



28th

INDIGENOUS PLANT USE FORUM

16-20 AUGUST 2026

Protea Hotel Karridene Beach, Durban, KwaZulu-Natal

Programme and Abstracts





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Theme:

**“Translating Indigenous Insight into Innovation
and Commercial Value.”**

Programme and Abstracts

© 2026 Indigenous Plant Use Forum
Compiled by Ryan D. Rattray
Edited by Ben-Erik van Wyk

The IPUF Organising Committee would like to extend a heartfelt *Thank you* to the following organisations for their support in making the 28th IPUF Conference a success:



Technology Innovation Agency

The Technology Innovation Agency (TIA) is an entity of the Department of Science, Technology and Innovation that serves as the key institutional intervention to bridge the innovation chasm between research and development from higher education institutions, science councils, public and private sector, and commercialisation (beneficiation).

In bridging the innovation chasm, TIA is an active funder, connector, facilitator and enabler.

TIA provides financial and non-financial support for innovations in various sectors of the economy including, the bioeconomy (health, agriculture, industrial biotechnology, and indigenous knowledge systems), advanced manufacturing, energy, ICT, and natural resources (mining, water, and waste management).



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Technology Innovation Agency



Technology Innovation Agency



Technology Innovation Agency



science, technology
& innovation

Department:
Science, Technology and Innovation
REPUBLIC OF SOUTH AFRICA



Venue of the 28th IPUF 2026

Protea Hotel Karridene Beach, Illovo, KwaZulu-Natal – South Africa.



Set on the warm shores of KwaZulu-Natal's South Coast, the Protea Hotel Karridene Beach lies nestled between the Umzimbazi lagoon and Illovo Beach, just 20 minutes south of Durban and within easy reach of King Shaka International Airport. This tranquil seaside resort combines comfortable, modern accommodation with lush subtropical gardens and access to one of the longest untouched stretches of beach in Natal, offering delegates a refreshing coastal setting for IPUF's 28th annual forum.

Part of the Protea Hotels by Marriott group, Karridene Beach has established itself as a popular venue for conferences and corporate events. It offers eight separate conference rooms accommodating from 2 to 200 delegates, ranging from practical work areas to boardrooms overlooking the Indian Ocean, providing an ideal setting for plenary sessions, parallel presentations, and breakaway discussions.

Accommodation comprises 81 luxurious, elegant, and spacious rooms and suites, each with individually controlled air-conditioning, satellite television, and tea and coffee stations. Facilities include Wi-Fi, business services, and 24-hour reception, alongside inviting lounges,



swimming pools, and direct beach access via a wheelchair-friendly boardwalk leading onto the beach.

A highlight of the hotel is the Oakwoods Restaurant, housed in a glass structure overlooking the Umzimbazi lagoon and the lush Natal vegetation that surrounds it, serving hearty buffet breakfasts, à la carte lunches, and buffet dinners. Lighter meals and refreshments are available at the Rumours Bar, a glass-enclosed bar with an outside patio seating area. Recreational offerings include mini-golf, squash courts, and three swimming pools, while the surrounding region boasts golf courses, bird sanctuaries, and the famed Aliwal Shoal dive sites.

Surrounded by coastal dune forest, lagoon waters, and rich birdlife, Karridene Beach provides not only the infrastructure for meaningful academic exchange but also a peaceful environment in which to recharge and reconnect with nature. Its setting in KwaZulu-Natal—a province renowned for its extraordinary plant diversity and deep-rooted traditions of indigenous plant use—offers a fitting backdrop to IPUF's ongoing mission to preserve and explore indigenous knowledge systems.

Excursion Details

When: Wednesday 19 August 2026 (see program)

Where: Karridene Beach Hotel (gardens and beach)

Aim: Getting to know Zulu medicinal and other useful plants and products

Activities:

- (1) A display of plants and products, and interactive session to discover and discuss, under the guidance of Lloyd Mhlongo and Ben-Erik Van Wyk.
- (2) A guided walk on the hotel premises and in the dune forest (along the beach) to study medicinal and other useful plants.

Medicinal and Edible Plants of KwaZulu-Natal



Izimila zokwelapha
nezidliwayo zaKwaZulu-Natali

Lloyd Sphiwe Mhlongo & Ben-Erik van Wyk



Panel Discussion: Unlocking TIA Funding Opportunities for Technology Development and Commercialisation in the Indigenous Plants Use Space

This panel, convened as part of the 28th Indigenous Plant Use Forum Conference, will introduce delegates to the Technology Innovation Agency's funding instruments and their role in advancing technology development, innovation and commercialisation in South Africa. TIA, an entity of the national Department of Science, Technology and Innovation, will share practical insights into the TIA Seed Fund, Technology Development Fund and Innovation Fund, highlighting how these instruments support innovators at different stages of the innovation value chain — from proof of concept and prototype development to demonstration, market validation and commercialisation readiness.

TIA's investment portfolio managers will unpack the funding landscape in an accessible and practical manner for scientists, academics, postgraduate students, SMMEs and private innovators working with indigenous plants, natural products and related technologies. The session will also provide guidance on eligibility considerations, application pathways, project readiness, and how delegates may position their innovations to access TIA funding opportunities and related funders within the broader innovation ecosystem.

Moderator:

- **Vuyisile Hobololo** (Head: Indigenous Knowledge Systems (IKS) Business Unit, Technology Innovation Agency)

Panellists:

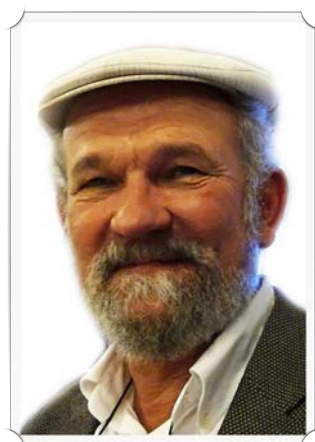
- **Londiwe Khumalo** (Portfolio Manager: Industrial Biotechnology, TIA)
- **Dr Xolisa Melamane** (Portfolio Manager: Agricultural Biotech, TIA)
- **Dr Tozamile Rubuluza** (Portfolio Manager: Energy, TIA)
- **Mondeli Mngoma** (Portfolio Manager: IKS, TIA)
- **Thuthukile Mthethwa** (Portfolio Manager: Energy, TIA)

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Message from the IPUF Chairman



The Indigenous Plant Use Forum (IPUF) was launched in August 1992 and activated in 1993 to “promote the cultural, socio-economic and scientific benefits to be derived from the sustainable use of the southern African flora”. Over the past 26 years, the annual IPUF conferences have inspired a new generation of ethnobotanists, entrepreneurs and academics, and created long-lasting friendships and collaborations. These meetings have traditionally provided an encouraging environment for young students to present their first conference lectures and have contributed substantially to the transformation of science in South Africa.

A hearty welcome to old friends and new acquaintances, may you enjoy the 28th annual IPUF conference on KwaZulu-Natal's South Coast, at the Protea Hotel Karridene Beach, Durban, South Africa. May you gain new inspiration and insights into your personal focus areas of interest and expand your network of like-minded enthusiasts.

A handwritten signature in black ink, reading "B-E van Wyk".

Prof Ben-Erik van Wyk

Chairman of the Indigenous Plant Use Forum (IPUF) (since 1996)

SARChI Research Chair in Indigenous Plant Use, University of Johannesburg



Acknowledgements

The organisers would like to thank the following institutions and persons for their valuable contributions to the 28th IPUF Conference 2026:

- ◆ The **DST-NRF SARChI: Indigenous Plant Use** for donating the 2028 IPUF Award
- ◆ The **Technology Innovation Agency (TIA)** for generously sponsoring the IPUF-TIA Mobilisation Grants for the attendance of ten students (MSc and PhD), five early career researchers, the TIA-IPUF Oswald Makunga Innovation Award, as well as contributing to the prize money for the student awards
- ◆ **All the exhibitors** in the indigenous plant product displays and items sponsored for the delegate bags
- ◆ Management and **Staff of Protea Hotel Karriene Beach**, especially Siphesihle Ntombela and her team, for their assistance and friendly efficiency
- ◆ **The session chairpersons** for their availability and time
- ◆ **The adjudicators** for their input in determining the best papers by young scientists and the best poster awards
- ◆ The University of Johannesburg (UJ) and the Department of Botany and Plant Biotechnology, University of Johannesburg, for the use of their facilities and logistical support
- ◆ **Staff and students of UJ** for their assistance in organising and executing the conference
- ◆ **The organising committee** for planning, managing and executing the conference
- ◆ **All participants of the 28th IPUF Conference 2026**, and especially those who travelled far – without you, this conference would not have been possible

IPUF 2025 Organising Committee

- ◆ Prof Ben-Erik van Wyk (UJ; IPUF Chairman)
- ◆ Dr Ryan D. Rattray (UJ; Conference Co-ordinator and IPUF Secretariat)
- ◆ Ms Tracey Moagi (UJ; Logistical support)
- ◆ Ms Marlette Compion-Venter (UJ; Logistical support)
- ◆ Mr Johandré van Rooyen (UJ; Website and Media)
- ◆ Mrs Jackey Deacon (MPE; Conference Agent)
- ◆ Mr Jean-Claude Laurent (Painting the IPUF Award stone)
- ◆ Dr Ancia Cornelius (TIA-IPUF Oswald Makunga Innovation Award Logo Design)



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General information

Indigenous Plant Use Forum (IPUF)

The Indigenous Plant Use Forum, better known as IPUF, was started by the National Research Foundation of South Africa (NRF) in 1993 to “promote the cultural, socio-economic and scientific benefits to be derived from the sustainable use of the southern African flora.”

The annual IPUF conferences are unique, multicultural and multi-disciplinary events that serve as a meeting point for a diversity of interest groups, including academics, traditional healers, anthropologists, businesspeople, resource managers, conservationists, policymakers, and indeed anyone interested in the sustainable use of the southern African flora.

Since the first annual conference in 1996, IPUF has attracted enthusiastic support and participation from delegates from South Africa and many other countries. It has been especially successful in transforming science in South Africa and promoting scientific research amongst young black students. In 2015, IPUF and the USA-based Society for Economic Botany held a joint annual conference in Clanwilliam, South Africa (the main geographical centre of the indigenous rooibos tea industry).

The 2023 IPUF conference was held in Skukuza, Kruger National Park, South Africa, and marked the 25th event organised under the leadership of Prof Ben-Erik van Wyk, who has been annually re-elected as chairman of IPUF since 1995. In 2024, the conference took place at the !Kha-tu San Cultural Centre on the Cape West Coast, under the theme "*Ancient Wisdom Inspiring Modern Successes*," at a venue honouring the oldest known culture in southern Africa. In 2025, we gathered at Misty Hills Country Hotel in Muldersdrift, Gauteng, under the theme "*Roots to Innovation: Bridging Traditional Knowledge and Future Discoveries*." This year, we meet on the KwaZulu-Natal South Coast at the Protea Hotel Karriene Beach, under the theme "*Translating Indigenous Insight into Innovation and Commercial Value*," continuing our commitment to advancing ethnobotanical research through dialogue between heritage and science.

Computer presentations

Delegates are requested to upload their PowerPoint files via Google Drive (https://bit.ly/IPUF_2026_Presentations; or by scanning the QR code below) on the day of arrival or alternatively during the break before the start of each session. One of the organisers will load the files onto the computer. Make sure to save your presentation in an older version of PowerPoint, in case you are using a very modern version (and perhaps a PDF as backup)! Furthermore, presenters are given 15 minutes to present their lectures, with 10 minutes at the end of each session for questions.



Posters

Poster presenters are personally responsible for affixing and removing their posters. Posters to be presented will be displayed in the designated venue in alphabetical order, according to the presenting author's surname. Please affix the poster to the position assigned to each presenter. Participants are requested to put up their posters during registration on Sunday afternoon, 16 August, and remove them by 09:00 on Thursday, 20 August 2026.

Notice board

Please check the notice board in the main foyer for any messages and announcements.

Meals

Lunch and tea/coffee will be served daily. Delegates are responsible for their own breakfast. Special dietary requirements will be clearly marked; however, please note that we are unable to accommodate any dietary needs for delegates who registered late and did not inform the organisers in advance.

Delegates **not** staying at Protea Hotel Karridene for the duration of the conference must arrange their own dinners from Monday to Wednesday, as dinner is included only for those with on-site accommodation. Those who wish to dine at Protea Hotel Karridene are welcome to do so, but must make their own reservations and settle payment directly with the venue. Please consult the Protea Hotel Karridene staff for dining options and availability.

- ◆ Tea/coffee Breaks will be hosted outside the Conference Venue
- ◆ Lunches will be hosted at the Protea Hotel Restaurant
- ◆ Dinners will be hosted at Protea Hotel Restaurant (subject to the above)
 - The following dinners are included in the conference registration fee:
 - Welcome reception (Sunday, 16 August 2026) – Viewing Lounge
 - Gala Dinner (Thursday, 20 August 2026) – Warner Room

Beverages

Additional beverages supplied outside of the designated meals/breaks will be at the delegates' own cost.

Indigenous plant use product display

Exhibitors are welcome to display their products or promotional materials at any time during the conference, and a representative should ideally be available during tea breaks. All individuals and companies involved in indigenous plant-based products are encouraged to participate in this informal show and promotion. This is the forum's effort to promote the development, use, and manufacturing of products based on indigenous plants.

IPUF Student Awards

The awards for the three best paper presentations are for young scientists and postgraduate students. The poster prizes are open to all delegates. The winners will each receive a certificate and prize money.

The adjudication guidelines are available at the end of the booklet. Young scientists are the only people eligible for the best paper awards. They must have specifically indicated on the registration form that they wish to be considered for the award. A young scientist will qualify by conforming to at least one of the following conditions at the start of the meeting:

- ◆ Under the age of 30 years at the date of the meeting, or
- ◆ Three or fewer presentations at prestigious scientific meetings, or
- ◆ Five or fewer years of work in the respective discipline associated with the presentations.

Furthermore, young scientists eligible for adjudication are indicated by the  symbol in the programme.

The TIA-IPUF Oswald Makunga Innovation Award



Aimed at promoting innovation and the industrial application of scientific and traditional knowledge relating to the use of indigenous plants in South Africa, the Indigenous Plants Use Forum (IPUF) and the Technology Innovation Agency (TIA) will jointly present an Innovation Award at the 28th Indigenous Plant Use Forum, to be held in Durban.

Now in its second year, this Award adds to the existing list of awards IPUF already presents to recognise the outstanding scientific research efforts of postgraduate students and emerging scholars in the Indigenous Plant Use domain.

Award and Value

The award will be received by 3 delegates at each IPUF conference. These will be:

- ◆ Gold (Winner) – R10 000.00
- ◆ Silver (First Runner-Up) – R7 000.00
- ◆ Bronze (Second Runner-Up) – R5 000.00



In addition to the financial reward, the winner will be guided and mentored by the TIA Indigenous Knowledge System team during the Opportunity Building phase of the TIA Technology Development Fund application development.

The overall aim of the Award, therefore, is to identify and recognise the innovative efforts of researchers in the Indigenous Plants Use domain, and to support such innovations towards further technological development and commercialisation.

Naming of the Award:

The award shall be named the TIA-IPUF Oswald Makunga Innovation Award, in honour of the late Professor Hercules Oswald Daluxolo (HOD) Makunga (1932–2013), who is widely regarded as one of South Africa's first black academic botanists. He was a pioneer in the field, with a lifelong passion for plants and a distinguished career in academia and research. In addition to his academic career as a botanist, his leadership expertise was demonstrated through his roles in civil society, community, and local economic development within the rural town of Alice, Eastern Cape province.

The TIA-IPUF Oswald Makunga Innovation Award is therefore purposed at identifying innovative research and development projects that clearly define a problem requiring the application of indigenous plant use in society, present a solution to that problem, and demonstrate commercial potential in the form of a product or service that can be launched into the market from the said scientific research effort.

Mobile phones

Delegates are asked to please switch their phones to silent during the sessions. A ringing cell phone disrupts the speakers. The organisers thank you for your co-operation.

Liability

The organisers give notice that they do not accept responsibility or liability in respect of either person or property for injury, damage, loss, accident, delay, or irregularity which may be occasioned as a result of attendance at the conference and excursions.

Disclaimer

The University of Johannesburg encourages academic debate and discussion that are conducted in a manner that upholds respectful interaction, safety of all involved, and freedom of association as enshrined in the law, the Constitution, and within the boundaries of the University policies. The views expressed during events are expressed in a personal capacity and do not necessarily reflect the views of the University of Johannesburg.

Programme

Sunday, 16 August 2026

14h00-17h00

Registration:

Conference Karridene Room Foyer, Protea Hotel Karridene Beach

17h00-18h00

Welcome Reception &
Cocktail Function –
Viewing Lounge (First floor)

- ◆ Welcome - Prof Ben-Erik van Wyk (IPUF Chairman)
- ◆ Mr Vuyisile Hobololo (Head: Indigenous Knowledge Systems – Technology Innovation Agency)



Monday, 17 August 2026

Keynote Session 1: Cyril Lombard Chairperson: Ben-Erik van Wyk			
09h00–09h30	From African traditional medicines to Indigenous food and beverage ingredients: reframing biodiversity commercialisation for greater socio-economic impact		
09h30–09h40	Questions and discussion/interaction		
Session 1 – Conservation and Cultivation 1 Chairperson: Mapula Razwinani			
09h40-09h55	Deciphering the multi-target mechanisms of endophytic <i>Bacillus tropicus</i> -derived compounds against bacterial infections	Tsolanku Maliehe	
09h55-10h10	Unlocking the "honey" behind honeybush	Rayganah Rhoda	
10h10-10h25	Trade and cultivation of <i>Phoenix reclinata</i> in the Eastern Cape	Kurhula Ndhlovu	
10h25-10h40	UHTO: A game changer for honeybush processing and community development	Cecilia Bester	
10h40-10h55	Effect of replacing lucerne hay with <i>Seriphium plumosum</i> meal on live weight gain, meat quality and sensory attributes Nguni steers	Motswapo Phoko	
10h55-11h10	From biopiracy to bio-sovereignty: A blockchain-enabled Helix Protocol for enforcing benefit-sharing in indigenous plant data systems	Tshepo Aphane	
11h10-11h20	Session Questions		
11h20-11h50	Tea & Coffee Break		

Session 2 –Biological Activities and Medicinal Plant Chemistry 1			
Chairperson: Sandy van Vuuren			
11h50-12h05	Exploring the anticancer and anti-metastatic potential of <i>Nerium oleander</i> plant extracts against cervical cancer cell lines ME-180	Mbangiseni Muelelwa	
12h05-12h20	Computational metabolomics identifies flavonoids as chemotaxonomic markers of <i>Plectranthus hadiensis</i> and <i>Plectranthus ambiguus</i> leaf tissues	Akhona Myoli	
12h20-12h35	To bee or not to bee: the antimicrobial potential of South African bee products against <i>Helicobacter pylori</i>	Sarhana Dinat	
12h35-12h50	Evaluation of South African medicinal plants used for urinary tract infections: antimicrobial activity and phytochemical characterisation of the most active species	Maboka Mabusela	
12h50-13h05	Antimycobacterial potential of South African propolis: antibiofilm, quorum-sensing inhibition and antibiotic interaction studies	Nyiko Mzimba	
13h05-13h20	Secondary metabolites found in <i>Erythrina abyssinica</i> induce apoptosis in ME-180 cervical and A375 melanoma cancer cells	Boitumelo Ntisa	
13h20-13h30	Session Questions		
13h30-14h30	Lunch		

Session 3 – Ethnobotany and Indigenous Knowledge 1			
Chairperson: Ashwell Ndhlala			
14h30-14h45	The contribution of indigenous plants to rural livelihoods in the Wild Coast, Eastern Cape, South Africa	Nasiphi Ntshanga	
14h45-15h00	Plant-based drug discovery for neuropharmacology: Putting the IKS into the CNS	Niël De Beer	
15h00-15h15	Ethnobotanical practices and conservation of <i>Stangeria eriopus</i> in South Africa	Sqinisiwe Nyawo	
15h15-15h30	Medicinal plant use in KwaZulu-Natal and Eastern Cape Provinces of South Africa: comparisons with data from Eastern Pondoland	Sibulele Fili	
15h30-15h45	Elucidating stress adaptation mechanisms and phytochemical production in <i>Pelargonium sidoides</i> under varying irrigation levels	Palesa Ndlangamandla	
15h45-15h55	Session Questions		
15h55-16h40	Tea & Coffee Break		

Session 4 – Conservation and Cultivation 2			
Chairperson: Clarissa Naidoo			
16h40-16h55	Honeybush processing reimagined: Development of an ultra-high temperature oxidation (UHTO) process	Dalene De Beer	
16h55-17h10	The world's trade in South African succulent plants	Tasneem Variawa	
17h10-17h25	Effects of cutting position and leaf area retention on rooting and growth of vegetatively propagated <i>Cannabis sativa</i>	Azile Dumani	
17h25-17h40	Importance of indigenous crops in alleviating the double burden of malnutrition and promoting access and equity in Africa	Thierry Regnier	
17h40-17h55	Evaluation of physiological and biochemical responses of <i>Amaranthus</i> genotypes under field-induced short-term water stress	Pfunzo Gavhi	
17h55-18h05	Session Questions		
18h05	End of Day 1		



Tuesday, 18 August 2026

Panel Session: Technology innovation Agency			
Chairperson: Ben-Erik van Wyk			
09h00–09h40	Unlocking TIA Funding Opportunities for Technology Development and Commercialisation in the Indigenous Plants Use Space		
Session 5 – Biological Activities and Medicinal Plant Chemistry 2			
Chairperson: Niël de Beer			
09h40-09h55	Micromorphology, anatomy, and histo-phytochemical profiling of secretory structures of <i>Pelargonium tomentosum</i>	Michelle Rauleka	
09h55-10h10	Synthesis, characterisation, and evaluation of the biological activities of medicinal plants-based gold nanoparticles	Amidou Samie	
10h10-10h25	Phytochemical and biological evaluation of <i>Pterocarpus angolensis</i> extracts for wound healing applications	Mapula Razwinani	
10h25-10h40	Influence of zeolite application rates on secondary metabolite accumulation in broccoli (<i>Brassica oleracea</i> var. <i>italica</i>) under field conditions	Yonela Kipi	
10h40-10h55	Phytochemical dosing patterns in <i>Matricaria chamomilla</i> (chamomile): A critical analysis of standardisation and therapeutic relevance	Thabo Dlamini	
10h55-11h10	Ethnobotany meets ophthalmic microbiology: South African medicinal plants against ocular pathogens	Ragosebo Makua	
11h10-11h20	Session Questions		
11h20-11h50	Tea & Coffee Break		

Session 6 –Biological Activities and Medicinal Plant Chemistry 3			
Chairperson: Maxleene Sandasi			
11h50-12h05	Targeting apoptosis using methanolic extracts of <i>Carpobrotus edulis</i> in suppressing pancreatic cancer cell growth.	Ramalebana Makalapeto	
12h05-12h20	<i>In vivo</i> comparative evaluation of the anxiolytic activity of selected non-native plant species and <i>Mesembryanthemum tortuosum</i>	Katlego Maobela	
12h20-12h35	Phytochemical screening and antioxidant evaluation of <i>Agave angustifolia</i> and <i>Agave sisalana</i>	Gloria Mkhize	
12h35-12h50	Anti-epileptic effects and safety profiling of <i>Hypoxis hemerocallidea</i> in a zebrafish larvae model	Yolette Nyathi	
12h50-13h05	An integrated network pharmacology approach to evaluate bioactive phytochemicals of <i>Entada elephantina</i> and their mechanisms in targeting diabetes-related genes	Elliasu Salifu	
13h05-13h20	Elemental composition, antioxidant vitamins, and LC–MS-based profiling of antioxidant phenolic compounds of selected African medicinal plants: potential roles in modulating uterine fibroid pathophysiology	Gcobisa Manzane	
13h20-13h30	Session Questions		
13h30-14h30	Lunch		

Session 7 – Biological Activities and Medicinal Plant Chemistry 4			
Chairperson: Salome Mahlo			
14h30-14h45	Nutritional and functional evaluation of underutilised, wild-type <i>Corchorus olitorius</i> fruits from Limpopo: implications for dietary diversity and food safety	Tumelo Matlou	
14h45-15h00	Phytochemical composition and antioxidant activity of <i>Eichhornia crassipes</i> : implications for dermo-cosmetic use	Clarissa Naidoo	
15h00-15h15	The effect of geographical location and extraction techniques on the chemical profile of essential oils from <i>Pelargonium</i> cv. rosé in the Eastern Cape	Bulelwa Ngcangatha	
15h15-15h30	<i>In vivo</i> seed propagation of selected medicinal plants used against human pathogens	Amore Magwete	
15h30-15h45	The phytochemical composition and biological activities of <i>Aloe maculata</i> and <i>Bulbine latifolia</i> extracts	Omphilethabo Mathope	
15h45-16h00	Antifungal potential of some plant extracts against <i>Candida albicans</i>	Dimakatjo Mothapo	
16h00-16h10	Session Questions		
16h10-16h40	Tea & Coffee Break		

Session 8 – Biological Activities and Medicinal Plant Chemistry 5			
Chairperson: Wilma Augustyn			
16h40-16h55	Phytoconstituents and antifungal activity of indigenous fruits against fungal infections	Salome Mahlo	
16h55-17h10	Potential of Ugandan medicinal plants as novel antimalarial agents	Lydia Bunalema	
17h10-17h25	Antimicrobial properties of the fresh leaf material against the ear pathogens	Lebogang Legodi	
17h25-17h40	The ethnobotany and chemistry of <i>Dolichothrix ericoides</i> (Asteraceae)	Thato Moloi	
17h40-17h55	From traditional use to targeted discovery: unlocking antimicrobial chemistry in southern African medicinal plants	Tamarin Powell	
17h55-18h05	Session Questions		
18h05	End of Day 2		
18h15-19h30	Poster Session		



Wednesday, 19 August 2026

Mid-Conference Excursion	
09h00-11h30	Getting to know South African and Zulu medicinal plants and products (and other useful plants): a display and interactive session to discover and discuss, under the guidance of Lloyd Mhlongo and Ben-Erik Van Wyk.
12h00 – 13h00	Lunch
13h00	Meet in front of the hotel for an exploratory walk (remember your water bottle, hat and sunscreen!).
14h30-16h30	Guided walk on the hotel premises (garden) and in the dune forest along the beach to study medicinal and other useful plants.
17h00	End of Day 3



Thursday, 20 August 2026

Annual IPUF Business Meeting

The IPUF Business Meeting will be held in the Conference Hall at Protea Hotel Karridene Beach, Durban, KwaZulu-Natal, South Africa. All members and interested persons are welcome to attend the meeting, which will be held on Thursday, 20 August 2026, at 09h00.

During this meeting, those in attendance will decide the location and the topics of the symposia for the next IPUF conference. Delegates are encouraged to participate in this important process by proposing a location and a venue for the 2027 conference. This is also an appropriate time to ensure that topics or symposia of particular interest to IPUF members receive the necessary attention in planning the programme for 2027.

Annual IPUF Business Meeting

Agenda:

- 09h00-09h40
1. Welcome
 2. Acknowledgements
 3. IPUF 2026 – Venue
 4. 2026 Theme
 5. IPUF symposia themes
 6. Future plans for IPUF
 - a. Nominations/voting for the IPUF Chairman
 - b. Nominations/voting for the IPUF Vice-Chairman
 - c. Nominations/voting for the IPUF Treasurer
 - d. Nominations/voting for the IPUF Secretariat
 7. General

Plant product display

An opportunity is provided for individuals or companies to display and/or sell products/crafts relevant to indigenous plant use. Please contact ipuf@uj.ac.za for a space. The product display will continue throughout the conference in the Poster Hall, with time during the breaks for interested persons to ask questions directly to the exhibitors.



Session 9 – Conservation and Cultivation 3 Chairperson: Gugulethu Khumalo			
09h40-09h55	Influence of irrigation regime and selected plant nutrients on the growth responses and tea quality of <i>Cyclopia longifolia</i>	Siphamandla Cebani	
09h55-10h10	Environmental influence on the metabolomic profile of <i>Agathosma betulina</i>	Nompumelelo Mnisi	
10h10-10h25	Assessing the indigenous tree-based provisioning ecosystem services in various vegetation types: insights from five communities in the Vhembe Biosphere Reserve, South Africa	Ratsodo Phillip Tshidzumba	
10h25-10h40	Optimizing irrigation and harvesting age for enhanced growth, yield and soil health in the leaves of <i>Lobostemon fruticosus</i>	Luvolwethu Dukashe	
10h40-10h55	Exploring the relationship between fatty acid composition and oxidative indices in South African indigenous fruit seed oils	Wilma Augustyn	
10h55-11h10	Environmental education through Indigenous Gardens	Bridget Ringdahla	
11h10-11h20	Session Questions		
11h20-11h50	Tea & Coffee Break		

Session 10 – Biological Activities and Medicinal Plant Chemistry 6			
Chairperson: Shakira Shaik			
11h50-12h05	The chemical diversity in the tribe Teedieae (Scrophulariaceae)	Siyonela Quvile	
12h05-12h20	When plants fight back: antifungal metabolites from South African <i>Pelargonium</i> species	Akshay Raghoonandan	
12h20-12h35	Laboratory-based Therapeutic-Potency Measuring of <i>Medicago sativa</i>	Thapelo Makhele	
12h35-12h50	Evaluation of phytochemicals, antioxidant, antimycobacterial and anti-virulence activity of selected medicinal plants used for treatment of tuberculosis and related symptoms	Matsilane Mashilo	
12h50-13h05	Phytochemical profiling, antioxidant activity, and mitochondrial-dependent apoptosis induced by <i>Ricinus communis</i> extracts in human promyelocytic leukaemia (HL-60) cells	Tokologo Ramothloa	
13h05-13h20	The immunomodulatory and pro-resolving effects of two indigenous South African medicinal plants	Gugulethu Khumalo	
13h20-13h35	Session Questions		
13h35-14h30	Lunch		

Session 11 – Conservation and Cultivation 4			
Chairperson: Mpho Choene			
14h30-14h45	Evaluating dosing guidelines for <i>Ginkgo biloba</i> : an evidence-based approach to standardisation	Reenen Herbst	
14h45-15h00	Improving the propagation techniques of <i>Hypoxis hemerocallidea</i> for the commercialization of herbal remedies	Joseph Malele	
15h00-15h15	Antioxidant compounds derived from African medicinal plants: the interplay of sustainability, maceration efficacy, and societal impact	Khayelihle Ncama	
15h15-15h30	Propagation of <i>Abrus precatorius</i> : a local farmer's innovation	Madimetja Magoro	
15h30-15h45	Perceived abundance and cultural-economic use-value of tree species in the Mopane Woodlands, Mopani District, South Africa	Lucky Makhube	
15h45-16h00	Forming, optical activity, and spectrophotometric techniques	Majorobela Motaung	
16h00-16h10	Session Questions		
15h10-16h40	Tea & Coffee Break		

Session 12 – Ethnobotany and Indigenous Knowledge 2			
Chairperson: Ben-Erik van Wyk			
16h40-16h55	A quantitative survey of the diversity of food plants used by the Vhavenda	Khathutshelo Magwede	
16h55-17h10	Regional diversity in medicinal plant use in the Northern Cape Province of South Africa	Marlette Compion-Venter	
17h10-17h25	A review of useful plants of KwaZulu-Natal Province, South Africa	Lloyd Mhlongo	
17h25-17h35	Session Questions		
17h35	End of Day 4		
18h30	Gala Dinner & Awards		



Invited Keynote Speaker





Mr Cyril Lombard

Cyril brings more than 30 years of experience across the biotrade, natural products, and small and medium-enterprise development sectors, with a career distinguished by pioneering work in commercialising southern Africa's indigenous natural products.

His work in the sector began in Namibia in the 1990s, where he was part of the team that established commercial marula oil production. This included setting up the supply associations and co-operatives that underpinned the industry and driving the commercial linkages that connected producers to global companies. Building on this foundation, he established the Southern African Marula Oil Producers' Network in 1999, facilitating the transfer of technology and know-how to community-based businesses across Botswana, Namibia, eSwatini, South Africa, and Zimbabwe.

In 2000, Cyril joined the project formulation team behind the creation of the Southern African Natural Products Trade Association, PhytoTrade Africa. There he established the organisation's European office and held the roles of Head of Market Development and Head of R&D. During this period, he led the effort to secure international market access for baobab fruit, achieving its registration as a novel food ingredient in the EU and gaining recognition of the fruit as a safe food ingredient with the FDA in the USA, as well as comparable approval in Canada. He went on to serve as CEO of PhytoTrade Africa from 2013 to 2016, and during this time also sat on the board of directors of the Union for Ethical Biotrade.

Alongside his executive work, Cyril has been active in fundraising for the development of the biotrade sector and provides advisory services to the GIZ ABioSA and BioInnovation Africa projects. He is a director of Biotrade Ventures, an incubator of opportunities in the indigenous natural products sector, with projects in Botswana and South Africa.

His current focus is on developing the marula fruit sector, with particular attention to securing access to local, regional, and international markets.

From African traditional medicines to Indigenous food and beverage ingredients: reframing biodiversity commercialisation for greater socio-economic impact

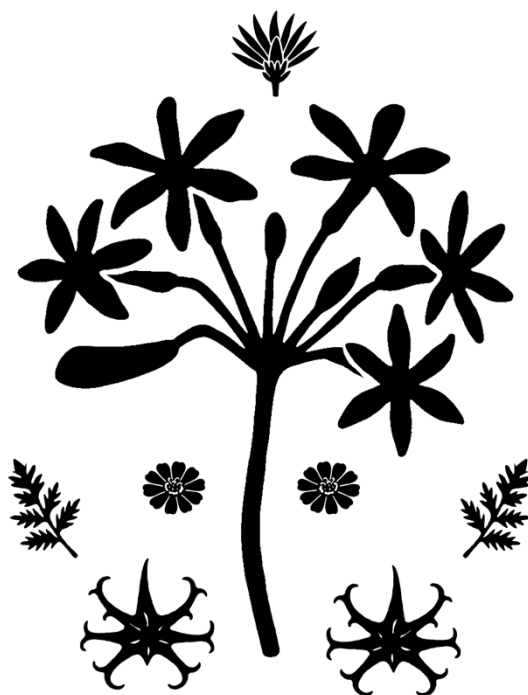
Cyril Lombard

Biotrade Ventures NPC

Abstract: South Africa's National Biodiversity Economy Strategy and Bio-economy Strategy create a strong expectation that the country's plant biodiversity and associated traditional knowledge should contribute to jobs, rural livelihoods, enterprise development, exports and inclusive economic growth. Over the past two decades, substantial public funding and university research have focused on African Traditional Medicines and indigenous medicinal plants. This research has generated important scientific knowledge, postgraduate training and publications. However, evidence of broad commercialisation impact remains limited. Only a small number of Southern African medicinal species have achieved meaningful regulated market access in major international markets, and success in the EU, USA and China remains narrow relative to policy expectations. This presentation argues that the current system is unlikely to deliver substantially better outcomes unless major common commercialisation bottlenecks are recognised and properly resourced. These bottlenecks include regulatory market access, safety evidence, product specifications, quality standards, history-of-use documentation, toxicology, allergenicity, processing data, and credible pathways through EU Novel Foods, US GRAS/NDI, China new food raw materials, and related systems in India, Brazil, Japan and Korea. The presentation proposes a strategic rebalancing: not to abandon medicinal-plant research, but to place greater emphasis on indigenous foods, beverages, nutritional ingredients, superfruits and wellness products, where regulatory barriers may be more proportionate to achievable commercialisation. Examples include marula fruit, baobab, morama, mafura, Kei apple, wild melons and cucumbers, indigenous teas and selected ATM species with credible food-use histories. To achieve measurable socio-economic impact, universities must be part of a wider, well-funded sector-support ecosystem involving industry associations, regulatory experts, laboratories, incubators, accelerators, public-private partnerships, grant funding, blended finance, patient capital and private-sector investment. International examples such as New Zealand kiwifruit and mānuka honey show that coordinated sector-level support can convert natural resource potential into market access, consumer products and sustained value-chain benefits.



Abstracts: Oral Presentations



From biopiracy to bio-sovereignty: A blockchain-enabled Helix Protocol for enforcing benefit-sharing in indigenous plant data systems

Tshepo Aphone

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Abstract: The rapid digitisation of biological data has exposed a critical governance gap in global biodiversity frameworks, enabling what is increasingly termed digital biopiracy. Through the unrestricted use of Digital Sequence Information (DSI) from repositories such as NCBI GenBank, commercial entities are able to utilise indigenous biological resources without engaging in benefit-sharing agreements, thereby circumventing the principles of the Nagoya Protocol. This loophole disproportionately affects biodiversity-rich regions in the Global South such as South Africa, undermining both data sovereignty and the rights of indigenous knowledge holders. This study proposes the Helix Protocol (Bio-Block OS), a blockchain-enabled framework designed to operationalise and enforce benefit-sharing through automated, code-based systems. The protocol is structured around three interoperable modules: (i) a Minting Console, which registers biological assets onto a distributed ledger through validated compliance with national legislation such as the National Environmental Management: Biodiversity Act (NEMBA), generating an immutable digital fingerprint; (ii) a Live Oracle, which continuously monitors global genomic databases and patent repositories to detect unauthorised utilisation of registered biological data; and (iii) a Smart Contract layer, which automates real-time benefit-sharing through triggered royalty distributions upon detection of commercial use. Using *Siphonochilus aethiopicus* as a case study, the protocol demonstrates a proof-of-concept for transitioning from reactive, legal enforcement to proactive, computational governance. Grounded in principles of African data sovereignty and relational ethics, this framework presents a scalable solution for the protection, validation, and equitable commercialisation of indigenous medicinal plant resources.

Exploring the relationship between fatty acid composition and oxidative indices in South African indigenous fruit seed oils

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^c Agricultural Research Council-Tropical and Subtropical Crops, Agro-processing, Nelspruit, South Africa

Abstract: This study evaluates the quality and shelf-life potential of various indigenous fruit seed oils by integrating analyses of their fatty acid profiles, physical constants, and oxidative indices. Edible oil parameters, such as free fatty acid (FFA), peroxide value (primary oxidation), *p*-anisidine value (secondary oxidation), and iodine value (unsaturation), assess the quality, purity, and safety of edible oils. The fatty acid composition of oils is related to these values and can be used to determine their longevity and industrial applications. Fatty acid profiles can identify oils and detect adulteration. The identity of a seed oil is primarily dictated by its fatty acid composition. In this study, the seed oils were extracted from *Sterculia murex* (Lowveld chestnut), *Sclerocarya birrea* (marula), *Trichilia dregeana* (forest mahogany), *Trichilia emitica* (Natal mahogany), *Oncoba spinosa* (snuffbox) and *Englerophytum magalismontanum* (stamvrug). Lowveld chestnut (LC) and snuffbox (Sn) oils were characterised by very high levels of polyunsaturated fatty acids, 39.2% and 80%. These oils have high nutritional value, as they contain linoleic acid (LC and Sn) and linolenic acid (Sn), which are essential fatty acids (omega 3 and 6). However, high unsaturation is associated with lower shelf life, as reflected by high iodine, *p*-anisidine, and peroxide values, and a low rancimat value, indicating a shorter shelf life. Oils with higher saturation, such as Natal mahogany and forest mahogany, have lower values for iodine, *p*-anisidine and peroxide and a higher rancimat value, indicating better shelf life. Chemical profiles of edible oils can predict their applications.

UHTO: A game changer for honeybush processing and community development

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^c Department of Food Science, Stellenbosch University, Stellenbosch, South Africa

Abstract: Honeybush, an endemic South African herbal tea with a long history of medicinal use by the Khoi-San people, is gaining increasing market recognition, creating opportunities for rural economic development. However, much of the honeybush supply is still wild-harvested and sold at low prices to processors, limiting income for harvesters and small-scale farmers. A key constraint to broader participation in the value chain is the lack of accessible small-scale processing technologies. To address this, the Agricultural Research Council (ARC) has developed an innovative ultra-high temperature oxidation (UHTO) process that significantly reduces processing time and is suitable for small-scale applications. This technology has been successfully validated at a laboratory scale. Preliminary pilot-scale trials also gave promising results. The ARC now aims to establish a small-scale processing facility in the Tsitsikamma region to implement the UHTO technology. The project will focus on optimising processing parameters for multiple honeybush species, refining the UHTO equipment design, and developing an MSME to enable local farmers and wild harvesters to process, package, and market their own products. By removing processing barriers and introducing local value addition, this initiative will enhance income opportunities, support inclusive participation in the honeybush industry, and contribute to its sustainable growth. The project also promotes the preservation of indigenous knowledge alongside the integration of appropriate modern technologies within local communities. This initiative represents a transformative opportunity to reshape the honeybush value chain and empower primary producers.

Potential of Ugandan medicinal plants as novel antimalarial agents

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^b Faculty of Health Sciences, Department of Pharmacology and Therapeutics, Busitema University, Tororo, Uganda

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^d Natural Products Research and Innovation Centre, Busitema University Faculty of Health Sciences, Tororo, Uganda

Abstract: Malaria remains a disease of public health concern, with sub-Saharan Africa being the most affected. The current treatment modalities have been threatened by the emergence and spread of resistance to artemisinin combination therapies. Consequently, there is widespread community use of herbal medicines, which has prompted scientific studies on their efficacy, safety, and phytochemical composition. This review aimed to compile and analyse Ugandan medicinal plants as potential anti-malarial drug sources, with a focus on ethnobotanical use, phytochemistry, efficacy, and toxicity.

A total of 257 plant species belonging to 78 families, with Asteraceae, Fabaceae, Lamiaceae, and Euphorbiaceae, providing the highest number, were used in ten districts of Uganda in the management of malaria. More than half (51%, 132) of the plant species were tested for in vitro (57.0%, n=107) or and/or in vivo (43.0%, n=81) anti-plasmodial activity, and 123 plant species were active. More than half (56.5%, n=148 plant spp) of the reported medicinal plants in Uganda were tested for acute toxicity, and 41.4% were considered relatively safe, with LD50 values above 5000 mg/kg. Most phytochemical compounds responsible for the plants' antiplasmodial activity have not been fully isolated and characterised, though a limonoid identified as gedunin from *Azadirachta indica* was highly active with an IC₅₀ of 0.72µg/mL.

Some medicinal plants in Uganda exhibit promising antiplasmodial activity and an acceptable acute toxicity profile, making them potential sources of novel antiplasmodial agents. More phytochemical and pharmacological studies are warranted to identify the phytochemicals responsible for the antiplasmodial activity and their mechanism of action.

Influence of irrigation regime and selected plant nutrients on the growth responses and tea quality of *Cyclopia longifolia*

Siphamandla Cebani^{a,b}, Nike Lewu^a, Cecilia Bester^a, Reckson Mulidzi^a and Francis Lewu^b

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^b Agricultural Research Council Infruitec-Nietvoorbij, Private Bag X5026, Stellenbosch 7599, South Africa

Abstract: *Cyclopia* Vent. spp., commonly known as honeybush, is an indigenous South African crop originating from the Cape Floristic Region and widely valued for its use as an herbal tea with recognized therapeutic properties. In addition to traditional consumption, honeybush extracts are increasingly utilized in the functional food and cosmetic industries, creating a growing demand for sustainable and optimized production systems. This study investigates the interactive effects of nutrient management and irrigation regimes on the growth performance and tea quality of *Cyclopia longifolia*. The trial location is at the Research Farm of the Agricultural Research Council (ARC) Infruitec-Nietvoorbij, Stellenbosch. The trial was planted as a randomized block design with 15 treatment combinations replicated in three block replicates. The 3 × 5 factorial treatment structure consists of three irrigation levels (well-watered, moderately stressed, and severely stressed) and five fertilizer [potassium (K) and boron (B)] treatments (unfertilized control, K1, K2, B1 and B2). Data collection focuses on key growth parameters, yield, and quality-related traits relevant to tea production. Preliminary observations indicate that both irrigation levels and nutrient application influence plant growth responses, with notable interaction effects between water availability and nutrient supply. Harvesting was carried out at the end of March 2026, and the results on tea quality will be presented. The outcomes of this study are expected to contribute to the development of integrated fertilization and irrigation guidelines tailored for honeybush cultivation. Such guidelines will improve resource-use efficiency, enhance crop productivity, and promote sustainable production practices among local growers in South Africa.

Regional diversity in medicinal plant use in the Northern Cape province of South Africa

Marlette Compion-Venter^a and Ben-Erik van Wyk^a

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Abstract: A study was initiated to answer the following questions: (1) what plant species do people still commonly use in primary health care in the Northern Cape? (2) do these species differ from the most popular medicinal species as recorded in previous ethnobotanical surveys? (3) are there differences between villages and regions in terms of the plant species that are used? Fieldwork conducted between December 2025 and March 2026 gave the following results: 158 different plant species, plant products and other medicines are still used for everyday health care by the 150 persons interviewed. Species that were used the most as medicine overall were *Lessertia frutescens* (93 users, 271 use-records), *Artemisia afra* (29, 74 use-records), *Dicoma capensis* (20, 62 use-records), *hyraceum* (hyrax urine) (18 users, 63 use-records), *Ruta graveolens* (16, 33), *Cannabis sativa* (12, 37), honey (9, 12), *Tulbaghia violacea* (8, 24), *Agathosma betulina* (7, 18), *Aizoon africanum* (6, 13), *Allium sativum* (6, 27), *Bulbine frutescens* (6, 24), *Syzygium aromaticum* (cloves and clove oil) (8, 18), *Ricinus communis* (oil and leaves) (5, 13) and *Antizoma miersiana* (5, 10). In the five regions, the same species are mostly used, but the frequency of use changes. A comparison with published quantitative ethnobotanical data from surveys conducted in Namaqualand (Nortje, 2009) and De Beer (2011, 2022) shows some interesting differences (based on frequency of citation and Species Popularity Index values), suggesting that the surveys may have recorded indigenous knowledge about the plants and their uses, but that it cannot be assumed that they were (are) still used in everyday health care. There are distinct differences between villages and regions that may be primarily due to local availability of the plants and products.

Honeybush processing reimaged: Development of an ultra-high temperature oxidation (UHTO) process

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^c Crop Development, Infruitec-Nietboorbij, Agricultural Research Council, Stellenbosch, South Africa

Abstract: Conventional honeybush herbal tea is produced by oxidising (also referred to as “fermenting”) the chopped shoots of *Cyclopia* species at high temperatures for extended periods (e.g. 80°C/24 h, 90°C/16 h, etc.). The long processing time is a major bottleneck in honeybush production, while the lack of supervision during overnight processing can lead to inconsistent quality. Processing at temperatures above 100°C under pressure, i.e., ultra-high-temperature oxidation (UHTO), was investigated as an alternative to reduce processing times and improve product quality. UHTO temperature-time regimes were optimised for *C. intermedia* (120°C/3 h), *C. subternata* (120°C/2 h), *C. genistoides* (120°C/3 h) and *C. longifolia* (120°C/3 h). UHTO processing enhanced the fruity and sweet-associated aroma notes of the infusions, while reducing the floral notes. The effect of UHTO processing on the phenolic composition of the infusion varied by species and compound. UHTO treatment resulted in a large reduction in mangiferin content, indicating that for products requiring a high mangiferin content, standard processing conditions are preferred. A consumer study in both South Africa and the USA found no significant preference for either standard or UHT-processed honeybush, indicating that both would be equally acceptable to consumers. Preliminary testing of the first up-scaled prototype (100 kg capacity) yielded positive results, though further design improvements are required.

Plant-based drug discovery for neuropharmacology: Putting the IKS into the CNS

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^b Department of Pharmacology, School of Medicine, Faculty of Health Sciences, University of Pretoria, Pretoria, South Africa

Abstract: Life expectancy in sub-Saharan Africa (SSA) has increased markedly over recent decades, resulting in a rapidly expanding ageing population and a corresponding rise in age-associated neurodegenerative disorders, including dementia and Parkinson's disease. Despite this growing burden, central nervous system (CNS) drug discovery remains dominated by Western biomedical paradigms that privilege reductionist, target-driven approaches and animal models, frequently leading to high failure rates, limited translatability, and prohibitive development costs. This dominance contributes to epistemic injustice by marginalising Indigenous Knowledge Systems (IKS), particularly those embedded in African traditional medicine, which have historically addressed CNS-related conditions such as epilepsy, anxiety, depression, and age-related cognitive decline.

Decolonizing neuropharmacology represents both an ethical necessity and a scientific opportunity. Colonial legacies continue to shape knowledge production, regulatory structures, and intellectual property regimes, often excluding Indigenous practitioners as legitimate contributors to pharmacological research. Ethnobotanical and pharmacological evidence from South African medicinal plants illustrates the therapeutic potential of African flora while also highlighting risks associated with biopiracy and cultural appropriation, particularly amid the contemporary resurgence of psychedelic medicine.

An integrative framework is proposed that combines ethnobotanical mapping, reverse pharmacology, *in silico* docking, and community-based participatory research, supported by principles of Indigenous data sovereignty, equitable benefit sharing, and ethical collaboration. The responsible application of artificial intelligence is discussed as a means of advancing network pharmacology while safeguarding Indigenous Cultural and Intellectual Property. Embracing pluralistic knowledge systems and equitable research partnerships offers a pathway toward more inclusive, culturally relevant, and sustainable innovation in CNS drug discovery.

To bee or not to bee: The antimicrobial potential of South African bee products against *Helicobacter pylori*

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Department of Pharmacy and Pharmacology, Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, South Africa

Abstract: *Helicobacter pylori* is implicated in numerous ailments, including gastric ulcers. Current treatments for *H. pylori* infections often result in a rapid gain in resistance and gut microbiome dysbiosis. Bee products have been used for centuries for medicinal purposes, including the treatment of gastric ulcers. While several studies globally have investigated the anti-*H. pylori* properties of bee products, an investigation into a comprehensive range of southern African bee products was yet to be explored. This study aimed to investigate the antimicrobial activity of South African honey and propolis against *H. pylori*. Honey (76 samples) and propolis (51 samples) were sourced directly from apiarists in South Africa. The broth microdilution and agar dilution assays were carried out to determine the minimum inhibitory concentrations (MIC) of ethanolic propolis extracts and honey, respectively. A total of 27 propolis extracts had noteworthy antimicrobial activity against at least one *H. pylori* strain ($\text{MIC} \leq 0.51 \text{ mg/mL}$). All propolis extracts investigated were considered non-toxic when evaluated using the brine shrimp lethality assay. A third of the investigated honey samples demonstrated noteworthy anti-*H. pylori* activity ($\text{MIC} \leq 8.33\% \text{ v/v}$). Selected combinations of honey with probiotics showed a greater increase in anti-*H. pylori* activity. The results of this study show the *in vitro* potential of utilizing honey and propolis as treatment options for *H. pylori* infections, as well as the benefit of including probiotics as a potentiator of activity.

Phytochemical dosing patterns in *Matricaria chamomilla* (chamomile): A critical analysis of standardisation and clinical relevance

Thabo Dlamini and Niël (AD) de Beer

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Abstract: Herbal remedies are widely used in complementary and alternative medicine, yet concerns persist regarding variability in the dosing and efficacy of phytochemicals across different forms of administration. This systematic review conducted a comparative analysis of phytochemical dosing in *Matricaria chamomilla* (chamomile) when consumed as a tea versus in standardised supplement form. The primary research question was: *How does the phytochemical content and dosage of chamomile differ between herbal teas and standardised supplements, and what are the implications for efficacy and safety?* The objective was to evaluate published studies reporting the quantitative composition, extraction methods, degree of standardisation, and clinical relevance of phytochemicals in various chamomile formulations. Databases including PubMed, Scopus, and Google Scholar were systematically searched for peer-reviewed articles that met the predefined inclusion criteria. Data were extracted, screened, and analysed in accordance with PRISMA 2020 guidelines. Ethical approval was not required, as the review was based entirely on secondary data from previously published studies. The review identified significant differences in the concentration and bioavailability of key active compounds, such as apigenin and bisabolol, across different preparation types. Standardised supplements generally contained higher, more consistent phytochemical doses than teas, which exhibited greater variability due to differences in infusion time, plant part used, and extraction efficiency. These findings contribute to an evidence-based understanding of phytochemical dosing in herbal medicine and may inform clinical recommendations, regulatory frameworks, and consumer use of chamomile products.

Environmental education through Indigenous Gardens

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^b NRF-SAEON-EFTEON, Northern Drakensberg Landscape, Maloti House, Midmar Nature Reserve, R103, Howick, 3291, KZN, South Africa

Abstract: Indigenous plant knowledge is a key aspect of resilient social-ecological systems, yet its translation into formal education remains limited. Garden spaces and interactive learning environments are increasingly recognised as important tools in environmental education. Experiential and place-based learning approaches encourage sustainable behaviours and foster a sense of environmental stewardship. Ultimately, these approaches empower future generations to contribute meaningfully to environmental conservation and resilient, sustainable communities.

This study presents a collaborative case study from Bambanani Primary School, KwaZulu-Natal, within the Sustainable Schools Programme implemented by One Planet SA, with contributions from EFTEON. The programme aims to cultivate Education for Sustainable Development practices relevant to South African schools. It promotes the establishment of school gardens as living classrooms, enabling hands-on learning in Natural Sciences and providing learners with direct exposure to indigenous ecosystems on their school grounds. A site-specific indigenous garden was co-developed, and over 100 plants representing 35 indigenous species were sourced to reflect local flora and highlight ecological functions and cultural values, including palatable grasses, local succulents, pollination syndromes, threatened species, and plants used in traditional medicine.

Since its establishment, the garden has served as a living laboratory and has been utilised for biodiversity lessons and activities aimed at enhancing understanding of plant diversity while strengthening the connection between classroom learning and the natural environment. This work demonstrates the transformative potential of indigenous school gardens to foster ecological literacy, promote community pride, and embed sustainable practices into everyday learning.

Optimizing irrigation and harvesting age for enhanced growth, yield and soil health in the leaves of *Lobostemon fruticosus*

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Abstract: Increasing global dependence on herbal medicine has intensified pressure on wild populations of medicinal plants, leading to localized declines. *Lobostemon fruticosus*, an indigenous South African medicinal shrub used for treating skin-related conditions, is increasingly threatened by overharvesting. Although important, limited information exists on irrigation management and the harvesting age required for its cultivation. This study investigates the effects of five irrigation regimes (1, 2, 3, 4, and 5 L/plant) on growth, biomass yield, soil enzymatic activity, and microbial functioning of *L. fruticosus* across different harvesting ages (H1, H2, and H3) under controlled glasshouse conditions. Plant height, stem diameter, number of branches, chlorophyll content and biomass yield were measured, while soil enzymatic activity was assessed using β -glucosidase and acid phosphatase. Irrigation significantly influenced plant growth, yield and soil biological activity ($p < 0.05$). Moderate irrigation (3 L) resulted in high growth performance with maximum plant height (56.60 cm), stem diameter (12.65 mm) and branching (24.93 branches per plant), while the highest biomass yield was at 2 L (730 kg/ha). In contrast, low irrigation (1 L) restricted growth but increased chlorophyll content (95.10 CCI), whereas excessive irrigation (5 L) reduced growth and chlorophyll levels. Soil enzymatic activity varied with irrigation, with β -glucosidase highest under 1 L (148.4 $\mu\text{g pNP g}^{-1} \text{h}^{-1}$) and acid phosphatase peaking under 2 L (305.3 $\mu\text{g pNP g}^{-1} \text{h}^{-1}$). Moderate irrigation optimized plant productivity and soil functionality, providing a basis for sustainable cultivation of *L. fruticosus*.

Effects of cutting position and leaf area retention on rooting and growth of vegetatively propagated *Cannabis sativa*

Azile Dumani^{a,b}, Tembakazi T. Silwana^b, Ifeanyi Egbichi^a, Adebola O. Oyedeji^c, Babalwa Mpambani^b, Hlabana A. Seepe^c

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Abstract: The absence of standardised propagation procedures remains a significant barrier to the cultivation of high-quality medicinal cannabis, which is extensively cultivated in rural regions of South Africa. Addressing this issue is crucial for the commercialisation of cannabis for therapeutic purposes and product development. This study evaluated the impact of cutting position and leaf area retention on the adventitious rooting and growth of medicinal cannabis propagules. The study was conducted at Dohne Agricultural Development Institute, Eastern Cape, utilising a Randomised Complete Design with three replications. Treatments were: i) herbaceous shoot cuttings with 50% leaf area trimmed ii) herbaceous shoot cuttings with 100% leaf area, and iii) basal stem cuttings. Sixty 15 cm cuttings per treatment were excised at a 45° angle below the node, from vegetatively branched plants. Cutting bases were treated with Indole-3-butyric acid (IBA), planted into a commercial peat-based rooting medium, and housed in 60-celled propagation incubators. Moisture levels were adjusted daily using distilled water. Data was collected every two weeks until six weeks after planting. Parameters measured included rooting percentage, time to 50% rooting, height, number of leaves, fresh and dry weights (shoot, root, and total), shoot and root lengths, and the root-to-shoot ratio. Results indicated that HS100%LA, succeeded by HS50%LAT, excelled in all rooting and growth metrics. In contrast, the basal stem cutting produced unfavourable results for all measured parameters. This study shows that using herbaceous shoot cuttings with 100% leaf area retention improves vegetative propagation and successful establishment of medicinal *C. sativa*.

Medicinal plant use in Eastern Pondoland: comparisons with data from KwaZulu-Natal and the Eastern Cape Province of South Africa

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Abstract: Eastern Pondoland, part of the Maputaland–Pondoland–Albany Biodiversity Hotspot, remains one of South Africa’s least documented regions for indigenous medicinal plant knowledge, with the only prior broad account (Zukulu et al., 2012) confined to the Amadiba coastal communities. This study presents the first systematic, quantitative survey to span three Eastern Pondoland towns simultaneously — Bizana, Flagstaff and Lusikisiki — using the Matrix Method (De Beer & Van Wyk, 2011) with 48 participants. A total of 293 medicinal plant species from 90 families were recorded, dominated by Asteraceae (38 species), Fabaceae (19), and Asparagaceae (13). Species Popularity, Cultural Importance and Ethnobotanical Knowledge indices were calculated at town and regional level, with 57.0% of species shared across all three towns, indicating a strong shared regional ethnobotanical knowledge alongside locally distinctive knowledge. To contextualise these findings regionally, the Pondoland data was compared against an Amandawe Zulu inventory from KwaZulu-Natal and a compiled Xhosa dataset from the Eastern Cape. Homogeneity Index values showed greater overlap between Eastern Pondoland and the KwaZulu-Natal dataset (HI = 0.24) than with the geographically closer Xhosa dataset (HI = 0.15), with only 57 species shared across all three. Approximately 49% of Eastern Pondoland species were absent from both comparison datasets, representing previously undocumented records. These findings highlight both a resilient, cross-cultural core of medicinal plant knowledge and substantial undocumented local diversity, underscoring Eastern Pondoland’s value as a priority area for indigenous knowledge documentation.

Evaluation of physiological and biochemical responses of *Amaranthus* genotypes under field-induced short-term water stress

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Abstract: Drought, a major abiotic factor limiting crop productivity worldwide, is particularly problematic under climate change. Sustaining crop productivity requires screening of drought-tolerant genotypes. *Amaranthus* is a climate-resilient and nutrient-rich crop; however, the variation in drought tolerance among its genotypes remains poorly understood. This study evaluated the effects of short-term water stress on morphophysiological and biochemical traits of leafy-vegetable *Amaranthus* genotypes under open-field conditions. Seeds of *A. tricolor* (Ames1980, PI702915), *A. dubius* (PI698379), and *A. graecizans* (PI173837, PI288277, PI604196) were germinated in potting soil in a greenhouse for 21 days and then transplanted into the field in a randomised complete block design. Ames1980, PI173837, and PI698379 showed susceptibility to 7-day water deprivation, with over 30% reductions in plant height and biomass, whereas other genotypes exhibited smaller declines. Relative Water Content decreased by less than 30% in most genotypes, except for PI698379 under water-deprivation stress, which showed high water-use efficiency. Oxidative stress was evident, with over a 70% increase in hydrogen peroxide in Ames 1980, PI698379, and PI173837, and over a 100% increase in malondialdehyde in Ames 1980, PI698379, and PI604196. In response to oxidative stress, all genotypes exhibited increased osmolyte accumulation and antioxidant activity. Proline increased by more than 30% in Ames1980, PI702915 and PI698379 while sugars remained unchanged. Significant increases in superoxide dismutase (54-155%) and ascorbate peroxidase (48-116%) activities were also observed. Genotypes PI702915, PI288277, and PI604196 demonstrated resilience to water deficit, maintaining higher growth and water status with lower oxidative damage. Further studies will assess responses under prolonged drought and explore the underlying molecular mechanisms.

Evaluating dosing guidelines for *Ginkgo biloba*: An evidence-based approach to standardisation

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Abstract: The widespread use of *Ginkgo biloba* as a complementary therapy for neurological conditions has outpaced the development of standardised dosing guidelines, particularly in jurisdictions like South Africa, where regulatory frameworks remain fragmented. This scoping review critically evaluates existing dosing recommendations for *G. biloba* across global regulatory bodies (FDA, EMA, EDA, Health Canada), traditional systems (TCM, Ayurveda), and clinical literature, with the aim of informing evidence-based standardisation tailored to the South African context. Using the PRISMA 2020 framework, 29 human studies were synthesised, focusing on standardised extracts (EGb 761, GBE50) and their efficacy in cognitive impairment, dementia, stroke and stroke recovery models, and neuropsychiatric conditions. Dosage ranged from 120–450 mg/day, with higher doses (≥ 240 mg/day) consistently associated with improved cognitive outcomes. This review highlights significant variability in phytochemical composition, safety profiles, and regulatory oversight, underscoring the need for harmonised dosing protocols. Doses identified are stratified by indication, incorporate patient-specific factors, and incorporate standardisation criteria and implementation strategies aligned with SAHPRA’s regulatory goals. This work contributes a foundational framework for the safe, effective, and contextually relevant use of *G. biloba* in South African clinical practice.

The immunomodulatory and pro-resolving effects of two indigenous South African medicinal plants

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Abstract: Indigenous South African medicinal plants are widely used for inflammatory conditions, yet their pharmacological evaluation remains largely confined to conventional anti-inflammatory endpoints, with limited investigation of resolution-phase mechanisms. *Tetradenia riparia* (Hochst.)Codd and *Plumbago auriculata* Lam., are used for the management of pain and inflammation. However, their capacity to modulate macrophage-driven resolution programmes and lipid mediator networks remains underexplored. Lipopolysaccharide (LPS)-stimulated human macrophages were treated with crude extracts and fractions, followed by transcriptional profiling of pro-inflammatory cytokines, including tumour necrosis factor alpha (TNF- α), interleukin (IL)-1 beta (IL-1 β), IL-6, and IL-8. Signalling nodes, including signal transducer and activator of transcription 3 (STAT3), Janus kinase 2 (JAK2), and phosphoinositide 3-kinase (PI3K), alongside resolution-associated determinants (arachidonate 12-lipoxygenase (ALOX12), ALOX15, G protein-coupled receptor 18 (GPR18), and GPR32), were evaluated by qPCR. Targeted lipid mediator profiling quantified prostaglandins, leukotrienes and pro-resolving lipid mediators, including 17-hydroxydocosahexaenoic acid (17-HDPA). Untargeted LC-MS/MS metabolomics coupled with molecular networking characterised the plant extract's chemical space. The leaf extracts and their fractions showed significant downregulation of pro-inflammatory cytokines and suppression of STAT3, JAK2, and PI3K signalling. These changes were accompanied by upregulation of ALOX12, ALOX15, GPR18, and GPR32, independent of M2 markers (CD163, MRC1). Furthermore, molecular networking data analysis revealed more than 80% of chemical constituents found in *T. riparia* and *P. auriculata* have no spectral matches in global natural product's databases. Our findings provide a mechanistic framework linking ethnobotanical knowledge with resolution biology and highlight the value of integrating lipid mediator profiling with systems-level metabolomics to interrogate complex plant-derived therapeutics.

Influence of zeolite application rates on secondary metabolite accumulation in broccoli (*Brassica oleracea* var. *italica*) under field conditions

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Abstract: Broccoli (*Brassica oleracea* var. *italica*) is a nutritionally important vegetable rich in health-promoting secondary metabolites, yet its accumulation is often constrained by declining soil fertility and inefficient nutrient and water management practices. This study evaluated the influence of zeolite soil amendment on the accumulation of secondary metabolites in broccoli under field conditions. A field experiment using a randomised complete block design tested zeolite at 0, 5, 10, 15, and 20 t ha⁻¹, applied before transplanting. Broccoli samples were harvested, oven-dried at 60 °C, and analysed for secondary metabolites, including phenolic acids and flavonoids, as well as antioxidant activity, with data evaluated by ANOVA and Fisher's LSD at $p \leq 0.05$. The results showed that zeolite application significantly increased the concentrations of specific phenolic acids, including gallic acid, chlorogenic acid, and caffeic acid, as well as flavonoids, enhancing antioxidant, anti-inflammatory, and health-promoting properties. Flavonoid compounds, such as quercetin and kaempferol, were also significantly elevated compared to the control. The 10 t ha⁻¹ treatment recorded the highest accumulation of these compounds and exhibited the greatest antioxidant activity. The 15 t ha⁻¹ treatment showed comparable values but was not significantly different from 10 t ha⁻¹. In contrast, the 20 t ha⁻¹ treatment did not result in further significant increases in secondary metabolite contents. The findings suggest that zeolite applications at 10 t ha⁻¹ and 15 t ha⁻¹ optimise overall metabolite accumulation in broccoli, whereas higher rates significantly suppress the synthesis of key specialised metabolites, such as glucosinolates.

Antimicrobial properties of the fresh leaf material against the ear pathogens

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Abstract: Ear infections are inflammations of the middle ear caused by bacterial, viral, or fungal infections. Local people and traditional health practitioners use medicinal plants to treat ear infections in Limpopo Province. An ethnobotanical survey was conducted to document the indigenous knowledge of medicinal plants used to treat ear infections in the Vhembe District, Limpopo Province. A semi-structured questionnaire and a field walk with traditional health practitioners were used to gather information on the vernacular names of the plant (s) used, the mode of preparation, and other relevant details. The results revealed that 10 plant species belonging to different families were used to treat ear infections. Fresh leaves of *Aloe greatheadii*, *Aloe marlothii*, *Kalanchoe luciae*, *Dracaena aethiopica*, and *Dracaena trifasciata* were extracted using solvents of varying polarities such as acetone, dichloromethane, ethyl acetate, hexane, and water. Antimicrobial activity of the plant extracts was investigated against bacteria (*Escherichia coli*, *Pseudomonas aeruginosa*, and *Staphylococcus aureus*) and fungi (*Aspergillus fumigatus* and *Candida albicans*) using micro-dilution and bioautography assays. Methanol extracted significantly large quantities (10%) of plant material as compared to other solvents. Antimicrobial activity was observed in some plant extracts, with excellent minimum inhibitory concentrations (MICs) ranging from 0.02 to 0.31 mg/ml and moderate activities ranging from 0.63 to 2.5 mg/ml against the selected pathogens. Medicinal plants used in the study may serve as a source of new, effective antifungal drugs to combat ear infections in humans.

Evaluation of South African medicinal plants used for urinary tract infections: antimicrobial activity and phytochemical characterisation of the most active species

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Abstract: Urinary tract infections (UTIs) are among the most prevalent bacterial infections worldwide, and their treatment has become increasingly challenging due to multidrug-resistant uropathogens. In South Africa, more than 150 plant species are traditionally used to manage UTIs; however, their therapeutic potential against uropathogenic bacteria remains underexplored.

This study investigated the antimicrobial activity of 46 Southern African plant species traditionally used to treat UTIs. Organic (dichloromethane: methanol), aqueous extracts and essential oils were evaluated against six reference strains (*Klebsiella pneumoniae* ATCC13887, *Pseudomonas aeruginosa* ATCC27853, *Escherichia coli* ATCC8739, *Proteus mirabilis* ATCC43071, *Staphylococcus saprophyticus* ATCC15305, and *Enterococcus faecalis* ATCC201212), along with their clinical isolates, using minimum inhibitory concentration (MIC) broth microdilution assays. Toxicity was assessed using the brine shrimp lethality assay.

Organic extracts of *Withania somnifera* and *Bolusanthus speciosus* showed notable activity against multiple pathogens, with *B. speciosus* demonstrating broad-spectrum antibacterial effects (MIC 0.33-0.5 mg/mL). *Leonotis leonurus* essential oil also exhibited noteworthy activity (MIC 0.83 mg/mL) against *S. saprophyticus*, *E. faecalis*, *K. pneumoniae*, and *E. coli*. Toxicity testing of *B. speciosus* was dose-dependent (43% mortality at 0.5 mg/mL; 68% at 1 mg/mL), with lower toxicity at ≤ 0.5 mg/mL.

UPLC-MS analysis of *B. speciosus* extracts tentatively identified prenylated isoflavonoids and isoflavanones, such as hydroxywighteone, bolusanthol B and sophoraisoflavanone B, which may contribute to its antimicrobial properties. This highlights the value of indigenous knowledge as a foundation for modern drug discovery and highlights *B. speciosus* as a promising candidate for further investigation.

Propagation of *Abrus precatorius*: a local farmer's innovation

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Abstract: The demand for herbal remedies in South Africa for primary health care is imminent and very high. The use of traditional medicine in the country is increasing daily due to its effectiveness in treating many ailments. A significant advantage of traditional medicines is that they have very few side effects. *Abrus precatorius* is widely used in various forms in communities in South Africa. Studies have revealed that the plant has therapeutic potential, including anti-bacterial, anti-fungal, anti-tumour, anti-migraine, and anti-inflammatory properties, as well as the treatment of inflammation, ulcers, wounds, and sores. The value of *Abrus precatorius* prompted the farmer to preserve and develop a locally appropriate multiplication approach. Qualitatively, the seeds, seedling emergence, plant growth, harvesting time and quantity harvested per plant were recorded. Therefore, the aim of this paper is to share valuable information about a remarkable, locally appropriate seed multiplication approach.

A quantitative survey of the diversity of food plants used by the Vhavenda

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Abstract: Information from the existing literature on Vhavenda food plants and their uses was enriched through a reconnaissance survey conducted among Tshivenda-speaking communities in the Vhembe District Municipality. A list of 179 useful food species representing 58 families was compiled, accompanied by photographs organised into a flip-file album. Among the 179 species identified, several categories emerged based on their primary uses: edible fruits, leaves cooked as vegetables, beverages, sources of caterpillars feeding on leaves, sources of edible seeds, nutraceuticals, cooking sodas, famine foods, edible sweet nectars, edible gums, condiments, sources of edible stinkbugs, edible leaf stalks, and cooking oil. Plant families with the highest species representation were Fabaceae, Malvaceae, Cucurbitaceae, Amaranthaceae, Rubiaceae, Apocynaceae, Anacardiaceae, Moraceae, Myrtaceae, and Asteraceae. The most frequently mentioned and widely used plants include species from the genera *Amaranthus*, *Cucumis*, *Ficus*, *Grewia*, *Lannea*, *Momordica*, and *Syzygium*. Notably, species with the broadest range of uses were *Adansonia digitata*, *Amaranthus hybridus*, *Bidens pilosa*, *Citrullus lanatus*, *Corchorus tridens*, *Lagenaria siceraria*, *Landolphia kirkii*, *Sclerocarya birrea*, and *Vigna unguiculata*. This data is of significant scientific and practical value, offering comparative insights into future quantitative ethnobotanical studies. It provides a foundation for understanding cultural and contemporary biocultural plant use patterns in South Africa. Additionally, the findings can inform policymakers focused on floristic diversity, helping identify culturally important species that may warrant prioritization for conservation efforts.

***In vivo* seed propagation of selected medicinal plants used against human pathogens**

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Abstract: Seed germination is a complex and crucial process in the plant life cycle, involving the transformation of a dormant seed into an actively growing seedling. In the current study, the effects of temperature on seed germination and of sowing pretreatment on the emergence of selected plant species used for the treatment of fungal infections were investigated. Seeds of *Momordica balsamina* (3 seeds) and *Myrothamnus flabellifolius* (4 seeds) per treatment was exposed to three different pre-treatment methods: cold water, hot water, and smoke water for 22 hours, replicated 4 times. The results showed that both smoke and hot water treatments had a significant effect on seed emergence in both *M. flabellifolius* and *M. balsamina*. Cold water treatment resulted in lower emergence percentages in both *M. balsamina* (25%) and *M. flabellifolius* (31%) compared to other pretreatments. Smoke water and hot water are the best sowing pretreatments, as they resulted in the highest emergence percentages of 67% (*M. balsamina*) and 62.5% (*M. flabellifolius*), respectively. The seed germination temperature trial was conducted with five different temperature treatments, ranging from 15 to 30 °C for 30 days. The final germination percentage of *C. edulis* was highest at 20 °C (100%), followed by 25 °C (97%) and 15 °C (95%), with a marked decline at 30 °C (80%). These results indicate that 20 °C and 25 °C are ideal temperatures for the germination of the selected medicinal plants.

Traditional use of indigenous vegetables and fruits against fungal skin infections

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Abstract: skin infections are primarily fungal and bacterial attacks on the skin. The study aimed to investigate the anti-dermatophytic activity of selected plant species used for the treatment of skin infections against the dermatophytes. A survey was conducted on the indigenous knowledge of medicinal plants used for the treatment of skin infections in Mopani, Capricorn, and Vhembe districts. The study revealed twenty-three plant species, belonging to 20 different families, are used to treat skin infections in humans. The leaves were the most frequently used plant parts, and a paste was the most common mode of preparation. Root, fruit, bark, leaves, seeds, and in some instances, the whole plant are used for the preparation of medicine. The mode of preparation was decoction (37%), followed by paste (21%), and steam (2%). The antifungal activity of the plant extracts of *Prunus persica*, *Diospyros mespiliformis*, *Ficus sur*, *Ficus sycomorus*, *Moringa oleifera*, *Ficus sansibarica* subsp. *sansibarica* and *Ximenia caffra* var. *natalensis* were investigated for the anti-dermatophytic activity against *Candida albicans*, *Trichophyton rubrum*, and *Microsporum gypseum*. The dichloromethane leaf extracts of *P. persica* and *M. oleifera* had excellent activity with Minimum Inhibitory Concentration (MIC) values ranging between 0.02 and 0.08 mg/ml against the tested fungal pathogens. The excellent activity of the aqueous extracts against *C. albicans* confirms the efficacy of traditional methods for the treatment of skin infections.

Forming, optical activity, and spectrophotometric techniques

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Abstract: Saponins are bioactive glycosides widely distributed in plants and known for their pharmacological properties. This study evaluated the effects of extraction solvent and analytical method on saponin determination using a two-way analysis of variance (ANOVA) with replication. Three analytical methods, namely foam-forming, optical activity, and spectrophotometric methods, were applied across multiple solvent extracts. The results revealed that both extraction solvent and analytical method significantly influenced saponin quantification ($p < 0.001$). Furthermore, a significant interaction effect ($p < 0.001$) indicated that analytical method performance varied with the solvent used. Post hoc analysis showed that the spectrophotometric method consistently yielded higher values than the other methods. These findings highlight the importance of selecting appropriate analytical techniques in phytochemical studies to ensure accurate quantification.

Targeting apoptosis using methanolic extracts of *Carpobrotus edulis* in suppressing pancreatic cancer cell growth

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Abstract: Pancreatic cancer remains a formidable global health challenge, characterised by low survival rates, with 510,992 cases and 467,409 deaths reported in 2022. Current cancer treatments, such as chemotherapy, radiotherapy, and surgery, are expensive and limited, primarily by their inability to differentiate between cancerous and non-cancerous cells. Consequently, investigating alternative anticancer treatments, such as medicinal plants, is crucial. This study aimed to investigate the potential anticancer properties of a crude methanolic extract of *Carpobrotus edulis* by targeting apoptotic machinery in pancreatic cancer cells (MIA PaCa2). Multiple assays, including Alamar blue, ATP, Hoechst staining, Caspase 3/7 activity, DNA fragmentation, and RT-qPCR, were conducted to assess apoptosis induction. The crude extract significantly reduced MIA PaCa2 cell viability, with an IC₅₀ of 85.44 µM, demonstrating high selectivity (selectivity index of 3.65) towards the pancreatic cancer cell line, suggesting that the crude methanol extract did not affect the MRC-5 non-cancerous cell line. Mechanistic investigations confirmed that the crude extract activated both the extrinsic and the intrinsic apoptotic pathways, evidenced by a significant increase in TNF and Bak1 expression, which led to increased caspase 3/7 activity, ultimately resulting in DNA and nuclear fragmentation, chromatin condensation, and the formation of apoptotic bodies. The downregulation of STAT3 further suggested that cell growth was inhibited. In conclusion, the crude methanol extract demonstrated promising proapoptotic properties through activating the extrinsic and intrinsic mediated apoptotic pathways. Future research will focus on isolating and purifying compounds from *Carpobrotus edulis*.

Laboratory-based therapeutic-potency measuring of *Medicago sativa*

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Abstract: Access to curative drugs and health essentials during war times is usually gravely disrupted, resulting in increased preventable morbidity and mortality. The indigenous use of plant-based medicines remains the only reliable option during military conflicts that prevent consistent courier of essentials, and thus laboratory testing of ethnobotanic materials for use as medicine is critical and urgent. *Medicago sativa* (alfalfa/lucerne) is an ancient boon of therapeutic, war, agricultural, and environmental importance. The traditional pharmacologists/medicine-man/woman or herbalists of times past assembled a library of plants and other natural materials of healing importance, and therapeutic testing permits us to account for the observed experimental/ethnobotanic remedial bioactivities and to explore other potential uses they may possess. The phytochemical content was confirmed using GC-MS and LC-MS, while phenolic content was measured using the reliable Folin-Ciocalteu-reagent assay. The therapeutic potential/activity of *Medicago sativa* was measured using the reliable Sulforhodamine B Assay, Broth Micro-Dilution Assay, the colorimetric Microplate Alamar Blue Assay (MABA), the 3,4,5-dimethylthiazol-2-yl)-2,5-diphenyl tetrazolium bromide (MTT) assay, anti-inflammatory assay towards the macrophage cell line RAW 264.7, and the Glucose Utilization Activity using L6 muroid skeletal muscle and C3A/HEPG2 liver cells. The world health organization confirms that there are ten top causes of death in humans globally, and seven of the ten can be regarded to be promoted or worsened primarily by low-grade chronic inflammation and oxidative stress. And in the search for novel therapeutics, plants and other natural materials still hold the reins as the primary source of affordable, sustainable, and easily accessible bioactive compounds.

Perceived abundance and cultural-economic use-value of tree species in the Mopane Woodlands, Mopani District, South Africa

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Abstract: Identifying the key products of mopane woodlands, the perceived abundance of species, and the associated use values have important implications for rural communities and the sustainable use of mopane woodlands. This study examined local perceptions of tree species abundance and their associated use-values across four communities in the Mopani District, South Africa. The semi-structured questionnaire and key informant interviews were used to collect the data. The data were analysed using descriptive statistics, the Friedman test, the Smith Salience Index, Kendall's W, Pearson correlation, and the Fidelity test. There was a very strong level of agreement ($W = 0.83$) among the communities regarding the perceived abundance of tree species, and this agreement was statistically significant ($\chi^2 = 19.85, p < 0.05$). *Colophospermum mopane*, *Sclerocarya birrea*, and *Combretum imberbe* are the most perceived abundant species in the study areas and have high value. The tree species with high use-value showed a positive correlation with perceived abundance, supporting the study's ecological apparency hypothesis.

Deciphering the multi-target mechanisms of endophytic *Bacillus tropicus*-derived compounds against bacterial infections

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Abstract: Bioactive compounds from endophytic bacteria are increasingly recognised as promising agents against bacterial infections; however, their molecular mechanisms underlying their antibacterial activity remain poorly understood. This study aimed to investigate the molecular mechanisms of compounds from endophytic *Bacillus tropicus* linked to *Adansonia digitata* in the treatment of bacterial infections. Antibacterial activity of the extract was evaluated using the minimum inhibitory concentration (MIC) microdilution method, and its chemical constituents were identified by gas chromatography–mass spectrometry (GC–MS). Network pharmacology analysis, Gene Ontology (GO) and Kyoto Encyclopaedia of Genes and Genomes (KEGG) pathway enrichment analyses were performed using ShinyGO to elucidate potential mechanisms of action. The human electronic Fluorescent Pictograph (HeFP) server was utilised to predict the expression distribution of key hub genes. The compound–target interactions were evaluated using SwissDock platform. The extract had MIC values ranging from 31–250 µg/mL. GC–MS analysis identified 34 compounds, including phenol, 2,4-bis(1,1-dimethylethyl), hexadecanoic acid methyl ester and 2-pentanone, 4-hydroxy-4-methyl, which are known for their antimicrobial properties. Key hub targets included AKT1, ESR1, JAK2, PTGS2 and SYK. GO enrichment revealed 1000 biological processes, 114 cellular components, and 249 molecular functions. KEGG analysis identified 186 pathways. Molecular docking showed moderate to strong binding affinities (–5.5 to –8.01 kcal/mol). AKT1 showed relatively consistent expression across most tissues compared with ESR1, reflecting their distinct biological roles. These findings suggested that the compounds exert antibacterial effects through multi-target interactions.

Improving the propagation techniques of *Hypoxis hemerocallidea* for the commercialization of herbal remedies

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Abstract. *Hypoxis hemerocallidea* (Hypoxidaceae) is a high-value indigenous medicinal plant that is increasingly overharvested and utilised for traditional medicine and pharmaceutical applications. Despite its importance, sustainable and scalable propagation remains a major challenge, particularly for small-scale growers. This study investigated the effect of low-cost light spectra on breaking seed dormancy to improve seed germination and corm growth in *H. hemerocallidea*. The effect of three seed pre-treatments (hot water, 15 min microwave exposure, and smoke water) combined with four LED light regimes (blue, red, red + blue and control) was evaluated using a completely randomised design (CRD) experiment. Percentage germination, and mean time germination (MTG) were assessed, while corm cuttings were evaluated for vegetative development, including rooting, sprouting, number of leaves, leaf length and biomass accumulation. Both LED light and pre-treatments significantly affected seed germination, with red and blue light producing faster and higher germination than the control. The shortest MTG was achieved under blue LED light combined with hot water pre-treatment (2.86 days), followed by red light with hot water (3.34 days). For corm cuttings, red LED light significantly enhanced sprouting, leaf development, and biomass accumulation, producing the highest fresh weight (2.81 g) and dry weight (0.33 g). This study demonstrates that LED light can be used as a practical and affordable propagation strategy for *H. hemerocallidea*, offering an alternative to tissue culture for resource-limited growers. The approach has direct implications for conservation, commercial cultivation and reducing pressure on wild populations.

Ethnobotany meets ophthalmic microbiology: South African medicinal plants against ocular pathogens

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Abstract: Medicinal plants are widely used in indigenous health practices in southern Africa for the treatment of eye infections. Despite the potential ocular irritancy, traditional use extends to 137 plant species reported to treat eye disorders or infections. A review found limited scientific validation, especially against neglected ocular pathogens. This study evaluated 37 plant species for antimicrobial activity (minimum inhibitory concentrations-MIC) against nine bacterial pathogens, including *Cutibacterium acnes* (ATCC 11827), *Escherichia coli* (ATCC 8739), *Haemophilus influenzae* (ATCC 19418), *Klebsiella pneumoniae* (ATCC 13887), *Neisseria gonorrhoeae* (ATCC 43069), *Pseudomonas aeruginosa* (ATCC 27853), *Staphylococcus aureus* (ATCC 25923), *Streptococcus pneumoniae* (ATCC 41619) and *Streptococcus pyogenes* (ATCC 12344). Toxicity was evaluated using the *Artemia franciscana* brine shrimp lethality assay, followed by dose-response analysis for selected extracts. Several species, including *Helichrysum aureum*, *Helichrysum cymosum*, *Lantana camara*, *Leucosidea sericea*, *Lippia javanica*, *Plectranthus ciliatus* and *Withania somnifera* demonstrated notable antimicrobial activity against selected pathogens. The best antimicrobial efficacy was observed with the organic extract of *L. javanica* (MIC of 16 µg/mL against *S. pneumoniae*). Toxicity screening indicated that the majority of the active extracts remained non-toxic at both 24 h and 48 h, and dose-response analyses confirmed a positive safety profile across the tested concentrations. The organic extract of *L. sericea* demonstrated synergistic interactions with the standard treatment chloramphenicol when tested against *S. aureus*. The findings provide a promising direction towards natural product-based ophthalmic therapeutics.

Elemental composition, antioxidant vitamins, and LC–MS-based profiling of antioxidant phenolic compounds of selected African medicinal plants: potential roles in modulating uterine fibroid pathophysiology

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Abstract: Uterine fibroids are benign smooth muscle tumours of the uterus and a leading cause of gynaecological morbidity among women of reproductive age, particularly in Africa, where access to advanced therapies remains limited. Emerging evidence links nutritional deficiencies, oxidative stress, and chronic inflammation to fibroid pathophysiology, suggesting a role for nutrient-rich medicinal plants in disease management.

African medicinal plants are widely used in the traditional treatment of uterine fibroids; however, their elemental composition, vitamin content, and safety profiles remain poorly characterised. This study evaluated the elemental composition, antioxidant vitamins, LC–MS-based profiling of antioxidant phenolic compounds and toxicological safety of selected medicinal plants used in fibroid management.

Elemental analysis was conducted using Inductively Coupled Plasma–Optical Emission Spectroscopy, while antioxidant vitamins were analysed using UV-VIS, and phenolic compounds were analysed using LC-MS. The results revealed essential macro-elements (Ca, Mg, K, Na) and trace elements (Fe, Cr, Cu, Mn, Co, B) involved in antioxidant defence, enzymatic function, and hormonal regulation. Vitamins A, C, and E were also detected, indicating roles in modulating oxidative stress, inflammation, and hematopoiesis. LC–MS profiling revealed the presence of numerous phytochemicals with reported antioxidant activity, including luteolin, vitexin, β -glucogallin, gallic acid, eriodictyol, swartziol, and quercetin, together with several other antioxidant phenolic constituents.



Trace levels of potentially toxic elements, including arsenic, mercury, and antimony, were detected but remained within World Health Organisation permissible limits, suggesting acceptable safety under recommended use.

Overall, these findings demonstrate that the studied plants possess nutritional value and low levels of toxic elements, supporting their potential as safe, evidence-based herbal interventions for the management of uterine fibroids.

Evaluation of phytochemicals, antioxidant, antimycobacterial and anti-virulence activity of selected medicinal plants used for treatment of tuberculosis and related symptoms

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Abstract: The escalating global threat posed by multidrug-resistant tuberculosis (TB) has created an urgent need to explore alternative treatment options beyond conventional antibiotics. This study investigated the polyphenolic content and the antioxidant, antimycobacterial, and anti-virulence activities of selected medicinal plants traditionally used to treat TB and related symptoms. Total phenolics, tannins, and flavonoids were quantified using colorimetric assays. Antioxidant capacity was assessed via DPPH and ferric-reducing power assays. Antimycobacterial activity against *Mycobacterium smegmatis* was evaluated using broth micro-dilution, growth kinetics, cell constituent leakage, and respiratory chain dehydrogenase inhibition assays. Anti-virulence effects were examined using crystal violet biofilm and swarming motility assays. Among the tested plants, *Tarchonanthus camphoratus* exhibited the highest concentrations of polyphenolic compounds and, alongside *Combretum hereroense*, demonstrated strong antioxidant activity. Notably potent antimycobacterial effects (MIC = 0.16 mg/mL) were observed with extracts from *Senecio macroglossus*, *Nerium oleander*, and *Tetradenia riparia*. These extracts not only delayed the onset of exponential bacterial growth but also induced significant membrane damage and impaired metabolic processes essential for bacterial survival. In contrast, *Tabernaemontana elegans* showed the least activity, with MIC values exceeding 2.5 mg/mL. Additionally, most plant extracts reduce motility by 12–100% and effectively inhibit early-stage biofilm development. In conclusion, polyphenol-rich extracts from these selected medicinal plants exhibit promising dual antimycobacterial and anti-virulence activities against *M. smegmatis*. These findings highlight their considerable potential as valuable starting points for the future development of new, multi-target therapeutic strategies to combat drug-resistant tuberculosis.

The phytochemical composition and biological activities of *Aloe maculata* and *Bulbine latifolia* extracts

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Abstract: Medicinal plants contain chemical substances that act as precursors to produce medications and display therapeutic activity in traditional and modern medicine, including anti-inflammatory, antimicrobial, antiviral, and anticancer. *Aloe maculata* is extensively used for skin conditions, and *Bulbine latifolia* is used as a blood cleanser. The current study aims to investigate the phytochemical composition of *Aloe maculata* and *Bulbine latifolia* leaves and stems and to determine their biological activities, thereby validating their reliability in traditional medicine. *Aloe maculata* and *Bulbine latifolia* plants were collected from nurseries in Pretoria and identified by SANBI. Dried plant material (10 g) was extracted with various solvents (100 mL). Phytochemical testing and thin-layer chromatography (TLC) were done to determine the phytochemical characteristics. Antioxidant activity was tested using the 2,2-diphenyl-1-picrylhydrazyl radical scavenging method, and antibacterial activity was tested using *Escherichia coli* via the agar well diffusion technique. Lastly, a systematic review of the literature was conducted to assess the toxicity of *A. maculata* and *B. latifolia* extracts. Anthraquinones, quinones, cardenolides and alkaloids were detected in both *A. maculata* and *B. latifolia* leaf and stem extracts. *A. maculata* extracts had no antioxidant action, and *B. latifolia* had limited antioxidant capacity. Both plants exhibited antibacterial activity in different zones of inhibition (100ug/ml, 50ug/ml, 25ug/ml). In examined articles, *A. maculata* did not exhibit significant cytotoxicity; however, *B. latifolia* was shown to display cytotoxic activity. This study provides a foundation for future research at the chemical and pharmacological levels and contributes to understanding these plants as therapeutic agents.

Nutritional and functional evaluation of underutilised, wild-type *Corchorus olitorius* fruits from Limpopo: implications for dietary diversity and food safety

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Abstract: Indigenous plant species remain an underutilised yet critical resource for addressing micronutrient deficiencies and enhancing dietary diversity in South Africa. While *Corchorus olitorius* is widely consumed for its nutrient-rich leaves, its fruit remains largely unexplored despite its potential for food and nutraceutical applications. This study evaluated the nutritional composition, mineral profile, safety, and functional properties of wild-harvested *C. olitorius* fruits collected from Masia and Valdezia villages in Limpopo.

Fresh fruits were freeze-dried (-80 °C), milled, and analysed using modified AOAC methods. Mineral content was quantified using ICP-OES, and functional properties were assessed using standard protocols. Microscopy revealed a multilocular, mucilage-filled capsule structure. Upon sectioning, tissues browned rapidly, likely due to polyphenol oxidase and/or peroxidase activity. Nutritional analysis showed appreciable moisture (14%), fibre (1.3%), and soluble protein (2.5%), with high ash (10%) and fat (3.1%) content across both sites. Valdezia samples showed a richer mineral profile, although sodium, magnesium, and zinc remained relatively stable. Elevated arsenic concentrations resulted in a Hazard Risk Index exceeding safe limits (>1), while cadmium, chromium, nickel, and lead showed low HRIs (≤0.9), indicating negligible risk under the studied scenario. Functional analysis revealed high water absorption capacity (13.6–14.3 g/g) and moderate oil absorption (2.2–2.8 g/g). Swelling power increased with temperature, reaching 6.6 g/g at 90 °C, while water solubility remained low.

These findings highlight the potential of wild *C. olitorius* fruits as a locally available nutritional resource and support their inclusion in strategies to improve dietary quality and food system resilience.

A review of useful plants of KwaZulu-Natal Province, South Africa

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Abstract: A review of the useful plants of Kwa-Zulu will be presented, giving some insights into the fascinating plant-related traditions and customs of the region. The review is partly based on a rigorous quantitative ethnobotanical study of Zulu traditional plant use in the Amandawe area of KwaZulu-Natal, which yielded a treasure trove of new data. For formal interviews, a flip-file of photographic images of 310 useful plant species was presented to 37 research participants. The data were substantially enriched by informal interviews, literature records and personal experiences. Qualitative use-records were entered into an inventory, resulting in 122 new species records (25% of the total), 655 newly recorded Zulu vernacular plant names and 2691 previously undocumented use-records. The expanded inventory thus far includes a total of 1428 plant taxa, mainly indigenous (1296), followed but naturalized exotics (130) and some cultivated crop plant species (15) that have become an integral part of the Zulu culture. Useful plant species were assigned into five broad use-groups (medicinal: 1011 species; rituals: 660; crafts: 434; food: 392; veterinary: 139), which were further grouped into specific categories based on their individual uses. The Amandawe data set contributed 375 medicinal plants species, 289 charm plants [including protective charms (163), offensive charms (140), general charms (129) and other types of charms (73)], 157 food plants, 209 craft plants and 113 species used for spiritual and ritual purposes. The Amandawe study revealed how much ethnobotanical knowledge is at risk of being lost, thereby sending a message that recording of such data is a matter of urgency.

Phytochemical screening and antioxidant evaluation of *Agave angustifolia* and *Agave sisalana*

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Abstract: *Agave angustifolia* (AA) and *Agave sisalana* (AS) are traditionally used by local communities to treat skin rashes, blemishes, and other dermatological conditions. These ethnobotanical uses have been adopted by small-scale cosmetic industries, which incorporate Agave extracts into products with claimed soothing and nourishing properties. This study aimed to validate these claims by investigating the phytochemical composition and antioxidant activity of both species collected from northern KwaZulu-Natal, South Africa. Leaf extracts were obtained via gradient maceration using *n*-hexane, ethyl acetate, and methanol. Qualitative screening confirmed the presence of flavonoids, phenols, saponins, tannins, glycosides, and terpenoids in both species, with alkaloids detected only in AS. UV–Vis analysis revealed higher phenolic content in the hexane fraction of AS. Antioxidant activity, evaluated using DPPH and FRAP assays, was highest in methanolic extracts, while hexane fractions showed the lowest activity. The ethyl acetate fraction of AS demonstrated stronger antioxidant capacity than AA, whereas AA exhibited relatively higher radical scavenging activity in the hexane fraction. The presence of phenolic and polyphenolic compounds supports the antioxidant, anti-inflammatory, anti-ageing, and antimicrobial potential of these extracts. For cosmetic applications, methanolic extracts are recommended for incorporation into anti-ageing serums, antioxidant creams, and repair formulations targeting oxidative stress. Ethyl acetate fractions, particularly from *A. sisalana*, show promise in brightening and protective formulations, while hexane extracts may be suitable for emollient-rich products such as moisturisers and barrier creams. Overall, these findings validate the traditional use of *Agave* species and highlight their potential as multifunctional bioactive ingredients in natural cosmetic formulations.

Environmental influence on the metabolomic profile of *Agathosma betulina*

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Abstract: *Agathosma betulina* (round-leaf buchu) belonging to the Rutaceae family, is an evergreen perennial shrub endemic to South Africa's Cape Floristic Region. Buchu has been used in traditional medicine by the Khoi-San people to treat various ailments. The aromatic leaves are prepared as infusions to relieve urinary tract infections, stomach ailments, colds, and fever, while crushed leaves are applied externally for wounds. Although biological activities of buchu have been reported, limited studies have compared the accumulation of phytochemicals across different growing environments, which may influence the medicinal efficacy of the plant. The aim of this study was to perform phytochemical profiling of *A. betulina* from three growing environments and assess semi-qualitative variation using chemometrics approach. Aqueous methanolic extracts (80%) were prepared from leaf samples collected from nine plants across three environments. Chemical profiling was conducted using ultra-performance liquid chromatography coupled with quadrupole time-of-flight mass spectrometry (UPLC-QTOF-MS). Twelve compounds were tentatively identified, including chlorogenic acid, salvigenin, 4-hydroxystyrene, verbasoside, rutin, euxanthone, syringic acid, naringin, hesperidin, diosmin, epi-12-palmatoside G, and wharangin. Chemometric analysis of the UPLC-QTOF-MS data revealed clear variation in metabolite composition among the growing environments. Wild and open-field cultivated populations showed similar phytochemical diversity, whereas glasshouse-grown plants exhibited reduced chemical richness. These findings suggest that environmental stress factors play a key role in stimulating flavonoid biosynthesis and shaping the overall phytochemical profile of *A. betulina*. This study provides valuable insight into the environmental influence on the phytochemistry of buchu and highlights its implications for medicinal, pharmacological, and agricultural applications.

In vivo* comparative evaluation of the anxiolytic activity of selected non-native plant species and *Mesembryanthemum tortuosum

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Abstract: Anxiety is a normal emotional response to stressful or unusual situations. However, it can become problematic when it is persistent and excessive, leading to compromised mental and physical health. Indigenous medicinal plants have played a central role in phytomedicinal research and the discovery of novel therapies for central nervous system (CNS) disorders. Still, the growing use of non-native medicinal plant species in local health practices calls for their evaluation alongside well-established indigenous herbal remedies. This study evaluated the anxiolytic effects of three non-native species (*Matricaria recutita*, *Rhodiola rosea*, and *Valeriana officinalis*) compared to the indigenous South African *Mesembryanthemum tortuosum*, using a zebrafish larval model. Commercial herbal products of the four plant species were procured and extracted using methanol and water. Zebrafish larvae at 5 days post-fertilization were exposed to the treatments, and anxiety-like behaviour was assessed by monitoring reverse thigmotaxis using the light-dark transition assay. The results indicate that all the tested treatments, except the methanol extract of *M. recutita*, exhibited significant anxiolytic activity ($p < 0.05$). *Valeriana officinalis* exhibited greater overall efficacy across all tested preparations. Hydroxyvalerenic acid and valerenic acid, two compounds associated with *V. officinalis*, were also evaluated for anxiolytic activity. Hydroxyvalerenic acid demonstrated significant anxiolytic activity at 250 μM ($p < 0.0001$) and valerenic acid at 5 and 10 μM ($p < 0.05$). This study highlights the importance of using well-established indigenous plant species as benchmarks while advancing the scientific investigation of non-native plant species in CNS drug discovery.

The ethnobotany and chemistry of *Dolichotheix ericoides* (Asteraceae)

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Abstract: *Dolichotheix ericoides* (Asteraceae, Gnaphalieae, *Stoebe* clade) is a monotypic, ericoid shrub endemic to the Cape Floristic Region of South Africa. The species has been reported to be used in traditional Cape Herbal Medicine for treating stomach complaints, colds, and pain, yet no phytochemical data have hitherto been reported. Our aim was to explore the chemistry of *D. ericoides* for the first time, including both volatile and non-volatile constituents of the aerial parts. UPLC-MS profiling of a methanol extract revealed a rich phenolic profile, with major metabolites including quinic and citric acids, piscidic and feruloylhexaric acid derivatives, caffeoylquinic acids, chlorogenic acid; 1,4- and 3,4-dicaffeoylquinic acids; and tricaffeoylquinic acid, flavonol glycosides and methoxylated flavonols: myricetin-*O*-hexoside, kaempferol-7-*O*-galactoside, 6-methoxyquercetin-3'-*O*-glucoside, limocitrin, isorhamnetin, and a peonidin-glucoside-pyruvic acid adduct. This profile shows clear alignment with the typical chemical profiles thus far known for the *Stoebe* clade, namely the accumulation of caffeoylquinic acid conjugates and highly methoxylated flavonoids, providing the first chemical evidence linking *Dolichotheix* to the clade. Hydrodistilled essential oil from the aerial parts was analysed by GC-MS. In contrast to the monoterpene-rich oils typical of many taxa of the *Stoebe* clade, the volatile fraction of *D. ericoides* is dominated by long-chain n-alkanes (eicosane, docosane, pentacosane) and free fatty acids (tetradecanoic, hexadecanoic, oleic, and linoleic acids) together with their butyl esters; the labdane diterpene manool represents the only major terpenoid constituent. These findings establish the first phytochemical fingerprint of *D. ericoides*, anchor its chemistry within the *Stoebe* clade, and offer a molecular framework for its traditional medicinal uses. Further work is in progress to isolate diterpenoid lactones.

Antifungal potential of some plant extracts against *Candida albicans*

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Abstract: Oral candidiasis is a fungal infection that mostly infects people with a weakened immune system and healthy individuals. The study aimed to investigate the medicinal plants used for the treatment of oral candidiasis in Mopani District, Limpopo Province, South Africa. Five plant species (*Ziziphus mucronata*, *Kleinia longiflora*, *Entada elephantina*, *Dichrostachys cinerea*, and *Peltophorum africanum*) used for the treatment of oral candidiasis were selected from the Ethnomedicinal Plants database of over 300 traditional plants used for medicinal purposes in the Vhembe district, Limpopo province. The plant materials were extracted with water, acetone, dichloromethane, methanol, and hexane. Methanol extracted the highest quantity (9.67%) of plant materials, followed by dichloromethane (2.33%) and acetone (0.33%). The anti-candidal activity of the plant extracts was investigated using microdilution and bioautography assays. The methanol leaf extracts demonstrated good activity against the tested fungal pathogen, with MIC values of 0.1 mg/mL and 0.39 mg/mL, respectively. In the bioautography assay, antifungal compounds with R_f values of 0.93 and 0.77 were observed in acetone, dichloromethane, and methanol extracts of *Z. mucronata*. The results support the use of these plants by the traditional health practitioners and the local people for the treatment of oral candidiasis.

Exploring the anticancer and anti-metastatic potential of *Nerium oleander* plant extracts against cervical cancer cell lines ME-180

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Abstract: Cervical cancer is the fourth most frequently diagnosed cancer among women worldwide. In 2022, approximately 660,000 new cases and 350,000 deaths were reported globally, with over 90% of fatalities in low- and middle-income countries. Conventional cervical cancer treatments, such as surgery, chemotherapy, and radiotherapy, are limited by severe side effects, high costs, recurrence, and resistance, restricting access for many patients. Given these constraints, medicinal plants have emerged as promising sources of chemoprotective phytochemicals for cancer therapy. This study aimed to investigate the anticancer and antimetastatic potential of *Nerium oleander* against cervical cancer cell lines. Cytotoxic activity was assessed using the Alamar Blue assay. *Nerium oleander* extracts (acetone, methanol, ethyl acetate, and chloroform) showed IC₅₀ values of 42.56 µg/mL, 29.43 µg/mL, 36.12 µg/mL, and 90.62 µg/mL, respectively, indicating cytotoxicity. A light microscope was used to observe morphological changes. Treated cells displayed cytotoxic and apoptotic effects, along with a notable loss of normal morphology, including cell shrinkage and detachment, compared with untreated controls. An *in vitro* wound-healing assay was used to evaluate antimetastatic activity. All extracts significantly inhibited cell migration, preventing wound closure compared to untreated cells. The Caspase-Glo® 3/7 assay was used to confirm apoptosis induction at IC₅₀ values, showing low caspase activity in untreated and the highest activation in methanol extracts, followed by acetone and moderate effects from ethyl acetate and chloroform extracts. Future research includes ATP quantification, DNA fragmentation, Western blotting, Annexin V/PI staining, and RT-PCR-based gene expression profiling to fully elucidate the mechanisms underlying apoptosis and antimetastasis.

Computational metabolomics identifies flavonoids as chemotaxonomic markers of *Plectranthus hadiensis* and *P. ambiguus* leaf tissues

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Abstract: *Plectranthus ambiguus* (known as *iBoza elincane* in isiZulu) and *Plectranthus hadiensis* (known as *iLozane* in isiXhosa) have garnered interest in their pharmacological potential and use as traditional medicine in South Africa. However, prior phytochemical studies have largely focused on classical screening methods targeting abietane diterpenoids (terpenoids), a chemical class well known for characterising these species. Thus, a comprehensive metabolomics-based approach is reported herein to investigate and compare the broader metabolite profiles of *P. hadiensis* and *P. ambiguus*, beyond diterpenoids. This untargeted, computational metabolomics study integrated machine learning models with feature-based molecular networking, MS2query, and MS2LDA to analyse leaf extracts from both species. As expected, prenol lipids (i.e., diterpenoids) were detected and identified as one of the major chemical classes that differentiate the two plants. However, this trend was extended to the flavonoid chemical class. Across both leaf tissues of *P. ambiguus* and *P. hadiensis*, flavonoids were detected at varying distributions, where glycosylated flavones were more abundant in *P. hadiensis* while glycosylated flavanols and methylated flavones were found in higher levels in *P. ambiguus*. To the best of our knowledge, this is the first study to apply such an integrated computational metabolomics framework in the chemical profiling of *P. ambiguus* and *P. hadiensis*, offering novel insights into their phytochemical relationships and species-specific chemical signatures. This comparative analysis bridges indigenous knowledge with modern analytical science, expanding the current understanding of *Plectranthus* phytochemistry beyond classical diterpenoid profiling.

Antimycobacterial potential of South African propolis: antibiofilm, quorum-sensing inhibition and antibiotic interaction studies

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Abstract: In our earlier studies, selected South African propolis samples displayed noteworthy antimycobacterial activity. Subsequent studies explored additional antimicrobial mechanisms, including antibiofilm and anti-quorum-sensing activities. Antibiofilm activity was evaluated using crystal violet, resazurin, and tetrazolium assays. Propolis exhibited concentration-dependent antibiofilm effects, with biomass inhibition and eradication exceeding 60% at 195–391 µg/ml and metabolic activity reduced by 80–89%. Furthermore, propolis samples inhibited violacein production at concentrations of 50–200 µg/ml in *Chromobacterium violaceum*. Chemical analysis identified pinocembrin and galangin as key constituents present in antimycobacterially active propolis samples. Building on these findings, this study investigated the antimycobacterial activity of the bioactive flavonoids and evaluated the interaction between propolis and antimycobacterial antibiotics. Minimum inhibitory concentrations (MICs) of pinocembrin and galangin were determined against *Mycobacterium smegmatis* (ATCC 14468) and *Mycobacterium fortuitum* (ATCC 6841). Pinocembrin and galangin exhibited MICs of 78.13 µg/mL and 156 µg/mL, respectively, against both strains. The interactive efficacy of propolis, pinocembrin, or galangin in combination with rifampicin, isoniazid, and ethambutol was evaluated against *M. smegmatis*, *M. fortuitum*, and *M. tuberculosis* H37Rv using the fractional inhibitory concentration index (ΣFIC). Seven of eight propolis samples, which previously showed noteworthy antimycobacterial activity, demonstrated synergistic interactions with rifampicin against both non-tuberculous mycobacterial species, while interactions against *M. tuberculosis* were indifferent. Ethambutol combinations produced predominantly synergistic effects against *M. fortuitum* and additive effects against *M. smegmatis*. Therefore, South African propolis has the potential to enhance antibiotic efficacy, disrupt biofilm formation and quorum-sensing-mediated bacterial communication against mycobacterial species.

Phytochemical composition and antioxidant activity of *Eichhornia crassipes*: implications for dermo-cosmetic use

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Abstract: *Eichhornia crassipes* (water hyacinth) is a highly invasive aquatic species that poses significant ecological threats to freshwater systems; however, its rich phytochemical composition presents an opportunity for value-added applications. This study investigated the phytochemical profile and antioxidant potential of *E. crassipes*, with specific emphasis on its suitability for dermo-cosmetic applications. Whole plants were harvested from natural freshwater bodies, cleaned, and separated prior to extraction. Gas Chromatography–Mass Spectrometry (GC–MS) analysis identified 125 bioactive compounds across plant parts, including ethanol, 2-butoxy- (up to 65.23%), n-hexadecanoic acid (5.76%), D-limonene (10.99%), stigmasterol (1.73%), and 9,12,15-octadecatrienoic acid methyl ester (4.29%), many of which are associated with antioxidant, anti-inflammatory, and skin-beneficial properties. Antioxidant activity was evaluated using the DPPH radical scavenging and Ferric Reducing Antioxidant Power (FRAP) assays, revealing part-specific activity, with root extracts exhibiting the strongest effects (DPPH EC₅₀ = 1.47 µg/mL; FRAP EC₅₀ = 2.81 µg/mL). These findings demonstrate that *E. crassipes* is a promising, sustainable source of bioactive compounds with potential application in dermo-cosmetic formulations. Valorisation of this invasive species may contribute to environmentally responsible management strategies while supporting the development of plant-based cosmetic ingredients. Further in vivo validation and formulation studies are warranted to confirm efficacy and safety.

Antioxidant compounds derived from African medicinal plants: the interplay of sustainability, maceration efficacy, and societal impact

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Abstract: Medicinal plants are an important source of active ingredients used in most therapeutic products that are important for human and animal health. These products have long been used to sustain human life, and this knowledge has been passed down through generations. However, factors like overharvesting, climate change, overgrazing, and monocropping threaten the sustainability of most indigenous plants. Research into the solvents that yield the highest levels of active compounds from plant parts is necessary as an alternative to bulk harvesting. A literature review indicated that maceration with methanol, hot or cold water, ethanol, and, to a lesser extent, acetone is a common method for extracting antioxidant compounds from African medicinal plants. The selection of the extraction method, ideal temperature, extraction duration, solvent pH, and plant parts to be extracted was highlighted as important as the choice of extraction solvent. Studies have also reported the fermentation of aqueous extracts to enhance antioxidant activity in certain plant species. This is particularly essential in continents such as Africa, where water is the second most used solvent for research. The availability of medicinal plants is also reported to be gradually declining in their native ecosystems, highlighting the need to improve research targeting the sustainability of endangered or critically endangered species. Further studies on the cultivation and extraction accuracy of phytochemicals from African medicinal plants are recommended to guide the research and link it to ordinary African societies while embedding policies that emphasize practices that result in a low ecological footprint.

Trade and cultivation of *Phoenix reclinata* in the Eastern Cape

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Abstract: Commercial use of indigenous plants is seen as a way to support rural development and cultural conservation, yet its impact is hindered by limited product development and market integration. The study assesses trade in *Phoenix reclinata* products in the Eastern Cape, South Africa, highlighting livelihood benefits, market interactions, and constraints. Eleven traders from four villages were interviewed using a structured format to obtain data on demographic profiles, harvesting techniques, income, trade challenges and attitudes towards cultivation. Results indicate that the sale of *P. reclinata* products provides some income, albeit limited relative to household needs. The trade provides mainly supplementary income alongside social grants for most participants, whereas only a few consider it their principal livelihood. Despite local use and cultural importance, the trade faces challenges in terms of labour intensity and market reach. Despite such limitations, the adoption of *P. reclinata* cultivation remains limited. Traders' limited willingness to cultivate the species stemmed from cultural beliefs, safety concerns, and the notion that the species grows naturally and does not require human intervention. This indicates that the limitations to cultivation arise as much from socio-cultural norms and livelihood factors as from technical constraints. The findings identify a mismatch between the economic opportunities associated with *P. reclinata* and its existing use, highlighting the need for coordinated interventions focused on market and value chain development, diversification and culturally appropriate cultivation strategies.

Elucidating stress adaptation mechanisms and phytochemical production in *Pelargonium sidoides* under varying irrigation levels

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Abstract: *Pelargonium sidoides*, commonly known as African or South African geranium, is a native rhizomatous plant indigenous to South Africa, Lesotho, and Eswatini. It is characterized by its maroon flowers and red-rooted rhizomes. Traditionally, it has been widely utilised for its medicinal properties in the treatment of respiratory ailments such as bronchitis, the common cold, and tuberculosis, as well as for the management of gastrointestinal conditions. The therapeutic potential of *P. sidoides* is largely attributed to its rich phytochemical composition, including coumarins, phenolic compounds, and flavonoids, which exhibit antiviral, antifungal, antibacterial, and immunomodulatory activities. The increasing demand for this plant in the pharmaceutical and herbal industries has led to excessive harvesting of wild populations, posing a serious threat to its sustainability. In addition, water scarcity remains a significant challenge for its cultivation and productivity, despite its natural tolerance to dry conditions. As such, effective irrigation strategies are essential to ensure sustainable production and optimal plant growth. This study aims to evaluate the effects of varying levels of water depletion and harvest times on stress-response mechanisms and phytochemical production in *P. sidoides* roots and leaves. The study will examine the morpho-physiological traits, biochemical characteristics, and chemical composition under controlled irrigation and harvesting times. Currently in its preliminary stage, this project outlines the proposed methodology and objectives, providing a foundation for advancing sustainable cultivation practices for this valuable medicinal plant.

The impact of geographical location and extraction techniques on the chemical profile of essential oils from *Perlargonium* cv. rosé in the Eastern Cape

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Abstract: Plants belonging to the Geraniaceae family are well-known for their aromatic and medicinal properties. It grows well at a temperature range of 10°C-33°C, and the favourable rainfall for dryland growing of rose geranium should range from (700-1500) mm. The high economic value of these plants is due to their secondary metabolites, especially the essential oil of their foliage, a complex mixture of volatile phytochemicals, including terpenes, esters, aldehydes, alcohols, ketones, and phenols. The main phytoconstituents of the essential oil belong to the terpenoid group of metabolites, such as monoterpenes, sesquiterpenes, diterpenes, and their esters. Of these, geraniol, linalool, citronellol, and their esters (50–70%) generally constitute a major portion of the essential oil, responsible for its fragrance. The quality of the oil is determined by the balance of these, not the quantity. Essential oils are biosynthesised in specialised tissues known as glandular trichomes, which are present in leaves, green branches, and fresh flowers. Geraniaceae family plants have been highly useful in perfumery, cosmetics, aromatherapy, pharmaceuticals, and the food industry. Several pharmacological properties, such as antifungal, anti-inflammatory, anticancerous, antidepressant, antibacterial, antioxidant, and antiseptic, are attributed to geranium oil.

Secondary metabolites found in *Erythrina abyssinica* induce apoptosis in ME-180 cervical and A375 melanoma cancer cells

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Abstract: Cancer continues to present a significant global burden, with cervical cancer being the fourth most common cancer in women and accounting for approximately 350,000 deaths worldwide in 2022, while melanoma ranked seventeenth with around 58,667 fatalities in the same year. The urgency to address this burden is heightened by the limitations of current cancer treatments, which are often non-specific, toxic to healthy cells, and have issues of resistance and metastasis. Therefore, there is a need for effective, bio-friendly, and affordable alternative treatments. Medicinal plants like *Erythrina abyssinica* offer promising sources of anticancer agents, having been utilised for decades for various illnesses. This study aimed to evaluate the cytotoxic effects of secondary metabolites from *E. abyssinica* on cervical and melanoma cancer cells and to explore the underlying mechanisms of action. The isolated compounds, 5-methoxyjamaicin and derrone, demonstrated cytotoxicity against ME-180 cervical and A375 melanoma cells, but not against HEK293 normal cells. This cytotoxicity correlated with increased caspase activity and decreased ATP levels in the cancer cells. Morphological characteristics of apoptosis included cell shrinkage, chromatin condensation, disruption of epithelial morphology, nuclear fragmentation, and loss of cell-to-cell interactions. The compounds have the potential to activate the intrinsic apoptotic pathway, thereby inducing cell death. These findings suggest that 5-methoxyjamaicin and derrone could serve as an alternative treatment for cancer, selectively targeting cancerous cells over normal cells. However, further research is necessary to elucidate additional molecular, cellular, and physiological pathways influenced by these compounds.

The contribution of indigenous plants to rural livelihoods in the Wild Coast, Eastern Cape, South Africa

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Abstract: The use of indigenous plant resources for cultural observation is part of the traditions of local and indigenous communities in South Africa. In the Eastern Cape, rural livelihoods are closely intertwined with the use of indigenous plants. While the Sustainable Livelihood Framework (SLF) predominantly focuses on five capital types, emerging research has expanded the SLF to include cultural capital. In this study, we explore the contribution of cultural capital, specifically indigenous plant use, indigenous plant knowledge and cultural skills, to rural livelihoods in the Wild Coast. Using a mixed-methods approach, the study identified 313 cultural objects, with a significant reliance on wild-harvested indigenous plants for household items and cultural materials. Findings reveal a gendered system of plant-based innovation in which women use plant fibres to craft essential household items, such as mats and baskets, whilst men craft infrastructure, such as kraals, fences, and thatch roofs. Through the integration of indigenous knowledge with community-based tourism, innovative solutions emerged, resulting in food provision, income generation, social cohesion and spiritual well-being. Findings from this study suggest that recognising indigenous knowledge and skills as a form of capital offers a culturally aligned pathway to improve rural livelihoods in the Eastern Cape.

Anti-epileptic effects and safety profiling of *Hypoxis hemerocallidea* in a zebrafish larvae model

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Abstract: *Hypoxis hemerocallidea* is an indigenous South African medicinal plant, commonly referred to as African potato, 'umuthi womfula' (IsiNdebele), 'gifbol' (Afrikaans), or 'lotsane' (Southern Sotho). The rootstock (corm) of *H. hemerocallidea* is used by various cultures in southern Africa for conditions such as epileptic seizures, heart disease and infertility. There are gaps in literature regarding the anti-epileptic activity of *H. hemerocallidea*, resulting in limited scientific evidence to support its traditional use. This study proposes zebrafish larvae as an ideal animal model for investigating the anti-epileptic activity and toxicity profile of *H. hemerocallidea*. The corms of five *H. hemerocallidea* plants were collected and extracted using methanol, water and methanol-water (1:1, v/v). The chemical profiles of the extracts were determined using ultra-performance liquid chromatography coupled to mass spectrometry (UPLC-MS). Safe concentrations of the crude extracts and pure compounds were determined, and the anti-epileptic activity was assessed using the pentylenetetrazole (PTZ) assay. *Hypoxis hemerocallidea* extracts showed high chemical similarity, with hypoxoside and dehydroxyhypoxoside identified as the predominant compounds. Methanol and methanol-water extracts significantly reduced epileptic seizure activity at 50 and 100 µg/mL (activity < 5000 mm) compared to the negative control 1% DMSO (7800 mm). In contrast, the water extract showed a moderate effect only at the highest concentration tested (400 µg/mL; 6000 mm). Hypoxoside (2 327.08 mm) was highly active with activity comparable to the positive control, valproic acid (2 903.07 mm). The zebrafish embryotoxicity test showed that *H. hemerocallidea* extracts are relatively safe at low concentrations.

Ethnobotanical practices and conservation of *Stangeria eriopus* in South Africa

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Abstract: *Stangeria eriopus* is a culturally important cycad species that faces intense harvesting pressure in the wild, driven by its use in traditional healing. Semi-structured interviews with 36 plant users, harvesters, and traders across KwaZulu-Natal, Eastern Cape, and Gauteng were conducted to explore ethnobotanical practices and community perspectives, to help inform culturally appropriate conservation strategies for the species. Key findings indicated that the *S. eriopus* lignotuber is the primary part harvested and used in traditional medicine and cultural rituals. Non-commercial harvesters often employ a *stem-halving* harvesting technique, whilst commercial harvesters reported whole-plant extraction. Despite participants noting declines in local populations alongside increasing harvesting pressure in recent years, 62% believed that *S. eriopus* will persist in the wild. Participants mentioned various common alternative plants used in place of *S. eriopus* when it is unavailable. Participants showed a strong preference for wild *S. eriopus* plants over cultivated ones, citing their accessibility and greater potency. Despite >50% of participants being aware of conservation laws for *S. eriopus*, compliance was minimal. Many continue to harvest or trade *S. eriopus* illegally as a livelihood and cultural necessity, viewing conservation laws as impractical. These findings highlight significant challenges in balancing cultural beliefs, livelihoods and conservation of *S. eriopus*, emphasising the need for management strategies that engage local practitioners and address the socio-economic drivers of resource use.

Effect of replacing lucerne hay with *Seriphium plumosum* meal on live weight gain, meat quality and sensory attributes of Nguni steers

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Abstract: Indigenous woody plants, which are often rich in crude protein and widely available in rangeland systems, may serve as alternative feed resources for livestock, particularly during periods of feed scarcity. *Seriphium plumosum* has been found to be nutritionally superior to grasses at certain times of the year, and its strategic integration as supplementary feed for ruminants may help close the feed gap during drought or the dry season. This study evaluated the potential of *Seriphium plumosum* meal in replacing lucerne hay on growth performance, meat quality and sensory attributes of Nguni steers. Twenty-eight Nguni steers were individually housed and assigned to four dietary treatments containing *S. plumosum* meal at inclusion levels of 0%, 10%, 20%, and 30% over a 111-day experimental period. The study followed a completely randomised design with seven replicates per treatment. Live weight gain was measured fortnightly. Meat colour was measured using Minolta Chroma meter (Model CR200, Osaka, Japan), water-holding capacity was determined, while Warner–Bratzler shear force was evaluated by cutting three steaks (25 cm thick, load cell 2000) at an internal diameter of 1.27 cm on the 10th rib, total cooking loss was calculated as the % difference in weight of the cooked and raw meat. The dietary inclusion of *S. plumosum* had no significant effect ($P > 0.05$) on live weight gain, meat colour, tenderness, or cooking loss. This suggests that moderate levels of condensed tannins in *S. plumosum* supported rumen microbial balance and efficient nutrient utilisation without compromising growth performance or meat quality.

From traditional use to targeted discovery: unlocking antimicrobial chemistry in southern African medicinal plants

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Abstract: The increasing prevalence of antimicrobial resistance creates an urgent need for new antimicrobial agents. Southern African medicinal plants represent a valuable yet underexplored source of chemically diverse bioactive compounds. This study investigated Cape aloe (*Aloe ferox*), golden sage (*Salvia aurea*) and wild garlic (*Tulbaghia violacea*) using an integrated metabolomic and bioactivity-guided approach to identify promising antimicrobial extracts, combinations and compounds.

Extracts prepared (using freeze- and sun-drying) from different plant parts were chemically profiled using liquid chromatography–mass spectrometry (LC–MS). Their antimicrobial activity was evaluated against selected ESKAPEE bacterial pathogens and the fungi *Candida albicans* using broth microdilution assays. Selected extracts were subsequently assessed separately and in combination to investigate potential synergistic interactions. Thin-layer chromatography (TLC) and TLC bioautography were used to separate extract components and localise antimicrobial activity. Distinct bioactive bands were detected and prioritised for further purification through preparative TLC and bioactivity-guided isolation. By integrating LC–MS profiling, antimicrobial screening and chromatographic localisation, this workflow reduces the complexity of crude extracts and directs isolation towards the compounds most likely to contribute to activity. Future work will include purification and isolation of single compounds. The study provides a foundation for developing standardised plant-derived antimicrobial preparations or lead compounds, supporting the translation of southern African medicinal plant knowledge into scientifically validated innovations.

Chemical diversity in the tribe Teedieae (Scrophulariaceae)

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Abstract: The tribe Teedieae (Scrophulariaceae) is a small but phylogenetically informative lineage of southern African shrubs and subshrubs, currently comprising the genera *Dermatobotrys*, *Freylinia*, *Phygelius*, *Oftia* and *Teedia*, together with the Madagascan endemic *Ranopisoa*. Recent molecular and palynological studies indicate that Teedieae represent an early-branching lineage within the crown group of Scrophulariaceae. Scrophulariaceae are particularly well known for the widespread occurrence of iridoid compounds, a dominant class of secondary metabolites, making the Teedieae an important group for investigating the chemical diversity and evolutionary patterns of secondary metabolites. The aim of this study was to investigate, for the first time, the chemistry of the southern African tribe Teedieae. Chemical diversity within the tribe was assessed using LC–MS–based metabolomic profiling of seven representative species: *Oftia africana*, *O. glabra*, *O. revoluta*, *Freylinia tropica*, *F. lanceolata*, *Teedia lucida* and *Phygelius capensis*, to identify potential diagnostic differences in their secondary metabolite patterns. Methanolic extracts of the seven species were analysed using LC-MS to evaluate quantitative and potential qualitative differences in metabolite composition in a negative-ion mode. Several compounds were tentatively identified through UHPLC–MS analysis, including gluconic acid, saccatoside, 6-O-(4-hydroxybenzoyl) ajugol, premnacorymboside B, verbascoside, buddlejiaside A, scrophuloside A8, ligutroside, periclymenosidic acid and harpagoside. Shared compounds detected in the species included saccatoside, premnacorymboside B and several unknown compounds, indicating a conserved core phytochemical composition within the tribe.

When plants fight back: antifungal metabolites from South African *Pelargonium* species

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Abstract: Fungal infections remain a major global health concern, particularly in immunocompromised individuals, with increasing resistance to antifungal agents highlighting the need for novel therapeutics with alternative mechanisms of action. This study aimed to evaluate the antifungal potential of four *Pelargonium* species (*P. elongatum*, *P. quercifolium*, *P. ribifolium*, and *P. odoratissimum*) endemic to the Greater Cape Floristic Region and to characterise their metabolomic profiles in relation to observed bioactivity using Liquid Chromatography-Mass Spectrometry (LC-MS)- based metabolomics. Leaf extracts were prepared in acetone, methanol, acetonitrile, and hydro-methanol containing 1% formic acid, and screened for antifungal activity against *Cryptococcus neoformans* using a minimum inhibitory concentration (MIC) assay. Interestingly, *P. elongatum* acetone extracts showed the strongest activity (3.125 mg/mL), while the other extracts showed an overall growth inhibition range of 3.125 to 6.25 mg/mL. To further understand the chemical basis of this activity, LC-MS-based metabolite profiling combined with feature-based molecular networking (FBMN) revealed that flavonoids and phenolic acids were the most prominent metabolite groups. Coumarins, organic acids, and phospholipids were also detected. Notably, two of the most active species have not previously been extensively metabolically profiled. Principal component analysis (PCA) explained 73.1% of the variance, suggesting partial overlap among species and stronger species-specific chemical differentiation. Lastly, in-silico molecular docking further indicated potential interactions between identified metabolites and the fungal enzyme fructose-1,6-bisphosphate aldolase (FBA II), which plays a key role in the glycolysis and the gluconeogenesis pathways. Overall, the *Pelargonium* species represent promising sources of antifungal metabolites for future investigation.

Phytochemical profiling, antioxidant activity, and mitochondrial-dependent apoptosis induced by *Ricinus communis* extracts in human promyelocytic leukaemia (HL-60) cells

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Abstract: *Ricinus communis* is traditionally used for medicinal applications; however, linking its phytochemical makeup to mechanism-based anticancer effects remains underexplored. This study investigated the secondary metabolite profile, antioxidant potential, and mitochondrial-dependent apoptosis induced by *R. communis* extracts on HL-60 cells. Sequential extraction with solvents of increasing polarity was performed, and GC-MS analysis characterised the phytochemical composition. Antioxidant activity was evaluated using DPPH and FRAP assays. Methanolic extracts with diverse phytoconstituents were selected for in vitro evaluation. GC-MS revealed organ-specific secondary metabolites, with N-hexane extracts dominated by ethanol, 2-butoxy-; methanol extracts enriched in o-xylene; and flowers containing 1,3-benzenediamine derivatives and betulin. All extracts displayed significant antioxidant activity, with leaf extracts demonstrating the strongest effect (DPPH IC₅₀ = 1.21 µg/mL; FRAP IC₅₀ = 5.06 µg/mL), followed by flower extracts (DPPH IC₅₀ = 1.77 µg/mL; FRAP IC₅₀ = 61.73 µg/mL) and root extracts (DPPH IC₅₀ = 10.18 µg/mL; FRAP IC₅₀ = 313.03 µg/mL). Despite pronounced antioxidant capacity, anti-leukaemia activity was limited. Morphological analysis at 24 h revealed no significant apoptotic changes. WST-1 assays showed consistently high cell viability (~98–100%) across 20–100 µg/mL, with no IC₅₀ achieved. JC-1 analysis demonstrated preserved mitochondrial membrane potential, with red/green fluorescence ratios comparable to control cells, indicating no intrinsic apoptotic activation. These findings suggest that although *R. communis* exhibits strong antioxidant properties, mitochondrial-mediated apoptosis in HL-60 cells is not significantly induced under the tested conditions. The study contributes to the pharmacognostic characterisation of *R. communis* and underscores the importance of mechanistic validation in anticancer screening.

Micromorphology, anatomy, and histo-phytochemical profiling of secretory structures of *Pelargonium tomentosum*

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Abstract: Secretory structures play a crucial role in plant defence and ecological adaptation by producing and storing bioactive secondary metabolites. *Pelargonium tomentosum* (Geraniaceae), an aromatic species valued for its essential oils, which offer respiratory, analgesic, and aromatherapeutic benefits, remains understudied in terms of its structural and chemical localization. This study integrates micromorphological, anatomical, and histochemical approaches to elucidate the secretory architecture and metabolite distribution in *P. tomentosum*, providing insights into its bioactive potential and structural basis for therapeutic efficacy. Fresh samples of *P. tomentosum* were collected and authenticated against herbarium specimens. Microscopical examinations were performed using stereomicroscopy and scanning electron microscopy (SEM) to characterise trichome morphology, type, and distribution. Histochemical assays localized major metabolite classes using Ruthenium red, Sudan III/IV, Ferric chloride, Wagner's reagent, and Phloroglucinol. Phytochemical extractions and qualitative analyses of flavonoids, phenolics, sterols, saponins, and amino acids were also conducted. Micromorphological examination identified glandular and non-glandular trichomes with significant structural variation. Non-glandular trichomes were unbranched and ranged from unicellular to multicellular, while glandular trichomes comprised capitate, peltate, and an intermediate transitional type. SEM analysis showed dense trichome distribution on both leaf surfaces, particularly in juvenile leaves. Histochemical assays revealed mucilage, lipids, alkaloids, and phenolics co-localized within glandular heads. Phytochemical screening detected phenolics, saponins, flavonoids, fixed oils, fats, and sterols, whereas amino compounds were absent. Integrated micromorphological and histochemical findings underscore the pharmacognostic and taxonomic importance of *P. tomentosum*. The discovery of a possible novel trichome type provides new insights into the structure-function relationships within aromatic Geraniaceae and supports future investigations.

Phytochemical and biological evaluation of *Pterocarpus angolensis* extracts for wound healing applications

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Abstract: Wound healing is a multifactorial biological process influenced by oxidative stress, inflammation, and microbial burden. This study evaluated the in vitro wound-healing potential of *Pterocarpus angolensis* seed and seed case crude extracts prepared under charred and non-charred conditions. Extracts were assessed for phytochemical composition, antioxidant, antimicrobial, and anti-inflammatory activities, cytocompatibility, and cell proliferation, and UPLC-MS analyses indicated the presence of bioactive phytochemicals, including phenolic acids, flavonoids, glycosylated phenolics, and tannin-like compounds. The extracts demonstrated notable antioxidant activity in the ABTS and DPPH assays, with selected samples exhibiting strong radical-scavenging effects. Antimicrobial activity against wound-associated bacterial strains was limited. However, several extracts significantly supported HaCaT keratinocyte viability and proliferation at lower concentrations, while selected treatments reduced nitric oxide production in LPS-stimulated RAW 264.7 macrophages, indicating anti-inflammatory activity. These findings suggest that *P. angolensis* may promote wound repair primarily through redox modulation, attenuation of inflammation, and support of epithelial cell growth, rather than through direct antibacterial action. The results provide scientific support for its traditional use and justify further investigation of its wound-healing bioactives.

Importance of indigenous crops in alleviating the double burden of malnutrition and promoting access and equity in Africa

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Abstract: Africa is experiencing a fast nutrition transition characterized by the coexistence of undernutrition and rising rates of obesity and diet-related non-communicable diseases. While stunting, micronutrient deficiencies, and wasting remain prevalent, urbanization and globalization have accelerated the consumption of processed, energy/calories-dense foods. In addition, rising food prices have become a critical barrier to achieving SDG 2 in Africa. Inflation has disproportionately affected access to diverse, nutrient-rich foods, pushing vulnerable households toward cheaper staples. This review critically examines the underlying determinants of the double burden of malnutrition, encompassing socio-economic transformations, insufficient policy interventions, and the deleterious effects of food price inflation on dietary quality, equity, and health outcomes, particularly among women and children. It further interrogates potential remedial strategies, such as biofortification, the promotion of indigenous crops, and strengthened regional trade cooperation, as mechanisms to enhance affordability and resilience within food systems. Ultimately, the analysis underscores the necessity of coordinated, cross-sectoral engagement among health, agriculture, and education, with particular emphasis on investment frameworks to secure equitable access to nutritious diets by advancing the systematic development of indigenous crop cultivation.

Unlocking the “honey” behind honeybush

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Abstract: Honeybush is an herbal tea endemic to South Africa associated with many health benefits and therefore is quite appealing to the local and global markets. Honeybush is still at its initial stages of research as studies only truly commenced in the early 90s, thus there are a lot to discover concerning this crop within many research fields. However, there is a lack of knowledge regarding the genetic information on honeybush when compared to other crops. It is necessary for studies to expand on this as a deeper look into the genetics of honeybush can lead to insights into evolution, adaptation and characteristics of the crop. However, the starting point for this is to execute a *de novo* genome assembly for the different species of honeybush. As honeybush is an indigenous species, it was approved to be sequenced under the 1KSA initiative that aims to sequence 1000 genomes of South Africa’s unique indigenous species. Four species were submitted: *Cyclopia longifolia*, *C. maculata*, *C. pubescens* and *C. subternata*. The DNA for these four species was extracted and then sequenced using Oxford Nanopore Technology in collaboration with CenGen. Our aim is to use the sequence data received to construct draft genome assemblies of these four species. This step is significantly important as it serves as a comprehensive framework for various research aspects such as genome annotation, population genetics, genetic diversity, evolutionary relationships, and comparative genomics. This can therefore be used to assist in future studies, selections and recommendations on a genetic level.

An integrated network pharmacology approach to evaluate bioactive phytochemicals of *Entada elephantina* and their mechanisms in targeting diabetes-related genes

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Abstract: Medicinal plants have become valuable sources for identifying bioactive compounds with therapeutic potential for many chronic disorders, including diabetes. *Entada elephantina*, a plant widely used in traditional medicine across southern Africa, has been employed to treat inflammation, wounds, and other long-term health conditions. However, the exact impact and mechanism of action of its phytochemical constituents in diabetes remain unclear. To provide further insight into the mechanism of action of *E. elephantina*, network pharmacology was used to identify key targets and their roles in diabetes pathogenesis. A total of 159 common targets were identified between the phytochemicals of *E. elephantina* and diabetes-related genes. Based on the degree score, the hub targets AKT1, BCL2, EGFR, SRC, ESR1, GSK3B, MMP9, MMP2, KDR, and FOS were significantly correlated with the phytochemical constituents. AKT1, SRC, and MMP2 were enriched in the PI3K–Akt signaling pathway according to Kyoto Encyclopedia of Genes and Genomes analysis, indicating a significant connection to diabetes development. Moreover, the binding affinity of the phytochemicals to these target proteins was further verified by molecular docking and molecular dynamics simulations. The compounds, particularly galloylated and glycosylated flavonoids, exhibited favourable binding properties and structural stability toward AKT1, SRC, and MMP2, thus holding promise for modulating their functions. Therefore, these findings support the antidiabetic potential of *E. elephantina* and highlight its phytochemical constituents as promising candidates for further experimental investigation.

Synthesis, characterisation, and evaluation of the biological activities of medicinal plant-based gold nanoparticles

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Abstract: In the present study, we synthesised AuNPs using extracts from *Spirostachys africana* (*S. africana*) and evaluated their biological activities. *S. africana* extracts were used to synthesise AuNPs, which were further characterised using Ultraviolet-Visible spectrophotometry (UV-Vis), X-ray diffraction (XRD), Dynamic light scattering (DLS), Transmission electron microscopy (TEM), and Fourier-transform infrared spectroscopy (FTIR). Antimicrobial activity was tested against the World Health Organization (WHO) bacterial priority pathogens. We further assessed the cytotoxicity, anti-inflammatory, and antioxidant activities using the 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide (MTT) assay, Griess assays, and 2,2-diphenyl-1-picrylhydrazyl (DPPH) method, respectively. The UV-Vis analysis indicated the formation of AuNPs with a surface plasmon resonance (SPR) peak at 541. The XRD showed face-centred cubic structures with crystalline sizes of 9–10 nm; DLS measurements displayed a monodisperse distribution; and TEM showed spheroidal AuNPs with sizes of 6–32 nm. The FTIR identified the hydroxyl, carboxyl, and amine groups involved in the reduction and capping of the Au⁺ ions. Antimicrobial assays demonstrated significant antibacterial effects against *S. aureus* (25 mm) and *P. aeruginosa* (16 mm). The MIC against *S. aureus* was 0.64 mg/mL. Ethanol extracts-conjugated AuNPs exhibited selective toxicity against MCF-7 cancer cells, while stimulating MCF-10 cells and RAW 264.7 macrophage cells at concentrations of 0.08 mg/mL. The extracts showed anti-inflammatory activity and strong antioxidant activity. AuNPs synthesised from *S. africana* extracts exhibit promising antibacterial activity against AMR pathogens, as well as significant cytotoxic, anti-inflammatory, and antioxidant activities.

Assessing the indigenous tree-based provisioning ecosystem services in various vegetation types: insights from five communities in the Vhembe Biosphere Reserve, South Africa

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Abstract: Forests provide valuable provisioning ecosystem services from their composition of indigenous plants that profoundly support the livelihood of the rural dwellers. This study assessed the use value of various indigenous tree species in the Vhembe Biosphere Reserve. Household surveys were conducted in five purposively selected communities in different vegetation types in the Vhembe Biosphere Reserve. Descriptive and inferential statistical tests were used to analyse quantitative data, including percentages, the chi-square, and Friedman's mean ranking test, while content analysis was used to analyse qualitative data. The findings revealed that the majority of community members across vegetation types used indigenous trees for various provisioning ecosystem services, including firewood, medicinal, fruits, timber, and fodder. The results further showed that all communities had rules and regulations governing access to and use of these resources, with the main objective of conserving and sustaining their availability. During the focus group discussion across all five communities, there was consensus on the need to conserve indigenous trees within their respective vegetation types by raising seedlings and planting them in homesteads to reduce pressure on the few remaining trees. However, the challenges of growing these indigenous trees were raised as a discouraging factor in considering this option. Nonetheless, the unsustainable exploitation of indigenous trees calls for immediate intervention if communities are to continue accruing forest resources without jeopardising the needs of current and future generations. Consequently, this underscores the need to establish effective community-based forest management committees to ensure community members comply with access and use rules and regulations.

The world's trade in South African succulent plants

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Abstract: Over the past decade, demand for succulent plants has increased drastically, shifting from a niche interest to a global trend driven by expanding collector communities across regions such as East Asia and Europe, and fuelled by social media exposure and e-commerce platforms. Although South Africa hosts exceptional succulent diversity with many endemic and highly sought-after species, it plays a relatively small role in the legal global supply of indigenous succulents. Assessments of exporting nurseries indicate limited local production of in-demand species, particularly those regulated under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). International demand has instead been supplied through large-scale illegal harvesting and laundering of wild plants. Distance from markets, limited skills/resources, and regulatory burdens have been attributed as reasons for the poor commercial-scale production and trade of artificially propagated succulents. It may be that a lack of investment in the horticultural sector is ultimately to blame, as well as poor oversight of compliance by regulatory authorities, which has thus far diminished the need for artificial propagation. Trade analyses show that countries in North America and the European Union are key importers and producers of South African succulents, with East Asian countries driving demand for rarer species, stimulating both legal and illegal trade. This globalised market presents both economic opportunities and significant conservation challenges. With demand for succulent plants projected to grow, South Africa's role in supplying its indigenous plants remains a critical area for research, investment and development.

Abstracts: Poster Presentations



Bioprospecting *Ricinus communis* for antimalarial lead compounds: From folk remedy to molecular discovery

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Abstract: The continued development of resistance by *Plasmodium falciparum*, the causative agent of malaria, to most of the currently used antimalarials represents a growing threat that underscores the need for alternative therapeutic strategies. Throughout history, medicinal plants have been used as a cornerstone for basic health care owing to their rich biodiversity and the complex array of bioactives that they harbour. As such, this has positioned plants as a promising avenue and reservoir of potential drug candidates. This is exemplified by the discovery of artemisinin and chloroquine from plants. Thus, given the above, *Ricinus communis*, a plant used in folk medicine, was investigated and evaluated for its antimalarial activity. To achieve this, the plant material was collected and subjected to sequential extraction using hexane, ethyl acetate, dichloromethane and methanol. The resulting crude extract was then evaluated *in vitro* for its antimalarial and cytotoxic potential. This was followed by active isolation evaluation of the active ingredient in the dichloromethane and ethyl acetate extract. The isolated compounds were then structurally analyzed using combinational spectroscopic techniques (Nuclear Magnetic Resonance) and revealed that two of the pure fractions were pinoresinol and ricinoleic acid. While the evaluation of the antimalarial and cytotoxic activity of the isolated compound is ongoing, the identification of pinoresinol, a compound previously shown to have antimalarial properties, provides preliminary pharmacological validation of the ethnopharmacological use of *Ricinus communis* in folk medicine and underpins further bioassay-guided fractionation of the active extracts.

Phytochemical characterization and bioactivity assessment of leaf and stem extracts of *Tecomaria capensis* (Thunb.) Spach

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Abstract: *Tecomaria capensis*, a flowering plant native to South Africa and a member of the Bignoniaceae family, has been traditionally used in medicine for various therapeutic purposes. This study aimed to investigate the phytochemical composition and biological activities of the plant's leaf and stem extracts. Preliminary phytochemical screening confirmed the presence of several bioactive compounds in both plant parts. Gas Chromatography–Mass Spectrometry (GC-MS) analysis identified 49 distinct compounds, while Fourier Transform Infrared (FTIR) spectroscopy revealed a diverse range of functional groups—including alcohols, carboxylic acids, phenols, amides, and alkyl halides—based on characteristic peak values in the powdered samples.

Elemental analysis by EDX indicated a high carbon content (63.02%), along with oxygen, chlorine, sodium, calcium, potassium, magnesium, and copper. Antioxidant activity was notably strong in methanolic stem extracts, with low IC₅₀ values in both DPPH and FRAP assays. In contrast, leaf extracts exhibited weaker antioxidant activity (IC₅₀ > 1000 µg/mL). Stem extracts showed potent antioxidant potential, with IC₅₀ values of 2.61 µg/mL (methanol), 3.41 µg/mL (chloroform), and 4.00 µg/mL (hexane). Cytotoxicity testing on HEK293 cells showed moderate IC₅₀ values: 42.61 ± 0.08 µg/mL (leaf) and 46.37 ± 0.08 µg/mL (stem) for hexane extracts.

Additionally, methanolic extracts demonstrated significant antibacterial activity against *E. coli*, *S. aureus*, and *P. aeruginosa*. These findings position *T. capensis* as a promising source of natural antioxidants, antibacterial, and anticancer agents, warranting further pharmacological exploration.

Pipecolic acid as a potential alleviator of salt stress in tomato (*Solanum lycopersicum*) seedlings

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Abstract: Tomato is a widely cultivated horticultural crop whose productivity is significantly threatened by salinity, an abiotic stress that adversely affects plant growth, development, and yield. Pipecolic acid (Pip), derived from L-lysine metabolism, is known for its role in systemic acquired resistance; however, its role in abiotic stress tolerance remains unclear.

This study evaluated the effects of salinity (0, 100, 150, and 200 mM NaCl), Pip (75, 125, and 150 μ M), and their combination (150 and 200 mM NaCl with 150 μ M Pip) on tomato seedlings. Treatments were applied to 9-day-old seedlings, and responses were assessed after 1, 3 and 6 days using morphological, physiological and biochemical parameters.

Results showed that salt stress significantly reduced shoot length, fresh and dry weight, particularly at 150 mM NaCl for the entire stress duration, compared to the control. However, chlorophyll (chl a, chl b, and total chl) content increased under all NaCl concentrations on day 6. Osmolytes, including proline and total soluble sugars, accumulated significantly under all salt treatments, with greater accumulation under 200 mM NaCl. Hydrogen peroxide increased under 150 mM NaCl on day 3 as confirmed by histochemical staining, while malondialdehyde levels increased at 100 mM NaCl on day 6.

Pip alone did not negatively affect growth or induce oxidative damage, which was confirmed by histochemical staining, but enhanced osmolyte accumulation, although chlorophyll content was reduced. Combined treatments improved plant growth and biomass at early time points, increased osmolyte accumulation, did not induce oxidative damage and reduced chlorophyll levels. Overall, pipecolic acid enhanced salinity tolerance in tomato through osmotic adjustment and mitigation of oxidative stress.

Medicinal *Cannabis* and industrial hemp: the sunrise industry of South Africa, present status and future potential

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Abstract: Cannabis (*Cannabis sativa*) with high-THC (psychoactive) and low-THC (industrial hemp) have attracted unprecedented attention due to their diverse applications. Cannabis is a multipurpose crop with nutritional, medicinal, and industrial uses; hence it presents the possibility of subjecting it to genetic engineering to produce useful compounds/raw products which are highly valuable. Cannabis biotypes with elevated THC levels are commonly used for medicinal and recreational purposes, thus building a strong connection to social and religious rituals particularly by the Rastafarian community. The most common uses of medical cannabis include reducing chronic pain in adults caused by multiple sclerosis, post-traumatic stress disorder, cancer, epilepsy, and nausea, amongst others. There is a mounting interest in this plant within the pharmaceutical and construction sectors, as its metabolites exhibit potent bioactivity relevant to human health. Information on clinical use of cannabis is limited possibly due to historical prohibition of cannabis cultivation across the world. This also likely contributed to the limited availability of information on open-field production, as cultivation was often conducted stealthily. Latest legal adjustments in South Africa assisted in the promotion of research and the use of cannabis for various products. Legalization will give rise to a profitable cannabis and hemp industry with future economic potential. There is an increased demand for high-performing cultivars grown in open field conditions that can deliver quality products for various applications. Yet, scientific literature required to facilitate the production of advanced cannabis outdoor cultivation is rare and not available which promoted this study.

Indigenous bulb propagation workshops for Traditional Healers to promote sustainability

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Abstract: The Indigenous Bulb Propagation Workshops were specifically designed for traditional healers in rural KwaZulu-Natal. The programme aimed to enhance their knowledge and practical skills in seed collection and bulb propagation, thereby promoting sustainable harvesting practices for medicinal plants.

Traditional healers typically rely on vegetative cuttings from medicinal trees, direct wild harvesting, or purchasing material from muthi markets. Many geophytic species, including bulbs, are subject to destructive harvesting because the entire bulb is removed for medicinal use. The workshops addressed this challenge by providing hands-on training in sustainable techniques, including seed collection, seed propagation, and proper seed storage for subsequent seasons. These skills enable healers to cultivate their own medicinal plants, produce surplus material for sale at local markets, generate supplementary income, and reduce pressure on wild populations.

Bulbs were presented in staggered growth stages during the workshops. Participants observed mature plants producing seed, planted seeds in seedling trays, received 6-8-week-old seedlings for transplanting into larger containers, and were provided with mature bulbs expected to flower and set seed in the following season. This progressive, practical approach reinforced learning and equipped healers with the full propagation cycle.

Antimicrobial activity and cytotoxicity of medicinal plants used for cattle wound treatment in Ephraim Mogale Municipality, South Africa

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Abstract: Medicinal plants are widely used due to their accessibility, affordability, and effectiveness in treating human and animal ailments. This study documented and evaluated plants used for treating animal wounds in Ephraim Mogale Municipality, including their antimicrobial and cytotoxic activities. A structured interview with 30 cattle farmers was conducted. Findings showed strong reliance on medicinal plants and indigenous knowledge as primary treatment for cattle wounds.

Antimicrobial activity and safety of acetone leaf extracts of *Aloe lateritia*, *Tagetes patula* (dwarf marigold) and *Pancreatium trianthum* were evaluated *in vitro* against ATCC strains of *Escherichia coli*, *Staphylococcus aureus* and *Aspergillus terreus* using serial microdilution and cytotoxicity (MTT) assays. The MICs against bacteria ranged from 0.07 to 2.50 mg/ml, while antifungal activity ranged from 0.46 to 1.56 mg/ml. Gentamicin and Amphotericin B showed MICs ranging from 0.01 to 0.03 mg/ml. *P. trianthum* exhibited the highest total antibacterial activity (142.85 ml/g) while *A. lateritia* showed the lowest (1.33 ml/g). LC₅₀ values against Bovine dermal cells exceeded 1mg/ml, indicating no toxicity. These findings highlight the therapeutic potential of these plants for treating cattle wounds, although *in vivo* studies will be required to confirm their efficacy.

Fertilization effects on secondary metabolite accumulation in *Pelargonium sidoides* roots

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Abstract: The genus *Pelargonium* is a fundamental part of the Cape flora. *Pelargonium sidoides*, a medicinal species indigenous to South Africa and Lesotho, is widely used in traditional medicine, particularly for treating respiratory tract infections. Increasing demand has led to localized declines in wild populations, highlighting the need for cultivation. However, the lack of established cultivation guidelines, especially regarding fertilizer requirements, limits its production. This study investigated the effects of five nitrogen (N) fertilization rates (0, 30, 60, 90, and 120 kg N ha⁻¹) on the accumulation of targeted secondary metabolites in cultivated *P. sidoides*. The experiment was conducted at the Bien Donne farm of the Agricultural Research Council (ARC) Infruitec-Nietvoorbij, Stellenbosch. Root extracts were analyzed using UPLC-QTOF-MS, identifying 11 compounds, mainly phenolic acids, flavonoids, and coumarins with known bioactive (antioxidant, antimicrobial, antiviral, and immunomodulatory) properties. N application significantly influenced metabolite accumulation. Umckalin contents were higher in fertilized plants, increasing from 164.20 mg/g in the control to 276.66 mg/g at 30 kg N ha⁻¹, before declining at higher rates. A similar pattern was observed for umckalin sulfate, while astilbin peaked at 90 kg N ha⁻¹ (346.45 mg/g). Multivariate analyses (PCA and PLS-DA) showed clear differentiation among treatments. Overall, moderate nitrogen application (30–90 kg N ha⁻¹) enhanced the accumulation of key bioactive compounds. These findings provide a basis for optimising fertilisation strategies to improve phytochemical quality, support sustainable cultivation, and reduce pressure on wild populations.

Translating indigenous insight into innovation and commercial value: An integrated approach to invasion ecology, medicinal plant chemistry, and land capability for sustainable mine rehabilitation

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Abstract: Indigenous plant knowledge offers solutions for biodiversity conservation, rural livelihoods, and sustainable development. Yet its translation into innovation and commercial value remains limited. This study introduces a resource-oriented rehabilitation framework linking ethnobotany, invasion ecology, medicinal plant chemistry, and land capability assessment in mining-disturbed landscapes.

At Mogalakwena Platinum Mine, alien invasive plant species (AIPS) are reframed as strategic and manageable resources. By analysing vegetation, soils, heavy metals, and land capability, this study demonstrates how resilient pioneer species can drive bioenergy production, essential oil extraction, and phytoremediation. Controlled valorisation of AIPS supports ecosystem restoration, local livelihoods, and compliance with mine closure requirements under NEMBA.

Sustainable cultivation systems, combined with rigorous quality control, reduce harvesting pressure on wild populations while ensuring product consistency and market acceptance. Collaboration among scientists, traditional knowledge holders, policymakers, and industry stakeholders is vital to co-develop ethical, evidence-based value chains. This work demonstrates how indigenous insight, ecological restoration, and market-driven innovation can transform degraded mining landscapes into resilient, value-generating socio-ecological systems that deliver both environmental and economic benefits.

Comparative metabolites profiling of different solvent extracts of *Asparagus* species cladodes using liquid chromatography-mass spectrometry-based metabolomics and molecular networking

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Abstract: *Asparagus* species are naturally distributed worldwide and are known as a cure for various ailments due to their pharmacological properties. However, the metabolic choreography of these *Asparagus* species is not well characterised and the compounds that contribute to their bioactivities remain unknown. This study applied an ultra-high performance liquid chromatography-quadrupole time-of-flight mass spectrometry-based metabolomics and molecular networking approach to study the effects of different solvents (ethyl acetate, methanol, and chloroform) with varying polarity on metabolites extraction and identification of bioactive compounds from three *Asparagus* species (*A. falcatus*, *A. plumosus*, and *A. densiflorus* ‘Meyersii’). Multivariate statistical clustering analyses (principal component analysis) revealed a significant separation among the three solvents and the three species, indicating significant metabolic differences. A total of 118 metabolites were identified in the three species extracted with the different solvents, and the methanolic and chloroform extracts were identified to contain more metabolites compared to ethyl acetate extracts. These metabolites were identified as belonging to the classes of flavonoids, cinnamic acids, organooxygen compounds, steroids, fatty acids, benzenes, and glycerophospholipids. Furthermore, these compound classes were differentially distributed among the three species, indicating chemical/chemotaxis differences between the species compared. Chloroform and methanol are recommended as optimal solvents for extracting high levels of phytochemicals from *Asparagus* species.

Influence of irrigation regimes on secondary metabolite accumulation in *Lobostemon fruticosus* at different growth stages

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Abstract: The eight-day healing bush, *Lobostemon fruticosus* of the Boraginaceae family, is one of the oldest medicinal plants used in the Cape by Khoisan communities and early settlers. However, natural populations are declining due to veld fires and localized overharvesting, emphasizing the need for cultivation, particularly for commercial use. Despite its importance, limited information exists on how agronomic practices such as irrigation influence secondary metabolite production across developmental stages. This study evaluated the effect of five irrigation regimes (1 L, 2 L, 3 L, 4 L, and 5 L per plant) on secondary metabolite accumulation at three harvesting stages (H1, H2, and H3) under controlled glasshouse conditions at the Agricultural Research Council – Infruitec, Stellenbosch. UPLC-QTOF-MS profiling identified ten compounds, including phenolic glycosides, flavonoids, phenolic acids, and terpene derivatives, known for antioxidant, antimicrobial, and anticancer properties. Significant differences ($p < 0.05$) were observed across irrigation levels and growth stages. Moderate irrigation (T3 and T4) enhanced key metabolites such as dichotomoside C (133.51 mg/g) and granaxylocarpin A (177.04 mg/g) at H3. In contrast, severe water deficit (T1) promoted early accumulation of stress-related compounds like rosmarinic acid (7699.4 mg/g at H1), while excessive irrigation (T5) reduced metabolite levels. Multivariate analyses (PCA and PLS-DA) showed clear clustering by irrigation and growth stage, with 63.6% variation explained. These findings confirm that metabolite accumulation is strongly influenced by irrigation and plant maturity, with moderate irrigation and late harvesting optimizing phytochemical yield while supporting sustainable cultivation practices.

Exploring the antimalarial potential of *Ziziphus mucronata*: a South African indigenous medicinal plant

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Abstract: *Ziziphus mucronata* is a South African medicinal plant widely used in traditional medicine for febrile illnesses including malaria, yet its antiplasmodial constituents remain largely unexplored. This knowledge gap is increasingly critical as *Plasmodium falciparum* continues to develop resistance to current antimalarial therapies, threatening treatment efficacy, particularly in rural communities where traditional remedies often serve as the primary healthcare option. This study integrated untargeted LC-MS metabolomics with bioassay-guided fractionation to investigate the antiplasmodial properties of *Z. mucronata* bark. Direct and sequential extractions using solvents of varying polarity were evaluated *in vitro* against chloroquine-sensitive *P. falciparum* NF54. All extracts exhibited activity, with IC₅₀ values ranging from 1–20 µg/mL. Multivariate analysis of LC-MS metabolomics data revealed distinct solvent-dependent chemical profiles, highlighting the chemical diversity achieved through different extraction systems. Bioassay-guided fractionation enabled the isolation and structural characterisation of three compounds from the most active fractions. These findings provide scientific support for the traditional use of *Z. mucronata*, while prioritising bioactive compounds for further investigation and demonstrating how indigenous knowledge can guide evidence-based natural product research towards accessible, affordable and locally relevant complementary healthcare approaches.

Anticancer activity and protein kinase modulation by aqueous leaf extracts of *Lessertia frutescens* in MCF-7 breast cancer cells

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Abstract: Secondary metabolites derived from medicinal plants play a significant role in modulating key signalling pathways involved in cancer progression. *Lessertia frutescens* (LF), widely used in traditional medicine, has been associated with antioxidant and anticancer properties; however, its molecular mechanisms of action in cancer signalling remain insufficiently understood. This study aimed to evaluate the anticancer potential of aqueous leaf extracts of LF, with emphasis on its ability to modulate protein kinases involved in cancer-related signalling pathways. Volatile compounds were identified using Gas Chromatography-Mass Spectroscopy (GC-MS) with reference to the NIST 08 library. Cytotoxicity effects were evaluated using the MTT assay of MCF-7 cell lines, and subsequently apoptosis induction was assessed using the caspase 3/7 activity assay. Modulation of signalling pathways was investigated using phosphoprotein array analysis. GC-MS profiling revealed the presence of multiple bioactive compounds with known pharmacological relevance. The aqueous leaf extracts exhibited significant dose-dependent antiproliferative activity against MCF-7 cells. Induction of apoptosis was evidenced by increased caspase 3/7 activity. Furthermore, the human phosphokinase antibody array with 44 pre-spotted kinases showed that the aqueous leaf extracts of LF significantly down-regulated several key protein kinases, including STAT3, WNK1, Pyk2, p27, PLC- γ 1, eNOS, p53, AKt1 / 3, STAT A/B, CREB, Erk1/2/3, EGFR, YES, Fyn, CHK2 and TOR when compared to untreated cell controls and Taxol (positive control). The findings of this study suggest that the aqueous leaf extracts of LF exhibit potent *in vitro* anticancer activity through induction of apoptosis and modulation of multiple cancer associated signalling pathways.

Variability assessment of Bambara groundnuts accessions in Limpopo province

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Abstract: Food and nutrition security is a worldwide challenge. Bambara groundnut (*Vigna subterranea*) is an indigenous African legume which plays an important socio-economic role in the semi-arid regions of Africa. The study is aimed at evaluating the variability among the local accession in Limpopo province. The experiment was conducted at Towoomba Research Station in Limpopo Province during 2021 and 2022 planting seasons. The study was arranged in a randomized complete block design replicated three times. The 12 accessions of Bambara groundnuts were collected from the three districts of Limpopo province (Vhembe, Mopani and Sekhukhune). Inter-row spacing of 20 cm and intra-row spacing of 50 cm. The plot size was 4 x 5 m rows. The plant height, spread, dry matter yield was collected during the growing season (29, 62, 99 DAP). Grain yield, pods per plant, yield per plant and hundred seed weight were collected at harvest. The results indicated significant variation among Bambara groundnuts accessions in the number of germinated seedlings at 14 DAP. Highly significant variation was observed in the performance of Bambara accessions with regard to plant height, plant spread, leaves dry matter, stem dry matter, total dry matter, pods per plant, yield per plant, hundred seed weight and grain yield. The significant variation among the Bambara accessions offers the opportunity for promoting breeding and Bambara groundnut conservation.

Investigating the cytotoxic effects of *Agathosma betulina* on breast cancer cells

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Abstract: Breast cancer is a life-threatening disease, impacting women worldwide. The current cancer treatments often result in severe negative side effects for patients, i.e., killing normal cells. It is thus important to investigate novel, safe and cost-effective anti-cancer treatments. Hence, the study aims to investigate how *Agathosma betulina* extracts induce cell death in breast cancer cells. Methanol and ethyl acetate crude extracts were obtained from performing sequential extraction of *A. betulina*. Alamar Blue assay was used to analyse the cytotoxicity of the extracts against MRC-5 normal lung fibroblast and MCF-7 breast cancer cells, and ATP bioluminescence was used to confirm their toxicity. Cell damage in cancerous cells was measured using LDH to determine the mechanism of induced cell death. Microscopic assays were used to analyse nuclear and morphological changes in cells. TBARS assay quantified free radical production to evaluate oxidative stress. Finally, apoptosis-related gene expression was analysed using real-time PCR. From the results, crude extracts selectively killed MCF-7 cells with minimal cytotoxicity to MRC-5 cells. At IC₅₀, ATP bioluminescence showed a decrease in ATP production, and minimal extracellular LDH indicate apoptosis, not necrosis from the LDH assay. The treated cells showed nuclear and morphological changes, including shrinkage and nuclear envelope breakdown. Elevated MDA from the TBARS assay indicates oxidative stress, suggesting an intrinsic apoptotic pathway, which was supported by increased *BAX* and *p53*, and reduced *BCL-2* observed from the PCR assay. In conclusion, both crude extracts of *A. betulina* exhibit cytotoxic effects on breast cancer cells and can initiate apoptotic pathways.

Antimicrobial activity of South African propolis against oral pathogens

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Abstract: Oral infections, including dental caries and periodontal diseases are one of the most common infectious diseases known to mankind. These infections are often treated with antibiotics; however, due to antimicrobial resistance, the effectiveness of conventional treatments are limited. Alternative therapeutic options are urgently needed. Propolis, known for its antimicrobial, anti-inflammatory, and immunomodulatory properties is one option to be examined. Despite this, investigation into the potential of South African propolis for the treatment of oral infections is limited. This study aimed to evaluate the effectiveness of 90 locally sourced propolis samples and explore its potential as a natural antimicrobial against oral pathogens. The Minimum inhibitory concentration (MIC) and Minimum bactericidal concentration (MBC) using broth microdilution assays were undertaken against seven oral pathogens: *Enterococcus faecalis* (ATCC 29212), *Lactobacillus acidophilus* (ATCC 314), *Lacticaseibacillus casei* (ATCC 334), *Lacticaseibacillus rhamnosus* (ATCC 7469), *Porphyromonas gingivalis* (ATCC 33277), *Staphylococcus saprophyticus* (ATCC 15305) and *Streptococcus mutans* (ATCC 25175). Activity was compared to the Brazilian gold standard propolis. South African propolis revealed promising but variable activity dependent on both pathogen type and geographical origin of the samples, with the majority of the samples displaying noteworthy inhibitory activity with MIC values ≤ 0.5 mg/mL. The strongest activity was observed against *E. faecalis*, *L. rhamnosus*, and *L. casei*. Several samples exhibited effective bactericidal activity (MBC ≤ 0.5 mg/mL). Overall, the results confirm that South African propolis holds therapeutic potential in oral health and could be developed as a natural adjunctive agent in caries prevention, endodontic treatment, and periodontal support, provided that future work focuses on standardisation and clinical validation.

Economic potential of moringa leaf extract as a biofertilizer for smallholder farmers in Limpopo, South Africa

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Abstract: Synthetic fertilizers costs are associated with global market volatility and are often not affordable to smallholder farmers. At the same time, their excessive use contributes to soil degradation, water pollution, and increased greenhouse gas emissions, all of which are closely linked to climate change. Research on sustainable and low-cost agricultural input has intensified interest in plant-based biofertilizers such as *Moringa oleifera*. Research on *Moringa oleifera* has increasingly highlighted its potential as a natural biofertilizer and plant growth enhancer due to its rich composition of macro- and micronutrients as well as plant growth hormones such as cytokinins, auxins, and gibberellins. Globally, studies have shown that moringa leaf extract, when applied as a foliar fertilizer or soil amendment, can significantly improve plant growth, yield, and nutrient uptake across a variety of crops. In the South African context, research on moringa has largely focused on its nutritional value, medicinal properties, and potential for food security, particularly in rural provinces such as Limpopo. Despite this growing body of research, there is limited empirical evidence in South Africa on the use of moringa leaves as a fertilizer, particularly under field conditions. Furthermore, there is a lack of comparative studies evaluating moringa-based biofertilizers against conventional inputs, coupled with limited analysis of their economic feasibility for smallholder farmers. This represents an important opportunity for localized, applied research on moringa as a potential sustainable agricultural input. This study aims to address these gaps by evaluating the feasibility and effectiveness of moringa leaf-based biofertilizers in Limpopo.

Gas exchange measurements and carbon assimilation responses of common bean (*Phaseolus vulgaris*) to calcium carbonate nano-fertiliser application methods and rates

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Abstract: Efficient plant performance depends on the coordinated regulation of carbon assimilation and transpiration, which are vital for growth, nutrient transport, and thermal regulation, and targeted nutrient delivery can enhance this balance. The study evaluated the effects of calcium carbonate (CaCO_3) nano-fertiliser application methods (foliar spray and soil drench) and rates (0, 50, 100, and 150 mg/L^{-1}) on gas exchange parameters and carbon assimilation of common bean (*Phaseolus vulgaris*) grown over two seasons. A randomised Complete Block Design with eight replicates per treatment was employed. Gas exchange measurements were obtained using an infrared gas analyser, and a $^{13}\text{C}/^{12}\text{C}$ isotope ratio was performed at 50% maturity using an elemental analyser coupled to an isotope ratio mass spectrometer (IRMS). Data was analysed using three-way ANOVA at $p < 0,05$. Results showed a significant interaction between application methods and rates, with responses exhibiting a non-linear, dose-dependent pattern. Foliar application at 100 mg/L^{-1} consistently enhanced photosynthetic rate, intercellular CO_2 concentration, transpiration rate, and intrinsic water use efficiency compared to soil drench. Moderate rates of 50-100 mg/L^{-1} further enhanced metabolic coordination, reflected by increased shoot carbon percentage, reduced carbon-to-nitrogen ratios, and greater shoot carbon accumulation compared to soil drench. These responses suggest better nitrogen incorporation and tighter regulation of carbon fixation processes. The highest rate of 150 mg L^{-1} resulted in limited improvements. These findings demonstrate that CaCO_3 nano-fertiliser strongly depends on both application method and rate, with foliar application at moderate concentrations optimising gas exchange and carbon assimilation, highlighting the importance of precision nutrient management.

Deciphering the chemical and therapeutic potential of *Salvia* species against COVID-19: An LC-MS-based metabolomics and network pharmacology study

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Abstract: *Salvia* species are used traditionally to treat various ailments and have been reported to have potential inhibitory activity against SARS-CoV-2. However, little is known about these species, as their chemical composition remains underexplored, and there is a lack of direct evidence regarding their potential as therapeutics. Hence, the need to investigate/identify their active compounds and determine their mechanisms of action. In this study, LC-MS-based metabolomics, combined with molecular networking, was employed to elucidate the chemical composition of two *Salvia* species (*S. aurea* and *S. dolomitica*) and to identify and annotate their active compounds. Furthermore, molecular docking and network pharmacology were used to investigate potential inhibitors and mechanisms of action of these identified compounds against COVID-19 viral and human targets, respectively. Statistical analysis (PCA) revealed distinct groupings and clear separations between the two species, indicating significant differences in metabolite profiles. A total of 83 compounds were identified from the two species, belonging to the classes of flavonoids, hydroxycinnamic acids, and terpenes, the major classes of compounds found in *Salvia* species. These compounds demonstrated maximum inhibitory activity against five key viral proteins and revealed therapeutic mechanisms against COVID-19 through anti-inflammatory effects. Overall, this study highlighted the use of metabolomics, molecular docking, and network pharmacology to identify active compounds and underlying therapeutic mechanisms of *Salvia* species for treating COVID-19. Through these findings, we lay the foundation for further studies of *Salvia* and *Salvia*-based drugs for treating COVID-19.

Ethnobotanical survey, bioactive compounds and multivariate analysis of indigenous leafy vegetables used as medicine in the Ga-Molepo region of Limpopo province

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Abstract: Indigenous leafy vegetables (ILVs) remain essential components of traditional Q6 food and healthcare systems in rural South Africa. However, their specific roles as food-based medicinal resources remain insufficiently documented. This study identified ILVs consumed for nutritional and medicinal purposes in the Ga-Molepo area of Limpopo Province and evaluated their bioactive compounds in line with their ethnomedicinal uses. Ethnobotanical data were collected through semistructured interviews with 216 participants selected using systematic sampling. Five ILVs—*Bidens pilosa*, *Cleome gynandra*, *Crotalaria juncea*, *Tribulus terrestris*, and *Amaranthus cruentus*—were prioritised based on frequency of citation. Their total carotenoid content, total phenolic content, antioxidant capacity (DPPH, ABTS, FRAP), and antinutritive factors (phytates and tannins) were quantified. Untargeted metabolite profiling was conducted using UHPLC-QTOF-MS, followed by multivariate analysis. *B. pilosa* exhibited the highest phenolic content and antioxidant activity, while *C. juncea* contained the most carotenoids. Over 200 metabolites were detected, predominantly flavonoids, aligning with known therapeutic properties of ILVs. Although the findings confirm the significance of ILVs as food-based medicines, the study is limited by the absence of micronutrient profiling, full MS/MS confirmation, and quantitative metabolomics. Further research should integrate nutritional, pharmacological, and clinical assessments to strengthen evidence for ILVbased interventions in non-communicable diseases.

Sorghum (*Sorghum bicolor*) cultivar evaluation in Limpopo Province

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Sorghum is an important cereal crop and a staple grain for millions of people in Africa. The crop is well adapted to arid and semi-arid environments and can grow under low soil fertility, low rainfall, and high-temperature conditions where other cereal crops often fail to thrive. Despite this resilience, there are grain yield losses due to biotic factors such as diseases and pests, and abiotic factors such as drought and low soil fertility, especially in improved short-to medium-sorghum cultivars grown in humid, tropical, and subtropical climates. The objectives of the study were to evaluate the best-performing sorghum cultivar and determine the most efficient fertiliser. Six sorghum seed samples were cultivated at 90 mm depth in a 5 m x 5 m plot on an RCBD experiment replicated three times at Madzivhandila College and Towoomba Research Station. The experiment was conducted in two locations under four fertilisation methods (organic manure, compost, control, and 3:2:1 LAN). Data was collected on emergence rate (%), number of seeds that emerged), plant height, pests and diseases and yield attributes). All data were analysed using SAS. Results revealed that, although there was no uniform stand establishment at Madzivhandila College compared with uniform stand establishment at Towoomba Research Station, sorghum cultivars were resistant to bird infestation and drought at both sites. Furthermore, the crops' cultivars fertilised with organic compost and inorganic fertilisers performed better than the control fertilised cultivars in terms of stand establishment. It was concluded that sorghum cultivation should be advocated to increase food security, reduce poverty and reduce unemployment.

An overview of the possible use of syringa (*Melia azedarach*) as a botanical insecticide in small-scale farming systems

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Abstract: An increasing concern regarding the high price of synthetic insecticides and their harmful effects on the environment and human health has led to a major trend in current insect pest management strategies. Scientists, governments, and farmers are advocating for the use of biologically based products that are less hazardous and environmentally friendly. Botanical extracts are an appropriate answer to the question as they are biodegradable and effective against pests without harming beneficial insects. *Melia azedarach*, commonly known as syringa, is a deciduous tree in the Meliaceae plant family, native to Indomalaya and Australia. It is one of the promising plants with both antifeedant and repellent properties. Its leaves, seeds and fruit contain bioactive compounds such as limonoids, triterpenoids, and alkaloids that are known for their insecticidal activity. The tree grows easily in many parts of sub-Saharan Africa. In South Africa, it grows well across all provinces in a wide range of ecosystems, including but not limited to savannahs, roadsides, urban open spaces, waste areas, and rivers. According to the Conservation of Agricultural Resources Act 43 of 1983, the plant is declared a Category 1b or 3 invader, depending on where it is growing, thus, prohibiting the cultivation of the tree and encouraging the management and control of the existing plants to prevent further spread. Syringa is difficult to control because it can regrow from stems and suckers. Using its extracts can be a cost-effective pest control measure against many insect pests, particularly in the small-scale farming sector.

Antidiabetic effects of *Entada elephantina* roots using *in vitro* and *in silico* approaches

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Abstract: *Entada elephantina* (Burch.) S.A. O'Donnell & G.P. Lewis, commonly known as eland's wattle, elephant's root, *intolwane* (Zulu), *leerbossie* (Afrikaans), and *mositsane* (Sesotho), is traditionally used by the Basotho people of South Africa for the treatment of diabetes. This study investigated the *in vitro* and *in silico* antidiabetic potential of *E. elephantina* roots (n = 10) collected from different locations across the Northern Cape Province of South Africa. Methanol extracts were evaluated for α -glucosidase and α -amylase inhibitory activity, the latter using the 3,5-dinitrosalicylic acid (DNSA) assay, while glucose uptake and utilisation were assessed in L6 myoblasts and C3A hepatocytes. *In silico* techniques were employed to assess binding interactions of the identified phytochemicals against α -amylase and α -glucosidase, two targets implicated in diabetes. The methanol extracts demonstrated strong antidiabetic activity, with α -amylase inhibition exceeding 70% for all samples at higher concentrations (62.5–500 μ g/mL) and α -glucosidase inhibition exceeding 90% across all tested concentrations (31.25–500 μ g/mL). An increase in glucose utilisation was observed after 24 h compared to untreated L6 myoblasts and C3A hepatocytes. Molecular docking results indicated a higher binding affinity for α -amylase than for α -glucosidase and the reference compound, miglitol. This enhanced binding was further supported by favourable interactions with key amino acid residues, including Asn140, Ser142, Ser143, and Ala150. These findings provide a foundation for further investigation of the antidiabetic potential of *E. elephantina* using complementary *in vivo* and *in silico* approaches.

Evaluating drought tolerance in indigenous African amaranths using *in vitro* screening approaches

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Abstract: Rising incidents of crop failure due to drought pose a significant threat to food security in southern Africa. While various agronomic, physiological, and molecular strategies have been explored to mitigate climate change impacts, research has largely focused on major commercial crops, with limited attention given to undervalued indigenous African species. This study evaluated the effects of drought stress on six genotypes each of two indigenous leafy vegetables, *Amaranthus dubius* (D₁–D₆) and *Celosia argentea* (A₁–A₆). Seeds collected from local wild populations were germinated and propagated *in vitro*. Regenerated shoots were rooted, excised, and re-rooted on media supplemented with 0–200 mM mannitol to simulate drought stress. After ten days, chlorophyll content, proline accumulation, relative electrolyte leakage, and biomass were assessed. Re-rooting under 200 mM mannitol varied widely among genotypes (80–0%), decreasing in the order of A₆>A₄>A₁>D₃>A₂>D₆>A₅>D₂>D₅>A₃>D₄>D₁. *C. argentea* exhibited significantly greater tolerance than *A. dubius*, with higher average root re-growth (97.6% vs 18.8%) and higher LD₅₀ values (196.2 mM vs 47 mM). Stress-induced injury, reflected by membrane damage, chlorophyll loss, and reduced leaf water status, was significantly greater in *A. dubius*. Both species displayed substantial phenotypic plasticity across genotypes for all measured traits. These findings highlight the potential of undervalued indigenous African vegetables as climate-resilient crops for sustainable food systems. Targeted genotype selection and cultivar development could therefore support their wider adoption under drought-prone conditions.

Evaluating hemp cultivars under dryland conditions in Keiskammahoek and Cradock, Eastern Cape

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Abstract: Industrial hemp (*Cannabis sativa*) cultivars exhibit significant variability in growth, biomass accumulation, and reproductive development depending on genetic traits and environmental conditions. This study was planted in the summer season of 2024/25 to evaluate the performance of four hemp cultivars (Futura, Yuma, Fedora, and Oriola) at two sites in the Eastern Cape, South Africa (Keiskammahoek and Cradock). The experimental layout was a split-plot in a randomised complete block design. One plot is for grain and the second one is for fibre production. Growth parameters measured included plant biomass, flower yield, root biomass and stem characteristics.

At Keiskammahoek, Yuma demonstrated markedly superior vegetative growth, producing substantially greater stem weight, root biomass, and total plant biomass compared with the other cultivars. In contrast, Futura, Fedora, and Oriola produced relatively lower biomass but showed measurable flower production. At the Cradock site, similar trends were observed, with Yuma consistently producing the highest plant biomass and flower yields across replicates. The cultivar also exhibited greater root biomass, suggesting stronger below-ground development and improved resource acquisition. However, variability between sites was evident, indicating that environmental conditions influenced cultivar performance.

Overall, the results highlight strong cultivar effects on biomass production and reproductive allocation. Yuma demonstrated the highest growth potential and biomass accumulation across sites, while Futura, Fedora, and Oriola showed more balanced vegetative and reproductive development. These findings suggest that cultivar selection plays a critical role in optimizing hemp productivity under different agro-ecological conditions in the Eastern Cape.

Antibacterial, antibiofilm and toxicity profiles of *Argemone ochroleuca* Sweet and *Argemone mexicana* against phytopathogenic bacteria

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Abstract: Plant diseases remain a major constraint to agricultural productivity, and the growing resistance to synthetic pesticides necessitates the development of alternative control strategies. *Argemone ochroleuca* and *A. mexicana* are known to contain bioactive compounds with notable biological activities, highlighting their potential as eco-friendly alternatives. However, their activity against phytopathogenic bacteria remains underexplored. This study aimed to investigate the antibacterial, anti-biofilm, phytotoxic and cytotoxic activities of extracts from both species against phytopathogenic bacteria. Extracts were obtained using water, acetone, methanol and dichloromethane. Antibacterial activity was determined using the microdilution method, while antibiofilm activity was assessed at the initial cell attachment (T0), preformed (T8), and mature biofilm (T24) stages. Phytotoxicity was evaluated using a seed germination assay, and cytotoxicity was assessed using the tetrazolium-based colourimetric assay on HEK cells. Acetone extracts of *A. ochroleuca* roots and *A. mexicana* shoots and roots exhibited the best antibacterial activity, with an MIC of 0.06 mg/mL against *Xanthomonas gardneri* 1790. The highest biofilm inhibition was recorded at T0 on *A. mexicana* root aqueous extracts against *Ralstonia solanacearum* 1315 at 87.21%, indicating preferential interference with early biofilm development. Aqueous extracts showed no phytotoxic effect on tomato seed germination, whereas the acetone, methanol, and dichloromethane extracts caused significant inhibition. Most extracts exhibited low cytotoxicity on HEK cells, with IC₅₀ values greater than 0.020 mg/mL. These findings demonstrate that *A. ochroleuca* and *A. mexicana* possess potent antibacterial and antibiofilm activities, particularly against early-stage biofilms, with minimal cytotoxicity, supporting their potential as eco-friendly agents for plant disease management.

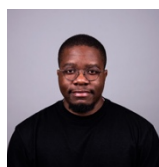
The phytochemical and pharmacological properties of *Cussonia spicata* (Araliaceae)

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Abstract: *Cussonia spicata*, known as *umsenge*, belongs to the Araliaceae or ginseng family, and species of this family have been associated with numerous pharmacological properties, which include anti-ageing, antiapoptotic, anticancer, antidiabetic, anti-inflammatory, antiobesity, antioxidant, antiviral, immunomodulatory, immunostimulant, and neuroprotective. This study aims to investigate the phytochemical constituents and pharmacological properties of *C. spicata* to support its traditional applications. Phytochemical screening, FTIR, antioxidant, and antimicrobial assays were conducted using standard protocols. The anti-inflammatory and anticancer activities were assessed using the MTT assay. The phytochemical analysis showed the presence of flavonoids, terpenoids, steroids, and alkaloids. The FTIR reveals the presence of OH, C-C, PO₃, and C-CL bonds. The methanol extract demonstrated significant antioxidant, antimicrobial, anti-inflammatory, and anticancer activities, followed by ethanol and aqueous extract. All the extracts demonstrated dose-dependent antioxidant, anti-inflammatory, and anticancer activities. These findings suggest that *Cussonia spicata* possesses significant antimicrobial, antioxidant, anti-inflammatory, and analgesic properties, supporting its potential use as a source of natural bioactive compounds for developing therapeutic agents.

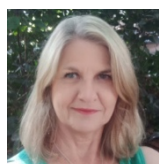
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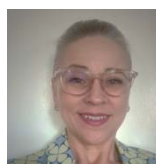
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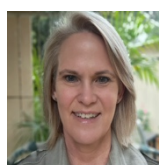
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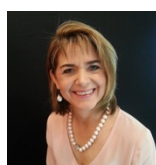
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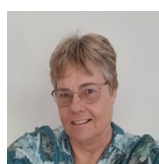
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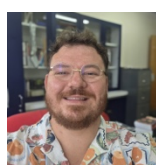
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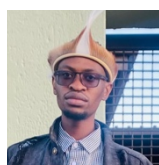
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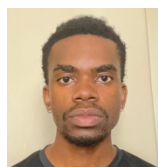
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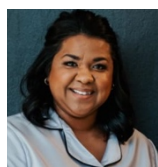
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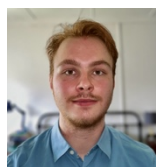
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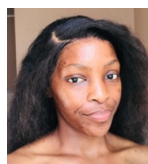
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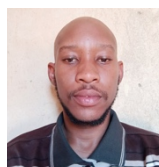
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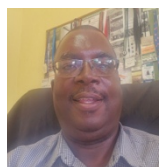
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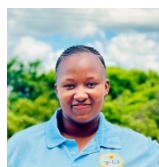
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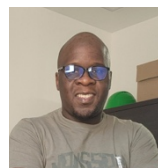
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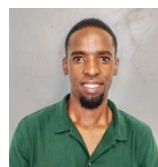
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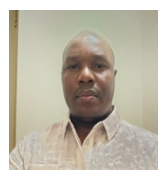
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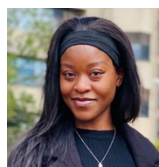
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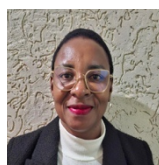
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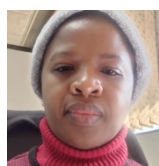
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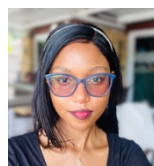
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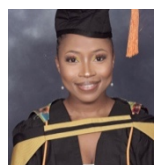
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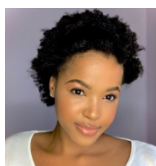
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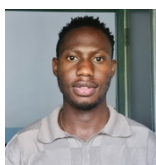
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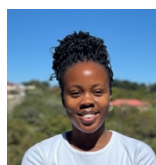
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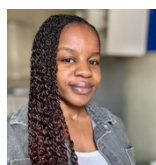
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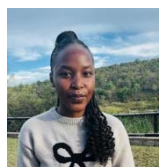
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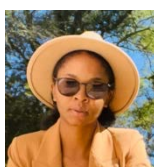
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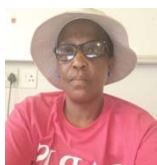
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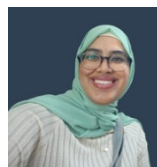
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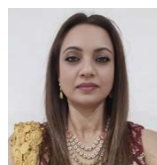
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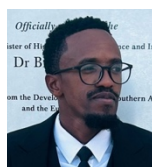
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Adjudication criteria and guidelines

IPUF Best Young Scientist and Poster Awards

Criteria	Points
5. Audibility and clarity	/10
6. Visual contact with audience	/10
7. Logical sequence of ideas	/10
8. Quality and use of visual aids	/10
9. Appropriate use of time	/10
10. Significance of the problem	/10
11. Experimental design	/10
12. Quality of results obtained	/10
13. Conclusion	/20
TOTAL	/100

Objective

The objective of these awards is to encourage a high standard of presentations at the annual Indigenous Plant Use Forum (IPUF) meeting by adjudicating and rewarding the best presentations (paper and/or poster) by a young scientist.

Criteria

The criteria for adjudication are:

1. Audibility and clarity (10 points)

This refers to the extent to which the entire audience can hear and understand what the presenter is saying. It includes the manner, tone, volume, speed and clarity of the speech, and their variation to capture and retain the interest and attention of the audience. Appropriate use of hand and body language must be included in judging this point.

2. Visual contact with audience (10 points)

This is adjudicated on the extent to which the manner and success of the presenter feature in the establishing and maintaining visual contact with the audience. The presenter must look at, and talk to the audience, and ensure that the audience's attention is focused on him/her.

3. Logical sequence of ideas (10 points)

This covers the logical sequence from the beginning to end. It also covers the flow of thought in the presentation and the extent to which this is logical and used to enhance the communication of the message to the audience.

4. Quality and use of visual aids (10 points)

In addition to the quality of the visual aids, of equal importance in adjudicating this point, is the proficiency of use of the aids and the extent to which they are used as an aid to support and enhance the presentation. The flashiness of the aids should not overpower or dominate the presentation to the detriment of communicating the message.

NB: A presentation must be remembered for what was communicated and not what aids were used.

In the case of a poster presentation is the candidate must not be penalized if all the text (with figures, tables, photos etc.) is not legible to the whole audience at the time he presentation, as the poster may be presented from the place where it is displayed.

NB: All the text and ideas on the poster must however be understood, legible and dear to any person who wants to look at the poster during his/her own time, without the presenter having to be present and explain.

5. Appropriate use of time (10 points)

This refers to the extent to which the presentation is delivered within the time limit and is not rushed, drawn out or truncated.

6. Significance of the problem (10 points)

This refers to the significance or impact of either basic or applied research.

7. Experimental design (10 points)

This refers to the design of the experiments, whether the stated objectives were addressed by the methods used, and whether the experiments were well-planned and executed.

8. Quality of results obtained (10 points)

This refers to the significance, originality and quality of the results obtained.

9. Conclusion (20 points)

This is adjudicated based on the interpretation and implications of the results, the correlation of the conclusions with the results presented, and suggestions for future areas to be investigated.

TIA-IPUF Oswald Makunga Innovation Award

Eligibility

In order to qualify to be considered for the Innovation Awards, the following criteria need to be met:

- a) Recipients must be researchers and emerging researchers whose abstracts have been reviewed and accepted for presentation at the given IPUF conference
- b) Recipients must be 40 years of age or younger at the start of the conference
- c) Recipients must be South African
- d) Recipients must have indicated to the IPUF conference organisers that they would like their paper to be considered for the Innovation Award

Adjudication

A total of 4-5 adjudicators will listen to and score the paper presentations whose presenters have indicated an interest in competing for the Award.

TIA will contribute 2-3 of the 5 adjudicators who have a background and experience in evaluating the technical and commercial merits of innovations in Indigenous Knowledge Systems and related sectors.

IPUF will contribute the other 2 adjudicators with strong indigenous plant use scientific knowledge, understanding and expertise.

Rubric

The adjudication process will evaluate the content of the papers on the following six elements, namely: Scientific Merit, Industrial Application, Novelty (Newness), Commercial Potential, Technology Readiness Level (Stage of Development) and Potential Social Impact.

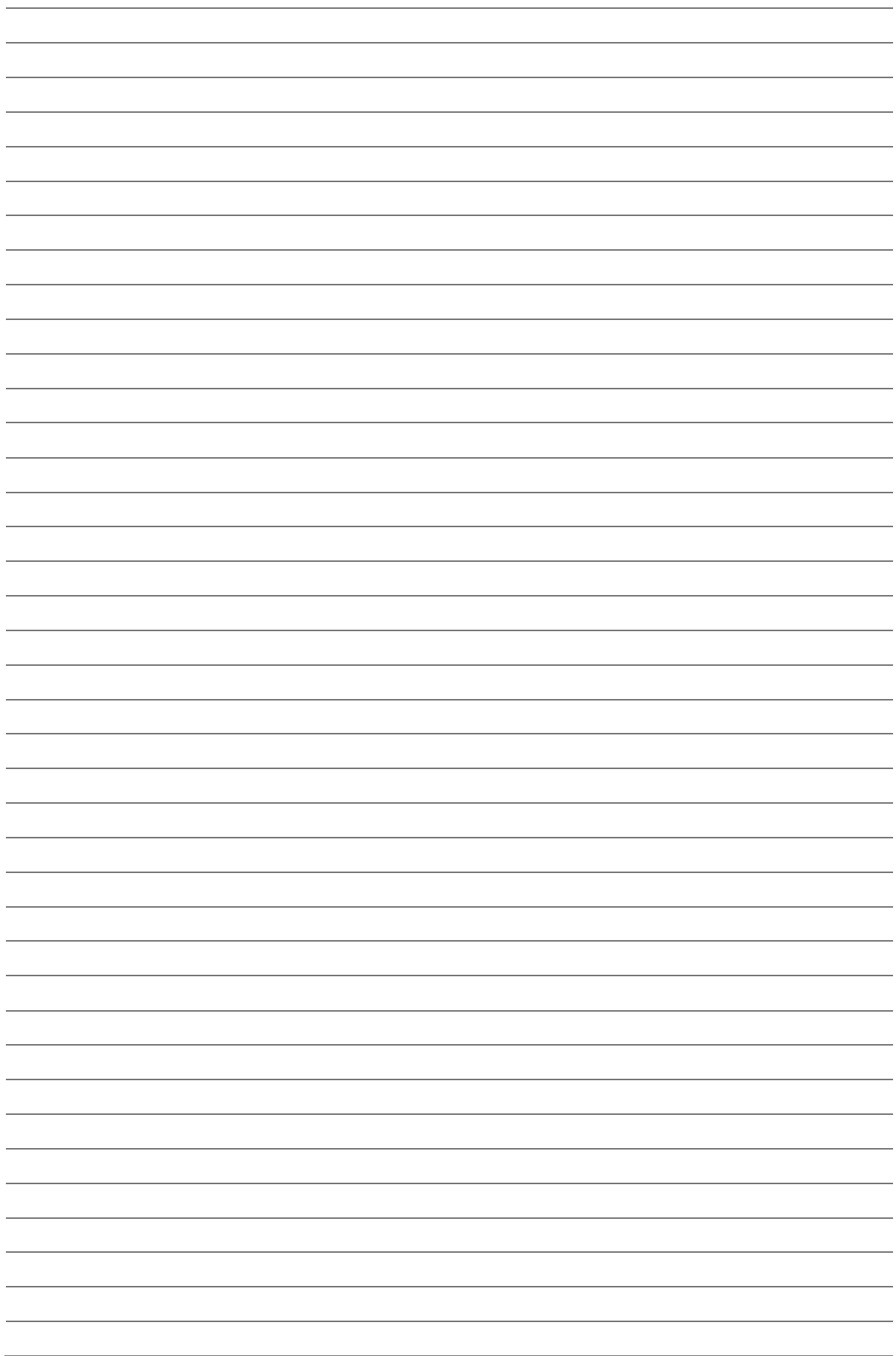
Scientific Merit, Industrial Application, Novelty and Technology Readiness Level are each scored out of 10, while Commercial Potential and Potential Social Impact are each scored out of 20, giving a maximum total of 100.

Scores are awarded according to the rubric below, where higher scores indicate stronger performance: Poor (1-2 / 1-5); Below Average (3-4 / 6-8); Average (5-6 / 9-12); Good (7-8 / 13-16); and Excellent (9-10 / 17-20).

Scientific Merit	Industrial Application	Novelty (Newness)	Commercial Potential	Technology Readiness Level (Stage of development)	Potential Social Impact
10	10	10	20	10	20
TOTAL SCORE (OUT OF 100) =					

Notes

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.







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Compiled by Ryan D. Rattray