

# Global Summit on Phytochemistry & Traditional Medicine Research



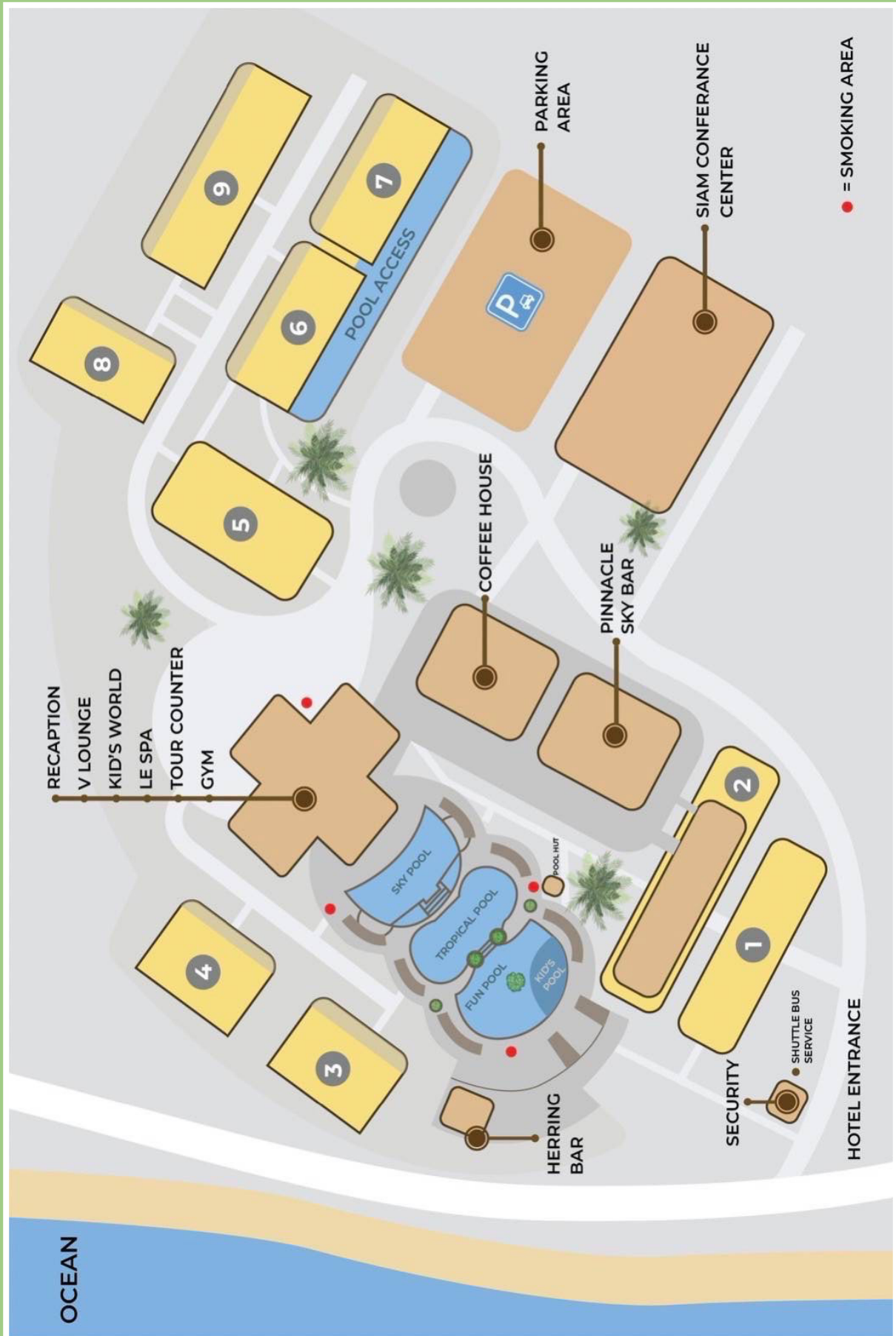
April 6-7, 2026 | Phuket, Thailand  
April 8, 2026 | Virtual



**Novotel Phuket Resort**  
282 Phrabarammee Road,  
Patong, Kathu, 83150,  
Phuket, Thailand



# FLOOR PLAN



# Welcome to the **Global Summit on Phytochemistry and Traditional Medicine Research (PhytoTMed-2026)**.

On behalf of the **Organizing Committee**, it is our great pleasure to welcome you to the **Global Summit on Phytochemistry and Traditional Medicine Research (PhytoTMed-2026)**. Whether you are joining us in the breathtaking island paradise of **Phuket** or participating online, we are honored to have you at this inspiring international gathering. From **April 6-8, 2026**, we invite you to immerse yourself in a vibrant program of distinguished plenary and keynote lectures, focused sessions, and engaging discussions, designed to advance research in phytochemistry, herbal science, and traditional medicine.

This summit provides an exceptional platform for leading researchers, clinicians, practitioners, and industry experts to exchange ideas and share their common passion for advancing phytochemistry and herbal science. We are confident that these three days will facilitate the meaningful collaborations and lasting connections necessary to drive scientific excellence forward in such a remarkable setting. Thank you for joining us for what promises to be an unforgettable experience dedicated to the advancement of phytochemistry and traditional medicine research.

## Conference Organizing Committee



**Prasob-Orn Rinthong**  
Mahasarakham University  
Thailand



**Ratre Sawangjit**  
Mahasarakham University  
Thailand



**Andreas Hensel**  
University of Munster  
Germany



**Blassan George**  
University of Johannesburg  
South Africa



**Hiba Boujnah**  
CCCTIM, Charité - University  
Medicine Berlin, Germany

## Presentation Guidelines

**Plenary Talks:** Each plenary speaker will have 35 min for presentation, followed by a 5-min discussion.

**Keynote Talks:** Each keynote speaker will have 25 min for presentation, followed by a 5-min discussion.

**Featured Talks:** Each featured speaker will have 17 min for presentation, followed by a 3-min discussion.

**Young Researchers' Presentations:** Each young researcher will have 10 min for presentation, followed by a 5-min Q&A session.

**Time Management:** Please ensure that your presentation does not exceed the allotted time.

**Presentation Files:** Speakers should bring their presentation saved on a USB memory stick.

**Backup Submission:** We recommend emailing a backup copy of your presentation to [https://phytotmed.com/submit\\_presentation](https://phytotmed.com/submit_presentation).

**Multimedia Content:** If your presentation includes videos or animations, please ensure all files are correctly linked and formatted. You may test your slides during the breaks.

**Q&A Procedure:** During the discussion, conference chairs or moderators will facilitate questions by moving the microphone. Audience members are requested to raise their hands to receive the mic.

- 8:00** On-site Registration & Badge Pickup
- 9:00** Welcome and Opening Remarks  
**Blassan George**, Professor, University of Johannesburg, South Africa

**Chair: Andreas Hensel**, Professor, University of Munster, Germany



**09:10**  
**Hiba Boujnah**  
 CCCTIM, Charité - University Medicine Berlin, Germany

Traditional Medicine at a Turning Point: Global Priorities, Partnerships, and the Role of WHO Collaborating Centres



**09:40 | Plenary**  
**Andreas Hensel**  
 Professor, University of Munster, Germany

Urinary Tract Infections: Learning from Nature to Combat Uropathogens on Non-antibiotic Level; Traditional Plants, Exciting Phytochemistry, Innovative Molecular Targets, Clinical Evidence



**10:20 | Keynote**  
**Mathias Schmidt**  
 Director, HerbResearch, Germany

Sustainability for Herbal Medicinal Products - More Than Meets the Eye

10:50 Networking & Coffee

@ Foyer

## Session I: Phytochemistry, Extraction and Advanced Analytical Approaches

**Chair: Pharkphoom Panichayupakaranant**, Professor, Prince of Songkla University, Thailand



**11:20 | Keynote**  
**Pharkphoom Panichayupakaranant**  
 Professor, Prince of Songkla University, Thailand

Herbal Product Development through Green Microwave Extraction



**11:50**  
**Alexander Areesanan**  
 Research Associate, University of Basel, Switzerland

Characterization and Identification of Bioactive Compounds from *Buddleja officinalis* Maxim. Flowers in the Context of Dry Eye Disease



**12:10**  
**Onuma Kaewkla**  
 Associate Professor, Mahasarakham University, Thailand

Endophytic Actinobacteria from Thai Medicinal Plants as a Good Source of Bioactive Compounds and Genome Data Mining of Some Selected Strains



**12:30 | Young Researcher**  
**Thokchom Biona**  
 Galgotias University, India

HPTLC Quantification of Gallic Acid from *Rhus chinensis* Mill Used for Diabetes in Manipur, North-Eastern India

12:45 Group Photo followed by Lunch

@ Coffee House Restaurant

## Session II: Scientific Validation and Global Integration of Traditional Medicine

**Chair: Sulaiman C T**, Senior Scientist, CMPR, Arya Vaidya Sala, Kottakkal, India



**14:00 | Keynote**  
**Sulaiman C T**  
 Senior Scientist, CMPR, Arya Vaidya Sala, Kottakkal, India

Validation of Traditional Knowledge and Drug Development



14:30

**Zijing Hu**

Associate Professor, University of Johannesburg,  
South Africa

Reimagining Global Health Through Integrative Medicine:  
Traditional Knowledge, Local Contexts, and Shared  
Futures



14:50

**Christal Burnette**

Managing Director, Haitai Corporation, Japan

Okinawan Yakuzen: The Traditional Healing Method  
Behind the World's Longest-Lived People



15:10

**Jan Claesen**

Associate Professor, Cleveland Clinic Research, USA

Gut Microbial Metabolism of Dietary Polyphenols in  
Health and Disease



15:30

**Roger Coopoosamy**

Professor, Mangosuthu University of Technology,  
South Africa

Phytomedicines: Past, Present and Future

15:50 Poster Presentation and Networking Drinks

@ Foyer

### List of Posters

PT-1	<b>Prasob-Orn Rinthong</b> Mahasarakham University, Thailand	Ultrasonic-Assisted Extraction and Ethosome-Based Delivery of Mahajak Oil to Enhance Lignan Recovery and Skin Permeation
PT-2	<b>Ratree Sawangjit</b> Mahasarakham University, Thailand	Effectiveness and Safety of Turmeric for the Treatment of COVID-19: An Updated Systematic Review and Meta-Analysis of Randomized Controlled Trials
PT-3	<b>Abel Matondo</b> Royal London Hospital, United Kingdom	Glucose and Lipid Lowering Effects of <i>Enhydra fluctuans</i> Extract in Cadmium-Treated Normal and Type-2 Diabetic Model Rats
PT-4	<b>Yupaporn Chantong</b> Rajamangala University of Technology Isan, Thailand	Antioxidant Activity of Thai Traditional Herbal Effervescent Tablets (Ya Od Ya Ba) for Methamphetamine Withdrawal

9:00 Introduction and Day 2 Opening Remarks

**Chair: Heidi Abrahamse**, Director, Laser Research Centre, University of Johannesburg, South Africa



09:10 | Plenary

**Heidi Abrahamse**

Director & Professor, Laser Research Centre,  
University of Johannesburg, South Africa

Evaluation of Nano-Phyto Formulations of Berberine and Pheophorbide-a Mediated Photodynamic Therapy on Human Lung Cancer Spheroids Model



09:50 | Keynote

**Mathias Schmidt**

Director, HerbResearch,  
Germany

GACP and GMP in the Cultivation of Medicinal Cannabis



10:20 | Keynote

**Blassan George**

Professor, University of Johannesburg,  
South Africa

Nanoformulations of Phytochemicals in Photodynamic Therapy for Cancer

10:50 Networking & Coffee

@ Foyer

## Session III: Phytopharmacology and Translational Therapeutics

**Chair: Biswatrish Sarkar**, Associate Professor, Birla Institute of Technology, India



11:20

**Biswatrish Sarkar**

Associate Professor, Birla Institute of Technology,  
India

Hepatoprotective Potential of Krishna Tulsi (*Ocimum tenuiflorum*): From Traditional Medicine to Phytopharmaceutical Development



11:40

**Kalpana Rahate**

Professor, Galgotias University, India

Design and Synthesis of Targeted Rutin Derivatives as CK2 Alpha Kinase Inhibitors



12:00

**Young-Mo Kim**

Associate Professor, Chungnam National University,  
South Korea

Efficacy and Safety of SKCPT in Patients with Knee Osteoarthritis: A Multicenter, Randomized, Double-Blinded, Active-Controlled Phase III Clinical Trial



12:20

**Rosnani Hasham**

Associate Professor, Universiti Teknologi Malaysia,  
Malaysia

Safety Profiling and Skin Barrier Characterization of a Topical Herbal Cream Containing *Ficus deltoidea* Leaf Extract



12:40 | Young Researcher

**Amoolya Sree**

NIPER Guwahati, India

Rutin Hydrate-loaded Fenugreek Seeds-generated Exosome-like Nanoparticles: Connecting Rutin Hydrate with Primary Dysmenorrhea by Network Pharmacology and Inflammation Reduction Synergism in Disease-induced Mice Model

12:55 Lunch

@ Coffee House Restaurant

14:00 VISIT followed by Informal Dinner (\*Ticket Required)

## Zoom Link

<https://us06web.zoom.us/j/84667402444?pwd=L2tgHTZNcWmCTRhhdVR90TiaClljdm.1>

Meeting ID: 846 6740 2444

Passcode: wN52gy

07:40 Platform Opens &amp; AV Check

07:50 Welcome and Opening Remarks

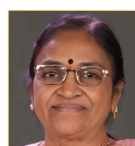
## Online Session I: Phytochemical Innovations and Functional Foods

Chair: **Samantha Meyer**, Senior Lecturer, Cape Peninsula University of Technology, South Africa

08:00 | Keynote

**Kylie O'Brien**Adjunct Professor, Torrens University,  
Australia

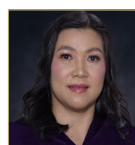
Medicinal Cannabis and Women's Health



08:30

**B. Andallu**Former HOD, Dept of Food & Nutritional Sciences,  
Sri Sathya Sai Institute of Higher Learning, IndiaMedicinal Potential of Mulberry (*Morus indica L.*) Leaves:  
*In vitro* and *In vivo* Assessment

08:50

**Shikha Saxena**Associate Professor, School of Health Sciences and  
Technology, UPES, IndiaResponse Surface Optimization of a Perilla–Fenugreek–  
Kodo Millet Functional Food Premix for Glycemic Enzyme  
Inhibition

09:10

**Edlyn E. Pooten**Researcher, Aurora State College of Technology,  
Philippines*In Silico* Assessment of Phenylpropanoids from *Ageratina  
adenophora* Reveal Dual Antidiabetic and Anticancer  
Potential via Molecular Docking and ADMET Profiling

09:30

**Jelena Popović-Dorđević**

Professor, University of Belgrade, Serbia

Morphological and Phytochemical Changes of Medlar  
Fruit During the Ripening Process

09:50

**Zakaria Hazzoumi**Assistant Professor, University Mohammed VI  
Polytechnic, MoroccoLinking Rhizosphere Microbiota Biomass and Activities to  
Secondary Metabolite Variation in Some Native Medicinal  
Plants from Semiarid Ecosystem

10:10

**Samantha Meyer**Senior Lecturer, Cape Peninsula University of  
Technology, South Africa*Cotyledon orbiculata* and *Salvia aurea* Plant Extracts and  
Biogenic Nanoparticles: A Biological Assessment of Their  
Cosmeceutical Potential

10:30 Session Discussion

10:40 Networking Break

## Online Session II: Ethnopharmacology and Phytotherapy

Chair: **Jelena Popović-Dorđević**, Professor, University of Belgrade, Serbia

10:50 | Keynote

**Rainer Stange**

MD, Immanuel Hospital Berlin, Germany

Phytotherapy for Infectious Disease with Traditional  
Plants from the Western World



11:20

**Lyuben Zagorchev**

Associate Professor, Faculty of Biology, Sofia University, "St Kliment Ohridski", Bulgaria

Traditional Use and Phytochemical Composition of Parasitic Plants: Focus on *Cuscuta spp.*



11:40

**Patrícia Rijo**

Professor, Universidade Lusófona, Portugal

Phytotherapeutic Potential of *Plectranthus spp.* in One Health Contexts



12:00

**Nompumelelo Mkhwanazi**

Senior Lecturer, University of KwaZulu- Natal, South Africa

*Alternaria alternata* (Fr) Keissl Crude Extract Inhibits HIV Subtypes and Integrase Drug-Resistant Strains at Different Stages of HIV Replication



12:20

**Liselotte Krenn**

Associate Professor, ESCOP, Exeter, United Kingdom and University of Vienna, Austria

What Do Medical Students Know and Think About Phytotherapy/Phytopharmaceuticals



12:40

**Walaa Maghrabi**

Assistant Professor, King Abdulaziz University, Saudi Arabia

Perceived Usefulness Drives TCIM Use Worldwide: A Key Insight for Integration Strategies



13:00 | E-Poster

**Malkhaz Getia**

Tbilisi State Medical University, Georgia

Preliminary Assessment of the Biological Activity of *Swida iberica* Growing in Georgia

13:10 Session Discussion

13:20 Networking Break

## Online Session III: Advanced Phytomedicine and Translational Research

**Chair: Patrícia Rijo**, Professor, Universidade Lusófona, Portugal



13:30 | Keynote

**Matthias Lorenz**

Founder and Executive Manager, PhytoConsult, Germany

Production of Medicinal and Secondary Metabolite-yielding Plants in Controlled Environments ('Vertical Farming')



14:00

**Krystyna Skalicka-Woźniak**

Professor, Medical University of Lublin, Poland

Bridging Gaps in Natural Product Drug Discovery: Advanced Tools for CNS Pharmacology



14:20

**Mervin Meyer**

Professor, University of the Western Cape, South Africa

Harnessing Nanotechnology to Improve Plant-based Cancer Therapies



14:40 | Keynote

**Ricardo Ghelman**

Professor, Brazilian Academic Consortium for Integrative Health (CABSIN), Brazil

Clinical and Pre-clinical Studies of Anti-neoplastic Phytotherapeutic Agents from Latin America

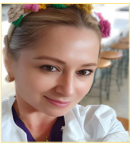


15:10

**Robert Trybulski**

Associate Professor, Upper Silesian Academy, Poland

Applications of Dry Needling in the Management of Myofascial Pain: Summary of Findings from Four Clinical Studies



15:30

**Raquel Amanda Villamizar Gallardo**

Professor, University of Pamplona,  
Colombia

Evaluation of Antibacterial Effect of Five Essential Oils  
Against Nosocomial Multidrug Resistant *Pseudomona*  
*aeruginosa* Strains, Isolated from Sick Patients in a Third  
Level Hospital Located in Norte de Santander, Colombia

15:50 Session Discussion

16:00 Closing Remarks & Acknowledgments

## Traditional Medicine at a Turning Point: Global Priorities, Partnerships, and the Role of WHO Collaborating Centres

Hiba Boujnah

CCCTIM, Charité - University Medicine Berlin, Germany

### Abstract:

WHO Collaborating Centres (WHO CCs) are a key institutional mechanism through which WHO advances research, technical cooperation, and policy implementation. In Traditional, Complementary and Integrative Medicine (TCIM), however, the distribution of WHO CCs remains geographically uneven, with implications for equity, context-specific evidence generation, and health-system integration.

This presentation examines the role of WHO CCs in advancing the WHO Traditional Medicine agenda through a case study of the Charité Competence Center for Traditional & Integrative Medicine (CCCTIM), Charité – Universitätsmedizin Berlin. As the most recently designated WHO Collaborating Centre on Traditional Medicine, and the first designated in the context of the WHO Global Traditional Medicine Centre era, CCCTIM provides a timely example of how WHO CC designation can function as both a technical and strategic platform.

## Urinary Tract Infections: Learning from Nature to Combat Uropathogens on Non-antibiotic Level; Traditional Plants, Exciting Phytochemistry, Innovative Molecular Targets, Clinical Evidence

Andreas Hensel

University of Munster, Germany

### Abstract:

Urinary tract infections (UTI) are under worldwide most diagnosed bacterial infections with enormous costs for the health care system. The main pathogen causing UTI is uropathogenic *E. coli* (UPEC), beside *Klebsiella*, *Proteus* and *Pseudomonas* species. UTI are even more serious due to a high recurrence rate. UPEC are Gram-negative bacteria, perfectly adapted to the harsh environment of the urinary tract, expressing a wide variety of virulence factors as e.g. hemolysin, biofilm forming factors, immune escape factors, fitness and motility genes, and a variety of outer membrane proteins responsible for the bacterial adhesion to and invasion into the host cells and the ability to form intracellular reservoirs. Antibiotic treatment of UTI is routinely performed within clinical practice, but due to the short application of standard antibiotics (e.g. fosfomycin only one dose!) the resistance situation seems dramatic. The investigation of pathoblockers should pinpoint compounds from nature, which specifically interact with the different bacterial virulence factors of UPEC to interact with the protein machinery for successful adhesion, invasion, toxin formation or immune escape.

Polymethoxylated flavones from *Orthosiphon aristatus* (Java tea) have been shown to interact with the chaperon-usher system of UPEC, leading to strongly reduced formation of the FimH-dominated fimbria, which are necessary for the bacterium to get into physical adhesion contact with the host cell. This antiadhesive effect has been shown under in vitro and in vivo assays at different levels.

Standardized extracts from cranberry (*Vaccinium macrocarpum*) fruits and horsetail herb (*Equisetum arvense*) stimulate the human kidney after 7 days of oral intake towards a strongly increased secretion of Tamm-Horsfall Protein (THP), a central player of the innate immune defense. THP, a highly mannosylated glycoprotein, interacts specifically with the mannose-binding domain of FimH from UPEC, which leads to a aggregation of bacteria, which are not able anymore to recognize the mannose-containing glycoproteins of uroplacins from the host cells, which again reduces the bacterial adhesion and the infection of the host cells.

Traditionally herbal medicinal products for UTI are often used as complex mixtures for preparation of aqueous infuses. Such a complex standard formulation, widely used in Europe for UTI has been investigated phytochemically and for its specific function. Data obtained indicate that the coextraction of all four herbal ingredients with hot water will lead to a different chemical composition compared to the separate extraction of the four herbs. Alone. Interestingly, the coextraction accumulates a series of malonylated damaran triterpens, which are shown for the first time to strongly interact with the fimbriae formation of UPEC, leading to drastically decrease bacterial adhesion to the eucaryotic

host cells. Using different vivo test systems these effects have been also shown in higher experimental setups.

Learning from nature: it is obvious that natural products from plants provide a very interesting approach to identify inhibitors of bacterial virulence factors, which enables us to learn from traditional medicines if we are able to adapt modern and state of the art experimental protocols for exact analytical characterization of the extracts and powerful in vitro and in vitro assays to correlate these analytical data with functional aspects.

## Sustainability for Herbal Medicinal Products - More Than Meets the Eye

**Mathias Schmidt<sup>1,2\*</sup>, Michael Heinrich<sup>2</sup>, Banaz Jalil<sup>2</sup>, Olaf Kelber<sup>2</sup>, Kenny Kuchta<sup>2</sup>, Matthias Lorenz<sup>2</sup>, Gaia Scalabrino<sup>2</sup>, and Joanna Sucholas<sup>2</sup>**

<sup>1</sup>Herbresearch Germany, 86874 Mattsies, Germany

<sup>2</sup>European Sustainability Initiative Team

### Abstract:

In 2015, the United Nations defined 17 “sustainable development goals”, SDGs, with the aim of ending poverty, protecting the planet and ensuring peace. The 17 SDGs apply to all types of business, including the value chain of herbal medicinal products (HMP). Medicinal plants seem to be a regrowing resource, hence sustainability in this sector has been somewhat neglected. Our expert group was founded to identify unsustainable practices in the supply chain of HMP on different levels, including sourcing/cultivation, quality specifications and analyses, manufacture and regulatory issues. A mutual understanding of the requirements in the supply chain from growers or collectors down to the pharmaceutical industry and even the prescribers and corresponding measures are needed to assure long-term sustainability of HMP. Typical issues are the conservation status of the plants, their quality and the occurrence of adulterations. The application of the SDGs goes beyond these problems by applying measures for sustainability in day-to-day work, e.g. in the laboratory.

## Herbal Product Development through Green Microwave Extraction

**Pharkphoom Panichayupakaranant**

*Phytomedicine and Pharmaceutical Biotechnology Excellence Center, Faculty of Pharmaceutical Sciences, Prince of Songkla University, Hat-Yai, Songkhla 90110, Thailand*

### Abstract:

Selecting an appropriate extraction method is a critical step in the development of herbal products for commercialization. Conventional techniques such as Soxhlet extraction, heat reflux, and maceration are often energy-intensive, time-consuming, and rely on large volumes of toxic organic solvents, limiting their industrial applicability. In response, green extraction technologies have gained increasing attention as safer, more sustainable, and cost-effective alternatives. Among them, microwave-assisted extraction (MAE) combined with green solvents has emerged as a particularly promising approach, offering high extraction efficiency while reducing environmental and safety concerns. Notably, common pharmaceutical excipients used in topical and oral dosage forms can function as environmentally friendly extraction media, eliminating solvent evaporation and simplifying downstream processing. For example, isopropyl myristate and cetyl alcohol were used to extract 2.0% w/w  $\alpha$ -mangostin from mangosteen (*Garcinia mangostana*) pericarp, enabling direct incorporation into anti-acne creams and oral-ulcer gels. Similarly, glycerin and a eutectic mixture of sucrose and citric acid facilitated the extraction of 1.7% w/w [6]-gingerol from ginger (*Zingiber officinale*) for anti-emetic pastille formulations. Propylene glycol was applied to obtain a phenylbutenoid-rich extract from Cassumunar ginger (*Zingiber cassumunar*) for analgesic and anti-inflammatory patches. In addition, rice bran oil was successfully employed as a green solvent in MAE to prepare a standardized chamuangone extract from *Garcinia cowa* leaves, exhibiting significant anticancer activity. Overall, microwave-assisted green extraction using pharmaceutical excipients represents an effective strategy to streamline herbal product development. This approach minimizes the use of hazardous solvents, reduces processing steps, and provides a sustainable pathway for the industrial production of herbal formulations.

## Characterization and Identification of Bioactive Compounds from *Buddleja officinalis* Maxim. Flowers in the Context of Dry Eye Disease

Alexander Areesanan<sup>1\*</sup>, Andreas Wasilewicz<sup>2</sup>, Benjamin Kirchweger<sup>3</sup>, Sven Nicolay<sup>1</sup>, Amy Zimmermann-Klemd<sup>1</sup>, Eva Waltenberger<sup>2</sup>, Mehdi A. Beniddir<sup>4</sup>, Judith M. Rollinger<sup>2</sup>, Ulrike Grienke<sup>2</sup>, and Carsten Gründemann<sup>1</sup>

<sup>1</sup>Translational Complementary Medicine, Department of Pharmaceutical Sciences, University of Basel, Campus Rosental, Mattenstrasse 22, 4058 Basel, Switzerland

<sup>2</sup>Division of Pharmacognosy, Department of Pharmaceutical Sciences, Faculty of Life Sciences, University of Vienna, Josef-Holaubek-Platz 2, 1090 Vienna, Austria

<sup>3</sup>Pharmaceutical Biology, Department of Pharmacy, Ludwig-Maximilians-Universität München, Butenandtstraße 5-13, 81377 Munich, Germany

<sup>4</sup>Équipe Chimie des Substances Naturelles, BioCIS, CNRS, Université Paris-Saclay, 17 Avenue des Sciences, 91400 Orsay, France

### Abstract:

Dry eye disease (DED) is becoming increasingly prevalent globally and is characterized by inflammation of the ocular surface and tear-film instability. Both are closely linked to excessive accumulation of reactive oxygen species (ROS). Both traditional East Asian medicine and recent scientific research have highlighted *Buddleja officinalis* flowers as a rich source of antioxidant and anti-inflammatory constituents. The chemical composition and pharmacological activity of *B. officinalis* flower extracts were profiled *in vitro* to explore their potential as a novel therapy for DED. Two preparations, a conventional hydroethanolic (BO-HE) and a lead-like enhanced extract (BO-LLE), were characterized via UHPLC-UV-MS and ELSD for their chemical composition. The pharmacological activities of BO-HE and BO-LLE were then examined across several *in vitro* DED cell models. Both extracts exhibited strong free radical scavenging activities, reduction of intracellular ROS and modulated the release of inflammatory mediators in UVB-exposed human corneal epithelial cell-transformed (HCE-T) cells. The extracts also supported epithelial wound healing of HCE-T. In immune cells, both extracts suppressed pro-inflammatory cytokines in LPS-exposed THP-1 cells and BO-LLE efficiently inhibited calcium influx in Jurkat cells, even at low doses. BO-LLE also uniquely promoted larger lipid droplet formation in meibomian gland cells, potentially enhancing tear-film stability. Moreover, to identify antioxidant and cytotoxic constituents from multi-component mixtures of the BO-LLE, a combination of MS- and NMR- based biochemometric approaches also have been implemented. The findings revealed phenylethanoid glycosides and triterpene saponins as the principal drivers of the BO-LLE's antioxidant and cytotoxic effects, respectively. Overall, the findings indicate that *B. officinalis* flower, particular BO-LLE extract, hold strong potential for DED interventions due to their broad spectrum of DED-relevant pharmacological activities.

## Endophytic Actinobacteria from Thai Medicinal Plants as a Good Source of Bioactive Compounds and Genome Data Mining of Some Selected Strains

Onuma Kaewkla<sup>1\*</sup>, Arinthip Thamchaipenet<sup>2</sup>, and Christopher Milton Mathew Franco<sup>3</sup>

<sup>1</sup>Department of Biology, Faculty of Science, Mahasarakham University, Maha Sarakham 44150, Thailand

<sup>2</sup>Department of Genetics, Kasetsart University, Chatuchak, Bangkok 10900, Thailand

<sup>3</sup>Department of Medical Biotechnology, College of Medicine and Public Health, Flinders University, Adelaide, Australia

### Abstract:

This project aimed to study the biodiversity of endophytic actinobacteria from six medicinal plants that were collected from the Phujong-Nayoa National Park, Ubon Ratchathani province, Thailand, and study their antimicrobial activity. Leaves, twigs, and roots were collected and surface sterilized before being placed on three isolation media. One hundred eighty-four isolates were obtained. The majority of isolates belonged to the genus *Streptomyces* (n = 98; 53.3%), with the rest belonging to the genus *Nocardia* (n = 66; 35.9%), *Microbispora* (n = 6; 3.7%), *Pseudonocardia* (n = 6; 3.7%), *Micromonospora* (n = 5; 2.7%), and *Rhodococcus* (n = 3; 1.6%). The best medium was VL70 plus amino acid mixture solidified with gellan gum, yielding good biodiversity, including novel species. All actinobacteria were tested for antimicrobial activity against four bacteria and two fungi. Overall inhibition showed that *Streptomyces* had the highest number of strains showing good ( $\geq 75\%$  inhibition) antimicrobial activity, followed by *Nocardia* strains. The selected strains can inhibit methicillin-resistant *Staphylococcus aureus* (MRSA). Some strains could degrade *L*-arginine and asparagine. Genome data mining of three *Streptomyces* spp., *Streptomyces naphthomycinicus* TML10<sup>T</sup>, *Microbispora clasuenae* CLES2<sup>T</sup>, and *Micromonospora terminaliae* TMS<sup>7</sup> revealed that they contained biosynthesis gene clusters (BGCs) of various bioactive compounds. Also, gene prediction and protein sequence

analysis indicated that some strains had genes encoding valuable enzymes, arginine deiminase, and *L*-asparaginase type II, which benefit the treatment of cancer worldwide. Endophytic actinobacteria isolated from medicinal plants are a good source as antibiotic producers. Further study will elucidate the structure of bioactive compounds to prove their novelty and can be applied to use in the pharmaceutical arena.

## HPTLC Quantification of Gallic Acid from *Rhus chinensis* Mill Used for Diabetes in Manipur, North-Eastern India

Thokchom Biona\*, and Kalpana Rahate

School of Medical and Allied Sciences, Galgotias University, Greater Noida, Gautam Buddh Nagar, Uttar Pradesh, India 203201

### Abstract:

*Rhus chinensis* Mill, a medicinal plant widely used by indigenous people in Manipur, India, has long been utilized to treat diabetes and other metabolic problems. Despite its widespread ethnomedical importance, thorough phytochemical research into its antidiabetic potential is limited. The present study aims to elucidate *R. chinensis*' phytochemical profile and provide a scientific basis for its traditional use in diabetes management. Plant material was subjected to hydroalcoholic solvent extraction (70:30) using maceration technique and the yield of the extract was found to be 12.2%. The total phenolic content and flavonoid content of *R. chinensis* extract was found to be 245±0.03 mg GAE/g and 92±0.03 mg QE/g respectively. The extracts were further evaluated using *in-vitro* antidiabetic bioassays, including  $\alpha$ -amylase and  $\alpha$ -glucosidase inhibition assays, to assess their ability to modulate carbohydrate digestion. The IC<sub>50</sub> of *R. chinensis* hydroalcoholic extract against  $\alpha$ -amylase was 77.57 ±0.6 µg/mL while IC<sub>50</sub> of *R. chinensis* against  $\alpha$ -glucosidase was 72.45±0.9µg/mL. The antioxidant activity of the hydroalcoholic extract was found to be IC<sub>50</sub> 40±1.27 µg/mL performed by DPPH free radical scavenging assay and IC<sub>50</sub> 45±0.7 µg/mL by ABTS assay. Quantification of gallic acid was done using High-Performance Thin-Layer Chromatography (HPTLC) technique. The samples were spotted in the form of bands with CAMAG microliter syringe on a precoated TLC Silica gel 60 F254 plates. The plate was developed using toluene: ethylacetate: formic acid (5:4:1) (v/v/v) as a mobile phase and detection and quantification were performed by densitometric scanning at 254 nm. It was found that 49.63 µg/ml of gallic acid was present in 10mg of hydroalcoholic extract of *R. chinensis*. The findings provide significant scientific evidence that supports its ethnopharmacological claims and emphasize its potential as a natural source of bioactive chemicals for diabetes treatment and sets a foundation for future pharmacological validation.

## Validation of Traditional Knowledge and Drug Development

Sulaiman C T

Centre for Medicinal plants Research (CMPR) Arya Vaidya Sala, Kottakkal, Kerala, India

### Abstract:

Ayurveda, India's ancient medical system, offers a vast repository of traditional knowledge, particularly in the use of medicinal plants. Translating this wisdom into scientifically validated herbal drugs holds significant promise for developing safe, effective, and affordable therapeutics. This approach requires integrating Ayurvedic principles with modern technologies to ensure quality, safety, and efficacy. Analytical tools like chromatography and spectroscopy aid in standardizing formulations and understanding traditional processes such as Shodhana and Bhavana. Special attention is needed for polyherbal formulations, where therapeutic effects arise from synergistic interactions among multiple constituents, including minor compounds often overlooked in conventional research. Emphasizing holistic bioactivity aligns with Ayurvedic philosophy and offers a model for innovative drug discovery. Strategic integration of traditional knowledge with modern science can enhance global acceptance of Ayurveda and contribute meaningfully to the pharmaceutical landscape.

## Reimagining Global Health Through Integrative Medicine: Traditional Knowledge, Local Contexts, and Shared Futures

Zijing Hu

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### Abstract:

This talk positions traditional medicine and integrative healthcare as critical components of future global health strategies. Drawing from experiences of TCM practice, education, and research in South Africa, it reflects on how traditional knowledge systems can enhance health equity, strengthen community engagement, and expand therapeutic options. The presentation also considers policy frameworks and collaborative models that support safe, effective, and culturally attuned integrative care.

## Okinawan Yakuzen: The Traditional Healing Method Behind the World's Longest-Lived People

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<sup>2</sup>*Okinawa Blue Zone Association, Urasoe City, Okinawa, Japan*

### Abstract:

Yakuzen, meaning “healing with food,” is a traditional system of herbal and functional cooking deeply rooted in Okinawan culture. Okinawa, Japan, is home to some of the world’s longest-living people and is famously known as a longevity hotspot. This presentation will explore the history of Yakuzen, the role of Yakuzen healers, and the core principles behind this method, including the use of local ingredients, and the balance of yin and yang as well as hot, warm, neutral, cool, and cold foods. Yakuzen practices range from anti-inflammatory combinations to phlegm-reducing meals and are believed to contribute to Okinawa’s exceptional life expectancy. By linking cultural heritage with modern nutritional science, this talk will reveal how Yakuzen may be the secret behind the longevity diet.

## Gut Microbial Metabolism of Dietary Polyphenols in Health and Disease

Jan Claesen

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### Abstract:

The molecular mechanisms by which dietary fruits and vegetables confer health benefits remain poorly understood. Historically, beneficial properties in the amelioration of conditions like cardiometabolic disease or intestinal cancer have been attributed to the antioxidant activity of flavonoids. However, flavonoids are consumed in a largely glycosylated form, rendering them poorly available for small intestinal absorption and subsequent systemic distribution. Upon reaching the colon, select commensal gut bacteria can catabolize these flavonoid substrates into smaller monophenolic acids.

Our lab uses several mouse disease models to assess the contribution of microbial catabolism to the beneficial effects exerted by dietary flavonoids. In a diet-induced obesity model, we identified gut microbial flavonoid catabolites, which on their own are sufficient to reduce cardiometabolic disease burden in mice. Dietary supplementation with flavonoid composites attenuated obesity and continuous delivery of the catabolite 4-hydroxyphenylacetic acid was sufficient to reverse hepatic steatosis. We showed that this anti-steatotic effect is associated with the activation of AMP-activated protein kinase  $\alpha$ . Analysis of healthy human gut metagenomes revealed that under one percent of individuals contains a complete flavonol catabolic pathway, underscoring the rarity of this process in people. Our studies will impact the design of dietary and probiotic interventions to complement traditional cardiometabolic treatment strategies.

## Phytomedicines: Past, Present and Future

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### Abstract:

Phytomedicine, defined as the use of plant-derived substances for therapeutic purposes, has played a fundamental role in human healthcare for thousands of years. Archaeological and historical evidence suggests that the medicinal use of plants dates back at least 60,000 years, with early civilizations such as the Egyptians, Chinese, and Indians documenting herbal remedies for various ailments. Traditional medical systems, including Ayurveda, Traditional Chinese Medicine, and African traditional medicine, relied heavily on botanical resources as primary healthcare interventions. These practices formed the basis for many modern pharmaceuticals, as several widely used drugs were originally derived from plant secondary metabolites with pharmacological properties. In the present era, phytomedicine continues to gain global recognition due to increasing interest in natural products, the rise of chronic diseases, and the emergence of drug-resistant pathogens. Approximately 80% of the world's population relies partly on plant-based medicines for primary healthcare, particularly in developing countries. Advances in phytochemistry, pharmacology, and biotechnology have enabled the isolation, characterization, and validation of bioactive plant compounds responsible for therapeutic effects. Contemporary research integrates ethnobotanical knowledge with modern analytical techniques, including metabolomics, molecular biology, and computational drug discovery, to identify novel phytochemicals with potential medicinal applications.

Looking to the future, phytomedicine holds promise for innovative drug discovery and sustainable healthcare solutions. Emerging technologies such as synthetic biology, nanotechnology, pharmacogenomics, systems biology are expected to enhance the development of standardized plant-based therapeutics and improve their efficacy and safety. However, challenges remain, including issues related to quality control, standardization, regulatory frameworks, and conservation of medicinal plant biodiversity. Addressing these challenges through interdisciplinary collaboration and evidence-based research will be essential to fully harness the therapeutic potential of phytomedicines. Consequently, the integration of traditional knowledge with modern scientific methodologies will likely shape the future landscape of global healthcare, positioning phytomedicine as a significant contributor to next-generation therapeutics.

## Ultrasonic-Assisted Extraction and Ethosome-Based Delivery of Mahajak Oil to Enhance Lignan Recovery and Skin Permeation

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### Abstract:

Mahajak is a nine-herb polyherbal oil recorded in King Narai's Medicinal Formulas (Ayutthaya period) comprising sesame oil, kaffir lime, cumin, fennel, garden cress, black cumin, dill, long pepper, and camphor, traditionally applied for pruritus, muscle pain, and wounds. However, conventional deep-frying plus infused aromatization is time-consuming and limits scale. This study accelerated production using ultrasonic-assisted extraction (UAE) and enhanced dermal delivery via ethosomes while preserving Mahajak's chemical profile. Oils prepared by maceration (MMOF), conventional aromatization (CMOF), and UAE at varied sonication conditions (UMOF10/20/30) were compared for oil recovery and GC-MS fingerprints. UMOF20 and UMOF30 achieved significantly higher oil recovery than CMOF, MMOF, and UMOF10 ( $p < 0.05$ ), while retaining CMOF-like fingerprints with elevated levels of ten constituents. The optimized UAE oil (UMOF20) was formulated into nine ethosomal systems (F1-F9; cold method) containing 2-4% w/w phospholipids and 20-40% w/w ethanol. The lead formulation (UMOF20-F1) showed pH  $4.77 \pm 0.02$ , vesicle size  $225.00 \pm 3.60$  nm, PDI  $0.35 \pm 0.01$ , zeta  $-11.87 \pm 0.55$  mV, and high entrapment efficiency for sesamin and sesamolin ( $94.13 \pm 0.21\%$  and  $99.14 \pm 0.07\%$ ). Accelerated stability at  $40 \pm 2$  °C for 90 days yielded size  $239.12 \pm 3.65$  nm, PDI  $0.35 \pm 0.01$ , zeta  $-11.8 \pm 0.32$  mV, and pH  $4.56 \pm 0.10$ , indicating acceptable short-term stability with gradual drift after 60-90 days. Ex vivo permeation across skin was markedly improved versus non-encapsulated UMOF20. UAE thus streamlines Mahajak production and enriches characteristic phytochemicals, while ethosomal encapsulation substantially improves transdermal delivery, supporting scalable development of value-added topical Mahajak products.

# Effectiveness and Safety of Turmeric for the Treatment of COVID-19: An Updated Systematic Review and Meta-Analysis of Randomized Controlled Trials

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## Abstract:

This comprehensive and updated systematic review and meta-analysis (SR-MA) was performed to determine the effectiveness and safety of turmeric in patients with coronavirus disease 2019 (COVID-19). Multiple databases were searched from inception to July 31, 2024, for randomized controlled trials (RCTs) evaluating the use of turmeric in patients with mild to severe COVID-19. This SR-MA uniquely includes recent trials conducted alongside modern antiviral-based regimens and explores effect modifiers by disease severity, comorbidity, formulation, and treatment duration. Twenty-three RCTs with 1,407 participants were included, making this the largest synthesis to date. Most studies (17/23, 73.9%) enrolled hospitalized patients; over half involving mild to moderate cases. The most common intervention was nano-curcumin 160–240 mg/day (39%), used as an adjunct to standard care. Nine studies were rated high risk of bias (ROB). Meta-analysis showed turmeric significantly reduced all-cause mortality (Relative risk (RR) = 0.39; 95% confidence interval (95%CI): 0.23–0.67;  $I^2 = 0\%$ ;  $n = 8$  RCTs; moderate certainty), suggesting a 61% reduction in risk of death. It also reduced the need for intubation/mechanical ventilation (RR = 0.35; 95%CI: 0.17–0.72) and clinical deterioration (RR=0.36; 95%CI: 0.22–0.59), while improving overall symptom resolution (RR = 1.36; 95%CI: 1.16–1.59). These results remained robust after excluding high ROB studies. Adverse events, mostly mild gastrointestinal symptoms, were comparable to placebo. In conclusion, turmeric, particularly bioavailability-enhanced nano-curcumin, provides meaningful clinical benefits and a favorable safety profile as an adjunctive therapy for COVID-19. Further large-scale, high-quality, multicenter RCTs are warranted to confirm its therapeutic potential, particularly in resource-limited settings.

## Glucose and Lipid Lowering Effects of *Enhydra fluctuans* Extract in Cadmium-Treated Normal and Type-2 Diabetic Model Rats

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## Abstract:

**Background:** Cadmium (Cd) exposure and diabetes-related hyperglycemia are increasingly recognized as interacting factors that aggravate metabolic dysregulation and organ damage. Natural plant-based therapeutics may offer protective effects against such combined metabolic and toxic insults. This study investigated the antihyperglycemic, antidyslipidemic, and tissue-protective effects of *Enhydra fluctuans* extract in cadmium-induced normal and type 2 diabetic rat models.

**Methods:** Forty-eight Long-Evans rats were randomly divided into six groups: normal control (N-C), cadmium-treated normal (N-Cd), plant-treated normal (N-P), plant plus cadmium-treated normal (N-PCd), plant-treated diabetic (DM-P), and plant plus cadmium-treated diabetic (DM-PCd). Cadmium toxicity was induced using CdCl<sub>2</sub>, and *E. fluctuans* extract was administered orally at 200 mg/kg for 21 days. Blood glucose and biochemical parameters were measured using enzymatic colorimetric methods. Liver and heart tissues were examined histologically using hematoxylin and eosin staining. Statistical and bivariate correlation analyses were performed to assess metabolic associations.

**Results:** Administration of *E. fluctuans* extract significantly reduced blood glucose levels in N-PCd and DM-PCd groups ( $p < 0.05$ ), and in the DM-P group ( $p < 0.01$ ). While total lipid levels were not significantly altered, the extract significantly improved the triglyceride to HDL-cholesterol (TG/HDL-C) ratio in N-P and DM-PCd groups ( $p < 0.05$ ). Cadmium exposure caused significant body weight loss and induced hepatic and renal impairment, as evidenced by altered biochemical markers. Bivariate analysis demonstrated significant positive correlations between serum glucose and SGPT levels ( $p < 0.05$ ), as well as between SGPT and TG/HDL-C ratio ( $p = 0.019$ ), particularly in diabetic plant-treated and pooled groups. Histopathological evaluation revealed severe liver and cardiac damage in cadmium-treated rats, including inflammation, necrosis, nuclear pyknosis, fibrosis, and myocardial fiber loss, whereas plant-treated groups showed marked tissue protection.

**Conclusion:** *Enhydra fluctuans* extract exhibits potent antihyperglycemic activity, partial antidyslipidemic effects, and protective action against cadmium-induced hepatic and cardiac damage, suggesting its potential as a novel oral antihyperglycemic agent in heavy metal-exposed environments.

## Antioxidant Activity of Thai Traditional Herbal Effervescent Tablets (Ya Od Ya Ba) for Methamphetamine Withdrawal

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### Abstract:

Methamphetamine use disorder is a major global public health concern. Withdrawal symptoms, including anxiety, depression, and cognitive impairment, are associated with dopaminergic dysregulation and oxidative stress, which may result from excessive production of reactive oxygen species (ROS). This condition leads to neuronal damage and increases the risk of relapse. The *Ya Od Ya Ba* formulation, a traditional Thai herbal remedy, has long been used for detoxification and symptom relief; however, its antioxidant potential in modern pharmaceutical dosage forms remains insufficiently explored. In this study, the *Ya Od Ya Ba* formulation, obtained from the Department of Thai Traditional and Alternative Medicine, Ministry of Public Health, Thailand, was evaluated for its antioxidant activity using DPPH and ABTS radical scavenging assays at concentrations ranging from 0.015625 to 1 mg/mL. The results were expressed as percentage inhibition, and IC<sub>50</sub> values were determined using linear regression analysis. The findings demonstrated a concentration-dependent increase in antioxidant activity in both assays. In the DPPH assay, scavenging activity ranged from 12.29% to 74.81% (IC<sub>50</sub> ≈ 0.36 mg/mL), whereas the ABTS assay showed activity ranging from 4.15% to 63.15% (IC<sub>50</sub> ≈ 0.75 mg/mL), suggesting relatively higher activity in the DPPH assay compared to ABTS. These results indicate that the effervescent *Ya Od Ya Ba* formulation possesses notable antioxidant activity and may contribute to reducing oxidative stress associated with methamphetamine withdrawal. This study provides preliminary evidence supporting the potential integration of Thai traditional herbal formulations with modern pharmaceutical development for applications in oxidative stress related conditions.

**Keywords:** Thai traditional medicine, effervescent tablets, antioxidant activity, methamphetamine withdrawal

### Evaluation of Nano-Phyto Formulations of Berberine and Pheophorbide-a Mediated Photodynamic Therapy on Human Lung Cancer Spheroids Model

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#### Abstract:

Lung cancer is the second most common cancer globally, with approximately 2 million new cases and 1.76 million deaths each year, largely due to late diagnosis. Major risk factors include smoking, radiation, pollution, genetic predisposition, and poor diet. Conventional treatments—such as surgery, chemotherapy, and radiotherapy—are often limited by toxicity and drug resistance. Photodynamic therapy (PDT) has emerged as a non-invasive, targeted alternative with reduced systemic side effects, particularly when enhanced by nanotechnology to improve photosensitizer (PS) delivery. Natural PSs like Berberine (BBR) and Pheophorbide-a (PPBa) exhibit strong anticancer properties. BBR induces reactive oxygen species (ROS) and apoptosis but suffers from poor solubility and stability. PPBa, a chlorophyll derivative, shows high photodynamic efficiency with minimal toxicity to healthy cells. Nanocarrier systems, especially liposomes, can improve PS solubility, stability, and tumor targeting. Three-dimensional (3D) spheroid models better mimic tumor physiology, making them suitable for evaluating such therapies. This study investigated liposomal nano-phytoformulations incorporating gold nanoparticles (AuNPs) and either BBR or PPBa (Lipo@AuNPs@BBR and Lipo@AuNPs@PPBa) in A549 lung cancer spheroids. Characterization confirmed successful co-loading and nanoscale sizes (~88–100 nm). IC50 values were 80 µg/mL for BBR and 60 µg/mL for PPBa formulations. Upon light activation (405 nm for BBR, 660 nm for PPBa), both nanocomplexes significantly reduced cell viability and proliferation while increasing cytotoxicity and inducing morphological changes. Drug release studies showed an initial burst (2–4 h) followed by sustained release, with up to ~90% release efficiency. Apoptosis assays confirmed enhanced cell death, with increased expression of pro-apoptotic markers (BAX, p53, cytochrome c). Overall, these liposomal nanocomplexes improved PS delivery, stability, and therapeutic efficacy through synergistic effects with AuNPs. The findings highlight their potential for advanced PDT applications, with future studies recommended for in vivo validation and hypoxia-targeted enhancements.

### GACP and GMP in the Cultivation of Medicinal Cannabis

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#### Abstract:

Regulation is typically slow in following trends. When it follows-up, it usually defines rather strict specifications for quality. Europe and the USA both included quality specifications for Cannabis flowers in their pharmacopoeias, with definitions for assays on CBD and THC as well as contaminants. There is currently a tendency towards stricter limits for the microbiological load, which requires good hygienic approaches in cultivation.

Current regulatory trends call for a cultivation of Cannabis flowers under GACP, with any post-harvesting activity performed under GMP. Major requirements for a GMP certification relate to the room conditions, especially temperature control by mapping and monitoring, and a quality management system governing all processes and documentations. Quality risk management is at the core of GMP. The overall goal is not necessarily to produce the best-possible product, but internal transparency and repeatability at all steps, leading to a consistent product.

Whereas GACP is still more open and currently confirmed by specialized organizations or through client audits, GMP is certified by governmental authorities. For exported products, there may even be a requirement for inspections from the importer's government. This needs to be carefully and systematically planned. It requires personnel with an understanding of GMP issues. It may seem very complex, but it is not an impossible task.

## Nanoformulations of Phytochemicals in Photodynamic Therapy for Cancer

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### Abstract:

Cancer remains a major global health burden, with breast cancer (BC) being the most frequently diagnosed malignancy among women worldwide. Despite advances in early detection and therapeutic strategies, conventional treatments including surgery, chemotherapy, radiotherapy, and hormone therapy are often limited by poor specificity, systemic toxicity, drug resistance, and disease recurrence. Nanotechnology has emerged as a promising approach to address these challenges by enabling targeted drug delivery, enhanced therapeutic efficacy, and reduced damage to healthy tissues. In parallel, plant-derived natural products continue to play a vital role in cancer therapy and offer sustainable alternatives for the green synthesis of nanoparticles (NPs). Berberine (BBR) and Pheophorbide a (PPBa) are promising photosensitizers (PSs) for photodynamic therapy (PDT) of cancer; however, their poor water solubility and limited bioavailability restrict clinical translation. This study developed green-synthesized metallic nanoparticles and liposome-based hybrid systems to enhance delivery and efficacy. A gold nanoparticle–liposome hybrid encapsulating PPBa (AuNPs-LIP-PPBa) was synthesized and confirmed by UV–Vis, FTIR, HR-TEM, SEM, and EDS analyses. In vitro studies against MDA-MB-231 breast cancer cells demonstrated enhanced ROS generation, mitochondrial damage, and apoptosis under 660 nm irradiation, with an IC<sub>50</sub> of 10 µg/mL. Separately, BBR-loaded green silver nanoparticles (BBR-AgNPs), biosynthesized using *Senna didymobotrya*, exhibited colloidal stability and phototoxicity in MCF-7 cells upon 470 nm PDT, with an IC<sub>50</sub> of 1.35 µg/mL. Furthermore, two liposomal nanocomplexes, Lipo@AuNPs@BBR and Lipo@AuNPs@PPBa, were evaluated in A549 3D spheroids. Post-PDT (15 J/cm<sup>2</sup>), both formulations significantly reduced ATP, increased LDH release, and induced apoptosis (IC<sub>50</sub> = 80 µg/mL for BBR; 60 µg/mL for PPBa), with strong upregulation of apoptotic markers (BAX, cytochrome c, p53). Overall, these results demonstrate that green-synthesized nanoparticles and liposomal nanocarriers can improve PDT outcomes through targeted delivery, ROS amplification, and apoptosis induction, highlighting their translational potential for preclinical cancer therapy.

## Hepatoprotective Potential of Krishna Tulsi (*Ocimum tenuiflorum*): From Traditional Medicine to Phytopharmaceutical Development

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### Abstract:

Krishna Tulsi (red forma of *Ocimum tenuiflorum* Linn.), a member of the Lamiaceae family, has been traditionally revered in Ayurveda for its diverse therapeutic functions including hepatoprotective property. These abstract highlights the strategic translation of this traditional knowledge towards developing a hepatoprotective phytopharmaceutical (PP) from Krishna Tulsi. Bioactivity guided fractionation was employed to obtain a polyphenol-rich fraction and target Nrf2-ARE pathway to ameliorate oxidative stress that occurs during hepatotoxicity. We found that polyphenols and their derivatives like quercetin, peonidin, apigenin, luteolin, caffeic acid, chlorogenic acid, and Kaempferol activated the Nrf2-ARE pathway and enhanced cellular antioxidant defenses. The PP exhibited concentration dependent ROS scavenging potential evaluated in the HepG2 cell line. It also effectively upregulated Nrf2, HO-1, NQO1 and downregulated Keap1 in a tBHP induced hepatotoxicity model in mice. PP also protected tBHP-induced oxidative damage of DNA bases as it could decrease 8-hydroxydeoxyguanosine (8-OHdG) content by increasing the Sirtuin- 1 level. This was also evident from increased expression of BER and NER genes. Thus, PP activated the Nrf2-ARE pathway and enhanced cellular antioxidant defenses to ameliorate hepatocellular toxicity. Overall, our work highlighted that harnessing the therapeutic potential of Krishna Tulsi may offer novel approaches for the management and prevention of oxidative stress-related disorders.

**Keywords:** Krishna Tulsi, Hepatotoxicity, Phytopharmaceutical, Polyphenols, Nrf2 ARE, DNA damage

## Design and Synthesis of Targeted Rutin Derivatives as CK2 Alpha Kinase Inhibitors

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### Abstract:

Triple Negative Breast Cancer (TNBC) is an aggressive and clinically problematic subtype of breast cancer caused by the absence of estrogen, progesterone, and HER2 receptors, resulting in restricted therapy options and a poor prognosis. Rutin, a natural flavonoid glycoside with reported antioxidant, anti-inflammatory and anticancer effects, has been explored limitedly for clinical therapy. In our study semisynthetic analogs of rutin have been designed, synthesized and characterized along with in vitro testing against TNBC. Rutin was methylated with dimethyl carbonate in presence of potassium carbonate and dimethylformamide, followed by acidolysis with HCl in presence of 95% ethanol to form intermediate tetramethylated rutin, with the help of molecular docking. It was then refluxed with different phenolic acids to obtain three ester derivatives of ferrulic acid, caffeic acid and salicylic acid. The synthesized compounds were characterized and evaluated for TNBC against MDA-MB-231 triple-negative breast cancer cell lines by MTT assay. The results indicated that all three test compounds RCP, RCF, and RSA had strong dose-dependent lethal effects on the breast cancer cells. Among them, RCP showed the maximum reduction in cell viability, indicating substantial anti-proliferative action, with around 73% inhibition at the highest tested concentration. RSA and RCF had significant cytotoxic effects, lowering cell viability by approximately 71% and 69%, respectively. Thus, molecular docking studies for the design of a semisynthetic bioactive molecule paved the way to desirable CK2 alpha kinase inhibitors with improved activity. The findings highlighted the potential of rutin-based molecules for the treatment of TNBC providing a basis for advanced pharmacological validation.

## Efficacy and Safety of SKCPT in Patients with Knee Osteoarthritis: A Multicenter, Randomized, Double-Blinded, Active-Controlled Phase III Clinical Trial

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### Abstract:

Ethnopharmacological relevance: Osteoarthritis (OA) is the most prevalent type of arthritis worldwide and a leading cause of years lost to pain and disability. Among the current pharmacological treatments for OA, symptomatic slow-acting drugs for OA (SYSADOA) induce pain relief and aim to improve joint function by relieving inflammation while causing fewer gastrointestinal and cardiovascular adverse events than nonsteroidal anti-inflammatory drugs (NSAIDs). SKCPT is a herbal SYSADOA formulated from *Clematis mandshurica*, *Trichosanthes kirilowii*, and *Prunella vulgaris* powdered extracts. This preparation has been shown to induce cartilage protection and anti-inflammatory effects in preclinical studies and inhibit glycosaminoglycan degradation and catabolic gene expression in human OA chondrocytes and cartilage. Aim of the study: We aimed to evaluate the non-inferiority of SKCPT to celecoxib and safety for treating knee OA. Materials and methods: This multicenter, randomized, double-blind, phase III clinical trial enrolled adults with primary knee OA who were randomized (1:1) to SKCPT 300 mg twice daily or celecoxib 200 mg once daily for 12 weeks. Results: In total, 278 patients were assigned to treatment (SKCPT, 136; celecoxib, 142) for approximately 12 weeks. The primary endpoint was the mean change of Korean Western Ontario and McMaster Universities Osteoarthritis Index (K-WOMAC) pain subscale scores from baseline to Day 84. The mean change (least squares [LS] mean  $\pm$  standard error) from baseline to Day 84 was  $-23.74 \pm 1.48$  for SKCPT and  $-25.88 \pm 1.44$  for celecoxib. The two-sided 95% confidence interval of the difference (LS mean) between groups was  $[-1.94, 6.20]$ , confirming that the upper limit was less than the non-inferiority margin of 10. Additionally, there were no significant differences in the secondary endpoints (mean changes of K-WOMAC pain, physical, stiffness subscale, and total score, and the frequency and number of doses of rescue medications) between groups at all time points. Differences between groups in adverse events and adverse drug reactions were not significant, and no serious adverse events occurred. Conclusions: SKCPT efficacy was non-inferior, and its safety profile was similar, to celecoxib. Building on previous results showing that SYSADOA reduce NSAID intake, the present results suggest that the SYSADOA SKCPT could effectively replace NSAIDs in knee OA treatment while avoiding long-term side effects.

## Safety Profiling and Skin Barrier Characterization of a Topical Herbal Cream Containing *Ficus deltoidea* Leaf Extract

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### Abstract:

*Ficus deltoidei*, a medicinal plant traditionally used in Southeast Asia, is rich in bioactive flavonoids such as vitexin and isovitexin. This study aimed to evaluate the in vitro safety of *F. deltoidea* leaf extract and the efficacy of a topical herbal cream containing *F. deltoidea* leaf extract in promoting skin barrier recovery, including transepidermal water loss (TEWL), hydration, melanin, erythema and elasticity. The safety of *F. deltoidea* leaf extract was evaluated using three in vitro assays: a reconstructed human epidermis (RHE) model for irritation assessment, a direct peptide reactivity assay (DPRA) for skin sensitization potential and a direct cell contact cytotoxicity test on L-929 mouse fibroblast cells. The extract was categorized as a non-irritant in the RHE test, with tissue viability remaining above 50%. All acceptance criteria were met, showing an average peptide depletion of 10.21% in the DPRA, classifying it as low reactive, and it was found to be non-cytotoxic at a 0.1% concentration. An in vivo tape-stripping model was employed in 20 human volunteers to simulate superficial skin barrier disruption. The test sites were treated with *F. deltoidea* cream, placebo cream, or untreated skin (control). Treatment with *F. deltoidea* cream significantly accelerated skin barrier repair, as evidenced by a marked reduction in TEWL and improved hydration compared with the placebo and control groups. The formulation also reduced erythema and melanin levels, indicating anti-inflammatory and anti-melanogenic effects, and enhanced skin elasticity, suggesting anti-aging potential. Pearson's correlation analysis revealed strong interdependence among the parameters, with TEWL being negatively correlated with hydration ( $r = -0.96$ ) and elasticity ( $r = -0.84$ ), whereas hydration was positively correlated with elasticity ( $r = 0.95$ ). The therapeutic effects of *F. deltoidea* cream are attributed to its flavonoid content and antioxidant properties. This study provides scientific support for the traditional use of *F. deltoidea* in skin-related treatments.

## Rutin Hydrate-loaded Fenugreek Seeds-generated Exosome-like Nanoparticles: Connecting Rutin Hydrate with Primary Dysmenorrhea by Network Pharmacology and Inflammation Reduction Synergism in Disease-induced Mice Model

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### Abstract:

Primary dysmenorrhea (PD) is a common and debilitating condition affecting millions of women globally, yet often remains overlooked despite its impact on quality of life. The study investigates the potential of fenugreek seed-derived exosome-like nanoparticles (EPDENS) and rutin hydrate-loaded EPDENS to alleviate pain in PD. EPDENS were prepared using a polymer-based precipitation technique with polyethylene glycol 6000, followed by a systematic optimisation process comprising an initial risk assessment, Taguchi orthogonal array screening, and a Box-Behnken design. The optimised EPDENS demonstrated desirable characteristics:  $6.4 \times 10^{10}$  particles/ml, mean size of  $114.1 \pm 0.508$  nm, protein content of  $8.62 \pm 0.50$  mg/ml, trigonelline concentration of  $107.57 \pm 1.80$   $\mu$ g/ml, and RNA content of  $56.826 \pm 0.749$  ng/ $\mu$ l. Rutin hydrate, a flavonoid glycoside, was loaded into the EPDENS via the freeze-thaw method, achieving a drug entrapment of  $32.91 \pm 1.33\%$ . Characterisation using X-ray diffraction, differential scanning calorimetry, and scanning electron microscopy confirmed successful loading. In vitro release studies showed that  $76.77 \pm 0.27\%$  of externally added rutin hydrate and  $44.75 \pm 0.49\%$  of endogenous trigonelline were released from the rutin hydrate-loaded EPDENS at different pH conditions. Network pharmacology identified key targets of rutin, including COX-2, NLRP3, and MAP kinase, revealing stronger interactions with NLRP3 and MAP kinase than with aspirin, suggesting potential inhibitory effects. Confocal laser scanning microscopy demonstrated effective internalisation of coumarin 6-loaded (Rutin hydrate-loaded) EPDENS in RL95-2 uterine cells. The rutin hydrate-loaded EPDENS significantly reduced writhing responses compared with aspirin in Swiss Albino mice, indicating their potential. Histological analysis revealed restoration of normal uterine morphology. The formulation modulated prostaglandins by lowering PGF<sub>2</sub> $\alpha$  and increasing PGE<sub>2</sub>, thereby reducing the PGF<sub>2</sub> $\alpha$ /PGE<sub>2</sub> ratio. Future research should focus on conducting clinical trials to validate safety and efficacy in humans, and exploring the potential of these EPDENS to treat various inflammatory and pain-related conditions.

## Medicinal Cannabis and Women's Health

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<sup>2</sup>NICM Health Research Institute, Australia

### Abstract:

Medicinal cannabis has a long history of use in gynaecology in several cultures. The endocannabinoid system, a complex neuro- and immuno- regulatory cell signalling system provides the basis for understanding how medicinal cannabis may be useful in the treatment of many diseases and conditions, including those affecting women in particular. The endocannabinoid system components are found throughout the CNS and body, including the female reproductive system. Components of cannabis interact with the endocannabinoid system. In this presentation, Professor O'Brien will discuss some of the scientific rationale for consideration of medicinal cannabis as a potential treatment option for some women's health conditions.

## Medicinal Potential of Mulberry (*Morus indica* L.) Leaves: *In vitro* and *In vivo* Assessment

Andallu B

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### Abstract:

The leaves of mulberry (*Morus indica* L.) of *Moraceae* family possess several [bioactive compounds](#) that can fight against various ailments. *In vitro* antioxidant and *in vivo* antidiabetic, hypolipidemic, and antioxidant potential of mulberry leaves were investigated. Ethanolic extract of mulberry leaves was tested for [antioxidant activity](#) *in vitro* using butylated hydroxytoluene as a positive control. *In vivo* studies conducted in STZ-diabetic Wistar albino rats, supplemented with mulberry leaves, showed good glycemic control, hypolipidemic, antioxidant, and cataract retardation effects in the experimental group as compared with diabetic control rats. Further the studies were extended to type 2 diabetes subjects given mulberry leaf powder (5 g/day) in capsules for 60 days, who served as subjects for *in vivo* assessment. Mulberry leaf extract scavenged [DPPH](#), [nitric oxide](#) and superoxide radicals in a concentration-dependent manner and inhibited FeSO<sub>4</sub>-induced [lipid peroxidation](#) and [hydroperoxides](#) in the erythrocyte [membrane model](#). Mulberry supplementation significantly improved glycemic control in the diabetes experimental group vs. glibenclamide-treated controls. The results from pre- and post-treatment analyses of blood and urine samples showed significantly decreased fasting blood glucose, serum total cholesterol, triglycerides, plasma free fatty acids, LDL-cholesterol, VLDL-cholesterol, plasma peroxides, urinary peroxides, while increasing HDL-cholesterol in mulberry mulberry-supplemented group. Although the patients with glibenclamide treatment showed marginal improvement in glycemic control, the changes in the lipid profile were not statistically significant except for triglycerides (10%, p<0.05), plasma peroxides (15%, p<0.05), and urinary peroxides (19%, p<0.05). Mulberry displayed an apparent effect on the level of glycosylated hemoglobin (HbA1c) in diabetic patients. Both *in vitro* and *in vivo* experiments proved that mulberry leaves possess tremendous potential to fight against the multifactorial pathogenicity of diabetes, which can be postulated to be a result of the synergistic action of phytochemicals such as [carotenoids](#), [flavonoids](#), moracins, deoxynojirimycin, Moran A present in mulberry leaves. Hence, the leaves can be used as a functional food being rich in nutrients, phytochemicals, nontoxic, and inexpensive, as mulberry can be grown in our home garden.

**Keywords:** Mulberry, phytochemicals, *in vitro*, *in vivo*, antioxidant, antidiabetic

## Response Surface Optimization of a Perilla–Fenugreek–Kodo Millet Functional Food Premix for Glycemic Enzyme Inhibition

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### Abstract:

This study aimed to optimize an indigenous functional food premix composed of Perilla seeds, Fenugreek seeds, and Kodo millet for its inhibitory effects on the key carbohydrate-digesting enzymes  $\alpha$ -amylase and  $\alpha$ -glucosidase, which are critically involved in postprandial hyperglycemia associated with Type 2 Diabetes Mellitus (T2DM). A 20-run Central Composite Design (CCD) was employed to systematically evaluate the individual, interaction, and quadratic effects of the three ingredients using Response Surface Methodology.

The quadratic model developed for  $\alpha$ -amylase inhibition was statistically significant ( $F = 12.88$ ,  $p = 0.0004$ ), with a nonsignificant lack of fit ( $p = 0.0999$ ), indicating good model adequacy. The model demonstrated a strong adjusted  $R^2$  value (0.8559), although the predicted  $R^2$  (0.4198) suggested moderate predictive performance. Significant contributors to  $\alpha$ -amylase inhibition included the interaction between Perilla and Fenugreek (AB) and the quadratic effects of Fenugreek ( $B^2$ ) and Kodo millet ( $C^2$ ).

In contrast, the  $\alpha$ -glucosidase inhibition model exhibited highly robust quadratic behavior ( $F = 148.58$ ,  $p < 0.0001$ ), with a nonsignificant lack of fit ( $p = 0.7929$ ). The model showed excellent reliability and predictive accuracy, reflected by high adjusted (0.9790) and predicted (0.8069)  $R^2$  values. Response surface analysis revealed that intermediate concentrations of all three components produced maximal inhibitory activity against both enzymes.

The observed enzyme inhibition patterns closely corresponded with total phenolic content measurements, suggesting that polyphenolic compounds play a central role in mediating the bioactivity of the premix. Overall, the optimized Perilla–Fenugreek–Kodo millet premix demonstrated concentration-dependent inhibition of  $\alpha$ -amylase and  $\alpha$ -glucosidase, highlighting its potential as a functional dietary intervention for attenuating postprandial blood glucose spikes and supporting nutritional management strategies for individuals with T2DM.

## In Silico Assessment of Phenylpropanoids from *Ageratina adenophora* Reveal Dual Antidiabetic and Anticancer Potential via Molecular Docking and ADMET Profiling

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### Abstract:

Plants remain an important source of structurally diverse secondary metabolites with potential relevance to multifunctional diseases such as cancer and diabetes. In this study, phenylpropanoid compounds from *Ageratina adenophora* were investigated using integrated in silico molecular docking and ADMET profiling to explore their prospective antidiabetic and anticancer relevance. Thirteen phenylpropanoids were identified and structurally characterized using ultra-high-performance liquid chromatography coupled with a quadrupole time-of-flight mass spectrometer (UHPLC-QTOF-MS).

All identified compounds were evaluated for drug-likeness, pharmacokinetic properties, and predicted toxicity using ADMET modeling, followed by molecular docking against selected protein targets implicated in cancer and glucose regulation, including colon cancer antigen 10 (PDB ID: 2HQ6), a lung cancer-associated target (humanized monomeric RadA complexed with naphth-1-ol; PDB ID: 4B32), and the insulin receptor (PDB ID 1IR3). Among the screened compounds, isolariciresinol demonstrated the most favorable overall profile, exhibiting compliance with key drug-likeness criteria, predicted oral bioavailability, and acceptable ADMET characteristics.

Docking analyses revealed that isolariciresinol exhibited consistent binding affinities across all targets, with docking scores of -6.95 kcal/mol. These values were exceeded, those of reference compounds, including the anticancer fluorouracil and the antidiabetic agent acarbose. Ligand efficiency calculations and hydrogen-bond interaction analyses further supported the stability and specificity of the predicted ligand-protein interactions.

Collectively, these findings suggest that phenylpropanoids from *A. adenophora*, particularly isolariciresinol, represent promising computational leads with potential relevance to both cancer and diabetes. However, experimental validation through *in vitro* and *in vivo* studies is required to substantiate their biological activity and therapeutic feasibility.

**Keywords:** Phenylpropanoids, Isolariciresinol, Molecular Docking, ADMET

## Morphological and Phytochemical Changes of Medlar Fruit During the Ripening Process

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### Abstract:

Medlar fruit (*Mespilus germanica* L.) belongs to Rosaceae family mainly grown in the Northern hemisphere. Fruits are harvested when physiologically ripe, after which they are placed in a dry cool place until they reach consumer acceptance of ripeness. The Medlar fruits are rich sources of dietary fiber, phytochemicals, carotenoids and chlorophyll that may be associated with number of beneficial health effects. Furthermore, the ripeness degree, levels of sugars, color, size, and texture are some of the fruit features considered in medlar trading. Despite its rich nutritional and functional content, the fruit remains relatively unexplored in scientific research.

The Medlar fruits at different stages of ripeness, physiological ripe (PR) and consume ripe (CR) were analyzed for their physical characteristics, pigments (chlorophyll a & b,  $\beta$ -carotene, lycopene), total phenolic content (TPC), total flavonoid content (TFC), while *in vitro* antioxidant activity was determined using the total antioxidant capacity (TAC), cupric reducing antioxidant capacity (CUPRAC), and 2,2'-azino-bis(3-ethylbenzothiazoline-6-sulfonic acid (ABTS) assays and samples were characterized by FTIR, while color measurements were performed (RGB values) in flesh and peel using smart phone application Colour Detector.

The mass was higher in CR fruit (16.0 $\pm$ 3.6g vs 14.6 $\pm$ 3.3g), and the highest concentration was determined for chlorophyll a and b (31.51 $\pm$ 0.63 and 22.56 $\pm$ 0.33 $\mu$ g/g, respectively). The TPC and TFC did not differ between the two types of fruit. Antioxidant assays indicated higher *in vitro* activity of CR fruits (TAC=9.97 $\pm$ 0.63mg/g<sub>AEE</sub>; ABTS=3.04 $\pm$ 0.19 $\mu$ mol/g<sub>TROLOX</sub>; CUPRAC=0.99 $\pm$ 0.09mg/g<sub>AEE</sub>). The process of Medlar ripening was reflected in FTIR spectra by the decrease in esterified pectin band at 1740cm<sub>-1</sub>, changes in carbohydrate-associated peaks in 1500–900cm<sub>-1</sub> region, variations in the aromatic region 1600–1500cm<sub>-1</sub> and the change in the intensity of –OH stretching vibrations around 3300cm<sub>-1</sub>. The current results indicate high phytochemical composition of this fruit with the potential industrial use as a functional ingredient during the new food development.

## Linking Rhizosphere Microbiota Biomass and Activities to Secondary Metabolite Variation in Some Native Medicinal Plants from Semiarid Ecosystem

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### Abstract:

Medicinal plants are valuable sources of bioactive compounds used in traditional and modern medicine. In semi-arid ecosystems, understanding how environmental factors influence plant–microbiome interactions is essential

for their sustainable use and conservation. This study investigates the effects of soil physicochemical properties and rhizospheric microbiota on secondary metabolite production in two spontaneous medicinal species, *Ziziphus lotus* and *Peganum harmala*, from the semi-arid Rhamna region of Morocco. Sampling was conducted across three environmentally contrasting sites, evaluating soil characteristics, plant biochemical traits, secondary metabolites, microbial biomass, and enzymatic activities.

Significant site–plant interactions were observed across all measured parameters. *P. harmala* at site 3 was associated with higher soil humidity (11%) and alkaline pH (8.5), whereas *Z. lotus* showed the highest electrical conductivity (514  $\mu\text{S}/\text{cm}$ ). Rhizospheric soils of both species contained higher total organic carbon (0.73%) and organic matter (1.27%) compared to bulk soil. Nutrient dynamics differed between species: *Z. lotus* enriched nitrogen and potassium, while *P. harmala* enhanced phosphorus availability. Microbial biomass phosphorus peaked in *P. harmala* (0.2 ppm), whereas *Z. lotus* exhibited greater microbial enzymatic activities, particularly urease (122  $\mu\text{g}/\text{g}/\text{h}$ ) and dehydrogenase (0.8  $\mu\text{g}/\text{g}/\text{h}$ ).

Biochemical responses also reflected distinct adaptive strategies. *Z. lotus* accumulated higher soluble sugars (0.16 g/g FW) and chlorophyll (5 mg/g FW), suggesting a carbon-based osmoprotection mechanism. In contrast, *P. harmala* showed elevated proline levels (>1000  $\mu\text{g}/\text{g}$  FW), indicating stress-defense adaptation. Essential oil yield varied by site, reaching 0.15% in *Z. lotus* and >0.1% in *P. harmala*.

Overall, these findings demonstrate that native species modulate their rhizosphere and metabolic profiles according to site-specific conditions, reflecting distinct adaptive strategies to cope with semi-arid stress.

**Keywords:** *P. harmala*, *Z. lotus*, secondary metabolites, microbial biomass, enzymatic activities, semi-arid ecosystems

## **Cotyledon orbiculata and Salvia aurea Plant Extracts and Biogenic Nanoparticles: A Biological Assessment of Their Cosmeceutical Potential**

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<sup>2</sup>Department of Science, Technology and Innovation/ Technology Innovation Agency Nanotechnology Platform, Department of Biotechnology, University of the Western Cape, Cape Town, South Africa

### **Abstract:**

*Cotyledon orbiculata* and *Salvia aurea* are medicinal plants used in South African traditional medicine to treat many skin ailments caused by microbial infections and inflammation. We investigated the antimicrobial, anti-inflammatory, immune-modulatory and wound healing properties of the plant extracts and biogenic nanoparticles derived from the extracts. Green synthesis of nanoparticles is considered to be eco-friendly and cost-effective, and in many instances have biological activity that is superior to that of the plant extract alone. Green nanotechnology also advantageously promotes the sustainable use of medicinal plants as less physical plant material is required to achieve therapeutic results. The antimicrobial activity of the extract and nanoparticles were evaluated against common skin pathogens, while the immunomodulatory activity was determined by measuring the effects on cytokine production. The wound healing activity was then assessed on cell cultures using the scratch assay. Thereafter, the cosmeceutical effects of the biogenic nanoparticles were investigated by assessing their effect on collagen production, as well as their ability to protect cells against oxidative stress. For both plants, antimicrobial activity of the nanoparticles was higher than that of the extracts. The nanoparticles also inhibited cytokine secretion, suggesting significant anti-inflammatory activity. Gene expression analysis demonstrated that the nanoparticles can promote wound healing by activating genes involved in cell proliferation and migration. The nanoparticles also significantly enhanced collagen production and improved cellular resistance to oxidative stress-induced damage. These nanoparticles can therefore be of great importance in the development of new novel cosmeceutical products.



## Traditional Use and Phytochemical Composition of Parasitic Plants: Focus on *Cuscuta* spp.

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### Abstract:

Parasitic plants are a diverse group of flowering plants that obtain some or all of their water and nutrients by attaching to the roots or shoots of other plants through specialized organs called haustoria. They represent about 4,500 species across 20–28 families, including well-known genera such as *Cuscuta* (dodders), *Striga* (witchweeds), and *Orobanche* (broomrapes). Beyond their agricultural importance as pests, many parasitic plants have long been used in traditional medicine for treating inflammation, infections, wounds, and various chronic conditions. Phytochemical studies have revealed that they are rich in diverse bioactive compounds, including alkaloids, flavonoids, phenolic acids, glycosides, terpenoids, and lignans, which contribute to their antimicrobial, antioxidant, anti-inflammatory, and anticancer activities.

The genus *Cuscuta*, or dodders, represents approximately 200 species of shoot holoparasitic plants. In traditional medicine, dodders are also known as a rich source of bioactive compounds, including flavonoids, alkaloids and carotenoids, determining their antioxidant, anti-inflammatory, and hepatoprotective effects. Some species, such as *Cuscuta chinensis* Lam., are widely used in Chinese medicine for enhancing kidney and liver function, improving male fertility, and protecting against neurodegenerative diseases. Additionally, *Cuscuta* extracts have shown potential in modulating the immune system and exhibiting anticancer properties.

In the present study, we investigated the distribution, genetic diversity, antioxidant activity and bioactive compounds in *Cuscuta* spp. in Bulgaria. We established the species-specific profiles of flavonoids and carotenoids, as well as their influence on the antioxidant properties, and suggested their applicability as chemotaxonomical markers. We also found that these phytochemicals are largely influenced by the host range and environmental factors.

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## Phytotherapeutic Potential of *Plectranthus* spp. in One Health Contexts

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### Abstract:

The *Plectranthus* genus, extensively utilized in traditional medicine, represents a rich reservoir of bioactive abietane diterpenoids with significant pharmacological potential<sup>[1]</sup>. This study investigates key lead compounds derived from *Plectranthus* spp., emphasizing their mechanistic roles in cancer therapy.

Among the diterpenoids analyzed, Parvifloron D (ParvD) from *P. ecklonii* and 7 $\alpha$ -acetoxy-6 $\beta$ -hydroxyroyleanone (Roy) from *P. grandidentatus* have demonstrated promising bioactivity<sup>[1]</sup>. A particularly noteworthy derivative, benzoylroyleanone (RoyBz)—a patented compound synthesized from Roy—acts as a PKC-selective activator with potent antiproliferative effects against colon cancer<sup>[2]</sup>. Mechanistic investigations revealed that RoyBz induces apoptosis via a PKC-dependent mitochondrial pathway, positioning it as a novel therapeutic agent.

Functional validation in xenograft mouse models using human colon cancer cells, including PKC $\delta$ -knockdown variants, confirmed the essential role of PKC $\delta$  in RoyBz-mediated tumor suppression<sup>[2]</sup>. Furthermore, metabolic analyses uncovered its impact on glucose metabolism, indicating a potential role in metabolic reprogramming, a critical vulnerability in cancer cells<sup>[3]</sup>.

These findings underscore the therapeutic relevance of *Plectranthus*-derived diterpenoids in cancer drug discovery, highlighting RoyBz as a dual-targeting agent capable of disrupting ATP production and reprogramming tumor metabolism<sup>[2]</sup>. This research reinforces the value of natural products in the development of innovative and sustainable anticancer therapies<sup>[1]</sup>.

## References:

- [1] Bangay, G., Brauning, F. Z., Rosatella, A., Díaz-Lanza, A. M., Domínguez-Martín, E. M., Goncalves, B., Hussein, A. A., Efferth, T., & Rijo, P. Anticancer diterpenes of African natural products: mechanistic pathways and preclinical developments. *Phytomedicine*, 2024,129, 155634.
- [2] Sitarek, P. et al. & Rijo, P. Insight into the Biological Activities of Selected Abietane Diterpenes Isolated from *Plectranthus* spp. *P. Biomolecules* 2020.10.
- [3] Domínguez-Martín, E. M. et al. & Rijo, P. Phytochemical Study and Antiglioblastoma Activity Assessment of *Plectranthus hadiensis* (Forssk.) Schweinf. ex Sprenger var. *hadiensis* Stems. *Molecules* 2022, 27.

## **Alternaria alternata (Fr) Keissl Crude Extract Inhibits HIV Subtypes and Integrase Drug-Resistant Strains at Different Stages of HIV Replication**

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### **Abstract:**

A novel antiretroviral therapy that inhibits many HIV-1 subtypes and drug-resistant variations is required due to resistance development in current ones. Fungal endophytes, such as *Alternaria alternata* secondary metabolites has antiviral potential. Therefore, the purpose of this study is to examine the anti-HIV activities and mode of action of *A. alternata* crude extract against several HIV-1 subtypes and integrase-resistant mutant strains.

The MTT assay was used to measure the cell cytotoxicity at 50% (CC50) of *A. alternata* crude extracts. Site-directed mutagenesis was used to introduce the HIV-1 integrase mutations T66K and S230R. The antiviral activity of various HIV-1 subtypes (A, B, C, and D) and integrase-resistant drug-resistant strains was evaluated using a luciferase-based antiviral assay. Additionally, the inhibitory concentration at 50% inhibition (IC50) and selectivity indices (SI) were computed. The mechanism of action of the *A. alternata* crude extract was evaluated using the luciferase and p24 ELISA-based time of addition test. The relative binding affinities of the discovered bioactive compounds of *A. alternata* against HIV-1 integrase resistant strains (T66K and S230R) were calculated using molecular docking.

The *A. alternata* crude extracts CC50 was 300 µg/mL, showing it was not cytotoxic to cell lines. In all HIV-1 subtypes, including A, B, C, and D, the *A. alternata* crude extract exhibited 100% inhibition. The results demonstrated that the *A. alternata* crude extracts has therapeutic potential. The *A. alternata* crude extract demonstrated a strong anti-HIV-1 activity against integrase strand transfer drug-resistant strains T66K and S230R, with a 0.7265 and 0.8751-fold increase in susceptibility, showing that *A. alternata* crude extract could potentially overcome drug resistance. The crude extract exhibited antiviral action, showing that attachment (88%/ 10.38 pg/mL), reverse transcription (81%, 13.74 pg/mL), integration (65%, 17.74 pg/mL), and proteolysis (9%, 49.32 pg/mL) were inhibited. This suggests that the *A. alternata* crude extract has different compounds that can inhibit HIV replication in different stages. Binding affinity calculations showed that compounds 2,3-2H-Benzofuran-2-one, 3,3,4,6-tetramethyl-, 3-Methyl-1,4-diazabicyclo[4.3.0]nonan-2,5-dione, N-acetyl, Coumarin, 3,4-dihydro-4,5,7-trimethyl-, Cyclopropanecarboxamide, N-cycloheptyl, and Pyrrolo[1,2-a]pyrazine-1,4-dione, and hexahydro-3-(2-methylpropyl)- were found to exhibit promising inhibitions and the antiviral activity may be attributed to these compounds. Binding mechanisms of the identified compounds were found to be due to the synergy of van der Waals forces, hydrogen bonds, and hydrophobic interactions using in silico tools. *A. alternata* crude extract demonstrates strong antiviral activity against HIV-1 subtypes A, B, C, and D and integrase drug-resistance strains. It has been effective in inhibiting various stages of the HIV-1 life cycle.

## **What Do Medical Students Know and Think About Phytotherapy/Phytopharmaceuticals**

**Liselotte Krenn<sup>1</sup>, and Martin Burkart<sup>2</sup>**

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<sup>2</sup>Dr. Schwabe Holding SE & Co. KG, Global Medical Affairs, Karlsruhe, Germany

## Abstract:

Since foundation in 1989, the European Cooperative on Phytotherapy (ESCOP) is engaged as the leading European umbrella organisation of national associations of phytotherapy and herbal medicine. During 37 years, ESCOP promoted phytotherapy on the European level. Many patients are interested in this evidence-based therapy, but medical school curricula have significantly decreased or cancelled teaching this topic. As data about the knowledge and interest of medical students in Europe in this field are scarce, a survey was initiated by ESCOP and the company Schwabe, to get first insight what medical students know and think about herbal medicinal products (HMPs)/phytopharmaceuticals and phytotherapy.

150 students in the last part of their medicine studies were interviewed in three European regions, namely Germany (n=50); Czech Republic, Slovakia, and Hungary (n=50); Italy and Spain (n=50). The quantitative online survey with qualitative elements used a questionnaire translated into the respective languages.

About 70% of all participants indicated at least some knowledge of HMPs/phytopharmaceuticals and phytotherapy and the half of the German students had a favorable position of HMPs/phytopharmaceuticals. In contrast, the agreement with this opinion was only 30% in Italy and Spain and only 22% in third region. The survey resulted in the very important outcome: the interest of the many of participants in learning more about the topic. As reliable sources of information in this field, university courses and seminars with practising physicians were specified. Other very strong and credible sources providing knowledge are scientific organisations, scientific publications, university professors and lecturers.

The results of this survey underline the potential for national and international associations in the provision of relevant education in phytotherapy focusing on therapeutic effects and evidence regarding benefits and risks.

Krenn L., Burkart M. The attitude of medical students concerning herbal medicinal products/phytopharmaceuticals/phytotherapy in different regions of Europe. *Phytomedicine Plus* 2024;4(2), 100525

## Perceived Usefulness Drives TCIM Use Worldwide: A Key Insight for Integration Strategies

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## Abstract:

**Background:** Integrating Traditional, Complementary, and Integrative Medicine (TCIM) into healthcare systems is a global priority. The WHO Global Traditional Medicine Strategy 2025–2034 aims to advance evidence-informed, safe, and effective integration of TCIM to support people-centred and sustainable healthcare. Understanding what drives individuals to use TCIM is essential for developing culturally sensitive and sustainable integration strategies.

**Objective:** To identify the most influential determinant of TCIM utilization and explain its relevance for sustainable, people-centred integration of TCIM practices into healthcare systems.

**Methods:** An overview of reviews was conducted following PRISMA guidelines. Systematic reviews published in Arabic and English between 2005 and 2024 were retrieved from PubMed, Embase, and reference lists. Eligible studies examined determinants of TCIM use across diverse populations and regions. A factor was considered a key determinant if it was consistently reported and conceptually robust across different contexts.

**Results and Discussion:** Sixty-two systematic reviews, representing approximately 2,800 primary studies, were analyzed. Perceived usefulness consistently emerged as the most influential and universal determinant of TCIM use. Regardless of culture or geography, people use TCIM when they perceive it as beneficial—even without formal scientific validation. Perceived usefulness offers a practical lens for guiding TCIM integration. By identifying which modalities communities trust most and the benefits they perceive, health authorities can develop national TCIM policy that reflect real community priorities. Such policy can guide research, funding, and innovation toward safe, trusted, and sustainable integration. Recognizing community preferences enhances satisfaction, strengthens trust, and fosters a more responsive and sustainable healthcare system.

**Conclusion:** Perceived usefulness can serve as a guiding principle for successful TCIM integration. Embedding this concept into policy and service design ensures culturally grounded, trusted, and sustainable health systems that align with people's lived realities.

**Keywords:** Traditional Medicine, Integrative Health, Perceived Usefulness, Health Systems, WHO Strategy

## Preliminary Assessment of the Biological Activity of *Swida iberica* Growing in Georgia

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### Abstract:

This study aimed to evaluate the medicinal potential of *Swida iberica* (Woronow) Pojark. ex Grossh. (syn. *Cornus iberica* Woronow), a thus far unstudied species of small deciduous tree belonging to the dogwood (*Cornaceae*) family and an endemic of the Caucasus. Members of *Cornaceae* have traditional medical use and exhibiting antipyretic, astringent, antidiarrheal, analgesic, and anti-inflammatory properties.

The leaves of *Swida iberica*, collected in eastern Georgia during active flowering, were dried and extracted with ethanol at concentrations of 93%, 70%, and 50% under continuous shaking for 2 hours each. The obtained extracts were joined, concentrated and subsequently delipidated with hexane, yielding a hexane fraction. The ethanolic extract was separated by column chromatography on Diaion HP-20 resin (density 1.01 g/mL). The antiviral, cytotoxic, anti-inflammatory, antimicrobial and antioxidant activity of obtained fractions was evaluated based on *in vitro* tests.

*Swida iberica* has demonstrated notable biological activities. The 30% and 100% methanolic fractions have shown noteworthy antiviral activity with total survivability of keratinocytes treated with HSV-1. The 30% methanolic fraction exhibited moderate cytotoxic activity against DLD-1 cells in both *Hoechst* and *Resazurin* assays, without significant toxicity toward normal skin fibroblasts (WS-1). The hexane extract, ethyl acetate fraction, the 30% and 100% methanolic fractions demonstrated strong anti-inflammatory activity, with nitric oxide (NO) inhibition greater than 90%. The 50% methanolic fraction showed moderate antifungal activity against *C. albicans*. The 50% and 100% methanolic fractions showed high antioxidant activity in the normal skin fibroblasts-based model, with the former's activity (IC<sub>50</sub> 0.5 ± 0.1 µg/mL) exceeding that of quercetin. All methanolic fraction have shown considerable antioxidant activity in the ORAC assay.

Overall, the activities, demonstrated by the *Swida iberica* extracts and fractions, indicate a promising source of biologically active compounds.

**Acknowledgement:** The study was supported by the Shota Rustaveli National Science Foundation of Georgia (Project: # FR-24-4028).

## Production of Medicinal and Secondary Metabolite-yielding Plants in Controlled Environments ('Vertical Farming')

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### Abstract:

The increasing global demand for herbal medicines, in conjunction with increasing environmental pressures, climate change and heavy reliance on wild harvesting, poses significant challenges to the sustainable supply of high-quality herbal raw materials. A significant proportion of the world's medicinal plants are still sourced from wild populations. The overexploitation of these resources poses considerable ecological risks and leads to uncertainties regarding quality and availability. Climate change, land scarcity and increasing regulatory requirements are posing challenges to conventional cultivation methods.

The presentation analyses the potential of vertical farming systems (VFS) as an alternative form of production for secondary metabolite-producing plants. The VFS enables location-independent, controlled, year-round cultivation under defined environmental conditions. Precise regulation of light, water, nutrients and climate parameters enables specific influence on yield, active ingredient content and product quality. In addition, the adoption of these practices has the potential to mitigate the risks associated with pollutants, contamination, and crop losses due to plant diseases and pest infestation. The technology also creates new potential for the breeding, standardization and traceability of plant-based raw materials.

The opportunities and limitations of this form of production along the entire value chain – from plant breeding and cultivation to pharmaceutical use – are discussed. In addition to technological and economic aspects, ecological effects, regulatory framework conditions and current research needs are also addressed.

The potential of vertical farming, particularly for the cultivation of high-quality medicinal plants that require standardization, is significant. However, the current limitations of this method are attributed to high investment costs and energy requirements, as well as a need for further practical experience in the field.

In conclusion, while vertical farming is a promising innovation, it is presently not a complete replacement for existing production systems.

## Bridging Gaps in Natural Product Drug Discovery: Advanced Tools for CNS Pharmacology

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### Abstract:

Bridging critical gaps in natural product drug discovery requires integrated strategies that connect bioactive constituents with their molecular mechanisms and central nervous system (CNS) effects. A key challenge lies in the rapid identification of lead compounds, clarification of their pharmacological targets, and understanding their mechanisms of action within complex biological systems. Application of mass spectrometry-based metabolomics helps to create a powerful platform for linking bioactivity with specific constituents. LC–MS/MS-based targeted metabolomics will be discussed as a robust approach for assessing bioavailability, pharmacokinetics, and neuropharmacological effects, including alterations in amino acids, lipids, and neurotransmitter profiles. Advanced separation techniques, particularly countercurrent chromatography, will be highlighted as efficient tools for isolating bioactive molecules from complex plant matrices. This lecture will address these challenges by emphasizing how the integration of advanced analytical technologies, innovative separation methods, and complementary biological models can bridge existing gaps in natural product research and accelerate CNS drug discovery.

## Harnessing Nanotechnology to Improve Plant-based Cancer Therapies

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### Abstract:

Plant extracts serve as vital sources of bioactive agents that combat cancer by modulating various molecular pathways essential for tumor growth. An estimated 60% of approved anticancer drugs originated from natural sources, which include plant extracts. The clinical potential of crude plant extracts and their derived bioactive compounds is frequently limited by challenges such as poor aqueous solubility and limited absorption. Plant-derived nanoparticles (PDNs) may offer significant therapeutic advantages over crude extracts by overcoming these limitations. PDNs are composite materials that form through the interaction and combination of natural phytochemicals (like polyphenols, flavonoids) with metal ions. PDNs often exhibit enhanced biological activity compared to the crude extracts they are derived from. We explored the use of several indigenous South African medicinal plants and nanoparticles derived from these plants as a strategy for enhanced anticancer activity. Our results demonstrate that nanoparticles derived from *Cyclopia intermedia* (Honeybush) show a significant synergistic cytotoxic effect when combined with conventional chemotherapeutic agents, including doxorubicin, cisplatin, and vinorelbine. Gene expression profiling revealed that these nanoparticles sensitize cancer cells by upregulating pathways involved in apoptosis, autophagy, and oxidative stress. Furthermore, we found that nanoparticles derived from *Sutherlandia frutescens* (Cancer Bush) and *Salvia aurea* (Brown Sage) significantly enhance the effector functions of NK-92 natural killer cells. In co-culture models, these nanoparticles activated NK-92 cells, leading to targeted lysis of malignant cells. These findings highlight PDNs as a promising platform for novel cancer treatments that combine targeted drug delivery advantages with potent immunomodulatory and chemo-sensitizing effects, suggesting significant potential for improved clinical outcomes.

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### Abstract:

**Introduction:** The use of Traditional, Complementary and Integrative Medicine (TCIM) among cancer patients in Latin America ranges from 50% to 90%, yet these practices are rarely discussed with healthcare professionals. Herbal medicine and natural products are among the most commonly used approaches. Brazil and other Latin American countries have increasingly incorporated integrative oncology programs within medical institutions and national health policies. At the same time, the region holds exceptional biodiversity with strong potential for discovering new bioactive compounds relevant to cancer care.

**Methodology:** This study integrates evidence from systematic reviews, evidence gap maps, clinical trials, and ethnopharmacological studies conducted in Latin America. Data were compiled from collaborative initiatives between the Brazilian Academic Consortium for Integrative Health (CABSIN), BIREME/PAHO/WHO, and international research networks, which produced 28 evidence maps based on more than 2,000 systematic reviews assessing over 460 TCIM interventions and 320 outcomes were analyzed alongside clinical and preclinical studies on medicinal plants.

**Results:** Evidence mapping suggests promising effects of certain integrative therapies for cancer-related symptoms, including improvements in quality of life, fatigue, pain, and treatment-related side effects. Moderate to high confidence evidence supports the use of *Viscum album* and *Panax ginseng* for specific outcomes. Studies on Latin American plants demonstrate cytotoxic and antioxidant activities, with compounds such as  $\beta$ -lapachone showing potential antitumor effects. Clinical studies also suggest that *Paullinia cupana* (guarana) may reduce chemotherapy-related fatigue, while *Uncaria tomentosa* (cat's claw) shows safety and potential supportive benefits in advanced cancer patients. Ethnopharmacological studies report over 300 medicinal plants used for cancer-related conditions in Mexico and 84 plants in Brazil.

**Discussion:** Despite promising findings, most studies remain preclinical, and high-quality clinical trials are limited. The region's vast biodiversity—particularly in Brazil, which hosts nearly 19% of global flora—represents a major opportunity for novel therapeutic discoveries.

**Conclusion:** Strengthening international collaboration, funding, and multicenter clinical research is essential to translate Latin America's biodiversity and traditional knowledge into evidence-based integrative oncology innovations.

## Applications of Dry Needling in the Management of Myofascial Pain: Summary of Findings from Four Clinical Studies

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### Abstract:

**Purpose:** This series of studies aimed to evaluate the effectiveness of dry needling (DN) in the management of myofascial pain, with particular emphasis on different application techniques (multiple insertion – Hong method, sustained insertion), the combination of DN with other interventions (manual therapy), and safety analysis in both athletes and patients with pain disorders.

**Methods:** The research included randomized clinical trials and a cross-sectional study, involving several hundred participants—both athletes (e.g., MMA fighters, combat sport practitioners) and patients with chronic neck pain. Measurements included biomechanical parameters (muscle tone, stiffness, elasticity), maximal strength, tissue perfusion, pressure pain threshold (PPT), range of motion, and the incidence and type of adverse events. In one study, the influence of the local twitch response (LTR) on treatment outcomes was also assessed.

## Results:

- **Technique comparison:** Sustained insertion (GS) led to greater reductions in muscle tone and stiffness, higher PPT, and better tolerance than the Hong method (GH), which showed more minor adverse events.
- **DN combined with manual therapy:** The combination significantly outperformed manual therapy alone in improving PPT, tone, and stiffness in athletes with acute neck pain, although no advantage was found for maximal strength or range of motion.
- **Effects in MMA athletes:** A single DN session targeting the flexor carpi radialis significantly improved perfusion, elasticity, PPT, and grip strength compared to placebo, with effects lasting up to 48 hours.
- **Safety:** The most common mild adverse effects were pinpoint bleeding, pain during or after treatment, and bruising. Serious complications (e.g., pneumothorax, nerve palsy) were very rare (<3%) and mainly associated with needling in high-risk anatomical regions.

**Conclusions:** DN, particularly sustained insertion and in combination with manual therapy, is an effective method for reducing myofascial pain and improving muscle biomechanical properties and perfusion. The presence of LTR may enhance selected effects, especially in perfusion and maximal strength. The procedure has a high safety profile when patient selection and correct technique are observed.

## Practical implications:

- Technique selection should be individualized—sustained insertion may be preferred for patients with low pain tolerance or higher risk of adverse effects.
- Incorporating DN into comprehensive physiotherapy (e.g., with manual therapy) may accelerate return to sport.
- Monitoring and reporting adverse events should be a standard part of clinical practice.

## References:

1. Trybulski R, Kuźdźał A, Stanula A, et al. *Comparing multiple versus sustained insertion dry needling therapy for myofascial neck pain: a randomized controlled trial.* Ann Rehabil Med. 2025.
2. Kuźdźał A, Clemente FM, Klich S, et al. *Combination of Manual Therapy and Dry Needling Effectively Improves Acute Neck Pain and Muscular Tone and Stiffness in Combat Sports Athletes: A Randomized Controlled Study.* J Sports Sci Med. 2024;23:852-862.
3. Trybulski R, Kuźdźał A, Stanula A, et al. *Biomechanical Profile after Dry Needling in Mixed Martial Arts.* Int J Sports Med. 2024. doi:10.1055/a-2342-3679.
4. Trybulski R, Kuźdźał A, Kiljański M, et al. *Adverse Reactions to Dry Needling Therapy: Insights from Polish Physiotherapy Practice.* J Clin Med. 2024;13:7032.

## Evaluation of Antibacterial Effect of Five Essential Oils Against Nosocomial Multidrug Resistant *Pseudomonas aeruginosa* Strains, Isolated from Sick Patients in a Third Level Hospital Located in Norte de Santander, Colombia

**Raquel Amanda Villamizar Gallardo**

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### Abstract:

*Pseudomonas aeruginosa* is an opportunistic pathogen with a notable capacity to develop mechanisms of resistance to multiple antibiotics, leading to difficult-to-treat infections and increased mortality. It is classified by the WHO as a high-priority bacterium. Therefore, the search for new alternatives, such as essential oils, is positioned as a novel therapeutic option to address this problem. The main objective of this study was to evaluate the antibacterial effect of five essential oils as green agents capable of eliminating the growth of multidrug-resistant nosocomial strains of *P. aeruginosa*. Methodologically, this research is experimental, with a mixed approach and descriptive and correlational scope. *Pseudomonas aeruginosa* strains were obtained from men and women hospitalized in surgical wards (orthopedics, plastic surgery, and vascular surgery) treated at a tertiary hospital located in the department of Norte de Santander, Colombia, and were characterized by using standard microbiological methods and automated test Vitek 2\* (Biomeriux). Antibacterial susceptibility was evaluated using the broth microdilution technique, following the guidelines of the Clinical and Laboratory Standards Institute (CLSI) according to its documents M07 - Ed12 and M100-Ed35 with some modifications. Instead of using antibiotics, essential oils were the inhibitory agents (i.e. quick relief, rosemary, eugenol, anise, and eucalyptus). Preliminary results have allowed to identify three strains of *Pseudomonas aeruginosa* resistant to quinolones, fourth-generation cephalosporins, and carbapenems. In addition,

it was determined that the essential oils of eugenol and anise exhibited greater efficacy in inhibiting bacterial growth, with an MIC of 32 µg/mL for all the multidrug-resistant strains tested. This leads to the conclusion that there is a latent public health problem, since this nosocomial bacterium was mainly affecting patients with long periods of hospitalization. In addition, it can be state that essential oils are an effective and eco-friendly alternative for controlling multidrug-resistant strains. However, more research is required before scaling from lab to a clinic application.

## Venue:

### Novotel Phuket Resort

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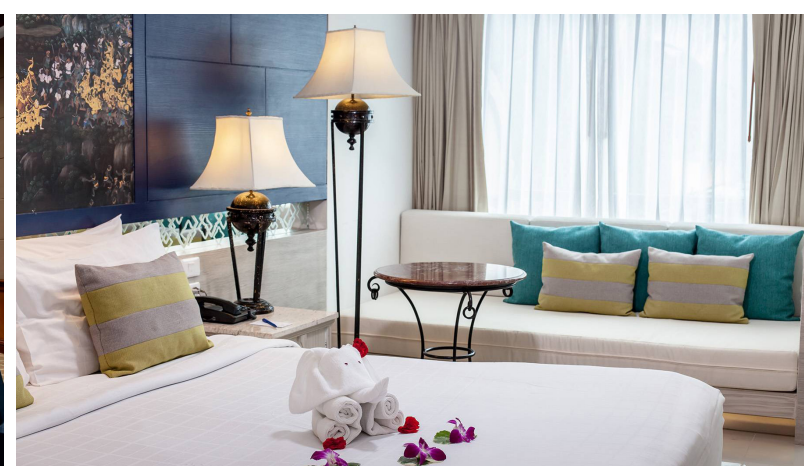
**Phuket, Thailand** is a world-renowned tropical destination known for its stunning beaches, crystal-clear waters, and vibrant cultural charm. Famous for places like Patong Beach, the Old Phuket Town, and nearby islands such as Phi Phi and James Bond Island, Phuket offers a perfect blend of natural beauty, adventure, and relaxation. With its rich Thai heritage, lively markets, delicious cuisine, and warm hospitality, Phuket is an ideal location for both memorable travel experiences and international gatherings.

### Weather

In April, Phuket is hot and mostly dry, with temperatures around 30-34°C and occasional light rain. The sea is warm and calm, perfect for beach activities. It's a great time to visit, with plenty of sunshine and moderate humidity.

## Best Tourist Attraction in Phuket, Thailand

- **Big Buddha** - 45-meter tall statue offering panoramic views of Phuket.
- **Patong Beach** - Popular for water sports, nightlife, and Bangla Road.
- **Phang Nga Bay & James Bond Island** - Known for dramatic limestone cliffs and sea cave kayaking.
- **Phi Phi Islands** - Famous for Maya Bay, snorkeling, and scenic boat tours.
- **Wat Chalong** - Most important Buddhist temple on the island.
- **Phuket Elephant Sanctuary** - Ethical elephant experiences in a natural habitat.
- **Old Phuket Town** - Colonial architecture, vibrant markets, and street art.
- **Promthep Cape** - One of the best sunset viewpoints in Phuket.
- **Similan Islands** - Top-rated destination for diving and snorkeling (seasonal).
- **Phuket FantaSea** - Cultural theme park with live shows and family-friendly fun.





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