GHANA SCIENCE ASSOCIATION

33rd Biennial Conference

THEME

Combating Climate Change: The Role of Science, Technology and Innovation

DATE

5th – 7th September 2023

HOST

Accra Branch

PROGRAMME AND BOOK OF ABSTRACTS

GHANA SCIENCE ASSOCIATION

IITA Transforming African Agriculture · CGIAR · IWMI International Water Management Institute · Energy Commission · The Ghana Chamber of Mines · CHEMICO · Blue Skies · Council for Scientific and Industrial Research CSIR Ghana · WATER RESEARCH INSTITUTE, CSIR · Centre for Plant Medicine Research CPMR EST. 1975 · PLANT GENETIC RESOURCES RESEARCH INSTITUTE, CSIR · RMG Ghana Ltd · Radiological and Medical Sciences Research Institute GAEC · bnari Biotechnology and Nuclear Agriculture Research Institute · JAPAN MOTORS Driven by Excellence

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WEST AFRICAN CENTRE FOR CELL BIOLOGY OF INFECTIOUS PATHOGENS
WACCBIP
www.waccbip.ug.edu.gh
(WACCBIP)

The Energy Commission of Ghana is 25 years! Hurray!!!

The Energy Commission was established under the Energy Commission Act, 1997 (Act 541) to regulate and manage the development and utilization of energy resources in Ghana, as well as to provide the legal, regulatory and supervisory framework for all providers of energy in the country. Over the last 25 years, these are some of our key milestones:

25TH ANNIVERSARY

25 years of excellence in energy regulation...

- *Transformation of Electrical Appliances Market in Ghana*
- *Energy Efficiency and Conservation Promotion*
- *Regulation of the Renewable Energy Industry*
- *Regulation of Electricity and Natural Gas*
- *Energy Planning and Policy Recommendation*
- *Certification of Electrical Wiring Practitioners*
- *Implementation of Local Content and Local Participation in the Electricity Supply Industry*
- *Regulations for Electric Vehicles Charging Stations*

The Energy Commission continues to play a significant role in the transformation of the energy sector in Ghana

Energy Commission: *Securing Ghana's Energy Future Today*

: 0302813756 /7/9

: www.energycom.gov.gh

: Ghana Airways Avenue (Behind Alliance Française, Airport Residential Area.
PMB Ministries Post Office, Accra-Ghana

EnergyCommissionGhana EnergyCommission EnergyCommissionGhana

33RD BIENNIAL CONFERENCE

OF THE GHANA SCIENCE ASSOCIATION

THEME

Combating Climate Change: The Role of Science, Technology, and Innovation

HOSTED BY

Accra Branch of GSA

DATE & VENUE

5th – 7th September 2023 at the WACCBIP Auditorium, Department of Biochemistry, Cell and Molecular Biology, University of Ghana, Legon

PROGRAMME AND BOOK OF ABSTRACTS

TABLE OF CONTENTS

ABOUT GHANA SCIENCE ASSOCIATION

Motto: Advancing Science, Technology and Innovation

The Ghana Science Association (GSA), a voluntary, non-profit making and multidisciplinary organisation of scientists, technologists, and mathematicians was formed in 1959. The Association traces its origin to the West African Science Association (WASA) which was formed in 1953 at the University College of the Gold Coast. WASA was formed to provide West African scientists the forum to advocate the importance of Science and Technology as a necessity and bedrock for national development. The formation of GSA broadened the scope of activities from reading scientific papers to involvement in national and international affairs. The Association was placed on government subvention under the Ministry of Education as far back as 1961 by a Presidential Fiat. Hence the Association is supported through a budgetary allocation from the Ghana Government. Other sources of income include membership dues and proceeds from workshops and conferences. The GSA was mandated to promote, popularize, and demystify science and create a scientific culture in the country. The Association has made tremendous contributions to National Development, Health, and Economic Growth through scientific interventions. The Secretariat is a point where scientific and technological information and research findings are obtained by individuals and corporate bodies.

Membership of the Association is drawn from the Universities, Research Institutes, Industry, Government, and Persons interested in the promotion of Science and Technology.

Vision

To become a dominant voice in Science and Technology advocacy by promoting and popularizing Science and Technology to meet national developmental needs.

Mission

Advancing Science, Technology, Engineering and Mathematics (STEM) through interaction and cross-fertilization of ideas of all interested people to: -

- Popularize, promote, and disseminate scientific information and technology transfer for national development.
- Contribute to the development of national Science and Technology policy.
- Collaborate with industry to set national research agenda.
- Establish linkages with industry to promote the transfer and application of science.
- Seek affiliation and foster cooperative links with other national and international organizations.

Activities

- Organization and Participation in Scientific Conferences, Workshops, Seminars, Symposia, Public Lectures, Quizzes and Science Fairs.
- Promotion of Carrier Development of Scientists in Universities and Research Institutes in Ghana and elsewhere.
- Publication of the Scientific Journal, Magazines and Books (e.g., Journal of the Ghana Science Association and Everyday Science for Schools Magazine)
- Training Programme for Mathematics and Science Teachers to Improve the Teaching and Learning of These Subjects in Schools and Colleges of Education

Contribution to National Development

Issues of national importance have been regularly and consistently highlighted at biennial workshops, conferences, etc. Communiqués had been submitted to Government and other stakeholders on very topical themes to help shape national policies.

JOURNAL OF THE GHANA SCIENCE ASSOCIATION

The JGSA is currently listed on Scopus with an assigned ISSN Number.

Guidelines for Authors for Publication of Articles in the Journal of the Ghana Science Association (JGSA)

General

The editorial office requires a soft copy of a Manuscript, preferably in a Microsoft Word format, previously unpublished, complete with title, name(s), and address(es) of the author(s) and abstract of not more than 250 words in English. Manuscripts should be typed using Times New Roman font, size 12, and double-spaced. Pages must be numbered, beginning from the Title Page. Unless otherwise stated, the first-named author of a joint publication will be taken as the corresponding author. Please provide phone numbers and e-mail, if available. Manuscripts should be sent to the email: gsasecretariat@gmail.com

Text Preparation

The structure of the main text should be in the following order: Abstract, 1. Introduction, 2. Method, 3. Results, 4. Discussion, and 5. Conclusion. These headings should be typed in lowercase but boldface (left aligned) and numbered 1, 2, 3, etc. Subsections of these (except conclusion) should be numbered, e.g., 1.1 (heading typed normally) and 1.1.1 (heading typed in italics), etc. for further subsections. The above order should be followed by Acknowledgements and References.

Abstract

The abstract should be typed in a block, i.e., without paragraphs or subdivisions; and should give a comprehensive summary of the paper. It should be able to stand by itself and should incorporate objective, methodology results, and conclusion. Keywords are not required.

References

References should be given in the text by indicating author(s) and year of publication. When a reference is part of a sentence it should be cited as Menyeh and O'Reilly, (1991); Menyeh et al. (1997), but when it is inserted within a sentence it should be: (Menyeh and O'Reilly, 1991); (Menyeh et al., 1997), etc. Only references cited in the text should be listed in alphabetical order (with names of all contributors, not, for example, Menyeh et al…) at the end of the paper. In other words, references that are not cited in the text cannot be listed.

The following are examples:

Book Reference: [In the following order: Name of author(s), year of publication, the title of a book, publisher, place of publication, and the numbers for the referenced pages, e.g., "O'Reilly, W. (1984). Rock and Mineral Magnetism, Blackie, Glasgow, pp. 120-125"].

Journal Reference: [e.g., Menyeh, A. and O'Reilly, W. (1991). The magnetization process in monoclinic pyrrhotite particles containing few domains, Geophysical Journal International, 104, 387399]. Names of periodicals should be abbreviated according to the World List of Scientific Periodicals. However, if in doubt, the full name of the journal should be given. The above journal, for example, should be abbreviated as Geophys. J. Int.

Conference Proceedings: [e.g. Ofosu-Asiedu, A. (1997). "The Wood Industry and the Environment". In: A. Menyeh, S. Osafo Acquaah and W. O. Ellis (Eds.), Proceedings of the 20th Biennial Conference, Kumasi, 4th August 1997, pp.19-34].

Reference from a book edited by one or more persons [e.g., Kullerud, G. (1971). "Experimental techniques in dry sulfide research". In: G. C. Ulmer (Ed.), Research techniques" for high pressure and high temperature, Springer-Verlag, New York, pp.288-315].

Tables

The maximum size for a table should be 150 mm x 200 mm and it should be without an outside border as well as lines for row and column entries. However, only headings for the columns should be enclosed between the top and bottom borders: Tables should be numbered consecutively and referred to in the text [e.g., (Table 1)]. The titles should be typed on top in Boldface [e.g., Table 1. Variation of Temperature with...]. Indicate in pencil in the right-hand margin, the desired location of Tables.

Dimensions

S.I. units should be used throughout the text. Use negative indices instead of / and leave a space between numbers and symbols [e.g. 1.5 m s-1, not 1.5 ms-1 or 1.5 m/s]

Equations

Equations should be typed in Math. Mode [i.e. z = ax + by]. If there is more than one equation, they should be numbered consecutively [e.g. z = ax + by ... (1)]. For clarity, indicate in words, in the righthand margin, the name of any Greek symbol the first time it is used in the text.

Referees

Each manuscript will be refereed by at least two reviewers.

Proofs

Proofs will be sent to the authors. They must be returned quickly to ensure a high speed of publication.

PUBLISH WHAT YOU PAY

PAYMENTS BY PRODUCING MEMBER COMPANIES OF THE GHANA CHAMBER OF MINES IN 2022.

REVENUE	US Dollars
Total Mineral Revenue	5,643,082,602
Mineral Revenue Returned through the Bank of Ghana	1,411,158,351
Mineral Revenue Returned through commercial banks	2,732,796,751
Total Mineral Revenue Returned to the Country	4,143,955,102
Percentage of Mineral Revenue Returned to the Country	**73%**
LOCAL EXPENDITURE	**US Dollars**
Payments for Goods and Services (excluding diesel and electricity)	2,027,841,236
Payment for Electricity Consumed	292,197,268
Payment for Diesel Consumed	490,264,331
Total Expenditure	**2,810,302,835**
OTHER BIG-TICKET EXPENDITURE	**US Dollars**
Amortizing of loans, including interest payments	54,136,155
Expenditure on imported consumables	266,041,517
Capital Expenditure (Capex)	913,569,119
HUMAN RESOURCE INFORMATION	
Compensation to Employees of Producing Member Companies (USD)	678,602,741
Number of Ghanaians in Direct Employment (Producing Members)	11,191
Number of Expatriates in Direct Employment (Producing Members)	93
Total Direct Employment	**11,284**
Share of Expatriates in Total Employment	**0.82%**
DIRECT FISCAL PAYMENTS	**GH₵**
Corporate Tax	3,580,669,840
Mineral Royalties	1,796,206,746
Employee Income Tax Payments (PAYE)	1,002,945,678
Others (Self-Employed)	1,108,438
***Dividends	435,099,625
Total Fiscal Payments	**6,816,030,327**
SOCIAL INVESTMENT SPENDING	**US Dollars**
Expenditure on Corporate Social Investments	43,294,041

Source: Ghana Chamber of Mines, Ghana Revenue Authority, Non-Tax Revenue Unit of Ministry of Finance

The Producing Member Companies of the Chamber for the period ending December 2022 were:

- Abosso Goldfields Limited
- Adamus Resources Limited
- AngloGold Ashanti Iduapriem Limited
- AngloGold Ashanti Obuasi Limited
- Asanko Gold Mine Limited
- Chirano Gold Mines Limited
- FGR Bogoso Prestea Limited
- Ghana Manganese Company Limited
- Golden Star Wassa Limited
- Gold Fields Ghana Limited
- Newmont Ghana Gold Limited
- Newmont Golden Ridge Limited
- Mensin Gold Bibiani Limited
- Perseus Mining (Ghana) Limited

PROGRAMME OUTLINE

MONDAY 4TH SEPTEMBER 2023

4:00 pm – 6:00 pm	Arrival and Registration of Participants at the WACCBIP Auditorium, Department of Biochemistry, Cell and Molecular Biology, University of Ghana, Legon

TUESDAY 5TH SEPTEMBER 2023

7:30 am – 8:00 am	Arrival of Participants at the conference venue
8:00 am – 8:30 am	Registration of Participants continue.

Plenary Session I

8:30 am - 9:00 am	Topic 1:	Climate Change, Agriculture, and Food Systems
	Speaker:	Prof. Paul P. Bosu Director General, CSIR
9:00 am – 9:30 am	Topic 2:	Climate Change and Environment
	Speaker:	Dr. Daniel Benefor Principal Programme Officer Climate Change Unit EPA
9:30 am – 10:00 am	Discussions	
10:00 am – 10:20 am	Presentation/Message Dr. Olufunke Cofie Country & Regional Representative IWMI/CGIAR Research Center	
10:20 am – 10:40 am	Snack Break	

Formal Opening

11:00 am – 11:05 am	Prayer
11:05 am – 11:10 am	Introduction of Chairman and other Dignitaries
11:10 am – 11:20 am	**Chairman's Opening Remarks** Prof. Gordon Awandare Pro Vice-Chancellor, University of Ghana
11:20 am – 11:35 am	Address by GSA Honorary National President Dr. Michael Osae
11:35 am – 11:45 am	*Fraterna Messages*
11:45 am – 11:50 am	Statement by Special Guest I Dr. Bryan Acheampong Hon. Minister for Food & Agriculture
11:50 am – 11:55 am	Statement by Special Guest II Dr. Kwaku Afriyie Hon. Minister for Environment, Science, Technology & Innovation
11:55 am – 12:15 pm	Keynote Address Prof. Agyare Wilson WASCAL
12:15 pm – 1:15 pm	Presentation of Young Scientists Challenge Award
1:15 pm – 1:20 pm	Chairman's Closing Remarks
1:20 pm – 1:25 pm	Vote of Thanks
1:25 pm – 1:30 pm	Closing Prayer
1:30 pm – 1:40 pm	Group Photograph
1:40 pm – 2:00 pm	Formal Opening of Exhibition
2:00 pm – 3:00 pm	Lunch for Invited Guests and Registered Participants

Plenary Session II

3:00 pm – 3:30 pm	Topic 3:	Climate Change and Green Energy
	Speaker:	Mr. Kennedy Amankwa Deputy Executive Director Energy Commission
3:30 pm – 4:00 pm.	Discussions	
4:00 pm – 6:00 pm	Cocktail	

WEDNESDAY, 6TH SEPTEMBER 2023

7:30 am – 8:30 am	Arrival of Participants at the conference venue

Plenary Session III

8:30 am – 9:00 am	Topic 4:	Health and Pandemic Preparedness
	Speaker:	Prof. William Ampofo Noguchie Memorial Institute
9:00 am – 9:30 am	Topic 5:	National STI Policy on Climate Change and National Development
	Speaker:	Dr. Mrs. Wilhemina Quaye Director STEPRI – CSIR
9:30 am – 10:00 am	Discussions	
10:00 am – 10:20 am	Cocoa Break/Exhibition	
10:20 pm – 01:00 pm	Biennial General Meeting (BGM) I	
01:00 pm – 02:30 pm	Lunch	
02:30 pm – 05:30 pm	Scientific Session I	
07:00 pm – 11:00 pm	Dinner Dance	

THURSDAY, 7TH SEPTEMBER 2023

6:30 am – 8:30 am	Arrival of participants
8:30 am – 11:00 am	Scientific Session II
11:00 am – 1:30 pm	Biennial General Meeting (BGM) II/Release of Communiqué
1:30 pm – 3:30 pm	Lunch
3:30 pm – 6:00 pm	Excursion

FRIDAY 8TH SEPTEMBER 2023

Departure

LIST OF SPONSORS

1. International Institute of Tropical Agriculture (IITA), Ghana
2. International Water Management Insitute (IWMI), Ghana
3. Energy Commission
4. Chemico Limited
5. The Ghana Chamber of Mines
6. Council For Scientific and Industrial Research (CSIR)
7. Centre for Plant Medicine Research, Mampong-Akuapim
8. Biotechnology and Nuclear Agriculture Research Institute (BNARI), GAEC
9. Radiological and Medical Sciences Research Institute (RMSRI), GAEC
10. Water Research Institute, CSIR
11. Plant Genetic Resources Research Institute, CSIR
12. West African Centre for Cell Biology of Infectious Pathogens (WACCBIP), University of Ghana
13. Blue Skies
14. RMG Ghana Limited

LIST OF STAFF

1. Mr. Forson Dzotor	-	Scientific Coordinator (Head of Secretariat)
2. Ms. Ramatu Hajia Balah	-	Scientific Administrative Officer
3. Mr. Daniel Kojo Gidi	-	Administrative Officer
4. Mr. Eric Ayisi Essel	-	Accountant
5. Mr. Bennet Ansong Boateng	-	IT/Publications Officer
6. Mr. William Akoto-Danso	-	Procurement/Marketing Officer
7. Ms. Henrietta Anang	-	Accounting Assistant
8. Mr. Ernest Megbenu	-	Security Guard
9. Mr. Kenneth Amuh Akrebeto	-	Security Guard
10. Mr. Gideon Acquaye Obuobi	-	Security Guard
11. Mr. Benjamin Antwi	-	Driver/Messenger
12. Mr. Ebenezer Owadie	-	Cleaner/Driver
Office Location	-	10 Airways Avenue Airport Residential Area Accra
GPS Code	-	GA-037-1703
Telephone	-	0302-732-605
E-mail	-	info@ghanascience.gov.gh gsasecretariat@gmail.com
Website	-	https://www.ghanascience.gov.gh/ https://www.ghanascience.org.gh/

LIST OF NATIONAL EXECUTIVE COMMITTEE MEMBERS (NEC) 2021 - 2023

1.	Dr. Michael Osae	-	Hon. National President (Chairman)
2.	Dr. Irene Opoku-Ntim	-	Hon. National Secretary
3.	Dr. Esther Marfo Ahenkora	-	Hon. National Treasurer
4.	Prof. William Gariba Akanwariwiak	-	Immediate Past National President
5.	Prof. Gideon Helegbe	-	Hon. President, Tamale Branch
6.	Dr. Thomas Tagoe	-	Hon. President, Accra Branch
7.	Prof. Jacob Agbenorhevi	-	Hon. President, Kumasi Branch / Editor, Everyday Science for Schools
8.	Prof. Michael Adinortey	-	Hon. President, Cape Coast Branch
9.	Mr. Stephen Opoku	-	Hon. President, Koforidua Branch
10.	Dr. Jude S. Bayor	-	Hon. President, Navrongo Branch
11.	Rev. Kwame Nkrumah Hope	-	Hon. President, Asante Mampong
12.	Dr. Selina Saah	-	Hon. President, Sunyani Branch
13.	Dr. Yeboah Kwaku Opoku	-	Hon. President, Winneba Branch
14.	Dr. Nii Korley Kortei	-	Hon. President, Ho Branch
15.	Prof. Kwaku Tano-Debrah	-	Editor-in-Chief, Journal of the GSA
16.	Rev. Thomas K. Arboh	-	Ghana Association of Science Teachers
17.	Mr. Forson Dzotor	-	Scientific Coordinator (SC)

LIST OF NATIONAL OFFICERS (NO) 2021 - 2023

1.	Dr. Michael Osae	-	Hon. National President (Chairman)
2.	Dr. Irene Opoku-Ntim	-	Hon. National Secretary
3.	Dr. Esther Marfo-Ahenkora	-	Hon. National Treasurer
4.	Mr. Forson Dzotor	-	Scientific Coordinator (Head of Secretariat)

LIST OF BRANCH EXECUTIVES 2021 - 2023

The following were introduced as new branch executives:

1. Accra Branch
   - Dr. Thomas Tagoe - President
   - Dr. Ernest Biempuo - Secretary
   - Dr. Elmer Ametefe - Treasurer

2. Kumasi Branch
   - Dr. Jacob Agbenorhevi - President
   - Dr. Ishmael Takyi - Secretary
   - Dr. Abena Achiaa Boakye - Treasurer

3. Tamale Branch
   - Prof. Gideon Helegbe - President
   - Dr. Abdul Nashirudeen Mumuni - Secretary
   - Dr. Humphrey Garti - Treasurer

4. Sunyani Branch
   - Dr. Selina Ama Saah - President
   - Benjamin Darko Asamoah - Secretary
   - Ms. Charity Odumale Roberts - Treasurer

5. Asante-Mampong Branch
   - Rev. Kwame Nkrumah Hope - President
   - Dr. D. Yar - Secretary
   - Dr. (Mrs.) Janice Dwomoh Abraham - Treasurer

6. Koforidua Branch
   - Steven Opoku - President
   - Prof. John Owusu - Secretary
   - Esther Anokye - Treasurer

7. Cape Coast Branch
   - Prof. Michael Adinortey - President
   - Dr. Jerry Opoku-Ansah - Secretary
   - Dr. (Mrs.) Alimatu Saadia Yussiff - Treasurer

8. Navrong Branch
   - Dr. Jude Simons Bayor - President
   - Dr. Melvin-Guy Adonadaga - Secretary
   - Dr. Mary-Magdalene Pedavoah - Treasurer

9. Winneba Branch
   - Dr. Yeboah Kwaku Opoku - President
   - Dr. Prince Owusu Adoma - Secretary
   - Dr. Felicity Bentsil-Enchill - Treasurer

10. Ho Branch
    - Dr. Nii Korley Kortei - President
    - Prof. Maxwell Selasie Akple - Secretary
    - Dr. Rukiya Naa Amerley Laryea - Treasurer

LIST OF TOPICS FOR PLENARY SESSIONS

1. Climate change, agriculture, and food systems
2. Climate change and environment
3. Climate change and green energy
4. Climate change, one health and pandemic preparedness
5. National STI policy on climate change and national development

LIST OF SPEAKERS FOR PLENARY SESSIONS

1. Prof. Paul P. Bosu - Director General of CSIR
2. Dr. Daniel Benefor - Principal Programme Officer, Climate Change Unit, EPA
3. Mr. Kennedy Amankwa - Deputy Director, Energy Commission
4. Prof. William Ampofo - NMIMR, University of Ghana
5. Dr. Mrs Wilhelmina Quaye - Director – STEPRI, CSIR

LIST OF GUEST SPEAKERS

1. Prof. Gordon Awandare (Pro-Vice Chancellor, University of Ghana) - Chairman
2. Dr. Kwaku Afriyie (Hon. Minister, MESTI) - Guest Speaker
3. Dr. Bryan Acheampong (Hon. Minister, MoFA) - Special Guest
4. Prof. Daoud Kone (Director of Capacity Building, WASCAL) - Keynote Speaker

LIST OF LOCAL ORGANIZING COMMITTEE

1.	Prof. Agnes Budu	-	Chairman
2.	Prof. Regina Appiah-Opong	-	Member
3.	Dr. Latifatu Mohammed Adjah	-	Member
4.	Dr. Kwame Amoah	-	Member
5.	Dr. Emily Milla	-	Member
6.	Dr. Gifty Lailah	-	Member
7.	Dr. Thomas Tagoe	-	Co-opted Member
8.	Dr. Ernest Biempuo	-	Co-opted Member
9.	Dr. Elmer Ametefe	-	Co-opted Member

LIST OF CHAIRPERSONS FOR PLENARY SESSION

NO.	CHAIRPERSONS	PLENARY SESSION
1	Prof. Nathaniel Owusu-Boadi	I
2	Prof. Nana Ama Brown Klutse	II
3	Prof. Regina Appiah-Opong	III

ABSTRACTS CATEGORIES

SESSION I			
CATEGORY	TITLE	ROOM	VENUE
B	Biological, Medical and Veterinary Sciences	1	WACCBIP Conference Room 101
P	Physical and Computational Sciences	2	Board Room 108
A	Agricultural and Environmental Sciences	3	PhD Lecture Room 107
T	Technology and Engineering Sciences	4	Graduate Lecture Room G1

SESSION II			
CATEGORY	TITLE	ROOM	VENUE
B	Biological, Medical and Veterinary Sciences	1	WACCBIP Conference Room 101
A	Agricultural and Environmental Sciences	3A	Board Room 108
A	Agricultural and Environmental Sciences	3B	PhD Lecture Room 107
A	Agricultural and Environmental Sciences	3C	Graduate Lecture Room G1

LIST OF CHAIRPERSONS FOR SCIENTIFIC SESSIONS

SESSION	NAME	CATEGORY	DATE	TIME
I	i. Professor Gideon Helegbe School of Medical Health Science, UDS	B	06/09/2023	02:00 pm – 05:00 pm
	ii. Professor Michael Adinortey Department of Chemistry, UCC	P	06/09/2023	02:00 pm – 05:00 pm
	iii. Dr. Esther Marfo-Ahenkora Animal Research Institute, CSIR	A	06/09/2023	02:00 pm – 05:00 pm
	iv. Dr. Jude Simon Bayor Department of Applied Physics CK TEDAM - UTAP	T	06/09/2023	02:00 pm – 05:00 pm
II	i. Professor Agnes Budu University of Ghana	B	06/09/2023	08:30 am – 11:00 am
	ii. Professor Kwaku Tano-Debrah Depart of Nutrition and Food Science University of Ghana	A	06/09/2023	08:30 am – 11:00 am
	iii. Professor Innocent Lawson Department of Soil Science University of Ghana	A	06/09/2023	08:30 am – 11:00 am
	iv. Professor Jacob Agbenorhevi Department of the Food Science and Technology, KNUST	A	06/09/2023	08:30 am – 11:00 am
I & II	Poster Boards	All Sessions	06/09/2023 – 07/09/2023	Throughout Sessions

SCIENTIFIC SESSION DETAILED PROGRAMME & TIMETABLE

BIOLOGICAL, MEDICAL AND VETERINARY SCIENCES

WEDNESDAY, 6TH SEPTEMBER 2023

BIOLOGICAL, MEDICAL, AND VETERINARY SCIENCES

Scientific Session I - Oral

Chairman: Prof. Time: 02:30 pm – 05:00 pm
Room: 1

NO	TIME	AUTHOR/PRESENTERS	TITLE OF PAPER
1.	02:30 pm - 02:40 pm	**Osei Nyarko Charles**, Zanu, H.K. and Ammisah-Reynolds, P.K	Effects of *Allium Sativum* Extract on the Reproductive Function and Haematology of Male *Rattus Norvegicus* Treated with Monosodium Glutamate
2.	02:40 pm - 02:50 pm	**Michael Boakye Addo**, Zanu, H.K. and Ammisah-Reynolds, P.K	Effects of Two Levels of Dietary Fat and Fibre on the Growth, Haematology, Serum Biochemistry and Histology of the Heart, Liver and Kidney of Male Wistar Rats
3.	02:50 pm - 03:00 pm	**Selina Ama Saah**, Nathaniel Owusu Boadi, Patrick Opare Sakyi, Godfred Darko, and Michael Baah Mensah	Risk of Exposure to Trace Elements through the Application of Facial Makeup Powders
4.	03:00 pm - 03:10 pm	**Francis Addy** and Abdul-Rahman Abubakari	Health Risks of Rats in Market Centres: A Case Study in Tamale City
5.	03:10 am - 03:20 am	**Anthony Wemakor** and Raymond Atabariba	Common Mental Disorders in Mothers and Nutritional Status of Children in East Mamprusi Municipality, Ghana
	03:20 pm - 3:40 pm	**Questions & Discussion**	
6.	03:40 pm - 03:50 pm	**Gertrude Lucky Aku Dali**, Denis Worlanyo Aheto, and John Blay	Ecological Health Assessment of Mangrove Forests in Ghana: A Multi-Criteria Approach
7.	03:50 pm - 04:00 pm	**Francis Addy**, Gideon Adu-Bonsu, Emelia Kpiebaya, Thomas Romig and Marion Wassermann	Prevalence of Worm Infections in Donkeys From Bolgatanga and Zuarungu, Ghana
8.	04:00 pm - 04:10 pm	**Anthony Wemakor**, Matilda Kwaako and Raymond Atabariba	Determinants of Anaemia in Adolescent Girls in Kumbungu District, Ghana
9.	04:10 pm - 04:20 pm	**Frederick Sarfo-Antwi**, Christopher Larbie and Benjamin Obukowho Emikpe	Phytochemical, Antioxidant, and Toxicological Assessment of *Balanites Aegyptiaca* Leaves Extract in Rats
10.	04:20 pm - 04:30 pm	**Charity Odumale Roberts**, Michael Ayikwei Quashie, Kwasi Sarfo and John Kofi Brewu	Occupational Stress Among University Staff in Ghana – A Generational Perspective
	04:30 pm - 05:00 pm	**Questions & Discussion**	

THURSDAY, 7TH SEPTEMBER 2023

BIOLOGICAL, MEDICAL, AND VETERINARY SCIENCES

Session II - Oral

Chairman: Prof. Time: 08:30 am – 11:00 pm
Room: 1

NO	TIME	AUTHOR/PRESENTERS	TITLE OF PAPER
11.	08:30 am - 08:40 am	**Desmond Sarfo Boampong**	Knowledge, Attitude and Practice on Antimicrobial Use and Resistance Among Nursing Mothers within the Cape Coast Metropolis
12.	08:40 am - 08:50 am	**Hilda Ohene-Asa**, R. Ohene-Larbi, D. Owusu-Ntumy, B. Sasu, T. Odoom and M. Ayim-Akonor	One or More?: Diversity of Pathogens Associated with Respiratory Disease Outbreaks in Poultry in Greater-Accra
13.	08:50 am - 09:00 am	**Matilda Ayim-Akonor**, Amakye-Anim J, Odoom T, Wallace P, Folitse R, Fenteng D and Aryee M	High Seroprevalence of Infectious Bronchitis in Commercial Poultry in Ghana: Evidence-Based Justification for Serotyping and approval for Vaccination
14.	09:00 am - 09:10 am	**John Ekow Mbir Amoah**, John K. Eminah, Ernest I. D. Nmang-Wara and James Awuni Azure	The Status of Biology Teaching and Learning Materials in Selected Central Regional Schools, Ghana
15.	09:10 am - 09:20 am	**Atakora Rosemond**, Ayim-Akonor Matilda, Ohene Larbi Rita, Ababio Patrick, Adawo Paul and Odoom Theophilus	Susceptibility of Pathogenic *E. Coli* Associated with Avian Colibacillosis to Frequently used Antimicrobials: A Prospective Study
	09:20 am - 09:40 am	**Questions & Discussion**	
16.	09:40 am - 09:50 am	**Gideon Kofi Helegbe**, Uzzah Mohammed Forgor, George Billak Doopaar and Etornam Axandrah Emmanuel	Prevalence of Anaemia and G6PD Deficiency and its Impact on Diabetic Patients in Tamale Metropolis of Ghana
17.	10:00 am - 10:10 am	**Frances Nathan-Mensah**, Nkrumah Theresah, Owiredu Nikki, Ohene Larbi Rita, Owusu-Ntumy Dela Doreen, and Koranteng Asafu-Adjeye Achiamaa	Microbial Quality of Beef Offal Sold Within Selected Markets in Accra
18.	10:10 am - 10:20 am	**Amponsah Marfo Melvic**	Association Between Myopia and the ABO/RH Blood Groups Among College of Science Students, KNUST

19.	10:20 am - 10:30 am	**Nii Korley Kortei**, Harrison Nii Odartey Lamptey, Benjamin Kingsley Harley, Vincent Kyei-Baffour, Leslie Owusu Ansah and George Tawia Odamtten	Fungal Diversity, Exposure to Mycotoxins (Ochratoxin A and Aflatoxins), and their Cancer Risk Characterization Associated with the Consumption of Two Traditionally Fermented Alcoholic Beverages (Pito and Palm Wine) in the Ho Municipality, Ghana
20.	10:30 am - 10:40 am	**Zanu, H.K.**, Berchie F., Gyasi S.A., Osman A., Bayor V. and Nkrumah C	Determination of Feed Uniformity using Dry Matter, Ash, and Particle Size Distribution Analysis as a Rapid Assay
	10:40 am - 11:00 am	**Questions & Discussion**	

WEDNESDAY, 6TH - THURSDAY, 7TH SEPTEMBER 2023

BIOLOGICAL, MEDICAL AND VETERINARY SCIENCES

Poster Session

Chairman: LOC
Room: Main Room

NO	TIME	AUTHOR/PRESENTERS	TITLE OF PAPER
21.		**George Owusu**, Meshack Antwi Adjei, Jones Ofori Amoah, Williams Adu Asamoah and James Asenso	Effect of Hydroethanolic Leaf Extract of *Cordia Vignei* on Adjuvant-Induced Arthritis in Sprague Dawley Rats
22.		**Nii Korley Kortei**, Valentina Sylvia Gillette, Michael Wiafe-Kwagyan, Leslie Owusu Ansah, Vincent Kyei-Baffour and George Tawia Odamtten	Mycoflora Profile, Levels of Aflatoxin M_1, Exposure and the Risk Characterization of Local Cheese *'Wagashie'* Consumed in the Ho Municipality, Volta Region, Ghana
23.		**George Owusu**, George Kwaw Ainooson, Meshack Antwi Adjei and Jones Ofori Amoah	Effects of Hydroethanolic Leaf Extract of *Cordia Vignei* Hutch and Dalziel in Dextran Sodium Sulfate-Induced Ulcerative Colitis in C57BL/6 Mice
24.		**Elmer Ametefe**, Kwesi Obuobisa Ayeh, Majeed Mohammed Issahaku, Emmanuel Amoako-Amponsah and Agoha Righteous Kwaku	Antimicrobial Activity and Antibiotic Susceptibility of *Bacillus Spp*. Isolated from Dawadawa
25.		**Elmer Ametefe**, Kwesi Obuobisa Ayeh, Emmanuel Nii Agmor Fadi and Emmanuel Amoako-Amponsah	Antibiotic Susceptibility of Lactic Acid Bacteria Isolated from Date Fruit
26.		**Caleb Eyiram Klomegah**, Cedella Nyame, Yasmeen A. Acquah and Elmer Ametefe	Haemolytic Activity, Acid and Bile Tolerance of *Bacillus Spp*. Isolated from Dawadawa
27.		**Margaret Mary Bruce-Mensah** and Andy Quashie	Extraction of Cinnamon Oil Using Novel Solvent
28.		**Jude Badu Teye**, Rita Ohene Larbi, Flora Otoo, Linda Akosua Osei, Stanley Akwa, Doreen Dela Owusu-Ntumy, Jacob Hamidu and Matilda Ayim-Akono	Antimicrobial Susceptibility Profile of *E. Coli* Isolated from Poultry in Two Districts in the Greater Accra Region

29.	**Jennifer Afua Afrifa Yamoah**, Doreen Dela Owusu-Ntumy, Bernard Borteih Bortei, Matilda Ayim-Akonor, Rita Ohene Larbi, Nikki Owiredu and Kwadwo Yeboah Boateng	Understanding the Impact of Poultry Production Training on Antimicrobial Usage, Knowledge of Antimicrobial Resistance, and Attitudes Towards Prudent Antimicrobial Usage among Poultry Farmers
30.	**Ethel Abena Gobe** and Charles Apprey	Dietary Diversity, Micronutrient Adequacy and its Association with Nutritional Status amongst Pregnant Women attending Antenatal Clinic at Ashaiman Polyclinic
31.	**Selasi Dzitse**	Conservation Status/Biology of the Abyssinian Ground-Hornbill (*Bucorvus abyssinicus*)
32.	**Kombat Nayam Bright**, Ayim-Akonor Matilda, Teye Jude, Ohene Asa Hilda and Nkrumah Theresah	Microbiological Evaluation of Edible Beef Offals in Greater Accra
33.	**Jennifer Afua Afrifa Yamoah**, Kwabena Owusu Ansah, Kwadwo Boateng Yeboah, Gabriella Amoakoma Essuman, Julius Beyuo, Charles Kusi, Gbolabo Olaitan Onasanya, Mark Ewusi Shiburah, Edmund Sottie, Theresa Manful Gwira and Paul Amponsah Wallace	Effects of Animal Trypanosomes on Hematological Profile of Cattle Breeds in the Coastal Savannah Agro-Ecological Zone of Ghana
34.	**Nii Korley Kortei**, Valentina Sylvia Gillette, Michael Wiafe-Kwagyan, Leslie Owusu Ansah, Vincent Kyei-Baffour and George Tawia Odamtten	Toxicogenic Fungal Profile, Ochratoxin an Exposure and Cancer Risk Characterization Through Maize (*Zea Mays*) Consumed by Different Age Populations in the Volta Region of Ghana
35.	**Nii Korley Kortei**, Theophilus Annan, Vincent Kyei-Baffour, Edward Ken Essuman, Harry Okyere and Clement Okraku Tettey	Exposure and Risk Characterizations of Ochratoxins A and Aflatoxins through Maize (*Zea Mays*) Consumed in Different Agro-Ecological Zones of Ghana
36.	**Nii Korley Kortei**, Theophilus Annan, Adjoa Agyemang Boakye, Edward Ken Essuman, Clement Okraku Tettey, and Vincent Kyei-Baffour	Aflatoxin M_1 Exposure in a Fermented Millet-Based Milk Beverage '*Brukina'* and its Cancer Risk Characterization in Greater Accra, Ghana
37.	**Nii Korley Kortei**, Theophilus Annan, Vincent Kyei-Baffour, Edward Ken Essuman, Adjoa Agyemang Boakye, Clement Okraku Tettey and Nathaniel Owusu Boadi	Exposure Assessment and Cancer Risk Characterization of Aflatoxin M_1 (AFM_1) through Ingestion of Raw Cow Milk in Southern Ghana

38.	**Nii Korley Kortei**, Amanor D, Wiafe-Kwagyan M, Annan T, Deku JG, Boakye AA, Essuman EK, and CO Tettey	Profile Of Fungal Contaminants of Maize (*Zea Mays*) Intended for Consumption and their Potential Health Implications in the Ho Municipality of Ghana
39.	**Nii Korley Kortei**, Barnabas Teye Djaba, Clement Okraku Tettey, Alfred Ofori Agyemang, Enoch Aninagyei, Edward Ken Essuman, Adjoa Agyemang Boakye and Theophilus Annan	Toxicogenic Fungi, Aflatoxins, and Antimicrobial Activities Associated with some Spices and Herbs From Three Selected Markets in Ho Municipality, Ghana
40.	**Nii Korley Kortei**, Sandra Badzi, Salifu Nanga, Michael Wiafe- Kwagyan, Denick Nii Kotey Amon and George Tawia Odamtten	Survey of Knowledge and Attitudes to Storage Practices Preempting the Occurrence of Filamentous Fungi and Mycotoxins in some Ghanaian Staple Foods and Processed Products
41.	**Nii Korley Kortei**, Grace Kumah, Clement Okraku Tettey, Alfred Ofori Agyemang, Theophilus Annan, Nathaniel Nene Djangmah Nortey, Edward Ken Essuman and Adjoa Agyemang Boakye	Mycoflora, Aflatoxins and Antimicrobial Properties of Some Ghanaian Local Spices and Herbs
42.	**Agoha Righteous Kwaku**, Adinkrah, Desmond, Ayeh O. Kwesi and Ametefe N. Elmer	Antimicrobial Activity, Acid, and Bile Salt Tolerance of Lactic Acid Bacteria Isolated from Fermented Ghanaian Traditional Beverage of Pearl Millet
43.		
44.	**F.A. Otabil**, D. Amagyei-Antwi, S. Kyeremeh and N.Y. Koomson	Relationship Between Blood Glucose Levels and Refractive Status in Patients Attending the Diabetes Clinic at the Bono Regional Hospital, Sunyani
45.	**George Owusu**, Meshack Antwi Adjei, Jones Ofori Amoah, Williams Adu Asamoah and James Asenso	Hydroethanolic Leaf Extract of *Cordia Vignei* Inhibits Adjuvant-Induced Arthritis in Sprague Dawley Rats
46.	**Tseh Mildred Mawuena**, Oduro O.K., Boakye A., Ellis, W.O. and Oduro I	Quality Assessment of Yaji Spice Mix in KNUST and its Environs
47.	**Papa Kofi Amissah-Reynolds**, John Lawrence Nketsiah, Kofi Agyapong Addo, Joyce Darkoa Asiedu and Victor Agyei	Zoonotic Gastrointestinal Parasites of Wild Mammals in Two Wildlife Sanctuaries in Central Ghana

48.	**Rita Ohene Larbi**, Doreen Dela Owusu-Ntumy, Jude Badu Teye, Bright Nayam Kombat, Wisdom Adeapena, and Matilda Ayim-Akonor	*Enterococcus* Spp. In Heathy Pigs in the Greater Accra Region: Antimicrobial Resistance Patterns and Implications for Public Health

PHYSICAL AND COMPUTATIONAL SCIENCES

WEDNESDAY, 6TH SEPTEMBER 2023

PHYSICAL AND COMPUTATIONAL SCIENCES

Scientific Session I - Oral

Chairman: Prof. Michael Adinortey Time: 02:30 pm – 05:00 pm
Room: 2

NO	TIME	AUTHOR/PRESENTERS	TITLE OF PAPER
49.	02:30 pm - 02:40 pm	**Callistus Nero**, Akwasi Acheampong Aning, Sylvester Kojo Danuor and Victor Mensah2	Prediction of Compressional Sonic Log in the Western (Tano) Sedimentary Basin of Ghana, West Africa using Ensemble Supervised Machine Learning Algorithms
50.	02:40 pm - 02:50 pm	**David Adu-Poku**, David Azanu, Selina Ama Saah and William Ofori Appaw	Prevalence of Pharmaceuticals in Surface Water Samples in Ghana
51.	02:50 pm - 03:00 pm	**Agbodah Kobina**	Global Disasters Forecasting: A Time Series Machine Learning Approach
52.	03:00 pm - 03:10 pm	**Adu-Sackey Albert**, Gabriel Obed Fosu and Enoch Mintah Ampaw	A Link Between the Series Method and Frobenius Method - A Blended Approach
53.	03:10 am - 03:20 am	**Obed Appiah**, Ebenezer Quayson, Ezekiel Martey Mensah and Christopher Bombie	Smart Soil Moisture Content Management Solution for Urban Farms in Developing Countries
	03:20 pm - 3:40 pm	**Questions & Discussion**	
54.	03:40 pm - 03:50 pm	**Jerry Ampofo-Asiama**, Samuel Bridge Nkansah, Nazir Kizzie-Hayford, Vivian Foli, Selorm Omega, Salifu Seidu-Larry, Nazir Kizzie-Hayford, and Isaac Okyere	A Comparison of the Quality of Smoked Fish Produced in Traditional and Improved Ovens in Ghana
55.	03:50 pm - 04:00 pm	**Eric Dominic Forson**, Prince Ofori Amponsah, Godfred Bright Hagan and Marian Selorm Sapah	Frequency Ratio-Based Flood Vulnerability Modeling Over the Greater Accra Region of Ghana
56.	04:00 pm - 04:10 pm	**Killian Asampana Asosega**, Eric Nimako Aidoo, Atinuke Olusola Adebanji and Ellis Owusu-Dabo	Bayesian Multilevel Perspective of Overweight/Obesity Status Risk Factors among Reproductive Age Women
57.	04:10 pm - 04:20 pm	**Irene Opoku-Ntim**, Frank Quashie and Theophilus Adjirackor	Citizen Science Approach to Home Radon Testing in the Offinso Municipality, Ghana
58.	04:20 pm - 04:30 pm	**Moro Haruna**	La Doped ZnO/G-C_3N_4 Van Der Waals Heterostructure's Electrical, Optical, and Structural Characteristics Modified for Photodegradation of Bromothymol Blue Dye in Water
	04:30 pm - 05:00 pm	**Questions & Discussion**	

WEDNESDAY, 6TH - THURSDAY, 7TH SEPTEMBER 2023

PHYSICAL AND COMPUTATIONAL SCIENCES

Poster Session

Chairman: LOC
Room: Main Room

NO	TIME	AUTHOR/PRESENTERS	TITLE OF PAPER
59.		**Abigail Nunoo Akuetteh**, Bismark Awinbire Akurugu, Obed Fiifi Fynn, Bruce Banoeng-Yakobu and Yvonne Sena Akosua Loh	Hydrogeochemical Characteristics of Dahomeyan Formation Aquifers in the Greater Accra Region, Ghana
60.		**Charles Aboagye Darkwa**, and Irene Opoku-Ntim	A Comparative Study of the Assessment of Indoor Radon Concentrations with Radon Concentrations and Radon Exhalation Rates in Soil Samples from the Traditional Main Halls in the University of Ghana Campus
61.		**David Adu-Poku**, Patrick Sewordor Etornam and Fauzia Alhassan	Extraction and Characterization of Watermelon (*Citrullus Lanatus*) Seed Oil as a Potential Feed for Biodiesel Production
62.		**Irene Opoku-Ntim**, Paulina Ekua Amponsah, Owiredu Gyampo, Ruth Araba Sam, Frank Quashie and Aba Bentil Andam	Radon: Communicating Risk, A Case Study of Weija, Kasoa and its Environs in the Greater and Central Regions of Ghana

FRESHLY
SQUEEZED
MANGO
ORANGE &
BANANA
250ml
BLUE
SKIES

AGRICULTURAL AND ENVIRONMENTAL SCIENCES

WEDNESDAY, 6TH SEPTEMBER 2023

AGRICULTURAL AND ENVIRONMENTAL SCIENCES

Scientific Session I - Oral

Chairman: Prof. Time: 02:30 pm – 05:00 pm
Room: 3

NO	TIME	AUTHOR/PRESENTERS	TITLE OF PAPER
63.	02:30 pm - 02:40 pm	**Frank Kwekucher Ackah**, Jonathan Ntow, Rosemond Godbless Dadzie and Redeemer Adjandeh	Microbial Quality and Safety of Fresh-Cut Fruits Sold in Cape Coast, Ghana
64.	02:40 pm - 02:50 pm	**Jacob K. Agbenorhevi**, Belinda B. Ntow, Abigail Danso and Rose Agbanu	Influence of Okra Pectin on the Physicochemical and Consumer Acceptability of Bread
65.	02:50 pm - 03:00 pm	**Ekene Kwabena Nwaefuna**, Peter Basepa Ketting, Alexander Egir-Yawson and Rofela Combey	A Geometric Morphometric Study of Ecological Populations of the Fruit Fly, *Batrocera Invadens*, from Ghana
66.	03:00 pm - 03:10 pm	**Felicia Danso**, Wilson Agyei Agyare and Ato Bart-Plange	Modelling Rice Yield from Biochar-Inorganic Fertilizer Amended Fields
67.	03:10 am - 03:20 am	**Kwabena Owusu Ansah**, Emmanuel Lartey Kwame Osafo and Alhassan Osman	Dose-Response of Biochar Inclusion on in Vitro Rumen Fermentation Characteristics and Methanogenesis from *Brachiaria Mulatto* II
	03:20 pm - 3:40 pm	**Questions & Discussion**	
68.	03:40 pm - 03:50 pm	**Michael Osae**, Veronica F. Siaw, John A. Larbi, and Philip K. Baidoo	Fall Armyworm Infestation in Ghana: Farmers' Knowledge, Impacts and Management Practices in Two Major Maize Enclaves
69.	03:50 pm - 04:00 pm	**Rhoda Lims Diyie**, Samuel Addo, Emmanuel Armah, Charles Mario Boateng, Judith Wayo, Mercy Oppong and Mike Y. Osei-Atweneboana	Towards Aquaculture Production: Genetic Evidence of the Unique Identity and the Population Structure of the West African Mangrove Oyster (Crassostrea Tulipa) from the Gulf of Guinea
70.	04:00 pm - 04:10 pm	**Ophelia Ayamba**	Household Factors Influencing Access to Community Woodlands in the Nandom District
71.	04:10 pm - 04:20 pm	**Emmanuel Appiah**, Margaret Esi Essilfie and Emmanuel Kwasi Asiedu	Integration of Biochar, Chicken Manure and NPK Fertiliser on Growth and Yield of Maize
72.	04:20 pm - 04:30 pm	**Doris Yaa Osei**, F. O. Sarkwa, E. C. Timpong-Jones, P. Asiedu, and D. Amedorme	Intake and Palatability of Forages Fed to Rabbits in the Coastal Savannah Ecological Zone of Ghana
	04:30 pm - 05:00 pm	**Questions & Discussion**	

THURSDAY, 7TH SEPTEMBER 2023

AGRICULTURAL AND ENVIRONMENTAL SCIENCES

Scientific Session II - Oral

Chairman: Prof. Time: 08:30 am – 11:00 am
Room: 3A

NO	TIME	AUTHOR/PRESENTERS	TITLE OF PAPER
73.	08:30 am - 08:40 am	**Samuel Mahama**, Esther Marfo-Ahenkora, Daniel Adu-Ankrah and Eugenia B Badu	Gender Dimensions of Adaptation to Climate Variations: Evidence from Cassava Farmers in Southern Ghana
74.	08:40 am - 08:50 am	**Esther Marfo-Ahenkora**, K. J Taah, E. Asare-Bediako and C.Y.F Domozoro	Residual Effect of Inorganic Fertilizer and Goat Manure on the Growth and Yield of Maize in the Semi-Deciduous Forest and the Coastal Savannah Agro-Ecological Zones of Ghana
75.	08:50 am - 09:00 am	**Achiamaa Asafu-Adjaye Koranteng**, K. A. Gbogbo, B. Adjei-Mensah, J. O. Darko, M. A. Okai and K. Tona	Oyster Mushroom and Enzyme Supplementation of Corncob Diet Improve Growth Performance and Nutrient Digestibility in Sasso Broiler Chickens
76.	09:00 am - 09:10 am	**Komivi Senyo Akutse**, Sharon W. Kinyungu, Ayaovi Agbessenou, Sevgan Subramanian and Fathiya M. Khamis	Dual Effects of Endophytic Fungi in Promoting Maize Seedlings Growth and Negatively Impacting the Biology and Reproductive Traits of Spodoptera Frugiperda
77.	09:10 am - 09:20 am	**Saada Mohammed**, Isaac Owusu Afriyie Hodgson, Jacob de Boer and Marja Lamoree	Assessment of Knowledge, Practice and Attitude of Pesticide Usage Among Pepper Farmers Under Two Different Irrigation Schemes in Ghana
	09:20 am - 09:40 am	**Questions & Discussion**	
78.	09:40 am - 09:50 am	**Salako Kolawolé Valère**, Serge M.G. Zanvo, Sylvanus Mensah and Romain Glèlè Kakaï	Impacts of Harvesting Intensity on Carbon Allocation to Species, Size Classes and Pools in Mangrove Forests, and the Relationships with Stand Structural Attributes
79.	10:00 am - 10:10 am	**Ophelia Ayamba**	Barriers and Enablers to Accessing Ecosystem Services from a Reserve Woodland in Nandom District of Ghana
80.	10:10 am - 10:20 am	**Jude Ofei Quansah**, Nfojoh C., Adu-Ofori, E. and Hodgson I. O. A.	Qualitative Properties of Raw Effluent from a Ghanaian Alcohol and Non-Alcoholic Beverage Factory
81.	10:20 am - 10:30 am	**Martha Duku Agyemang**	Raw and Treated Effluent Quality Characteristics from a Non-Alcoholic and Alcoholic Beverage Company in Accra, Ghana

82.	10:30 am - 10:40 am	**Kruenti Francis**, Lamptey Korkor Vida, Hagan Kofi Julius, Hagan Ato Bernard, Poku-Awuku Abena, Bortieh Bortei Bernard and Ofori Samuel Ayeh	Demographic Characteristics, Prospects and Challenges of Rabbit Farmers in Selected Regions of Ghana
	10:40 am - 11:00 am	**Questions & Discussion**	

THURSDAY, 7TH SEPTEMBER 2023

AGRICULTURAL AND ENVIRONMENTAL SCIENCES

Scientific Session II - Oral

Chairman: Prof. Time: 08:30 am – 11:00 am
Room: 3B

NO	TIME	AUTHOR/PRESENTERS	TITLE OF PAPER
83.	08:30 am - 08:40 am	**Anastasia Abena Afrah**, Dr. Enoch Selorm Ofori and Michael Osae	Effects of Egg Exposure to Ultraviolet Radiation on Post Embryonic Development and Reproduction of Three Diptera and a Lepidoptera
84.	08:40 am - 08:50 am	**Enoch Selorm Kofi Ofori**	Population Dynamics of Fruit Flies (*Diptera: Tephritidae*) in Mango Orchards in the Southeastern Mango Enclave of Ghana
85.	08:50 am - 09:00 am	**Vincent Botchway Ansah**, De-Graft Acquah, S.N. Dadzie, N. Karbo, G.O. Essegbey, K.O. Sam and R.B. Zougmore	Transitioning Climate Smart Agriculture into Food Systems in Ghana: Evaluation of Co-Benefits and Potentials of Agricultural Practices and Innovation Adaptations at Subnational Landscapes
86.	09:00 am - 09:10 am	Hamdiyah Alhassan, and Paul Adjei Kwakwa	Carbon Emission and Food Output Nexus: The Role of Fertilizer in Ghana
87.	09:10 am - 09:20 am	**Faustina Yaa Asantewaah Adu Boahene**, Daniel Attuquayefi and William Oduro	Microhabitat Variables and their Influence on Small Mammal Distribution in the Agumatsa Range, Ghana
	09:20 am - 09:40 am	**Questions & Discussion**	
88.	09:40 am - 09:50 am	**Melvin-Guy Adonadaga**, Bransford Boahene, Freda Adiali and Ampadu Boateng	Assessment of Knowledge, Attitude and Practice of Butchers and Meat Vendors on Meat Safety And Hygiene in Bolgatanga Municipality
89.	10:00 am - 10:10 am	**Esther Adoma Kyeremateng**, Annabel Quarshie, Ann Agyakomah Tawiah Karikari, Sylvester Coleman and Sandra Abankwa Kwarteng	Black Soldier Fly Larvae: A Possible Solution to Waste Management
90.	10:10 am - 10:20 am	**Benjamin Darko Asamoah**, Paul Danyi, Bernice Araba Otoo, Daniel Adusu and Bright Ankudze	Concentration and Ecological Risk of Heavy Metals in Residential and Farmland Surface Soils in the Sunyani Municipality of Ghana
91.	10:20 am - 10:30 am	**Papa Toah Akonor**, Cudjoe, M. C., Glover-Amengor, M. and Mintah, B.K.	Sensory Optimization of a Plant Milk Base for the Production of Yogurt
92.	10:30 am - 10:40 am	**Mawunyo Mary Alorwu**, Williams Ofosu Isaac and Abena Achiaa Boakye	Assessing Food Safety Knowledge and Practices Among Food Service Providers at KNUST: Strategies for Promoting Food Safety on the Campus
	10:40 am - 11:00 am	**Questions & Discussion**	

THURSDAY, 7TH SEPTEMBER 2023

AGRICULTURAL AND ENVIRONMENTAL SCIENCES

Scientific Session II - Oral

Chairman: Prof. Time: 08:30 am – 11:00 am
Room: 3C

NO	TIME	AUTHOR/PRESENTERS	TITLE OF PAPER
93.	08:30 am - 08:40 am	**Emmanuel Appiah**, Margaret Esi Essilfie and Emmanuel Kwasi Asiedu	Integration of Biochar, Chicken Manure and NPK Fertiliser on Growth Traits, Yield and Economic Returns of Maize
94.	08:40 am - 08:50 am	**Veronica F. Siaw**, John A. Larbi Philip K. Baidoo and Michael Osae	Incidence, Prevalence and Severity of Fall Armyworm Infestation in Ghana: A Case of Two Maize Enclaves in the Ashanti Region of Ghana
95.	08:50 am - 09:00 am	**Emmanuel T.D. Mensah**, Hedrick R. Dankwa, Ruby Asmah, Torben L. Lauridsen, Benjamin B. Campion and Regina Edziyie	Seasonal Changes in Fish Catch and Environmental Variables in a Large Tropical Lake, Volta, Ghana
96.	09:00 am - 09:10 am	**Frimpong Y. O.**, Boateng M., Amoah K. O., Adjei A., Atuahene P. Y. and Okai D. B.	Response of Albino Rats to Diets Containing Varying Levels of Ginger Residue
97.	09:10 am - 09:20 am	**Dinah Marri**, Samuel Adjei Mensah, Daniel Ashie Kotey, John Abraham, Maxwell Kelvin Billah and Michael Osae	Basic Developmental Characteristics of the Fall Armyworm, Spodoptera Frugiperda (J.E. Smith) (*Lepidoptera: Noctuidae*), Reared under Laboratory Conditions
	09:20 am - 09:40 am	**Questions & Discussion**	
98.	09:40 am - 09:50 am	**Charles Kwame Bandoh**, Pinto Ophelia, David Adu-Poku, Agnes Tutuwaa, Eric Selorm Agorku, Francis Kofi Ampong and Robert Kwame Nkum	Synthesis and Characterization of Zirconium Oxide-Based Nanocomposites for Photocatalytic Degradation of Eosin Yellow Dye in Water
99.	10:00 am - 10:10 am	**Gloria Boakyewaa Adu**, Shirley Lamptey, Mohammed Awal Alidu, Isaac Kodzo Amegbor, Charles Nelimor, Priscilla Francisco Ribeiro, George Yakubu Mahama, Julius Yirzagla, Yahaya Iddrisu, Stephen Yeboah, Benedicta Atosona, Paulina Abanpoka Aboyadana and Manigben Kulai Amadu	Exploring Sustainable and Eco-Friendly Fall Armyworm Management Options in Northern Ghana: Effects of Nitrogen Fertilizer Rates on the Growth and Yield of Fall Armyworm Tolerant Hybrid Maize Varieties Under Natural Fall Armyworm Infestation

100.	10:10 am - 10:20 am	**S.M.A. Tagoe** and M.J. Dickinson	Identification of Microorganisms Contaminating Oil Palm Fruits and Oil from Processing Mills in Ghana
101.	10:20 am - 10:30 am	**Husain Mohammed Sako** and Addison Duodu	Determination of Growth Potential in Two Chicken Strains using Morphological Markers at One Day Old
102.	10:30 am - 10:40 am	**Yaw Gyau Akyereko**, Maxwell Adu, Solomon Odoi Anim, Georgina Benewaa Yeboah and Faustina Dufie Wireko-Manu	Effect of Different Drying Methods on Nutritional and Physico-Chemical Properties of Egg Powder
	10:40 am - 11:00 am	**Questions & Discussion**	

WEDNESDAY, 6TH - THURSDAY, 7TH SEPTEMBER 2023

AGRICULTURAL AND ENVIRONMENTAL SCIENCES

Poster Session

Chairman: LOC
Room: Main Room

NO	TIME	AUTHOR/PRESENTERS	TITLE OF PAPER
103.		**Humphrey Ferdinand Darko**, Akrong Mark. O, Amu-Mensah Marian A., Amu-Mensah Frederick K. and Addico Gloria N	The Physico-Chemical Water Quality Assessment of Lake Bosomtwi: A Crater Lake in Ghana for Sustainable Management
104.		**Vincent Botchway Ansah**, De-Graft Acquah, S.N. Dadzie, N. Karbo, K.O. Sam and R.B. Zougmore	Assessment of Food Security Accessibility Dynamics of Climate Smart Agrarian Households in Ghana
105.		**Akakpo Amandine**, Kolawolé Moustapha, Adomou Aristide, Assogbadjo Achille Ephrem and Agbangla Clément	Growth Performance, Biomass Allocation and Stomatal Density of Balanites Aegyptiaca Delile in Response to Watering Regimes
106.		**Sedem Nyadzi-Korkoe**, and Sefakor A. Ofosuhene	Assessing the Potential of Toasted Fonio Grain Flour as a Substitute for Wheat in Biscuits
107.		**Hanif Lutuf**, Joshua Obeng, Fred Kormla Ablormeti, Emmanuella Lekete Lawson, Akpe Mary Eddy-Doh and Owusu Fordjour Aidoo	Morphological Characterization of Root Lesion Nematode Parasitizing Oil Palm Trees in Ghana
108.		**Seyramsarah Blossom Setufe**, Selorm Richard Ansong, Samuel Kweku Konney Amponsah, Andrews Apraku, Samuel Henneh and Jacob Bilikoni	Effects of Stocking Density on Biological Indices of Nile Tilapia Fingerlings (*Oreochromis niloticus* Linnaeus 1758) fed Various Commercial Feeds in Earthen Pond
109.		**Boateng M.**, Frimpong Y. O., Alhassan N. P., Atuahene P. Y., Amoah K. O. and Okai D. B.	Occurrence of Milk Spots and Cirrhosis in Livers of Pigs Slaughtered at the Kumasi Abattoir Company Limited
110.		**Zanu H. K.**, E. E. Yeboah, A. Yussif, M. Tankuba, N. Shafew, N. Seidu, M.S. Baping and S.A. Yeboah	Effect of Different Stocking Densities on the Growth Performance, Gastrointestinal pH, Carcass Traits, Bone Traits, and Litter Quality in Dual-Purpose Chickens

111.	**Samuel Ebo Owusu**, L. Atuah, I. Idun, D. Awunyo-Vitor, I. Ntekor and E. Appiah	Sustainable Commercial Sod Production of Cynodon Dactylon (Bermuda Grass) in Ghana: Assessing Growth, Visual, and Physical Quality
112.	**Holy Kwabla Zanu**, Amankrah, J., Pimpong, C.A. and Owusu, V	Effects of Regular Maize and Different Certified Maize Varieties on the Growth Performance and Carcass Traits of Broiler Chickens
113.	**Kwame A. Darfour-Oduro**, Peter Asiedu, Shadrach Norvinyo, Clement A. Adonbire and Edward Koomson	Quantifying Heat Stress Thresholds and Subsequent Decline in Reproductive Performance of Sanga Cows in Ghana

TECHNOLOGICAL AND ENGINEERING SCIENCES

WEDNESDAY, 6TH SEPTEMBER 2023

TECHNOLOGICAL AND ENGINEERING SCIENCES

Scientific Session I - Oral

Chairman: Prof. Time: 02:30 pm – 05:00 pm
Room: 4

NO	TIME	AUTHOR/PRESENTERS	TITLE OF PAPER
114.	02:30 pm - 02:40 pm	**Courage Sedem Dzah**	Understanding Ultrasound Technology for Food, Nutraceutical and Medicinal Applications
115.	02:40 pm - 02:50 pm	**Edward Kweku Nunoo**, Joseph Essandoh-Yeddu, Simon Mariwah, Shafic Suleman and Eric Twum	Electric Mobility Potential and Progress in Ghana towards a Green Energy Transition: Maximizing Opportunities to Achieve the SDGs
116.	02:50 pm - 03:00 pm	**Joseph Essandoh-Yeddu**, and Edward Kweku Nunoo	Electric Mobility in Ghana's Green Energy Transition: Progress and Potential Opportunities for the Sciences
117.	03:00 pm - 03:10 pm	**Emmanuel Baffour-Awuah**, Ishmael N. Amanor and Nana Yaa Serwaa Sarpong	Development of Solar-Powered Cassava (*Manihot Esculentum*, Crantz) Peeler
118.	03:10 am - 03:20 am	**Emmanuel Okoampah**, Joan Davids Shine, and Joseph Payne	Renewable Energy Evolution: Generating Hydrogen (H_2) Energy from the Splitting of Water in the Presence of Carbon-Dot-Mediated Gold Nanoparticles
	03:20 pm - 3:40 pm	**Questions & Discussion**	
119.	03:40 pm - 03:50 pm	**Emmanuel Kwesi Baah**, James Ben Hayfron-Acquah, Dominic Asamoah and Kwabena Owusu-Agyemang	Cognitive State Detection in Humans via Facial Expressions Processing: A Critical Review
120.	03:50 pm - 04:00 pm	**Isaac Darko-Mensah**	Innovative Technology for Green Energy-The Empower Playgrounds Innovation for Basic Schools in Ghana
121.	04:00 pm - 04:10 pm	**Kofi Ampomah-Benefo**, Gloria Boafo-Mensah, Elizabeth Von-Kiti, William Owusu Oduro, Maame Adwoa Bentumah Animpong, Latifatu Mohammed, Hubert Azoda Koffi and Richard Gyamfi Dwomoh	Portable Household Biogas Setup for Cooking: A Sustainable Solution to the Energy Transition Agenda
122.	04:10 pm - 04:20 pm	**Mark Amoah Nyasapoh**, Samuel Gyamfi, Seth Kofi Debrah, Hossam Gaber and Nana Sarfo Agyemang Derkyi	Synergistic Solutions for Ghana's Energy Transition: Harnessing the Power of Nuclear and Renewable Hybrid Energy Systems
123.	04:20 pm - 04:10 pm	**Anokye Acheampong Amponsah**, Adebayo Felix Adekoya and Benjamin Asubam Weyori	Fraud Detection and Prevention Method for Healthcare Claim Processing Using Machine Learning and Blockchain Technology
	04:20 pm - 05:00 pm	**Questions & Discussion**	

FRIDAY, 8TH OCTOBER 2021

WELLNESS, FOOD AND NUTRITION SCIENCES

Poster Session

Chairman: LOC Time: All Day
Room: Main Room

NO	TIME	AUTHOR/PRESENTERS	TITLE OF PAPER
124.		**Latifatu Mohammed**, Bismark Boating, Louis Hamenu, Juliet Attah, Rejart Adomah, Juliet Opoku, Mutala Mohammed, William Oduro, Francis Boateng Agenim and Jang Myoun Ko	Electrolyte and Separator Modification to Promote High Capacitance Retention and Cycle Stability of Electrochemical Energy Storage
125.		**Emmanuel Baffour-Awuah**, Nana Yaa Serwaa Sarpong and Ishmael N. Amanor	Development of a Preservation Technique For The African Garden Eggplant (*Solanum Aethiopicum* L.)

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FULL ABSTRACTS

1. Effects of *Allium Sativum* Extract on the Reproductive Function and Haematology of Male *Rattus Norvegicus* Treated with Monosodium Glutamate

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Abstract

This study sought to investigate the ameliorative effects of different doses of aqueous garlic extract (AGE) on the reproduction and haematology of male Wistar rats treated with Monosodium Glutamate (MSG). Twenty-five male Wistar rats with an average weight of 135g were randomly assigned to 5 treatments, with 5 rats in each treatment. Treatment 1 (control) received normal saline; Treatment 2 received 120 mg/kg BW of MSG; Treatment 3 received 120 mg/kg body weight (BW) of MSG and 500 mg/kg BW of AGE; Treatment 4 received 120 mg/kg BW of MSG and 750 mg/kg BW of AGE; and Treatment 5 received 120 mg/kg BW of MSG and 1000 mg/kg BW of AGE by oral gavage for 21 days. Epididymal sperm count, motility, morphology, White Blood Count (WBC), Red Blood Count (RBC), and Platelet-large cell ratio (P-LRC) were determined on day 21. There was no significant difference in sperm count among groups ($p > 0.05$). Sperm motility increased in groups 4 and 5. Immotile sperm were high in treatment 2. Normal sperm morphology was high in treatments 3, 4, and 5. Treatment 2 recorded lower WBC, RBC, and P-LCR as compared to the control group. The outcome of the research indicates that different doses of aqueous garlic extract might reduce the effect of MSG on the reproduction and haematology of male Wister rats.

Keywords: Garlic extract, Monosodium Glutamate, rats and reproductive traits

2. Effects of Two Levels of Dietary Fat and Fibre on the Growth, Haematology, Serum Biochemistry and Histology of the Heart, Liver and Kidney of Male Wistar Rats

Boakye M. A., Zanu H. K. and Ammisah-Reynolds P. K.

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Abstract

The intake of high levels of saturated fat poses health risks. But intake of high levels of fiber, such as those in corn cob, might reduce these risks. Therefore, the present study was conducted with the hypothesis that high fiber intake might have adverse effects on bodyweight (BW), haematology, and serum biochemistry from the intake of high levels of saturated fat in Wistar rats. Twenty-four (24) male Wistar rats were randomly assigned to four treatments in a 2 x 2 factorial arrangement in a CRD. The factors were dietary fat (low or high) and fiber (low or high). Data collected include intake, BW, organ weight (%), blood glucose, haematology, and biochemical indices. The results indicated that high fiber reduced ($P < 0.05$) the BW of Wistar rats throughout the study period (d 0 -56), and so did high fat reduced BW on d 56. The MID was higher in the group fed high fat ($P < 0.05$). In the group fed high fat, high fiber reduced platelets (PLT) ($P = 0.05$) and procalcitonin (PCT) ($P < 0.05$) levels. In the group fed a high fat, high fiber increased ($P < 0.05$) triglycerides (TGA) and Very Low-Density Lipoproteins (VLDL). In the group fed low fiber, low fat reduced the Low-Density Lipoproteins (LDL) ($P < 0.05$), but it increased TGA ($P < 0.05$) and VLDL ($P < 0.05$). High fiber increased Total Bilirubin ($P = 0.05$) and Indirect Bilirubin ($P = 0.074$), but it reduced Albumen ($P = 0.053$). Thus, the findings from this study indicate that increasing the level of dietary fiber might reduce risks posed by intake of high levels of fat.

Keywords: Fat, fiber, rats, blood, and organs.

3. Risk of Exposure to Trace Elements through the Application of Facial Makeup Powders

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Abstract
Cosmetics are ubiquitously used worldwide for regular self-care to enhance beauty. The existence of dangerous substances in these items is a source of concern. The study aimed to ascertain the levels of trace elements present in the face powders marketed in Ghana. Fifteen different brands of facial makeup powders were purchased from a local market in Ghana. The samples were analyzed using an X-ray fluorescence (XRF) analyzer to determine the concentrations of 16 metals (Pb, As, Hg, Zn, Fe, Mn, Cr, Ti, Cu, Ni, Co, Sb, Cd, Ag, Sn and Au). Trace elements contents were ordered in the following descending order according to the maximum concentrations: Fe > Zn > Ti > Mn > Cr > Hg > As > Pb > Cu, Ni, Co, Sb, Cd, Ag, Sn, and Au. Pearson correlation statistics showed strong positive relationships between Pb and Zn ($r = 0.71$), Pb and Cr ($r = 0.57$), Hg and Zn ($r = 0.63$), Hg and Fe ($r = 0.73$), Hg and Cr ($r = 0.61$), Zn and Fe ($r = 0.69$), Zn and Cr ($r = 0.88$), Fe and Cr ($r = 0.67$) and Fe and Ti ($r = 0.62$). Except for Pb and Cr, all the other elements had their margin of safety (MOS) values less than 100. The hazard indices (HI) for Pb, Mn, Cr and Ti were less than 1, indicating no risk. However, the HIs for As, Hg, Zn, and Fe were more than 1, indicating a potential risk of usage in adults. As a result, using face powders could put users at risk of exposure to heavy metals. Dermal exposure to heavy metals from cosmetics resulted in a lifetime cancer risk (LCR) that was higher than what was considered tolerable (LCR > 10-6). Mercury was identified as a potential skin sensitizer in the cosmetic samples examined by an exposure-based sensitization quantitative risk assessment (SQRA). According to this study on the trace element content of facial makeup, the presence of harmful elements in cosmetics must be regulated to protect consumer health.

4. Health Risks of Rats in Market Centres: A Case Study in Tamale City

Abdul-Rahman Abubakari and Francis Addy

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Abstract
Rodents are reservoir hosts for many illnesses and play a significant role in the transmission and spread of zoonosis. Climate change, urbanization and population expansion have fostered human-wildlife interactions in human settlements including urban public spaces which could pose a severe public health challenge. The present study was focused on screening urban rats for parasitic organisms of zoonotic potential. We lived-trapped 80 rats from three market centres in Tamale City and dissected them for endoparasites (helminths). Morphologically, the rats were identified as *Rattus rattus* and *Rattus norvegicus*. The prevalence of adult worm infection and worm larvae infection in these rats were 53.75% and 78.75%, respectively. Male rats were more commonly infected with adult worms than females (55.93% vs. 47.61%), whilst the opposite was in the case of worm larvae infection (77.97% vs 80.98%). Up to 136 worm larvae tentatively belonging to Taenia *taeniaeformis* were recovered from the liver, and 84 adult tapeworms were isolated from the intestine of affected rats. The isolated tapeworms were preliminarily classified as *Hymenolepis* spp. based on morphological features. These isolated parasites await molecular identification and characterisation. The results of this study showed that urban rats in the market squares are playing an important reservoir role for parasitic infections that may have significant public health concerns. The presence of rats in the market squares is more than a mere nuisance, they may pose a health threat; more data is needed to elucidate their impact on local public health.

Keywords: Rats, zoonosis, worms, Tamale city, market square.

5. Common Mental Disorders in Mothers and Nutritional Status of Children in East Mamprusi Municipality, Ghana

Anthony Wemakor and Raymond Atabariba

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Abstract

This study examined the determinants of maternal common mental disorders (CMDs) and the association between maternal CMDs and the nutritional status of children (6-23 months) in East Mamprusi Municipality. A cross-sectional design and a multiple-stage sampling technique were used to study 400 mother-child pairs. Data were collected using a semi-structured questionnaire, anthropometry, 24-hour dietary recall, social support scale, food insecurity experience scale and WHO Self Reporting Questionnaire. Chi-square and logistic regression analyses were used to study the determinants of maternal CMDs and the association of maternal CMDs with child nutritional status. The mean age of the respondents was 24.6 (±6.80) years. About a fifth (17.5%), 16.5% and 20.0% of the children were stunted, wasted and underweight respectively and 52.0% of the mothers had CMDs. Mothers who never attended School [Adjusted Odds Ratio (AOR): 2.77, $p = 0.006$] or from high socio-economic status households (AOR: 2.27, $p = 0.010$) were more likely to have CMDs while those who resided in peri-urban localities (AOR: 0.16, $p < 0.001$) or from food secure households (AOR: 0.34, $p < 0.001$) were protected against CMDs. The study did not find evidence of an association between maternal CMDs and wasting ($p = 0.493$), stunting ($p = 0.931$) and underweight ($p = 0.881$) in children. Low education and high socioeconomic status are risk factors and peri-urban locality and food security are protective factors of maternal CMDs. There was no evidence of an association between maternal CMDs and malnutrition in children in the East Mamprusi Municipality..

Keywords: Common Mental Disorders, nutritional status, mothers, children, East Mamprusi

6. Ecological Health Assessment of Mangrove Forests in Ghana: A Multi-Criteria Approach

Gertrude Lucky Aku Dali[1]*, Denis Worlanyo Aheto[2,3], John Blay[2,3]

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Abstract

Mangrove forests provide a wide range of crucial regulating services including coastal protection and climate regulation. Despite the increasing rate of mangrove degradation, a holistic method of assessing the ecological health of mangrove forests in Ghana is limited. The purpose of this study was to develop criteria for mangrove health assessment employing a multi-criteria approach including biological, chemical and physical factors, using the Kakum and Pra mangrove forests in Ghana as study sites. Mangrove cover change was assessed for the period 2005-2017. Mangrove species inventory, structural parameters, litter production and soil analyses were done in four 50 x 50 m study plots within each mangrove forest. Physico-chemical parameters of estuaries were measured in situ. Five and three true mangrove species were found in the Kakum and Pra mangrove forests, respectively. The species were of low structural parameters. Litter production rates were 9.60 t ha^{-1} y^{-1} and 10.72 t ha^{-1} y^{-1} for the Kakum and Pra mangrove forests, respectively. The mangrove sediments and estuaries at both study sites were of moderate quality. The mangrove health index (MHI) of the Kakum mangrove forest was 175, and that of the Pra mangrove forest was 190, indicating bad and moderate ecological health, respectively. This result calls for an urgent need for the conservation and sustainability of these forests since healthy mangrove forests are very important for climate change adaptation strategies for coastal habitants. It also stresses the need for evaluation of the ecological health of the remaining mangrove forests in Ghana to ascertain their status'.

Keywords: Ecological health; Mangrove forests; Multi-criteria approach; Mangrove health index; Climate regulation

7. Prevalence of Worm Infections in Donkeys from Bolgatanga and Zuarungu, Ghana

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Abstract
Gastrointestinal parasites are a major cause of morbidity and sub-optimal performance in domestic animals, including donkeys (*Equus asinus*). The study determined the prevalence of helminths (worms) in donkeys at slaughter in Bolgatanga and Zuarungu of Upper East Region, Ghana. The isolated worms were identified based on morphological features and fixed in 70% ethanol. The rumen flukes were further identified using molecular markers. Up to 55 donkeys aged 1 – 4 years (π = 2.9; Mo = 3 (47.23%)) slaughtered on slabs or floor were inspected. Worm infections were recorded in 51/55 (92.73%) donkeys whereby males recorded 87.5% prevalence as against 96.77% in females ($x2$ = 1.725; OR = 0.233). Most of the affected donkeys (64.70%) harboured single parasitic worm species. On the other hand, 35.30% of infected donkeys suffered polyparasitism. The common worms found were *Parascaris* spp. (n = 34 donkeys), *Anoplocephala* spp. (n = 31 donkeys) and *Paramphistomum* spp. (n = 5 donkey). Infections in foals (≤ 2 years) and adults (< 2 years) was 100% vs. 91.49% ($x2$ = 0.734, OR = 1.093). This result highlights the importance of parasitic infections in donkeys and the need for improvement in husbandry and veterinary care. Although donkeys are not raised in Ghana as food animals, the slaughter and consumption in some localities like seen in the study areas is becoming common. Attention should be given to the practice to ensure wholesome meat distribution and avoid environmental contamination and spread of diseases.

Keywords: Donkeys, helminths, *Parascaris* spp, *Anoplocephala* spp, *Paramphistomum* spp.

8. Determinants of Anaemia in Adolescent Girls in Kumbungu District, Ghana

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Abstract
The aims of the study were to measure the prevalence and identify the determinants of anaemia in adolescent girls in Kumbungu District, Northern Region. An analytical cross-sectional study with 370 adolescent girls selected using a multi-stage sampling technique in Kumbungu district was carried out. Data were gathered on socio-demographic characteristics, anthropometry, food insecurity, dietary diversity score, food-consumption score, nutritional knowledge, iron-folic acid practices, and the health of the adolescent girls. Haemoglobin was measured using a portable HemoCue hg 301+ Analyzer and haemoglobin concentration less than 12g/dl was used to define anaemia. Chi-square test and binary logistic regression modelling were used to identify the determinants of anaemia. The mean (±SD) age of respondents was 13.95 (±2.94) years. The prevalence of anaemia was 74.6%. The community status [Adjusted Odds Ratio (AOR) = 0.42; 95% CI: 0.24-0.75; p: 0.003], father's educational qualification (AOR = 0.44; 95% CI: 0.23-0.84; p: 0.013) and frequency of feeling nervous in the past 6 months (AOR = 2.13; 95% CI: 1.17-3.89; p: 0.014) were identified as determinants of anaemia. The prevalence of anaemia was high and community status, father's educational qualification and frequency of feeling nervous in the past 6 months were associated with anaemia among adolescent girls. The high prevalence of anaemia measured highlights the need for intensification of interventions and policies aimed at preventing and treating anaemia among adolescent girls in the Kumbungu district.

Keywords: Anaemia, adolescents, prevalence, determinants, Kumbungu

9.Phytochemical, Antioxidant, and Toxicological Assessment of *Balanites Aegyptiaca* Leaves Extract in Rats

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Abstract

The purpose of this research was to determine the acute and subacute toxic effects of 50% hydroethanolic extract (HLE), methanolic extract (MLE) and aqueous extract (ALE) of *Balanites aegyptiaca* leaves extract . Standard methods were used to analyze the extracts for phytochemical constituents, DPPH and FRAP activities, total phenolic content, total flavonoid content, and total tannins. The acute toxicity was assessed using a single oral dose of 5000 mg/kg body weight (b.wt.) of the extract, whereas in the subacute study, the extracts were administered orally (at doses of 100, 250, and 500 mg/kg, b,wt.) for 28 days and signs of toxicity were observed. The effect of treatment on body weights, relative organ weights, hematological, serum biochemical indices, and histopathological examination of the liver was used to assess safety. Phytochemicals such as alkaloids, phenols, flavonoids, triterpene, tannins, and saponins, was present in all crude extracts. The LD50 value was determined to be greater than 5000 mg/kg b.wt. In the subacute study, extract treatment had no significant effect on body weights, relative organ weights, biochemical, and hematological parameters when compared to non-treated rats at all doses. In histology, no significant hepatic lesions were found. The current study found that the crude extracts of *Balanites aegyptiaca* leave, have antioxidant properties and did not cause any harm in both acute and subacute toxicity to the male and female rats tested, so using these extracts for medicinal purposes is recommended.

10. Occupational Stress Among University Staff in Ghana – A Generational Perspective

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Abstract

The university workforce comprises different generational cohorts exhibiting diverse work ethics and adaptation to the work environment which affect productivity and the health of the staff. This study examined the generational perspectives of causes, effects and management strategies of stress among university staff in the Bono Region, Ghana. The Person-Environment (PE) Fit theory and the transactional model of stress and burnout underpinned the study. The study employed a quantitative research approach for data collection and analysis using a sample size of 410 university staff selected through the multi-stage sampling technique. The study revealed that academics in Gen X (1965 – 1980) are the most stressed generation while Baby boomer (1946 – 1964) non-academic staff are the least stressed. The cause of stress that significantly differs by generation is work-home interface ($p = 0.048$). Generally, Baby boomer had a more positive performance whilst Gen X was the least. The effects of stress experienced by the different generations such as behavioural ($p = 0.058$), and performance ($p = 0.511$) were not significantly different. Recreation ($p = 0.049$) was the only coping strategy that was most significant for generations and Baby boomers significantly managed their stress with recreation with a mean and standard deviation of 2.3939 and 0.97546 respectively. This study provides an empirical evidence from a Ghanaian context on the diverse generations of university staff. The study recommends the training of staff in occupational stress emphasizing the value of the unique strengths, weaknesses and needs of each generational cohort when planning for recruitment, retention, productivity and promoting the health of staff.

Keywords: Generational Cohort, Coping Strategy, Work- Home Interface, Performance, Recreation

11. Knowledge, Attitude and Practice on Antimicrobial use and Resistance among Nursing Mothers within the Cape Coast Metropolis

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Abstract

Microorganisms such as viruses, bacteria, fungi, and parasites can cause various illnesses, and antimicrobials are drugs used to prevent and treat these diseases in humans, animals, and plants. However, the excessive and often unnecessary use of these drugs has led to an unexpected surge in multidrug-resistant bacteria, viruses, and fungi, posing a serious challenge to global health. This study aimed to assess the knowledge, attitude, and practice concerning antimicrobial use and resistance among breastfeeding mothers in the Cape Coast Metropolis. This study utilized a cross-sectional study design in which data was collected using a well-structured questionnaire, administered to breastfeeding mothers in selected hospitals within the Cape Coast Metropolis, and analyzed using the Statistical Package for Social Science (SPSS). Of the 244 nursing mothers who participated in the study, 131 (53.7%) were familiar with the term "antimicrobials", and 140 (57.4%) correctly identified antibiotics as belonging to the antimicrobial drug class. Moreover, 124 mothers (50.8%) demonstrated awareness of the term "antimicrobial resistance". Concerning their practices, 113 (46.3%) reported taking antimicrobials whenever they experienced pain, while 121 (49.6%) only used them when prescribed by a doctor. Additionally, 144 (59%) expressed concern that the antibiotics they take can impact or affect the child they breastfeed. The findings of this study reveal that breastfeeding mothers within the Cape Coast Metropolis have limited awareness and understanding of antimicrobial use and resistance. This lack of knowledge contributes to improper attitudes and practices surrounding the use of antimicrobials. Therefore, special attention should be given to improving education and awareness among this group to promote responsible antimicrobial use.

12. One or More?: Diversity of Pathogens Associated with Respiratory Disease Outbreaks in Poultry in Greater-Accra

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Abstract

Respiratory disease (RD) outbreaks remain a major concern to the global poultry industry due to associated high morbidity and variable mortalities. A myriad of pathogenic agents including bacteria and viruses act singly or in association with each other to cause respiratory disease with clinical signs which may be indistinguishable without laboratory diagnoses. This study aimed at determining the major pathogens involved in respiratory disease outbreaks in commercial poultry in the Greater-Accra region. From seven farms,140 samples each of tracheal and choanal swabs were collected from birds confirmed to have respiratory disease and using PCR and standard microbiological culture techniques 5 major respiratory pathogens were identified: *Mycoplasma gallisepticum* (MG), Infectious bronchitis virus (IBV), Newcastle disease virus (NDV), Avian influenza virus and *Escherichia coli* (E.coli). A prevalence of MG (37.9%), IBV (26.4%), NDV (25.7%), and *E.coli* (20%) was recorded. The coinfection prevalence between two, three and four pathogens were determined with the highest (17.1%) recorded between MG and *E.coli*. and the lowest (6.4%) between NDV and *E.coli*. Coinfection prevalence of 12.1% and 4.2% was seen between IBV*E.coli*MG and NDV*IBV*E.coli respectively. A coinfection prevalence of 3.5% was recorded between the 4 pathogens NDV,IBV,MG and E.coli. Results from this study underscore the need for laboratory diagnosis during respiratory disease outbreaks on poultry farms, to ensure targeted treatment and management of the causative organisms.

13. High Seroprevalence of Infectious Bronchitis in Commercial Poultry in Ghana: Evidence-Based Justification for Serotyping and approval for Vaccination

Amakye-Anim J[1,2], Ayim-Akonor M[3]*, Odoom T[2,4], Wallace P[3], Folitse R[5], Fenteng D[4] and Aryee M[1]

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Abstract
Infectious bronchitis virus (IBV) continues to cause significant economic losses to the global poultry industry, and vaccination remains the best practical control method. Viral presence has been confirmed in some poultry farms in Ghana but the extent of spread across the country remains unknown, hence vaccination has not been officially approved. We aimed to determine the seroprevalence of IBV in poultry in Ghana by analysing 1,488 sera from layer birds from nine regions of three zones for IBV antibodies by ELISA. IBV antibodies were detected on all 46 farms visited. Seroprevalence in the northern, middle and southern zones was 97.6%, 96.7% and 82.7% respectively. Among the nine regions, a 100% seroprevalence was obtained in the Savanna and Bono East regions, with the Greater Accra region recording the lowest seroprevalence of 77.4%. The overall seroprevalence of IBV across the nine regions was 92.9%. We further assessed the relationship between seroprevalence and IBV risk factors. Our study shows intense activity and widespread IBV in the major poultry-producing regions of Ghana. The absence of IBV vaccination in the country exposes birds to continuous field infections which may contribute to poor productivity and loss of profit to producers, and calls for immediate serotyping and vaccine introduction to minimise IBV-associated losses in the poultry sector.

Keywords: Infectious bronchitis, seroprevalence, risk factors.

14. The Status of Biology Teaching and Learning Materials in Selected Central Regional Schools, Ghana

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Abstract
This paper investigated constraints associated with biology teaching and learning materials in selected schools in the Central Region of Ghana. The purpose of this study was to evaluate the classroom implementation of biology curriculum. A cross-sectional descriptive survey design was used for the study. The target population comprised 187 biology teachers and 7790 second year biology students in all the 58 public senior high schools that offered elective biology during the 2016/2017 academic year. The accessible population however consisted of 4500 second year biology students drawn from 21 schools. The final sample comprised 106 biology teachers and 354 biology students. Factor analysis was used to perform inferential analysis and draw conclusions on the research questions. Resources for teaching and learning biology was inadequate in all schools visited. Most teachers did not organise practical activities regularly and this affected some profile dimensions suggested by the teaching curriculum. It is recommended that only qualified and experienced teachers should be employed to handle senior high school students in order to build a good and strong foundation for them.

15. Susceptibility of Pathogenic *E. Coli* Associated with Avian Colibacillosis to Frequently used Antimicrobials: A Prospective Study

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Abstract

Avian colibacillosis, caused by *E. coli*, is the commonest bacterial disease of poultry with significant economic consequences, and the global resistance of bacteria to antimicrobials is impacting negatively on treatment outcomes. To contribute to the selection of effective antimicrobials for colibacillosis treatment in Ghana, we evaluated the susceptibility of 40 *E. coli* isolates obtained from 56 organs (lungs, liver, spleen and heart) of chickens diagnosed with avian colibacillosis from November 2022 to March 2023, to six antimicrobials of six classes, using the Kirby Bauer disc diffusion method according to the CLSI guidelines. The lungs had the highest isolation frequency (84.6%). About half of the isolates (n = 22, 55%) were each resistant to chloramphenicol and ciprofloxacin and more than two-thirds (n = 32, 80%) were resistant to trimethoprim-sulfamethoxazole. Nearly all isolates were resistant to tetracycline (93%) and ampicillin (95%). However, a majority (n = 34, 85%) were susceptible to gentamicin. More than two-thirds (n = 35, 87.5%) of isolates were multidrug-resistance (MDR) with 40.0% resistant to five antimicrobial classes. A substantial proportion, 28.6% and 22.9%, exhibited resistance to three and four classes respectively, with few (8.6%) resistant to all six classes. *E. coli* associated with avian colibacillosis exhibited high resistance to frequently used antimicrobials in the country and calls for on-farm efficacy studies of these antimicrobials.

Keywords: *E. coli*, avian colibacillosis, antimicrobials, multidrug resistance

16. Prevalence of Anaemia and G6PD Deficiency and its Impact On Diabetic Patients in Tamale Metropolis Of Ghana

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Abstract

Diabetes and glucose-6-phosphate dehydrogenase deficiency (G6PDd) are two common metabolic disorders that can affect the red blood cells and cause oxidative stress. Oxidative stress can damage biomolecules in the cells and lead to complications such as anaemia, cardiovascular disease, and kidney disease. The effects of G6PDd on diabetes are poorly understood. Routine glucose level measurement made by the health workers does not include investigating for the G6PD status of their patients as well as the effects of the drugs on their hematologic parameters. In this study, we evaluated G6PD activity and determined the prevalence of anaemia among diabetic patients in the Tamale Metropolis. We conducted a hospital-based cross-sectional study where 212 diabetic patients were examined for their G6PD activity as well as their haemoglobin levels. Anaemia was diagnosed by Hb <12 g/dL for non-pregnant female and <13 g/dL for male. The results showed that the mean G6PD activity was 81.54 ± 13.54 U/dL. The mean haemoglobin level was 12.54 ± 2.00 g/dL, which is slightly lower than the normal range. The overall prevalence of anaemia was 41.50%. The mean G6PD activity per gram of haemoglobin was 6.43 and 6.74 IU/g Haemoglobin for males and females respectively. There was a significant association between G6PD activity and haemoglobin levels ($p < 0.001$). Our study shows that diabetic patients in the Tamale Metropolis have a high prevalence of anaemia and low haemoglobin levels. This prompts for a routine check of the haemoglobin levels of the diabetic patients while they visit the health facilities.

17. Microbial Quality of Beef Offal Sold within Selected Markets in Accra

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Abstract

Offals locally called 'yɛmo adeɛ' are considered of lower quality than the muscle of the slaughtered animal and thus regarded as waste in some developed countries. In Ghana, offal is consumed widely across the country, and features prominently in sauces and soups such as okro stew, tuo-zaafi sauce and waakye sauce among others, offering a relatively cheaper animal protein source for the population. Offal could be a major pathogen source presenting a food safety risk to consumers. This study assessed the levels of faecal coliforms associated with offal sold at two principal markets in Accra specifically, Madina and Adenta. It further evaluated the antimicrobial susceptibility of associated Salmonella spp. Offal such as beef liver, stomach and intestines were sampled from these two markets from May to July, 2023. A total of 59 samples comprising 29 from Adenta and 30 from Madina were obtained. Spread plate technique was used for the faecal coliform count. Antimicrobial sensitivity was determined using the disc diffusion method according to CLSI standards. Sensitivity discs of chloramphenicol 30ug, ciprofloxacin 5ug, ampicillin 10ug, amikacin 30ug, cefoxitin 30ug and imipenem 10ug were used. The average faecal coliform count on the beef intestine, liver and stomach were between 4.08 log10 to 6.95log10 CFU/g. In all, 26 isolates of Salmonella spp were retrieved with Adenta having 11 (33.3%) and Madina 15 (27.3%) for liver and intestine and stomach had 36.4% individually. Two spp out of twenty-five were resistant to cefoxitin. All isolates were susceptible to the antibiotic tested. In conclusion, consumers must ensure the offal they consume is well cooked prior to consumption.

Keywords: Offal, Salmonella, Butcher, coliform, market

18. Association Between Myopia and the ABO/RH Blood Groups Among College of Science Students, KNUST

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Abstract

Determine the association between ABO/Rh blood groups and myopia COS students in KNUST. This cross-sectional study was conducted among randomly selected 407 COS students at KNUST. Non-cycloplegic objective refraction using an autorefractor was used to determine the refractive status. The ABO/Rh blood groups were determined using the tile method. Data were entered and cleaned with Microsoft Excel Version 16.0 and analysed with Stata Version 15. Pearson's Chi-square test of association and Fisher's exact tests were used to determine the association between myopia and ABO/Rh blood groups. A p-value of < 0.05 with a 95% confidence interval was set to be statistically significant. Three hundred and ten (310) students participated in the study out of which 169 (54.52%) were females and 141 (45.48%) with a mean age of 21.30 + 2.06. The means+standard deviation of the spherical equivalence was emmetropia 0.01 + 0.26, myopia -1.51 + 1.25 and hyperopia + 0.85 + 0.79. The overall prevalence of myopia was 34.19%. The order for blood groups was O > B > A > AB and Rh+ > Rh-. Chi-square test of association was applied to the association between myopia and the ABO blood group ($p\ value = 0.381$) as well as Rh blood groups ($p\ value = 0.802$) and there was no significant association. Myopia prevalence is still on the rise and as such extensive research should be conducted.

19. Fungal Diversity, Exposure to Mycotoxins (Ochratoxin A and Aflatoxins), and their Cancer Risk Characterization Associated with the Consumption of Two Traditionally Fermented Alcoholic Beverages (Pito and Palm Wine) in The Ho Municipality, Ghana

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Abstract

Traditionally fermented alcoholic beverages have unquestionably played a significant role in African native tradition. Evidence suggests ingredients used for the preparation of these local beverages, support the growth of microorganisms particularly fungi. Fungi have a high propensity to survive and subsequently produce deadly mycotoxins in these beverages and cause adverse health risks. This study aimed to update the mycoflora, evaluate levels of Ochratoxin A and aflatoxins contamination of some local beverages (Raffia Sap 'Palm wine' and sorghum beer 'Pito') in the Ho municipality, Volta Region, Ghana. Mycological analyses were done on Oxytetracycline Glucose Yeast Extract (OGYE) and Dichloran Rose Bengal Chloramphenicol (DRBC) media. The plates were incubated at 28 ± 1°C for 5–7 days. High-Performance Liquid Chromatography connected to a fluorescence detector (HPLC-FLD) was used to analyze the mycotoxin levels in the samples. Cancer risk assessments were done using deterministic models proposed by a Joint FAO/WHO Expert Committee on Additives. The fungal count of palm wine samples in the Ho municipality recorded were in a range of 3.29-4.59 log10 CFU/ml, while pito samples recorded a fungal range between 2.55- 4.08 log10 CFU/ml. A total of 13 fungal species, namely; *Aspergillus niger*, *Aspergillus terreus*, *Aspergillus flavus*, *Aspergillus fumigatus*, *Fusarium oxysporum*, *Fusarium oligosporus*, *Fusarium verticillioides*, *Trichoderma harzianum*, *Rhizopus stolonifer*, *Penicillium verrucosum*, *Rhodotorula mucilaginosa*., *Mucor racemosus* and *Yeast* were isolated from both palm wine and pito samples. Notably, ochratoxin A (OTA) quantities ranged between 2.77-17.78 µg/kg while aflatoxins ranged between 0-1.468 µg/kg for both samples. Cancer risk assessment computed for both moderate and heavy drinkers ranged between 1.3-47.81 ng/kg bw/day, 0.37-60.63, 0-0.0323, and 0.043-1.54 cases/100,000 person/yr for ochratoxin A while aflatoxins contents ranged 1.09-3.95 ng/kg bw/day, 101.27-366.97, 0-0.0396, and 0.043-0.156 cases/100,000 person/yr correspondingly for Estimated Daily Intake (EDI), Margin of Exposure (MOE), Average Potency, and Cancer Risks for the age categories considered. Generally, mean fungal counts in both palm wine and pito beverages were high and were found to be unsatisfactory. Fungi species in these beverages showed great diversity. Cancer Risk assessments for the mycotoxins suggested a potential health hazard to the consumers of these beverages in the Ho municipality.

Keywords: Ochratoxin A, aflatoxin, pito, palm wine, fungi, beverages.

20. Determination of Feed Uniformity using Dry Matter, Ash and Particle Size Distribution Analysis as a Rapid Assay

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Abstract

to ensure that there is efficient utilization of the diet by poultry for growth and health proper mixing of the diet is crucial. Elsewhere, various methods such as the use of synthetic amino acids, sodium, vitamin, chloride, chromium, zinc, manganese, copper and coloured iron particles have been used as indicators in assessing mixing uniformity. While these approaches are expensive, they are also time-consuming. A search for a less expensive and quicker alternative in testing the homogeneity of a feed mix for the Ghanaian poultry farmer would be worthwhile. Therefore, four experiments were conducted to evaluate the homogeneity of diets using dry matter (DM), ash, and particle size distribution (PSD) analysis as a rapid assay. The experiments were carried out in an on-station (two experiments) and on-farm situations (two experiments) by mixing 100 or 200-kg chicken diets. In each experiment, the diets were mixed with a shovel for either 2, 3, 4, 5, 6, or 7 times. After each turning, 5 samples each of about 200 g were fetched from the top and the four sides of the heap of feed for the analysis of DM, ash, and PSD. For brevity, only the results following 7 times of mixing are discussed. The results indicated that in all 4 experiments, there were no differences ($P > 0.05$) in the DM and ash. In experiment 1, the coefficient of Variation (CV) was lower for particle sizes of > 1000, > 500, and > 250 µm. In experiment 2, the CV was lower for particle sizes of > 250, > 75, and < 75 µm. In experiment 3, the CV was lower for DM, ash, and particle size of > 500, and < 75 µm. In experiment 4, the CV was lower for the ash and particle size of > 500 and < 75 µm. Since it was only in a few instances that little variation was observed in the parameters following 7 times of feed mixing, the hypothesis that DM, ash, and PSD analysis might be used to determine feed uniformity cannot be fully supported and thus warrants further studies.

Keywords: Feed uniformity, feed analysis, poultry diet, and rapid assay

21. Effect of Hydroethanolic Leaf Extract Of *Cordia Vignei* on Adjuvant-Induced Arthritis in Sprague Dawley Rats

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Abstract

Rheumatoid arthritis is a chronic inflammatory disease of the joint. Its prevalence is approximated to be 0.5 to 1% in the United States and other developed countries. Due to complexity of the disease, combinations of drugs of different classes and mechanisms of action are employed in its treatment. Chronic intake of these synthetic drugs often incurs potential health threats to the patient. Phytochemicals are therefore being explored as alternative or complementary to treatment. This study investigated the potential benefits of *Cordia vignie* in this debilitating disease. Adjuvant arthritis was induced by inoculation of 100 µL complete Freund adjuvant (CFA) to the paw of male Sprague Dawley rats. Rats were treated with either normal saline (10 $mlkg^{-1}$), dexamethasone (0.1 - 1.0 $mgkg^{-1}$) or *Cordia vignie* extract (CVE; 30 -300 $mgkg^{-1}$), 1 h before inoculation (prophylactic) or 10 days after inoculation (curative) and proceeded up to day 28. Paw thickness, body weight, joint damage, haematological and biochemical profiles were assessed. Excised joints were decalcified, sectioned and stained. CFA induced significant body weight loss which was not reversed by treatment with dexamethasone or CVE in the curative protocol. In the prophylactic study, only dexamethasone prevented CFA-induced weight loss. Both dexamethasone and CVE significantly ($P < 0.05$) reversed CFA-induced paw swelling in both prophylactic and curative studies. CVE significantly attenuated CFA-induced bone erosion and also reversed elevation of lymphocytes and neutrophils by CFA. Histopathology showed that CVE significantly reduced inflammatory cell infiltration and cartilage destruction and maintained joint architecture. The study showed that *Cordia vignei* ectract attenuated adjuvant arthritis in rats and could be exploited for future treatment of rheumatoid arthritis.

Keywords: Cordia vignei; Sprague Dawley; Adjuvant; Arthritis; Leaf extract

22. Mycoflora Profile, Levels of Aflatoxin M_1, Exposure and the Risk Characterization of Local Cheese **'Wagashie' Consumed in the Ho Municipality, Volta Region, Ghana.**

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Abstract

Wagashie is a West African type cottage cheese locally prepared from cow milk. *Wagashie* like other milk products, is prone to microorganisms particularly fungi contamination. These fungal species produce mycotoxins which are of serious public health concern. The aim of this work was to update the mycofloral profile, determine the concentrations of aflatoxin M1 and its health risk characterization due to the consumption of wagashie. Culturing the wagashie on mycological media (Oxytetracycline Glucose Yeast Extract OGYE, Dichloran Rose Bengal Chloramphenicol DRBC) caused a de-novo growth of the quiescent spores at 28–30°C for 5-7 days. The analysis of AFM1 levels in the samples was done using High-Performance Liquid Chromatography connected to a Fluorescence detector (HPLC-FLD). The exposure and risk assessment to the AFMI levels were determined using deterministic models prescribed by the European Food Safety Authority (EFSA). The fungal counts ranged between 2.36-4.30 log10 CFU/g. In total, thirteen (13) fungal species from eight (8) genera were isolated from all wagashie samples. They are; Fusarium oxysporium, Aspergillus flavus, Aspergillus niger, Fusarium verticilliodes, Penicillium digitatum, Trichoderma harzianum, Aspergillus terreus, Rhodotorula mucilaginosa, Rhizopus stolonifera, Aspergillus fumigatus, Yeasts, Mucor racemosus and Fusarium oligosporium belonging to the genera Fusarium, Aspergillus, Penicillium, Trichoderma, Rhodotorula, Rhizopus, Yeast sp and Mucor. Wagashie samples analyzed for AFM1 recorded were of low levels which ranged between 0.00 ± 0.00 - 0.06 ± 0.002 µg/Kg. Risk assessments of AFM1 using deterministic models produced outcomes that ranged between $5.92x10^{-3}$ - 0.14 ng/kg bw/day, 1.42 –44.35, 0–0.0323 ng aflatoxins/kg bw/day, and 1.51 x 10^{-3} − $9.69x10^{-4}$ cases/100,000 person/yr for estimated daily intake (EDI), margin of exposure (MOE), average potency, and cancer risks, respectively, for the age categories investigated. Fungal counts were interpreted as medium to high. It was also established that the consumption of wagashie may pose adverse health effects on all age categories in the selected zones of the study since all calculated MOE values were less than 100,000.

Keywords: Aflatoxin M_1, cancer, hepatocellular carcinoma, wagashie, milk products, fungi species

23. Effects of Hydroethanolic Leaf Extract of Cordia Vignei Hutch and Dalziel in Dextran Sodium Sulfate-Induced Ulcerative Colitis in C57BL/6 Mice

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Abstract

Ulcerative colitis (UC) is a chronic inflammatory bowel disease (IBD) that causes long-lasting inflammation on the innermost lining of the colon and rectum. Globally, its prevalence is about 1 % of the population. Due to adverse effects and high cost of treatment, biological compounds are being explored as alternative or complementary medicine. Cordia vignei is widely used in traditional medicine in treatment of ulcerative colitis in Ghana. this study assessed the anti-ulcerative effect of hydroethanolic leaf extract of *Cordia vignei* (CVE) in dextran sodium sulfate (DSS)-induced ulcerative colitis in C57BL/6. Mice were put into 12 groups (n=6). To induce colitis, dextran sodium sulfate (5%) was introduced into the drinking water of mice. This was repeated daily for 7 days. Mice were treated with either normal saline, sulfasalazine or CVE. Mice in groups I – VI were examined on day 12 while those in groups VII –XII, on day 28. Body weights of mice were taken every order day. The, colons, fecal matter, blood, and tissues were collected and studied. CVE did not significantly prevent weight loss. Both sulfasalazine and CVE significantly prevented anaemia, bloody stool formation, and colonic inflammation. Histopathology of CVE-treated colons showed improved infiltration and epithelial damage. Serum concentrations of catalase, superoxide dismutase and glutathione in CVE-treated mice were higher than the disease control mice. *Cordia vignei* extract exhibits potential anti-ulcerative effect.

24. Antimicrobial Activity and Antibiotic Susceptibility of *Bacillus Spp.* Isolated from Dawadawa

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Abstract

Dawadawa is a Ghanaian food condiment made from seeds of African locust bean tree, *Parkia biglobosa*. It is produced by spontaneous fermentation and contains different microorganisms which may be beneficial or harmful to human consumers. Beneficial microbes could be used as probiotics to enhance nutritional and health properties of Ghanaian foods. This study assessed the antimicrobial and antibiotic properties of some *Bacillus* strains isolated from dawadawa and their potential for use as probiotic starter cultures. Bacteria were isolated from dawadawa and were identified using observation of colony and cell morphologies, Gram staining, catalase, and oxidase tests. Agar-well diffusion method was used for antimicrobial activity assay. Bacillus strains were grown in the presence of *Pseudomonas aeruginosa*, *Staphylococcus epidermidis*, *Escherichia coli*, and *Klebsiella pneumoniae* for 24 hours. *Bacillus* strains were subjected to varying concentrations of gentamycin, kanamycin, clindamycin, streptomycin, chloramphenicol, ampicillin, tetracycline, ciprofloxacin, erythromycin, and vancomycin for 24 hours using Kirby-Bauer disc diffusion method. Isolates were identified tentatively as *Bacillus* species. Isolates IPC16 and CA2 MAJ had no antimicrobial activity against any test organism. The remaining isolates inhibited growth in at least one of 4 test organisms. Majority of bacterial isolates were susceptible to antibiotics with an overall average percentage susceptibility of 51.24%. Isolates ICA01-1, Y2, and ICP16 were not resistant to any antibiotic whereas CA1 Maj and Y1 showed resistance to most antibiotics. Isolates ICA01-1, and Y2 may be suitable for use as probiotic starter cultures for dawadawa production after further experiments have been carried out.

Keywords: Dates, antibiotics, probiotics, lactic acid bacteria

25. Antibiotic Susceptibility of Lactic Acid Bacteria Isolated from Date Fruit

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Abstract

Dates, *Phoenix dactylifera*, have been found to possess antioxidant, anticancer properties, and nutritional benefits. Studies have reported the presence of lactic acid bacteria (LAB) with probiotic potential in date fruits. Health benefits of LAB probiotics include but is not limited to reducing the risk of cardiovascular disease, modulating host immune system, and initiating antimicrobial activities against foodborne pathogens. An important characteristic of probiotics is their susceptibility to antibiotics. Hence, LAB must meet this criterion in addition to being safe to be used as a probiotic starter culture. Therefore, this work aimed to identify and assess the antibiotic susceptibility profile of date fruit-derived lactic acid bacteria.LAB were isolated from date fruits using MRS media from two different stages of date fruit (Rutab and Tamr). Gram staining, catalase, and oxidase tests were used in identification. Susceptibility of LAB strains to antibiotics; gentamicin, erythromycin, tetracycline, clindamycin, kanamycin, streptomycin, chloramphenicol, and ampicillin was assessed using Kirby-Bauer disc diffusion method. Bacterial load for Rutab and Tamr stages were 2×10^7 CFU/ml and 9×10^6 CFU/ml respectively. Tentatively, Lactobacillus, *Lactococcus*, *Streptococcus*, and *Pediococcus* were identified. Majority of isolates were susceptible to antibiotics. Susceptibility profiles of isolates DA2, DA4, DA5, FA1, FA2, and FA3, indicate they may have potential for use as probiotics due to no resistance to antibiotics.This preliminary study shows prospects for the use of isolated lactic acid bacteria strains from date fruit as starter cultures and probiotic supplements after further identification and characterization.

Keywords: Dates, antibiotics, probiotics, lactic acid bacteria

26. Haemolytic Activity, Acid and Bile Tolerance of *Bacillus Spp.* Isolated from Dawadawa

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Abstract

Fermented dawadawa is found across the savannah area of West and Central Africa. In addition to its flavourful properties, it contains *Bacillus* sp. which has been found to have probiotic properties. *Bacillus* sp. was isolated from dawadawa and cultivated in this experiment to evaluate haemolytic activity as well as acid and bile salt tolerance in order to understand the survival in the gastrointestinal tract and its efficiency as a probiotic. A total of eleven *Bacillus* spp. were isolated. They were characterized using the Gram-stain and biochemical tests. The acid and bile salt tolerance characteristics of these isolates were investigated by following monitoring their optical density at 0 hour and 18 hours after incubation in growth media at pH 1.5-3.5 as well as their ability to grow in media containing 0.3% bile. All isolates were identified as Gram-positive *Bacillus* spp. Six isolates were observed to be non-haemolytic, five isolates showed incomplete haemolysis and none of the isolates exhibited complete haemolysis. The acid and bile salt tolerance characteristics of these isolates showed that they were all bile salt resistant. The investigation of their acid tolerances over pH ranging (1.5-3.5) showed that all the isolates could grow in acidic conditions. This study revealed that six of the isolates possess probiotic potential whereas the five isolates are not suitable to be used as probiotics. *Bacillus* spp. found in dawadawa are probiotics and can survive under low pH concentrations and high bile salt concentrations present in the gastrointestinal tract.

27. Extraction of Cinnamon Oil using Novel Solvent

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Abstract

One of the ancient spices employed for the most part, in cookery, perfumery and for medicinal purposes worldwide is cinnamon bark. It also has biological activities which includes anti-viral, anti-bacterial and anti-fungal properties, antioxidants with anti-inflammatory effects, reduction of blood pressure, lowering of blood sugar and risk of type 2 diabetes, and relieves digestive discomfort amongst others. Ionic liquids (ILs) are compounds made up of only ions. One of the main properties of these salts that earns them the classification as ionic liquids and not molten salts is the fact that they have melting points below 100°C, unlike conventional molten salts like sodium chloride that has a melting point of 801°C, ILs have organic cations instead of inorganic ones as the molten salts do. Unlike most of the conventional organic solvents used in industry which emit volatile organic compounds (VOCs); with most of them being monitored and banned due to their hazardous nature and their carcinogenic effect on the liver, lungs, and the nervous system, ILs under normal or ambient conditions are non-flammable. This makes them attractive in their use as solvents for syntheses, catalysis, and extractions. In Ghana, cinnamon is grown in the Western Region at the Bawdie Arboretum in Wassa Amenfi East for export and local use. Though its uses previously were as flavours in cooking, most Ghanaians use it mainly now because of the health benefits, especially during the Covid-19 pandemic era. The most popular type of extraction used commercially or otherwise for the isolation of the oils is steam distillation (or hydrodistillation). The other types are maceration, Soxhlet extraction, and supercritical carbon dioxide extraction amongst others. This study aims at the comparison of the amounts of cinnamon oil extracted using conventional methods and the ionic liquid pre-treatment method by measuring the amounts of cinnamon oils present. The ionic liquid pretreatment method is a mixture with 20 wt% of cinnamon powder and stirred for 12 h at 80°C. The amount of cinnamon oil extracted in the hydrodistillation method was about four times higher than that from the IL extraction. On the other hand, the use of IL produced other materials which could be purified to produce other compounds.

Keywords: Ionic liquids; hydrodistillation; cinnamon; green chemistry

28. Antimicrobial Susceptibility Profile of *E. Coli* isolated from Poultry in two Districts in the Greater Accra Region

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Abstract

Globally, bacteria are becoming resistant to several antibiotics, posing a challenge to public and veterinary health. The frequent and indiscriminate use of antibiotics in the animal sector is a contributing factor to the global incidence of antimicrobial resistance. This study evaluated the susceptibility of 112 *E. coli* isolates obtained from poultry faecal samples from two major poultry farming communities (Adentan Municipal and Shai Osudoku District) in the Greater Accra region, from November 2021 to March 2022, to 10 antibiotics of eight antimicrobial classes. More than half of the isolates were resistant to tetracycline (92.9%), azithromycin (90.2%), trimethoprim/sulfamethoxazole (70.5%) and ampicillin (61.6%). Majority (n = 69, 61.6%) were multidrug resistant (MDR), of which 55.1%, 24.6% and 15.9% were resistant to three, four and five antimicrobial classes respectively. The high MDR of commensal E. coli in the districts calls for education of farmers on antimicrobial use to help minimise the rate of resistance developmen.

Keywords: Antimicrobial resistance, multidrug resistance, *E. coli*, poultry

29. Understanding the Impact of Poultry Production Training on Antimicrobial usage, Knowledge of Antimicrobial Resistance, and Attitudes towards Prudent Antimicrobial usage among Poultry Farmers

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Abstract

As part of a cross-sectional study to identify and characterize Carbapenem-resistant Enterobacteriaceae in poultry in the Greater Accra region, a face-to-face interview via a well-structured eSurvey questionnaire was conducted to investigate the knowledge and attitudes of poultry farmers to antimicrobial use (AMU) and its resistance amidst training in poultry production. The study utilized descriptive statistics to analyze and present the data. At a significance level of 0.05, the Friedman test and Fisher's Exact test were used to assess significant associations between potential explanatory variables and dependent variables. Overall, 64 out of 105 surveyed farmers had attended training in poultry production with only thirteen farmers having had training in AMU. NGOs (35.2%) and universities (30.8%) were the predominant institutions organizing the training. AMU among farmers was high (96.2%). The top three significant variables identified as drivers for AMU among poultry farmers were “to prevent disease in the flock, “the chickens are not eating” and “an increased mortality rate” (p-=0.001). Some farmers (47.2%) showed knowledge of antimicrobial resistance (AMR) with the understanding of the possibility of pathogens being resistant to drugs. About 58.5% of farmers believed in an excessive usage of antibiotics in the poultry industry. Furthermore, most farmers (63.2%) do not observe the withdrawal period for antibiotics and the majority do not discard eggs during antibiotic therapy (86.5%). In conclusion, steady education of poultry farmers on good husbandry practices, drug use and its resistance in animal farms will enhance their knowledge on AMU and AMR.

30. Dietary Diversity, Micronutrient Adequacy and its Association with Nutritional Status amongst Pregnant Women Attending Antenatal Clinic at Ashaiman Polyclinic

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Abstract

Dietary diversity and micronutrient adequacy are key factors that contribute to achieving optimal nutritional status during pregnancy. The study aimed to investigate the dietary diversity, micronutrient adequacy, and nutritional status among pregnant women receiving antenatal care at Ashaiman Polyclinic in Ghana. A cross-sectional study was conducted, involving 186 pregnant women who completed a questionnaire on socio-economic and demographic characteristics. Dietary intake and anthropometric status were assessed using a single 24-hour recall, and the Mid-Upper Arm Circumference (MUAC), respectively. While haemoglobin concentration was obtained from their Antenatal booklets. The analysis was performed using SPSS version 26. The results showed that the majority of women were between 26 and 30 years old and in the second trimester of pregnancy. Only 40.7% of women met the minimum dietary diversity score for women (MDD-W), while the mean micronutrient intake of the pregnant women met the estimated average requirement (EAR) for Thiamine, Niacin, Vitamins B6, B12, and C. About 67.8% of the respondents had haemoglobin concentration between 7.0 – 10.0g/dl indicating that they were mildly or moderately anaemic, whereas 99.5% of them had a MUAC ≥23cm. Multiple regression analysis indicated that dietary diversity was positively associated with occupation and gestation, while haemoglobin concentration was positively associated with gestational age and the number of households. These results suggest that efforts should be made to identify and address the specific needs of women at different stages of pregnancy and those from larger households. Additionally, the significant association found between occupation and dietary diversity highlights the importance of addressing the social and economic determinants of nutrition, such as access to diverse and nutritious foods, among pregnant women.

31. Conservation Status/Biology of the Abyssinian Ground-Hornbill (*Bucorvus abyssinicus*)

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Abstract

The Abyssinian Ground Hornbill (*Bucorvus abyssinicus*) is a large, striking bird native to savannas and woodlands sub-Saharan Africa. The species faces numerous threats leading to their decline and local extinction. This study aimed at comparing what is known between the only two ground-hornbill species (*Bucorvus abyssinicus* and *Bucorvus leadbeaterri*), to determine trends in research with respect to contributing countries, years, topical/thematic areas and to discover key gaps needed for conservation action. Targeted and non-targeted data on species were extracted using desk study from peered-reviewed journals, newsletters, conference proceedings, technical reports and unpublished data. Google scholar, web of science and scorpus were searched with keywords such as 'ground-hornbill, "Bucorvus leadbeaterri", "Bucorvus abyssinicus" and other known names such Bucorvus cafer for Southern ground-hornbill. The species is grossly understudied compared to its congener, Bucorvus leadbeaterri. Only an output 22 and 88 has been recording so far. This culminates to an average of 1 publication per every 6 years and 1 every year for *Bucorvus abyssinicus* and *Bucorvus leadbeateri* respectively. Of the 40 range states of occurrence, only (16 and 38) % has contributed to the total targeted research for both species. South Africa and United States of America accounted for the bulk of work for *Bucorvus leadbeateri* (71.3%) and *Bucorvus abyssinicus* (25%) respectively. New areas of scientific research remain challenging with dominant thematic areas limited to evolution, captive rearing and parasitology.
Conclusion: The species is grossly understudied compared to its congener. Urgent attention is therefore needed to prevent further population decline.

32. Microbiological Evaluation of Edible Beef Offals in Greater Accra

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Abstract

Edible offals are very rich sources of protein, vitamins and minerals. In Ghana, they are largely consumed in local dishes such as okro stew, tuo-zaafi sauce and waakye sauce. Due to unhygienic conditions at slaughter and processing, edible offals generally have poor microbial quality. We aimed to evaluate the microbial quality of edible beef offals sold in Accra. We analysed 40 offals (intestine, liver and tripe), from the Madina (n=18) and Adentan (n = 22) markets for total viable bacteria count (TVBC) using the plate count method and standard microbiological and biochemical testing for isolating *Salmonella spp*. The mean TVBC of intestine, liver and tripe from Madina were 2.6 log10 CFU/g, 2.7 log10 CFU/g and 3.6 log10 CFU/g respectively while that of Adentan were 2.9 log10 CFU/g, 1.9 log10 CFU/g and 15 log10 CFU/g respectively. Overall, the TVBC of offals from Madina was lower than that from Adentan, 2.9 log10 vrs 6.5 log10. Salmonella spp was isolated from 77.2% of offals from the Adentan municipality with the intestine having the highest isolation frequency of 87.6%. From offals obtained from Madina market, *Salmonella spp* was isolated from 77.7% of the samples. The highest isolation frequency, 83.3%, was obtained from intestine and tripe with the liver having the least isolation frequency of 66.7%. The TVBC of offals sold at the Madina and Adentan market from April-July 2023 did not exceed the permissible limit, 6 log CFU/g, of the Ghana Standards Authority. However, the high detection of *Salmonella spp* is a public health concern.

33. Effects of Animal Trypanosomes on Hematological Profile of Cattle Breeds in the Coastal Savannah Agro-Ecological Zone of Ghana

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Abstract
Trypanosomes characterization throughout the natural infection cycle and assessment of hematological parameters of cattle over a six month period was carried out at two different locations (Pokuase and Katamanso) in the coastal savanna agro-ecological zone of Ghana. Trypanosome characterization was conducted with nested tubulin locus-based PCR and hematological analysis with SK8800 Veterinary Full-auto Haematology Analyzer. Forty cattle were sampled comprising 20 N'dama from Pokuase and 10 Sanga and 10 Sanga crosses from Katamanso. Trypanosomes identified at both study sites were *Trypanosoma congolense* and *T. brucei* with *T. congolense* being predominant. *T. vivax* was however detected at the Katamanso Research Station. White Blood cell count did not differ ($p > 0.05$) between breeds irrespective of the location but differences ($p < 0.05$) existed in the Neutrophil (NEU), Hemoglobin (HGB), Red blood cells (RBC) and Hematocrit (HCT) between the breeds. Differences ($p < 0.05$) in HGB, RBC, HCT and MCV of breeds existed between the locations. There was a breed and trypanosome interaction ($p = 0.018$) for RBC and HCT which indicates that trypanosome infection had an effect on the RBC and HCT content of the blood. Hematological indices ranged from 14.83, 14.64 and 15.70 for WBC, 9.46, 10.36 and 10.13 for HGB, 5.32, 5.74 and 5.26 for RBC, 42.34, 39.92 and 35.26 for NEU and 19.37, 21.62 and 18.69 for Sanga, N'dama and Sanga cross respectively. Results from both locations and breeds indicate that trypanosome infection affected blood hematology hence indices such as RBC, HCT and HGB counts can be used as indicators of trypanosome infection.

Keywords: Sanga, N'dama, Sanga Cross, trypanosome, Hematology, infection

34. Toxicogenic Fungal Profile, Ochratoxin an Exposure and Cancer Risk Characterization Through Maize (*Zea Mays*) Consumed by Different Age Populations in the Volta Region of Ghana

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Abstract
Maize (*Zea mays*) is an important staple food crop for the majority of Ghanaians. Maize is mostly contaminated by fungal species and particularly mycotoxins. This work aimed to identify and quantify the incidence of fungal infection and exposure to Ochratoxin A (OTA) as well as the health risk characterization in different age populations due to maize consumption in the Volta region. Maize samples were plated on Dichloran Rose Bengal Chloramphenicol (DRBC) agar, and Oxytetracycline Glucose Yeast Extract (OGYE) agar. All media were prepared in accordance with the manufacturers' instructions. The plates were incubated at 28±2 oC for 5-7 days. High-Performance Liquid Chromatography connected to a fluorescence detector (HPLC-FLD) was used to analyze the ochratoxin A (OTA) levels in maize. Cancer risk assessments were also conducted using models prescribed by the Joint FAO/WHO Expert Committee on Additives (JECFA). The maize samples collected from the Volta region contained fungal population between the range of 3.08 to 4.58 log10 CFU/g. Eight (8) genera were recorded belonging to *Aspergillus*, *Trichoderma*, *Penicillium*, *Fusarium*, *Saccharomyces*, *Mucor*, *Rhodotorula* and *Rhizopus*. The species diversity includes *A. flavus*, *A. niger*, *T. harzianum*, *P. verrucosum*, *F. oxysporum*, *Yeast*, *F. verticillioides*, *Rhodotorulla sp*, *A. fumigatus*, *R. stolonifer*, *M. racemosus* species. Additionally, the ochratoxins level contained in the samples were very noteworthy and ranged from 1.22 to 28.17 ug/kg. Cancer risk assessments of OTA produced outcomes also ranged between 2.15- 524.54 ng/kg bw/day, 0.03 – 8.31, 0.0323, and 0.07 - 16.94 for cases/100,000 person/yr for Estimated Daily Intake (EDI), Margin of Exposure (MOE), Average Potency, and Cancer Risks respectively for all age categories investigated. There was a very high mycoflora load on the maize sampled from the Volta region, likewise, the range of mycotoxins present in the maize grains suggested the potential to pose some adverse health effects to the populace of the Volta region.

Keywords: Maize, fungi, ochratoxin A, risk assessment, cancer, toxicogenic fungi

35. Exposure and Risk Characterizations of Ochratoxins A and Aflatoxins Through Maize (*Zea Mays*) Consumed in Different Agro-Ecological Zones of Ghana

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Abstract
Mycotoxin contamination of foodstuffs is a serious food safety concern globally as the prolonged ingestion of these toxins has the tendency to worsen the risk of hepatocellular carcinoma. This study aimed at estimating ochratoxin A (OTA) and aflatoxin (AF) levels above international (European Food Safety Authority, EFSA) and local (Ghana Standards Authority, GSA) standards as well as the health risks associated with the consumption of maize (n = 180) sampled from six (6) regions representing the agro-ecological zones of Ghana. OTA and AF were measured with High-Performance Liquid Chromatography with a Fluorescence detector. Out of the 180 samples analyzed for total aflatoxins (AFtotal), 131/180 tested positive and 127 (70.50%) exceeded the limits of EFSA and ranged 4.27 - 441.02 µg/kg. While for GSA, 116 (64.44%) of samples exceeded this limit and ranged between 10.18-441.02 µg/kg. For OTA, 103/180 tested positive and 94 (52.22%) of samples between the range 4.00 - 97.51 µg/kg exceeded the tolerable limit of EFSA, whereas 89 (49.44%) and were in the range of 3.30 - 97.51 µg/kg exceeded the limits of GSA. Risk assessment values for total aflatoxins (AFtotal) ranged between 50-1150 ng/kg bw/day, 0.4-6.67, 0-0.0323 aflatoxins ng/kg bw/day and 1.62-37.15 cases/100,000 person/yr for Estimated Daily Intake (EDI), Margin of Exposure (MoE), Average Potency, and Cancer Risks respectively. Likewise, ochratoxin (OTA) values were in the ranges of $8.6x10^{-3}$ - 450 ng/kg bw/day, 0.05 - 2059.97, 0-0.0323 ochratoxins ng/kg bw/day and $2.78x10^{-4}$ - 14.54 cases/100,000 person/yr. Consumption of maize posed adverse health effects in all age categories of the locations studied since the calculated MOE values were less than 10,000.

Keywords: Ochratoxin A, aflatoxins, Ghana, toxigenic fungi, maize, cereals, HPLC-FLD

36. Aflatoxin M_1 Exposure in a Fermented Millet-**Based Milk Beverage '*Brukina*'** and its Cancer Risk Characterization in Greater Accra, Ghana

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Abstract
Brukina is a millet based fermented milk product which is consumed as a beverage in Ghana. It is however prone to aflatoxin M_1 (AFM_1) contamination, which is a serious health challenge for low and middle-income countries in subtropical regions. This study aimed at evaluating AFM1 levels and cancer risks associated with brukina (n = 150) sampled from different locations of the Greater Accra Region of Ghana. AFM1 were measured with High-Performance Liquid Chromatography (HPLC) connected to a Fluorescence Detector (FLD).Cancer risk assessments were also conducted using models prescribed by the Joint FAO/WHO Expert Committee on Additives (JECFA). Out of the 150 samples analyzed for AFM1, 80/150 (53%) tested positive between the range 0.00 ± 0.001-3.14 ± 0.77µg/kg. Cancer risk assessments of AFM_1 produced outcomes which ranged between 0.64 - 1.88 ng/kg bw/day, 0.31 - 9.40, 0.0323, and 1.94×10^{-3} - 0.06 for cases/100,000 person/yr for Estimated Daily Intake (EDI), Hazard Index (H.I), Average Potency, and Cancer Risks respectively for all age categories investigated. It was concluded that the consumption of brukina posed adverse health effects on the majority of the age categories in the different locations of Greater Accra Region since the calculated H.Is were greater than one (>1). Therefore, contamination of brukina with AFM1 should be considered a high priority in public health and Ghana's cancer risk management actions.

Keywords: AFM_1, fermented milk, *brukina*, mycotoxins, Accra, Ghana, HPLC-FLD

37. Exposure Assessment and Cancer Risk Characterization of Aflatoxin M_1 (AFM_1) through Ingestion of Raw Cow Milk in Southern Ghana

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Abstract

Milk and dairy products are the most important nutritional foods among all age groups. Aflatoxin M_1 (AFM_1) contaminates milk and makes its consumption potentially dangerous. Infants are mostly at risk because they are typically fed as many as six and more times per day, which is indeed a disquieting concern. This study aimed at evaluating AFM_1 levels especially above international (European Food Safety Authority, EFSA)(0.05 µg/kg) and local (Ghana Standards Authority, GSA) (0.5 µg/kg) standards and cancer risks associated with the ingestion of raw cow milk (n = 120) sampled from Southern Ghana (Greater Accra, Volta, Western and Eastern Regions). AFM1 were measured with High-Performance Liquid Chromatography with a Fluorescence Detector (HPLC-FLD). Risk assessments were also conducted using models prescribed by the Joint FAO/WHO Expert Committee on Additives (JECFA). Out of the 120 samples analyzed for AFM_1, 67 (55.8%) tested positive, 63 (52.5%) exceeded the limits of EFSA and were between the range 0.06 ± 0.001 - 3.52 ± 0.5 µg/kg whereas 50(41.7%) within the range of 0.50 ± 0.03 - 3.5 2.01 ± 0.5 µg/kg exceeded GSA limits. Risk assessments of AFM_1 for infants, toddlers, children, adolescents, and adults ranged between 0.06- 2.03 ng/kg bw/day, 197.04-6666.67, 0-0.0323 ng aflatoxins/kg bw/day and $1.94x10^{-3}$ - 0.07 cases/100,000 person/yr respectively for Estimated Daily Intake (EDI), Margin of Exposure (MoE), Average Potency, and Cancer Risks. It was concluded that the consumption of raw milk posed adverse health effects on all age categories studied for the regions investigated. The use of raw cow milk may cause some problems and endanger the health of people of different age groups due to non-compliance with prescribed regulatory limits.

Keywords: Aflatoxin M_1 (AFM_1), toxigenic fungi, raw milk, mycotoxins, Ghana, HPLC-FLD

38. Profile of Fungal Contaminants of Maize (*Zea Mays*) Intended for Consumption and their Potential Health Implications in the Ho Municipality of Ghana

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Abstract

Maize is a principal food crop used extensively by both humans and animals in Africa and across the globe. Unfortunately, maize is a perfect substrate for the growth of fungi, especially with toxicogenic species. The contamination is exacerbated subsequently by mycotoxins of these fungi, which is indeed a major concern to governments and the international community, as it renders the food unsafe for human and animal consumption. Whole maize was sampled from 10 different sites in the Ho municipality, Ghana, and assessed for moisture contents, fungal count, and species diversity. The fungal analysis was conducted at three points per location. Fungal species were cultured and identified on the two media used; Sabouraud Dextrose Agar (SDA) and Dichlor Rose Bengal Chloramphenicol (DRBC). A total of sixteen (16) fungal species belonging to eleven (11) genera were identified in this study. They included *Aspergillus niger*, *A. flavus*, *A. fumigatus*, *A. tamarii*, *A. ochraceous*, and *A. parasiticus*, *Cladosporium herbarium*, *Curvularia lunata*, *Penicillium citrinum*, *Fusarium moniliforme*, *Eurotium sp.*, *Mucor racemosus*, *Rhizopus stolonifer*, *Paecilomyces variotii*, *Neurospora sitophilia* and *Rhodotorula sp*. The genus *Fusarium* was found to be the most overriding fungus. The overall decreasing order of ranking of occurrence was *Fusarium* > *Penicillium* > *Aspergillus*. Fungal counts of the maize samples ranged between 2.77 ± 1.01- 4.1 ± 0.81 Log10 CFU/g and 3.00 ± 1.13 - 4.08 ± 1.22 Log10 CFU/g for SDA and DRBC respectively and showed no significant differences ($p > 0.05$). The moisture content of the maize grains ranged between 12.06 ± 1.17- 16.71 ± 2.65 %. Generally, there was a weak association between moisture content and fungal counts, which showed a poor fit to the linear equations ($R^2 = 0.1989$, $R^2 = 0.0047$ for SDA and DRBC respectively). Our results underscore that consumers and farmers should be up-to-date on the danger of fungal contamination in maize. The outcomes of this paper would be worthwhile in advising policy makers to particularly stress on in adopting international legislations on food quality parameters and to use tools that will change the frame of mind of the population on risks involving fungal intoxication.

Keywords: Maize, fungi, mycoflora, health, Ghana, toxicogenic fungi, pathogenic fungi

39. Toxicogenic Fungi, Aflatoxins, and Antimicrobial Activities Associated with some Spices and Herbs from Three Selected Markets in Ho Municipality, Ghana

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Abstract

Spices and herbs are widely used food ingredients that enhance most organoleptic features of prepared foods. They are also used for medicinal and preservative purposes. Spices and herbs are potential carriers of bacteria, yeasts, and moulds due to the nature of cultivation, harvest methods, storage conditions, packaging procedures, distribution, sale, and general handling. Although some fungi have been identified to be associated with most spices and herbs elsewhere in the world, little has been done on the presence of fungi in spices and herbs in Ghana. This study sought to identify the toxicogenic fungal profiles, mycotoxins (aflatoxins) present in some herbs; Bay leaf (*Laurus nobilis*), garden egg leaves ("Gboma") (*Solanum macrocarpon*) and spices; Ginger (*Zingiber officinale*), "Dawadawa"(*Parkia biglobosa*), as well as to investigate the antimicrobial properties of the selected herbs and spices. Decimal reduction technique was used to plate onto Dichloran Rose Bengal Chloramphenicol (DRBC) Agar media plates for fungal growth. Aflatoxin detection was carried out with High-Performance Liquid Chromatographer connected to a Fluorescence detector (HPLC-FLD). Antimicrobial properties were carried out using the agar diffusion method on solidified, freshly prepared Mueller Hinton Agar. A total of 12 species belonging to 7 genera; *Aspergillus* (*niger*, *flavus*, *fumigatus*, *ochraceus*), *Fusarium* (*oxysporum*, *vertcillioides*), *Mucor* (*racemosus*), *Penicillium* (*digitatum*, *expansum*), *Rhizopus* (*stolonifer*), *Rhodotorulla sp*., and *Trichoderma harzianum*, were identified as fungal contaminants. *Fusarium oxysporum* was the most predominant species identified. Fresh ginger recorded the greatest number of colony forming units (3.71 log10 CFU/g) with bay leaves recording the least number of colony counts (2.36 log10 CFU/g). Mycotoxin concentration detected in was 2.06 ± 0.07 µg/kg, dawadawa was 2.13 ± 0.09 µg/kg, however, mycotoxins were not detected in bay leaf and ginger. Ginger exhibited antibacterial activity against all bacteria ranging from 7.0 ± 0.0 mm to 12.0 ± 5.66 mm zones of inhibition. Ginger, bay leaves, and Gboma extracts displayed fair antimicrobial activity against the bacteria investigated. On the other hand, dawadawa generally produced the least resistance against the five bacterial species but exhibited the highest zone of inhibition. All samples were slightly acidic with pH readings ranging from 5.81 – 6.76.

Keywords: Spices, fungi, mycotoxins, aflatoxins, antimicrobial, herbs, Ghana

40. Survey of Knowledge, and Attitudes to Storage Practices Preempting the Occurrence of Filamentous Fungi and Mycotoxins in some Ghanaian Staple Foods and Processed Products

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Abstract

Mycotoxigenic fungi can infect and produce potent mycotoxins in foodstuffs prior to harvest, during harvest (field fungi), and in storage after harvest (storage fungi), which when ingested, can result in adverse health effects. This study was aimed at assessing the knowledge, attitudes, and practices adopted by the Ghanaian populace to help mitigate the occurrence of molds and mycotoxins in foods. A cross-sectional survey involving a structured questionnaire was conducted with 642 respondents from twelve regions of Ghana. Descriptive statistics and analyses of variance were calculated. Correct Classification Rate (CCR) was measured to assess the utility of a logistic regression model. The results of the study showed that the majority of 299 (46.6%) of the respondents were between the ages of 18-25. Age and educational level were related to knowledge about the occurrence of fungi and mycotoxins in foods ($p < 0.05$). More than half the respondents, 50% indicated that they knew of aflatoxins as a major mycotoxin present in food. Higher education directly influenced on the knowledge of mycotoxicosis and the management of stored food to present intoxication by fungal metabolites. 502 (32.9%) knew that consuming foods with toxins could cause stomach aches. The most commonly consumed food commodity despite the presence of visible growth of fungi was bread (35.3%). The average KAP score for knowledge showed that, out of 100%, there was adequate knowledge (63.8%) among the members of the Ghanaian populace. Favorable environmental conditions of high humidity (>85% ERH) and temperature (>28-32ºC) enhance the proliferation of fungi in most foods and the attendant production of mycotoxins such as aflatoxins, ochratoxins, and fumonisins are associated with several severe human and animal health conditions; mycotoxicosis was associated with high fever, pain, vomiting, suppression of immunity, cancer, etc. when these foods are consumed on regular basis for a prolonged length of time. Future examination of the food items used for the School Feeding Programme in Ghana will offer opportunities to examine the risks of feeding youth with fungal-contaminated food preparations from providers..

Keywords: Mycotoxins, toxicogenic fungi, knowledge, attitude, and storage practices, Ghana

41. Mycoflora, Aflatoxins and Antimicrobial Properties of Some Ghanaian Local Spices and Herbs

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Abstract
Fungi are significant contaminants and destroyers of spices. This study aimed at determining the mycoflora, mycotoxins, contaminants, and antimicrobial properties of some local spices; dawadawa (*Parkia biglobosa*), nutmeg (*Myristica fragrans*), turmeric (*Curcuma longa*), aniseed (*Pimpinella anisum*), ocimum (*Ocimum basilicum*) and clove (*Syzygium aromaticum*). Fungal culturing, identification, and enumeration were done with Dichloran Rose Bengal Chloramphenicol (DRBC). High-Performance Liquid Chromatographer with a Fluorescence detector (HPLC-FLD) was used to determine the aflatoxin levels in all spices. Mueller-Hinton Agar, chloramphenicol, normal saline, and extract were used with *Salmonella typhi*, *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, *Streptococcus mutans* to determine the antimicrobial activity of the spices (extracts). Twelve (12) fungal species belonging to seven (7) genera were recorded from the spices. The genera were predominantly; *Aspergillus*, *Fusarium*, *Rhizopus*, *Penicillium*, *Mucor*, *Trichoderma*, and *Rhodotorula*. Aflatoxins were detected in dawadawa only. Antimicrobial activity of the extracts had effective inhibition against the microbes investigated.

Keywords: Spices, fungi, mycotoxins, aflatoxins, antimicrobial, herbs, Ghana

42. Antimicrobial Activity, Acid, and Bile Salt Tolerance of Lactic Acid Bacteria Isolated From Fermented Ghanaian Traditional Beverage of Pearl Millet

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Abstract
Solom, a Ghanaian beverage, has potential probiotic lactic acid bacteria. Probiotics are live microorganisms that confer health benefits to the host when taken in adequate amounts. The lactic acid bacteria, as well as their probiotic potential in solom have not yet been characterized. This research aims to characterize the probiotic properties of isolated bacteria by studying antimicrobial activity, bile salt, and acid tolerance. The antimicrobial activity of the lactic acid bacteria was done by the agar well diffusion method. Zones of inhibition of clinical isolates of *E. coli*, *E. faecalis*, *P. mirabilis*, *E. gallinarum*, *K. pneumoniae*, and *E. cloacae* against the lactic acid bacteria isolates were measured. Acid tolerance was measured at pH 2.0, and 3.0 with 6.5 as the control. The $O.D_{600}$ were measured at 0 and 24 hours. Bile tolerance was measured at bile concentrations of 0.3 %, and 1 % with 0 % as control and the O. D_{600} measured. Against the clinical pathogens, except for *Enterococcus galinarum* and *Klebsiella pneumoniae*, all the lactic acid bacteria isolates elicited considerable zones of inhibition. After checking the survival of lactic acid bacteria under these stress conditions, all the lactic acid bacteria were bile salt and acid tolerant. Probiotics, produced by lactic acid bacteria, offer antimicrobial effects and the potential to reduce antibiotic use and combat antibiotic resistance.

Keywords: Lactic acid bacteria, Antimicrobial Activity, Acid Tolerance, Bile Tolerance.

43. Relationship Between Blood Glucose Levels and Refractive Status in Patients Attending the Diabetes Clinic at the Bono Regional Hospital, Sunyani

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Abstract

The study sought to determine the relationship between fasting blood glucose (FBG) levels and the refractive status of patients attending the diabetic clinic of the Bono Regional Hospital. A cross-sectional study was conducted on 168 randomly selected participants aged ≥ 18 years attending the diabetic clinic in July 2022 for routine assessment. FBG levels were checked and were categorized into hyperglycemic (>5.6mmol/L) and nonhyperglycemic (≤5.6mmol/L) with refractive status (RS) determined through objective and subjective refraction. Only right eye results were reported due to a strong positive correlation ($R(165) = 0.872$, $p < 0.001$) between spherical equivalent refraction (SER) of both eyes. Refractive status included hyperopia (SER ≥ +0.50), myopia (SER ≤ −0.50) and emmetropia (-0.50 < SER < +0.50). Descriptive statistics included means ± standard deviations, frequencies and percentages. Tests of associations were done using Pearson Chi-square and correlation analysis with a significance level set at $p<0.05$. Most participants were females (54.2%), hyperglycemic (76.2%) and aged 53 ± 17 years (range, 18 to 89 years). Mean FBG levels for all participants, hyperglycemic and nonhyperglycemic participants were 8.62±4.09, 9.85 ± 3.93, 4.67 ± 0.61 and mmol/L respectively (range, 3.4 to 24.4mmol/L). Hyperopia comprised 56.0% of all cases while myopia was 26.8% with the rest being emmetropic. Hyperglycemic participants were significantly more hyperopic (60.2%) than myopic (22.7%) or emmetropic (17.2%) ($p = 0.003$). A positive correlation existed between RS and FBG levels ($r =0.381$, $p < 0.001$) as well as hyperopia with FBG levels ($r = 0.445$, $p < 0.001$). A relationship between FBG and hyperopia was observed. Further research is required to better elucidate this relationship

44. Hydroethanolic Leaf Extract of *Cordia Vignei* Inhibits Adjuvant-Induced Arthritis in Sprague Dawley Rats

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Abstract

Rheumatoid arthritis is a chronic inflammatory disease of the joint. Its prevalence is approximated to be 0.6-1% in the United States and 0.5-1% in the developed countries. Due to complexity of the disease, combinations of drugs of different classes and mechanisms are employed in treatment. Chronic intake of these synthetic drugs often incurs potential health threat to the patient. Medicinal plants are therefore being explored as alternative or complementary treatment. The aim of this study is to investigate potential benefit of *Cordia vignie* in this debilitating disease. Adjuvant arthritis was induced by inoculation of 100 µL complete Freund adjuvant (CFA)/paw of male Sprague Dawley rats. Rats were treated with either normal saline (10 $mlkg^{-1}$), dexamethasone (0.1-1.0 $mgkg^{-1}$) or *Cordia vignie* extract (CVE; 30 -300 $mgkg^{-1}$) 1 h before inoculation (prophylactic) or 10 days after inoculation (curative) and proceeded up to day 28. Paw thickness, body weight, joint damage, haematological and biochemical profiles were assessed. Excised joints were decalcified, sectioned and stained for histopathology. CFA induced significant body weight loss which was not reversed by treatment with dexamethasone or CVE in the curative protocol. In the prophylactic study, only dexamethasone prevented CFA-induced weight loss. Both dexamethasone and CVE significantly ($P < 0.05$) reversed CFA-induced paw swelling in both prophylactic and curative studies. CVE significantly attenuated CFA-induced bone erosion and also reversed elevation of lymphocytes and neutrophils by CFA. Histopathology showed that CVE significantly reduced inflammatory cell infiltration and cartilage destruction and maintained joint architecture. We conclude that CVE attenuated adjuvant arthritis in rats and this effect could be exploited for future treatment of rheumatoid arthritis.

45. Quality Assessment of Yaji Spice Mix in KNUST and its Environs

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Abstract

Yaji spice mix is a popular seasoning blend used in West Africa for grilled meats and fish. This study assessed the microbiological and physicochemical quality of Yaji spice mix samples from Kwame Nkrumah University of Science and Technology (KNUST) and its environs. Physicochemical parameters, including moisture content, water activity and microbiological parameters such as Total Aerobic Plate Count (TAPC) and Total Yeast and Mould were analysed. There were no E. coli and Salmonella spp. in any of the samples. However, the highest Total Aerobic Plate Count (TAPC), indicating mesophilic bacteria load, was in sample A2 from Ayigya (6.36 ± 0.02 log cfu/g) ($P < 0.05$). Except for one sample, all exceeded the TAPC limit (5 log cfu/g) according to GS955:2019. The highest Total Yeast & Mold count (TYM) (4.24 ± 0.03 log cfu/g) was found in sample KT from Kotei, surpassing the limit (3 log cfu/g) according to GS955:2019. Additionally, this sample had the highest moisture content. In conclusion, these results indicated unacceptable levels of Total Aerobic Bacteria in the evaluated Yaji spice mix samples, posing microbiological safety concerns. The findings suggested inadequate hygienic practices during preparation by the vendors, leading to increased microbial load. The high moisture content and water activity in the spice mix may have contributed to microbial contamination. This emphasizes the need for improved hygiene practices in the preparation and storage of Yaji spice mix in KNUST and its environs. Future efforts should focus on implementing quality control measures to ensure the safety of this popular seasoning blend.

Keywords: Yaji, Safety, Quality, Microbiological, Physicochemical

46. Zoonotic Gastrointestinal Parasites of Wild Mammals in Two Wildlife Sanctuaries in Central Ghana

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Abstract

Parasitic diseases in wildlife species represent an important field of investigation as they may significantly impact the health and survival of wild species, with great potential to impact on human health. Several intestinal parasites of wild mammals are of zoonotic importance, especially in areas with frequent interaction between animals and humans. Handling and consuming wildlife species may expose humans to the infective stages of these parasites. To identify the gastrointestinal parasites of zoonotic and public health importance in wild mammal species in Bomfobiri Wildlife Sanctuary and Boabeng Fiema Monkey Sanctuary, fecal samples were collected from 174 animals belonging to nine species that serve either as tourist attractions or for bush meat. Examination of samples by flotation and microscopic techniques revealed one protozoan species, one trematode, three cestodes, and six nematode species respectively. 143 animals (82.2%) tested positive for at least one gastrointestinal parasite, 19.5% of which were single infections and 62.6% co–infections. The most predominant parasite was *Trichuris*, with rare cases of *Moniezia* in Colobus and Mona monkeys observed. The results highlight the presence of zoonotic parasites in wild mammals. It is essential to ascertain the transmission dynamics and impact of these parasites in mammals in various wildlife sanctuaries and protected areas in Ghana.

47. *Enterococcus Spp.* in Heathy Pigs in the Greater Accra Region: Antimicrobial Resistance Patterns and Implications for Public Health

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Abstract

Enterococcus spp. represent an important gram-positive group used severally as an indicator for faecal contamination of water, and antimicrobial resistance (AMR) in animals and is also a WHO priority pathogen. In the context of AMR, the food chain is considered as one avenue where resistant bacteria can be passed on through meat products contaminated with bacteria from the gut contents of animals. Cross-contamination in food preparation and poor hygiene could also be contributors to the transfer of antimicrobial-resistant *Enterococcus* spp. from animals to humans. However, there is no published work on the presence and AMR patterns of *Enterococcus* spp. in healthy pigs in Ghana. Thus, this study sought to answer questions in this regard. From 140 frozen rectal swab samples of apparent healthy pigs collected from 14 farms in the Greater Accra region between January to March 2022, we employed standard microbiological techniques to isolate and identify *Enterococcus* spp. Using the disc diffusion method, 94 confirmed isolates were tested against six antimicrobials (ampicillin 10µg, vancomycin 30 µg, ciprofloxacin 5 µg, erythromycin 15 µg, tetracycline 30 µg and linezolid 30 µg) according to CLSI guidelines. Enterococcus spp. were least resistant to ampicillin (11.7%) and vancomycin (14.9%), whereas higher resistance to erythromycin (67%) and ciprofloxacin (55.9%) was observed. Multidrug resistance was present in about a quarter (23.4%) of all isolates tested. These study findings, though preliminary, indicate the need to continually advance good antimicrobial stewardship and proper hygiene to avoid the proliferation of AMR bacteria.

Keywords: *Enterococcus* spp., healthy pigs, farms, antimicrobial resistance

48. Prediction of Compressional Sonic Log in the Western (Tano) Sedimentary Basin of Ghana, West Africa using Ensemble Supervised Machine Learning Algorithms

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Abstract

Sonic logs are essential for determining important reservoir properties such as porosity, permeability, lithology, elastic properties, etc. and yet may be missing in some well logging suites due to high acquisition costs, borehole washout, tool damage, poor tool calibration, or faulty logging instruments. The absence of these logs in hydrocarbon reservoirs may lead to poor understanding of the reservoirs and consequently poor reservoir evaluation and performance. This study aims at predicting the compressional sonic log (DT) based on commonly acquired logs using machine learning algorithms. Gamma ray, resistivity, density and neutron-porosity logs from three wells in the Western Basin of Ghana were preprocessed to remove outliers and thereafter, the logs from two of the wells were used to train and test the machine learning algorithms (Extreme Gradient Boosting (XGBoost), Light Gradient Boosting (LightGB) and Categorical Boosting (CB)). The algorithms were then validated by deploying them on the logs in the third well to predict the sonic log. All three algorithms successfully predicted DT as the predicted logs strongly correlated with the original logs in the wells. However, CB exhibited the best performance having the highest coefficient of determination, R2 (0.9123) and the lowest Mean Absolute Error, MAE (0.03327), Mean Squared Error, MSE (0.00262) and Root Mean Squared Error, RMSE (0.05122) as compared to the XGBoost and LightGB algorithms. The R^2, MAE, MSE and RMSE for XGBoost were respectively 0.9069, 0.03590, 0.00279 and 0.05278, making it more accurate than LightGB which had R^2, MAE, MSE and RMSE to be 0.89843, 0.03798, 0.00304 and 0.05512 respectively. The outcome of this study proves that machine learning is a valuable tool for oil and gas Exploration and Production.

Keywords: Extreme Gradient Boosting, Supervised Machine Learning Algorithms, Sonic log prediction, Well logging, Regression.

49. Prevalence of Pharmaceuticals in Surface Water Samples in Ghana

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Abstract

Pharmaceuticals, among the emerging contaminants, are pseudo-persistent and recently of serious concern due to universal use, toxicity, and resistance development at low concentrations. This study was aimed at assessing the prevalence and risk of eight pharmaceuticals in surface water used for vegetable irrigation in Ghana's Kumasi and Sunyani metropolises, which are influenced by hospitals, sewage treatment facilities, and market effluents. Samples were concentrated via solid-phase extraction (SPE) while liquid chromatography was used to identify and quantify the analytes. Ibuprofen, acetaminophen, and diclofenac were the detected analgesics in this study, with concentrations stretching from below the detection limit (not detected) to 319.0 ng/L, while amoxicillin, trimethoprim, and cefuroxime were the detected antibiotics with a concentration range of no detection to 840.0 ng/L. Based on the available long-term data, an environmental risk assessment was conducted. Because of the presence of ibuprofen, the lowest trophic level and fish were shown to be at risk. The estimated risk quotient values for antibiotics resistance were above 1 for all the antibiotics investigated in surface water impacted by the wastewater of hospitals and pharmaceutical companies except surface water impacted by sewage treatment plants (STPs) and market wastewater. The existence of these pharmaceuticals in surface water does not only point to a general concern for the environment but also a potential health risk on humans and other lives as a result of their impact on drinking water and vegetable production in Ghana.

50. Global Disasters Forecasting: A Time Series Machine Learning Approach

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Abstract

Floods and storms are some of the most damaging natural disasters which are caused by climate change with its numerous effects on various societies. Without drastic action toward the occurrence of these disasters now, adapting to their impacts in the future will be more challenging. To forecast the frequency of the most important catastrophes and assess whether there is an increasing trend in the time series of these phenomena, the Autoregressive Integrated Moving Average (ARIMA) and the Error Trend Seasonality (ETS) were used. A dataset from 1900 to 2021 was used and split into a training dataset and a test dataset. The (ETS) and the (ARIMA) are compared by computing forecast errors. The (ARIMA) model outperformed the (ETS) model on the test dataset, yielding a MAPE of 14% against 17%, and an RMSE of 15% against 17%. The ARIMA (2,1,0) with drift predicts averagely an estimated value of 186 floods in 2023 and 193 by the end of 2031 with an 80% and 90% confidence interval. With ARIMA (2,1,2) with drift, on average 112 storms are predicted for 2023, and 112 by the end of 2031, which gives an indication of stabilization in the frequency of storms. This study shows the potential use of machine learning algorithms for long-term planning in natural disaster management.

51. A Link Between the Series Method and Frobenius Method - A Blended Approach

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Abstract

This paper is innovation-driven, which is motivated in establishing a link between the series method which is suitable for handling ordinary differential equations (ODE's) about an ordinary point and the Frobenius method that works more effectively on differential equations about a regular singular point. The methodology we aim at adopting in establishing a possible shift from the series method into the Frobenius method, without the neglect of the structure of the series method due to a glitch around essential or regular singular point in favor of the Frobenius method is inspired and hinged on transforming the differential equation of interest into an equidimensional equation. The Blended or Mixed approach kick starts by expressing the differential equation with variable coefficients into groups of Cauchy-Euler equations rather than Taylor series. This predetermines at least an indeterminate coefficient from the leading term of the recursion obtained by initially assuming the series method solution form and then modifying its index counter to transition into the Frobenius series solution of a given non- constant second order differential equation. The advantage of the Blended Approach over these two well-known series solution methods is remarkably simple, since the coefficients of the series so formed are easily found and the resulting solution clearly mimics the Frobenius series solution. The theory of Frobenius method have four main possible solutions associated to the indicial roots, however for the Blended approach, all these are captured even though two of such unique solutions summarizes into one case, irrespective of whether the indicial roots differ by an integer or not. In fact, such roots produce two independent solutions under this new approach regardless of the difference in the choice of indeterminate coefficients found for the generation of all the unknown coefficients. Furthermore, this new method could be viewed as a means of curing the defect involving singularities associated with differential equation in the use of the series method whiles at the same time exhibiting the characterization of the Frobenius series solution.

52. Smart Soil Moisture Content Management Solution for Urban Farms in Developing Countries

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Abstract

Urban farming in developing countries grapples with challenges arising from manual irrigation, high water costs, and water scarcity. While the adoption of smart irrigation and precision agriculture techniques is necessary, the associated setup expenses often hinder their implementation. However, with the decreasing costs of Internet of Things (IoT) hardware, an alternative solution becomes viable. This study proposes a smart soil moisture content management system for urban farms in developing countries. The system employs a soil moisture meter developed with an Arduino microcontroller and a mobile app that allows farmers to record and monitor soil moisture information. The app utilizes an AI model to predict critical moisture levels, providing farmers with valuable insights on when to irrigate their crops. The proposed smart soil moisture management solution offers several benefits for sustainable urban farming practices. The solution helps farmers effectively manage scarce water resources. Additionally, it minimizes production costs by optimizing irrigation schedules, ensuring that crops receive the necessary moisture while avoiding over-irrigation. This, in turn, enhances productivity and supports food production in regions facing food insecurity challenges. Specifically, the solution contributes to SDG 2 (Zero Hunger) and SDG 1 (No Poverty) by enhancing food security, minimizing production costs and improving agricultural practices.

53. A Comparison of the Quality of Smoked Fish Produced in Traditional and Improved Ovens in Ghana

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Abstract
A number of traditional fish smoking ovens can be in found Ghana with the Chorkor oven been the most popular. Several studies have, however, reported that smoking fish using the Chorkor oven has both health and environmental implications through the presence of high levels of PAH in the smoked fish and the excessive generation of smoke, respectively. In this regard, the Ahotor oven was developed to help address some of the challenges associated with the Chorkor oven. This study was aimed at comparing the quality of fish smoked using the Ahotor oven to that of the Chorkor oven. Using Atlantic chub mackerel, fish smoking was carried out at two locations using both Chorkor oven and Ahotor oven, and a comparison of the physicochemical quality, shelf life and sensory attributes of smoked fish was carried out. There was no effect of smoking oven type on proximate composition, pH, Brix and hardness. However, fish smoked using Chorkor oven had higher browning index, peroxide value, total volatile basic nitrogen, histamine levels and polycyclic aromatic hydrocarbons (PAHs) levels. No differences in scores for appearance, aroma, taste, and texture was observed following sensory analysis although attributes such as smoky, burnt and brown were used to describe fish smoked using Chorkor oven.

Keywords: Ahotor oven, Chorkor oven, Smoking, Fish Quality, Sensory analysi

54. Frequency Ratio-Based Flood Vulnerability Modeling over the Greater Accra Region of Ghana

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Abstract
Flood occurrence is naturally annihilating, with enormous consequences on human lives, properties and resources. Thus, its occurrence worldwide, has serious environmental and socio-economic implications. Hence, the incorporation of an all-encompassing flood management scheme is indispensable to mitigate the effects of the flood on human lives, resources and other livelihoods. The preliminary objective of this study is to assess the vulnerability of the Greater Accra Region of Ghana to flooding by applying the frequency ratio modeling technique to integrate nine conditioning factors derived from climatic and remote sensing datasets. The nine conditioning factors, which comprise the slope aspect, topographic roughness index, topographic positioning index, stream power index, sediment transport index, profile curvature, LS factor, rainfall and drainage density were employed in outlining various flood prone zones within the study area using geographic information systems. 70% of flood inventory (training) data were chosen randomly to produce the flood susceptibility model. The remaining 30% of the flood inventory (validation) data were employed to validate and evaluate the efficacy of the flood vulnerability results generated. The flood vulnerability model was discretised into five classes of very high, high, moderate, low and very low zones representing respectively, 21.21%, 9.41%, 10.95%, 13.53% and 44.90% of the total study area size . This was succeeded by applying the area under the receiver operating characteristics (AUROC) curve on the output generated to assess its performance and accuracy. An AUROC score value of 0.788 was obtained, which shows that the model generated is accurate for the study area.

55. Bayesian Multilevel Perspective of Overweight/Obesity Status Risk Factors among Reproductive Age Women

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Abstract

Multilevel models within the Bayesian framework present much flexibility in explaining complex relationships in hierarchically structured data, mostly in public health and epidemiology. This study aimed at accounting for the disparity in overweight/obesity risk and, to identify significant risk factors for overweight/obesity among reproductive-age women through the Bayesian multilevel model. Data on 4,393 women together with their socio-demographic characteristics from the cross-sectional 2014 Demographic and Health Survey of Ghana were analysed. The intraclass correlation value of 0.164 implies that at least 16% of the total variance of a selected woman to be overweight/obese is explained by cluster differences. Model results showed that significant risk factors for overweight/obesity among reproductive age women are attainment of higher education (aOR= 1.62; 95% CI: 1.42, 2.17), living in households in the middle (aOR= 2.89; 95% CI: 2.36, 3.60) or rich (aOR= 5.65; 95% CI: 4.62, 6.95) wealth brackets, increase in age, being married (aOR= 1.67; 95% CI: 2.36, 3.60), widowed or divorced or separated (aOR= 2.05; 95% CI: 1.52, 2.80). The Bayesian multilevel model demonstrated good predictive ability based on the leave-one -out cross validation measure. The high prevalence of overweight/obesity requires urgent public health interventions to prevent future public health burden. Efforts to encourage lifestyle modification and public health education on the consequences of overweight/obesity are needed to solidify the gains of ensuring a healthy population by 2030 (SDG 3).

Keywords: Bayesian, Multilevel, Hamiltonian Monte Carlo, Intraclass Correlation, Credible interval, Obesity

56. Citizen Science Approach to Home Radon Testing in the Offinso Municipality, Ghana

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Abstract

In order to reduce lung cancer due to radon exposure situations, not only authorities and Organisations but also citizens may meaningfully contribute to radon mitigation actions. Radon is a prominent cause of lung cancer worldwide, however, few people have their homes tested for radon. Using a citizen science approach, this study recruited and trained a convenience sample of 80 non-scientist homeowners from four communities in the Offinso Municipality to test their homes for radon using a low-cost continuous radon detector and participate in a focus group discussion to evaluate their testing experience. The objective of this project was to utilise the power of citizen science to engage the public in research and, if necessary, to drive action. Although there was a significant increase in citizen scientists' perceived ability to contact a radon mitigation professional, there was no change in citizen scientists' beliefs that radon mitigation would reduce the risk of radon exposure, nor was there a change in their capacity to hire a radon mitigation professional over time. Radon-related Citizen Science efforts' experiences and lessons learned are recognised and addressed in order to inspire future Citizen Science initiatives that may contribute to lowering radon exposure and implementing national radon action plans.

Keywords: radon, lung cancer, citizen science, detector, mitigation

57. La Doped ZnO/G-C_3N_4 Van Der Waals Heterostructure's Electrical, Optical, and Structural Characteristics Modified for Photodegradation of Bromothymol Blue Dye in Water

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Abstract
Using semiconductor-based photocatalysts, organic contaminants in wastewater are reduced to CO_2 and H_2O, however, these systems have moderate selectivity, a small surface area, and considerable electron-hole pair recombination. A visible light-responsive photocatalyst with a high surface area, a low bandgap, less electron-hole pair recombination, and a porous structure may be made using La-doped ZnO/g-C_3N_4 nanocomposites. In this study, the energy band structure, optical properties, and charge transfer of the ZnO/g-C_3N_4 and La-doped ZnO/g-C_3N_4 heterostructures were fully computed using a hybrid density functional theory technique. DFT calculations using the plane wave basis set and optimized norm-conserving Vanderbilt pseudopotentials were carried out using the Quantum Espresso V.6.4 package. With the G-centered k-point grid of 7 x 7 x 1, for structural optimizations for sampling the first Brillouin zone, a kinetic energy cutoff of 55 Ry was set to expand plane waves, resulting in an energy convergence of 10-6 Ry. The band gaps for g-C_3N_4, ZnO, ZnO/g-C_3N_4 and La-doped ZnO/g-C_3N_4 composites were computed to be 2.69 eV, 3.36 eV, 2.85 eV and 2.44 eV, respectively, and were consistent with the experimental results. The study investigated the photocatalytic action of the nanocomposites under visible light irradiation using bromothymol blue as a module dye. La-doped ZnO/g-C_3N_4 nanoparticles demonstrated discernible photocatalytic performance, with the 0.6% La-doped ZnO/g-C_3N_4 exhibiting the best degradation percentage of 92% in 180 minutes and a rate constant of 1.68 x 10^{-2} min^{-1}.

Keywords: Semiconductor, Photocatalyst, Band gap, Nanocomposite, DFT

58. Hydrogeochemical Characteristics of Dahomeyan Formation Aquifers in the Greater Accra Region, Ghana

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Abstract
The demand for potable water cannot be underemphasised as it has led to the drilling of large numbers of boreholes in many homes in most parts of the Greater Accra Region and yet the quality of this source of water has not been adequately established for supply. In the wake of this, anthropogenic activities such as industrial and households waste threaten the quality of the available groundwater. This study aimed at assessing the factors that control groundwater chemistry and the quality of the water for agricultural and domestic purposes. A total of 49 groundwater samples were collected and analysed for major and minor ions. Water Quality index (WQI) was employed to evaluated to assess groundwater for domestic purposes. Sodium adsorption ratio, sodium percent and magnesium hazard were deployed to assess the quality for irrigation purposes. Results obtained revealed that ions in the groundwater system occur in the order $Na^{2+} > K^{+}. > Ca^{2+} > Mg^{2+}$ and Cl- $> HCO_3^{-} > SO_4^{2-}$ respectively for the major cations and anions. The water types Na-Cl, Ca-Mg-Cl and Ca-Cl identified indicate the influenced of rock weathering and evaporation/crystallization. The Multivariate statistical analysis revealed four (4) major groupings, suggesting that there is varying geochemical control sources, influenced by anthropogenic and geogenic activities. The high content of Na and Cl in the groundwater in some localised regions of the study area renders it unsuitable for domestic and agricultural use. The study revealed that about 55.5% of the groundwater is suitable for irrigation purpose

Keyword: Groundwater quality, Dahomeyan formation, Geochemical Processes, Hierarchical Cluster Analysis, Irrigation

59. A Comparative Study of the Assessment of Indoor Radon Concentrations with Radon Concentrations and Radon Exhalation Rates in Soil Samples from the Traditional Main Halls in the University of Ghana Campus

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Abstract

Indoor radon exposure has been identified as a significant health concern due to its potential carcinogenic effects. In this study, we present a comparative investigation of indoor radon concentrations with radon concentrations and exhalation rates in soil samples collected from the traditional main halls within the University of Ghana. The primary objective of this research was to assess the potential risk of elevated indoor radon levels emanating from the underlying soil in the campus vicinity . The study involved the measurement of indoor radon concentrations in selected traditional main halls using the passive method. Concurrently, soil samples were collected from the immediate surroundings of these buildings to determine radon concentrations and exhalation rates. From the results, the average soil radon concentration ranged from (166.26 - 222.20) Bq m^{-3} with a mean of (189.96 ± 23.12) Bq m^{-3}. The average surface exhalation rate ranged from (10.94 -14.62) µ Bq m^{-2} h^{-1} with a mean of (12.50 ± 1.52) µ Bq m^{-2} h^{-1}. The average mass exhalation rate was (3.17 ± 0.39) µ Bq kg^{-1} h^{-1}. Indoor radon concentrations obtained ranged from (12.25 - 939.10). Bq m^{-3} with mean concentration of (353.92) Bq m^{-3}. The findings from this study will contribute to the understanding of the factors affecting indoor radon concentrations in the University of Ghana campus and offer valuable insights for radon mitigation strategies in similar educational institutions. Furthermore, this research emphasizes the importance of periodic radon monitoring and highlights the need for awareness and potential interventions to reduce indoor radon exposure.

60. Extraction and Characterization of Watermelon (*Citrullus Lanatus*) Seed Oil as a Potential Feed for Biodiesel Production

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Abstract

To promote sustainable and environmentally friendly energy, researchers continue to search for suitable but non-food feedstock for biodiesel production. Watermelon seed offers one of such potential feedstocks. Different feedstocks can have different chemical compositions and fatty acid profiles, which can impact the characteristics of the resulting biodiesel. In this study, Watermelon seed oil (*Citrullus lanatus*) was extracted, characterized and investigated for its suitability as a potential feedstock for biodiesel production. The seed-oil was extracted with n-hexane at a temperature between 60 and 70°C. The determination of the following physicochemical properties: pH, density, iodine, saponification, acid and free fatty acid values of the oil sample were carried out according to acceptable standards. The extraction yield of the yellowish-brown oil was 46.8%. The saponification and iodine values were 182.04 mgKOH/g and 26.42 gI_2/100g respectively. The acid and free fatty acid values were 12.96 and 6.81 mgKOH/g respectively. A pH of 5.62 density of 0.85 g/cm^3 and a specific gravity of 0.92 were recorded accordingly. The results were not only within the acceptable standards of the American Society for Testing and Materials (ASTM) but also revealed the potential of the extracted watermelon seed oil as a suitable biodiesel feedstock.

61. Radon: Communicating Risk, A Case Study of Weija, Kasoa and its Environs in the Greater and Central Regions of Ghana

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Abstract
The second largest cause of lung cancer is radon, an environmental contaminant, with smoking being the primary cause. Radon risk communication has several challenges and necessitates a range of risk communication methodologies and strategies. People's levels of awareness and interest in radon exposure and its health implications vary. We investigated how 150 people interested in radon testing differed in their reaction to public health information about radon and their subsequent decision to test. Surprisingly, the majority of respondents in this study had limited comprehension of the radon hazard and hence took no precautions while living in radon-prone areas. Only 10% were prompted to radon test after 1 encounter with awareness information, while 35% required 2 – 5 encounters over several months, and 55% needed 6 to > 10 encounters over many years. The primary purpose of this paper is to emphasize the significance of developing targeted demographic messaging in order to create an effective radon awareness programme.

Keywords: radon, lung cancer, smoking, communication, national

62. Microbial Quality and Safety of Fresh-Cut Fruits Sold in Cape Coast, Ghana

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Abstract
In recent times, many people prefer to purchase fruits that have undergone minimal processing probably due to lack of time and convenience. Freshly cut fruits are ready-to-eat food, but they can also be a source of contamination. Street fruit sales are common in most African countries and greatly increase the risk of microbial contamination for consumers. This study sought to identify various bacteria, fungi and risk factors linked to fruits sold by street vendors and to evaluate the hygienic practices of fresh-cut fruit handlers in the Cape Coast Municipality in the Central Region of Ghana. Fresh-cut fruit contamination can be caused by the handlers. Sliced watermelons, pineapples and mangoes were purchased from selected markets in the Cape Coast metropolis and microbial analysis on the total aerobic bacteria plate count and total coliform count was performed on them in the laboratory. The mean total aerobic plate count ranged from 2.13 x 103 to 6.43 X 104 CFU/g while fungal count ranged from 4.50 x 102 to 4.67 x 10 3 CFU/g and total coliform count ranged from 1.79 x 103 to 1.32 x104 CFU/g. High percentages of bacterial and fungal species isolated were: *Staphylococcus aureus*, *Bacillus species*, *Escherichia coli*, *Salmonella species*, *Aspergillus niger*, *Aspergillus fumigatus* and *Saccharomyces cerevisiae*. As bacterial agents that cause food poisoning were isolated from them, these findings imply that the majority of fresh-cut fruits sold in Cape Coast may be related to public health issues.

Keywords: Coliform, count, aerobic, fresh-cut, bacteria.

63. Influence of Okra Pectin on the Physicochemical and Consumer Acceptability of Bread

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Abstract

Okra (*Abelmoschus esculentus* L.) pectin is known to have functionalities such as emulsifier, fat substitute and stabilizer in various food systems. However, the usage of okra pectin is yet to be explored in the bread-baking industry. The objective of this study was to determine the effect of okra pectin on the physical, chemical and sensory properties of bread. The okra pectin from three different genotypes (namely, Agbagoma, Nigeria and Balabi) were used in the bread formulations at 0% (Control), 0.2%, 0.5% and 1%. The consumer acceptability test was done on a 9-point hedonic scale using 30 panellists. The consumer acceptability of the bread samples varied in the range of 6 to 8 depending on the genotype and concentration of okra pectin used. The bread samples containing pectin had lower fat content, higher protein and retained more moisture than the control. The addition of the pectin to the formulation influenced the appearance/colour, texture and mouth feel of the bread. The specific volume of bread increased with the increasing pectin concentration studied and was highest in the samples containing Agbagoma. The findings indicate that okra pectin can be utilized in the bread-baking industry to improve upon bread quality attributes acceptable to consumers.

Keywords: okra pectin, bread; physicochemical properties, consumer acceptability.

64. A Geometric Morphometric Study of Ecological Populations of the Fruit Fly, *Batrocera Invadens*, from Ghana

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Abstract

In 2003 a member of the fruit fly genus Bactrocera was detected in Kenya and described as *Bactrocera invadens*. In 2005 same species was detected in Ghana and has spread throughout the country. In 2010 this species was synonymized with *Bactrocera dorsalis* but for purposes of distinction and identification, we continue to use the former name of this pest throughout this manuscript. Geometric Morphometrics captures the geometry of the structure enabling you to utilize shape information to remove variation in translation and rotation of the targeted structure. We report how landmark-based geometric morphometrics of wings was used to discriminate populations of *Bactrocera invadens* collected from four agro-ecological zones in Ghana. Wing images from 706 male B. invadens were captured with a camera coupled to the stereomicroscope using the Leica Application suite version 3.4.1. All the images were used to generate a TPS file using the TPS utility program and exported into TPS Dig, version 1.40 to facilitate digitization of landmarks. Raw 'x' and 'y' coordinates were imported into Morpho J 1.07a for the analyses. Procrustes ANOVA and Partial Least Scores were used to determine the significance of variations among the populations. To further assess the variation among populations, multivariate statistical analyses (Procrustes Fit, Principal Component Analysis, and Discriminate function analysis) were used. Junction of vein R4+5 and r-m cross vein was the principal component 1 responsible for 36.1% of the observed variability. Populations within Guinea Savannah (Northern) zone were more like populations within the Transition zone than any other zone. Significant variations were observed between Northern populations and Southern Populations. Our findings Geometric morphometry shows population segregation among populations from the different ecological zones and more significantly between populations from the Guinea Savannah zone and the Coastal Savannah zones. This segregation may result in possible population subdivisions that can affect mating compatibility among populations and the spread of desired genes especially when implementing a control strategy with a SIT component.

Keywords: Geometric, Morphometry, Bactrocera, Invadens, Fruit fly.

65. Modelling Rice Yield from Biochar-Inorganic Fertilizer Amended Fields

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Abstract

High concentration of atmospheric CO_2 is noted to increase yield by improving upon nutrient uptake and water use efficiency of plants. Temperature variations also affect plant growth and eventually crop yield as it affects respiration and photosynthesis. Soil fertility is an important parameter affecting the production of most crops. Field experiments are often time-consuming and involve a lot of drudgery. This research was therefore conducted to model the quantities of biochar-inorganic fertilizer combinations that give optimum yields of rice and assess the effect of changes in climatic parameters on the yield of rice. The CERES-Rice model was used to simulate the yield of rice using different combinations of biochar-inorganic fertilizers as soil amendments. Effects of changes in climatic parameters on the yield of rice were also simulated. The average simulated yields were 1.5 t/ha, 5.6 t/ha and 5.5 t/ha for treatments with 0 t/ha, 20 t/ha and 30 t/ha of biochar respectively. Increasing carbon dioxide concentrations generally led to an increase in the simulated yields of rice by 0.18%. It was observed that increasing temperature resulted in a reduction (7.64% to 34.67%) in rice yield for the various treatments. The model predicted accurately, the yields of rice upon the addition of the biochar-inorganic fertilizer with the treatment having 25% of the recommended rate of inorganic fertilizer and 20 t/ha of biochar giving the best yield. Simultaneous increases or decreases in all the climatic parameters resulted in a decline in the yield of rice.

Keywords: Climate, Modelling, Rice, Biochar, Fertilizer

66. Dose-Response of Biochar Inclusion on in Vitro Rumen Fermentation Characteristics and Methanogenesis from *Brachiaria Mulatto* II

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Abstract

Quantifying Methane (CH_4) from animal agriculture in Sub-Saharan Africa is limited due to a number of reasons although substantial amounts of these gases are perceived to be released from the sector. Efforts at mitigating emissions have centered on dietary manipulation strategies aimed at reducing rumen CH_4 emissions either *in vivo* or *in vitro*. This study assessed the dose-response of biochar produced from rice husk (RHB) inclusion *in vitro* Volatile fatty acids (VFAs), Ammonia-Nitrogen (NH_3-N) and CH_4 production from *Brachiaria mulatto II (BM)*. Whole BM at 60, 90 and 120 harvest days (HD) were each mixed with 0, 15 and 30 g/kg RHB in a 3x3 factorial arranged in a completely randomized design with three replications. Methane emissions were determined using the Pascal manometric glass tube method, NH_3-N by Nessler's reagent method and VFAs determined using a spectrophotometer. Lactic acid, NH_3-N, Methane and Total volatile acids (TVA) production were significantly ($p < 0.05$) affected by RHB inclusion. Biochar inclusion at 15 g/kg increased methane production but at 30 g/kg inclusion, methane was lowered for all HDs. A similar trend was observed for acetate, butyrate and propionate production after RHB inclusion. Methane production at 0, 15 and 30 g/kg RHB inclusion levels ranged from 49.18-53.81%, 51.18 - 55.06% and 48.64 - 51.44% respectively. TVA production at 0, 15 and 30 g/kg RHB inclusion levels ranged from 35.77-58.11 mmol/100g, 37.53 - 59.88 mmol/100g and 39.43 - 54.03 mmol/100g respectively. The changes in methane emissions after the inclusion of biochar indicate its potential for use as a methane-mitigating feed additive in ruminant diets.

Keywords: Methane, Rice husk, additive, manometric, volatile fatty acids.

67. Fall Armyworm Infestation in Ghana: Farmers' Knowledge, Impacts and Management Practices in Two Major Maize Enclaves

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Abstract

The fall armyworm, *Spodoptera frugiperda* is one of the calamity pests in agriculture with significant damage to food crops. Its infestation poses a threat to food security suggesting a need for urgent interventions. In this study, a questionnaire survey was conducted among farmers to assess their knowledge, attitude and practice on fall armyworm infestation to inform decisions towards management. From the results, most respondents were males (71.4% and 69.7% for Ejura and Ejisu respectively). While a larger number in Ejura (37.7%) belonged to the 31 – 45 years age group, those in Ejisu (41.4%) were mostly in the 46 – 60 years age group. Most respondents in both districts (64.3% in Ejura, 74.2% for Ejisu) had farming as their only occupation with some having additional occupations. Respondents had considerable knowledge (97.5% in both districts) of fall armyworms with a majority considering them to be invasive to Ghana. Fall armyworms infested the farms of respondents and maize was the major crop attacked. While the major effect of infestation was a reduction in crop yield in Ejura (mean = 1.07), farmers in Ejisu indicated a reduction in plant growth as the major impact (mean = 1.39). For control, chemical insecticide was found to be used by the majority of respondents in both districts (46.7% in Ejura and 98.0% in Ejisu). The study, thus, revealed farmers have much awareness of fall armyworms, their infestation and their impacts. Infestation, however, had varying effects in districts with farmers mainly employing chemical insecticides in managing infestation. This study provides information on the knowledge, attitude and practice of maize farmers in two key maize enclaves in Ghana, a good background for fall armyworm management decision-making.

68. Towards Aquaculture Production: Genetic Evidence of the Unique Identity and the Population Structure of the West African Mangrove Oyster (*Crassostrea Tulipa*) from the Gulf Of Guinea

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Abstract

A good understanding of the genetics of natural populations of fish is necessary for current conservation needs, and for the proactive management of potential impacts which could emerge from diversification through aquaculture activities. Thus, in this study, we established the genetic identity of *C. tulipa*, and the phylogenetic relationship between it and other *Crassostrea species*, to help clear the long-standing confusion of being a synonym of *C. gasar*. Also, the population structure of *C. tulipa* was investigated utilizing mitochondrial cytochrome oxidase I (COI) genes and microsatellites as markers, at four geographic locations in Southern Ghana. Results from this study provide for the first time, genetic sequences for *C. tulipa* which have been deposited at the GeneBank. The *C. tulipa* species were distinctively differentiated from other species of Crassostrea and consistently formed a different clade from *C. gasar* with no bootstrap value supporting their similarity. A mutation value as high as 288, a haplotype diversity of 0.893, and a genetic distance (1.40-1.55) were recorded between *C. tulipa* and *C. gasar sequences*. For population structure, Volta and Densu populations recorded the same values for expected heterozygosity (He), 0.125 and Shannon's information index (I), 0.173, whiles Nakwa and Whin were also the same, with He of 0.042 and I of 0.058 representing relatively low genetic diversity. AMOVA revealed moderate genetic differentiation among populations (6.0% of total variance, $P = 0.001$), consistent with the gene differentiation coefficient ($FST = 0.069$) and gene flow ($Nm = 3.39$). The *C. tulipa* population in Ghana based on its current low diversity requires in-situ conservation and ex-situ germplasm collections for resource protection.

Keywords: COI gene; Phylogenetic/Haplotypes Analysis; Microsatellite marker; Crassostrea tulipa

69. Household Factors Influencing access to Community Woodlands in the Nandom District

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Abstract

Farming households have adopted different coping and adaptation strategies to climate change including reliance on woodlands for ecosystem services. The over-reliance on the savannah woodlands for sustenance may have contributed to its degradation over the years. The objective of the study was to identify household factors that influence access to the woodland in Nandom District. Nandom District is endowed with reserve woodland, individual-owned plantations and community woodlands. A cross-sectional survey was conducted in all four political sub-districts of the Nandom District of the Upper West Region. Through systematic random sampling of households, 316 households participated in the study out of which 303 were farming households. Overall, 97% (294/303), 8.6% (26/303), and 23.4% (71/303) farming households accessed community woodlands, the reserve woodland, and household/family/individually owned plantations respectively. There is an association between access to community woodlands by farming households with sub-district ($\rho = 0.002$), settlement ($\rho < 0.001$), ownership of agricultural land ($\rho = 0.020$), and ownership of bicycles ($\rho = 0.017$). Access to community woodlands was not associated with the following factors: sex of household head, household size, household socio-economic status, number of household members that work, households with children less than 15 years, households with adults 65 years and older, households with persons living with disability, ownership of a motorcycle, ownership of animal-drawn cart, ownership of livestock and poultry. The ownership of agricultural land and bicycles may facilitate access to community woodlands which could have implications for the local land tenure system and livelihood opportunities.

Keywords: woodlands, ecosystem services, household factors

70. Integration of Biochar, Chicken Manure and NPK Fertiliser on Growth and Yield of Maize

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Abstract

Two field trials were conducted at different locations and seasons at the research field of AAMUSTED, Mampong campus, between August to December 2021 and March to July 2022 respectively to assess the effect of different rates of *Gliricidia sepium* biochar, chicken manure and NPK fertiliser on the growth, grain yield- and economic returns of maize. The experimental design was a 2 x 6 factorial laid in Randomized Complete Block Design with three replications. The treatments; [(10 t/ha CM, 300 kg/ha NPK, 2.5 t/ha GB, 150 kg/ha NPK + 1.25 t/ha GB, 1.25 t/ha GB + 5 t/ha CM, 150 kg/ha NPK + 5 t/ha CM) and no fertiliser (Control)] were applied on two maize varieties (*Obatanpa* and *Omankwa*). The results showed that Obatanpa x 10 t/ha CM and Obatanpa x 1.25 t/ha GB + 5 t/ha CM combinations had significantly higher leaf area, shoot and root fresh and dry weight, and grain yield (t ha^{-1}) compared to Omankwa grown under the same treatments. *Omankwa* and *Obatanpa* maize varieties planted on 300 kg/ha NPK gave the highest marginal rate of returns (Gh₵143.99 and Gh₵137.75), respectively during the major rainy season of 2022. The 10 t/ha CM and combined use of 1.25 t/ha GB + 5 t/ha CM gave higher vegetative biomass for ruminant feed and higher grain yield hence recommended. Both varieties grown on 10 t/ha CM and 1.25 t/ha GB + 5 t/ha CM differed significantly from the control in leaf area and shoot and root fresh weight. Given the insufficient available quantities of biochar and chicken manure, farmers are encouraged to apply 300 kg/ha NPK to their maize for better returns on investment although it did not result in higher yields compared to 10 t/ha CM and 1.25 t/ha GB + 5 t/ha CM.

Keywords: *Omankwa*, *Obatanpa*, chicken manure, marginal rate of returns, biochar.

71. Intake and Palatability of Forages Fed to Rabbits in the Coastal Savannah Ecological Zone of Ghana

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Abstract
This study sought to evaluate the preference of the commonly used forage species in the Savannah ecological zone of Ghana as a guide to their suitability as sole feed or supplement to concentrate diets for feeding rabbits. *Brassica oleracea* outer leaves, *Stylosanthes guianensis*, *Megathyrsus maximus* and *Musa paradisiaca* leaves were offered to mixed-strain rabbits in three trials. Thirty-two weaner kits were used in each trial. In the first trial, the time of the first bite and intake duration of the four forages offered together for 15 minutes were recorded. Weaners were randomly allocated to four groups, and kits in each group were offered one of the forage species separately with concentrate for three- and seven-days adaptation and testing periods respectively. Finally, kits were offered the forages together. *Brassica oleracea* was bitten first (0.20 min) and had the highest intake duration (2.07 min). *Brassica oleracea* had the highest daily and relative intakes and was the most consumed when the forages were offered separately and together. Intake of the forages was followed by *Stylosanthes guianensis*, while *Musa paradisiaca* and *Megathyrsus maximus* were the least preferred forages in terms of quantities consumed. The study suggests that the first method, the time of the first bite and intake duration of the forages, had a comparative advantage over the other methods in determining the preference of forages by rabbits in view of the shorter period required for the trial

Keywords: Palatability, preference ranking, acceptability, relative intake

72. Gender Dimensions of Adaptation to Climate Variations: Evidence from Cassava Farmers in Southern Ghana

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Abstract
This paper seeks to explore the gender dimensions regarding the adaptation to climate variations by cassava farmers in the Central Region, Ghana. The data used for the study were obtained through both quantitative and qualitative methods with a combination of cluster, stratified and simple random sampling techniques and from a sample size of 252 cassava farmers, using the Krejcie & Morgan (1970) model of $n = X^2NP*(1-P)/ME^2(N-1) + (X^2P(1-P)$. The results of the study showed clear gender disparities in the preference of the adaptation strategies. More males (25%) used early-maturing cassava varieties as an adaptation strategy. Similarly, the majority of male farmers (33%) changed their planting date to coincide with the onset of rains. On the other hand, the female farmers were in the majority in terms of intercropping, fertiliser usage, use of drought tolerant varieties and diversification into non-farming businesses. Results of both the chi-square test and symmetric measures returned significant values, less than 0.05, for fertiliser use, the use of drought tolerant varieties and bush fallowing, further buttressing the gender dimensions involved in the use of adaptation strategies by cassava farmers within the study area. Based on the findings, this paper makes a strong case for development practitioners, policy makers and government agencies to pay more attention to gender issues when developing interventions meant to facilitate adaptation to climate variation by farmers.

Keywords: Palatability, preference ranking, acceptability, relative intake

73. Residual Effect of Inorganic Fertilizer and Goat Manure on the Growth and Yield of Maize in the Semi-Deciduous Forest and the Coastal Savannah Agro-Ecological Zones of Ghana

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Abstract

Increased maize productivity could be enhanced through use of improved seeds and soil amelioration. Smallholder farmers in parts of Ghana, who apply fertilizer on maize plots in the major season seldom, apply in minor season. The study sought to evaluate effect of minor season application of soil amendments and also residual effect (for plots which received amendments in major season) on growth and yield of three maize varieties (Obatanpa, Omankwa, Ahomatea) in the Semi deciduous forest and Coastal savannah zones of Ghana. The study was conducted in the minor season of 2017. Experimental fields had previously been used for maize in the major season. Each plot made of one of four initial soil amendments {Goat manure 5 t ha^{-1}; inorganic fertilizer (NPK 95-37.5-37.5 kg ha^{-1}); 50% goat manure 2.5 t ha^{-1} + 50% inorganic fertilizer (NPK at 47.5-18.75-18.75 kg ha^{-1}); and Control} in the major season was split into two in the minor season and one had amendments re-applied and the other was without amendments (residual nutrients). The control plots were not split. This resulted in a split plot design of 3 maize varieties x 7 soil amendments with four replications. Results revealed that the combined treatment of 50% goat manure + 50% inorganic fertilizer had higher grain yields in both Agro-ecological zones with improved maize (Omankwa and Obatanpa) having significantly higher ($P<0.05$) grain yields than Ahomatea. The significantly lower ($P<0.05$) performance of maize varieties on residual plots in both zones suggests there were minimal residual effect from the major season. Hence, on continuously cropped fields, regular application of inorganic fertilizer + goat manure is essential for sustainable maize production.

Keywords: Palatability, preference ranking, acceptability, relative intake

74. Oyster Mushroom and Enzyme Supplementation of Corncob Diet Improve Growth Performance and Nutrient Digestibility in Sasso Broiler Chickens

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Abstract

This study investigated the use of ground corncobs (GCC) as an alternative fiber source for broiler diet. Three hundred and sixty (360) 3-week-old dual-purpose chicks (Sasso X44) obtained from Maison Diop de Lomé, Togo, were randomly allocated to four dietary treatments having 6 replicates with 15 birds per pen in a completely randomized design. Four experimental diets were formulated: C0 (Control/standard diet), C1 (10% GCC diet), C2 (10% GCC diet with 0.05% multi-blend enzyme), C3 (10% GCC diet with 0.5% flaked oyster mushroom (FOM)). At the end of the experimental period, it was revealed that apart from blood platelet counts which were significantly low ($p < 0.05$) in the additive-supplemented diets, GCC and its supplementation with either multi-blend enzyme or FOM had no influence ($p>0.05$) on hematological parameters. Birds fed the C0, C2 and C3 diets were more efficient ($p < 0.05$) in feed utilization in comparison to those fed the raw 10% GCC diet at week 12, with the final body weight of the C2 group significantly higher ($p<0.05$) than the C1 group. Percent breast weight was lowest ($p < 0.05$) in the birds of the C1 group compared to the other treatment groups. Crude protein was retained better ($p < 0.05$) in the additive-supplemented groups (C2 and C3) compared to the control group, whereas crude fiber digestibility was lowest in the C1 group. It is therefore beneficial to supplement corncob diets with multi-blend enzymes to improve feed efficiency, body weight and nutrient digestibility.

Keywords: Corncobs, multi-blend enzymes, oyster mushroom, nutrient retention

75. Dual Effects of Endophytic Fungi in Promoting Maize Seedlings Growth and Negatively Impacting the Biology and Reproductive Traits of Spodoptera Frugiperda

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Abstract

Endophytic fungi are gaining high attention in the sustainable management of insect pests and diseases worldwide. This study assessed the potential of eight fungal isolates in colonizing maize plants, their endophytic persistence, and their ability to promote seedlings growth through seed and foliar inoculations using fundal suspension at a concentration of 1x108 conidia/ml, as well as their pathogenic suppressive effects on the invasive fall armyworm, *Spodoptera frugiperda*. Fungal colonization rates of different plant parts by the endophytes varied as per the inoculation methods. *Trichoderma atroviride* F2S21, *T. asperellum* M2RT4, *T. harzianum* F2R41, *Trichoderma* spp. F2L41, Hypocrea lixii F3ST1 and *Fusarium proliferatum* F2S51 successfully colonized all the plant parts. Weekly assessment showed varied effect of the endophytes on maize plant growth parameters compared to the control, and the colonization pattern/rates significantly decreased over time. In addition, *T. harzianum* F2R41 outperformed all the other isolates in boosting seedlings height, whereas H. lixii F3ST1 and *T. asperellum* M2RT4 increased the wet and dry shoots weight. Furthermore, the number of egg masses laid on endophytically-colonized maize plants varied among the treatments; where *T. asperellum* M2RT4 and H. lixii F3ST1 significantly reduced the number of egg masses and the defoliation/feeding rates of the pest compared to the control. *Trichoderma harzianum* F2R41 had the highest negative impact on the pupation and adult emergence of *S. frugiperda* with a female-biased sex ratio. The findings indicate *that T. asperellum* M2RT4, *T. harzianum* F2R41, and H. lixii F3ST1 hold a potential to be developed as endophytic-fungal-based biopesticides for sustainable management of *S. frugiperda* and as plant growth promoters.

76. Assessment of Knowledge, Practice and Attitude of Pesticide Usage among Pepper Farmers under Two Different Irrigation Schemes in Ghana

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Abstract

Vegetables are susceptible to pests and diseases. As such, they require more pesticides than other crops. That may result in detrimental effects on the environment. The present study accessed the current knowledge, attitude and common practice of farmers in using pesticides on pepper farms from Vea and Weija in Ghana. The study was conducted from 5 till 13 March, 2019. Only pepper farmers (n = 35) were interviewed using a questionnaire for collecting data on farmers' demography, farm and pesticide use. The results show that 97% of the farmers are males in the age of 50 – 59 years. Farmers from both irrigation schemes were semi-literates with 46% of them having completed only basic education. Only 51% of the farmers had farms ranging from two to four acres in size. Due to the high cost of leasing land, about 60% of them had been cultivating the same plot of land for more than ten years. Although all farmers knew the advantages of using personal protective equipment (PPE), only 26% of them used PPEs during pesticide application. However, all farmers claimed to always change their clothes after applying pesticides, regardless of what they were wearing. About 71% of the farmers reported experiencing various health effects such as headache, eye irritation, skin problems, nausea, and general discomfort after application of the pesticides. To improve the farmer's health and ensure a safe working environment, awareness campaigns and trainings on a regular basis are essential.

Keywords: vegetables, irrigation, pesticides, questionnaire, education, exposure

77. Impacts of Harvesting Intensity on Carbon Allocation to Species, Size Classes and Pools in Mangrove Forests, and the Relationships with Stand Structural Attributes

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Abstract
Understanding the impacts of harvesting on mangroves' carbon potential is essential to inform decision-making for management and carbon economy policies. We assessed the impacts of harvesting intensity on (i) carbon allocation to species, size class, soil depth and pool (standing live trees, standing dead trees, litter, and soil); and (ii) carbon stock in the different carbon pools, and its relationships with stand structural attributes in Benin coastal line. Data was collected in 600 forest plots of 0.015ha across 20 mangrove sites in high and low harvesting intensity areas. Sixty litter quadrats were also established to sample litter, while 160 soil samples were collected for soil carbon content analysis. Regardless of the harvesting intensity, two mangrove species, *Rhizophora racemosa* and *Avicennia germinans* contributed more than 98% of the tree carbon. Small and medium size classes dominated tree carbon in high and low harvesting sites, respectively. Soil carbon up to 1m depth had the greatest share (55% - 70%) of the total carbon stock, followed by standing live trees (26% - 40%) and litter, and was not influenced by harvesting intensity. Harvesting intensity influenced the carbon stocks in standing live and standing dead trees, with greater values in low and high harvesting sites, respectively. The total carbon stock ($MgC.ha^{-1}$) was ~ 1.46-fold higher in low harvesting sites (308.54 ± 32.74) than in high harvesting sites (211.40 ± 14.91). This study expands our understanding of the carbon stock potential across coastal mangroves subject to different levels of disturbance in West Africa and their contribution to mitigating greenhouse gas emissions.

Keywords: *Avicennia germinans*, Benin, disturbances, *Rhizophora racemosa*, soil carbon, tree carbon

78. Barriers and Enablers to Accessing Ecosystem Services from a Reserve Woodland in Nandom District of Ghana

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Abstract
The impact of climate change and deforestation are increasingly becoming challenges to the protection and management of reserve woodlands and forests in Ghana. A cross-sectional study was conducted in the Nandom District to investigate barriers and enablers to accessing a reserve woodland that shares a boundary with the district. Additionally, focus group discussions and key informant interviews were held. The study defined a barrier as a factor that limits or prevents access to woodland ecosystem services in more than 50% of households. An enabler was defined as a factor that promotes access to woodland ecosystem services in more than 50% of households. Barriers to accessing the reserve woodland were community regulation (57.7%), family rules (69.2%), access to land for farming (65.4%), distance (53.8%), road condition (84.6%), transport of harvested products (57.7%), and physical challenges (80.8%) of household members. Violators caught harvesting trees for fuelwood were fined. Enablers to accessing the reserve woodland were poverty (73.1%), awareness of ecosystem service availability (88.4%), and benefits derived from ecosystem services (76.9%). Government agency regulation (80.8%) and family/friends' support to access ecosystem services (56.0%) were found to be both barriers and enablers to accessing the reserve woodland. Incentives to landowners/leaders (65.4%), incentives from landowners/leaders (80.8%), and awards/recognition (88.5%) were neither barriers nor enablers to accessing the reserve woodland. Community regulation and family rules may be more important in the protection and conservation of reserve woodland than regulation by government agencies. This has implications for efforts at managing national forest reserves across Ghana.

Keywords: reserve woodland, ecosystem services (ES), barriers, enablers

79. Qualitative Properties of Raw Effluent from a Ghanaian Alcohol and Non-Alcoholic Beverage Factory

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Abstract

High-pollutant effluents have the potential to harm the receiving water body and individuals who may come into direct contact with it. Some of the negative effects of effluent on receiving water bodies include eutrophication, loss of fish life, high levels of sludge deposits, stenches emitted from anaerobic processes occurring at the bottom of the receiving water body. The goal of this study was to evaluate the qualitative features of the raw effluent from a facility producing alcoholic and non-alcoholic beverages in Ghana. The effluent qualities chosen for the assessment included conductivity, ammonia, biological oxygen demand (BOD), chemical oxygen demand (COD), oil and grease and total suspended particles. Wastewater analyses were conducted using the wastewater standard methods. For three years, on a monthly basis sampling and analyses were carried out. According to the Ghana Environmental Protection Authority's guidelines for the discharge of effluent into receiving water bodies. The mean values for conductivity (1290 uS/cm), BOD (764 mg/l), COD (2873 mg/l), ammonia (4.35 mg/l), and oil and grease (3.89 mg/l) obtained were high. As a result, the raw effluent must be treated to prevent the pollution of the aquatic environment and outcomes could be applied to the design of the factory's wastewater treatment facility.

Keywords: Wastewater, COD, BOD, Beverages, Ammonia

80. Raw and Treated Effluent Quality Characteristics from a Non-Alcoholic and Alcoholic Beverage Company in Accra, Ghana

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Abstract

Industrial effluent has an enormous capability of polluting a receiving water body. Many water bodies are being polluted by untreated effluent discharged from various types of industries and disposal practices. The study was carried out to assess the quality characteristics of both raw and treated effluent from an alcoholic and non-alcoholic beverage factory in the country. The parameters selected for the study which are of environmental concern were pH, Conductivity, Turbidity, Total Suspended Solids (TSS), Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Ammonia (NH_3), Oil and Grease content. Sampling was done once a month but on different days of the month to cover all the different operational activities of the facility. A total of twenty-four (24) samples, were collected for a period of one year. The International Standard methods for the analyses of water and wastewater were followed. A descriptive cross-sectional study was conducted where the mean, standard deviation, minimum, maximum and range of raw and treated values were examined. In addition, the efficiency of the treatment plant was also assessed to determine its effectiveness in terms of pollutant removal. The mean values of Conductivity (2347µScm^{-1}), Turbidity (248 NTU), TSS (263mg/l), BOD (404mg/l), COD (1482mg/l), Ammonia (13.5mg/l) and, Oil/Grease (2.92mg/l) for the treated effluent exceeded their recommended Ghana Standard guideline values. The treated effluent was highly organic and had high levels of nutrients (NH_3). The results indicated that the performance of the treatment plant was insufficient in the control of organic and nutrient pollution load of the effluent.

Keywords: Wastewater, Pollutants, Treatment

81. Demographic characteristics, prospects and challenges of Rabbit Farmers in Selected Regions of Ghana

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Abstract

This work assessed the prospects and challenges of rabbit farming and the demographic profile of rabbit farmers in Ghana. The Open Data Kit in Kobocollect with a structured questionnaire was used to collect and analyse data from 253 rabbit farmers in four regions of Ghana. The results revealed that the rabbit industry is male-dominated. The mean age of the farmers was 36.9 years. The majority of farmers (over 67%) were formally educated. More than half of the respondents belonged to households of less than six members. A majority (70%) of the respondents engaged mainly in agriculture and its related jobs. More than 89% against 10.3% of the farmers agreed that rabbits rearing can ensure food security in Ghana. A greater fraction (79.2%) of them agreed that the rabbit business enables them to access food for their family. However, 81.9% of them raised the animals for income rather than food (16.0%) and hobby (2.1%). Feed (its availability and feeding techniques) was ranked the topmost challenge followed by the availability of drugs and vaccines. The weight of rabbits was ranked the topmost determinant of price. The rabbit industry in Ghana is resourced with educated, young, and experienced farmers who can apply modern rabbit production technologies to increase productivity. Nonetheless, the technologies (feed, breeds, housing, drugs, and vaccines) are inadequate in supply. Research to develop specialized feed packages for rabbits and the awareness creation on the potentials of rabbits are recommended.

82. Effects of Egg Exposure to Ultraviolet Radiation on Post Embryonic Development and Reproduction of Three Diptera and a Lepidoptera

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Abstract

The study was to assess the effect of eggs exposure to ultraviolet radiation on the survival of eggs, post embryonic development and adult fitness of insects. One hundred eggs collected from well-established laboratory colonies of fruit flies, mosquitoes, black soldier flies, and fall armyworms were exposed to UV-C at 200–280 nm for 0, 2, 4, 8 and 10 minutes. In a separate experiment, 30 banana fingers were kept in fruit fly oviposition cages for 24 hours before being exposed to UV light. The irradiated banana fingers were placed in cages at a temperature of 26°C for deposited eggs to develop into larvae. For both experiments, data on egg hatchability, pupation and adult exposure. Data was also collected on adult deformities. Data was analyzed using ANOVA at $p \geq 0.05$ in RUNSTAT. UV-C radiation significantly inhibited egg survival, post-embryonic development in a dose-dependent manner and caused deformities at various developmental stages in all the insect species when eggs were exposed directly. On the contrary, there was no UV-C-dependent effect when eggs of fruit flies were exposed inside banana. However consistent levels of development from the larval to adult stages were obtained at 8 minutes of exposure time. This study confirms that exposure of insect eggs to UV-C results in detrimental effects on the eggs and insect populations in general. Thus, in this era of climate change and depletion of the ozone layer, which results in increased UV-C reaching the earth's surface, populations of insects whose eggs are directly exposed to sunlight may be affected.

Keywords: Ultraviolet rays, eggs survival, post embryonic development, deformities.

83. Population Dynamics of Fruit Flies (*Diptera: Tephritidae*) in Mango Orchards in the Southeastern Mango Enclave of Ghana

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Abstract

To determine the population dynamics of fruit fly species in the southeastern mango enclave of Ghana, a year-long trapping of fruit flies was done in three farms. Five traps baited with Methyl eugenol (ME), Cuelure (CL), Terpinyl acetate (TA), Torula yeast (TY) or Trimedlure (TML) were placed in the three farms. A total of 172, 617 fruit flies were captured and collected from the traps. The fly densities were 143.10, 10.19, 4.03, 0.26 and 0.03 per trap per day for ME-, TY-, CL-, TA-, and TML-baited trap respectively. Ten fruit fly species namely *Bactrocera dorsalis* (Hendel), *Ceratitis cosyra* (Walker), *C. capitata* (Wiedemann), *C. penicillata* (Bigot), *Dacus bivittatus* (Bigot), *D. punctatifrons Karsch, D. langi Curran, D. longistylus Wiedemann D. ciliatus Loew and Zeugodacus cucurbitae* (Coquillett) were captured in the farms. Dacus langi and D. longistylus were for the first time identified in Ghana. The population of B. dorsalis and Z. cucurbitae fluctuated from April to July with that of B. dorsalis peaking in April, May and June. The periods of the peak population of B. dorsalis coincided with the major mango-growing season in the southeastern mango enclave. Knowledge of this seasonal variation in the population of the fruit flies could be harnessed for effective management of the major fruit fly pests in the study area. Particularly, interventions aimed at managing B. dorsalis, a major insect pest in the enclave, could be executed from April to July when this insect is most abundant.

84. Transitioning Climate Smart Agriculture into Food Systems in Ghana: Evaluation of Co-Benefits and Potentials of Agricultural Practices and Innovation Adaptations at Subnational Landscapes

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Abstract

Climate change is a global phenomenon which has implications for agriculture and human security. The agricultural sectors of many African economies are affected by climate change apart from their intrinsic challenges of low soil fertility, pests and diseases, low levels literacy and lack of resources to use improved technologies. Building the resilience of farming households against climate change effects is therefore very crucial. Climate Smart Agriculture interventions were recognized as options and remedies for addressing climate change impacts on agriculture since the interventions could potentially strengthen the pillars of mitigation, resilience and food security. The study evaluated the co-benefits and potential of major interventions towards achieving the intertwined objectives of climate smart agriculture by employing multifaceted approaches and methods. Integrated pest and disease management was observed to be very smart towards improving food yields and income levels hence the most essential practice in achieving productivity goal. Tillage and land management obtained the highest score and therefore very smart towards achieving the adaptation goal while vegetative cover management was also observed to be most smart towards achieving mitigation objectives. The study revealed that almost all the eight climate-smart practices considered were essential in achieving the triple actions of climate smart agriculture. However, the use of improved crop seeds or planting material and livestock breeds was observed to have the highest potential to achieving the triple action of productivity, adaptation and mitigation. It is therefore important for development partners to complement government efforts to critically invest in climate-smart practices mainstreaming into the agricultural sector and support the establishment of science-policy dialogue platforms in all districts. Private sector partnerships and investments in climate-smart research and development are also crucial.

Keywords: CSA pillars; resilience, productivity; adaptation; mitigation

85. Carbon Emission and Food Output Nexus: The Role of Fertilizer in Ghana

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Abstract
Food security remains a critical issue in many African countries including Ghana. Food prices have been a major inflator factor in Ghana. While many factors are responsible for inadequate food production the rising levels of carbon dioxide emissions raises more concern because of its environmental effect through global warming and climate change. Although there are efforts to reduce the levels of emissions the pace of emission cast doubts on whether Ghana can achieve its own Nationally Determined Carbon emissions. It is necessary to ascertain possible ways of mitigating the adverse effect of carbon emissions on food production in Ghana. In this study, the effect of carbon dioxide emissions and fertilizer application on food production is examined. Time series data from 1971-2021 and regression analysis are employed in this study. Ghana's food production was modelled as a function of labour, capital, trade openness, carbon emissions and fertilizer application. It was found that all the mentioned variables except carbon emission increase crop, food, livestock and fish production. However, fertilizer application moderates the negative effect of carbon dioxide emission to increase food production. Recommendations from the findings include hasten efforts to reduce carbon emissions level. Intensification of education on the right application of fertilizer would help promote food production.

Keywords: Food production, carbon emissions, fertilizer application, Ghana

86. Microhabitat Variables and their Influence on Small Mammal Distribution in the Agumatsa Range, Ghana

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Abstract
The distribution of small mammal species is influenced by environmental variables and vegetation. Studies on patterns of microhabitat variables used by small mammals are important for understanding the mechanisms involved in their distribution and abundance. This study sought to find out which microhabitat variables would influence the distribution of small mammals in the Agumatsa range. Nine microhabitat variables were recorded and replicated three times in a 5 by 5-meter quadrat at each trapping station. Sherman collapsible live traps were used to capture small mammals at each trap station. Traps were baited with corn dough mixed with peanut butter and placed randomly along transects of 15 Sherman traps spaced 10 meters apart. A total of 14,400 (5 days * 60 traps* 6 months *4 communities) trap nights were recorded for each year. Due to the non-uniformity of the microhabitat variables measured, the data was transformed by first calculating the averages of the measured variables, then the data transformed in densities per area in square meters, and the natural logarithm per data, thus transformation was done on all the variables measured. The survey was conducted in 2019 and 2020. 787 individual small mammal species with an overall trap success of 5.5% were recorded from this research. Eight species; *Praomys tullbergi* (238), *Mastomys erythroleucus* (200), *Lemniscomys striatus* (139), *Crocidura crossei* (92), *Mus musculus* (75), *Tatera kempi* (21), *Dasymys incomtus* (14) and *Oenomys ornatus* (8) were captured. Canonical correspondence analysis showed soil temperature as the most important environmental variable. The eigenvalues for unconstrained axes explained 2.6% variations, producing a correlation of 0.16. This affirms the fact that there is no significant association between the species and the environmental variables.

Keywords: Microhabitat variables, small mammals, Agumatsa.

87. Assessment of Knowledge, Attitude and Practice of Butchers and Meat Vendors on Meat Safety and Hygiene in Bolgatanga Municipality

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Abstract

The incidence of foodborne diseases has been on the rise in recent years. To combat this issue, strict safety and hygiene practices should be maintained in the handling of food. The study aimed to assess the knowledge, attitude, and practice (KAP) of butchers on meat safety and hygiene. A survey based on a structured questionnaire was conducted involving thirty-seven butchers within the Bolgatanga Municipality. The role and effectiveness of the Environmental Health Officers and Veterinary Officers in the supervision of such activities were also evaluated. The study revealed that the majority of respondents were between 18 to 40 years old and predominantly Muslims, without any formal education. The assessment of KAP showed that though the mean score for butcher's attitude was averagely accepted (52%), the knowledge and practice scores of 21% and 38% respectively were poor, indicating a significant risk of food poisoning for the general public. None of the butchers had received training on meat safety and hygiene, possibly contributing to their low knowledge and poor practices. On the question of possession of a medical certificate, a surprising 95% of the respondents did not possess a certificate. The Environmental Health Officers and Veterinary Officers' role was mainly inspection of the facility, ensuring hygienic practices and conducting post-mortem inspections. Findings from this study provide valuable insights for further research and decision-making. It is recommended that intervention measures in the meat handling process be implemented, including mandatory screening for contagious diseases and formal training on meat safety and hygiene.

Keywords: Meat Vendors, Hygiene and Safety Practices

88. Black Soldier Fly Larvae: A Possible Solution to Waste Management

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Abstract

The effects of greenhouse gases on climate change cannot be overemphasized. In our environment, decomposing bio-waste produces these greenhouse gases that increase our carbon footprint. This study investigated the possible use of black soldier fly larvae in degrading bio-waste. The study was conducted at KNUST with vegetable waste from the Ayigya market in Kumasi, Ghana, and consisted of two phases: fertilizer production and chemical analysis. Vegetable waste was collected and treated with black soldier fly larvae (BSFL) while control treatments were maintained. Amazingly, 2 kg of waste was broken down by 500 BSFL in 2 days, which confirmed that they are voracious feeders of waste. The frass was separated, cured, and subjected to biochemical analysis following larval feeding. The analysis showed significant differences in nutrient composition and physicochemical properties among the frass samples. Notably, there was a positive correlation between the number of BSFL used and the overall nutrient content, although decomposition rates varied. Impressively, the by-products of bio-degradation exhibited no significant difference compared to commercial fertilizers, indicating that they could serve as a viable and effective alternative to chemical fertilizers. These findings contribute valuable insights into the potential use of BSFL in degrading bio-waste and underscore the importance of composting for sustainable agricultural practices. Utilizing BSFL for vegetable waste management presents a promising approach to mitigate waste burdens, climate change, improve organic food and foster sustainable agricultural and environmental development.

Keywords: Black soldier fly larvae, bio-degradation, vegetable waste management, nutrient composition, sustainable agriculture, frass

89. Concentration and Ecological Risk of Heavy Metals in Residential and Farmland Surface Soils in the Sunyani Municipality of Ghana

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Abstract

Exposure to heavy metals poses serious human health and ecological threats, especially in developing countries where ecological risk assessment and remediation are often ignored. While many studies have reported heavy metal toxicities in rapidly urbanizing cities with increased anthropogenic activities, limited information exists on heavy metal toxicities and potential ecological risks on soils in the Sunyani Municipality. Using soil samples collected from residential and farmland surface soils, the study assessed the concentration and ecological risk assessment of nine heavy metals in the Sunyani Municipality. Apart from As and Mn, the two study sites generally recorded higher concentrations of all metals compared to the control site. However, concentrations of Cr, Cu, Pb, and Zn were marginally higher in the residential surface soils than in the farmlands. The soil contamination factor and geoaccumulation index both revealed moderate As, Hg, and Mn contamination at both study sites. Also, the soil enrichment factor revealed significant enrichment of As and moderate enrichment of Cd in the residential soil, while the farmland soils revealed moderate enrichment of As, Hg, and Mn. The potential ecological risk index revealed considerable ecological risk at both study locations, while the pollution load index revealed higher overall pollution in the residential area (PLI = 0.48) compared to the farmland surface soil (PLI = 0.40). The study, therefore, recommends the regulation of farming and other human activities that are potential sources of heavy metal contamination to maintain the baseline levels of the metals in the soil and reduce their health and environmental impacts.

90. Sensory Optimization of a Plant Milk Base for the Production of Yogurt

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Abstract

Plant-based yogurt is gradually gaining popularity as alternatives to dairy products because of increased awareness of healthy living. It is also a readily available and affordable alternative to yogurt produced from animal milk. The aim of this study was to optimize a plant-based milk mixture for yogurt production using a simplex lattice design. Ten formulations of plant-based yogurt (soymilk; 70 – 80%, tropical almond milk; 10 – 20%, and orange-fleshed sweet potato (OFSP) puree; 10 – 20%) were analyzed for their physical and sensory qualities. The results showed both soymilk and OFSP puree as the main contributors to the viscosity of the yogurt. However, only the latter reduced the incidence of syneresis in the product. Sensory evaluation showed increasing proportion of sweetpotato puree in the mixture improved score for mouth-feel. Similarly, high proportions of both soymilk and sweetpotato puree resulted in yogurt with the best consistency and overall likeness scores. Numerical optimization revealed that the optimal milk mixture for the production of an acceptable plant-based yogurt was; soymilk – 75%, almond milk – 12% and OFSP puree – 13%. The optimal yogurt was low in fat (2.3% w.b) but contained good amounts of protein (3.7% w.b) and minerals (0.52% w.b) compared to plain whole milk yogurt (3.0-3.9%, 2.7-4.3% and 0.6-0.8% for the respective nutrients). Microbial cell viability test showed an initial LAB count of log10 1.8 and a final count of 5.0 log10 cfu/mL. The plant-based yogurt was stable, as only a 10% increase in syneresis was recorded after 14-days of storage at 6.0 ± 1^{o}C. This study presents useful information to guide the development of nutritious and acceptable plant-based yogurt.

Keywords: Soymilk, tropical almond milk, OFSP puree, yogurt, sensory optimization.

91. Assessing Food Safety Knowledge and Practices Among Food Service Providers at KNUST: Strategies for Promoting Food Safety on the Campus

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Abstract

This study assessed food safety practices among food service providers on the Kwame Nkrumah University of Science and Technology campus. A mapping of the food service providers on the campus was carried out, and the different categories of hot-meal providers were identified. Thirteen identified restaurants and eateries were visited, and staff participation was solicited. Semi-structured questionnaires were used for the data collection, and the questionnaires were administered as interviews. Where applicable, interpreter-assisted interviews were conducted in Twi. The findings revealed that most participants were females (82.4%) and youthful, aged 20-40 (70.6%). A significant number of participants (70.6%) identified cooking as their work routine. Most participants were aware of the need for regular medical screening (88.2%) but found it unaffordable (94.1%). Respondents also indicated awareness of handwashing (100%) and the need for personal protective equipment (94.1%). However, their ability to demonstrate proper handwashing techniques and identify appropriate personal protective equipment was limited, indicating a need for capacity strengthening to enable effective safety practices during food preparation and handling. Respondent's knowledge of safe storage measures for leftover food was also limited, with over 64% not knowing the appropriate practices. The study shows a general awareness of food safety among foodservice operators on the KNUST campus but identifies a gap between knowledge and respondents' capacity to carry out appropriate/ tailored safety practices in food handling. The findings provide empirical data to inform policy interventions by the university management to safeguard against non-safe food practices on campus.

Keywords: Keywords: Food safety, Vendor practices

92. Integration of Biochar, Chicken Manure and NPK Fertiliser on Growth Traits, Yield and Economic Returns of Maize

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Abstract

Two field trials were carried out at different locations (AAMUSTED and Mampong campus) during 2021 minor (August - December) and 2022 major (March - July) seasons to assess the effect of sole and integrating Gliricidia sepium biochar (GB), chicken manure (CM) and NPK fertiliser on growth and yield of maize. The treatments included two maize varieties; *Obatanpa* and *Omankwa*, and five fertiliser rates; 10 t ha^{-1} CM, 300 kg ha^{-1} NPK, 2.5 t ha^{-1} GB, ½ NPK + ½ GB and ½ GB + ½ CM, and a control (no fertiliser). A factorial 2 x 6 randomized complete block design was used with three replications. The results showed that *Omankwa* and *Obatanpa* under sole chicken manure tasseled (between 3 and 6 days) and silked (between 2 and 6 days) earlierthan the same varieties grown under the control in the minor season. *Omankwa* and *Obatanpa* grown under sole chicken manure and ½ GB + ½ CM application gave taller plants, wider stem and cob diameter, and also higher grain weight per plant than the same varieties grown under sole GB, sole NPK and ½ NPK + ½ GB in both seasons. Obatanpa treated with 10 t/ha CM had the greatest grain yield of 3.47 t/ha and 7.47 t/ha in both seasons which are 39.64% and 28.96% higher than the same varieties grown under control . The sole application of chicken manure or ½ GB + ½ CM is recommended for maize cultivation, as they demonstrated superior performance in maize grain yield traits.

Keywords: Obatanpa, Omankwa, soil biochar, chicken manure, NPK.

93. Incidence, Prevalence and Severity of Fall Armyworm Infestation in Ghana: A Case of Two Maize Enclaves in the Ashanti Region of Ghana

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Abstract
The study aimed at assessing the incidence, prevalence and severity of fall armyworm infestation on maize farms in two major maize enclaves (Ejura and Ejisu) in the Ashanti Region of Ghana. Data was taken on the presence of fall armyworms, their levels of infestation and damage at the seedling and vegetative stages in both minor and major growth seasons. It was found that fall armyworm infestation was present on all farms surveyed. The prevalence and severity of infestation was found to be higher in the major season than the minor season in both growth stages ($p < 0.0001$). Ejisu had a higher prevalence (0.10 ± 0.04 larvae per plant) than Ejura (0.05 ± 0.03 larvae per plant) at seedling stage in the minor season while the prevalence for the major season was higher in Ejura (0.23 ± 0.02 larvae per plant) than Ejisu (0.17 ± 0.02 larvae per plant). At vegetative stage, there was a higher prevalence in Ejisu than Ejura for both seasons ($p = 0.781$). A low severity was recorded at the seedling stage in both districts for all seasons. This, however, varied among seasons at vegetative stage with both districts recording a low severity in the minor season and a moderate severity in the major season. The study thus, showed fall armyworm infestation to be a major challenge to maize production in both districts with varying prevalence and severity and confirms fall armyworm as a major constraint to maize production in both districts.

94. Seasonal Changes in Fish Catch and Environmental Variables in a Large Tropical Lake, Volta, Ghana

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Abstract
Fish species assemblage and selected environmental variables were monitored monthly in stratum III of Lake Volta from September 2014 to August 2016 to determine seasonal variability in species composition, catch and environmental variables that determine the structure of the fish community. A total of 1,557 individual fish belonging to 41 species, 25 genera and 13 families were recorded. The important fish species with respect to frequency of occurrence, abundance and weight, respectively, were as follows: *Chrysichthys* (100%; 43.03%; 17.93%), Tilapias (100%; 28.97%; 17.86%), *Alestes* (100%; 14.13%; 32.10%) and Bagrus (91.67%; 5.65%; 12.80%) in that order. Experimental catches which used only gill nets proved to be a good indicator of trends in commercial catches monitored, although locally evolved traps such as bamboo and basket traps are used mostly in fishing. There were no significant differences ($p > 0.05$) in species abundance, weight and diversity indices between the dry and wet seasons. The modal class of length frequency distribution of the dominant species in the catch, *Chrysichthys*, reduced from 125 mm in 2006 to 95 mm in the current study indicating overfishing. Environmental variables considered showed little variation and within optimal ranges for fish survival and did not differ significantly between seasons. Canonical Correspondence Analysis showed that environmental variables explained 43.30% of the variation in species abundance with Lake water level, nitrite-nitrogen and total dissolved solids being the main environmental factors influencing the structure of the fish community. Hence any climatic changes that will impact the hydrology of the Lake are likely to affect the fish community and consequently catches.

Keywords: *Chrysichthys*, environmental variables, fish species, species diversity, tilapias

95. Response of Albino Rats to Diets Containing Varying Levels of Ginger Residue

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Abstract
Some alcoholic beverage manufacturers in Ghana produce excessive volumes of ginger residue (GR), which when dumped into the environment causes pollution. Ginger is a natural herb that is rich in fibre and contains several phenolic compounds which could aid digestion, ameliorate gut microbiota and eventually improve the production performance of monogastric farm animals. This study was therefore aimed at utilizing GR in the diets of livestock using albino rats as a model and evaluating their response to diets containing varying levels of GR. The nutrient and phytochemical composition of GR were also determined. Five experimental diets were formulated with varying levels of GR. The diets were: T0 (no GR), T1 (0.5 g GR/100 g), T2 (1 g GR/100 g), T3 (1.5 g GR/100 g) and T4 (2 g GR/100 g). A total of twenty-five male albino rats with an average weight of 90.12 ± 16.6 g were used in a randomized complete block design with five replicates per treatment and one rat per replicate. Feed and water were given ad libitum for four weeks. The crude protein, ether extract and crude fibre content of the GR were 5.03%, 4.0% and 23.53%, respectively. Qualitative phytochemical analysis showed that the GR contained tannins, saponins, phenols, flavonoids, triterpenoids, coumarins, and steroids. The results obtained showed no differences ($P > 0.05$) in feed intake, weight gain, feed conversion ratio and feed cost per 100g weight gain among all the treatments. The GR also had no significant effect ($P > 0.05$) on the weight of the internal organs of albino rats. In conclusion, the addition of differing levels of GR did not affect the growth performance and carcass characteristics of albino rats and hence can be added to the diets of monogastric livestock without any detrimental effects.

Keywords: Ginger residue, carcass, phenolics, phytobiotics

96. Basic Developmental Characteristics Of The Fall Armyworm, *Spodoptera Frugiperda* (J.E. Smith) (Lepidoptera: Noctuidae), Reared Under Laboratory Conditions

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Abstract
The life cycle of the invasive alien insect pest, fall armyworm (FAW), Spodoptera frugiperda (J.E. Smith), was studied using a colony established from field-collected larvae. Eggs, neonate larvae, and newly emerged adult moths were used in experiments to investigate the basic biology of the FAW. Adult females laid up to 1184 eggs with a mean of 469 ± 22 eggs per female. The incubation period of eggs and percentage hatchability were 2-3 days and 80–87%, respectively. The mean larval lengths from the first to the sixth instar were 4.63, 6.60, 9.76, 15.86, 25.13, and 27.81 mm, respectively. The mean larval weights were 0.003, 0.019, 0.045, 0.050, 0.060, and 0.067 g, respectively, for the six instars. The mean width of the head capsule of the sixth instar larva was 2.76 mm. The total larval duration throughout the six instar stages was 16–18 days, while the mean pupal weight was 0.25 ± 0.001 g and 0.35 ± 0.011 g for males and females, respectively. The mean pupal length was 14.3 ± 0.16 mm for males and 17.2 ± 0.14 mm for females. Pupal duration ranged from 8 to 14 days, with a mean of 10.35 ± 0.26 days, while the pupal emergence rate ranged from 60 to 94%, with a mean of 80.25 ± 1.28%. The life cycle of males lasted 33–44 days and that of females lasted 36–49 days under laboratory conditions. Adult copulation occurred between 8 and 11 pm, with the peak occurring at 9 pm. Tis study provides baseline information about the biology of the FAW. Apart from being an important reference point for future research on the FAW, the data provided would aid FAW management decision-making.

97. Synthesis and Characterization of Zirconium Oxide-Based Nanocomposites for Photocatalytic Degradation of Eosin Yellow Dye in Water

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Abstract

In this research, ZrO_2, ZrO_2-g-C_3N_4, and a series of Co and g-C_3N_4 co-doped ZrO_2 (Co-ZrO_2-g-C_3N_4) photocatalysts have been successfully synthesized via the coprecipitation technique and used for photocatalytic removal of eosin yellow dye from simulated wastewater. The obtained nanomaterials were characterized by ultraviolet/visible (UV/Vis) spectrophotometry, X-ray powder diffraction (XRD), Fourier transform infrared (FT-IR) spectroscopy, scanning electron microscopy (SEM) and energy dispersive X-ray spectroscopy (EDX). Structural analysis showed that the nanocomposites were polycrystalline and possessed the mixed phases (monoclinic and cubic) of ZrO_2 with an average crystallite size of 27 nm. The UV/V is analysis of samples revealed a marginal increase in optical absorption of the Co-ZrO_2-g-C_3N_4 with increasing Co concentration and a corresponding red shift in the energy gap. It was observed from the photocatalytic activities that, the degradation efficiency was remarkably increased from 30% to 98% for pure ZrO2 and 0.8% Co-ZrO_2-g-C_3N_4 respectively. This is an indication that the 0.8% Co-ZrO_2-g-C_3N_4 is a promising semiconductor and may be used for the degradation of organic dyes in polluted water.

98. Exploring Sustainable and Eco-Friendly Fall Armyworm Management Options in Northern Ghana: Effects of Nitrogen Fertilizer Rates on the Growth and Yield of Fall Armyworm Tolerant Hybrid Maize Varieties Under Natural Fall Armyworm Infestation

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Abstract

In Ghana, fall armyworm (FAW), *Spodoptera frugiperda* (J.E. Smith) (Lepidoptera: Noctuidae) is a major source of maize yield losses. This study investigated the effects of high-nitrogen (N) (90 N kg/ha) and low-N (30 N kg/ha) fertiliser rates on the growth and yield of twelve maize hybrids with varying levels of tolerance to FAW under natural FAW infestation. The selected hybrids and two FAW-susceptible checks were planted in the Northern, Savannah, and Upper East Regions of Ghana in 2022. Data was collected on growth-and-yield-related traits, FAW-induced damage, and the number of FAW egg masses, larvae, and moths per plot. Genotype-by-fertilizer rate interaction effects for the number of FAW moths per plot, leaf area index at 4 weeks after planting (WAP), and stalk lodging were significant. There were no significant differences in the yield and performance of the hybrids in most agronomic traits between high-N and low-N plots. The high-N plots had significantly more FAW larvae than the low-N plots at 4 and 6 WAP. This resulted in a 5% higher mean grain yield (2.5 t/ha) in low N plots compared to high-N plots. A significant genotypic effect was observed for grain yield. The FAW-tolerant hybrids, M22-FAWTH-5, M22-FAWTH-3, M22-FAWTH-2, and M22-FAWTH-7, were the highest-yielding varieties across the two nitrogen rates, producing on average 28% more grains than the best FAW-susceptible check. The current results show that high N rates could promote FAW proliferation in maize, and FAW-tolerant varieties are a sustainable option to increase maize grain yield in both high and low N input situations under natural FAW infestation.

99. Identification of Microorganisms Contaminating Oil Palm Fruits and Oil from Processing Mills in Ghana

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Abstract
The aim of study was to develop a molecular technique on variability of the bacterial 23S rDNA and fungal ITS2 gene sequences to monitor the total bacterial and fungal populations of oil palm samples. Of particular interest was the identification of potentially toxigenic strains. Oil palm fruits and processed oil samples were collected from processing mills in the Eastern Region of Ghana. The fruits were washed in Potassium phosphate buffer to extract contaminating microorganisms. Bacterial and fungal species were identified by culturing and PCR analysis using Terminal Restriction Fragment Length Polymorphism (T-RFLP). T-RFLP analysis was performed on fruits stored over a 26 days period to analyse the build up of microbial communities. The distribution of microbes on fruits and oils from eight selected locations was also determined. A total of 30 bacterial and 31 fungal species were identified and these included colonisers, lipolytic, pathogenic and toxin-producing species. No samples amplified with aflatoxin biosynthetic gene primers in the PCR analysis. However, 57.9 percent of samples from the eight locations amplified with ochratoxin biosynthetic gene primers at a product size of 480-520 bp.

100. Determination of Growth Potential in Two Chicken Strains Using Morphological Markers at One Day Old

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Abstract
This study focused on assessing the one-day-old effect of some morphological markers and body weight at day-old on production traits in Ross broiler and Southern ecotype breeds of chicken as an alternative for genomic selection. The study was conducted at Akenten Appiah Menka University of Skills Training and Entrepreneurial Development Animal farm unit on Asante Mampong Campus of Ghana, from June to December 2022. 360 experimental birds were used for the experiment. For each breed, the chicks were put into four groups with 45 chicks in each group. Breast length (BRL), Back length (BL), Circumference of the head (CH) and day-old body weight (DOBW) were taken on the chicks at one day old in groups 1, 2, 3, and 4 respectively using a tailor's tape and a weighing scale. Chicks within each group were classified into three (3) subgroups and considered as treatments (T) 1,2 and 3. The treatments were described as higher (T1), medium (T2), and lower (T3) range based on the values obtained from the measurement and reared under randomised completely block design (RCBD). Data on production traits were taken up to week 8 for the Ross broiler and 18 weeks for the Southern ecotype chicken. The results from ANOVA using Statistics indicated that for the Ross broiler chickens, T1 in all the groups was significantly ($P < 0.05$) superior over T3 for feed intake, body weight, body weight gain and feed conversion ratio. T2 were significantly better than T3 in terms of body weight. For the Southern ecotype chickens, T1 were significantly ($P < 0.05$) better than T3 for feed intake, body weight, and body weight gain. However, for feed intake and body weight gain, T2 were significantly ($P < 0.05$) better than T3. Pearson correlation analysis also indicated a high, strong and significant ($P < 0.05$) correlation between the day-old markers concerning body weight. Regression equations of the day-old markers with body weight were positive and significant ($P < 0.05$) with the coefficient of determination (R2) ranging from 0.64 to 0.76 for Ross broilers and 0.81 to 0.95 for Southern ecotype chickens. CH and DOBW had the highest R2 values and thus the best predictors of body weight. It can be concluded that all the four-day-old markers can be used for selection purposes efficiently.

Keywords: Growth potential; morphological markers; production traits; coefficient of determination.

101. Effect of Different Drying Methods on Nutritional and Physico-Chemical Properties of Egg Powder

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Abstract
This study aimed to determine the effect of solar and freeze-drying methods on the nutritional and physico-chemical properties of egg powder. Fresh egg samples were dried separately using solar and freezing drying, and the physicochemical properties, proximate and mineral content were determined using standard methods. For the physicochemical properties, solar drying caused a reduction in the TSS and pH from 0.83 oBrix and 7.95 for fresh egg to 0.55 oBrix and 6.89 (solar dried egg powder) compared to that (0.95 oBrix and 7.73) of freeze drying, though both methods did not affect TTA. The drying methods reduced the colour characteristics (L*-41.62, a*-2.68 & b*-15.88) of the fresh egg to (L*-34.27, a*-0.51 & b*-13.29) and (L*-28.08, a*-0.91 & b*-5.74) for freeze and solar dried powders, respectively. Except for moisture (75.98%) which decreased significantly to 2.32% (freeze-drying) and 6.70% (solar drying), protein (54.40-55.93%), fat (27.75-29.49%), ash (4.14-4.58%), carbohydrate (7.03-7.69%) and energy (485.41-519.83%) increased greatly for the egg powders compared to the fresh egg which had 10.62%, 8.32%, 1.54%, 2.21% and 130.56 kcal correspondingly. The two egg powders had comparable concentrations of K, Ca, Fe, Zn and Mg, indicating equal effects of freeze and solar drying methods on mineral composition. The freeze-drying was more efficient in moisture removal, and maintaining a high nutritional profile as well as colour characteristics of the egg powder compared to the solar dryer, though both may have significant applications in egg powder production to promote food and nutrition security.

Keywords: Egg powder, Freeze drying, Solar drying, Physico-chemical properties, Proximate, Minerals

102. The Physico-Chemical Water Quality Assessment of Lake Bosomtwi: A Crater Lake in Ghana for Sustainable Management

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Abstract
Lake Bosomtwe in the Ashanti Region of Ghana is the only natural inland freshwater lake believed to have been formed by meteoritic impact. As the primary inland water body in the Region, the lake has become a popular tourist destination, leading to a surge in recreational activities. This popularity has brought challenges such as pressure on sanitation, increased demand for fish, and pollution of the lake. To address these concerns and promote sustainable management of Lake Bosomtwe, the Sustainable Management of Lake Bosomtwe Project was undertaken from 2012 to 2014. The project, implemented by the CSIR Water Research Institute and other stakeholders, received funding from the Spanish Government Funds-In-Trust, with support from the UNESCO Accra Office. It aimed to identify and implement specific actions to ensure the lake's sustainable management. This paper describes the physico-chemical water quality analysis of the lake, as well as its adjoining groundwaters (boreholes) and streams. Field visits were made to Lake Bosomtwe to collect water samples for analysis in CSIR Water Research Institute laboratories in Accra. Water sources sampled included the lake, boreholes, and flowing streams. In both the Lake and the Borehole, Turbidity, TSS and Colour indicated low levels. However, levels of Total Alkalinity were significantly high in both sources. The Borehole waters were very hard attributed to geology, while the Lake waters were moderately soft. Metal levels in the Lake were very low. Apart from phosphate, nutrient levels in the Lake were low. Human activities, specifically fertilizer application in and around the Lake, have been identified as the primary sources of pollution .

Keywords: Lake Bosomtwe, water quality, water pollution, sustainable management

103. Assessment of Food Security Accessibility Dynamics of Climate Smart Agrarian Households in Ghana

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Abstract
Food systems in Ghana are envisaged to be threatened by climate variability and change. Climate Smart Agriculture (CSA) presents options for addressing climate change effects on food systems. Several efforts have been initiated in Ghana towards the mainstreaming of CSA into its agriculture. The study examined the dynamics of accessibility dimension of food security in CSA agrarian households. A total of five hundred (500) smallholder farmers were sampled from ten districts across the major agroecological zones in Ghana using multi-stage sampling technique. Descriptive statistics and Food Insecurity Experience Survey Model (FIESM) were employed for analysis. Over 70% of the CSA agrarian households were food secured. No food insecurity with severe hunger was discovered among farmers without formal education as a result of adequate training, experience sharing and learning among groups. The results imply that as the adaptive capacities of agrarian households are enhanced to use multiple CSA practices, households are more likely to be food secured.

104. Growth Performance, Biomass Allocation and Stomatal Density of Balanites Aegyptiaca Delile in Response to Watering Regimes

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Abstract
Drought is a major abiotic factor constraining plant survival, and productivity. Understanding how species respond to drought can help selecting in resilient species to water stress in the domestication process, especially in the current context of climate change. This study compared the growth performances, biomass allocation and stomatal density of *Balanites aegyptiaca* from Benin under different watering regimes. A randomized complete block design with six watering regimes (*Control*: watering every day at 100% field capacity – FC till the end of the experiment, *light stress*: watering every 3 days at 100% FC till the end of the experiment, *moderate stress* 1: watering every 3 days at 50% FC till the end of the experiment, *moderate stress* 2: watering every 10 days at 100% FC until the end of the experiment, high stress: watering every 10 days at 50% FC till the end of the experiment, and severe stress: watering every 10-days at 25% FC till the end of the experiment) was established. Growth data were collected every ten days. At the end of the experiment, data on total biomass and its allocation (stem, leaves, and roots), and stomatal density were also collected. Results showed that the watering regimes significantly influenced the growth of the plants, the biomass allocation, and the stomatal density. Watering at 100% FC each ten days (moderate water stress) gave the higher growth, biomass, and stomatal density. This study shows that although *B. aegyptiaca* is well-known to adapt to drought, severe water stress can be detrimental to its growth.

Keywords: Domestication, desert date, water stress, West-Africa

105. Assessing the Potential of Toasted Fonio Grain Flour as a Substitute for Wheat in Biscuits

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Abstract

White fonio (*Digitaria exilis*) is considered to be one of the earliest crops cultivated in West Africa. The goal of this study was to evaluate the use of toasted fonio grain flour in biscuit production. Nine biscuits formulations comprising varying wheat to toasted fonio flour ratios were developed using mixture design. Constraints of the design were set based on a standard biscuit recipe with all other ingredients held constant. Analytical tests conducted showed that formulations which had equal proportions of wheat to fonio flour had comparable spread ratio to 100% wheat biscuits. There was however no significant difference between the %bake loss of all the formulations tested ($p > 0.05$) thus indicating that ratio of wheat to fonio does not significantly influence the degree of moisture loss in the final biscuit. Evaluation of the organoleptic properties of the biscuit formulations using a ninety member panellist and a balanced incomplete design indicated significant differences ($p < 0.05$) amongst the formulations for all the sensory parameters analysed except aroma. Panellists identified 6 out of the 9 biscuit formulations as having overall acceptability characteristics almost identical to 100% wheat biscuits. Findings obtained from this study support the use of toasted fonio grain flour in the production of baked goods.

Keywords: biscuit, fonio flour, toasted, whea

106. Morphological Characterization of Root Lesion Nematode Parasitizing Oil Palm Trees in Ghana

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Abstract

In a field survey of plant-parasitic nematodes found infecting oil palm in three regions of Ghana (Eastern, Central and Western regions), Root lesion nematode (*Pratylenchus* spp) was detected from all three regions. Morphological variations using principal component analysis (PCA) of the nematode have been given in this research. Six morphometric variables were used in the characterization of female *Pratylenchus* spp. These were body length (486.6 ± 35.8µm), body width (24.4 ± 2.3 µm), stylet length (16 ± 2µm), tail length (27 ± 3µm), anal body width (12.4 ± 2,6 µm), vulval position (80.1%). PCA revealed morphometric variation among the populations of female *Pratylenchus* spp. The first two principal components (PC) accounted for 82.09% of the total variation among the various populations. Six eigenvalues were noted. A plot of PC1 and PC2 showed clustering into two main groups. Populations from Western region (Aboasu, Atieku, Bogoso, Dramang, Huni valley) and Central region (Burukuso, Kyiabobso, Ntafrewaso, Twifo Hemang, Wawase) (Group I) were more closely related compared to populations from Eastern region (Adonkrono, Asuom, Kusi, Okumaning, Subi) (Group II). Biplots of the populations show body length, body width, and stylet length as variables which distinguished Group I from Group II. Same groupings from the PCA were shown in the dendrogram generated using Agglomerative Hierarchical Clustering (AHC). This study provides the first report on morphometric characterization of root lesion nematode populations in Ghana showing significant morphological variation.

Keywords: *Elaeis guineensis*, *Pratylenchus* spp., Morphometrics, Principal component analysis.

107. Effects of Stocking Density on Biological Indices of Nile Tilapia Fingerlings (*Oreochromis niloticus* Linnaeus 1758) fed Various Commercial Feeds in Earthen Pond

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Abstract
The effects of stocking density on growth, survival and yield on aquaculture are well known for different species and seems to impact production in various ways. However, information related to its impacts on the growth performance of Nile tilapia (*Oreochromis niloticus*) fingerlings in earthen ponds is limited. Hence, the main objective of this study was to determine the effects of stocking density on the growth performance of Nile tilapia fingerlings fed various commercial feeds in earthen pond. The experiment was carried out at the University of Energy and Natural Resources Demonstration Farm, Fiapre. Two hundred and ten Nile tilapia (*Oreochromis niloticus*) fingerlings were acclimatized and fed for two weeks under a static system at the fish pond (48.5m x 43m) They were divided into three treatment (RA, AL, CO) of stocking densities (10 fish/m^3, 20 fish/m^3) in twelve hapas of (1m x 1m each). Fish were fed at 5% body weight for 8 weeks. Biological indices were taken fortnightly and proximate analyses were taken for: RA-Raanan, AL-Aller aqua and CO- Coppens after 8 weeks. The experiment followed a 2x 3 completely randomized design. Results revealed, treatment CO (61.20 ± 0.00) g at 10 fish/m^3. Treatment C20 had best FCR (2.20 ± 0.00) at 20 fish/m^3. Highest Mean Weight Gain (g) (56.80 ± 0.00) was C10 at 10 fish/m3 with significant difference ($P<0.05$) from other treatments. Crude protein was highest (68.59 ± 0.71) g in AL 10. It is recommended that Nile tilapia (*Oreochromis niloticus*) fingerlings with 10 fish/m^3 fed Coppens feed (CO) will give the best mean weight gain for fish farmers.

Keywords: *Oreochromis niloticus*, Stocking Density, feeds, Growth Performance

108. Occurrence of Milk Spots and Cirrhosis in Livers of Pigs Slaughtered at the Kumasi Abattoir Company Limited

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Abstract
Fish species assemblage and selected environmental variables were monitored in Lake Volta from September In Ghana, pigs are severely affected by several intestinal parasites including *Ascaris suum*. This study was therefore conducted at the Kumasi Abattoir Company Limited (KACL) in Ghana to assess the occurrence and intensity of milk spots and cirrhosis which may be caused by the migration of *A. suum* larvae in the livers of pigs. Two hundred and thirty-three livers from pigs of different ages, breeds and sex were examined. The frequency of milk spots and liver cirrhosis, the intensity of occurrence and the distribution of pigs based on sex, breed and origin were determined by standard techniques. Out of the total number of pigs examined, 15.5% had milk spots present on the liver. The prevalence of milk spots was high in pigs from the Ashanti Region (17.2%) and also in fatteners (17.7%). The highest intensity of milk spots (2.3%) in this study was recorded in fatteners. Also, the prevalence of liver cirrhosis obtained from the study was 1.3%. The sex, origin, breed and growth stage of pigs did not influence the occurrence ($p > 0.05$) and the intensity of milk spots ($p > 0.05$). Moreover, the body condition score of pigs was not affected by the occurrence of milk spots ($p > 0.05$). The study shows the prevalence of milk spots in pigs slaughtered at the Kumasi Abattoir to be 15.5%, exceeding the warning threshold (10%) for the occurrence of milk spots. This, therefore, calls for the implementation of efficient deworming protocols and proper husbandry practices.

109. Effect of Different Stocking Densities on the Growth Performance, Gastrointestinal pH, Carcass Traits, Bone Traits and Litter Quality in Dual-Purpose Chickens

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Abstract

The study was designed with the hypothesis that a higher stocking density (SD) would impair the growth performance, gastrointestinal pH, bone trait, and litter quality in dual-purpose chickens (SASSO) in a 42-day trial. At d 9 post-hatch a total of 350 chickens were allocated to three SD (low, 15 birds per 2.24 m^2); (medium, 20 birds per 2.24 m^2) and (high, 30 birds per 2.24 m^2) with 5 replications per treatment in a CRD. Data on body weight (BW), Gain, feed intake (FI), feed conversion ratio (FCR), gastrointestinal (GI) pH, organ weight (% BW), and litter quality were collected. Throughout the trial, the low SD recorded the highest ($P < 0.05$) BW, Gain, and FI on d 16, 30, 37, 51, and 58 post-hatch and followed by the medium SD. The worst performance was recorded in the high SD in the entire study. On d 23 post-hatch, the high SD recorded a better ($P = 0.052$) FCR than those on the low. At d 44 post-hatch, none of the variables were influenced by SD though birds on the low SD had higher ($P > 0.05$) BW, Gain, and FI. The gut pH, bone traits (length, diameter, weight, and breaking strength of tibia and femur), and litter quality were not influenced by SD at d 58. It was concluded that an SD of 30 birds per 2.24 m^2 or beyond might reduce the growth performance of dual-purpose chicken and so a lower SD of 15 birds per 2.24 m^2 is recommended.

Keywords: Dual-purpose chickens, stocking density and welfare

110. Sustainable Commercial Sod Production of Cynodon Dactylon (Bermuda Grass) in Ghana: Assessing Growth, Visual, and Physical Quality

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Abstract

Despite health and environmental concerns associated with the use of artificial grass, there is a noticeable shift towards its usage. Using natural sod remains a more sustainable approach to maintain pitch quality in the country, though it is not commercially available. This study evaluated the growth, visual, and physical quality of Bermuda grass for commercial sod production using both seed and sprigs in Ghana. The experiment employed a 3 x 3 factorial randomized complete block design with three replications, considering fertilizer and base netting as factors. Fertilizer levels included chicken manure (10 tons/ha), Harvestmore® foliar fertilizer (460 kg/ha) and no fertilizer. Base netting consisted of window net, jute fibre mat, and no base netting. Parameters such as canopy height, clipping biomass, chlorophyll content index (CCI), color, tensile strength, and handling quality were measured. For seeded sod, chicken manure without base netting resulted in the highest canopy height (27.62 cm), while the foliar fertilizer and no net interaction recorded 33.13 cm for sprigged sod. The combination of chicken manure with base netting and without base netting exhibited the highest CCI, with values of 37.51 and 40.53 for seeded and sprigged sod, respectively. Treatments with fertilizer displayed the best genetic color performance, and treatments with window netting also showed the best results for handling and tensile strength. Overall, the application of chicken manure and foliar fertilizer with window netting significantly improved the growth, visual appearance, and physical strength of both seeded and sprigged sod, meeting commercial standards.

Keywords: Football pitches, natural turf, Bermuda grass, visual quality, fertilizer and netting.

111. Effects of Regular Maize and Different Certified Maize Varieties on the Growth Performance and Carcass Traits of Broiler Chickens

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Abstract

A study was conducted to evaluate the effects of different varieties of maize (Obatanpa, Abontem, Honampa), their mixture, or regular maize on the growth performances and carcass traits of broilers. A total of 180 Cobb 500 chicks were randomly allotted to 5 treatments with 4 replications of 9 birds per pen in a CRD. All the dietary treatments were formulated to be iso-caloric and iso-nitrogenous. The variables measured include bodyweight (BW, g), Gain (g), feed intake (FI, g), feed conversion ratio (FCR) and livability (%), and carcass weight (% BW). By d 21 none of the production variables were influenced ($P > 0.05$) by the treatments. The BW was highest in Abontem-based diets d 28 ($P = 0.068$), d 35 ($P = 0.092$), d 42 ($P = 0.05$), d 49 ($P < 0.05$) and d 56 ($P < 0.05$). The FCR was lowest ($P < 0.046$) with feeding Abontem at d 42. The worst BW and FCR throughout the study were recorded in birds fed regular maize. Birds fed the regular maize, Abontem, and Honampa recorded higher heart ($P > 0.052$) and proventriculus ($P > 0.002$) weights. Feeding the certified maize varieties, especially Abontem, yielded the best growth performance followed by the combination of the varieties with the regular maize giving the least performance. The findings suggest that feeding a particular improved maize variety might be preferred over their combination or the regular maize sold in the market.

Keywords: Obatanpa, Abontem, Honampa, maize varieties, and broiler performance

112. Quantifying Heat Stress Thresholds and Subsequent Decline in Reproductive Performance of Sanga Cows in Ghana

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Abstract

Heat stress as measured by Temperature Humidity Index (THI) negatively impacts cow productivity but its effect on cows in Ghana has been underexplored. The objectives of this study were to determine (1) the THI threshold at which conception rates and number inseminations per conception within 30 days decline in Sanga cows and (2) the percentage decline in conception rate and number of inseminations per conception for each unit change of THI above the THI threshold. Artificial insemination records on Sanga cows spanning 2014 to 2021 were obtained from the Amrahia Dairy Farms of Ghana and daily temperature and relative humidity records on the day of insemination were obtained from a Ghana Meteorologic Agency weather station in Tema, Ghana. A logistic regression model was fitted with conception rate and number of inseminations per conception as dependent variables and parity, year of insemination and THI index as independent variables. The study revealed a significant ($p<0.05$) effect of THI on conception rate but not on number of inseminations per conception in Sanga cow. Sanga cows' conception rate significantly decreased from 76% for THI class 83-85 to 54% for THI class ≥86 indicating that THI ≥86 is the threshold beyond which Sanga cows conception rate is compromised. A unit increase in THI reduced conception rate by 5% ($p<0.01$) in Sanga cows. Heat stress on the day of insemination had adverse effect on the conception rate of Sanga cows. Both short- and long-term heat abatement strategies are needed for improved reproductive performance of Sanga cows.

113. Understanding Ultrasound Technology for Food, Nutraceutical and Medicinal Applications

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Abstract

Global focus on food safety, health, nutrition and sustainability in an era of climate vulnerability has necessitated the exploitation of physical processing techniques in the food, nutraceutical and pharmaceutical industries. Although chemical treatments can ensure eradication of food-borne pathogens, negative effects on health cannot be overlooked. Even when chemical dosage is within acceptable limit, the biological burden based on individual carrying capacity and bioaccumulation are realities to contend with. Thus, processes that are safe, non-additive, eco-friendly or climate-smart, economically viable and nutrient-conserving are the way forward, going into the future of food, nutrition and medicine. This study seeks to throw light on the potentials of ultrasound technology as a physical process that can be exploited in varied industries, especially in the areas of food science and nutrition. It highlights some of the major setbacks with the technology's application in these areas and proposes ways in which they can be overcome.

114. Electric Mobility Potential and Progress in Ghana Towards a Green Energy Transition: Maximizing Opportunities to Achieve the SDGs

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Abstract

Ghana pledged, under the Paris Agreement, to mitigate climate change by putting in measures to decrease its greenhouse gas emissions by 15 percent relative to the baseline growth scenario by 2030. The emission reduction goals include introducing sustainable mass transportation to be achieved by the adoption and investment in electric mobility. Although relatively young in the field of scientific study, electromobility is gaining ground in Ghana as a cross-sectorial innovation to foster the decarbonization of road transport and a green energy transition. With a projected 3 million vehicular population by 2030, the promotion of electric vehicles (EVs) is estimated to displace about 25% of conventional cars, reduce gasoline demand, and improve local roadside air quality with a consequential reduction in overall national GHG emissions by 8%. This paper examines Ghana's electric mobility potential in green energy transition, significant progress, and the role of science in opportunities available in battery technology, renewable energy integration, smart charging technology, waste and circular economy, infrastructure development, and life cycle analysis in the value chain. The Model for Analysis of Energy Demand (MAED) tool was used for estimating sustainable energy requirements.

Keywords: Electric mobility, green energy transition, electric vehicles, science and technology, climate change, SDG 7

115. **Electric Mobility in Ghana's Green Energy Transition: Progress and** Potential Opportunities for the Sciences

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Abstract

Ghana, currently, a lower middle-income economy has a medium-to-long term ambition to achieving an upper middle-income status by 2030, the end target year of the Paris climate Agreement and also for achieving the UN Sustainable Development Goals. By 2030, the country's prevailing population of about 30 million is projected to reach ~37 million. Achieving and sustaining such an economy would require the current average GDP per capita of about $2,000 to expand to at least $3,000 - 5,000 by 2030. The projected rates of population-economic growth would increase the average electricity consumption per capita from the current of ~420 kWh to ~5000 kWh by 2030. The expected population, economic and energy growth would spur increases in total greenhouse gas (GHG) emissions from the prevailing average of about 42 million tonnes of carbon dioxide equivalent ($MtCO_2e$) to 74-80 $MtCO_2e$. However, under the Paris Agreement, Ghana has pledged to decrease its GHG by 15% relative to the baseline growth-scenario by 2030. Ghana's emission reduction strategy includes introducing Sustainable Mass Transportation by introducing electric vehicles (EVs) i.e. e-mobility. Vehicular population estimated at 2.2-2.7 million in 2020 would exceed 3 million in 2030 when Ghana becomes an upper-middle income country . The promotion of EVs is projected to displace 5-25% of conventional vehicles and potentially reducing about 5-23% of gasoline demand by 2030 with consequential reduction in overall national GHG emissions by 4-8% accompanied by potential improvement in local air quality due to zero gaseous-hazardous emissions depending upon the penetration scenario. The main challenges are the inadequate data on countrywide air quality measurements, and the handling of potential release of 1,200-6000 tonnes of rare metal lithium batteries as waste if without any recycling strategy . The challenges nonetheless open an opportunity for the sciences to take advantage of in battery recycling, evaluating long term local assembly/production besides improving and expanding air quality measurements countrywide. The Low Emissions Analysis Platform (LEAP) modeling tool was used for the baseline and future projections scenarios.

116. Development of Solar-Powered Cassava (Manihot Esculentum, Crantz) Peeler

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Abstract

The study was purposed to propose a theoretical design suitable for the construction of a fresh cassava peeling device that can reduce the peeling time of the produce, relative to existing designs as a means of reducing postharvest losses, between harvest and consumption market chain. The content analysis approach was used, relying on systematic review. The contents that were identified were selected, employing the Google database. Twenty-eight out of seventy-five journal papers were eventually selected. The selected documents were finally coded manually, reviewed and then analysed. The paper found that the theoretical design can be brought into reality using local materials. It was also found that performance parameters such as peel removal efficiency; overall peeling quality index; and peeler capacity and percent tuber flesh loss might be improved using the proposed design. Additionally, it was observed that employing solar energy to power the peeling device was a novel attempt to promote the use of green energy. The proposed design, could assist to achieve Sustainable Development Goal (SDGs) 2 (zero hunger) of Agenda 2030, through the promotion of sustainable agriculture; ending hunger; improving nutrition; and achieving food security. The novelty of the design are four-fold: One, Application of a combination of both drum and rubber brushes; two, the application of green energy (solar energy) to power the device; three, the potential improvement of performance parameters; and four, the possibility of using local materials for its construction.

117. Renewable Energy Evolution: Generating Hydrogen (H_2) Energy from the Splitting of Water in the Presence of Carbon-Dot-Mediated Gold Nanoparticles

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Abstract

Photocatalytic water splitting has emerged as promising to augment the quest of obtaining clean and renewable energy in the presence of metal nanoparticles (NPs) as photocatalyst. In this study, we explored the photo-catalytic efficiency of two formulations of carbon-dot-mediated gold nanoparticles (CDs-AuNPs-1 and CDs-AuNPs-2) supported on g-C_3N_4 to generate hydrogen energy over the splitting of water under visible light irradiation. Structural characterization of the novel CDs-AuNPs clusters were successfully analysed with TEM, UV/vis spectra, SAED, and XRD. Three (3) different formulations of CDs-NPs-1 and CDs-AuNPs-2 were created for the hydrogen evolution study when doping with g-C3N4 at concentrations of 10 mg, 5 mg, and 2 mg. After a 3-hour run, CDs-AuNPs-2-2 mg/g-C_3N_4, CDs-AuNPs-2-5mg/g-C_3N_4, CDs-AuNPs-1-5mg/g-C_3N_4, CDs-AuNPs-2-10mg/g-C_3N_4, CDs-AuNPs-1-10mg/g-C_3N_4, CDs-AuNPs-1-2mg/g-C_3N_4 enhanced the splitting of water with their hydrogen generation reaching, 110.71 $\mu molh^{-1}g^{-1}$, 90.36 $\mu molh^{-1}g^{-1}$, 75.88 $\mu molh^{-1}g^{-1}$, 66.89 $\mu molh^{-1}g^{-1}$, 44.39 $\mu molh^{-1}g^{-1}$, 28.92 $\mu molh^{-1}g^{-1}$ respectively. All the amount of H_2 reached by the aforementioned photocatalyst were around 3 times higher than the amount reached for pure g-C_3N_4 (27.64 $\mu molh^{-1}g^{-1}$). The amount of hydrogen (H_2) energy produced in the presence of the novel CDs-AuNPs photocatalysts illustrates a promising method to produce alternative energy to reduce the detrimental effects on the environment and energy crisis brought on by the continuous rise in the consumption of fossil fuels.

Keywords: Water, Photocatalysis, Hydrogen energy, Visible light, Nanoparticles

118. Cognitive State Detection in Humans via Facial Expressions Processing: A Critical Review

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Abstract

One puzzling challenge in psychology, neuroscience, human-computer interaction and social robotics has been decoding human behaviour. Cognitive science research has advanced with several techniques for understanding one's mental state using neuroimaging techniques with integrations of other advanced artificial intelligence tools. However, these advancements have been the perceived intrusiveness during the data collection as one undertakes cognitive state or skill activities. Additionally, the cost implications of addressing the rising mental health crises demand a better perspective on this challenge. This paper conducts a critical review to understand the perspectives, methodologies, and implications of the studies undertaken in understanding one's cognitive state or skill using facial expressions and other neuroimaging techniques. The study critically reviewed essential and highly related literature to establish the challenges and prospects for detecting and understanding one's cognitive state or skill using deep neural networks. Observations made indicate that there are limited resources for implementing a wide-scale adoption of neuroimaging tools for understanding one's cognition; the unravelling of the subtle changes in one's emotional expressions offers clues to understanding one's cognitive state, and limited and highly confidential datasets are lacking for an open challenge to building a proper cognition detection systems.

119. Innovative Technology for Green Energy-The Empower Playgrounds Innovation for Basic Schools in Ghana

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Abstract

Clean energy is energy that emits little to no greenhouse gas emissions and includes renewable and carbon-free sources. This is in contrast to fossil fuels, which produce a significant amount of greenhouse gas emissions, including carbon dioxide and methane. The UN SDG 7 is about ensuring access to clean and affordable energy, which is key to the development of agriculture, business, communications, education, healthcare, and transportation. The lack of access to energy hinders economic and human development. Many Ghanaians living in rural areas do not have access to electricity in their homes or schools. Children in these communities find it almost impossible to study, read, and do their homework at night. Most children assist on farms or other chores until past sundown, leaving no natural light left to study. The aim of our project was to construct merry-go-rounds that generate electricity which will then be used to charge rechargeable lanterns to provide light at night. Merry-go-rounds were constructed in schools in some selected rural communities in Ghana. Playing children spin the merry-go-round deck which is coupled through a spherical bearing to a multi-stage helical gearbox turning backward as a speed increaser. The high-speed output of the gearbox is coupled to a wind turbine generator which then converts over 70% of the mechanical energy to a three phase Alternate Current electricity. A buried conduit routes the electrical wires to the power box which contains a full-bridge rectifier, a solar power controller and a large storage battery. The rectifier converts the three phase AC power to constant polarity DC. The power from the storage battery is used to recharge smart, LED lanterns which children use to study at home. The merry-go-round also serves as an educational, hands-on learning experience for the children to learn more about engineering, technology and green energy.

Keywords: Green energy, Climate change, SDG

120. Portable Household Biogas Setup for Cooking: A Sustainable Solution to the Energy Transition Agenda

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Abstract

by the decomposition of organic matter in the presence of anaerobic bacteria. Biogas can be used for cooking, electricity generation, and heating. The use of biogas as a cooking fuel can reduce reliance on fossil-based fuels. Fossil fuels are a major source of greenhouse gas emissions and the reduction in the usage of these fuels can help mitigate climate change. This study monitored the production and usage of biogas as a supplementary cooking fuel in a household of four adults. The objective was to assess the feasibility of using a 200-liter bioreactor system to produce biogas using the in-house generated organic waste as feedstock and to quantify the potential reduction in greenhouse gas emissions. A 200-liter bioreactor system installed in a household of four adults was fed periodically with organic kitchen waste. The biogas produced was measured with a biogas flow meter and was collected and stored in a portable biogas storage balloon. The collected biogas was quantified and tested for cooking and heating water. The study found that the potential emission reduction from using biogas to replace LPG is up to 50%, indicating that a household of four adults could use biogas to cook food for an average of 2 hours per day and this could potentially reduce their greenhouse gas emissions by up to 1.3 kilograms of CO2e per day. This preliminary result provides an interesting concept on household biogas generation to support cooking and waste management at homes. Based on these findings, it is recommended that more research is needed to optimize the biogas production process as well as the efficiency of the system.

Keywords: climate change, greenhouse gas emissions, organic household waste, biogas.

121. Synergistic Solutions for Ghana's Energy Transition: Harnessing the Power of Nuclear and Renewable Hybrid Energy Systems

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Abstract
Nations all over the world are moving toward sustainable energy sources due to the urgent need to battle climate change. In alignment with Ghana's unwavering commitment to address climate change and mitigate its socio-economic impacts, this paper presents a persuasive argument for the adoption of nuclear and renewable hybrid energy systems, specifically integrating solar and wind power, as part of Ghana's comprehensive energy transition framework. By harnessing the unique advantages offered by both nuclear and renewable energy sources, Ghana can effectively realize its ambitious objectives of decarbonizing the energy sector, ensuring energy security, and fostering socio-economic growth. This paper serves as a roadmap, offering valuable insights into the integration of nuclear and renewable energy technologies, thereby illustrating the potential environmental, economic, and social benefits that can be attained through the implementation of such a hybrid system. By combining the reliable baseload power generation of nuclear energy with the clean and abundant attributes of solar and wind energy, Ghana can achieve a synergistic energy mix that minimizes greenhouse gas emissions while meeting the nation's increasing energy demands. The paper dives into important issues including the significance of sound institutional frameworks and strategic policy proposals that enable the deployment of nuclear and renewable hybrid systems necessary for a successful energy transition. Ghana can take the lead in the global energy transition in Africa by implementing nuclear and renewable hybrid energy systems, aiding in the fight against climate change and ensuring a prosperous and sustainable future for its people.

Keywords: climate change, greenhouse gas emissions, synergy, sustainable energy development, hybrid energy systems.

122. Fraud Detection and Prevention Method for Healthcare Claim Processing Using Machine Learning and Blockchain Technology

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Abstract
Healthcare fraud is a global problem affecting both developing and developed countries. It is the deliberate attempt of the perpetrators to take undue advantage of the inefficiencies in current healthcare systems. Fraud tends to deny legitimate beneficiaries of universal health coverage, especially those under health insurance protection. In this work, we propose using machine learning techniques and blockchain technology to detect and prevent fraud in healthcare, especially in claims processing. A decision tree classification algorithm is adopted to classify the original claims dataset. The extracted knowledge is programmed in the Ethereum blockchain smart contract to detect and prevent healthcare fraud. The comparative experimental results show that the best-performing tool achieves a classification accuracy of 97.96% and a sensitivity of 98.09%. This means that the proposed system enhances the blockchain smart contract's ability to detect fraud with an accuracy of 97.96%.

123. Electrolyte and Separator Modification to Promote High Capacitance Retention and Cycle Stability of Electrochemical Energy Storage

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Abstract

Separator plays a vital role in the functionality of liquid electrolyte-based electrochemical cells. However, the most commonly employed commercial polyolefin separators are inherently hydrophobic and thermally unstable contributing to poor cycle performance and high thermal shrinkage, respectively, which can shorten cycle life. Here, a high-performance supercapacitor based on composite separator from nano-Al_2O_3/PVDF-coated commercial polyethylene (PE) substrate prepared using a low-cost casting (stir-dip-coat-dry) technique coupled with a modified electrolyte containing 1M EMI-BF4 salt in EC: EMC: DMC (1:1:2 vol%) is reported. The results show that integration of nano-Al_2O_3 in the PVDF matrix contributes to a large interactive surface area that attenuates interfacial energy at the separator-electrolyte boundary and improves porosity as well as the overall performance. The filler also enhances high mechanical anchoring onto the PE substrate contributing to the overall physical and electrochemical properties of the separator. These modified PE separators with porous microstructure demonstrate superior electrolyte wettability (88%), stable electrochemical performance, and high cycle stability superior to analogous cells with commercial separators. Pairing the coated modified separator with the EMI-BF4-modified electrolyte, high ionic conductivity of up to 2.23 mS/cm is observed. This facile technique is scalable for separator-electrolyte design and is attractive for low-cost supercapacitor manufacturing, and is suitable for various safe and fast charging high-power devices.

Keywords: Supercapacitor, surface-modified separator, large interactive surface area, ionic electrolyte, lower interfacial energy.

124. Development of A Preservation Technique For The African Garden Eggplant (*Solanum Aethiopicum* L.)

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Abstract

The purpose of this paper is to propose a probable antioxidant preservation treatment technique for the fresh African eggplant (*Solanum aethiopicum* L.), specifically the Gilo phenotype, as a means of reducing postharvest losses of the produce. Content analysis was used, dwelling on systematic review. The contents that manifested were adopted, relying on the Google database. Thirty out of 96 research papers were finally selected, manually coded, reviewed and analysed. The paper found that 1-MCP, erythorbic acid and sodium succinate when employed, might extend the shelf life of fresh egg-plant phenotype under consideration beyond 6 days. The paper also found that the produce treated with 1-MCP might be longer than those treated with the other antioxidants. It was additionally discovered that, depending on the concentration of the antioxidant, the toxicity of the produce might be within the acceptable standards of the World Health Organization (WHO). The proposed technique could facilitate achieving Sustainable Development Goal (SDGs) 2 (zero hunger) of Agenda 2030, through the promotion of sustainable agriculture; ending hunger; improving nutrition; and achieving food security. Generally, antioxidant preservation of the phenotype appears to be unavailable in literature. Specifically, the application of 1-MCP, erythorbic acid and sodium succinate in the preservation of the produce appears not to have been explored. Additionally, the required concentration of these antioxidants that could ensure the acceptable WHO minimum toxicity standards has not been established. The study aims to lay the foundation for achieving these purposes.

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