



CAROL KAWUMA

LECTURER

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ABOUT ME

As a dedicated and results-driven Ph.D. graduate specializing in Plant Taxonomy and Biosystematics, I bring a robust academic and research foundation in botanical sciences. My experience as a university lecturer and researcher underscores my strong commitment to the advancement of systematic botany, plant biodiversity, and conservation. I possess proven expertise in morphological and molecular systematics, herbarium curation, field botany, and data analysis. My passion for plant science is evident in my desire to contribute to the field through cutting-edge research, interdisciplinary collaboration, and capacity-building initiatives.

RESEARCH INTEREST

MY RESEARCH CENTERS ON UNDERSTANDING PLANT MORPHOLOGICAL EVOLUTION, TRAIT VARIATION AND SYSTEMATICS USING BOTH MOLECULAR AND MORPHOLOGICAL DATASETS. I AM PARTICULARLY INTERESTED IN STRUCTURE FUNCTION RELATIONSHIPS IN PLANT ORGANS, EVOLUTIONARY DEVELOPMENTS AND THE INTEGRATION OF HERBARIUM AND NATURAL HISTORY COLLECTIONS IN ANSWERING PHYLOGENETIC AND EVOLUTIONARY QUESTIONS. I AM TO EXPAND MY RESEARCH TO INCLUDE THE DEVELOPMENTAL BASIS OF TRAITS AND PARENT OFFSPRING CONFLICT IN LAND PLANTS PARTICULARLY IN THE BRYOPHYTES.

SKILLS

MORPHOLOGICAL CHARACTER CODING AND SCORING; HERBARIUM SPECIMEN ANALYSIS AND DIGITALISATION; USE OF DICHOTOMOUS KEYS, FLORAS, MONOGRAPHS; TOOLS LIKE MORPHOBANK, EXCEL FOR MORPHOLOGICAL DATASETS

STATISTICAL SKILLS: USING PAST, SPSS, EXCEL

LAB WORK SKILLS: INCLUDING DNA EXTRACTION, AMPLIFICATION AND SANGER SEQUENCING, PCR AND ELECTROPHORENSIS FROM HERBARIUM AND SILICA DRIED PLANT TISSUES

SEQUENCE ALIGNMENT AND EDITING USING MEGA, GENIOUS PRIME; PUBLIC DATABASE MINING (NCBI); SEQUENCE MATRIX PREPARATION FOR PHYLOGENETIC INFERENCE, IQ TREE, MR BAYES, BEAST

DATA ANALYSIS (I) MORPHOLOGICAL DATA USING CLUSTER ANALYSIS, UPGMA, NEIGHBOR JOINING, SINGLE LINKAGES, COMPLETE LINKAGES (2) PHYLOGENETIC DATA MEGA X, IQ TREE, MR. BAYES, GENIEIOUS PRIME FOR MAXIMUM LIKELIHOOD AND BAYESIAN INFERENCE, GIS AND SPECIES DISTRIBUTION MODELLING USING MAXENT

ANCESTRAL CHARACTER STATE RECONSTRUCTION; COMBINED DATA MATRIX CONSTRUCTION

VISUALIZATION AND INTERPRETATION OF TRAITS FOR EVOLUTION ACCROSS CLADES; COMPARATIVE ANALYSIS IN R

ADAPTIVE TO NEW MODEL SYSTEMS INCLUDING MOSSES

DEVELOPMENTAL TRAIT SCORING AND EVOLUTIONARY TRAIT MODELLING USING R

HISTOLOGICAL AND ANATOMY

SHORT TRAININGS AND CERTIFICATES

THEORY AND PRACTICE OF PHYLOGENETICS

MAKERERE UNIVERSITY/COLORADO STATE UNIVERSITY

KAMPALA / OCT 2016

- Trained and introduced to systematics, phylogenetic analysis and parsimony
- Character coding for morphology and characters of special interest
- Optimisation and polymorphism/ missing data/inapplicable data
- Testing hypothesis of homology, maximum likelihood vs parsimony
- branch support, phylogenetic signals and tree searches
- Character coding for genes and gap characters
- Lineage sorting, introgression and paralogy lab

PLANT CONSERVATION

MAKERERE UNIVERSITY/UNIVERSITY OF OSLO

SEP 2022 - OCT 2022

Building knowledge for sustainable biodiversity conservation, from virtual learning to hands on experience (BIOcove)

APPLICATION OF BIODIVERSITY INFORMATICS

JRS BIODIVERSITY FOUNDATION

DEC 2021 - DEC 2021

Trained to generate information for conservation planning conducted with technical and material support from National museums of Kenya and JRS Biodiversity Foundation

Biodiversity data content

- Occurrence data
- Checklist data
- Sampling data

Standard and protocols

- Darwin Core Standard (DwC) and Darwin Core Archive Format (DwC-A)

Data sources/Acquisition

- Biodiversity inventories, Natural History (Specimen and Living collection)
- Data sharing
- Online databases

Data cleaning and Geo referencing tools

- Data quality, Taxonomic cleaning, Geographical cleaning
- Tools - Open Refine and GeoLocate

Introduction to Global Biodiversity Information Facility (GBIF)

- Data organisation
- Metadata creation
- Data publishing tools
- Access and use of data in GBIF
- Data papers

SCHOLARLY WRITING AND COMMUNICATION SKILLS

MAKERERE UNIVERSITY

MAR 2022 - APR 2022

Challenges and opportunities to Scholarly writing in academia

The art and practice of Scholarly writing

Critical academic reading and writing

Citation methods and ethics in Scholarly writing

Scholarly communication in science

Use of library resources for scholarly communication

Common short comings in the evaluation of papers for publication

Review of papers for quality

Scholarly work

ADVANCED RESEARCH METHODS

MAKERERE UNIVERSITY

I was trained in the following areas:

- The research process
- Formulating a research problem
- Research paradigms
- Theorisation and conceptualisation in a doctoral study
- Cross cutting research issues

BIODIVERSITY INFORMATICS AIMS BIODIVERSITY SUMMER SCHOOL

Trained in creating, accessing and analysing biodiversity data using R

SCHOLARSHIPS/GRANTS

A. FORMULATION AND CLINICAL EVALUATION OF PLANTS FOR THE MANAGEMENT OF COVID 19: FUNDED BY PRESIDE (STI-OP, UGANDA). ROLE: PLANT CONSERVATIONIST, FUNDING WORTH: 1,300,000,000/=

Plant taxonomist and conservationist /

B. FORMULATION OF HERBAL REMEDY FOR THE MANAGEMENT OF HIV RELATED ILLNESS. FUNDED BY BUSITEMA UNIVERSITY. ROLE: CO. PRINCIPAL INVESTIGATOR. FUNDING WORTH 25,000,000/=

CO-PRINCIPAL INVESTIGATOR /

C. PHD STUDY GRANT UNDER NOWERGIAN PARTNERSHIP PROGRAM FOR GLOBAL ACADEMIC COOPERATION (NORPART). ROLE: PHD RESEARCHER

PHD RESEARCHER /

D. GOVERNMENT OF UGANDA SCHOLARSHIP FOR BACHELOR OF SCIENCE DEGREE IN CONSERVATION BIOLOGY, MAKERERE UNIVERSITY. UNDERGRADUATE STUDENT /

RESEARCH EXPERIENCE

MAKERERE UNIVERSITY
Oct 2019 - Aug 2024

PHD RESEARCHER WORKING ON THE LEPTOSTEMONUM CLADE, GENUS SOLANUM

- Analysed morphological variations within *Solanum campylacanthum* in Uganda and evaluated its relationships with *Solanum cerasiferum* with emphasis to developmental influenced vegetation traits and their evolutionary significance within the *Leptostemonum* clade.
- Conducted detailed morphological assessments of *Solanum campylacanthum* and *Solanum cerasiferum* using both field collections and herbarium samples. Measurements of *Solanum cerasiferum* were made on images downloaded from GBIF and JSTOR Global Plants using IMAGE J software. A total of nine images including specimens collected from West, central, and eastern Africa were downloaded from GBIF (2022).
- Performed ancestral state reconstruction and comparative analysis to explore structure function relationship across clades focusing on trait evolution in *Solanum*
- Extracted and coded morphological characters from taxonomic monographs, floras, and primary literature for phenetic analysis for *S. campylacanthum* and *S. cerasiferum*.
- Built and curated character matrices for systematic and biosystematic studies involving *S. campylacanthum* and *S. cerasiferum*
- Utilized herbarium specimens from Makerere university herbarium (MHU) and University of Oslo Herbarium (O) to compare intraspecific within *S. campylacanthum* and interspecific (*S. campylacanthum* and *S. cerasiferum*) morphological variation.
- Assembled a comprehensive morphological dataset for the *Leptostemonum* clade, Genus *Solanum* using herbarium specimens and published floras.
- Documented over 30 diagnostic vegetative morphological traits both quantitative and qualitative (e.g., leaf shape, trichome type) across herbarium specimens, voucher specimens from field works.
- Compiled DNA sequence datasets of four gene regions (TrnL-TrnF, Waxy, NDHF and ITS) for specimens of the *Leptostemonum* clade from public databases (NCBI GenBank) and herbarium-derived specimens.
- Extracted genomic DNA from herbarium samples using EZNI plant kit.
- Amplified and sequenced four gene regions (TrnL-TrnF, Waxy, NDHF and ITS) using PCR and Sanger sequencing. Designed primers and optimized amplification for challenging herbarium specimens.
- Aligned and edited sequences using **Geneious prime** and **MEGA** Integrated morphological character matrices and molecular sequence data to infer phylogenetic relationships among plants of the *Leptostemonum* clade.
- Performed character evolution analyses (e.g., ancestral state reconstruction, trait mapping) using **Mesquite** and **R packages** (*phytools*, *ape*).
- Reconstructed phylogenetic trees using maximum likelihood and Bayesian methods (**IQ TREE** AND **MrBayes**) to test hypotheses.
- Conducted molecular systematics research using sequence analysis (e.g., ITS, NDHF, WAXY AND TRNL-TRNF) to resolve species boundaries and infer evolutionary relationships within species of the *leptostemonum* clade.

WORK EXPERIENCE

BUSITEMA UNIVERSITY
Jan 2021 - Present

LECTURER

- Developed and delivered comprehensive lecture materials for both undergraduate and postgraduate courses.
- Instructed a diverse array of botanical subjects, including BIO 2102 (Angiosperms: Form, Structure, Development, and Reproduction), BIO 2202 (Angiosperm Taxonomy), and BIO 3102 (Research Methods and Data Management).
- Facilitated practical learning experiences through SLB 1204 (Data Management) and SLB 1205 (Field Botany).
- Led PhD Seminar series, enhancing research understanding and application.
- Oversaw the academic and research program execution within the department.
- Conducted and supervised scientific fieldwork, providing hands-on research opportunities for students.
- Designed and graded examinations, ensuring fair and accurate assessment of student performance.

NATURAL PRODUCTS RESEARCH AND INNOVATION CENTRE (NAPRIC)
MBALE
Mar 2024 - Present

Chief scientist-Ethnobotany and conservation

- Deliver technical expertise across all ethnobotany and biodiversity conservation operations.
- Oversee management of the Botanical Garden and Herbarium, including curation, procurement, and inventory tasks.
- Lead coordination and supervision of Botanical Garden/Herbarium staff to maximize productivity and efficiency.
- Facilitate training and mentorship programs for students and staff to foster talent acquisition and retention.
- Provide strategic counsel to the centre leader and department head on botanical garden and herbarium development.
- Compile and submit regular reports, ensuring transparency and accountability in line with centre leader directives.

BUSITEMA UNIVERSITY
Jan 2010 - Dec 2020

ASSISTANT LECTURER

- Crafted and presented detailed lecture content for undergraduate courses.
- Constructed and evaluated exams to fairly and precisely measure student achievement.

BUSITEMA UNIVERSITY, BIOLOGY DEPARTMENT
Tororo
Jan 2021 - Dec 2022

HEAD OF DEPARTMENT

- Strategic Leadership: Spearheaded academic leadership and charted the strategic course for the department in harmony with the university's overarching objectives.
- Program Oversight: Directed the creation, execution, and evaluation of academic programs, ensuring relevance, superior quality, and adherence to both national and international benchmarks.
- Quality Control: Guaranteed exceptional teaching and learning standards within the department, overseeing quality and advocating for effective instructional methodologies.
- Research Advancement: Cultivated a research-centric environment, bolstering faculty research initiatives and enhancing academic scholarship.
- Curriculum Coordination: Led the initiation and systematic review of departmental academic program curricula.
- Examination Governance: Maintained strict adherence to regulatory standards in the administration and assessment of examinations.

EDUCATION

MAKERERE UNIVERSITY AND UNIVERSITY OF OSLO
KAMPALA
2026

Ph.D.

- Engaged in research with Prof. Brita Stedje and Dr. Namaganda Mary
- Investigated Molecular and Morphological Characterization of the *Leptostemonum* Clade within the Genus *Solanum* (Solanaceae) across Uganda.
- Assessed biodiversity and distribution patterns of the *Leptostemonum* clade, examining environmental influences on their presence in Uganda.
- Established evolutionary relationships among *Leptostemonum* species in Uganda through Sanger sequencing techniques.
- Analyzed morphological variations within *Solanum campylacanthum* in Uganda and evaluated its relationship with *S. cerasiferum*.

PHD THESIS: MOLECULAR AND MORPHOLOGICAL CHARACTERISATION OF THE *LEPTOSTEMONUM* CLADE OF GENUS *SOLANUM* (SOLANACEAE) WITH ITS DISTRIBUTION IN UGANDA

MAKERERE UNIVERSITY
KAMPALA
2017

Master's Degree

- Proficient in development and systems of classification
- Skilled in classification and identification methods
- Knowledgeable in taxonomic nomenclature
- Understanding of general ethnobotany, including medicinal and poisonous plants
- Fundamentals of plant pathology principles
- Expertise in biology and systematics of fungi and bacteria

MASTER'S THESIS: ADOPTION OF *SOLANUM MACROCARPON* AND *SOLANUM AETHIOPICUM* IMPROVED AGRICULTURAL TECHNOLOGIES AND THE BOTANICAL IMPORTANCES OF THESE SPECIES AMONG FARMERS IN MUKONO DISTRICT, SENTER UGANDA

MAKERERE UNIVERSITY
KAMPALA
2005

Undergraduate

- Trained in various conservation courses.
- Awarded a Bachelor of Science in Conservation Biology.

PUBLICATIONS

AFRICAN JOURNAL OF ECOLOGY

- Kawuma, C., Stedje, B., Katuura, E., Ipulet, P., Mulumba, J. W., Kakudidi, E., ... & Namaganda, M. (2025). Diversity, Distribution and Habitat Suitability Assessment of *Solanum* Species of the *Leptostemonum* Clade in Uganda. *African Journal of Ecology*, 63(2), e70021.

DATA IN BRIEF

- Kauma, C. M., Anywar, G., Serunjogi, D., Katuura, E., & Namaganda, M (2024). Dataset of the geographical distribution of species of the genus *Solanum*, subgenus *Leptostemonum* in Uganda. *Data in Brief* (Elsevier) <https://doi.org/10.1016/j.dib.2024.110159>.

PHYTOTAXA

- C. Kawuma, M. Namaganda, E. Katuura, P Ipulet, J. W. Mulumba, E. Kakudidi, F. T. Mugizi, A. O. Bello & B. Stedje (2024). Morphological variation in *Solanum campylacanthum* (Solanaceae) in Uganda and its relationship with *S. cerasiferum*. *Phytotaxa* <https://doi.org/10.11646/phytotaxa.661.1.4>

HELIIYON

- Owor, R. O., Kawuma, C., Nantale, G., Kiyimba, K., Obakiro, S. B., Ouma, S., Lulenzi, J., Gavamukulya, Y., Chebijira, M., Lukwago, T. W., Egor, M., Musagata, P., Andimya, M., Kibuule, D., Waako, P., & Hokello, J. (2024). Ethnobotanical survey and phytochemistry of medicinal plants used in the management of HIV/AIDS in Eastern Uganda. *Heliyon*, 10(11). [doi:10.1016/j.heliyon.2024.e31908](https://doi.org/10.1016/j.heliyon.2024.e31908)

PHYTOMEDICINE

- Samuel Baker Obakiro, Kenedy Kiyimba, Tonny Wotoyitidde Lukwago, Jalia Lulenzi, Richard Oriko Owor, Moses Andima, Joseph Francis Hokello, Carol Kawuma, Gauden Nantale, Dan Kibuule, Godwin Anywar, Paul Waako, Yahaya Gavamukulya (2023). Ethnobotanical study of plants used in management of diabetes mellitus in Eastern Uganda. *Phytomedicine Plus* 3 (4), 100486

TOXICOLOGY REPORTS

- Obakiro, S. B., Kiyimba, K., Owor, R. O., Andima, M., Lukwago, T. W., Kawuma, C., Gavamukulya, Y., Nabantanzi, A., Kibuule, D., Kato, C. D., Anywar, G., & Waako, P. (2024). Acute and subacute toxicity profile of ethanolic stem bark extract of *Albizia coriaria Welw. ex Oliv.* in Wistar albino rats. *Toxicology Reports*, 12, 178-185. [doi:https://doi.org/10.1016/j.toxrep.2024.01.005](https://doi.org/10.1016/j.toxrep.2024.01.005)

JOURNAL OF NUTRITION AND FOOD SAFETY

- Odit E., Omara D., Kitufu R. and Kawuma C. (2022). Effects of the different cooking methods on the concentration of Vitamins C in cowpea vegetable (*Vigna unguiculata*). *European Journal of Nutrition & Food Safety*

EA JOURNAL OF ENGINEERING

- C., Keneema, T., Semwogerere, E., Kamalha, D., Alio, and C., Kawuma. (2021). Statistical Model for Predicting Salinity of Water at Doho 1 Irrigation Scheme in Busia. *East African Journal of Engineering* 1: 39-47.

MANUSCRIPT IN PREP

- Phylogeny of the *Leptostemonum* clade in the genus *Solanum* (Solanaceae) in Uganda inferred from Waxy and TrnL-TrnF DNA sequence data

COLLABORATIONS

NATURAL HISTORY MUSEUM DNA LABORATORY, UNIVERSITY OF OSLO

PHD RESEARCHER

UNIVERSITY OF OSLO HERBARIUM (O)

PHD RESEARCHER

MAKERERE UNIVERSITY HERBARIUM (MHU)

PHD RESEARCHER

REFERENCES

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