to control hospitals but a 17% odd of reporting lower count of maternal and fetal management QIs. Factors associated with counts of reported QIs include increasing number of attending health workers, first visit and total number of visits to the facility. We believe the results of this study will be useful for developing substantive policies and practices for improving the quality of antenatal care in Nigeria.

Science as a Strategic Tool for Poverty Alleviation in Nigeria

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Throughout the history of mankind, science and technology have been dominant factors for initiating and accelerating human progress and development. The human resource base required driving the engine of development and transformation strategies of all nations are moulded mainly through science. All nations of the world are aware of the significant contributions of science and technology as exemplified in the development and transformation of their economies, improving the living standards of their people, promotion of good health, provision of abundant food through development of new methods and skills of production, affluence over poverty, reduction of hunger, increased earning power, reasoning over superstition, education and knowledge over ignorance, evolvement of workable and stable political systems and methods of governance, military supremacy, etc. The future of all nations can only be assured if there is sustainability of the issues raised here. Therefore, poverty alleviation is one of the most critical challenges facing Nigeria and her citizens. This has greatly hindered the pursuit of sustainable socio-economic growth. Attempts by various governments past and present, to put the menace under control have failed to yield the much expected result. This paper has made the case especially of the education component of science as a strategic tool for poverty alleviation in Nigeria. Hindrances towards effective utilization of science in the attainment of sustainable development have been highlighted. Recommended actions for alleviating poverty using science as a strategic tool to attain sustainable national development have been made.

Keywords: Science, Poverty alleviation, Sustainable development, Nigeria.

Scientific and Innovative Exploration of Underutilized Tropical Seeds for Greener Environment, Sustainable Health and Rural Poverty Reduction

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The attainment of the Sustainable Development Goals is a concept that requires novel scientific approaches from various perspectives and stakeholders. Throughout the world, the sustentation of elegant and exquisite skin and hair is the desire of most people. However, this feat is not achieved without the detrimental effects on the immediate environment. This work aimed at developing and standardising natural cosmeceuticals void of artificial constituents for tropical skins whilst identifying key natural anti-tyrosinase from underutilised tropical seeds which include *Sebal causarium*, *Cola gigantea*, *Blighia sapida*, *Cordia sebestena*, *Daniellia oliveri*, *Elaeis guineensis, Citrus aurantifolia*, *Citrus paradise, Vitellaria paradoxa, Citrullus vulgaris, Mormodica charantea, Delonix regia, Chrysophyllum albidum, Citrus limon, Vitis vinifera, Persea Americana, Kigelia africana, Prosopis africana* among others. The principles of Green Chemistry adopted for the preparation of natural medicated cosmetics ensured potent products free of all artificial antibiotics, colourings, fragrance and preservatives. Chemical compositions and structures of bioactive principles were obtained using GC-MS, NMR, MS, FT-IR spectroscopic techniques. The cytotoxicity (against mammalian cell), anti-parasite, anti-microbial, antioxidant, anti-inflammatory and toxicological potential of the lipids were evaluated following standard *in vitro* and *in vivo* procedures while various chemoinformatic tools were used to predict the binding mode and toxicities. Compounds which included thiocarbamate, isothiocyanate, nitrile and glucosinolate were characterised from the *Moringa oleifera* seeds while *Sebal causarium* was rich in linoleic acid (30%), *Daniellia oliveri* contained linoelaidic acid (56%), *Momordica charantia* had eleosteric acid (39%) as main constituents. The antimicrobial, antioxidant, anti-inflammatory and membrane stabilisation activities of the cosmetics were comparable to standard commercial synthetic products such as lux, abuad, dudu osun. The topical creams from the seed oils of *Chrysophyllum albidum, Citrus limon, Vitis vinifera* and *Persea americana* did not exhibit any skin sensitivity, acute dermatoxicity or dermal irritation as the membrane integrity of the skin were not compromised. Seventeen of the seed oils showed chemical and biological potentials for cosmeceutical utilization. The natural cosmetics was highly cost effective and with huge potential for application for economic purpose. The benign approach adopted validates the potential applications of the underexplored seeds for improved health, greener environment and reduced poverty.

Keywords: Green Chemistry, Sustainable Development Goals (SDGs), Rural Poverty Reduction (RPR), Anti-tyrosinase, Organic cosmetics, Underutilized seeds.

Synthesis and Characterization of SnO:Zn^{2+} and SnO:Dye Of *Tectona Grandis* Thin Films Deposited using Spray Pyrolysis

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In this study, SnO:Zn^{2+} and SnO:Dye of *tectona grandis* thin films were prepared by using spray pyrolysis technic. The doping was done by varying the concentration in the range, 0.1M – 0.5M and 1% - 5% for Zn^{2+} and dye of *Tectona grandis* respectively. The deposition was done at different Substrate temperature of 50°C, 100°C, and 150°C. The effect of Zn^{2+} - dye concentration and temperature on the optical and solid properties of the films were investigated by subjecting the films to UV spectrophotometer. It is observed that the peak refractive index corresponds to 3.5 for both un-doped and Zn^{2+} doped samples.. It is equally observed that the extinction coefficient (K) of the un-doped SnO thin films increased with substrate temperature. When the films were doped with 0.3M – 0.5M Zn^{2+} concentration, the extinction coefficient depicts lack of trend. Changing the dopant to dye of *Tectona grandis* did not have significant effect on the extinction coefficient spectra. It was observed that that the optical conductivity for un-doped SnO thin films showed a clear decrease iwith substrate temperature. Clear variation in optical conductivity values were observed for 0.2-0.5M Zn^{2+} doped samples. When dyes were introduced into SnO thin films, optical conductivity spectra showed a different behaviour. The real dielectric constant for un-doped SnO increases with substrate temperature between 1.25- 2.25 while those of 0.1M Zn^{2+} did same between 1.3- 2.50eV When dye was incorporated into the structure, the real dielectric constant spectra depict a similar pattern regardless of the bath temperature. It is also observed imaginary dielectric constant values of the un-doped and Zn^{2+} doped samples vary in similar pattern. No significant difference in magnitude was observed when different % of dyes of *Tectona grandis* was introduced into SnO thin films. It was also observed that the band gaps of the dye doped samples are lower: 1.55eV- 1.83eV than those of the Zn^{2+} doped samples, 1.60eV – 2.20eV. The incorporation of the dyes shifted the fundamental absorption edge of the un-doped SnO thin films thus providing tuning effect of the band gap for solar cell application. The evaluated band gap showed a red shift upon doping with the energy band gap decreasing from 1.60 – 2.22eV to 1.55 – 1.88eV for the investigated doping concentration range.

Keywords: Spray Pyrolysis, SnO:Zn^{2+}, Dye, *Tectona grandis*, Optical Properties, Deposition Temperature

Poster Presentations

Adherence of Healthcare Providers to WHO Management Guidelines for Malaria in Ijebu Ode, Nigeria

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Adherence to malaria treatment guidelines is pivotal to the management and control, and ultimately the actualisation of the eradication agenda in Africa. This study assessed malaria management practices among health care givers in Ijebu Ode community in Ogun State, Nigeria. Structured questionnaires measuring treatment practices were administered to consenting health care givers in the study area. Responses were scored and compared to national and WHO guidelines for malaria management to measure practice. A total of 46 health care givers made up of mostly doctors (54.3%) were enrolled into the study. Presumptive diagnosis (90.5%) was the most reported form of diagnosis while Arthemether-Lumefantrine (91.0%) was the most prescribed drug for treating uncomplicated malaria. Sulphadoxine-Pyrimethamine (85.0%) was mostly recommended to pregnant women for intermittent preventive therapy (IPT). Standard dose of SP is given at least twice during the pregnancy. The lack of necessary equipment was reported by 70% respondents as the reason for current management practices. Mean practice score in the study was 5.28±1.8 out of a total obtainable score of 8. Only 59% of study respondents had good practice based on our set threshold of 6 practice points. This study has shown fair practice among healthcare officers in the study area but also reveals that 41% of the healthcare providers are yet to meet up with the minimum standard practice for the management of malaria. This therefore necessitates the need for renewed efforts such as education of health care givers to ensure better compliance with guidelines.

Keywords: Malaria, Management & Control, Treatment, World Health Organisation

Adsorption of Phenol from Wastewater using Activated Carbon from Groundnut (*Arachis hypogaea L.*) Shells

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This study was to remove phenol from pharmaceutical wastewater using activated carbon derived from groundnut (*Arachis hypogaea L.*) shells. The adsorbent was characterised by Fourier Transform Infra-red Spectroscopy (FTIR), Scanning Electron Microscope (SEM) and X-ray Diffraction (XRD) analysis. The level of phenol in the effluent evaluated was 3.7 ppm which was above WHO standard. The optimal factors for phenol removal by ground-nut shell activated carbon (GSAC) were 176 minutes, 1.0 g/L adsorbent dosage, 35°C and pH of 6.5. The numerical optimisation revealed that the optimal removal efficiency for phenol adsorption was 99.4%. The adsorption of phenol was best fit to Langmuir isotherm and Pseudo-second order kinetic models. The monolayer adsorption capacity of the adsorbent for phenol removal was 115.5 mg/g. The adsorption process for phenol

removal was exothermic and spontaneous. Thus, GSAC showed increased efficiency in phenol removal from pharmaceutical wastewater.

Keywords: Adsorption, Activated carbon, Groundnut shell and Phenol

Air Pollution: Contribution of Kerosene Soot Particulates to Domestic Emissions

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The question, uppermost in mind is whether soot samples emit toxic particulates and could contribute to air pollution, occupational and domestic hazard on exposure of the populace. In this study, we document experimental report on the protocols and levels of pollutants emitted from soot into the near atmosphere. Characterization of soot was carried out using X-Ray Fluorescence (XRF) spectrometry, X-Ray diffraction (XRD), Scanning Electron Microscopy (SEM), and Fourier Transform Infra-red (FTIR) Spectroscopy. The pH of soot samples is near the neutral range (6.60-6.85). Samples are majorly covalent as revealed by the zero conductivity values. The moisture contents of KLS (10.0%) is almost twice, as was reported for KSS and are typical to explain the tendency of the soot dusts to form aerosols in near atmosphere. Poor or low value of bulk densities (0.058-0.060 g/cm^3) is an indication that the soot can be easily spread by air current to the environment. Levels of impure carbon revealed by EDS analysis clearly pointed at the organic pollutants loading potentials of the soot. Other findings include FTIR characteristics signals indicating aromatics, XRF analysis showing high concentration of Chromium and other toxic metals. Overall, impure carbon from kerosene based soot could contribute to local emissions, mostly produced by the sources with low emission height. Secondly, the levels of toxic metal in soot samples exceed the permissible legislative limit for air samples.

Keywords: Air pollution, aerosols, Kerosene, soot, carbon, metals, particulates

Analysis of Selected Pesticide Residues and Heavy Metals in Honey Obtained from Plateau State, Nigeria

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In this study, samples of honey were collected from five different farms in Plateau State and analysed for Pesticide residues (Atrazine and Cypermethrin) and heavy metals (Pb, Cd, Cr, Fe and Mn) using GC-MS and AAS techniques. Results of the analysis showed that atrazine and cypermethrin were found in all the samples in the range (0.01- 0.36 and 0.11- 0.26) mgkg^{-1}, respectively. All the samples contained Mn and Fe while Cd was found in sample from Maraban Jos only, with value 0.0013 mgkg$^{-1.}$ Pb was found in all the samples except Bokkos and Maraban Jos. The study revealed that all samples contained the selected pesticide residues above the maximum residue levels recommended by European Union, while concentration of heavy metals except Mn

found in all the samples were below the maximum concentration limits recommended by Food and Agricultural Organisation. The high concentration of pesticide residues found in the samples indicated contaminated environment in which those bees feed, therefore there should be close monitoring of the quality of honeys produced.

Antibacterial Properties of Selected Medicinal Plants on *E. coli*, *Salmonella sp* and *Shigella sp*.

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The antibacterial activities of the leaves of *Ficus carpensis*, *Newbouldia laevis*, *Vitex doniana*, *Spondias mombin* and *Psidium guajava* on *Escherichia coli, Salmonella sp*. and *Shigella sp* which are common causes of infectious diarrhea were studied. Ethanolic and aqueous extracts of *Ficus carpensis, Newbouldia laevis, Vitex doniana, Spondias mombin* and *Psidium guajava* were obtained using cold extraction at room temperature. The filtrates were dried at 40 °C to obtain the crude extracts and stored at 4 °C until use. Phytochemical analysis revealed the presence of tannins, flavonoids, glycosides, saponins, alkaloids, steroids, terpenoids. In vitro antimicrobial studies were investigated using macrobroth dilution method to determine the minimum inhibitory concentration (MIC) with ethanol and aqueous extracts of *Psidium guajava* possessing the lowest MIC of 50 mg/ml. The antimicrobial assay revealed that ethanol extracts showed more antimicrobial activity than the aqueous extracts. Ethanol and aqueous (hot and cold water) extracts of *Newbouldia laevis, Spondias mombin* and *Psidium guajava* exhibited varying degrees of antimicrobial activity with diameters of zone of inhibition ranging between 16.00 ± 0.00 and 24.33 ± 0.33 while ethanol and aqueous extracts of *Ficus carpensis* and *Vitex doniana* showed no activity against the diarrheagenic strains of *E. coli, Salmonella sp*. and *Shigella sp*. The synergistic combination of different plant extracts showed increased antibacterial effect.

Keywords: Antibacterial, Phytochemicals, *Psidium guajava*, Ethanol extracts, Synergistic

Antibiogram of Bacterial Flora of Public Health Significance Associated with Postharvest *Irvingia gabonensis* Seeds

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The spread of resistant bacteria within the community has continually posed obvious additional problems for infection control. Efforts to identifying sources of resistant bacteria have not been channeled towards some medicinal food condiments. This study investigated the antibiotic

resistance profile of bacterial flora of public health significance associated with postharvest *Irvingia gabonensis* in Southwestern Nigeria. Dried *I. gabonensis* seeds were purchased from local sellers from 25 different locations in Southwestern Nigeria. The blended and homogenized were serially diluted to up to 10^{-8} and plated using the spread plate technique. Plate count agar, violet red bile agar (VRBA), MacConkey agar, blood agar, mannitol/eggs yolk/polymyxin agar and mannitol salt agar (MSA) were used for the cultivation and enumeration of the aerobic mesophilic bacteria, coliforms, Enterobacteriaceae, *Streptococcus* spp, *Bacillus* spp and *Staphylococcus aureus*, respectively. Cell morphology, Gram's reaction, colony characterization and biochemical characterizations of isolates were performed according to standard procedures while API 20E and API 20NE were used for additional identification of members of *Enterobacter*iaceae and non-*Enterobacter*iaceae, respectively. The agar disc-diffusion method was employed to determine the antibiotic resistance profiles of the bacterial isolates. A total of 263 bacterial isolates (129 Gram-positive and 134 Gram-negative) were obtained from the sampled *I. gabonensis* seeds. The Gram-positive were *Bacillus cereus*, *Bacillus subtilis*, *Micrococcus luteus*, *Staphylococcus aureus*, *Staphylococcus epidermidis* and *Streptococcus pyogenes* while the Gram-negative bacteria were *Enterobacter aerogenes*, *Escherichia coli*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, *P. mirabilis* and *Serratia. rubidaea. P. aeruginosa* had the highest percentage occurrence of 14.07%, while the lowest was *S. pyogenes* (5.7%). Eighty-five (66%) of Gram-positive bacterial isolates exhibited resistance to penicillin, 65 (50.4%) to gentamicin, 69 (53.5%) to erythromycin, 63 (43.8%) to cloxacillin, 73 (56.6%) to chloramphenicol, 75 (58.1%) to amoxicillin, 58 (45%) to tetracycline while 69 (53.5%) showed resistance to streptomycin. *B. cereus* exhibited percentage resistance ranging from 31 to 68.8% to the anibiotics. The percentage resistances of *B. subtilis*, *M. luteus*, *S. epidermidis*, *S. aureus* and *Streptococcus pyogenes* ranged from 37.5 - 70.8%, 29.4 - 100%, 40 – 60%, 37.5 – 62.6% and 46.7 – 86.7%, respectively. However, 87 (65%) of Gram-negative bacterial strains exhibited resistance to cloxacillin, 82 (61.2%) to ceftazidime, 67 (50%) to ciprofloxacin, 77 (57.5%) to gentamicin, 74 (55.2%) to cefotaxime, 84 (62.7%) to augmentin, 61 (45.5%) to nitrofuratoin and 24 (17.9%) to ofloxacin. *Enterobacter aerogenes*, *Escherichia coli* and *Proteus mirabilis* strains showed percentage resistances ranging from 0 – 100% while *Klebsiella pneumoniae*, *Pseudomonas aeruginosa* and *Serratia rubidaea* strains exhibited percentage resistances ranging from 26.1 - 73.9%, 29.8 – 78.4% and 0 – 75%, respectively. This study showed that *I. gabonensis* seeds could be a source of antibiotic-resistant pathogenic bacterial strains, despite is enormous medicinal properties, which could be a threat to public health. The antibiotic resistance patterns of isolated bacterial strains are of medical importance as there are chances of transferring resistant traits.

Keywords: Antibiogram, antibiotic resistance, bacteria, *Irvingia gabonensis*, public health.

Anticonvulsant Activity of Methanol Extract of the Aerial Parts of *Caralluma dalzielii* N. E. Brown

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Caralluma dalzielii (Family: Asclepiadaceae) is a plant whose aerial parts have been used by traditional healers in the North-west Nigeria for the treatment of several ailments including

infertility, diabetes, leprosy, rheumatoid arthritis and epilepsy. Previous scientific research has shown its antidiabetic, anti-inflammatory and antinociceptive effects. Currently, there is paucity of data on its anticonvulsant activity. The present research therefore was aimed to investigate the anticonvulsant activity of methanol extract of the aerial parts of *Caralluma dalzielii* N. E. Brown using different anticonvulsant models in mice and chicks. The methanol extract of the aerial parts of *C. dalzielii* was subjected to phytochemical screening following standard procedures. The anticonvulsant activity of the extract (250, 500 and 1000 mg/kg p.o) was investigated in pentylenetetrazole (PTZ) and strychnine (STN) induced seizures in mice and maximal electroshock seizure (MES) in chicks. The sedative hypnotic effect was also studied using the diazepam induce sleep model in chicks. Diazepam and phenytoin were used as the positive control. Results were expressed as mean ± standard error of mean. Statistical analyses were carried out using ANOVA followed by Dunnett's post hoc test. Values of $p < 0.05$ were considered statistically significant. Phytochemical analysis of the methanol extract of *Caralluma dalzielii* plant revealed the presence of alkaloids, flavonoids, tannins, saponins, carbohydrates, steroids, glycosides, cardiac glycosides and phenols. Pre-treatment of mice with *Caralluma dalzielii* produced a dose-dependent protection against PTZ-induced seizures and mortality, 50% with 500 mg/kg and 100% with 1000 mg/kg of extract. The extract also significantly increased the latency/onset of myoclonic jerks and reduced the duration of tonic seizures dose dependently. In STN-induced seizure, the treatment (both diazepam at 5mg/kg and the extract) had no protection (0%) against seizure induction and mortality (100%) in all doses. However, the extract significantly prolonged the latency of tonic seizure and increased the survival time before death in a dose dependent manner. The extract at 1000 mg/kg showed more activity than diazepam with an increase in onset and duration of seizure. The extract had zero protection against maximal electroshock seizure but reduced mean recovery time from 10.37 ± 0.59 to 8.23 ± 1.47. In the diazepam-induced sleep test, the animals injected with diazepam showed loss of rightening reflex within 2-4 of administration. *Caralluma dalzielii* at a dose of 1000 mg/kg significantly shortened the onset and prolonged the duration of diazepam-induced sleep in chicks but at lower doses had no significant effect on the onset and duration of diazepam-induced sleep in the animal. The results of this study suggest that the methanol extract of *Caralluma dalzielii* may possess anticonvulsant activity in mice and chicks. This justifies its use in the treatment of epilepsy in Northern part of Nigeria.

Antimicrobial and Antioxidant Activities of the Extract and Solvent Fractions of a Marine Bacterium (Streptomyces canus Atcc 12647)

Kelvin Ejiofor

Streptomyces species are the most prolific producers of effective antibiotics within the group actinobacteria with recent studies pointing towards the marine isolates. This study evaluated the in-vitro antimicrobial and antioxidant activities of the methanol extract and solvent fractions of a new marine isolate Streptomyces canus ATCC 12647. The Streptomyces strain was cultured in M5 media for 4 days at 28oC and 180 rpm. At the end of the fermentation, the broth was centrifuged (8000 rpm, 1 h, 4oC) and the supernatant mixed with adsorbent resin (XAD-7HP and XAD-16N, 1:1) and shaken continuously at a reduced speed for 7 h. The resin was then collected by filtration and, washed with MilliQ water, and then eluted with methanol to obtain the extract. The extract was purified using vacuum column liquid chromatography (VLC) by gradient elution with methanol in acetone (25-100%, 1 L each). The antimicrobial assay was carried out using the agar well diffusion method, while the antioxidant assay was determined using 1, 1-Diphenyl-2- picrylhydrazyl

radical scavenging and phosphomolybdenum methods and the IC50 determined for both models. The results of the antimicrobial study showed remarkable antibacterial and antifungal activities against Bacillus subtilis, Staphyllococococus aureus and Candida albican. The standard drugs employed were ciprofloxacin and Fluconazole for the antibacterial antifungal assay respectively (MIC range of ciprofloxaxin 0.44 to 128 mg/L; 8 to 32 mg/L for fluconazole). Fractions F3 and F4 have the highest antimicrobial activity with MIC values of 0.417±0.022 and 0.168±0.014 mg/mL respectively. The extract and fractions demonstrated good in-vitro antioxidant activities in both models with the extract and F3 having the highest antioxidant potentials with percentage radical inhibition of 64.79±0.22 and 60.66±0.34% respectively compared to ascorbic acid with inhibition value of 71.10±0.24%. In the phosphomolybdenum method, the extract, F1 and F4 showed the highest percentage antioxidant activity with values 29.50±0.22, 29.50 ± 0.23 and 31.00 ± 0.20% respectively and 42.50 ± 0.21% for ascorbic acid. The IC50 values of fractions (F1 and F3) with most active antioxidant activity are 1.14 mg/ml, and 1.13 mg/ml and 1.79 mg/ml for ascorbic acid in DPPH model and 0.35 mg/ml, 0.51 mg/ml and 0.75 mg/ml for F1, F4 and ascorbic acid respectively in phosphomolybdenum model. Our results showed that extract and solvent fractions from the marine isolate had good antimicrobial and antioxidant activities.

Antipellicle and Antibacterial Properties of *Ficus Thonningii* (Blume) against *Acinetobacter baumannii*

M. E. Coker and E. C. Onu

Infections caused by *Acinetobacter baumannii* (*A. baumannii*) have constituted a serious issue in global healthcare as resistant forms are frequently reported. The ability of *A. baumannii* to adapt, adhere and persist in solid-liquid and air-liquid interfaces has aided its nosocomial importance. Plant metabolites have antimicrobial abilities and can prevent attachment of microorganisms to surfaces. This study investigated the antipellicle and antimicrobial properties of the leaves of *Ficus thonningii* against *A. baumannii*. Qualitative phytochemical screening was carried out on dried leaf samples. Successive gradient extraction was carried out using *n*-hexane, ethyl acetate and methanol with the Soxhlet extractor. Antibiogram of the isolates was determined using disc diffusion agar method. Antimicrobial activities of the extracts and fractions were conducted using agar-well diffusion method on twenty-three clinical isolates of *A. baumannii* from wound swab, urine, biopsy and sputum. The minimum inhibitory concentrations (MIC) and minimum bactericidal concentrations (MBC) were determined by agar dilution method. Bioactive fractions of the most active extract were obtained via vacuum layer chromatography and thin layer chromatography. The ability of the organisms to form pellicles was investigated. Subsequently, pellicle inhibitory ability of the extracts was investigated. Phytochemicals detected in the leaves of *F. thonningii* included terpernoids, steroids, saponins, tannins, flavonoids, anthraquinones and alkaloids. The antibiogram result showed that *A. baumannii* is a multidrug resistant pathogen as the organism was resistant to multiple classes of antibiotics. At 50 mg/ml, zones of inhibition ranged from 10 mm-15 mm, 9 mm-11 mm and ≤ 10 mm for ethyl acetate, methanol and *n*-hexane extracts respectively. MIC values ranged from 0.039-1.25 mg/ml, 0.039-20 mg/ml and 1.25-20 mg/ml for ethyl acetate, methanol and *n*-hexane extracts respectively. The MBC ranged from 5-20 mg/ml, 1.25-20 mg/ml, and ≥20 mg/ml for ethyl

acetate, methanol and *n*-hexane respectively. Pellicle formation was observed in 62.0% of isolates. There was a slight reduction in the pellicles formed at 12.5 mg/ml concentration. *Ficus thonningii* has good antimicrobial activities against *A. baumannii*. The inhibitory effect of the plant extract on pellicle formation in *A. baumannii* and the antimicrobial activity exhibited by the extract could be useful in combating resistant forms of the organism.

Keywords: *Acinetobacter baumannii, Ficus thonningii,* Antimicrobial, Antiadherence, Pellicle.

Assessment of Bacterial Communities in Underground Water Contaminated with Heavy Metals in a Local Mining Site (Ikwo Salt Mining Centre)

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Heavy metal contamination of underground water due to natural and anthropogenic sources is a global environmental concern. Release of heavy metal without proper treatment poses a significant threat to public health because of its persistence, bio magnification and accumulation in food chain. The objectives of this project were to determine the bacterial diversity in a heavy metal contaminated region of Enyigba, Ebonyi state. Four samples were collected from the study area (Royal Mining Salt, Enyigba) and a control from Federal University Ndufu-Alike Ikwo, Ebonyi state in triplicates. The probable tolerant genera were identified using Enterotube which was based on biochemical reactions. The physico-chemical parameters were analyzed and the different concentrations of heavy metals (Zn, Pb, Cd, Cr and As) were determined using AAS (Atomic Absorption Spectrometer) and its corresponding effects on bacterial communities were determined using the statistical package IBM SPSS Version 22.0. The dominant genera isolated were *Pseudomonas spp, Acinetobacter spp, Vibrio spp,* and *Enterobacter spp* in descending order of abundance. The most tolerant genera were subsequently utilized for examining their potential to degrade hydrocarbon. This was achieved by checking the abilities of the isolates to produce biosurfactant and calculating the emulsification index. *Pseudomonas spp* (86%) was found to have the highest index, followed by *Acinetobacter spp* (67%). The presence of Sulphate reducing bacteria (SRB) and Acid producing bacteria (APB) were confirmed using API RP-38 and ZPRA-5 test broth. Their presence was attributed to the high concentration of sulphate. This study summarizes the potentials of microbes in metal immobilization and hydrocarbon degradation.

Keywords: Heavy metals, Bacteria, Hydrocarbon, Biosurfactant

Assessment of the Liver and Kidney Function amongst Paint Factory Workers in Enugu Metropolis

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Some components of paint have been classified as toxic and carcinogenic to humans. Studies have identified that workers in paint industries are vulnerable to disorders due to the exposure to toxic chemicals and solvents used in the manufacture of paint. Liver and Kidney function markers have

being found useful in assessing toxic effect of some particular substances, therefore this study investigated the Liver and Kidney function parameters of paint factory workers in Enugu metropolis. Ethical clearance was obtained from Enugu State University Teaching Hospital (ESUTHP/C-MAC/RA/034/204). Forty three apparently healthy men (ages 21-40 years) were recruited for this cross-sectional study. Twenty-five paint factory workers were used as test subjects while eighteen non-paint factory workers as controls. Blood samples were collected from the participants for the determination of kidney function parameters (Serum electrolytes, urea, and creatinine) and liver function parameters (Alanine transferase (ALT), Aspartate transferases (AST), Alkaline phosphatase (ALP), conjugated and total bilirubin). The parameters were assayed using the standard colorimeteric methods and all data were analysed using the SPSS computer software version 22 at $p < 0.05$ statistically significant. There was a statistically significant increase ($P<0.05$) in mean AST (14.32 ± 2.34 IU/L; 12.28 ± 2.76 IU/L) and ALP (90.48 ± 17.25 IU/L, 76.96 ± 23.94 IU/L) of Paint factory workers(PFW) compare to the non paint factory workers (NPFW). There was also a significant ($p<0.05$) higher values in the mean of sodium (140.16 ± 2.15 mmol/L; 137.22 ± 2.57mmol/L) and Chloride (100.60 ± 2.06mmol/L; 97.44 ± 4.57mmol/L) of paint factory workers compared to non-paint factory workers, while other parameters (ALT, bilirubin, urea, potassium, bicarbonate , creatinine were not significant($p>0.05$) among both subjects. The study also found out that workers use of personal protective devices was (hand gloves 20%, goggles 8%, safety boots 52%, dust masks 40% and factory gown 36%). Self-reported occupational health problems amongst the paint factory workers was also evaluated, and headache had the highest percentage (68%), followed by eye irritation (60%), skin irritation (56%), dizziness(24%), sleep disorder(20%), anxiety(12%), while memory loss was (0%). This study shows that occupational exposure of humans to volatile organic compounds (VOC) and many heavy metals in paints may have long term deleterious effects on liver and renal functions of paint factory workers. It also concludes that paint factory workers in Enugu metropolis may be at risk of developing both liver and kidney disorders.

Keywords: Paint factory-workers, Liver, Kidney, Enugu, Toxic-components

Assessment of the Quality of Antenatal and Postnatal Care Services in Primary Health Centres in Rural Nigeria: Evidence from Exit Interviews

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To ensure universal health coverage for all Nigerians, the Federal Ministry of Health specifically recommends PHC as the entry point into the health care system. These PHCs provide the opportunity for health workers to offer personalized care that addresses both cultural and social realities of rural women designed to organize health services around patients' needs and expectations. However, while PHC holds the key to enabling women to access skilled pregnancy care, there is evidence of continuing under-utilization of primary care by pregnant women in rural communities in Nigeria. Our recent study in Edo State, South-south Nigeria showed that even in rural communities with available PHC services, only 47% of women used the services, while the

majority used alternative maternal health care services, including traditional methods. Part of the reasons adduced by the women for not using PHCs for maternal health care is their belief that the services provided in PHCs are of poor quality. The objective of this study was to assess the quality of antenatal and postnatal care services in Primary Health Centres (PHCs) in Etsako East and Esan South-East Local Government Areas of Edo State of Nigeria. The study consisted of exit interviews with 177 women after completion of antenatal and postnatal care in eight randomly selected PHCs from July 29-August 16, 2017. The pretested interview questionnaire consisted of questions on treatment received by women as well as their perceptions on satisfaction with the care they received. Twenty questions on the expected treatment and counselling during antenatal care such as whether weight, height, blood pressure, and fundal height were measured, and information on nutrition among others were used to measure the quality of antenatal care. The quality of postnatal care was measured with eight items including whether checks were conducted on the mother and the baby six weeks after delivery; what was done during the baby check – cord, checked, observation of how well baby breastfeeds, assessment of temperature; check to see if the baby might be sick; and information on immunization. The response was confirmed with sighting where necessary. For instance, the prescription and drugs received during the antenatal and postnatal care were sighted. The data were analysed with univariate and logistic regression analysis. The results showed the self-reporting by women of sub-optimal offerings of 20 signal antenatal treatments and 8 signal postnatal care treatments. Less than half (45.6%) of the women reported receiving below the mean of the signal antenatal treatments compared to only one third of postnatal care attendees. The predictors of sub-optimal offerings of standard PHC care included low status of women, young maternal age, and previous childbirths. Women reported lower satisfaction with postnatal care as compared to antenatal care, especially among women who had experienced delay in receiving care. We conclude that the provision of adequate facilities and equipment, the re-training of staff on equitable care for all persons and the provision of health education and counselling of women will improve the quality of antenatal and postnatal care in rural PHCs in Nigeria.

Benign Prostate Hyperplasia: Ethnobotanical Survey of Medicinal Plants Used in its Management in Ibadan South-West Nigeria

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Benign prostate hyperplasia (BPH) refers to the enlargement of the prostate gland in men. It is a major contributor to increased incidences of lower urinary tract syndromes and has been linked to erectile dysfunction. It occurs in 50% of men aged 50 and above, is a progressive and significantly impact negatively on the quality of life to warrant search for treatment. Ranked next to pharmaco-therapeutic agents which are associated with a number of side effects, the use of plant based treatment serve as a form of alternative treatment option in the management of the condition. From time immemorial, plants have been used by men to manage diverse disease conditions, BPH inclusive. However, knowledge about such medicinal plants is often lost due to improper documentation and handling. The objective of this study was to carry out an ethno botanical survey of medicinal plants used in the management of BPH in Akinyele – North Local Government Area of Ibadan Oyo State Nigeria and document such. Information about symptoms of the disease and plants used in the management of BPH was obtained from herb sellers, traditional healers and herbalists with the use of a structured questionnaire that provided information on the social demographics of respondents as well as other information. Information obtained provided insight into the local names of plants, parts of plant used, recipes for their preparation, doses administered

and how administered. Fresh samples of mentioned and identified plants by respondents were taken to a known herbarium for proper authentication and documentation. Respondents were able to identify symptoms of the disease to include; frequent urination, dribbling at end of urination, difficulty starting urination, and blood in urine. A total of 15 respondents were interviewed, 44.40% of whom were herbal practitioners or sellers with the highest educational qualification possessed being Senior School Leaving Certificate. A total of 25 plants were identified as useful in the management of BPH. *Chrysophillum albidum*, with a citation index of 0.2 was the most cited plant used in the management of BPH. Equally, leaves followed by root were the most used plant part. Some plants used in the management of BPH in Akinyele – North Local Government Area of Ibadan, Oyo State have been identified. There is a need to carry out follow -up pharmacological evaluation of these plants to ascertain if they actually possess these properties.

Keywords: Benign Prostate Hyperplasia, Ethnobotanical survey, Ibadan, Nigeria

Biostimulation of Indigenous Microorganisms with Gomeya: An Alternative Way of Bioremediation

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The accumulation and persistence of heavy metals in soil is a serious environmental challenge because these heavy metals are capable of leaching and may therefore impair surface and ground water quality as well as bioaccumulate in plants. The burden of heavy metals in the environment can be reduced through organic amendment stimulated bacterial remediation. This study was designed to treat heavy metals contaminated soil using cattle dung slurry (also called gomeya) stimulated bacterial inoculum. Heavy metal contaminated soil samples were purposively collected from the surrounding of a steel rolling mill in South-western area of Nigeria. Cattle dung slurry was collected from a commercial animal pen. Bacteria were isolated from the soil using pour plate agar technique and identified using biochemical and molecular techniques. The isolates were screened to select high heavy metals tolerant strains used in remediation following standard technique. The soil and cow dung slurry were analysed for heavy metals and sterilised using appropriate techniques. The sterilised soil and cow dung slurry were mixed in ratio 5:1 and remediated with *Alcaligenes faecalis* (LC349889.1), *Pseudomonas azotoformans* (LC349894.1) and *Bacillus mycoides* (LC349897.1) singly and in combination of two or three bacteria respectively thereafter *Corchorus olitorius* was planted for eight weeks using potted experiment. There were sixteen groups in all, sterilised soil only and unsterilised soil with cow dung slurry served as controls. Agronomic parameters such as plant height, stem diameter and number of leaves were monitored weekly in screen house conditions for eight weeks. Plants and composite soil for each study group were analysed for heavy metals thereafter. Data were analysed using descriptive statistics and ANOVA at $\alpha_{0.05}$. The soil was heavily contaminated with heavy metals, especially lead and chromium with concentrations of 1505.1-2333.6 and 1526.0-1678.7 mg/kg, respectively. Thirty-six bacteria isolates were identified as *Pseudomonas* (19), *Proteus* (5), *Alcaligenes* (5), *Enterobacter* (3), *Providencia* (2) and *Bacillus* (2) species. *Alcaligenes faecalis* (LC349889.1), *Pseudomonas azotoformans* (LC349894.1) and *Bacillus mycoides* (LC349897.1) exhibited high tolerance for heavy metals (400-450 μg/mL) and were used for remediation. Significant differences were observed in

the results obtained for the plant height, stem diameter and number of leaves in the treatment groups. Post bioremediation analysis of the soil samples revealed a reduction in the concentration of lead from 2333.55 to 20.8 and 22.6 mg/kg in groups treated with *Pseudomonas azotoformans* (LC349894.1) and a consortium of the three bacteria species while chromium reduced from 1678.7 to 1.8 mg/kg in groups treated with *Pseudomonas azotoformans* (LC349894.1). Postharvest analysis of *C. olitorius* revealed that percentage crude fibre, dry weight (g), lead and chromium concentration (mg/kg) were within the recommended values. *Pseudomonas azotoformans* (LC349894.1) effectively remediated heavy metals contaminated soil and can be employed in the treatment of such contaminated environment.

Keywords: Cattle dung slurry, heavy metal biomagnification, stimulated bacterial inoculum, *Corchorus olitorius*

Biosurfactant Activity of *Candida tropicalis* and *Aspergillus clavatus* Isolated from Oil-Polluted Soil

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Biosurfactants are surface-active molecules synthesized by microorganisms which have both hydrophobic and hydrophilic domains and are capable of lowering the surface tension and the interfacial tension of the growth medium. They are more active and less toxic than the chemical surfactants which are difficult to remove or degrade from the environment. The aim of this study was to determine the biosurfactant activity of fungi: *Candida tropicalis* and *Aspergillus clavatus* isolated from oil polluted soil. *C. tropicalis* and *A. clavatus* were isolated from soil samples obtained from three automobile workshops at Old Motor Spare Parts, Nkpor, Nigeria, using the spread plate technique. They were identified using the standard methods and confirmed using 18S rRNA gene sequence. Biosurfactant activities of the isolates were determined using the emulsification index (E_{24}), oil spreading technique and microbial cell surface hydrophobicity in three different oils: used engine oil (UEO), diesel and petrol. Data were analyzed using analysis of variance (ANOVA) at $P = 0.05$. The biosurfactant activity of the isolates showed high emulsification index (> 50%), oil displacement area (ODA) (> 4.5 cm^2) and cell surface hydrophobicity (> 50%) in UEO, diesel and petrol. However, the E_{24} of the isolates were significantly higher in petrol ($P < 0.05$) compared with UEO and diesel. The broth culture containing *A. clavatus* showed significantly higher ODA in petrol ($P < 0.05$) when compared with UEO and diesel. Moreover, there was no significant difference in the cell surface hydrophobicity ($P > 0.05$) of the isolates in UEO, diesel and petrol. The isolates *C. tropicalis* and *A. clavatus* possessed high biosurfactant activity in UEO, diesel and petrol, thus have a promising potential against different hydrocarbon pollution.

Keywords: Used engine oil, diesel, petrol, emulsification index, oil displacement area, microbial cell surface hydrophobicity.

Bulk Density, Cone Index and Water Content of Soils of University of Abuja in Relations to Crop Production

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The rapid deterioration of tropical soils is a contributory factor to global environmental degradation. This trend is made worst by the impact of climate change variables as increase in rainfall, among other land disturbances. Correlations were established between water content (θ), bulk density (ρ) and cone index (Δ) for soils of University of Abuja. Soil samples were collected spatially using soil core. Data was analysis using GENSTAT statistical software, where correlation analysis was carried out. Soil physical properties analysis was done at the University of Abuja Soil Science Laboratory. The relationship between Δ and θ is in the form: $\Delta = a\,\theta 2 + b\,\theta + c$, where the correlation coefficients r^2 for the various soils were found to be near unity ($r^2 = 0.99$). Similarly, Δ - ρ relationships were linear but the correlations got weaker with increasing sand content of the soils. The relationship indicated that the measured soil physical properties of the University of Abuja are hindering factors driving the behavior of the soils, and has a high potential for unsustainably supporting crop production rather could be a good soil material for civil engineering works as run-way or road foundations. The outcome of the study presented the evidence that the bulk density of the soils of the area is high with values observed at a range of 1.56 – 2.71 g cm^{-1} which pose serious bio-physical limitation for sustainable crop production. The soil therefore, requires deep tillage to reduce the bulk density and increase the porosity.

Keywords: Cone Index; Water content; Abuja; Soil sustainability; Climate change

Changes in Plasma Glutathione Level, Blood and Clotting Parameters in Sickle Cell Carrier and Healthy Participants after Cellgevity Supplementation

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Cellgevity (CGV) is a recent most widely glutathione (GSH) supplement that enhances GSH production in the body. It has been claimed that GSH plays a major rate limiting role in the biotransformation process in the body as a master antioxidant. This study investigated the changes in plasma GSH level, blood and clotting parameters in sickle cell carrier and healthy participants following six (6) weeks of CGV supplementation. Twenty-eight (28) healthy (HP) and twenty-four (24) sickle cell carrier (SCCP) participants were recruited and studied. Physical parameters of each the participants were taken. 5 mL of blood was withdrawn from ante-cubital vein for the measurement of blood cell counts, plasma clotting parameters and glutathione levels in the participants before and after 2000 mg/d of CGV supplementation. The basal haematocrit (Hct) level, red blood cell (RBC) count ($p < 0.05$), and haemoglobin concentration ([Hb]) ($p < 0.001$) were lower in SCCP than in HP. On the other hand, the basal plasma prothrombin time (PT) and international normalize ratio (INR) were in SCCP than in HP ($p < 0.01$ and $p < 0.001$ respectively). After CGV supplementation, white blood cell (WBC) count increased in HP ($p < 0.05$). Hct, RBC count ($p < 0.05$), [Hb] ($p < 0.001$), WBC count and erythrocyte sedimentation rate (ESR) ($p < 0.01$) increased in SCCP after CGV supplementation. Plasma GSH level increased in both groups of

participants following supplementation. However, INR reduced in both groups following supplementation. The study shows improvement in Hct, RBC and WBC counts, [Hb], ESR and INR in SCCP after CGV supplementation. On the other hand, WBC count and INR improved in HP after supplementation. Plasma GSH level was elevated following supplementation in both groups.

Keywords: cellgevity, glutathione level, blood parameter, clotting parameter, sickle cell carrier

Chemical, Anti-Nutritional Factors and Sensory Properties of Maize-Kidney Beans Flour

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In recent years, research efforts in developing countries have focused on the improvement of protein quality of food products due to mass malnutrition. *Tuwo* is a traditional food made from maize flour and consumed by all ages in Nigeria. Flours blends were obtained from Maize and kidney bean flours using the following proportions: A= (100% maize flour as control), B= (90:10), C= (85:15), D= (80:20), E= (75:25). Products were analyzed for proximate, functional, pasting, anti-nutrients and sensory properties. Proximate analysis showed increased in moisture, protein, ash, fiber contents while the reverse was the case for carbohydrate and fats. Functional analysis revealed bulk, water absorption and swelling capacities decreased while foaming, gelatinization, oil absorption capacities increased as substitution of kidney bean flour increased indicating good attributes suitable for food production. Pasting analysis showed increased in peak, trough, final, setback, and peak temperature as the kidney bean flour increased while the reverse was the case for peak time and breakdown viscosities. The anti-nutrients factors (Phytate, Tannins, Oxalate and Trypsin inhibitor) were found to be within the acceptable levels. The result of the sensory scores showed that sample C was the most liked among the entire samples at the ratio of (85% maize flour and 15 % kidney beans flours). Kidney beans and maize flour can be used to improve the nutrient composition and other quality attribute of *tuwo*.

Keywords: Maize flour, Kidney beans flour, *tuwo*

Chemical Composition, Mineral Ratios, Mineral Safety Index and Mineral Bioavailability of *Mucuna Flagellipes* (Ox-Eyed Bean) Seed Flour: An Underutilized Legume in Nigeria

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The promotion and consumption of underutilized legumes could help mitigate food insecurity and alleviate malnutrition in developing countries. The study was designed to determine the effect of processing on the nutrient and anti-nutrient compositions of *Mucuna flagellipes* seed flour an underutilized tropical legume. Their mineral ratios and mineral safety index (MSI) were estimated,

also their molar ratios were calculated and compared to the critical values to predict the implications for mineral bioavailability. The proximate composition of the samples showed that the flours had a range of moisture; 7.37 to 11.46 %, crude protein; 18.21 to 28.53%, fat; 2.93 to 3.97%, crude fibre; 8.06 to 12.90% ash; 2.74 to 4.69%, carbohydrate; 38.45 to 59.09% and energy; 1446.34 to 1285.43KJ/100g respectively. The vitamin composition of the samples showed that vitamin A, vitamin C and vitamin E varied between; 0.15 to 3.46 mg/100g, 0.03 to 85.54 mg/100g, 3.41 to 14.24mg/100g respectively. The mineral composition of the flours showed that the calcium, potassium, phosphorus, magnesium, iron and zinc contents of the samples varied between 132.02 to 167.00mg/100g, 85.91 to 145.00mg/100g, 80.95 to 132.87mg/100g; 83.74 to 145.19mg/100g, 19.90 to 33.16mg/100g and 3.96 to 6.26mg/100g, respectively. The following mineral ratios were lower than the reference balance (ideal) and also lower than the minimum in the acceptable ideal range:Ca/Mg, Ca/K, Ca/P and [K/(Ca+Mg)] for all the seed flours except for Ca/P mineral ratio whose value for the roasted seed flour falls within the acceptable ideal range. The mineral safety index showed that Ca, Mg, P and Zn were all lower than the standards for all the seed flours, whereas Fe was higher than the standard in all the seed flour. Standard mineral safety index values are Ca (10.0), Mg (15.0), Zn (33.0), Fe (6.70) and P (10.0). The anti-nutritional factors; phytate, oxalate, tannins, cyanide and trypsin inhibitors of the samples were significantly ($P \leq 0.05$) reduced by autoclaving and roasting than by boiling and soaking methods. The calculated molar ratios of phytate:calcium, phytate:iron, phytate:zinc, oxalate:calcium and [Phytate][Calcium]/[Zinc] were below the critical value and this indicate that the bioavailability of calcium, iron, and zinc in the raw and processed seed flour could be high. The proximate, vitamin and mineral compositions of the flours evaluated suggested that the flours have the potentials to be used as both nutritional supplements and functional ingredients in the preparation of a number of baked and complementary food products. While autoclaving is the most effective processing technique on reducing the anti-nutrients in *M. flagellipes* seed flour.

Keywords: *Mucuna flagellipes*, nutrient, anti-nutrient, mineral safety index, bioavalability

Comparative Aphrodisiac Activity of Two Ethnomedicinal Plants from Nigeria

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Erectile dysfunction is defined as the inability of a man to achieve and maintain an erection sufficient for mutually satisfactory intercourse with his partner. Various plants with aphrodisiac potentials are utilized in ethnomedicine to manage the condition. Two of such plants used in ethnomedicine in Nigeria are *Hymenocardia acida* Tul (Euphorbaceae) and *Icacina trichantha* (Icacinaceae). This study was aimed at evaluating the claimed aphrodisiac activity of the root of the two plants and stem bark of *Hymenocardia acida* using physical mating methods in rats. Male rats treated with 100, 200 and 400 mg/kg of extracts were mated with female animals, brought into artificial oestrous by the sequential oral administration of ethinyl oestradiol (100 mg per animal) and subcutaneous administration of progesterone (1mg per animal), 48 hrs and 6 hrs respectively prior to the initiation of mating. Parameters evaluated were mounting, intromission and ejaculatory frequencies as well as mounting, intromission and ejaculatory latencies. The methanol extract of the stem bark and root of *Hymenocardia acida* were observed to produce dose dependent increase in mounting, intromission and ejaculatory frequencies. At 200 mg/kg, mounting frequency of 4.60 ± 0.40 and 5.20 ± 0.30 were produced by the stem and root of *Hymenocardia acida* respectively. Equally, dose dependent decrease in mounting, intromission and ejaculatory latencies were recorded. Compared to the

control the effect produced by the root of the plant was statistically significant ($p < 0.05$). Extract of the root of *Icacina trichantha* at a dose of 200 mg/kg dose produced a mounting frequency of 0.60±0.20, while the 100 mg/kg dose effected a mounting frequency of 8.60±0.60. This work provides scientific evidence for the use of both plants in solving conditions of erectile dysfunction in folkloric medicine and justify further investigation.

Keywords: Aphrodisiac, *Hymenocardia acida*, *Icacina tricantha*, erectile dysfunction

Comparative Study of Heavy Metal Composition of Cow Skin Processed by Two Methods

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Processed cow skin is consumed as a delicacy across Nigerian geopolitical zones. In most abattoirs cow skin is processed by exposure to open fire generated using burning tire, wood or other sources of flame while in some cultures the processing involves the subjection to hot water and razor shaving. The present study evaluated the heavy metal concentrations in serum of rats fed diets containing different percentages of cow skin processed using the various methods. The processed cow skin was incorporated into feed of the test groups for the period of 28 days. The effect of cow skin processed by different methods - tyre flamed processing(TFP) and razor shaving (RSP) on the body weight and relative organ weight (liver and kidney) and heavy metal concentrations (Pb, Cd, Cu, Zn and Ni) of the rats were evaluated using standard methods. Result of the study showed no significant ($p>0.05$) difference in the body weights of all group of rats used in this study as well as in the relative organ weight. Rats fed with 30% TYP-cow skin had the highest lead (Pb) concentration (1.30±0.01 mg/l), while rats fed with 20% RSP- cow skin had the least (0.02±0.01 mg/l). Cadium (Cd) concentration were as follows; 10% TYP- cow skin (0.04±0.01 mg/l); 20%TYP- cow skin (0.05±0.01 mg/l), 30%TYP-cow skin (0.06±0.01 mg/l) and normal rat chow (control) (0.06±0.02 mg/l) and was not significantly ($p<0.05$) different from each other but was significantly ($p<0.05$) lower than rats fed with 20% RSP- cow skin (0.11±0.01). Copper concentrations were: 20% TYP-cow skin (0.22±0.01mg/l) and 30% TYP- cow skin (0.12±0.01mg/l) and was significantly when compared with those of fed 10% TYP- cow skin (0.04±0.01 mg/l), 20% RSP- cow skin (0.03±0.01 mg/l) and Normal chow (control) (0.06±0.02 mg/l). Zinc levels in rats fed with 10% TYP- cow skin (0.07±0.01g/l) and normal chow (control) (0.06±0.02 mg/l) was not significantly different from each other but significantly higher than rats fed with 20% TYP- cow skin (0.03±0.01 mg/l), 30% TYP- cow skin (0.03±0.01 mg/l) and 20% RSP-cow skin (0.03±0.01 mg/l).Nickel levels were highest in 30% RSP- cow skin (1.23±0.01 mg/l) fed rats while 20% RSP cow skin (0.19±0.01 mg/l) fed rats had the least. Serum levels of the heavy metals were generally higher than permissible ranges. The habitual consumption of processed cow skin may therefore predispose consumers to heavy metal toxicity.

Keywords: Cow skin, processing method, heavy metals, toxicity

Comparative Study of the Effects of Selected Natural and Synthetic Fertilizers on the Proximate and Vitamin Contents of Telfairia occidentalis (Fluted Pumpkin) Leaves

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Telfairia occidentalis is an indigenous leafy vegetable consumed in Nigeria. Low fertility status of soil has been known to hinder its performance; hence improved farming practices such as fertilizer application has been employed to increase crop yield. The study examines the proximate composition and vitamin contents of *Telfairia occidentalis* grown with natural (cow dung and poultry manure) and synthetic (NPK and urea) fertilizers. The research was conducted in the Botanical Garden of Federal College of Animal Health and Production Technology, Ibadan, Nigeria. The proximate composition and vitamin contents of the vegetable were determined at 12 weeks after sowing using standard method described by Association of Official Analytical Chemist (AOAC). Statistical analysis of the data was done by analysis of variance (ANOVA). Results of the proximate composition (%) showed: moisture content (9.30 - 9.96%), ash content (9.56 -10.73%), crude protein (19.76 - 21.67%), crude fat (3.42 - 3.80%), crude fibre (14.53 - 14.97%), carbohydrate (40.70 - 41.93%) and the energy yield (1157.18 - 1185.15%) while the vitamin contents (mg/100g) showed: vitamin A (3189 - 3267.36µg/100g), vitamin B1 (3.19-3.345), vitamin B2 (0.14 - 0.25), vitamin C (27.16 - 29.86) and vitamin K (33.44 - 36.47µg/100g). Based on these results, it was observed that Telfairia occidentalis grown with natural fertilizers can promote the increase in crude protein, carbohydrate, food energy yield, vitamin A, B1, B2 and C compared to those grown with synthetic fertilizers. Data analyzed showed that proximate composition was significantly affected by all treatments ($p < 0.05$) except in carbohydrate. However, no significant difference ($p > 0.05$) due to fertilizer application was observed in the vitamin contents except in vitamin B2. The application of natural fertilizers on the leaves of Telfairia occidentalis of the study produced higher effects of proximate composition and vitamin contents over synthetic fertilizer. These results advocate the use of natural fertilizers and that the indigenous leafy vegetables require urgent application of biotechnology so that nutritional potentials can be fully exploited.

Keywords: *Telfairia occidentalis*, proximate composition, vitamin contents, fertilizers

Controlling the Industrial Process of Solar Energy Technologies for Sustainable Development in Nigeria

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Solar energy resources has come to stay as a renewable energy sources but the proper technological devices that will drive and control the sector ranging from manufacturing of the devices such as panels, installation accessories , monitoring and controlling these utilities,

maintenance strategies, suitable Machine Learning tools, management techniques such as Programmable Logic Control PLC, Supervisory Control and Data Acquisition System to ensure the sector is equip to compete on the long run. This paper examines the control of solar equipment in Nigeria using PLC and SCADA for monitoring and Machine Learning for effective communication within the installation, process of keeping the facilities for Rural electrification and reducing the electric burden from the National grid so as to be available for industries, recommendations were made and conclusion were made that controlling solar equipment for production, installation and monitoring using the suitable technology is the tripod on which the sector will stand.

Keywords: machine learning, logic control, supervisory and data acquisition system, off grid

Development of a Biological Control Agent for Post-Harvest Yam Tuber Rot - *Trichoderma sp.*

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Yam is the common name for some plant species in the genus *Discoera*. They are perennial herbaceous vines cultivated for the consumption of their starchy tuber. Losses in yam have been attributed to insects, nematodes, rodents, respiration of the dormant tuber, water evaporation and Microbial pathogens. Microbial pathogens (bacteria and fungi) especially fungi which have more than thirty different genera associated with yam are the main cause of tuber loss during storage. Rot in yam tuber is the major limiting factor of post-harvest yam. Losses due to post harvest rot significantly affect farmers and seedlings for planting. The quality of yam tuber is affected by rots which make them unappealing to consumers. The study investigated the rot antagonistic capacity of *Trichoderma* sp. on post-harvest yam tubers. Healthy and unhealthy yam tubers were randomly collected from two states in the South-South geo-political zone of Nigeria; (Edo states and Rivers state). *Trichoderma* sp. were isolated from the peels of the healthy yams. Pathogenic fungi species isolated from Edo yams are *Penicillium oxalicum*, *Aspergillus niger*, *Botrydiplodia theobromea* while *Penicillium oxalicum*, *Aspergillus niger*, *Botrydiplodia theobromea* and *Fusaruim* sp. were isolated from Rivers yams. The trichoderma sp. isolated from Edo yam tuber inhibited mycelia extension grow of pathogenic fungi from Edo yam; *B theobromae* (52.5 %), *A niger* (17.8 %), and *P oxalicum* (42.5 %) while the *Trichoderma* sp. isolated from Rivers yam tuber inhibited mycelia extension growth of pathogenic fungi from Rivers; *B theobromae* (17.8 %), *A niger* (44.3 %), *P oxalicum* (46.1 %) and *Fusaruim* sp. (31.85 %). The in vitro result indicates *Trichoderma* sp. potential as a biological control agent of post-harvest rot of yam tuber. There are very few field trials, it is important to carry out field trial to reassure local farmer of the antagonistic capacity of *Trichoderma*. The *Trichoderma* sp. should be molecularly identified and freeze dry (lyophilized) to make it commercially available.

Development of Career Counseling Model for Choice of Courses in Tertiary Institutions using Machine Learning Algorithm

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Over 1500,000 candidates that leave secondary school every year in Nigeria aspire for tertiary education. Most of these prospective students are rural dwellers who are not privileged to have access to modern facilities technologically and are not exposed to right counselling that will inform their choice of career path in their post-secondary school education. Less than half of these candidates who are considered to be fortunate to gain admission into various tertiary institutions in Nigeria are without proper guidance on the choice of career path especially at the point of filling their Unified Tertiary Matriculation Examination (UTME) form. Most of these candidates especially the rural dwellers end up with career path that they know nothing about simply because the Joint Admission and Matriculation Board (JAMB) accredited centers where they are registering is left with no choice than to fill whatever they feel is relevant to the student's Olevel performance to enable them remain relevant since the candidate does not know the path to take. This has landed most of these prospective students in courses they are not knowledgeable in and has led to the overall under-performance or eventual withdrawal of such students from the institution thereby aborting their chosen career. There is a need for proper and precise guidance to these prospective students to help harness their abilities in determining their choice of courses hence the need to design an intelligent career counseling model to guide the prospective students on their choice of courses. The design of the Career Counselling Model will use hierarchical clustering machine learning algorithm. Python programming language will be used for the implementation. The implication of this model's implementation is that prospective candidates will be intelligently guided towards a successful choice of career path that will enable the student to make the right decision of a suitable course of study that best matches their desired career path based on the student's holistic makeup as they aspire to begin their journey in various tertiary institutions. This will greatly enhance the quality of employable graduates that will be turned over to the labour market.

Effect of Annealing on the Structural and Optical Properties of Natural and Synthetic Barium Sulphate ($BaSO_4$)

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The research examined the effect of annealing on the structural and optical properties of natural and synthetic barium sulphate. The precipitation technique was used to prepare the synthetic barium sulphate ($BaSO_4$) particles using Barium chloride ($BaCl_2$) and sulphuric acid (H_2SO_4) as solute and solvent respectively. The particles were annealed from 100°C–300°C in steps of 100°C for one hour each and allowed to cool down gradually in the annealing chamber. The structural and

optical properties were determined using GPC X-ray diffractometer, and UV-vis 1650 PC Shimadzu Ultraviolet spectrophotometer. It was found from X-ray diffraction that the synthesized samples possesses more refined peeks thereby enhancing crystallization which becomes more pronounced for annealing temperatures. The results also confirmed that the samples belong to the orthorhombic structure. The particle crystallinity increases with increase in the annealing temperature. The transmittance of the samples increases with increase in the annealing temperatures within the wavelength range of 200–800nm, however the natural $BaSO_4$ was found to show low transmittance in the visible region of the electromagnetic spectrum.

Keywords: $BaSO_4$ particles, Annealing, XRD, Optical properties, structural properties

Effect of Cellgevity Supplementation on Haematological Indices, Erythrocyte Integrity and Plasma Antioxidant Enzymes in Sickle Cell Carrier and Healthy Subjects

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Cellgevity (CGV) is a recent accessible dietary glutathione-producing neutraceutic for adjunct therapies, and it is gaining fast acceptance worldwide. However, there have been little or no reports of the effect of CGV on haematological antioxidant status in healthy subjects. Effect of CGV supplementation was studied on haematologic indices, erythrocyte resistance in hypotonic solution, and plasma antioxidant enzymes in sickle cell carrier (SCCS) and healthy (HS) subjects. Twenty-four (24) HS and twenty (20) SCCS were recruited and studied. Biophysical parameters were taken and recorded. Five (5) mL of venous blood (from ante-cubital vein) was withdrawn for the measurement of haematological indices, osmotic fragility and plasma antioxidant enzymes and glutathione (GSH) levels. Studied parameters were measured before and after six (6) week 2000 mg/d CGV capsule administered (as oral supplementation) to each subjects. The mean arterial pressure (MAP) of the HS and SCCS reduced after CGV supplementation ($p < 0.01$ and $p < 0.05$ respectively). Before supplementation, haematocrit (Hct), haemoglobin concentration ([Hb]), mean corpuscular haemoglobin (MCH), monocyte count (M) were lower in SCCS compared to HS ($p < 0.05$, $p < 0.001$). However, mean corpuscular haemoglobin concentration (MCHC) was higher in SCCS compared to HS ($p < 0.001$). after supplementation with CGV, neutrophil (N), Eosinophil, and monocyte (M) counts, catalase (CAT), superoxide dismutase (SOD), glutathione peroxidase (GPx) and GSH levels, and total antioxidant status (TAS) increased in HS ($p < 0.05$, $p < 0.001$) while malondialdehyde (MDA) reduced in them ($p < 0.05$). On the other hand, Hct, RBC, HbF, N, CAT, MCH, SOD, GSH, GPx, TAS, increased in SCCS ($p < 0.05$, $p < 0.01$ or $p < 0.001$) while platelet count (Plt) and MDA level reduced in them after supplementation. Initial lysis (IL), mean corpuscular fragility (MCF), and complete lysis (CL) reduced in both groups of subjects after CGV supplementation ($p < 0.001$). The blood cell indices, osmotic fragility of RBC, antioxidant enzymes and glutathione levels improved in both HS and SCCS after oral CGV supplementation.

Keywords: cellgevity, sickle cell trait, haematological indices, erythrocyte integrity, antioxidant enzymes, glutathione level

Effect of Electromagnetic Field on Microbial Load and Identities from Wastewater in Food and Diary Industries in Ibadan Metropolis Oyo State

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Wastewater can serve as a source waterborne disease that affect human and animals after consumption and it can also affect the ecological balance of soil and water microbiota when discharged into the environment. This research was designed to carry out microbiological analysis of wastewater sample and to determine the effect of Electromagnetic Field (EMF) on the populations and identities of microorganisms. Wastewater sample were collected from food and dairy industry in Ibadan. A 200 ml of wastewater sample were dispensed into six conical flask and it was subjected to microbiological analysis before and after exposure to Electromagnetic field (EMF) at 70nT, 80nT, 100nT 110nT, 120nT and 130nT. The presence of some microorganisms in the wastewater collected food and dairy industry showed their possible contamination. The bacteria isolated present includes *Shigella* spp, *Enterobacter aerogenes*, *Staphylococcus aureus*, *Bacillus cereus*, *Escherichia coli*, *Pseudomona. aeruginusa*, *Salmonella typhi*, *Lactococcus lactis*, *Aspergillus niger, Mucor mucedo*, *Aspergillus niger, Rhizopus stolonifer*, *Aspergillus flavus*, *Fusarium* spp and *Sacharromyce*s spp. The presence of these organisms confirms possible faecal contamination. It had the highest mean values for Fungal load with EMF strength 70nT wass 7.6×10^4 Cfu/ml and it was reduced to 4.7×10^4 cfu/ml while the highest mean values for bacterial load which is 1.86×10^4 Cfu/ml, after exposure to 120 hours the bacterial load were reduced to 2.7×10^3 Cfu/ml. It is therefore recommended that wastewater from industries should be treated with EMF before discharging to the environment. This will help to reduce health problems.

Effect of Inhibition of Epithelial Sodium Channel with Amiloride on Renin –Angiotensin – Aldosterone - System during High Salt Ingestion in Normotensive and Hypertensive Nigerian Subjects

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The Epithelial Sodium Channel (ENaC) and T594M polymorphism, which may be contributory to the development of hypertension has been reported in over 5% of Blacks including Nigerians (Elias et al, 2019) and is selectively blocked by Amiloride (Baker et al, 2002). Perturbations in the Renin-Angiotensin- Aldosterone-System (RAAS) may also occur as part of the ENaC mutations (Spence & Rayner, 2018). In the present study, we have investigated the response of the RAAS to high salt ingestion and the effects of administration of amiloride. Experiments were carried out on 19 healthy adult normotensive (NT) and 27 hypertensive (HT) Nigerian subjects. The subjects were salt loaded with 200mmol sodium chloride daily for 5 days and changes in BP as well as serum electrolytes determined, in addition to the levels of Plasma Renin Activity (PRA) and Aldosterone concentrations, by ELISA. After a week washout period, the subjects were then given the salt load + 5mg amiloride for 5 days and the tests were repeated. Data were analysed using ANOVA with significant level at $p<0.05$. The results show significant increases, after salt loading, in BP ($P<0.01$) in both NT and HT subjects but salt + amiloride resulted in significant decreases ($P<0.05$) in BP in NT and HT. Basal level of PRA (mIU/L) was significantly lower ($p<0.05$) in HT (11.7 ± 2.6) compared with NT ($22.\pm5.1$) and the levels increased significantly ($p<0.05$) after salt to 37.2 ± 5.9

in NT and to 19.1±4.0 in HT. After salt + amiloride, PRA decreased in NT to 26.0±2.9, but increased further in HT to 28.6±3.0. Aldosterone level was reduced in NT and HT after salt but after salt + Amiloride, it decreased further in NT but increased in HT. Serum K^+ was reduced after salt in both NT and HT, but after salt + amiloride, it rose significantly above control in HT but remained virtually unchanged in NT. The results confirm low PRA in black hypertensive subjects, while amiloride increased both PRA and Aldosterone levels in HT but not in NT. It thus appears that the increase in serum K^+ in HT after salt + amiloride acted as trigger for the rise in PRA as well as aldosterone levels in HT subjects as K^+ has been shown to be a stimulus for increase in their production (Bauer & Gauntner, 1979). The significance of this amiloride induced rise requires further unraveling of possible mechanisms.
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Effect of Water Yam and Soybean Composite Flours on the Quality of Wheat Based Bread Sold in Kaura-Namoda Bakery of Zamfara State

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Water yam and soybean were produced into flours and used to substitute wheat flour at different proportions.Five bread samples were produced from the proportion of wheat/water yam/soybean flours as 80%:10%:10%(B), 75%:15%:10% (C), 70%:20%:10% (D), 65%:25%10% (E) and 100% wheat was the control sample (A).The composite flours were subjected to functional and pasting analysis, while the mineral and vitamin content of the bread were analysed. Subsequently, the functional analysis showed, water and oil absorption capacity, foaming capacity increased ($p \leq 0.05$) significantly while the reverse was the case for swelling index and gelation temperature but the bulk density didn't decrease($p \geq 0.05$) significantlywith increasing amount of water yam flour addition at constant soybean level. Pasting analysis showed Peak, trough, breakdown, final and set back viscosities of the flour blends decreased ($p \leq 0.05$) significantly, while peak time and pasting temperature increased ($p \leq 0.05$) significantly with increasing amount of water yam flour at constant soybean flour inclusion. The mineral content of the bread also indicated that potassium, phosphorus, calcium, iron and sodium content increased ($p \leq 0.05$) significantly while zinc content decreased ($p \leq 0.05$) significantly. The vitamin content of the bread samples also indicated that thiamine, niacin, ascorbic acid, folate increased ($p \leq 0.05$) significantly while riboflavin didn't increased ($p \geq 0.05$) significant in the composite bread samples. The nutritional content of wheat-water yam-soybean composite flours bread was nutrient dense product.

Keywords: Wheat, water yam and soybean flours, functional, pasting, mineral and vitamin analysis.

Effects of Cadmium Induced Oxidative Stress on Testicular Sperm Characteristics of Rabbit Bucks and the Ameliorative Potentials of Vitamin E and Omega 3 Fatty Acids

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Oxidative stress is considered a major contributory factor to infertility. A ten weeks study was carried out to investigate the effects of Cadmium (Cd) induced oxidative stress on testicular sperm characteristics and the ameliorative potentials of Vitamin E (VIT.E) and Omega 3 fatty acids (O3FA) using mixed-bred rabbit bucks. A total of sixteen bucks with an average age of 12 weeks (Average body weight: 848.33±2.84g) were randomly assigned to four treatments with four bucks per treatment. Each buck was house individually as a replicate. Rabbit bucks in Treatment one (T1) were fed basal diet plus free water, while those of treatment two (T2) were fed basal diet plus 50mg Cd/liter of water. Treatment three (T3) groups of rabbits were fed 250mg VIT.E/kg diet plus 50mg Cd/liter of water, whereas treatment four (T4) groups were fed 200mg O3FA/kg diet plus 50mg Cd/liter of water. Parameters evaluated includes; Final Body Weight (FBW), Testicular Weight (TW), Epididymal Weight (EW), Testicular Length (TL), Testicular Volume (TV), Testicular Circumference (TC), Sperm Motility (SM), Sperm Viability (SV), Epididymal sperm count (ESC), and histopathology of the testis. Blood Catalase (CAT), Superoxide Dismutase (SOD) and Malondialdehyde were also evaluated to ascertain the magnitude of oxidative stress. Rabbit bucks on T3 and T4 had significant ($P<0.01$) higher FBW (T3:1201.33±29.90g; T4:1220.33±43.04g), ESC (T3:168±15.10($x10^6$); T4:174±13.35($x10^6$)), and SM (T3:56.67±3.33%; T4:60.00±5.77%) than those on T2 (1005.33±68.55g, 94±8.41($x10^6$)) and 33.33±3.33%, respectively) but was lower than the T1 (1438.33±52.35g, 248±7.51($x10^6$), and 74.00±3.06, respectively). TW (2.63±0.26g) and EW (0.70±0.20g) of T1 group were significantly ($P<0.05$) higher than T2 (TW: 1.03±0.15g; EW: 0.10±0.00g), T3 (TW: 1.26±0.33g; EW: 0.20±0.58g), and T4 (TW: 1.20±0.42g; EW: 0.16±0.03g) groups. SV (66.67±3.33%) and TV (3.67±0.67ml) of T3 group were significantly ($P<0.05$) higher than those of T2 (SV: 48.33±4.41%; TV: 1.83±0.17ml) but were similar ($P>0.05$) to T1 (SV: 78.33±1.67%; TV: 2.50±0.29ml) and T4 (SV: 48.33±4.41%; TV: 2.17±0.17ml). TC and TL were not significantly ($P>0.05$) different among treatments. The level of CAT and SOD in the blood decreased significantly ($P<0.01$) in T2 (CAT:60.33±1.45ku/l; SOD: 10.67±0.67u/ml) rabbits relative to T1 (CAT:104.00±3.06ku/l; SOD: 18.00±1.16u/ml) group but showed significant improvement in CAT for T3 (76.33±4.10ku/l) and T4 (81.33±3.53ku/l) groups. MDA of T2 (14.6±1.76TBARS) rabbits were significantly ($P<0.05$) higher than those of T1 (9.00±1.00TBARS) but were similar ($P>0.05$) to T3 (12.67±0.88TBARS) and T4 (12.00±2.00TBARS). Histological evaluation of the testis showed a severe degeneration of the seminiferous tubules epithelium of T2 rabbit bucks, a mild degeneration of the tubules in T3 and T4 groups, and normal tubules in T1 group. From these results, we concluded that severe oxidative stress in rabbit bucks could lead to poor testicular sperm characteristics. However, feeding antioxidants like VIT.E and Omega 3 fatty acids could potentially improve the poor reproductive status of rabbit bucks under severe oxidative stress conditions.

Keywords: oxidative stress, rabbit bucks, testicular sperm, Vitamin E, omega 3 fatty acids

Effects of Fresh and Fermented Fruit Juice of *Morinda citrofolia* (Rubiaceae) on Reproductive Parameters in Male Rats

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A decline in male fertility manifested as decreased sperm count, motility, viability and sub optimal levels of male reproductive hormone have been reported in recent times. Different parts of *Morinda citrifolia*, is used in ethnomedicine for the management of several disease conditions including use as an immune booster and promoter of male reproductive function and fertility. This study was aimed at investigating the effects of fresh and fermented fruit juice of the plant on reproductive parameters in male rats. Male rats (180-220 g), divided into eight groups of five animals each were treated with fresh and fermented juice of *Morinda citrofolia*. Group I received 10 mL/kg of distilled water and served as the negative control Group. Animals in groups 2 - 4 received 2.5, 5 and 10 mL/kg of fresh *Morinda citrifolia* fruit juice respectively while group 5-7 received 2.5, 5 and 10 mL of the fermented fruit juice respectively for 60 days via the oral route. Animals in group 8 did not receive any treatment and served as the normal control animals. At the end of the treatment period, animals were sacrificed, blood collected and analysed for levels of luteinizing hormone (LH) follicle stimulating hormone (FSH), testosterone and progesterone. Histological evaluation of the testis, sperm count, morphology and motility were also determined. The results obtained from the hormonal analysis showed that the fresh and fermented fruit juice of *M. citrifolia* increased the serum levels of FSH, LH, testosterone and progesterone significantly. The increase produced by the fresh juice was however higher than that seen with the fermented juice. The sperm count was dose dependently increased by both the fresh and fermented fruit juice, while other sperm parameters were affected. The result obtained from this study indicates that *Morinda citrifolia* fruit juices has the potential to enhance male reproductive function and provides support its use in ethnomedicine for this purpose.

Keywords: *Morinda citrofolia,* Reproductive parameters, Male rats, sperm count

Electrochemical Quantification of the Levels of Hydrogen Peroxide Involved in Cassava Post-Harvest Deterioration using Glassy Carbon Electrode Modified with Chitosan/Silver Nanoparticles Hybrid

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This study correlates the production of hydrogen peroxide in cassava with its rapid postharvest physiological deterioration (PPD). Chitosan/silver nanoparticles hybrid was synthesized and immobilized on glassy carbon electrode for improved detection of hydrogen peroxide using cyclic voltammetry detected around 500mV. β-carotene contents for the cassava cultivars were

quantified using UV-Vis spectroscopy, while their hydrogen peroxide scavenging abilities were determined using cyclic voltammetry. The production of hydrogen peroxide from the different cultivars on the fifth and sixth day after harvest was found to correlate with their respective β-carotene contents, as well as their hydrogen peroxide scavenging abilities. The cultivar with the highest β-carotene content (0.0044mg/g) was found to have the lowest level of hydrogen peroxide on day 5 and day 6: 0.096mmol/g FW and 0.141mmol/g respectively; while that with the least β-carotene level (0.0004mg/g) demonstrated the highest level of hydrogen peroxide content on day 5 and day 6: 0.037mmol/g FW and 0.094mmol/g respectively; and highest percentage increase from the fifth to the sixth day of the PPD process. It is seen from this study that an increase in the level of hydrogen peroxide indicates PPD, and that antioxidants with hydrogen scavenging properties can help increase shelf-life.

Keywords: Cassava, Hydrogen peroxide, Cyclic voltammetry, Postharvest physiological deterioration (PPD), β-carotene, Chitosan/silver nanoparticles (CS/AgNP)

Enhancement of the Value of Fruits in Improving Micronutrient Intakes among Nigerians: Challenges and Prospects

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Nigeria, being a tropical country, is endowed with many fruits such as banana (*Musa sapientum*), mangoes (*Mangifera indica*), pawpaw (*Carica papaya*) and a host of others. Unfortunately, production, processing and utilization of these highly economic crops have been on the relatively low level within the Nigerian economy. Even as sources of highly cherished nutrients like minerals, vitamins, energy (due to sugars and some proportion of carbohydrates) and fibre, apart from the aesthetic value they impart, fruits have not been accorded the importance they deserve in our diets and their feasible contributions to the economy. This would partly explain the increasing rate of micronutrient deficiencies among Nigerians, especially babies and toddlers. In this paper, feasible utilization of fruits as a component of weaning and adult foods was investigated by incorporating fruits such as ripe banana, mango or pawpaw into ogi slurries and evaluating some nutrient and chemical composition. Fruit addition was found to improve significantly the ash, mineral, β-Carotene, riboflavin and vitamin C contents of ogi but produced no effect on the thiamin content. Changes in pH, titratable acidity, alcohol content and sugars were found to depend on the period of fermentation and type of fruit. Organic acids identified in plain- and fruit-ogi were propionic, lactic, acetic, butyric, citric, malic and succinic acids. The above study has further underscored earlier studies on the potentials of incorporating fruits into traditional foods; however the challenges facing the fruit industry within the Nigerian economy have to be overcome. These include establishment of fruit plantations and development of the industry on a commercial scale in terms of cultivation including breeding, harvesting, transportation and storage, distribution and conversion to intermediate raw materials for other segments of the industry.

Fabrication of Dye Sensitized Solar Cells using Dye Molecules Isolated from the Leaves of *Hibiscus rosa-sinensis*

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Dye sensitized solar cells (DSSCs) is a type of photovoltaic devices that provide high photon conversion efficiency at low cost, simple preparation methodology, low toxicity and ease of production. The dye which acts as a sensitizer plays a vital role in the performance of DSSCs. The photophysiochemical and photo-voltaic properties of the dyes improve the operational standard of DSSCs. Natural dyes from plant materials are organic dyes that can be accessed with minimal level of chemical pollution compared to synthetic dyes (organic or inorganic). Dye molecules from the leaves of *Hibiscus rosa-sinensis* (Hibiscus flower plant) were used as sensitizers for the fabricated cells and were fully characterized using NMR, FT-IR, UV-vis and ToF-MS. Two among ten commercially available dyes (methylene blue and alizarin) that were theoretically investigated were also used for DSSC fabrication separately to compare their photovoltaic outputs with those of the cells made from the isolated dyes. Fill factor (FF), efficiency (η), short-circuit current density (J_{sc}), open-circuit voltage (V_{oc}) and incident photon-to-current efficiencies (IPCE) of the fabricated DSSCs were determined. The photovoltaic data obtained from the DFT/TD-DFT studies of the commercially available and the isolated dyes were correlated with the responses obtained from the fabricated cells. The DFT/TDDFT results showed a fair correlation with the experimental DSSC photovoltaic properties, thus indicating the feasibility of adopting the theoretical method as a tool to design suitable sensitizers for DSSC application. The results overall indicate that some of the isolated dyes showed higher photovoltaic performance than the investigated methylene blue and alizarin, and so could be good candidates for DSSC application.

Factors Associated with Malnutrition and the Nutritional Status of Under-Five Children in Danko-Wasagu, Kebbi State, Nigeria

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Globally, malnutrition is a major health problem that threatens the wellbeing, health and survival of children particularly under-5 years. Nutritional status and child growth is universally accepted as a significant indicator of health and wellbeing of populations. Malnutrition causes morbidity and mortality among children in developing countries including Nigeria. It accounts for approximately 41% of the total mortalities among under-5 children in developing countries. Thus, assessing nutritional status of population in our communities especially under-5 children would help contribute in monitoring and achievement of one of the sustainable development goals by the year 2030. Hence, the present study was aim to assess the nutritional status of under-5 years children and associated factors in Danko-Wasagu. The socio-demographic characteristics, prevalence of childhood diseases, anthropometric parameters and dietary pattern of the children were investigated. The results indicated that 54.8% of the caregivers are young adults within 20 to 24 years of age with 41.7% having two living children. In addition, 58.0% of the caregivers have family monthly income below ₦20,000 and doing small scale business with no any formal education. However, based on MUAC and weight-for-height indices, none of the children has severe-acute-

malnutrition (SAM). Moreover, there was 65.5% prevalence of diarrhea, 45.2% with dermatitis and 25.0% with acute respiratory infections. Besides, the data indicated that stunting, underweight and wasting were 72.7%, 29.8% and 11.9% respectively. The consumption of cereals food group by the children was 92.7% while 28.6% and 31.0% of the children met the minimum dietary diversity and minimum meal frequency respectively. In addition, wasting, underweight and stunting among the children were significantly ($p<0.05$) associated with caregiver's age. Children who were wasted showed statistically significant ($p<0.05$) association with education level of mother, family monthly income and minimum dietary diversity whereas children who were underweight significantly ($p<0.05$) showed association with mother's occupation, childhood disease and minimum dietary diversity. In conclusion, there was high prevalence of chronic malnutrition and childhood diseases, although without any case of SAM in the study area. The dietary practice among children in Danko-Wasagu needs improvement which could impact positively on their nutritional status.

Keywords: Malnutrition, Nutritional status, Under-five-children, Childhood diseases, Dietary pattern

Gene Regulating Effects of *Cymbopogon citratus* on Glucose and Lipid Metabolism of Normal Albino Rats

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Previous reports showed that Cymbopogon citratus (lemon grass) possesses significant hypoglycaemic/antidiabetic and hypolipidaemic effects. This study investigated the underlying mechanisms by which C. citratus extracts and phytochemical fractions maintain glycemic control and regulate fat metabolism of normal rats using gene expression techniques. Specifically, the effects of different preparations of C. citratus - as powder (2%, 10% and 30%) mixed in rat feed; as aqueous and ethanol extracts administered orally (30 and 100 mg/kg b.w.); and as phytochemical fractions (saponins, flavonoids, and tannins) each administered at 30μg/kg b.w. were assessed. The effect of C. citratus on insulinotropic genes: glucagon like peptide-1 (GLP-1), insulin, glucose transporter-4 (GLUT-4) and potassium ion gated channel (KCNJ5); fatty acid metabolism genes: fatty acid synthase (FA-Synthase), acetyl coA carboxylase (AcCE) , 3-hydroxyl, 3-methyl, glutaryl CoA reductase (HMG CoA reductase); and inflammatory cytokines: interleukin-1α (IL-1α) and tumor necrotic factor (TNF-α) were studied. The results showed that both extracts and fractions exhibited insulinotrophic effects by up-regulating insulin, GLP-1, and GLUT-4 genes. Generally, C. citratus up-regulated lipogenetic enzymes while lipolytic enzymes were repressed. The different administrations of C. citratus did not alter inflammatory genes. Our finding indicate that C. citratus regulates glucose and fat metabolism via multiple mechanisms; this could have significant implications in the holistic management of diabetes and also presents an opportunity for the development of novel anti-diabetic drugs.

Haematinic and Haemapoietic Potentials of Crude Methanolic Extract of *Buchholzia coriacae* Seeds in Wistar Rats

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Anemia is a public health problem and one of the most wide spread disorders of blood that affect the populations of all age, both rich and poor countries in the world. The poor economic condition in developing countries has triggered the increase in the number of anemic people who cannot afford the expensive orthodox haematinic. This study investigated the haematinic and haemapoietic potentials of *Buchholzia coriacea* seeds. Wistar rats (n=30) were grouped into 6 (A to F). Groups A to C were intra-peritoneally induced for anemia with 0.1mg/kg body weight (mg/kg b.wt) of phenyl hydrazine for 7 days. Anemic groups (A and B) and normal groups (D and E) orally received 250 and 500mg/kg b.wt extract respectively; group C received 4.0 mg/kg b.wt of Ranferon-12 for 2 weeks while group F served as control. Blood samples were collected into ethylene diamine tetra acetic acid containers for complete blood counts and plain containers for liver marker enzymes and proteins at days 0 (baseline),8 (protective phase) and 15 (recovery phase). Acute toxicity test of the extract revealed an oral LD_{50} of 5000mg/kg b.wt. The phytochemistry revealed alkaloids (+++), saponins (+++), resins (+), flavonoids (+++), cyanogenic glycosides (+), cardiac glycosides (+), steroids (+++) and trepenoids (+). The significant ($p < 0.05$) results during protective phase (day 8), include anemic group A, decreased neutrophil (16±4%) and increased lymphocyte (82±4%), haematinic control group C, decreased neutrophil (18%±8.5%) and increased lymphocyte (80±8.7%), normal group D, decreased neutrophil (18±13.6%) and increased lymphocyte (80±14%), normal group E, decreased neutrophil (27±6.43%) and increased lymphocyte (72±5.51%) compared to group F control neutrophil (41±6.11%) and lymphocyte (56±6.56%), increased aspartate transaminase (AST) in groups A (265±4.62 iu/L), B (208±2.59 iu/L) and C (188±4.73 iu/L), increased alkaline phosphatase (ALP) in groups A (247±2.31 iu/L), B (235±81.98 iu/L) and C (258±85.81 iu/L), increased albumin in group B (3.57±0.12 g/dl) and increased globulin in group C (3.4 0±72 g/dl) compared to group F control AST (136±16.44 iu/L), ALP (167±18.90 iu/L), albumin (2.3±0.10 g/dl) and globulin (2.7±0.10 g/dl).The significant ($p<0.05$) results during recovery phase (day 15) in group A, increased leucocytes (I0.4±0.5×10^9 L), group B, decreased red blood cells (4.82±0.48×10^{12}/L) , increased leucocytes (9.3±1.5×10^9/L) and increased globulin (3.7±1.5×10^9/L), group D, decreased leucocytes (5.3±2.5xI0^9/ L) decreased neutrophil (25± 0.5%), decreased ALP (187±0.01 iu/L) and increased albumin (4.40±0.01 g/dl), group E, increased haemoglobin (15.2±0.5g/dl), increased haematocrit (0.44±0.01L/L), increased red blood cells (7.05±0.57×10^{12}/L), increased leucocytes (5.7±2.2x10^9/ L), decreased neutrophil (29±1.5%), increased AST (271±9.45 iu/L), decreased ALP (154±12.05 iu/L) and increased globulin (4.10±0.10 g/dl) compared to group F control, haemoglobin (13.4±1.4 g/dl), haematocrit (0.40±0.01 L/L), red blood cells (5.43±0.55x10^{12}/L), leucocytes (6.1±0.5x10^{12}/ L), neutrophil (40±1.5 %), albumin (3.5±0.17 g/dl) and globulin (3.1±0.35 g/dl).The results indicate that the local herb have demonstrated haemapoietic and haematinic potentials and also promotes protein synthesis.

Health Impacts of Vehicular Emissions on Traffic Workers in Lagos Metropolis, Nigeria

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Air pollution from vehicle is fast becoming a major health and physical problem. Lagos state is the smallest state in Nigeria yet has the highest urban population. This study assessed the concentration of air pollution caused by vehicular emissions during different periods in various traffic congested locations across four local government areas of in Lagos and its health impact on traffic workers. Well-designed questionnaires were administered to traffic personnel (Traffic police, Lagos State Traffic Management Authority (LASTMA) uniformed men, National Union of Road Transport Workers (NURTW)) uniformed menwho control traffic in Lagos. The air quality was also measured for Carbon mono oxide (CO), Sulphur dioxide (SO_2), Nitrogen dioxide (NO_2), Particulate matter (PM). The Aerocet 531 particulate matter monitor was used tomeasure the amount particulate matter (pm), Multi-Rae plus Gas Monitor was used to measure CO while V-Rae monitor PGM 7840 was used to measure the NO2 and SO2 concentration at peak periods between 8.00 and 9.30 am and at off peak period between 1.00 and 2.30 pm. At peak period the concentration range of CO, SO_2, NO_2, in Lagos was between 4.0 and 13.0ppm, 0.1 and 0.3ppm, 0.2 and 0.5 atpeak period while at off peak the concentrations were found to be between 1.0 and 10.0 ppm, 0.1 and 0.3, 0.1 and 0.2 ppm. The WHO value/ limit are is 10.0ppm, 0.01ppm, 0.04 ppm for CO, SO_2, NO_2 respectively. The concentration range for $PM_{2.5}$ and $PM_{10.0}$ at peak period were between 0.010 and 0.046 mg/m^3, 0.063and 0.572 mg/m^3 respectively while for off peak period the concentration varied from 0.006 to 0.039 mg/m^3 and 0.040 to 0.205 mg/m^3. The WHO limit for $PM_{2.5}$ and $PM_{10.0}$is 0.025 and 0.050 mg//m^3 respectively.The questionnaires also showed that 56%, 53% and 49% of the sampled population (90) suffered from frequent headaches fatigue and frequent cough respectively. In general this study showed vehicular emissions impact negatively on the air quality. The poor air quality especially at peak period may have negative impact on traffic workers.
Thus measures should be put in place to reduce the hours of exposures of traffic workers to vehicular emissions and the use of more traffic lights should be encouraged for traffic controls

Keywords: Lagos state, Vehicular emission, Traffic workers, Air pollution

High Efficiency Perovskite Solar Cell using Carbon Nanotubes as HTM

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Perovskite based solar cells have enjoyed rapid and an unprecedented evolution over the past decade. These light-harvesting materials are of huge interest to the academic community in order to make more efficient solar cells which are expected to attain swift commercialization. They have attractive properties, most especially their high power conversion efficiency (PCE) within few years in comparison to other third generation thin film technologies. In This research work, the effect of incorporating multi-walled carbon nanotubes as the hole-transport layer on the photovoltaic performance of perovskite solar cells was investigated. UV-Vis spectrophotometry, Scanning Electron Microscopy, Surface Profilometer, Raman Spectroscopy and Solar Simulator were used to characterize and study the properties of the prepared cells. The reference cell (without MWCNTs)

demonstrated a PCE, Jsc, Voc and FF of 2.82 %, 7.64 $mAcm^{-2}$, 0.88 V, and 42.00 % respectively. When MWCNTs was incorporated, we observed a PCE of 4.30%, Jsc of 8.47 $mAcm^{-2}$, VOC of 0.85V, and FF of 60.00%. The MWCNTs modified device shows an enhancement of 52.48 % in PCE, 10.86 % in Jsc, and 42.86 % in FF over the unmodified device. This is due to improved surface area of MWCNTs by acid treatment in generating functional groups that act as conducting bridge in reducing the contact resistance between individual nanotubes.

Impact of Multi-Faceted Interventions on Women's Satisfaction with Maternal Health Care in Referral Hospitals In Nigeria

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Despite the adoption of primary health care as the entry point into Nigeria's health care system, up to 70% of maternal health care services in Nigeria are delivered by referral facilities – secondary and tertiary hospitals. In 2015, we began a comprehensive program aimed at improving the quality of obstetrics care in Nigeria's referral hospitals with the overall goal to reduce maternal mortality. Our initial formative research in eight referral hospitals in four geo-political zones of the country identified several factors that were perceived by women and health providers as associated with poor quality antenatal, delivery and postnatal care in the hospitals. To address these challenges, we designed and have implemented a multiple set of interventions in partnership with various stakeholders. Data on patient satisfaction were collected for 21 months (3 months before the intervention and 18 months during the intervention) using exit interview with 2,262 clients who were randomly selected (1,057 in the control sites and 1,205 in the intervention sites). The assessment was based on 15 statements that measured patient satisfaction in the three dimensions of structure (physical environment, cleanliness, availability of human resources, etc.), process (interpersonal behaviour of the providers, waiting time, providers' competency, etc.), and outcomes (the health of the mother, etc.) in the continuum of maternal care. The response options were disagree (coded 1), neither agree nor disagree (coded 2), and agree (coded 3). Scores on the 15 items measuring patient satisfaction were aggregated using principal component analysis. Higher values indicated higher level of satisfaction with 15 as the least possible score and 45 as the highest possible score. The scale reliability coefficient was 0.7669. A two-category composite measure of patient satisfaction (less and more satisfaction) was generated using the median value (42) as the cut off. Scores above the median were categorized as more satisfaction (coded 1) whereas scores equal to the median or less were grouped as less satisfaction (coded 0). Descriptive statistics and logistic regression models that adjusted for selected characteristics of the respondents were used to compare level of satisfaction between the intervention and control sites before the intervention and during the intervention periods. The odds of reporting more satisfaction was significantly lower in the intervention sites before the intervention (OR 0.18 95%CI:0.11-0.30) but during the intervention period the odds of being more satisfied became 57% higher in the intervention sites compared to the control sites (OR 1.57 95%CI:1.31-1.90). Within site analysis show that the odds

of more satisfaction was higher during the intervention period compared to the pre-intervention period in the intervention sites (OR 4.05 95%CI: 2.79-5.85). The odds increased as the intervention progressed. On the contrary, satisfaction with care in the control sites was 53% lower during the intervention period compared to the pre-intervention period (OR 0.47 95%CI: 0.34-0.66). The odds in the control sites remained significantly lower as the intervention progressed compared to the pre-intervention period. The results of this study will be useful for developing substantive policies and practices for improving the quality of maternal care in Nigeria.

In Situ Monitoring of Plastic Waste Dumps in the Lagos Lagoon, Nigeria and Stakeholders' Environmental Risk Perception

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Plastics are synthetic or semi-synthetic organic compounds which are lightweight, durable and can be moulded into solid materials. They have become a menace in aquatic ecosystems due to their inability to degrade thereby posing a threat to aquatic biota. However, data on the occurrence of plastic in Nigerian aquatic ecosystems is scanty. Hence, in this study, we assessed and characterised plastic waste dumps in the Lagos lagoon, Nigeria at 10 anthropic-impacted sites for two (2) months. Also, stakeholders' environmental risk perception of the plastics in the Lagoon was evaluated through questionnaire administration. Five (5) sites on the lagoon were characterised as having high (≥ 10 kg) plastic wastes load as follows; Oworonshoki (14.5 kg), Ebute Ilaje (14.5 kg), Iddo (11 kg), Apapa (10.5 kg) and Ibeshe (10 kg). The plastic wastes load at the other sites (Oreta, Odo Iyalaro, Ajah, Abule Eledun and Ikoyi) ranged from 2.5 to 0.5 kg. Polyethylene terephthalate was the highest in plastic waste dumps with 16.7% found on the coastal body. 83.3% of the stakeholders (residents) dispose of their plastic wastes into the lagoon while 60% of the residents have no knowledge of the risks posed by the plastic waste dumps in the Lagos lagoon. The results indicate the unregulated practice of plastic waste dumping into the lagoon with potential risks posed to biota. Further studies are recommended to evaluate the occurrence of macroplastics and microplastics in various matrices of the lagoon including biota as well as evaluation of potential biological effects posed to aquatic biota. This will provide evidence-based data for targeted interventions to sustain life below water as contained in the United Nations Sustainable Development Goal 14.

Keywords: Plastic waste dumps, Lagos lagoon, Stakeholders' risk perception, in situ monitoring

In Vitro Antioxidant Activity-Guided Fractionation of *Daucus carota* L. Seed Extract

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Daucus carota Linn (carrot) seed is medicinally useful in the treatment of diabetes mellitus. The present study investigates the *in vitro* antioxidant activities and phytochemical constituents of several fractionated products of aqueous seed extract of *Daucus carota*. *D. carota* seed (78.833g) was pulverised and dissolved in 400 ml of distilled water for 24 hours. The crude extract obtained (16.396g, 20.8% yield) was partitioned in water/ethyl acetate (3:1) to yield ethyl acetate fraction (8.2g, 52.4% yield) and aqueous ethyl acetate fraction (8.6g, 56% yield) which was fractionated on silica in a column chromatography using hexane, ethyl acetate and methanol. Thirteen (13) fractions were collected and evaluated for their *in vitro* antioxidant activities and phytochemical compositions. The fractions exhibited *in vitro* antioxidant activities at 0.2 – 1.0 mg/ml with 2, 2-diphenyl-1-picrylhydrazyl (DPPH) scavenging activities (IC_{50} = 1.38 - 22.96 μg/ml), total antioxidant capacity (IC_{50} = 1.17 - 3.13 μg/ml) and nitric oxide scavenging activities (IC_{50} = 3.20 - 20.72 μg/ml). Fractions 4 – 8 expressed promising *in vitro* antioxidant activities with IC_{50} comparable with that of vitamin C and butylated hydroxytolene. The phytochemical screening of fractions 4 – 8 revealed the presence of alkaloids, flavonoids, and phenolics, which could be responsible for the antioxidant activities. The results suggest that fractions obtained from *Daucus carota* L. seed extracts possess significant antioxidant potential.

Keywords: Antioxidants; *Daucus carota; In vitro;* Phytochemicals; Fractionation; Seeds

Investigating the Physiochemical and Microbiological Properties of Jatropha Seed Cake Waste Material as a Potential for Green Economy Soil Amendment

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The demand for farmers to provide food for increasing populations has made the use of inorganic fertilizer more competitive as it has been utilized frequently to boost farm produce. However its continuous usage is detrimental to natural healthy state of soil. Based on this, alternative environmentally friendly fertilizer which incorporates Jatropha cake with rich vital soil nutrients as carrier material has been identified as a better farm tool. In the current study, investigations were made on the physiochemical and biochemical analysis of Jatropha seed cake waste as source of soil nutrient. Sample of the seed cake was collected from National Research Institute for Chemical Technology (NARICT), Zaria, after biodiesel transesterification process. The cake was air dried for six weeks to stabilize and was ground using a pestle and mortar and then taken to the Soil and Water Laboratory of Institute For Agricultural Research (IAR), Ahmadu Bello University, Zaria for analysis. 2 g of cake sample was digested and Nitrogen(N), Phosphorous (P) and Potassium (K) as well as Carbon (C) contents were analysed in the digestate using N Kjeldahl digestation and distillation technique, absorbance measurement of P using calorimeter, K concentration in the digestate using flame photometer and carbon content using the Walkley and Black procedure. Total metal contents (Copper, Zinc and Iron) were also determined by di-acid digestion (nitric:

perchloric acid) of seed cake followed by AAS analysis of the digestate. The pH and EC were determined in the sample by inserting digital pH mater and EC meter in the cake paste until the reading in the meters had stabilized. Microbial analysis was carried out using Invic test while microbial count was done with a colony counter. The NPK as well as the C concentrations were 3.33%, 0.46%, 1.2% and 30.52% respectively. These values were within the specified ranges recommended by the Food and Agriculture Organization of the United Nations for organic soil nutrients. The Cu, Zn and Fe concentrations were 0.05%, 0.09% and 0.02% respectively. These values with the exception of Fe concentration were within tolerable limits of trace metals concentrations recommended. The pH value of 4.9 and EC value of 976dsm^{-1} are not within specified ranges recommended. Biochemical analysis and colony count revealed the presence of *Bacillius spp*, *Proteus* and *Aspergillius niger* with colony count 5.2×10^{7} CFU and 6.0×10^{5} CFU respectively. The study suggests that the waste may not be safe for direct land application. It is therefore recommended that the waste should be subjected to other forms of treatment to eliminate pathogenic organisms before it is used as a soil nutrient

Keywords: Jatropha seed cake, waste, digestate, analysis, tolerable limit

Involvement of Gabaergic Pathways in the Anticonvulsant Activity of the Methanol Stem Bark Extract of *Combretum hypopilinum*

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The aim of this study was to evaluate the preliminary phytochemical screening and anticonvulsant activity of the methanol stem bark extract of Combretum hypopilinum. Preliminary Phytochemical screening of the crude methanol stem bark extract revealed the presence of secondary metabolites such as steroids, flavonoids and alkaloids. To ascertain the safety of the extract in mice, acute toxicity studies was carried out using Lorkes method and oral LD50 was found to be 3807.89 mg/kg. Crude methanol stem bark extract of Combretum hypopilinum was investigated for its anticonvulsant effects using diazepam induced sleep test, Pentylenetetrazole (PTZ) test, strychnine induced seizure test, and maximal electroshock seizure test models. Different concentrations of the crude extract were orally administered to five groups of six mice in each case. The extract showed significant increase in the onset and duration of sleep in diazepam induced sleep test at doses of 100mg/kg, 200mg/kg, and 400 mg/kg. The extract was active in maximal electroshock seizure test at doses of 200mg/kg and 400 mg/kg. The extract also exerted significant seizure inhibition activity in Pentylenetetrazole (PTZ) seizure test at a dose of 400 mg/kg. The extract had no effect on Strychnine (STC) induced seizure at the tested doses. It may be concluded from the result of this study that The Methanol stem bark of Combretum hypopilinum contains bioactive compounds with anticonvulsant activities, this findings also supports the traditional use of the plant in the treatment of epilepsy.

Isolation of Protein from Defatted *Carica papaya* Linn. Seeds: Influence of pH And NaCl on its Solubility and Functional Properties

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This work reports the isolation of protein from defatted *Carica papaya* Linn. Seed (CPS), with the crude protein product containing 88.08% protein. Under its natural conditions, the solubility of this protein isolate is comparable to sweet lupin protein isolate (98.79%). The solubility of the protein decreases with decreasing pH, with the minimum solubility observed at its isoelectric point (pH 4). The water holding capacity, oil holding capacity, foaming capacity, foam stability, emulsifying capacity and emulsion stability were found to be 3.65 g/g, 3.60 g/g, 26.14%, 13.06%, 74.05m^2/g, 100.80%. The profiles of functional properties were determined with varying pH values and NaCl concentration, and improved properties were observed in the alkaline pH range and in the presence of NaCl. Electrophoretic analysis showed that the high molecular weight protein globulin was the major protein in the protein isolate.

Keywords: Carica papaya seed; functional properties; foaming properties; Protein isolate; proximate composition.

Methanol Extract of *Nymphaea lotus* (Linn) Ameliorated Carbon Tetrachloride-Induced Rat Liver Fibrosis and Inhibit Human Castrate Resistant Prostate Carcinoma *In Vitro*

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Nymphea lotus (Linn) is commonly used for traditional management of cancer and liver diseases in Nigeria. Information is however limited on the scientific evaluation of its hepatoprotective and anticancer effect. Herein, we investigated the anti-fibrotic effect of the methanol extract of *N. lotus* in rats, and the inhibitory effect of the extract and its fractions on castrate resistant prostate carcinoma cell lines (PC3 and Du145). Fibrosis was induced in rats by carbon tetrachloride (CCl_4). Anti-fibrosis was carried out at test concentrations 50, 100 and 200 mg/Kg, with corn oil as vehicle control. It was investigated by estimating concentrations of serum hepatic markers of liver injury (aspartase transaminase (AST) and alanine transaminase (ALT)), antioxidant enzymes (Superoxide dismutase (SOD), catalase (CAT), reduced glutathione (GSH), Glutathione peroxidise (GPx)), Lipid peroxidation (LPO); and histopathological analysis. Anti-cancer effect was investigated using methylene blue assay at concentrations 20, 50, 100 and 200 μg/mL in PC-3 and DU145 and normal cell (NKE). Co-exposure of $CCl_4$and *N. lotus* resulted in significant reduction in AST and ALT levels, increased antioxidant enzymes (CAT, GSH and GPx), reduced LPO level, and amelioration of CCl_4 induced hepatic histopathologic lesions. *N. lotus* also inhibited growth or proliferation of PC3 and

DU145 with the acetone fraction showing an IC_{50} of 27.65, 89.31 and 244.60 μg/mL in PC3, DU145 and NKE respectively. These show that the methanol extract of *N. lotus* ameliorated CCl_4 induced fibrosis via inhibition of CCl_4 induced oxidative stress in rats and inhibited proliferation of castrate resistant prostate carcinoma cell line.

Keywords: Antioxidant enzymes, Lipid peroxidation, Fibrosis, Prostate cancer

Methanol Leaf Extract of *Lasimorpha senegalensis* Protects the Liver against Paracetamol-Induced Liver Damage

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The acute toxicity effect, phytochemical analysis and hepatoprotective activity of *Lasimorpha senegalensis* methanol leaf extract were investigated in this study. The plant material was defatted with petroleum ether, and subjected to extraction using 80% methanol. The active principles present in the extract were determined by phytochemical tests and Gas Chromatography-Mass Spectrometry (GC-MS) technique. A total of 25 rats randomly divided into five groups of five rats each were used for the acute toxicity study. Groups 1-5 were administered the increasing doses of the extract orally. The rats were observed over a period of 24 h for acute toxicity signs such as dullness, anorexia and death. Thirty rats of mixed sexes randomly assigned into six groups (1-6) of five rats each were used for the study on the effect of pre-treatment with *L. senegalensis* extract on the serum biochemical profile of rats following paracetamol (PCM) toxicity. The rats in groups 2-5 were pre-treated with 50 mg/kg, 100 mg/kg, 200 mg/kg of *L. senegalensis* extract and 100 mg/kg silymarin, respectively, twice daily for 4 days. One hour after the last treatment on the fourth day, all the rats in groups 2-6 received 2500 mg/kg PCM orally. Group 6 rats served as negative control while group 1 rats were neither intoxicated nor treated with the extract and served as the normal control. Eighteen hours after PCM intoxication, blood samples were collected for biochemical analysis. Three rats in each group were sacrificed and sections of the liver were harvested for histopathology. The activities of serum aspartate aminotransferase (AST), alanine aminotransferase (ALT), alkaline phosphatase (ALP) and the concentrations of total and direct bilirubin were investigated. The extract did not cause clinical signs of acute toxicity such as dullness, cycling and death even at the highest dose of 5,000 mg/kg body weight. The phytochemical tests of the extract showed the presence of alkaloids, flavonoids, saponins, tannins and terpenes while GC-MS revealed that the extract contains a phenolic compound (3, 4-Dihydroxyphenylglycol) with strong antioxidant activity as well as a number of other hepatoprotective and anti-inflammatory agents such as cycloheptasiloxane, tetradecamethyl. The mean serum ALT, AST, and ALP activities as well as the mean serum total and direct bilirubin concentrations of groups 3 and 4 (pre-treated with 100 mg/kg and 200 mg/kg of the extract and exposed to PCM intoxication) were significantly ($p < 0.05$) lower when compared with group 6 (rats intoxicated with 2500 mg/kg PCM only). However, the mean serum ALT, AST, ALP, total and direct bilirubin values of rats in groups 3-5 were statistically comparable. The lower values of these markers of organ damage in groups 3-5 indicate that the integrity of hepatocytes membrane was preserved. Histopathological studies revealed that liver damage characterized by necrosis with infiltration of inflammatory leucocytes induced by PCM in rats was higher in the group that received 2500 mg/kg PCM only. Flavonoid and terpenes

have excellent hepatoprotective effects. This study therefore showed that the methanol leaf extract of *L. senegalensis* possesses some active constituents that have hepatoprotective potential.

Keywords: Hepatoprotective, *Lasimorpha senegalensis,* paracetamol, flavonolignan, folkloric medicine, 3, 4-Dihydroxyphenylglycol

Microbiological, Physicochemical and Genotoxicological Studies on some Industrial Effluents from Osun State, Nigeria

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Industrial effluents that enter water body may lead to heavy source of environmental pollution and affects the water quality. It can serve as habitat for pathogenic microbes and can constitute health hazard to the populace. The menace of waterborne diseases and epidemics still looms large on the horizon of developing countries as a result of drinking from polluted water from industries (Adeyeye, 1994). Chemicals that have been used to inhibit microorganisms in wastewater can cause deteriorating effects on aquatic microbiota and humans. Better alternative that may not have adverse effect on microbiota present in the wastewater or the populace consuming the water is by the use of Electromagnetic Field (Adeyinwo *et al.*, 2006). This research is aimed to determine microbial load and identities, to investigate the effect of Electromagnetic Field (EMF) on the populations and identities of microorganisms, genotoxic and mutagenicity activity, and also physicochemical properties of the wastewaters. Effluent will be obtained from different industries in Osun state. Microorganisms from the wastewater will be isolated by using the standard methods. The isolated organisms will be culturally, morphologically, biochemically and molecularly characterized using standard techniques (Cheesbrough, 2012). The genototic and mutagenicity activities of the effluent will also be analyse by using Muta-Chromotest and also Son of sevenless (SOS) chromotest (Mortelman and Zeiger, 2000). The physiochemical composition of waste water such as Biological oxygen demand (BOD), Electrical Conductivity, pH, Temperature, Chemical oxygen demand (COD), Total suspended Solid (TSS) (A.O.A.C, 2016) will be determined. All the experiments will be carried out in triplicate. Data obtained will be analyzed using the statistical software Minitab 7 and P less than 0.05 will be considered.

Mobile Communication Technology for Improving Access to Health Care in Nigeria: A Qualitative Appraisal of Current Availability and Usage

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There has been a rapid expansion in the use of mobile communication technology in low- and middle-income countries, including in the area of accessing and delivery of healthcare. Mobile phone consultation (mConsulting) with healthcare providers is an innovative way to make quality health care available to everyone but little is known about its usage, regulations and modes of operation in

Nigeria. This study deploys descriptive and cyber-mapping methods to examine availability, current use, modes of operation and regulation of mConsulting services in Nigeria in two disadvantaged urban settlements in Ibadan, Nigeria. Using an explorative descriptive method, 15 users of mobile health in two urban slums (Sasa and Idikan, Ibadan) were interviewed on the use of mobile phone consultations to access care. A cyber-mapping method was used to identify and explore the operational modes of available service providers in Nigeria. In-depth interviews on policy and regulation issues were conducted with five of the identified service providers.A total of twenty mConsulting providers were identified by cyber mapping as providing services in Nigeria. Only about one-third of the users from the slums had engaged the use of one form of mConsulting services or another. Available modes of interaction included the use of mobile applications (Apps), website chat (Text), audio (Voice) and video call. Cost of consultation ranged between 'no fees' to $166.67 per annum. Targeted population for identified service providers in Nigeria ranged from general to specific subsets of the population. Other services identified as being available from the providers included referral, e-record keeping and drug prescription. Although, there is no specific national policy on mConsulting or e-health in Nigeria, providers claim to be guided by what is practiced in the traditional healthcare systems. The findings demonstrate that mobile phone consulting services have been introduced into Nigeria without the existence of a policy and regulatory framework. While this innovation is likely to improve accessibility to healthcare, particularly in underserved segments of the population, it is important to regulate the practice to assure quality and mitigate harm.

Negligible Hysteresis Perovskite Solar Cell using Ag@P_4VP Nanoparticles Modified Photoanode

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Perovskite solar cells (PSCs) have been demonstrated as the systems of the near future. To date, unfortunately, most PSCs suffer from current-voltage hysteresis, which derives from interface mismatch, surface defects, ion migration, ferroelectric property and unbalanced charge transport within the perovskite device. Here, we demonstrate a facile strategy to significantly reduce the hysteresis and improve the performance of PSC by introducing Ag@P_4VP in the ETM to help in better electron extraction. It was found that Ag@P_4VP introduction severely decreases the trap state density in TiO_2 leading to a lower recombination rate and negligible hysteresis. The forward and reverse scan of pristine based device showed a 3.80 and 3.03 % of PCE, thereby yielding an average power conversion efficiency of 3.41 %. A negligible hysteresis effect was observed with the Ag@P_4VP NPs based device. The device exhibits a forward scan PCE of 5.69 %, and 5.57 % of PCE, for the reverse scan which shows an average power conversion efficiency of 5.63 %.

Optimization of Diclofenac-Na Removal from Simulated Wastewater using Tricomposite Clay Adsorbent

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Diclofenac-Na (DCF-Na) works as antiuricosurics and analgesic which is frequently used to suppress inflammation and to relieve pain in diseased conditions, such as arthritis or acute injury. Toxicological studies have demonstrated that the presence of DCF-Na in water bodies, even at trace concentrations, can adversely affect human life, flora, and fauna. This study investigated DCF-Na removal from simulated wastewater using adsorbent composite developed from Bentonite Clay, Kaolinite Clay and Worm Casting (BKW). Each of the tricomposite clay was crushed, wet-sieved, sun-dried and subsequently crushed to fine particles. The crushed fine particle of each sample (80 g) was activated with 100 ml of 2 M of H_3PO_4 for 24 hours, neutralized to pH of 7.0, sundried and then re-ground. Simplex Centroid Design of the Design-Expert (DOE) (7.1.6) software was employed to optimize the effective mix ratio of the mass composition (25–50%) of the three clay samples. The BKW clay composite (1 g) was added to 100 ml of 10 mg/l of DCF-Na solution and agitated for 4 hours. The unadsorbed amount was quantified using UV spectrophotometer. The data generated were analyzed statistically using tools available in the DOE software. The effective composite mix ratio was 1:2:1 (w/w) (Bentonite Clay: Kaolinite Clay: Worm Casting). The maximum Adsorption Capacity (q_e) of the DCF-Na solution by the clay composite was 0.850 mg/g with a removal efficiency of 85% while the minimum is 0.457 mg/g with a removal efficiency of 45.7%. The Quadratic model developed for Adsorption Capacity gave Coefficient of Correlation (R^2) of 0.9228, Adjusted R^2 of 0.8745 and Predicted R^2 of 0.7900. The model was significant with a Prob > F of 0.003 and F value of 19.12. The BKW Clay composite adsorbent developed demonstrated satisfactory efficiency for DCF-Na removal from aqueous solution.

Keywords: Adsorption, Diclofenac-Na, Optimization, Simulated Wastewater, Tricomposite Clay

Optimization of Polyphenols Extraction from Sweet Potato Peel : Single Factor Vis-À-Vis Chemometrics Approach

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The study was aimed at the optimization of the extraction conditions of phenolic compounds from an orange-fleshed cutivar of sweet potato peel from a single factor vis-a-vis chemometric experimental approach. The effectiveness of extracting antioxidants compounds using an aqueous medium (water) was compared to organic solvents. Water-to-peel, time of extraction and

extraction temperature was established to have significant effects on the total antioxidant and scavenging activities. Optimal extraction variables of 60 °C for 20 minutes, at a solvent-to-peel powder ratio of 100:7.5 mL/g was derived for the process. Approximately 157.0 g of peel powder was obtained from a kilogram of the dried potato peel using a simple but scalable method. The polyphenol isolate contained 31.39 % polyphenols and compared significant well with vitamin C and butylated hydroxytoluene (BHT) in terms of its antioxidant activities. In summary, this study uses aqueous medium as its extracting solvent, which offers great prospect for future use in the extraction and purification of bioactive compounds from plant materials.

Keywords: Antioxidants; Bioactive component;*Ipomoea batatas* peel;Chemometrics; Extraction; Polyphenols

Perception of Service Providers and Policymakers on the Impact of Mobile Phone Consultations on Nigeria's Health System

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Mobile communication technology has the potential for improving access to quality healthcare and health system strengthening in Nigeria and other low- and middleincome countries because of the deep penetration it has achieved, even in slums and other disadvantaged populations in the country. The policy and regulatory framework of the nation's health system is yet to be revised to take cognizance of the increasing adoption of this innovation in health care. The views of the providers of these services and the policymakers responsible for the needed changes ought to be known so as to focus advocacy for best practices. The aim of the study was to ascertain the view of existing service providers and government policymakers on mobile phone consultations (mConsulting), its regulation, particularly in the area of quality assurance, and its overall role in Nigeria's health system. An exploratory and qualitative method was used to evaluate the perception of 15 health workers in Ibadan, Lagos and Abuja about mConsulting and its role in providing health care to Nigerians. In-depth interviews were conducted with seven policymakers in Ministries of Health, five service providers of mConsulting and three mHealth experts to obtain their views on issues that had to be captured in policies that will govern mConsulting in the country. The health workers have not yet perceived a wide acceptance or popularity of mConsulting among the population and they have concerns about quality assurance in the provision of mConsulting services in Nigeria. Some participants perceived that mConsulting may have a negative impact on hospital revenue generation but do not consider it a threat to the healthcare workforce. Other issues raised included inadequate medical training for this mode of health care delivery and the likelihood of misdiagnoses of various health problems. The policymakers generally expressed the view that the current policies in the health system could be adapted to deal with the challenges posed by this innovation. Despite the rising popularity and innovation of mConsulting in improving health care access in Nigeria, there are lacunae in existing regulations and policy which require appropriate remedy. These can be adapted from existing policies in the health system. Health workers expressed concerns about quality assurance and the increased likelihood of misdiagnosis with this modality of healthcare delivery.

Physico-Chemical, Algal, Biochemical, Genotoxic and Haemotoxic Evaluations of Sublethal Concentration of an Abattoir Effluent in Clarias gariepinus (The African Sharptooth Catfish)

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The meat producing industry is one of the most successful food industries in sub-Saharan Africa, particularly in Nigeria. Most abattoirs are sited close to flowing water as an efficient means of waste disposal. In this study, the physico-chemical parameters, selected pharmaceuticals and algal load in untreated abattoir effluent collected from the Kara cow market, Ogun state, Nigeria were evaluated. Also, biochemical (liver function enzymes), haemotoxic and genotoxic (micronucleus assay) effects of the sublethal concentration (10% 96 hLC_{50}) of the effluent were evaluated over a period of 14 days in *Clarias gariepinus* (The African Sharptooth Catfish). The median lethal concentration (96 hLC_{50}) of the effluent against *C. gariepinus* was 173.69 mL/L (17.4%). Diclofenac and oxytetracycline were not detected in the effluent. Nitrates, phosphates, sulphates, chloride, ammonia, TDS, TSS and BOD_5 in the effluent were above the acceptable limits by the National Environmental Standards and Regulations Enforcement Agency (NESREA). Mostly diatoms (*Navicula* spp.) and euglenoids (*Phacus* sp.) were identified in the effluent with the most abundant being diatoms (Bacillariophyta). The concentration of the liver function enzymes (ALT- 167.27±25.86 U/L, ALP- 129.93±60.18 U/L, LDH- 3764.07±589.54 U/L, AST- 1234.53±609.58 U/L) and frequency of micronuclei (4.89±2.05 ‰) were significantly higher ($p<0.05$) in the exposed fishes compared to the control (ALT- 89.9±17.29 U/L, ALP- 54.4±3.06 U/L, LDH- 3489.2±96.59 U/L, AST- 455.5±61.31 U/L; MN- 0.44±0.17 ‰). There was a non- significant decrease ($p>0.05$) in red blood cells (RBCs) in the control ($1.46\pm0.01\times10^6$/µL) compared to the exposed fish ($1.39\pm0.08\times10^6$/µL). However, platelets and white blood cells (WBCs) were significantly higher ($p<0.05$) in the control ($106.5\pm2.5\times10^3$/µL; $72.15\pm0.95\times10^3$/µL) compared to the exposed fish ($163\pm5.03\times10^3$/µL; $75.97\pm0.67\times10^3$/µL). These results demonstrate a potential adverse impact of the untreated effluent on fishes in the Ogun River. Measures are recommended to be taken to treat the effluent before discharge in order to prevent eutrophication in the Ogun River as well as to sustain the ecosystem services provided by the River to biota and human community around it. This is relevant to the United Nations Sustainable Development Goal (UN SDG) 14 on preventing pollution from land-based sources in order to sustain life below water.

Keywords: Abattoir effluent, Ogun River, Genotoxicity, Haemotoxicity, Liver function enzymes, Algae

Phytochemical and Antioxidant Evaluation of *Cassia sieberiana* (D.C.) Stem Bark

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The Plant *Cassisa sieberiana* (D.C) belongs to the Fabaceae family and it is extensively known for its purgative and diuretic properties. It is used to treat constipation, urinary infections, intestinal parasites, Hansen's disease (leprosy), edemas, sexually transmitted diseases, schistosomiasis, weakness, sterility, renal pain, infantile fever and anemia. The research is aimed to evaluate the phytochemical and antioxidant activity of extracts of the stem bark of *Cassia sieberiana*. The evaluation of the powdered stem bark of this plant was carried out to determine its Pharmacognostical profile, including macroscopic, microscopic, chemomicroscopical and quantitative parameters. Chemical profile of the stem bark was also determined using thin layer chromatography (TLC). The phytochemical and *in vitro* antioxidant study was performed on the extracts. Preliminary phytochemical screening of *C. sieberiana* stem bark extracts revealed the presence of tannins, cardiac glycoside, sterol, saponin, flavonoids and triterpenes. Extracts were evaluated for their phenolic and antioxidant activity. Phenolic content was measured using Folin-Ciocalteu reagent and was calculated as 7.64mg and 2.97mg gallic acid equivalents for ethyl acetate and methanolic extract respectively. Antiradical activity of the extracts was measured by DPPH (2, 2-diphenyl-1- picryl hydrazyl) assay and was compared to ascorbic acid (vitamin C). The extracts had significant radical scavenging activity. The plant was identified as potentially novel source of free radical scavenging compound. The result indicates that the extracts have marked amount of total phenols which could be responsible for the antioxidant activity.

Keywords: Chemomicroscopical, Phytochemical, Antioxidant, *Cassisa sieberiana* and Stem bark

Phytochemistry and *In Vitro* Anti-Bacterial Studies on *Desplatsia dewevrei* Fruits

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The chemical compositions of plants have been reported to have direct and/or indirect impact on the anti-bacterial activities of diverse medicinal plants. This study was aimed at estimating the phytochemical composition (by traditional methods and GC-MS analysis) and the anti-bacterial effects of the methanol extract of *Desplatsia dewevrei* fruits. Freshly harvested fruits of *D. dewevrei* were diced in bits and shade-dried for three weeks. Dried fruits were pulverized using a mechanical mill after oven-drying for an hour at 40°C. Extraction was done by maceration using methanol as solvent. Extract was concentrated to dryness using a rotary evaporator and freeze dried to powder at -4°C. For qualitative, qualitative and GC-MS analysis, standard procedures reported in literature were strictly adopted. Qualitative phytochemistry of *D. dewevrei* fruits

showed that quinones and phlobatannins were abundantly present while, quantitative analyses showed a relatively high phenolic and tannic acid content which may account for the observed anti-bacterial activity the plant effects. GC-MS analysis of *D. dewevrei* methanol fruits extract showed gas chromatograms having 63peaks representing different phyto-compounds. Of the sixty-three (63) phyto-compounds presented, 9-Octadecenoic acid, methylester, (E)- was the highest peaked while Octane,1-(ethenythio)-; a reported xenobiotic, had the widest peak area of 13.53 at a retention time of 5.075 minutes. Although *D. dewevrei* showed no zone of inhibition for gram negative bacteria, its inhibitory effect on gram positive bacteria at 300 mg/mL is noteworthy. As evident in this study, *D. dewevrei* fruits are rich in therapeutic phytochemicals. However, further study on the anti-bacterial effect of *D. dewevrei* using other solvent extract is recommended for comparative studies and future incorporation in drug development.

Keywords: Medicinal plant; *Desplatsia dewevrei*; Phytochemistry; GC-MS, Anti-bacterial

Polycyclic Aromatic Hydrocarbons (PAHs) in Fish Samples Processed using Different Methods

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Fish, is prone to contamination as a result of water pollution. In this this study, we determine the level of polycyclic aromatic hydrocarbon (PAHs) in fish samples processed, using different methods and marketed in Makurdi, Benue state. The samples were coded as SF (Smoked Fish), SD (Sundried), FD (fried fish), FF (Fresh fish), CD (Canned fish in Vegetable oil) and OD (Oven dried) fish samples. The proximate analysis of the samples were determined and heavy metals was analyzed, using Atomic Absorption spectrophotometer(AAS). PAHs in the samples were quantified, using gas chromatography – mass spectrometer (GC-MS). The ΣPAH concentrations were in the range of 0.2- 10 μg/kg in most of the samples, indicating pyrogenic and petrogenic sources of pollutants. The ΣPAHs of the six membered ring dominates in smoked fish (32.07%), having Bezo(ghi)perylene (16.041%) as most abundant. sundried sample (64.32 %) with Dibenz(a,h) anthracene (38.191%) as the most abundant; fried sample (88.41%), presenting dominancy of Dibenz(a,h) anthracene (63.665%). Fresh and subsequently the oven dried has 6 membered ring Dibenz(a,h) anthracene (38.028%) as the highest of the PAHs. On the contrary, canned fish shows 4 and 5 membered ring as most prominent with abundant of 51.33 and 39.27 % respectively. Triphyenylene (40.386%) tops the group as most abundant of the PAHs. Generally, the heavy metals (Cr, Cd, Ni and Mn) and PAHs concentrations in the samples, points more at pyrogenic than petrogenic origin and were within the NAFDAC permissible limits.

Keywords: PAHs, Fish, Processing, Petrogenic, Pyrogenic, Diagnostic

Production of Bioethanol from Millet Stover by Co-Cultures of *Saccharomyces cerevisiae* and *Aspergillus niger*

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Lignocellulose-based biofuels such as bioethanol have attracted much attention for several decades because of their potentials to replace fossil-based fuels. In the present study, bioethanol production was carried out from millet stover by hydrolysis and fermentation. A fungal strains-*Aspergillus niger* and yeast *Saccharomyces cerevisiae* were used for fermentative production of bioethanol individually and combined. The production was carried out in two steps; saccharification and fermentation for a period of 10 days. Quality assessment of the bioethanol produced from the organisms (individually and combined) was carried out. High yield of 6.93% reducing sugar was obtained using 0.4M HCl at 40°C while a low yield of 4.83% was obtained using 0.6M HCl at the same temperature. In addition, 4.6% and 4.1% yield of bioethanol were obtained on the 6th day of fermentation using *S. cerevisiae*, and *A. niger* respectively while combination of the two species produced a yield of 4.0%. Additionally, at the same day, bioethanol concentration of (0.15 ±0.010) and (0.12±0.01) were obtained with *S. cerevisiae* and *A. niger* individually and their combination produced (0.10±0.01) bioethanol concentration. Nonetheless, concentration of the bioethanol drops drastically at the 9th day of the experiment. Interestingly, the physicochemical properties of bioethanol produced by the organisms individually and combined was found not to differ significantly ($p<0.05$). Finally, in light of the observed yield, it can be concluded that production of bioethanol from Millet stover had better yield when *S. cerevisiae* and *A. niger* were used individually than in combination.

Keywords: *Aspergillus*; bioethanol; fermentation; millet stover; saccharification; *Saccharomyces*

Promotion and Adoption of Orange Fleshed Sweet Potato as Crop and Food in Ogbomoso and Offa Zones in Nigeria

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The research sought to promote orange fleshed sweet potato (OFSP) as a test-crop to improve the level of vitamin A intake through its adoption and consumption. Use of shelf stable flour for products was done to establish the suitability and thereby reduce post-harvest losses of fresh tuber. This was to introduce the crop and enhance production and uses to improve livelihoods in six local government areas in the zones. Diagnostic survey and focus group discussion on planting of existing conventional sweet potato varieties in the two zones were conducted. Chinchin, bread and biscuit were developed from wheat and OFSP (mother's delight) flour. 'Amala' (dough) was developed from mixture of OFSP flour and cassava starch and 100% fermented OFSP flour. All products, except the latter, were made with optimization process (minimizing moisture content, oxalate and tannin and maximising proximate content, phytate, β-carotene, bulk density and water absorption capacity) using Simplex Lattice Design (SCD) of Design expert. Women groups and interested men

were trained on value addition. Sensitization and awareness on the crop was done through crop and product distribution in open local markets, radio jingles and drama, and meetings with cooperative societies. At the inception of the research, OFSP was planted by only 4.5% of the farmers. Acceptable bread and biscuit (83.75:16.25) and chinchin (87.5:12.5) of good sensory qualities were produced from composite of wheat and OFSP flour, respectively. 'Amala' of good sensory qualities was also made from admixture of OFSP flour (86.13%) and cassava starch (13.87%), and 100% OFSP flour that was fermented for 24 hr when compared with control. Range of 0.16 - 0.21 mg/100 g beta-carotene was obtained in chinchin, bread and biscuit. The populace accepted OFSP as crop and food. Suitability of OFSP flour as shelf stable intermediate product for food production was established. Retention of beta-carotene in the final products has potential to curb incidence of vitamin A deficiency among rural dwellers and other low income groups, especially the vulnerable groups.

Proximate, Total Calorific Values and Organoleptic Qualities of Milk Chocolate Incorporated with Different Spices

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An innovative spicy chocolate was developed in this study by partial replacement of cocoa nibs with different selected spice powders of : Ginger (G_{11}), Garlic (G_{12}), Clove (C_{13}), Cinnamon, (C_{14}), Turmeric (T_{15}), *Aframomum danielli*, (A_{16}), *Aframomum melegueta*, (A_{17}), Thyme (T_{18}), Black Pepper (B_{19}) and Clappertonia (C_{20}) . Milk chocolate without spices (C_{10}) served as Control. The proximate chemical qualities of samples were carried out using standard methods. The total calorific value (TCV) was determined using the Atwater factors (physiological fuel values) of 4kcal, 4kcal and 9kcal per gram of carbohydrate, protein and fat respectively. The sensory evaluation was carried out by panel of tasters consisting of 13 males and 18 female's staff of the Cocoa Research Institute of Nigeria who were used to consuming chocolates. The result showed significant differences in the proximate chemical compositions of the chocolates ($p<0.05$). Apart from black pepper with a significantly lower protein and ash contents than the control chocolate, all the other spices significantly caused an increase in percentage protein and ash in milk chocolates. The trend of protein increase is T18 > G11 > T15 > C20 =A17 > A16 > C14 > C13 > G12 > C10 > B19 > respectively. The range of values obtained for the proximate compositions were: Protein (6.34-7.44), Fat (31.53-34.42), Ash (2.27-2.81), Moisture Content (5.06-5.86), Crude fibre (2.35-2.68%) and Carbohydrate (47.83-51.63). The Total Calorific Value (TCV) also showed significant differences among all the samples at $p<0.05$ with the TCV of the control chocolate being the highest. The addition of spices contributed to acceptable tastes, aroma, flavor and general acceptability of milk chocolates. In conclusion, this study showed that the incorporation of Spices in chocolate increased the protein and ash content of milk chocolate, the organoleptic acceptance while reducing the TCV values This is a desirable findings in view of the fear of high calorific values of Milk Chocolate which may predispose consumers to obesity when consumed.in large quantities.

Keywords: Spice, Chocolate, Proximate, Organoleptic qualities

Psychoperiscope

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Evidence-based assessment utilizes information about clinimetrics, psychopathology risk factors, rating scale scores, and other in-depth assessments to conduct an iteratively efficient approach to estimating the probability of a given diagnosis until that probability falls into a range suggesting it unlikely to be present, or likely enough to warrant treatment. Once the practitioner and client agree on the treatment plan, subsequent steps include monitoring progress and outcomes toward making decisions about treatment termination while a continuous monitoring helps to guard against relapse. A more empirical evidence-based assessment is an approach to clinical evaluation which emphasizes the use of research and theory to guide the selection of constructs, assessment methods, assessment measures, and the analysis and interpretation of the resulting assessment data. Hence, the cogent need for more empirical evidence-based assessment led to developing a 21-item Psychoperiscope by coining periscope and psychometrics to mirror the mediating-moderating effect of cognitive coping strategies in the relationship between illness and quality of life. During its development process, Psychoperiscope was pilot-tested on a sample of hospital in-patients (n=30*3) who were selected by multistage sampling method, involving cluster sampling and stratified random sampling techniques. The pilot study used mixed methods embedded design and the findings proved Psychoperiscope as a significantly reliable in-patient screening tool. The follow-up replication study was conducted at five rural primary health centers within community settings. Thus, the research setting comprised of five rural communities which include three communities in Bauchi State and then two communities in Plateau State. As earlier adopted during the Psychoperiscope development process, the replication study adopted mixed methods embedded design and multistage sampling method. Study participants were 50*3 (50x3) out-patients, i.e. 10 out-patients at each of the five centers, alongside their respective family members (one each) and their healthcare provider(s). The three versions of Psychoperiscope were systematically administered to individuals who consented among the three categories of potential participants, including out-patients (assessment subjects), their respective family members (one each) and their clinician(s)/health worker(s). Analyses of the resulting data were based on item-total statistics, Pearson's correlation analysis, and exploratory factor analysis (EFA). A threshold of item-minimum-excellent significance level at 0.60 was adopted while all the analyses were carried out at $p \leq 0.05$. Results show Pearson correlation [$r = 0.60 - 0.64$ ($p < 0.05$)]; Cronbach's alpha [$\acute{\alpha} = 0.62$ (raw = 0.60 and standardized = 0.64)]; scale mean of the means (3.75); mean of the variances (0.44); variance of the means (0.17); and variance of the variances (0.23). Though not as highly significant as the pilot study findings, the replication study further shows that Psychoperiscope is significantly reliable for health research and can serve as a valid tool for patient screening. The recommendation to adopt an experimental case study, earlier emanated from pilot study, towards ensuring appropriate hypotheses testing is hereby sustained to aid digitalizing Psychoperiscope.

Keywords: Replication study; Quality of life; Psychoperiscope; Psychometrics; Mixed methods; embedded design; Illness; Empirical evidence-based assessment

Rapid Assessment Of Water And Sediment Around A Battery Plant Dumpsites In South-Western Nigeria

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In a quick assessment carried out around dumpsites of a battery manufacturing plant, heavy metals content of sediment, surface water and ground water samples from seven ponds, three streams and a well were assessed using Atomic Absorption Spectrophotometer (AAS). Some physicochemical parameters of the samples were also investigated. Metal concentration in sediment samples ranged from 25.71-75,843 μg/gPb, 0.74-4.13 μg/gCd, 32.35-385.31 μg/gCu, 3.17-28.5 μg/gNi, 558.25-908.42 μg/gFe and 10.01-53.59 μg/gZn and levels for Pb, Cd and Cu obtained in some samples from ponds close to the dumps at Ile-Igbon, exceeded values for sediment quality guidelines. In water samples, concentration of metals ranged as Pb(0.0003-5.69 mg/L), Cd(0.00006-0.0699 mg/L), Cu(0.0001-0.09 mg/L), Ni(0.0001-0.38 mg/L), Fe(0.0399-17.099 mg/L) and Zn(0.00001-0.14891 mg/L). Physicochemical parameters in water were pH (4.54-7.59), Temperature (25-28 ^{o}C), DO (2.49-6.45 mg/L), TS (296-35,100 mg/L), TSS (2.0-281 mg/L), TDS (290-34,800 mg/L), Cl^- (12.2-52.5 mg/L), NO_3^- (3.2-800 mg/L), PO_4^{3-} (0.14-1.58 mg/L) and SO_4^{2-} (76.0-5,300 mg/L). Results obtained for TSS, TDS, NO_3^-, SO_4^{2-}, Pb, Cd and Fe in water, especially in ponds at Ile-Igbon and Ni in Aweere stream, exceeded limits set by standard organizations as well as results from similar work.
Keywords: Battery dumpsite, Ile-Igbon, Sediment, Heavy metal, Assessment

Recovering of Oyster from Oil Polluted Creeks of Niger Delta Area of Nigeria using Depuration

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Depuration is the natural cleansing process that can be performed in a controlled environment by immersion in tanks of clean seawater to allow sewage contaminants to be purged without interference while soaking is the process that involves moving contaminated shellfish from polluted areas to clean waters in a bowl and allowing the animals sufficient time to purge off unwanted biological and chemical contaminants.. In this study ,the effects of depuration and soaking on the elimination or reduction of total heterotrophic bacteria and total fungi in mangrove oyster (*Crassostreagasar*) from Slaughter and Abuloma at different time intervals in a polluted creek in Rivers State, Nigeria was investigated. Oysters were depurated and soaked separately in water tanks, and samples taken at intervals of 24, 48, 72 and 96 hours during depuration for microbial analysis. Results showed that slaughter and Abuloma at intervals of 24, 48, 72, and 96 hours during soaking and depuration at dry and wet seasons had significant effect on the microbial counts. At Slaughter and Abuloma there was significant difference ($P<0.05$) at different time intervals of soaking and depuration for both seasons. The oyster that did not undergo depuration (control) for all the locations had the highest counts for soaking and depuration at both dry and wet seasons. Notably between 24 and 48 hours of depuration for both dry and wet seasons, no significant difference ($P>0.05$) on total fungi counts was recorded. At slaughter location during wet season,

control had the highest TBC of 0.48 x10^5 CFU/g followed by 0.31 x 10^5CFU/g during dry season. At Abuloma location during wet season, the control had the highest TBC of 0.48 x10^5 CFU/g followed by 0.32 x 10^5CFU/g during dry season. The control from Slaughter recorded 5.41CFU/g for wet season and 4.12CFU/g for dry season for total fungi counts. At Slaughter location, during dry season the control had the highest hydrocarbon utilizing bacteria of 9.80CFU/g while at Abuloma, 9.17CFU/g was recorded during wet season and 77.20 CFU/g for dry season. The depurated oyster at 96h for both seasons reduced to 1.28 from 5.41CFU/g for total fungi count during wet season and reduced to 1.28 from 4.12 during dry seasons. At Abuloma, there was significant difference ($p<0.05$) for soaking at different time intervals for both seasons except at 96h of soaking for dry seasons, the level of total fungal counts was reduced. Depuration was effective against these bacteria after 72 hours. Soaked oyster at different time interval reduced slightly within the range of 8.67-8.49 x 10^5 CFU/g from the control which had 8.90 x 10^5 CFU/g. It is therefore necessary to determine the concentration of the total heterotrophic bacteria in this polluted creeks and the effect of depuration and soaking time on heterotrophic bacteria of oyster harvested from the polluted creeks of Rivers state, Nigeria at different seasons. The depuration of these contaminants on the shellfish was faster during rainy season than dry seasons brought about satisfactory results.

Keywords: Depuration, soaking, slaughter, oyster, wet season, dry season

Science and Technology Education: Catalyst for Nigeria's Democratic Development

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A catalyst from biochemical and general scientific perspective refers to anything that accelerate or facilitate the accomplishment of a given process. It is imperative to state that science and technology education is actually a catalyst in the transformation of any nation. Infact, economic indices of development of countries are hinged on the level of their scientific and technological advancement. Democratic developments are not exceptions within this context also. Looking at Nigeria's situation, we could say that our democratic evolution has undergone different metamorphosis over the past two decades. This paper therefore is an attempt to juxtapose the understanding of some vocabulary from pure science background of the authors to explain the democratic journey as a nation so far. The paper will examine the role played by science and technology literacy on the overall transformation of our democratic experience since the beginning of the fourth republic. Furthermore, the paper will also find a correlation between the different democratic dispensations the nation has passed through with a view to understanding the impact of communication and information technology as one of the scientific catalyst of our democratic development. The place of social media in youth sensitization and participation, introduction of innovations like card readers in the recent elections, involvement of different election monitoring mechanisms will be discussed briefly too. In conclusion, the paper will make an appraisal of the gains recorded and areas needing improvement.

Keywords: Catalyst, Democracy, Nigeria, Science and Technology, Education

Serum Calcium, Alkaline Phosphatase Activity and Creatinine Level in Postmenopausal Women in Enugu Metropolis

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Maintaining good physical functioning is an important aspect of independence in later life especially in post menopause while poor physical functioning is associated with institutionalization, hospitalization, and mortality. Menopause is the cessation of menses for 12 consecutive months. Post menopause is associated with numerous hormonal, physiological and biochemical changes affecting bone mineral metabolism as well as renal function. This study investigated the serum levels of calcium, creatinine and alkaline phosphatase activity of postmenopausal women in Enugu metropolis. Ethical clearance was obtained from Enugu State University Teaching Hospital (MAC/RA/034/VOL 11/60). Forty postmenopausal (50- 65years) and twenty premenopausal (30-45 years) apparently healthy women were recruited for this cross sectional study. Blood sample were collected from the participants for the determination of serum calcium, creatinine and alkaline phosphatase (ALT) activity. Serum calcium was assayed using O-cresolphthalein complexone method, creatinine was done using Jaffe kinetic method while ALP was determined using phenolphthalein monophosphate substrate method. Data were analysed using SPSS computer software version 20 and results were represented as mean ± standard deviation. The results showed that there was significantly ($p < 0.05$) higher values in the mean of serum calcium (2.51 ± 0.25mmol/l, 2.24 ± 0.29 mmol/l), creatinine (72.50 ± 16.44 μmol/l, 61.03 ± 18.46 μmol/l) and alkaline phosphatase (94.44± 29.36 IU/L, 66.17 ± 16.11 IU/L) in postmenopausal women compared to premenopausal women. Calcium and alkaline phosphatase showed a significant positive correlation with the age of the postmenopausal subject ($r=0.418$; $p= 0.007$ and $r=0.353$; $P = 0.025$) respectively while creatinine showed no significant correlation. This study concludes that serum calcium, serum creatinine and alkaline phosphatase activity is higher in postmenopausal women compared with premenopausal women. This indicates that the postmenopausal women may likely be prone to osteoporosis, cardiovascular disease and renal dysfunction.

Keywords: Postmenopausal, Premenopausal, Calcium, Creatinine and Alkaline phosphatase

Sublethal Concentrations of Zinc and Lead Compounds Instigated Time-Dependent Alterations in Transmembrane ATPases Activities in African Catfish (*Clarias gariepinus*)

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The consumption of African catfish has become a staple source of protein in Nigerian foods, but increasing aquatic pollution by environmental contaminants like heavy metals raises public health concern as a result of their adverse effects on biological systems. Therefore, the present study was designed to evaluate the effects of sublethal concentrations of zinc (Zn) and lead (Pb) on membrane-bound Na^+/K^+ ATPase (NKA) activity in tissues of catfish. Box-Behnken Design (BBD), a typified Response Surface Methodology (RSM), was employed in the study with selective priority for 0-20 % sublethal concentrations of 96 h-LC_{50} values of Zn (32.15 mg/l) and Pb (55.12 mg/l) in a

time-dependent monitoring of Na^+/K^+ ATPase activity in gills and hepatocytes of African catfish. The interactive toxicity of Zn and Pb generated quadratic models, which differed significantly ($p<0.0001$), for the evaluation of Na^+/K^+ ATPase activity in gills and hepatocytes with R^2 values >90 % as well as insignificant lack of fit ($p>0.0001$). Increasing Zn and Pb interactions caused significant inhibition ($p<0.0001$) of the enzyme activity. The laboratory verification of the models under optimum conditions was adequate for the prediction of gill and hepatocyte Na^+/K^+ ATPase activities, which were numerically designated as (2.24 ± 0.38) and (2.24 ± 0.19) μmol Pi/mg protein respectively. The present study hereby culminates that the time-dependent interaction of the two toxic metals may be synergistic or additive in nature to instigate inhibitory effect on the physiological function of membrane-bound Na^+/K^+ ATPase activity.

Keywords: African catfish, Box-behnken design, Na^+/K^+ ATPase activity, Response surface methodology,

Supplemental Phytase in Calcium and Phosphorous Deficient Broiler Chicken Diets Enhanced Calcium, Phosphorous and Nitrogen Retention

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Poultry has little or no endogenous phytase to digest phytin-phosphorous and complex nitrogen from plant sources. This results to low digestibility and retention of the innate nutrients from plant sources. Therefore, much of the excess dietary calcium, phosphorous and nitrogen are eventually voided in faeces thereby contributing significantly to land and water body degradation. This study was aimed at assessing the effects of phytase supplementation on calcium, phosphorous and nitrogen retention in broiler chicken fed diets with varying levels of calcium and phosphorous. One-day old Arbor Acres broiler chicks (n=320) were randomly allocated to six dietary treatments of 45 chickens per group in a completely randomized design. Each treatment was in triplicates comprising 15 chicks per replicate. Basal starter and finisher diets had 3000 kcal/kg ME and crude protein of 23 and 20%, respectively. Control (T_1) group were standard starter and finisher diets without phytase (1.5% Dicalcium phosphate-DCP+0 phytase), T_2 was supplemented with 0.1% phytase (1.5% DCP+0.1% phytase, T_3 had 0.1% phytase but without DCP inclusion (0% DCP+0.1% phytase), T_4 0.75% DCP+0% phytase, T_5 (0.75% DCP+0.1% phytase), while T_6 was without DCP and phytase supplementation (0% DCP+0%phytase). The chicks were fed *ad libitum* on the respective starter diets for the first 21 days and finisher diets from 22-42 days. At day 35, five chickens per replicate were selected and housed in metabolic cage for a week. The first four days was used to acclimatize the birds and the total voided faecal droppings in the last three days were collected and dried. The feed and faeces were assayed chemically using standard procedures. Calcium, phosphorous and nitrogen retention were also calculated. Data were subjected to descriptive statistics and analyses of variance at $\alpha_{0.05.}$ Digestibility of dry matter ranged between 64.9 (T6) and 67.8% (T_3) as well as crude protein of between 68.6 (T_2) and 71.88% (T_5), were similar ($p>0.05$). Digestibility of crude fibre (49.23%), ether extracts (61.44%) and ash (61.69%) were consistently lower ($p<0.05$) for broilers on T_6 but significantly higher for those on T_2 which had crude fibre, ether extracts and ash digestibility of 63.7, 68.2 and 77.4%, respectively. Calcium and phosphorous intake of chickens reduced significantly ($p<0.05$) from 0.77 and 1.33g, in broilers on control and T1 (0.75 and 1.31g, respectively to 0.42 and 0.61g, respectively in those on T6. Nitrogen intake and excretion were not significantly affected ($p>0.05$) by the treatments. The voided calcium as well as

phosphorous reduced significantly ($p>0.05$) from T1 and control to T6 which correlated negatively with the levels of intake. Calcium and phosphorous retentions were similar for chicks on all treatments, irrespective of the supplemental phytase and levels of DCP inclusions. In conclusion, phytase supplementation enhanced the release of the innate feed calcium and phosphorous which compensated sufficiently for the deficit. Therefore, supplemental phytase in calcium and phosphorous deficient broiler chicken diets enhanced calcium, phosphorous and nitrogen retention.

Keywords: Dicalcium phosphate, Arbor Acres broiler chicks, Phytin phosphorous, Faecal droppings, Nutrients retention

Synthesis, Characterization and Biological Evaluation of ZnO Nanoparticle from Zn(II)-Schiff Base Complex

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Zinc oxide (ZnO) has exhibits interesting properties as semiconductor material owing to its application on solar cells, gas sensing, high catalytic and photochemical activity. Due to many biological processes taking place at the nanoscale level, there is the potential that engineered nanomaterials may interact with biomolecules and cellular processes, hence, ZnO nanoparticles are believed to be biosafe, nontoxic, and biocompatible. Zn(II) complexes of tridentate Schiff base was synthesized and characterized using melting point, thermogravimetric analysis, UV-Vis, and Fourier transformed infra-red (FTIR) spectroscopy. ZnO nanoparticles were prepared using Zn(II)-Schiff base complex through one step calcination process at different temperature: 250-350 °C. The structural studies of synthesized metal oxides were carried out with powder X-ray diffraction (PXRD), transmission electron microscopy (TEM), FTIR, photoluminescence (PL) and UV-visible spectroscopy. Average sizes of the ZnO nanoparticles were found to be < 50 nm. The antioxidant activities of the product were investigated through scavenging activity on 1,1-diphenyl-2-picrylhydrazine (DPPH). The obtained Inhibitory Concentration IC_{50} value of the DPPH activity for the product at 300 °C ($IC_{50} = 4.56 \pm 1.47\,\mu M$) was higher than other products.

Keywords: Metal complexes, ZnO Nanoparticles, XRD, UV-visible, TEM, TGA/DTA, FT-IR

The Development of a Mobile Application to Peripheral General Health workers to Diagnose and Treat People with Skin Diseases in Resource-Poor Settings

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The study objective was to develop a mobile phone application to increase the capability of peripheral health workers in resource-poor settings to diagnose and treat skin diseases and contribute to strengthening the health system. The development of the NLR SkinApp went through five stages: (1) a pilot project using a paper-based algorithm in Nigeria, leading to the development of the first version of the skinApp; (2) a field test of the first version of the mobile phone application in 2015 in Zambezia Province, Mozambique; (3) development of a second version of the Skin App based on results of the field test; (4) an implementation project using the second version of the Skin App in Nampula Province, Mozambique, 2017–2018, leading to the creation of a third version; and (5) a validation study of the third version of the SkinApp in Bugando Medical Centre in Mwanza, Tanzania. During all five stages, several dermatology experts with experience in resource-poor areas generously contributed to the content, narrative, and imagery, and provided feedback. The main findings of the validation study were that (1) the SkinApp was easy to use after a short introduction about its functionalities; (2) peripheral health workers made correct diagnosis in 78% of patients with skin diseases included in the SkinApp; (3) not all skin diseases in the application were relevant in some of the contexts; (4) the treatment advice was clear, but not all treatment options were available at the peripheral level in some Provinces/Local Governments; (5) a tele-dermatology function would enhance the usefulness of the application. There is a clear need to address the mismatch between the burden of skin diseases at the community level in resource-poor areas and the capability of peripheral health workers to diagnose, treat, and refer people with skin diseases, including skin NTDs. mHealth in general and the NLR SkinApp in particular can help to bridge this gap. The technical requirements and costs to ensure the sustainability of these innovative approaches are likely to increase, especially upon usage in different countries, which requires context-specific adaptation such as the use of the local language and alignment with the epidemiological situation. Therefore, more research is needed to gather evidence on the health outcomes and (cost-) effectiveness of mHealth for skin diseases, including skin NTDs, to ensure a wider use in support of peripheral health workers.

The Role of Mathematics Education in Attaining the Sustainable Development Goals (SDGs), Political Stability and National Security in Nigeria

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The paper examines the role of mathematics education in attaining the Sustainable Development Goals, political stability and national security in Nigeria; and revitalizing mathematics education as a tool for enhancing these variables. Using content analysis, it was discovered that lack of these variables are due to absence of sufficient consideration to mathematics education in Nigeria. It was recommended that government should collaborate with entrepreneurs to teach and encourage skills acquisitions in tertiary education. In addition, the teaching and learning of mathematics should be motivated and encouraged at all levels of education to achieve technological and scientific developments.

Keywords: Mathematics Education, Sustainable Development, Political Stability and Security.

Timing Mulching for Sustainable Plantain Production in the Rainforest Agroecology of Southeastern Nigeria

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The application of different plant waste mulch sources to plantain at three different times was explored for improved yield, income generation and for sustainable production of plantain during the early and late cropping seasons for food security, poverty and hunger eradication in Nigeria. The study investigated the effect of three times of mulching plantain (at planting, 3 and 6 months after planting) with five plant waste material mulch sources (palm bunch refuse, palm fibre, woodchips, sawdust and multispecies thrash) at Owerri in the tropical rainforest agroecology of southeastern Nigeria. Plantain in each treatment combination received 10 tha^{-1} of poultry manure at two and four months after planting respectively. The experiment was a 3 x 5 factorial experiment laid out in a Randomized Complete Block Design with three replications. The rate of degradation of plant waste mulch materials was rapid (2-3 weeks) for multispecies thrash, moderate (9-12 months) for palm bunch refuse and palm bunch fibre and slow for woodchips and sawdust (12-15 months) and thus affected the effectiveness of mulch in moisture conservation and yield of plantain. Mulching plantain at planting with thrash enhanced crop yields but aggravated significant yield decline of the first ratoon plantain. Mulching plantain at planting was not as effective as mulching at three months after planting (July). Mulching in July produced highest plantain yield and sustained plantain availability in the plantain off season while mulching at 6 months after planting (October) was least effective in moisture conservation and improvement of plantain yield. Mulching plantain with plant waste materials significantly suppressed weed growth, stimulated high density plantain roots, early sucker proliferation, minimized black sigatoka disease incidence and increased the yield of plantain. Mulching plantain at 3 and 6 months after planting (MAP) with palm bunch refuse, oil palm fibre, woodchips and saw dust sustained heavy plantain yields, increased number of hands and

marketable fingers per bunch, high productive mats in plant and first ratoon plantain. These findings are important for the development of effective mulching strategy for rainfed and drier agrarian zones.

Keywords: Plantain, mulching, Sustainable, Palm bunch refuse

Utilization of Hexadecane and Heptane by *Serratia sp.* under Different Potassium Nitrate (KNO_3) Concentrations

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Composition of mineral salts medium varies depending on the scientific protocol used. Potassium Nitrate (KNO_3) is one of the components of mineral salts medium (MSM) used in microbiology and other experiment. In this work, the ability of *Serratia sp* to degrade hexadecane and heptane at different KNO_3 concentrations was studied. Four experiments were carried out with variations in hexadecane (26μl), heptane (29μl), salt concentrations and the days of observations. Mineral salts medium composed of 0.125g/ml of KH_2PO_4, 0.35g/ml of Na_2HPO_4, 0.05g/ml of $MgSO_2.7H_2O$, 0.075g/ml of KNO_3 and 0.25g/ml of $[NH_4]_2SO_4$ was used. Growth rate using plate count method was tested during the days of observation. Results showed the ability of *Serratia* sp to degrade hexadecane and heptane as the only source of carbon and energy, because the total viable count increased from 79×10^2 to 172×10^6 cfu/ml for the normal MSN with hexadecane as carbon source. In the set up with normal MSM with heptane, total viable count increased from 22×10^2 to 452×10^6 cfu/ml. In the set up with hexadecane and X4 KNO_3 in normal MSM, the total viable count increased from 26×10^2 to 33×10^6 cfu/ml. In the fourth set up with heptane and X4 KNO_3 in MSM, the total viable count increased from 117×10^2 to 238×10^6 cfu/ml. It is concluded that the mixture of the hydrocarbons enhanced the degradation efficiency of *Serratia sp*.

Keywords: KNO_3, hexadecane, heptane, *Serratia sp*., salts

Vegetable Blends: Utilization of Underutilized Vegetables for Cooking Paste

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Vegetables are key food materials which are rich sources of micronutrients and phytochemical essential in nutrient metabolism and which play protective and antioxidative roles in the body. The study aimed to produce different blends of cooking paste, making use of underutilized vegetables (cucumber, carrots and eggplant) with or without tomatoes (the most acceptable for cooking in the country). Objectives of the study include: development of different vegetable blends; evaluation of the nutritive properties with comparism to the normal tomato blend and comparing the sensory qualities of the different vegetable blends with the control (tomato blend). Research design was developmental and analytical. Four samples: AA (blend of 280g eggplant + 120g chili pepper + 160g onion); AD (blend of 260g eggplant + 180g carrot + 60g chili pepper); AJ (blend of 180g

eggplant + 100g cucumber + 200g tomato + 160g onion); and AS (blend of 280g tomato + 120g chili pepper + 160g onion). Recipes were developed, produced and taken to the food quality control laboratory for energy, fiber, vitamin C and B-carotene analysis while the 9 point Hedonic scale was used to assess sensory qualities. SPSS version 16 was used to analyze the data generated. Descriptive statistics using mean ±SD for the nutrients value and inferential statistics it using analysis of variance (ANOVA) to determine how different and significant are the nutrients and sensory values of the different blends from one another. Results showed that per 100g of the blends AA, AJ and AD had more fiber content (6.60±0.14 – 7.10±0.14) than AS blend (6.60±0.14) with significant difference (df=2, p<0.05), and higher ascorbic acid content in AA, AD and AJ (135±2.10-142±2.10) than AS (133±2.10) with significant difference (P<0.05). Higher energy value (121±2.75-132±2.75) was observed in blends AA, AD and AJ than AS (210±2.75) with significant difference p<0.05 with AD and AJ blends having higher beta carotene content (2236±2.45 - 2240±2.45) than AA and AS blends with significant difference (df=2, P,0.05). Sensory evaluation revealed that AS was rated highest (7.33±0.23) in taste than AA (7.20±0.55), AD (7.13±0.52) and AJ (7.26±0.38) but with no significant differences (df=3, p>0.05). With regards to colors of the different blends, AS was rated highest (8.00±0.22) than AA (7.60±0.42), AD (6.80±0.33) and AJ (7.20±0.30) with significant difference (df=3, p<0.05). For acceptability of the different blends of vegetables, AS was more acceptable (7.25±1.11) than AA (5.50±1.26), AD (6.75±1.26) and AJ (6.25±1.80) but with significant difference (df=3, p>0.05). Underutilized vegetables when properly blended contain more energy, fiber and micronutrient than the normal tomato blends being currently used. However, public enlightenment of the nutritional and protective benefits of these vegetables should be done to enhance their utilization at various homes.

Keywords: Vegetable, vitamin, mineral, fiber, protective benefit

Work Process Improvement using Modeling and Simulation in a Tertiary Hospital Radiology Department

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Service delay has remained a persistent problem in the radiology departments of most Nigerian tertiary hospitals. The service bottlenecks arising from the ill-managed patient flow and poor scheduling processes result in excessively long waiting time for patients. Patient access to care, efficiency and productivity, as well as resource utilization has been adversely affected by this.
The aim of the study was to measure, analyze and improve the patient flow at the radiology department of a Nigerian Teaching Hospital using modeling and simulation. This prospective cross-sectional study was carried out in a tertiary hospital radiology department on adult ambulant patients that underwent routine radiographic investigations. The patient flow process was observed from entry to exit using stopwatches in order to study the departmental operations. Arrival time, service time and waiting time were measured for each patient and MATLAB Simulink was used to model and simulate the workflow process. Different scenarios to modify patient flow in the radiology department were tested on the validated simulation model. Optimization approaches were proposed and were tested through simulation. The probability of n

arrival is inversely related to the arrival rate. There was an observation of high patient arrivals for early hours of each day and lower arrival rates as the day progresses. System utilization increases with increase of the arrival rate and generally decreases with increase in the number of servers and mean service rate. The probability of the number of delays decreases at higher utilization rates. A new scheduling model was proposed which showed a modification of the arrival rate and performance parameters to the required degree. A software program called "MATLAB Estimator" was developed which showcases output parameters once the input parameters are known. This aided implementation of the proposed model. Reduced patient wait time was achieved using the proposed model. Operations planning and control process can be enhanced by radiology service managers using forecasts of system demands which will enable work process improvement.

Keywords: Patient flow process; System utilization; Modeling and simulation; Radiology department; MATLAB Estimator

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