The Critical Role of Plants in Human Health, Traditional medicine & ecosystems, while aiming to strengthen their use & sustainable conservation

Dr. Anywar Godwin, (PhD)

godwinanywar@gmail.com
ORCID https://orcid.org/0000-0003-0926-1832


The Critical Role of Plants
in Human Health, Traditional Medicine & Ecosystems
HUMAN HEALTH
• Natural Remedies
• Nutrition & Food Security
• Pharmaceuticals
TRADITIONAL MEDICINE
• Ancient Knowledge
• Cultural Heritage
• Community Healing
Healing & Well-being
ECOSYSTEMS
• Biodiversity
• Soil & Water
• Climate Balance
Strengthening Use & Sustainable Conservation
Sustainable Harvesting
Protecting Habitats
Supporting Research
Community Involvement
Policy & Education

Traditional Medicine in Africa & Why Plants Matter

- Over 80% rely on traditional medicine in the developing world
- “The sum total of the knowledge, skill, and practices based on the theories, beliefs, and experiences indigenous to different cultures, whether explicable or not, used in the maintenance of health as well as in the prevention, diagnosis, improvement or treatment of physical and mental illness” (WHO, 2000).
- Embedded in culture and livelihoods
- Major source of drug discovery leads
- Herbal Medicine, Spiritual & Ritual Healing, Bone-setting & Manual Therapies, Ethnoveterinary Medicine, TBA etc.
- African medicine is the oldest & possibly the most diverse of all therapeutic systems in the world (Gurib-Fakim, 2006).

Plants and Ecosystem Health

An ecosystem is a dynamic community of living organisms (plants, animals, microbes) interacting with each other and their non-living physical environment (sunlight, water, soil, air) in a specific area.

•Plants as keystone species in ecosystems

•Ecosystem services provided by plants:

- Climate regulation & carbon sequestration
- Soil fertility & water regulation
- Pollination & biodiversity support

•Link between ecosystem degradation and declining human health

Medicinal plants & Infectious diseases

- Infectious diseases are directly responsible for more than 26% of annual deaths worldwide.
- About 14 million people die annually around the world from infectious diseases, 90% of whom are from developing countries (Ismahene 2022).
- This is compounded by antimicrobial resistance (AMR), a phenomenon which occurs when bacteria, viruses, fungi and parasites mutate over time and no longer respond to medicines.

Akwongo *et al. Tropical Medicine and Health* (2024) 52:84
https://doi.org/10.1186/s41182-024-00628-x

Tropical Medicine and Health

RESEARCH Open Access

In vitro antifungal activities of medicinal plants used for treatment of candidiasis in Pader district, Northern Uganda

Betty Akwongo[1,2*], Esezah K. Kakudidi[1], Anthony M. Nsubuga[1], Morgan Andama[2], Mary Namaganda[1], Patience Tugume[1], Savina Asiimwe[1], Godwin Anywar[1] and Esther Katuura[1]

Abstract

Background The emergence of multidrug resistant *Candida* species to available drugs has led to renewed interest in the use of herbal medicines globally. This study scientifically verified antifungal effectiveness of five commonly used plant species in Pader district, against selected pathogenic candida strains.

Methods Powdered roots of *Momordica foetida*, *Sansevieria dawei* and *Distimake dissectus*; and stem barks of *Khaya anthotheca* and *Mitragyna rubrostipulata* were extracted sequentially using petroleum ether and methanol, respectively; and total water extraction at 24.4 °C (maceration), 60 °C (decoction) and boiling water at 87 °C (hot water infusion). Extracts and their combinations, positive controls (amphotericin B, and fluconazole) and negative control (80% dimethyl sulfoxide, verified to be tolerable concentration to the tested *Candida* species) were screened and verified for their antifungal activity against *Candida albicans* (ATCC: American Type Culture Collection reference strain 10231, ATCC 90028, 0770a and 0796), *C. glabrata* (VVc 004, ATCC 2950) and *C. tropicalis* (ATCC 750 and 0210) using agar well diffusion and broth micro-dilution, respectively.

Results Aqueous extract (24.4 °C) of *M. rubrostipulata* (ZOI: 18.00 ± 1.00 to 38.33 ± 0.17; MIC: 3.13 ± 0.00 to 20.83 ± 4.17; MFC: 12.50 ± 0.00 to 200.00 ± 0.00), methanol extract of *K. anthotheca* (10.11 ± 0.31 to 15.11 ± 0.65; 1.04 ± 0.26 to 12.50 ± 0.00; 12.50 ± 0.00 to 100.00 ± 0.00), and combination of aqueous extract (60 °C) of *D. dissectus* + methanol extract of *K. anthotheca* (7.89 ± 0.26 to 19.67 ± 0.37; 0.78 ± 0.00 to 50.00 ± 0.00; 12.50 ± 0.00 to 200.00 ± 0.00) exhibited broad spectrum antifungal activities and were fungistatic against all tested *Candida* species, which comprised 8 clinical/control and susceptible/resistant strains. None of the conventional drugs used demonstrated broad spectrum antifungal activity across all tested *Candida* species/strains.

Conclusion Methanol extract of *K. anthotheca*, aqueous extract (24.4 °C) of *M. rubrostipulata,* and combination of aqueous extract (60 °C) of *D. dissectus* + methanol extract of *K. anthotheca* could be effective in the treatment of candidiasis. They demonstrated potential broad spectrum antifungal activity against different species and strains of tested Candida than the fluconazole and amphotericin B drugs. Their fungistatic nature showed their ability to inhibit fungal growth. Hence, these extracts/extract combination can offer better treatment option for candidiasis if they are standardized and also their active curative compounds isolated and made into antifungal drugs.

Keywords Medicinal plants, Antifungal activity, Candidiasis, *Candida* species, Multidrug resistance, Minimum inhibitory concentration (MIC), Minimum fungicidal concentration (MFC)

*Correspondence:
Betty Akwongo
b.akwongo@muni.ac.ug; bakwongobetty2014@gmail.com
Full list of author information is available at the end of the article

Quorum sensing & antibiofilm assays

- Biofilms are complex structures created when bacteria colonise an extracellular matrix, resulting in permanent attachment to biotic & abiotic components, offering protection & boosting antimicrobial resistance (Jamal *et al.*, 2018).

- Biofilms aid bacterial growth, antibiotic resistance, immune cell evasion, & genetic material transfer.

- Intercellular communication, also known as quorum sensing, is directly linked to biofilms (Kai, 2018).

Some Uganda plant extracts for quorum quenching activity against *S. aureus e.g., Solanum aculeastrum & Sesamum calycinum subsp. angustifolium*

SCIENTIFIC REPORTS

nature research

Check for updates

OPEN

Targeting ESKAPE pathogens with anti-infective medicinal plants from the Greater Mpigi region in Uganda

Fabien Schultz[1,2,3], Godwin Anywar[4], Huaqiao Tang[6], François Chassagne[6], James T. Lyles[6], Leif-Alexander Garbe[2,3,5] & Cassandra L. Quave[1,6,7]

Antibiotic resistance poses one of the greatest threats to global health today; conventional drug therapies are becoming increasingly inefficacious and limited. We identified 16 medicinal plant species used by traditional healers for the treatment of infectious and inflammatory diseases in the Greater

Antimalarial compounds

Contents lists available at ScienceDirect

Journal of Ethnopharmacology

journal homepage: www.elsevier.com/locate/jethpharm

Ex vivo and *in vitro* antiplasmodial activity and toxicity of *Caesalpinia decapetala* (Roth) Alston (Fabaceae)

Douglas O. Ochora [a,b,c,*], Caroline Murithi [d], Rael J. Masai [a], Farid Abdi [c], Agnes Cheruyiot [c], Esther Katuura [e], Savina Asiimwe [e], Alice Nabatanzi [e], Godwin Anywar [e], Hannington Oryem-Origa [e], Jane Namukobe [f], Esezah K. Kakudidi [e], Abiy Yenesew [g], Hoseah M. Akala [c], Edwin Kamau [h]

[a] Department of Biological Sciences, School of Pure and Applied Sciences, Kisii University, P.O. Box 408-40200, Kisii, Kenya
[b] DSI/NWU, Preclinical Drug Development Platform, Faculty of Health Sciences, North-West University, Private Bag X6001, 2520, Potchefstroom, South Africa
[c] United States Army Medical Research Directorate-Kenya (USAMRD-K), Kenya Medical Research Institute (KEMRI)—Walter Reed Project, P.O. Box 54-40100, Kisumu, Kenya
[d] Department of Biology, Faculty of Science and Technology, University of Nairobi, P.O. Box 30197-00100, Nairobi, Kenya
[e] Department of Plant Sciences, Microbiology & Biotechnology, College of Natural Sciences, Makerere University, P. O. Box 7062, Kampala, Uganda
[f] Department of Chemistry, College of Natural Sciences, Makerere University, P. O. Box 7062, Kampala, Uganda
[g] Department of Chemistry, Faculty of Science and Technology, University of Nairobi, P.O. Box 30197-00100, Nairobi, Kenya
[h] Medical Research Council, Centre for Global Infectious Disease Analysis, Department of Infectious Disease Epidemiology, Imperial College London, London, UK

- The roots extract showed the highest antiplasmodial activities among the samples when tested against 4 strains of *Plasmodium falciparum* (W2, DD2, 3D7, and D6) and fresh *P. falciparum* field isolates using the SYBR green I assay.

Medicinal plants & HIV/AIDS

Journal of Ethnopharmacology 246 (2020) 112205

Contents lists available at ScienceDirect

Journal of Ethnopharmacology

journal homepage: www.elsevier.com/locate/jethpharm

Indigenous traditional knowledge of medicinal plants used by herbalists in treating opportunistic infections among people living with HIV/AIDS in Uganda

G. Anywar[a,d,*], E. Kakudidi[a], R. Byamukama[b], J. Mukonzo[c], A. Schubert[d], H. Oryem-Origa[a]

[a] Department of Plant Sciences, Microbiology & Biotechnology, College of Natural Sciences, Makerere University, P.O.Box 7062, Kampala, Uganda
[b] Department of Chemistry, College of Natural Sciences, Makerere University, P.O.Box 7062, Kampala, Uganda
[c] Department of Pharmacology & Therapeutics, College of Health Sciences, Makerere University, P.O.Box 7062, Kampala, Uganda
[d] Fraunhofer Institute for Cell Therapy & Immunology (IZI), Perlickstraße, 104103, Leipzig, Germany

ARTICLE INFO

Keywords:
Medicinal plants
Herbalists

ABSTRACT

Ethnopharmacological relevance: Currently, more than two thirds of the world's 36.9 million people living with HIV/AIDS reside in Sub-Saharan Africa. Opportunistic infections (OI) associated with HIV are the single most important cause of mortality and morbidity among HIV/AIDS patients in poor countries. There is widespread use

Data in brief 29 (2020) 105097

Contents lists available at ScienceDirect

Data in brief

journal homepage: www.elsevier.com/locate/dib

Data Article

Data on medicinal plants used by herbalists for boosting immunity in people living with HIV/AIDS in Uganda

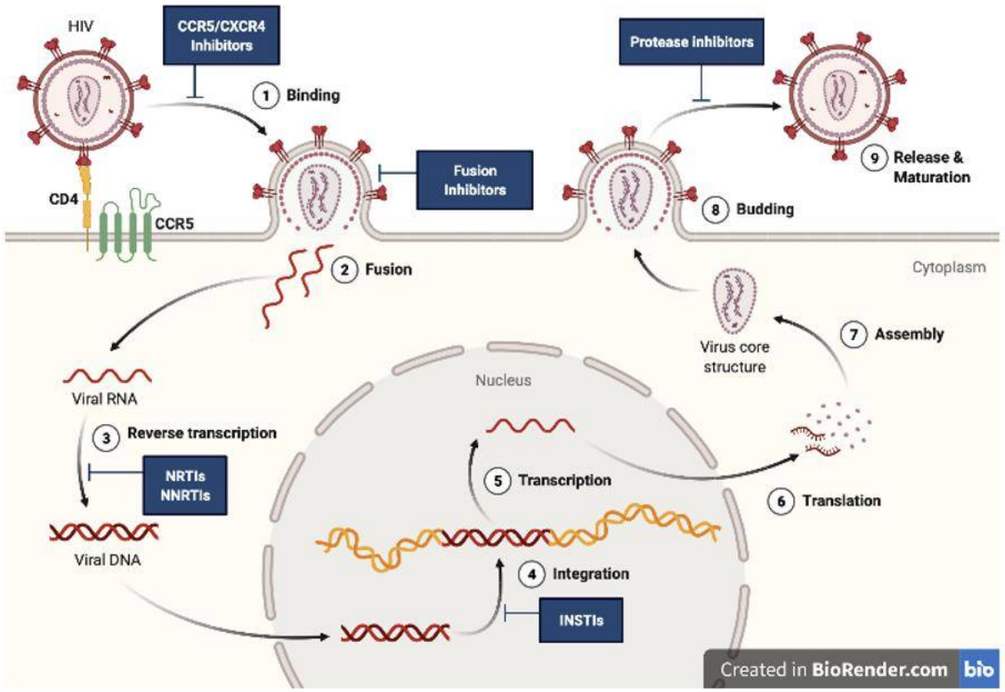
Godwin Anywar [a, d, *], Esezah Kakudidi [a], Robert Byamukama [b], Jackson Mukonzo [c], Andreas Schubert [d], Hannington Oryem-Origa [a]

[a] Department of Plant Sciences, Microbiology & Biotechnology, College of Natural Sciences, Makerere University, P.O.Box 7062, Kampala, Uganda

Clay tablets "mumbwa"

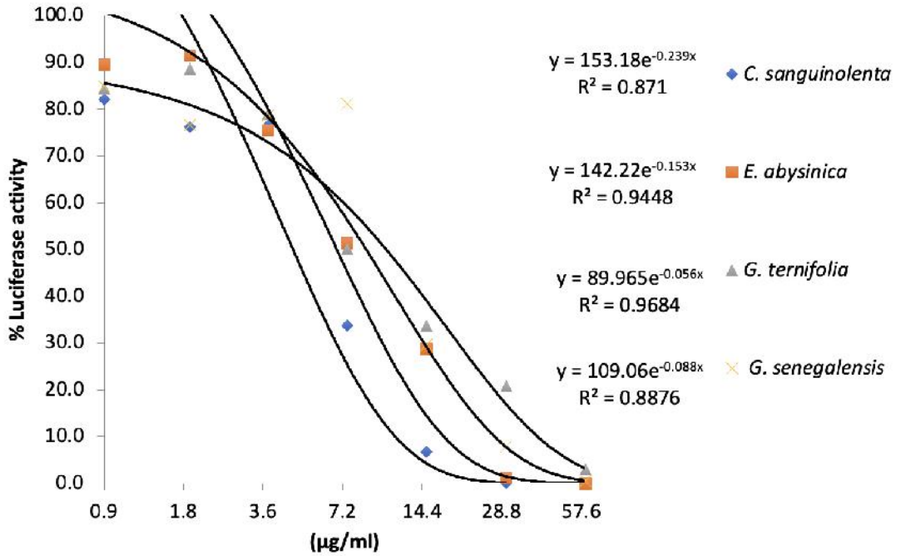
Anti-viral activity of Ugandan Medicinal Plants against HIV-1

HIV-target sites for therapeutic intervention



The selectivity indices of the plant extracts in HIV-infected cells was calculated using the SI = CC50/EC50 (Cos et al. 2002; Locher et al. 1996).

- Both the ethanol & DMSO extracts of *Cryptolepis sanguinolenta* *sanguinolenta*, (SI = 74.7 & 51.4) & *Psorospermamum. febrifugium* (SI = 56.3 & 47.5) exhibited the highest SI against HIV-1 PV.



Anti-HIV-1 activity of the ethanol extracts of *C. sanguinolenta*, *E. abyssinica*, *G. ternifolia*, & *G. senegalensis*

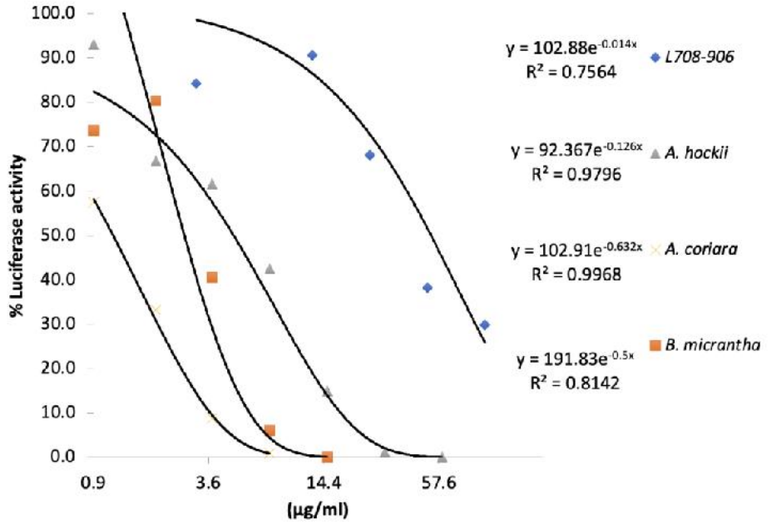
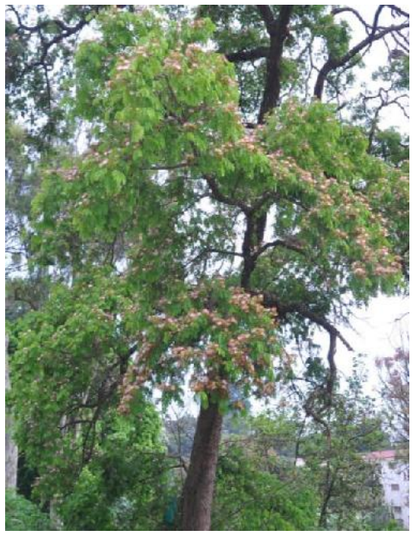


Fig1: Anti-HIV-1 activity of L708-906, the ethanol extracts of A. *hockii*, *A. coriaria* & *B. micrantha*

Cryptolepis sanguinolenta

Acacia hockii

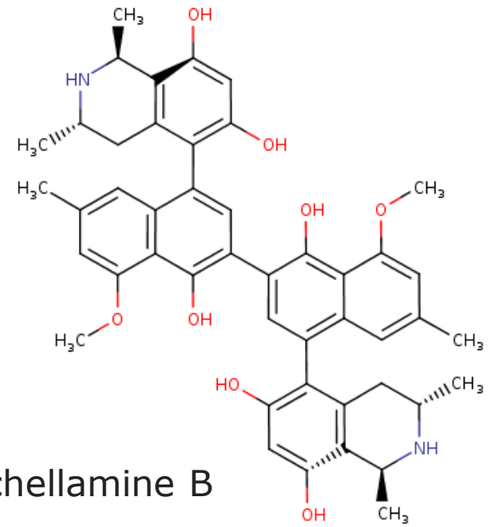
W. ugandensis



A. coriaria

Antiviral Compounds

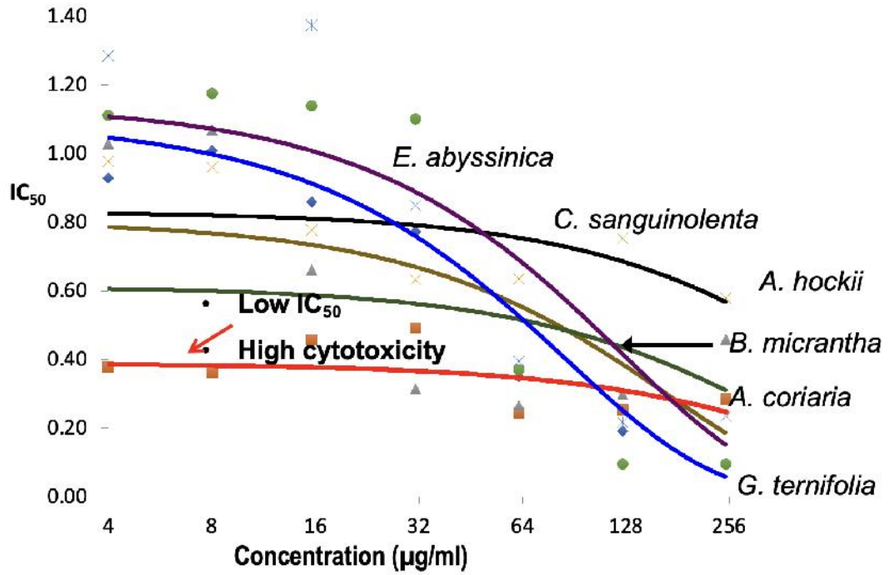
Anti HIV compounds



Michellamine B

Ancistrocladus korupensis from Mt Korup National Park, Mundemba, S. West Cameroon

- Michellamine B progressed to advanced preclinical development.
- *In vivo* studies, demonstrated that effective anti-HIV concentrations could only be achieved at doses close to neurotoxic dose levels (Supko et al. 1995).



Cytotoxicity of the Ethanol extracts of selected medicinal plants

frontiers in Pharmacology

REVIEW
published: 15 April 2021
doi: 10.3389/fphar.2021.615147

A Review of the Toxicity and Phytochemistry of Medicinal Plant Species Used by Herbalists in Treating People Living With HIV/AIDS in Uganda

G. Anywar[1,2,3], E. Kakudidi[1], R. Byamukama[4], J. Mukonzo[5], A. Schubert[2], H. Oryem-Origa[1] and C. Jassoy[3]*

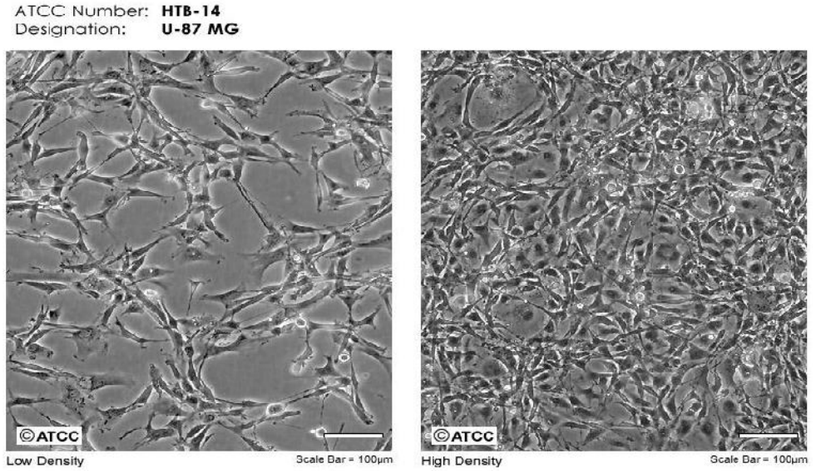
[1]Department of Plant Sciences, Microbiology and Biotechnology, College of Natural Sciences, Makerere University, Kampala, Uganda, [2]Fraunhofer Institute for Cell Therapy and Immunology (IZI), Leipzig, Germany, [3]Institute for Virology, University Clinics and Faculty of Medicine, University of Leipzig, Leipzig, Germany, [4]Department of Chemistry, College of Natural Sciences, Makerere University, Kampala, Uganda, [5]Department of Pharmacology and Therapeutics, College of Health Sciences, Makerere University, Kampala, Uganda

OPEN ACCESS

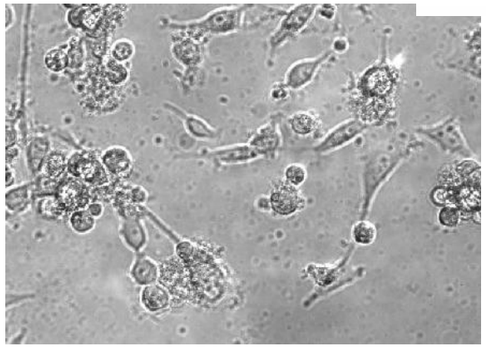
Edited by:
Kazhila Croffat Chinsembu, University of Namibia, Namibia

Reviewed by:

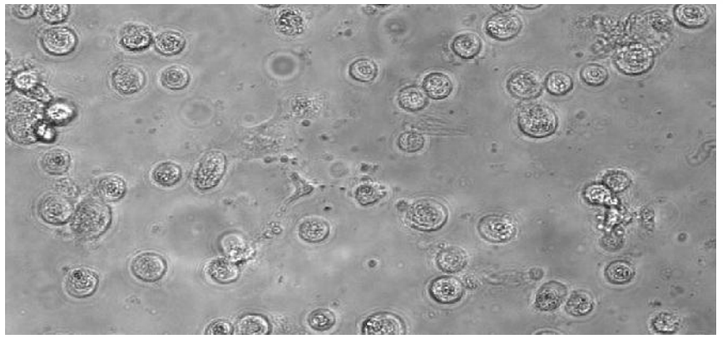
Introduction: Despite concerns about toxicity, potentially harmful effects and herb-drug interactions, the use of herbal medicines remains widely practiced by people living with HIV/AIDS (PLHIV) in Uganda.



Healthy untreated U87.CD4.CXCR4 cells under a microscope 400x



U87.CD4.CXCR4 after treatment with *B. micrantha*



Cytopathic effect of DMSO on U87.CD4.CXCR4 cells under a microscope 400x

Medicinal plants & the immune system

6 Traditional African Medicinal Plants for a Strong Immune System

Anywar Godwin

CONTENTS

6.1 INTRODUCTION

Africa is disproportionately affected by diseases such as HIV/AIDS, which attack and destroy the immune system. More than 68% of the 38 million people globally affected by HIV/AIDS reside in sub-Saharan Africa (UNAIDS 2020). Furthermore, many of them do not have access to modern treatment facilities or medicines.

The immune system consists of a highly complex mechanism for defending the body against disease by identifying and killing pathogens or tumour cells (Gertsch et al. 2011; Wen et al. 2012; Wynn et al. 2013). It is composed of the innate and adaptive immune systems. The former is characterized by a non-specific response of cells *via* molecular interactions and the expression of inducible cytokines and chemokines, whereas the latter consists of specialized effector cells (T and B cells) which recognize antigens, that are processed and presented by macrophages and dendritic cells. This leads to the activation of cytotoxic T cells and generation of antibodies which are pivotal in eliminating or preventing pathogenic insults (Gertsch et al. 2011; Kuwabara et al. 2017).

Conventionally, disorders of he immune system are categorised as: (i) primary immune deficiencies, which occur when one is born with a weak immune system, such as severe combined immunodeficiency (SCID), (ii) acquired immune

DOI: 10.1201/9781003137955-6

European Journal of Integrative Medicine 35 (2020) 101011

Contents lists available at ScienceDirect

European Journal of Integrative Medicine

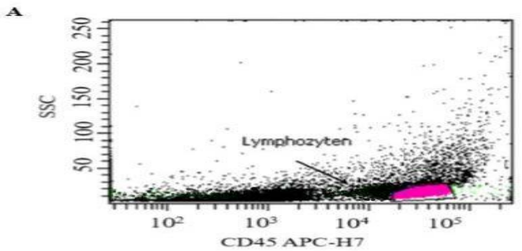
journal homepage: www.elsevier.com/locate/eujim

Research paper

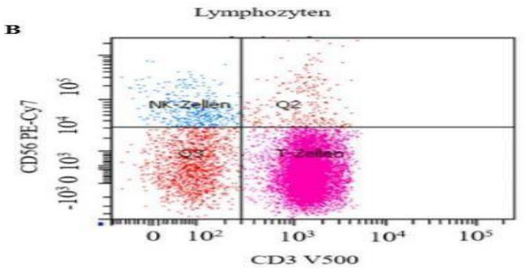
Medicinal plants used by traditional medicine practitioners to boost the immune system in people living with HIV/AIDS in Uganda

Godwin Anywar[a,d,*], Esezah Kakudidi[a], Robert Byamukama[b], Jackson Mukonzo[c], Andreas Schubert[d], Hannington Oryem-Origa[a]

[a] Department of Plant Sciences, Microbiology & Biotechnology, College of Natural Sciences, Makerere University, P.O. Box 7062, Kampala, Uganda
[b] Department of Chemistry, College of Natural Sciences, Makerere University, P.O. Box 7062, Kampala, Uganda
[c] Department of Pharmacology & Therapeutics, College of Health Sciences, Makerere University, P.O. Box 7062, Kampala, Uganda
[d] Fraunhofer Institute for Cell Therapy & Immunology (IZI), Perlickstraße, 104103, Leipzig, Germany



A. Dot plot of all cells with gate on lymphocytes,



B. Dot plot of lymphocytes with gate on NK &T cells

Discussion

- Only extracts of *Z. chalybeum* & *W. ugandensis* showed an increase in IL-4 of about 2 %.

- Extracts of *P. febrifugium* stimulated TNF-α & extracts Z. *chalybeaum* and *W. ugandensis* stimulated IL-4.

- *W. ugandensis* has previously been shown to exert immunostimulatory effects in Leishmania infected mice via production of IFN-γ & low levels of IL-4 (Ngure et al. 2014).

Ethnoveterinary Medicine in Uganda

Journal of Ethnopharmacology 358 (2025) 120917

Contents lists available at ScienceDirect

Journal of Ethnopharmacology

journal homepage: www.elsevier.com/locate/jethpharm

A review of ethnoveterinary botanical medicines used in Uganda: Their phytochemistry, bioactivity and toxicity

Godwin Anywar [a,b,*], Arnold Ssegabo [a], James Wanyama [a], Caroline S. Weckerle [c]

[a] Department of Plant Sciences, Microbiology and Biotechnology, Makerere University, P.O.Box 7062, Kampala, Uganda
[b] Ethnopharmacology and Zoopharmacognosy, Bernhard Nocht Institute for Tropical Medicine, Hamburg, Germany
[c] Institute of Systematic and Evolutionary Botany, University of Zürich, 8008, Zürich, Switzerland

ARTICLE INFO

Keywords:
Ethnoveterinary medicine
Livestock diseases
Pastoralists
Indigenous traditional knowledge

ABSTRACT

Ethnopharmacological relevance: The use of ethnoveterinary medicine remains a prominent aspect traditional medicine in Uganda. Many rural farmers have and still depend on it for managing their livestock. This review gives a comprehensive over view of ethnoveterinary research in Uganda over a period of quarter a century from 1999 to 2024.

Aim of the study: The aim of this study is to give an over view of the ethnoveterinary medicine in Uganda, entailing the different practices and medicinal plant species used, their bioactivity, phytochemistry and safety/toxicity.

Materials and methods: A literature search was conducted using available databases including ScienceDirect, PubMed, Scopus and Google Scholar. Dissertations, theses, books and technical reports were also searched. The search focused on diseases/ethnoveterinary uses and the animals treated, the method of preparation using the plants, the plant parts used, the bioactivity of the plants in relation to the mentioned traditional uses, their phytochemical composition and toxicity.

Results: The practice of ethnoveterinary medicine is widespread and commonplace in Uganda, especially among the pastoral communities. We recorded the use of 245 plant species from 71 families used against several animal diseases and conditions. Most of the plant species used were from the Fabaceae (38), Asteraceae (16) and Euphorbiaceae (13) families. Most of the plant species were herbs (48 %), followed by shrubs (26 %) and trees (25.4 %) and the most commonly used plant parts used in ethnoveterinary medicine were the leaves (34.2 %), roots (21.0 %) and bark (14.1 %) Of these, 171 (68.9 %) had previous reports supporting one or more of the mentioned traditional uses in different studies *in vitro*. Most of the plant species (207, 84.5 %) had some information on their phytochemical composition known while only 104 (41.9 %), had some information on their safety or toxicity reported in previous studies.

Conclusions: Uganda has a rich repertoire of medicinal plant species used in ethnoveterinary medicine to treat a variety of animal diseases. Most of the plant species used have however not been scientifically evaluated for their efficacy, bioactivity and toxicity. We recommend a systematic study of the medicinal plants species and practices used in ethnoveterinary medicine in Uganda.

1. Introduction

Ethnoveterinary medicine (EVM) is a popular practice among people in low-income nations, incorporating traditional beliefs, knowledge, skills, and practices for managing animal disease (Caudell et al., 2017). Communities throughout the world use a wide range of EVM to prevent, diagnose, and treat illnesses that affect their livestock and companion animals (Köhler-Rollefson et al., 2008). These practices provide special insights into the interactions that exist between people, animals, and the environment (Batool et al., 2025). Ethnoveterinary medicine has been

Abbreviations: ECF, East Coast Fever; NCD, Nwecastle disease; FMD, Foot and Mouth Disease; CNS, Central Nervous System; GLA, Gamma-linolenic acid; THC, Tetrahydrocannabinol; CBD, Cannabidiol; AST, Aspartate Amino Transferase; ALT, Alanine Amino Transferase.

This article is part of a special issue entitled: ISE-APSS 2024 congress published in Journal of Ethnopharmacology.

* Corresponding author. Department of Plant Sciences, Microbiology and Biotechnology, Makerere University, P.O.Box 7062, Kampala, Uganda.
E-mail address: godwinanywar@gmail.com (G. Anywar).

https://doi.org/10.1016/j.jep.2025.120917
Received 28 February 2025; Received in revised form 9 October 2025; Accepted 15 November 2025
Available online 21 November 2025

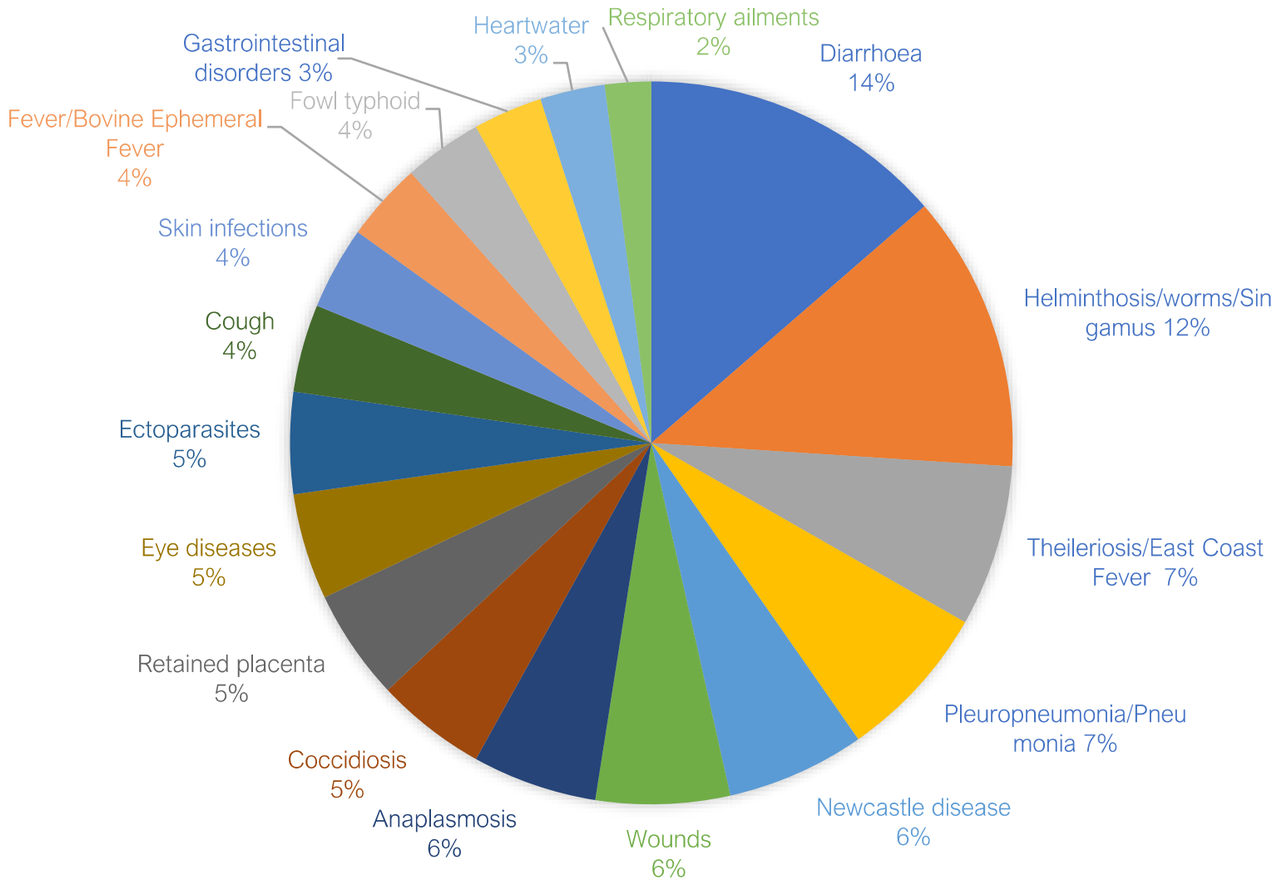
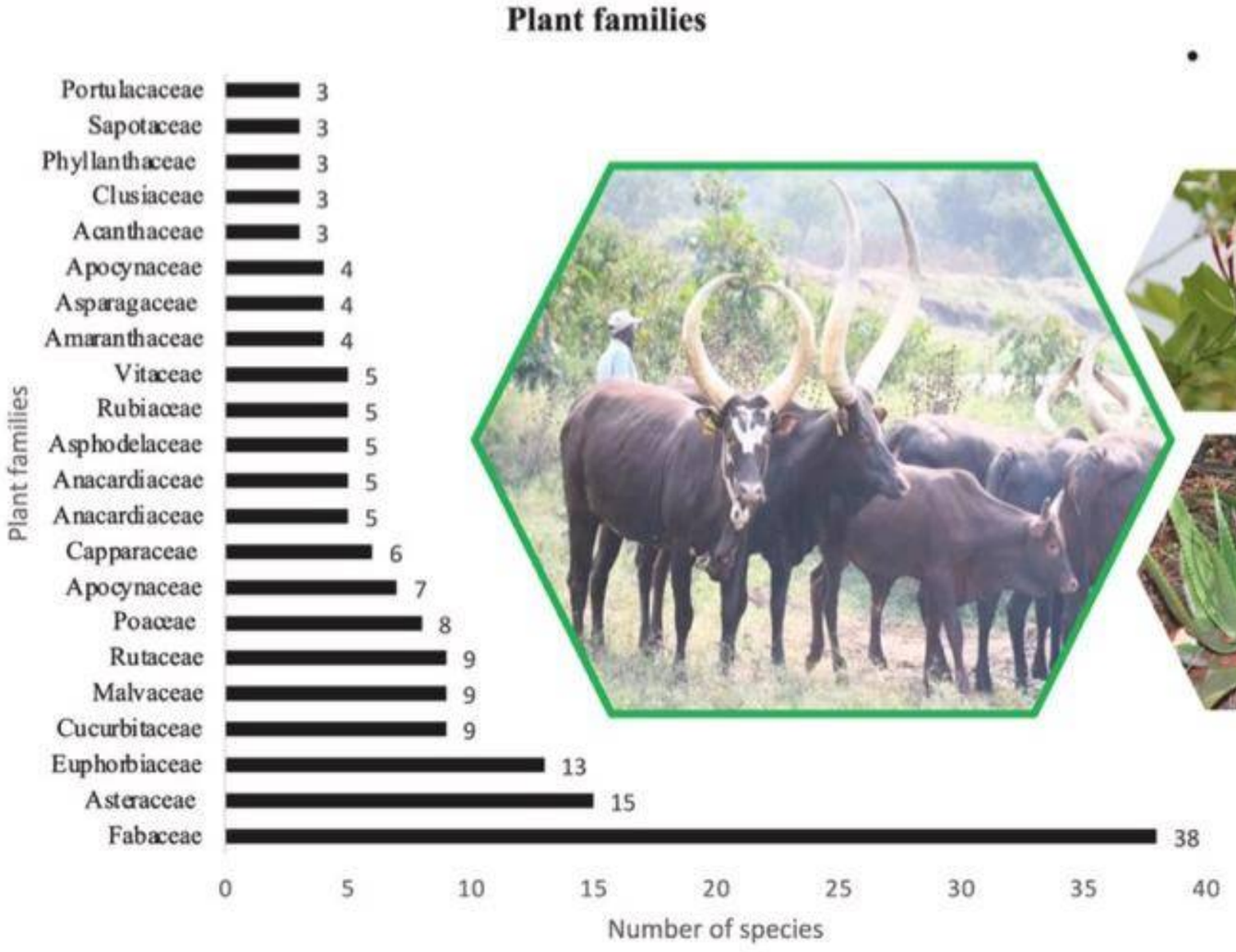
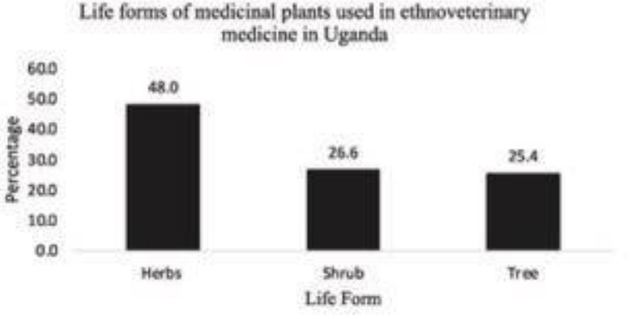


Fig. 4. Commonest disease treated.

28



- 248 plant species from 71 families



Nabatanzi *et al. BMC Veterinary Research* (2025) 21:551
https://doi.org/10.1186/s12917-025-05008-z

BMC Veterinary Research

RESEARCH Open Access

Knowledge and practices of traditional treatment of chicken diseases using medicinal plants by indigenous communities in Najjembe sub-county, Buikwe district central Uganda

Alice Nabatanzi[1], Samuel Baker Obakiro[2,5*], Abdul Walusansa[3], Nambejja Cissy[4] and Godwin Anywar[1,6]

Abstract

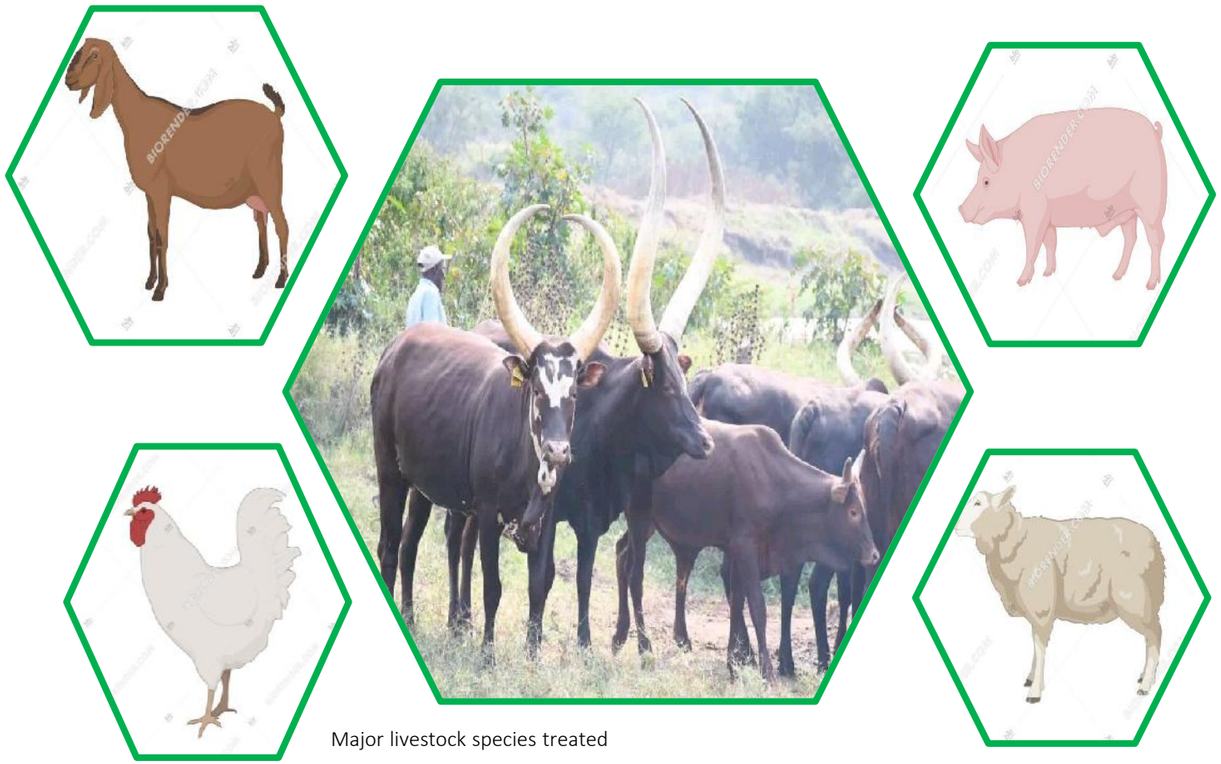
Background For centuries, farmers in central Uganda have used diverse medicinal plants in ethnoveterinary medicine for treating chicken diseases. However, the unique plant species used, and associated ethnoveterinary knowledge had not been well documented. Hence this research reports the medicinal plants used in the management of chicken diseases in Najjembe sub-county, Buikwe District, Central Uganda to guide the advancement and sustainable use of these plants in the future.

Methods An ethnoveterinary survey was conducted among 150 chicken farmers who were purposively sampled from ten villages within Najjembe sub-county, Buikwe district from January to September 2021. Voucher specimens of the plants were prepared, identified and authenticated at Makerere University Herbarium. Numerical data summarized using percentages, frequencies, Informant Consensus factor (ICF) and paired comparisons.

Results All farmers (150), atleast used medicinal plants to treat chicken diseases, with majority of them aged 25 to 44 years (65.3%) and acquired this indeginous knowledge from family members (48%). Fifty-nine plant species were reported with the most cited or preferred being; *Aloe vera* (L.) Burm.f., (64), *Capsicum frutescens* L., (60), *Nicotiana tabacum* L. (55), *Cannabis sativa* L. *(50), Biders pilosa* ...(12), *Momordica foetida* Schumach.(10). The plants belonged to 59 genera and 31 families: mostly Asteraceae (n=8, 13.6%), Fabaceae (n =5, 8.5%), Rosaceae (n=5, 8.5%), Myrtaceae (n−4, 6.8%) and Lamiaceae (n−4, 6.8%). Most medicinal plants were herbs (45.8%) and trees (25.4%). Leaves (66.1%) were the most used parts and were largely prepared as decoctions (38.9%). Most plant species had ICF greater than 0.7 for given chicken disease implying a high consensus in the community. *Nicotiana tobacum* L. had ICF values of 0.98, 0.98, 0.90, 0.98, 0.86 and 0.88 for swollen eyes, manson's eye worm, eye infections, diarrhea, fowl typhoid and flue. The major challenges reported were failure to determine doses and scarcity of medicinal plants due to the escalating deforestation of Mabira Central Forest Reserve.

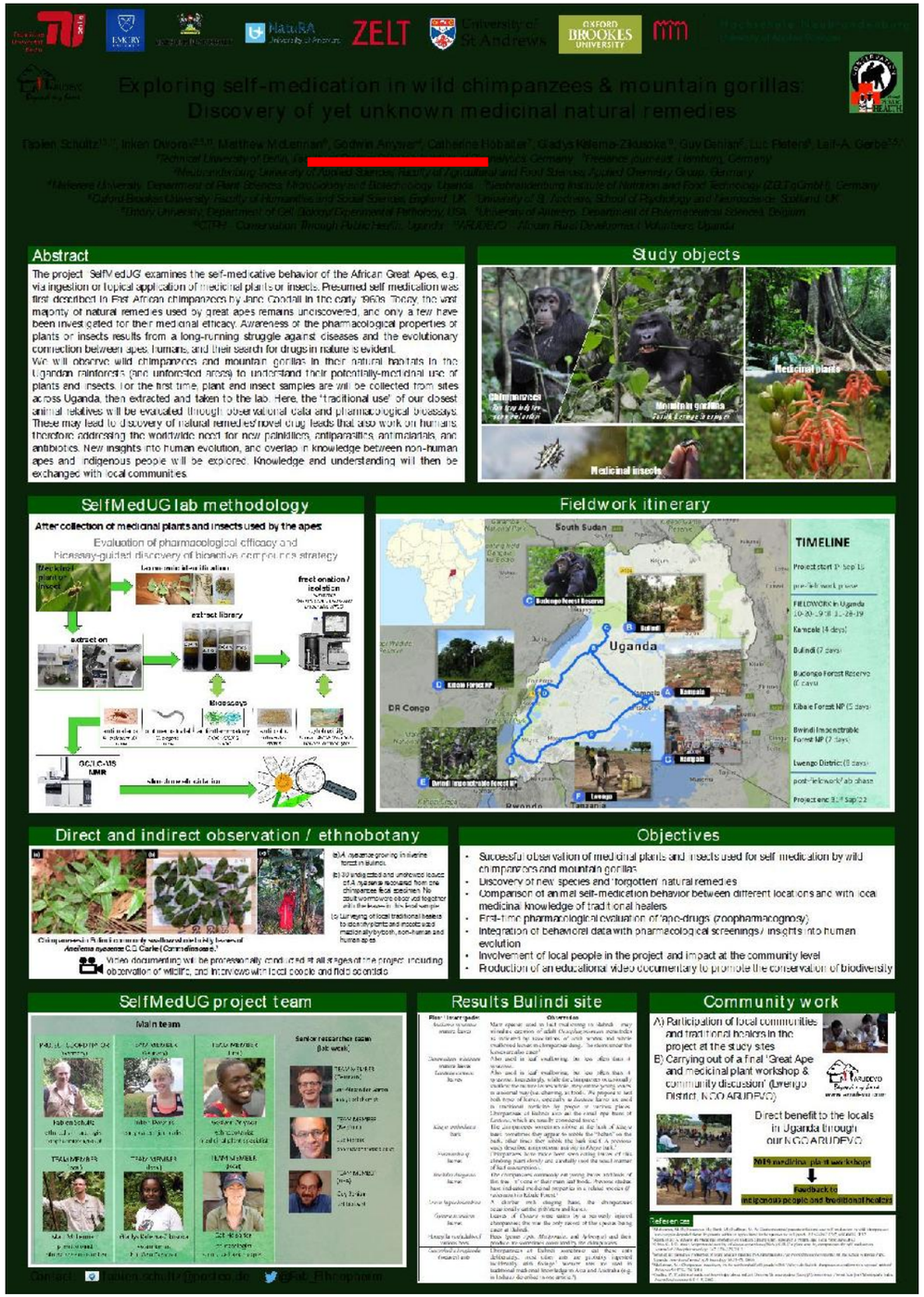
*Correspondence:
Samuel Baker Obakiro
sobakiro@gmail.com

Full list of author information is available at the end of the article



Major livestock species treated

Self medication in animals



Access through **Makerere University** | Purchase PDF | Other access options

ELSEVIER

Phytochemistry Letters

Volume 69, Supplement, October 2025, 103069

Behavioral and pharmacological investigation of putative self-medicative natural materials used by wild chimpanzees and mountain gorillas

Fabien Schultz [a b] *, Inken Dworak-Schultz [a], Florian Wald [a k], Lisa Grohs [a], Tabitha Iker [a], Godwin Anywar [c], Gladys Kalema-Zikusoka [d], Matthew McLennan [e], Catherine Hobaiter [f], Lewis Marquez [g], Sunmin Woo [g], Luc Pieters [h], Guy Caljon [i], Cassandra Quave [g], Elodie Freymann [j], Leif-Alexander Garbe [a j]

Show more

+ Add to Mendeley | Share | Cite

https://doi.org/10.1016/j.phytol.2025.103069

Get rights and content

Access through your organization

Check access to the full text by signing in through your organization.

Access through **Makerere University**

Traditional Medicine in Transition in Uganda: Past, Present and Future

Advances in Integrative Medicine xxx (xxxx) xxx

Contents lists available at ScienceDirect

Advances in Integrative Medicine

journal homepage: www.elsevier.com/locate/aimed

Practices of disease diagnosis and patient monitoring by traditional herbalists in Mpigi district, Uganda: Implications for integration into the conventional health care system

Henry Kyeyune[a,*], Bruhan Kaggwa[a], Richard Odoi Adome[a], Godwin Anywar[b], Edson Irecta Munanura[a], David Walusimbi[a], Judah Mpew[redacted]

[a] Department of Pharmacy, School of Health Sciences, College of Health Sciences, Makerere University, P.O. Box 7072, Kampala, Uganda
[b] Department of Plant Sciences, Microbiology & Biotechnology, School of Biological Sciences, College of Natural Sciences, Makerere University, P.O. Box 7062, Kampala, Uganda
[c] Trinity Centre for Global Health, Trinity College Dublin, Ireland

ARTICLE INFO

Keywords:
Traditional medicine
Traditional herbalist
Disease
Diagnosis
Patient monitoring
Traditional medicine practices

ABSTRACT

Background: The use of herbs by traditional healers plays a vital role in primary health care in rural Uganda, where most patients still prefer and use herbal medicines. However, specific literature on the traditional healing practices of herbalists is lacking. This study documented the methods traditional herbalists in Mpigi District, Uganda, employ to diagnose disease, monitor patients and handle cases of treatment failure.

Materials and methods: An exploratory study was carried out from June to November 2019 in the rural district of Mpigi in Uganda. In-depth interviews were conducted with 20 herbalists. The interviews were audiotaped, transcribed verbatim, and themes were generated using qualitative content analysis.

Results: The methods used to diagnose disease included; prior conventional diagnosis, the patient's description of their experience with the disease condition (including signs, symptoms, and history of disease), physical examination for signs of disease, referral for conventional diagnosis, or to another herbalist, and use of conventional tools. Herbalists use phone calls, patients' visits, and set review dates to monitor response to therapy. Patient monitoring during therapy emphasizes the improvement or resolution of signs and symptoms of disease and does not consider adverse drug reactions to therapy. Disease conditions that do not respond to therapy are referred to conventional health centres and other traditional health practitioners.

Conclusions: Diagnosis of disease and monitoring of patients depends on presenting symptomatology as observed by the herbalist or described by the patient. There is considerable dependence on the conventional health system through referral for diagnosis and management of non-responsive conditions.

1. Background

Traditional medicine (TM) is widely used around the world to treat various diseases [15,16,26,33]. An estimated 70–90 % of the rural population in developing countries have used herbal medicine to partially or fully meet their primary healthcare needs [20,33]. Studies have shown that patients from lower socioeconomic backgrounds are more likely to opt for traditional and complementary medicine than conventional health care [15]. In Uganda, 60 % of the population utilizes TM for primary healthcare [21]. Besides its affordability, TM is also the preferred option for meeting the healthcare needs of many people worldwide due to its cultural acceptability and proximity to homesteads, which renders it accessible in contrast to conventional medicine [13, 26]. Recognizing its importance in global public health, the World Health Organization (WHO) has been advocating for the integration of TM into national health systems to improve access to primary healthcare [16,26]. It has been argued that the integration of the practice would not only improve access to primary healthcare services but also enhance accountability by the practitioners, facilitate quality assurance and data reporting, and reduce healthcare costs [26].

Unlike in orthodox medicine, where practitioners complete formal training before being licensed to practice, TM practitioners in most

* Corresponding author.
E-mail address: henry.kyeyune@mak.ac.ug (H. Kyeyune).

https://doi.org/10.1016/j.aimed.2024.10.012
Received 22 May 2024; Received in revised form 16 August 2024; Accepted 16 October 2024
Available online 19 October 2024

Contemporary Shifts in Traditional Medicine

Traditional Medicine in Transition • Documentation · Research · Innovation · Integration

Documentation
- Field Notes
- Audio / Video
- Community Records

Lab & Field Work
- Bioactive Compound Analysis
- Safety & Efficacy Studies

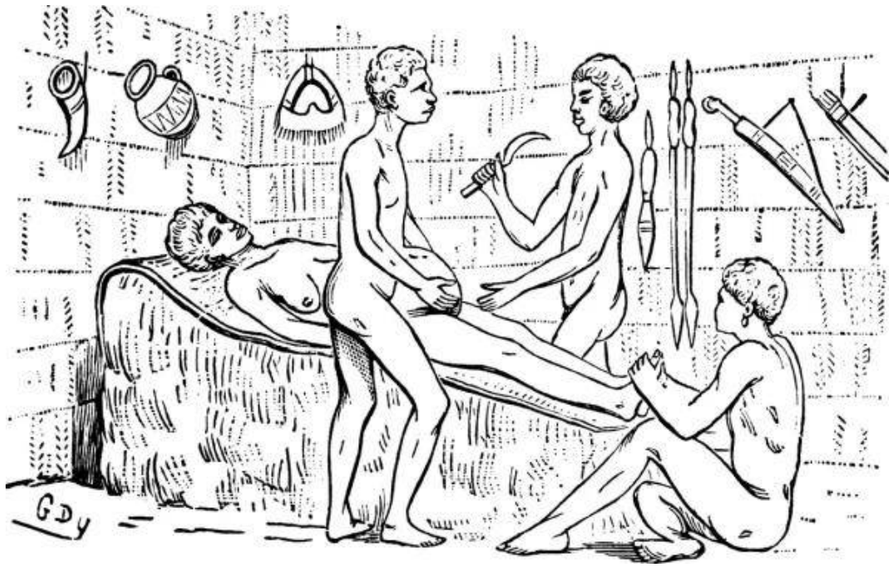
Digital Databases
- Herbarium Systems
- Traditional Knowledge Digital Library
- Searchable Plant Records

IP & Benefit-Sharing
- Nagoya Protocol
- Community Rights
- Ethical Governance

Modern Diagnostics ↔ Modern Diagnostics
- Lab Tests (Blood Work)
- X-Rays, Imaging
- Clinical Evaluation

Traditional Birth Attendants

The first ever recorded Caesarean sections were performed traditionally using herbs in Uganda in 1879 (Ackerknecht, 1947; Dunn, 1999),



A caesarean section performed by indigenous healers in Kahura, Uganda. As observed by medical missionary Robert William Felkin in 1879


TRADITIONAL MEDICINE
IN TRANSITION
MOBILE MUSEUM


TRADITIONAL MEDICINE IN DAILY LIFE


KASHARI S.S


IN
rtners & Funders
MINISTRY OF TOURISM, WILDLIFE AND ANTIQUITIES
MAKERERE UNIVERSITY

Medicinal plants in snakebite management

Opilia amentacea (Epolokiliok) Roots was associated with the doctrine of signatures (DoS) (Okot et al., 2020).

Okot *et al. Tropical Medicine and Health* (2020) 48:44
https://doi.org/10.1186/s41182-020-00229-4

Tropical Medicine and Health

RESEARCH Open Access

Medicinal plants species used by herbalists in the treatment of snakebite envenomation in Uganda

David Fred Okot[1,2*], Godwin Anywar[3], Jane Namukobe[1] and Robert Byamukama[1]

Abstract

Background: There are high mortality and morbidity rates due to poisonous snakebites globally with sub-Saharan Africa having some of the highest cases. However, traditional medicine practitioners (TMP) have been treating snakebites in Uganda for long despite the fact that few studies have been conducted to document such vital and rich indigenous traditional knowledge before it is lost. This study aimed to document the medicinal plant species used by experienced TMP in treating snakebite envenomation in selected post-conflict parts of Uganda. An ethnopharmacological survey was conducted in Kitgum, Serere, Kaberamaido and Kaabong districts in Uganda. Twenty-seven TMP with expertise in treating snakebites were purposively identified using the snowball technique and interviewed using semi-structured questionnaires. Data were analysed using simple descriptive statistics.

Results: Sixty plant species from 28 families were documented with high consensus among the isolated indigenous Ik tribe of Kaabong district. Most of the plant species used were from the Asteraceae and Fabaceae families with eight species each. The genus *Echinops* was the most well-represented with three species. The most commonly used plant species were of citation were *Steganotaenia araliaceae* (16), *Microglossa pyrifolia* (Lam.), *Gladiolus dalenii* Van Geel (13), *Aframomum mildbraedii* Loes. (11), *Jasminum schimperi* Vatke and *Cyathula uncinulata* (Schrad) Schinz (10) and *Crinum macowanii* Baker and *Cyphostemma cyphopetalum* (Fresen.) Desc. ex Wild & R.B. Drumm (10). *S. araliaceae* which was mentioned by all the TMP in the Ik community was used for first aid. Most of the plant species were harvested from the wild (68.75%) and were herbs (65.0%) followed by trees (23.3%). The most commonly used plant parts were roots (42.6%) and leaves (25.0%). Thirteen different methods of preparation and administration were used. Most of the medicines were administered orally (61.2%) and topically (37.6%). The commonest methods of oral application were cold water infusions (32.5%) and decoctions (21.7%).

Conclusions: TMP widely use several medicinal plant species for treating snakebite envenomation in the selected post-conflict regions of Uganda

Keywords: Medicinal plants, Envenomation, Snakebite, Traditional medicine practitioners, Post-conflict, Uganda

* Correspondence: okotfd@gmail.com; df.okot@gu.ac.ug
[1]Department of Chemistry, Makerere University, P. O. Box 7062, Kampala, Uganda
[2]Department of Chemistry, Gulu University, P. O. Box 166, Gulu, Uganda
Full list of author information is available at the end of the article

molecules MDPI

Article

In Vitro Anti-Venom Potentials of Aqueous Extract and Oils of *Toona ciliata* M. Roem against Cobra Venom and Chemical Constituents of Oils

David Fred Okot [1,2,*], Jane Namukobe [1], Patrick Vudriko [3], Godwin Anywar [4], Matthias Heydenreich [5], Oyedeji Adebola Omowumi [5] and Robert Byamukama [1]

1 Department of Chemistry, Makerere University, Kampala P.O. Box 7062, Uganda
2 Centre for Snakebites and Venom Research, Department of Chemistry, Gulu University, Gulu P.O. Box 166, Uganda
3 Research Centre for Tropical Diseases and Vector Control, Department of Veterinary Pharmacy, Clinics and Comparative Medicine, College of Veterinary Medicine, Animal Resources and Biosecurity, Makerere University, Kampala P.O. Box 7062, Uganda; patrick.vudriko@mak.ac.ug
4 Department of Plant Sciences, Microbiology & Biotechnology, Makerere University, Kampala P.O. Box 7062, Uganda
5 Institute of Chemistry, University of Potsdam, Karl-Liebknecht-Str. 24-25, D-14476 Potsdam, Germany
6 Department of Chemical & Physical Sciences, Faculty of Natural Sciences, Walter Sisulu University, Private Bag X1, Mthatha 5099, South Africa
* Correspondence: okotfd@gmail.com

Abstract: There are high mortality and morbidity rates from poisonous snakebites globally. Many medicinal plants are locally used for snakebite treatment in Uganda. This study aimed to determine the in vitro anti-venom activities of aqueous extract and oils of *Toona ciliata* against *Naja melanoleuca* venom. A mixture of venom and extract was administered intramuscularly in rats. Anticoagulant, antiphospholipase A_2 (PLA_2) inhibition assay, and gel electrophoresis for anti-venom activities of oils were done. The chemical constituents of the oils of *ciliata* were identified using Gas chromatography-tandem mass spectroscopy (GC-MS/MS). The LD_{50} of the venom was 0.168 ± 0.21 µg/g. The venom and aqueous extract mixture (1.25 µg/g and 3.5 mg/g) did not cause any rat mortality, while the control with venom only (1.25 µg/g) caused death in 1 h. The aqueous extract of *T. ciliata* inhibited the anticoagulation activity of *N. melanoleuca* venom from 18.58 min. to 4.83 min and reduced the hemolytic halo diameter from 24 to 22 mm. SDS-PAGE gel electrophoresis showed that oils completely cleared venom proteins. GC-MS/MS analysis showed that the oils had sesquiterpene hydrocarbons (60%) in the volatile oil (VO) and oxygenated sesquiterpenes (48.89%) in the non-volatile oils (NVO). Some major compounds reported for the first time in *T. ciliata* NVOs were: Rutamarin (52.55%), β-Himachalol (9.53%), Girinimbine (6.68%) and Oprea1 (6.24%). Most compounds in the VO were reported for the first time in *T. ciliata*, including the major ones Santalene (8.55%) and Himachal-7-ol (6.69%). The result showed that aqueous extract and oils of *T. ciliata* have anti-venom/procoagulant activities and completely neutralized the venom. We recommend a study on isolation and testing the pure compounds against the same venom.

Keywords: snakebite; venom; medicinal plants; anticoagulation; antiphospholipase a_2 inhibitor; rutamarin and seselin

Citation: Okot, D.F.; Namukobe, J.; Vudriko, P.; Anywar, G.; Heydenreich, M.; Omowumi, O.A.; Byamukama, R. In Vitro Anti-Venom Potentials of Aqueous Extract and Oils of *Toona ciliata* M. Roem against Cobra Venom and Chemical Constituents of Oils. *Molecules* **2023**, *28*, 3089. https://doi.org/10.3390/molecules28073089

Academic Editor: Francesco Caccioia

Received: 2 February 2023
Revised: 1 March 2023
Accepted: 2 March 2023
Published: 30 March 2023

1. Introduction

The World Health Organization classified snakebite envenomation as one of the most neglected tropical diseases (NTD) in terms of incidence, severity, and clinical characteristics [1]. This has served as a basis for its advocacy and enlisting as an NTD under category A [1,2]. In Sub-Saharan Africa, Snakebite envenoming constitutes a serious medical condition that primarily affects residents of rural communities including Asia, Latin America, and New

Bioprospecting

- Biodiversity prospecting/bioprospecting is the systematic search for biochemical & genetic information in nature in order to develop commercially valuable products for pharmaceutical, agricultural, cosmetic & other applications (UNDP, 2006).

- To extract the maximum commercial value from genetic resources & indigenous knowledge, while creating a fair compensation system that can benefit all.

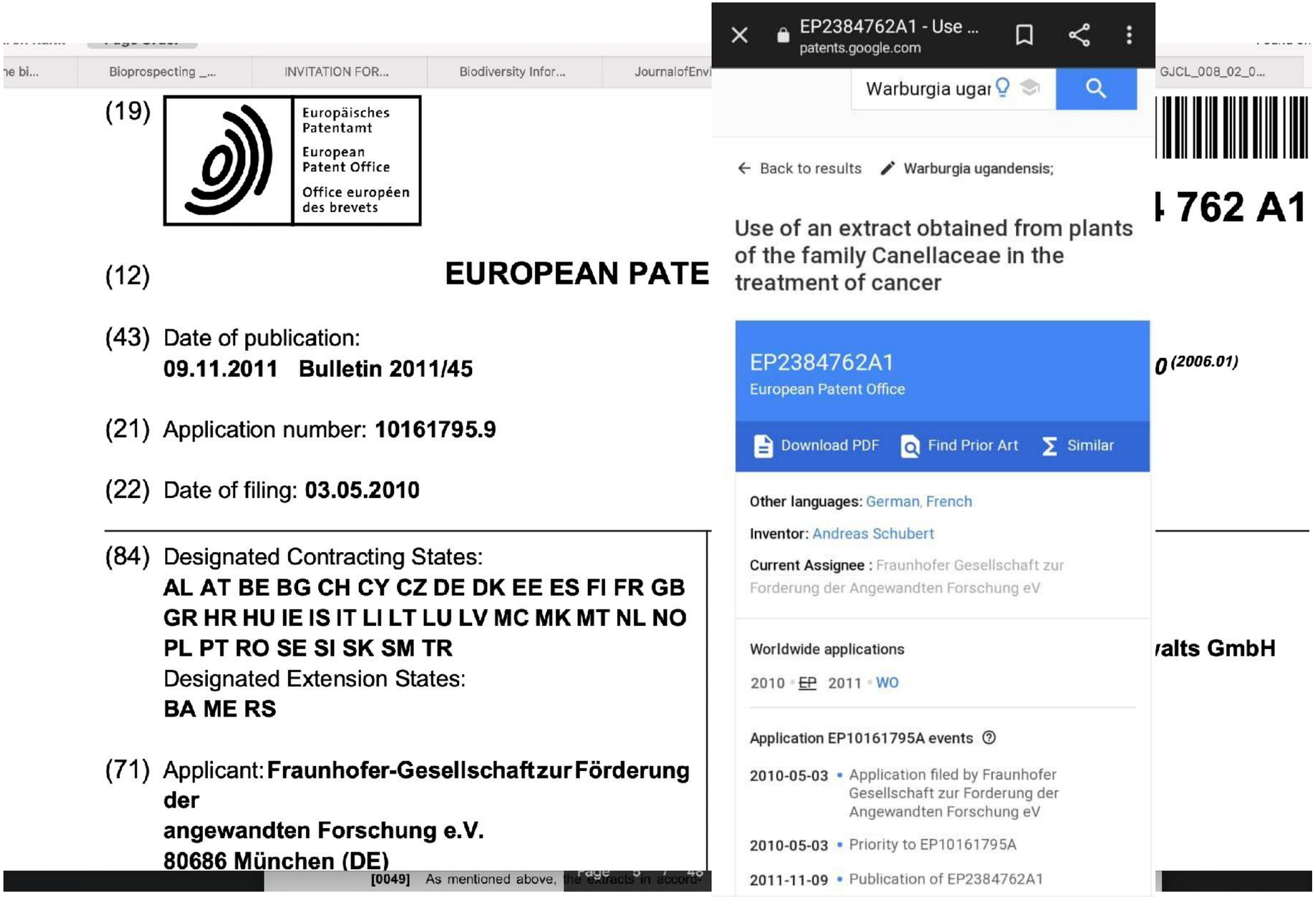
1. Sample collection
2. Isolation
3. Characterization
3. Product development
4. Commercialization

Biopiracy

- Biopiracy is the theft/misappropriation of genetic resources & traditional knowledge through the intellectual property system.

- Also involves the unauthorized and uncompensated collection of genetic resources for commercial purposes.

Conservation & sustainable use



(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(12) EUROPEAN PATE

(43) Date of publication:
09.11.2011 Bulletin 2011/45

(21) Application number: **10161795.9**

(22) Date of filing: **03.05.2010**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO SE SI SK SM TR
Designated Extension States:
BA ME RS

(71) Applicant: **Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e.V.**
80686 München (DE)

[0049] As mentioned above, the extracts in accord-

EP2384762A1 - Use ...
patents.google.com

Warburgia ugar

← Back to results ✎ Warburgia ugandensis;

Use of an extract obtained from plants of the family Canellaceae in the treatment of cancer

EP2384762A1
European Patent Office

Download PDF | Find Prior Art | Similar

Other languages: German, French

Inventor: Andreas Schubert

Current Assignee : Fraunhofer Gesellschaft zur Forderung der Angewandten Forschung eV

Worldwide applications

2010 • EP 2011 • WO

Application EP10161795A events

2010-05-03 • Application filed by Fraunhofer Gesellschaft zur Forderung der Angewandten Forschung eV

2010-05-03 • Priority to EP10161795A

2011-11-09 • Publication of EP2384762A1

Warburgia patent24

References

McCorkle, C., 1986. An introduction to ethnoveterinary research and development. J. Ethnobiol. 6, 129–149.

Anywar, G., Ohia, C., & Nalumansi, P.A. (2021). Chapter 26 - Traditional system of medicines in Africa. In C. Egbuna, A.P. Mishra, & D. Goyal (Eds.), Preparation of Phytopharmaceuticals for the Management of Disorders: The Development of Nutraceuticals and

Schultz, F., Dworak-Schultz, I., Wald, F., Grohs, L., Iker, T., Anywar, G., Kalema-Zikusoka, G., McLennan, M., Hobaiter, C., Marquez, L., Woo, S., Pieters, L., Caljon, G., Quave, C., Freymann, E., & Garbe, L.-A. (2025). Behavioral and pharmacological investigation of putative self-medicative natural materials used by wild chimpanzees and mountain gorillas. Phytochemistry Letters, 69, 103069. https://doi.org/https://doi.org/10.1016/j.phytol.2025.103069

World Health Organization. (2000). General Guidelines for Methodologies on Research and Evaluation of Traditional Medicine. Geneva: WHO.

Heinrich, Michael. (2010). “Ethnopharmacology in the 21st Century-Grand Challenges.” Frontiers in Pharmacology 1:8.

Okot, D. F., Anywar, G., Namukobe, J., & Byamukama, R. (2020). Medicinal plants species used by herbalists in the treatment of snakebite envenomation in Uganda. Tropical Medicine and Health, 48(1), 44. https://doi.org/10.1186/s41182-020-00229-4

Alagesaboopathi C. Ethnomedicinal plants used for the treatment of snake bites by Malayali tribal’s and rural people in Salem district, Tamilnadu, India. Int J Biosci. 2013;3:42–53.

World Health Organization. (2000). General Guidelines for Methodologies on Research and Evaluation of Traditional Medicine. Geneva: WHO.

Heinrich, Michael. (2010). “Ethnopharmacology in the 21st Century-Grand Challenges.” Frontiers in

Acknowledgements

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

The Swiss Agency for Development and Cooperation (SDC)

Thank you for listening